The Sustaining Base – How Significant are the Shortcomings?

A Monograph
by

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This monograph examines the impacts that shortcomings in the capacity of the United States industrial base, to provide surge production of essential equipment, will have on operational commanders. The increasing size, complexity and technological sophistication of armies and their weapon systems has increased the importance of the sustaining base. Although the industrial capacity and natural resources of the U.S. were significant to the success of the Allies in past conflicts, the complexity of today's weapons and weaknesses in American business make support for the next conflict a matter of concern.

The strength of the industrial base has been affected by weaknesses in the economy and by bureaucratic complexities in the system to supply Government materiel.

At the strategic level, the U.S. must give attention to the needs of the industrial base. Secondly, the U.S. must continue to develop relations with aligned nations in order to supplement our industrial capability. Finally, national leaders must support operational commanders who must rapidly apply overwhelming force to any conflict in which the country is involved.

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ABSTRACT

THE SUSTAINING BASE - HOW SIGNIFICANT ARE THE SHORTCOMINGS? by LTC Ernest R. Rogers III, USA, 52 pages.

This monograph examines the impacts that shortcomings in the capacity of the United States industrial base, to provide surge production of essential equipment, will have on operational commanders. The increasing size, complexity and technological sophistication of armies and their weapon systems has increased the importance of the sustaining base. Although the industrial capacity and natural resources of the United States were significant to the success of the Allies in past conflicts, the complexity of today's weapons and weaknesses in American business make support for the next conflict a matter of concern.

The importance of the industrial base and its relevance to the operational commander was illustrated in the American Civil War, World War I, and World War II. The historical examples establish the premise that the nation which is better prepared to support its forces will be successful in war. Each example demonstrates a slow start of a strong industry to support the armed forces, sharing the industrial burden with allied nations, and operational commanders implementing innovative solutions to materiel shortages, or delaying operations when necessary.

The strength of the industrial base has been affected by weaknesses in the economy and by bureaucratic complexities in the system to supply Government materiel. Specific deficiencies include lack of modernized equipment, departure from the industry of many smaller secondary item producers, and decreasing productivity. Also affecting industrial support is the complexity of current equipment, which is difficult to produce, and competition from foreign competitors, which weakens domestic suppliers. These weaknesses are cause for concern in a protracted, global war; however, regional conflict, which the armed forces are capable of executing with equipment on hand, is more likely.

The analysis shows that operational commanders can expect to start with a full complement of equipment, including war reserves, but planning cannot include a resupply of major items. Thus, in preparing for conflict, they should seek to prestock equipment, take precautions to preserve their fighting power, and quickly apply overwhelming strength in order to take advantage of the synergistic effect of available weapons and avoid incremental employment. When the operational commander is faced with shortages of equipment, he must be innovative. He must find alternate means to accomplish desired ends, resequence operations or delay until means are available.

At the strategic level, while the U.S. must give attention to the needs of the industrial base, it would not be wise to pour national assets into building a sustaining base that can stand alone in support of all contingencies. To expend a large portion of the gross national product on the maintenance of a robust industrial base detracts from other sectors of the economy. Secondly, the United States must continue to develop relations with aligned nations in order to supplement our industrial capability. Finally, national leaders must support operational commanders who must rapidly apply overwhelming force to any conflict in which the country is involved.

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INTRODUCTION

The national security strategy of the United States is designed to employ the power of the country to protect the safety of the nation, its citizens, and its way of life. A key element of the current strategy is to maintain industrial capability that is capable of producing the military material required by the nation's armed forces. The strategy calls for an industrial base that is strong, flexible, and technologically advanced to produce essential material and to deter potential enemies. A strong industrial base contributes to national security by demonstrating that we can meet our obligations to allies as well.

The national military strategy supports the national security strategy and both are aimed at attaining the vital interests of the country. Decisions and policy contained in these strategies related to management of the industrial base, impact on the operational commanders who are executing the military strategy. This monograph will explore the impact of strategic decisions at the operational level. The strategic decisions have a significant effect in determining industrial base capabilities which in turn effect the operational commander.

Until the presidency of Ronald Reagan, each administration since Truman's had placed less and less emphasis or resources on planning for industrial mobilization.[1] Under the Reagan administration, the industrial base benefited from the increased emphasis on defense . Increases in military spending levels made the defense industry more attractive. Consequently, there were a higher number of defense suppliers. The Reagan program included the appointment of industry and

defense experts, committed to revitalize industrial base programs, to key positions. In spite of the progress attained, shortcomings remained. The challenges of the industrial base are fluid; suppliers have gone out of business, and new deficiencies have developed. The abilities and inabilities of the industrial base to provide essential materiel will have impacts on the operational commander. What the impacts are will depend, at least in part, on the nature of the future conflict and the demands placed on industry.

The importance of the industrial base and its relevance to the operational commander is illustrated by the role of industry in the American Civil War, World War I, and World War II. In the Civil War, the industrial strength of the north and weaknesses of the south created options and restrictions for the respective operational commanders. Northern commanders were able to fight a war of attrition while commanders of southern forces felt compelled to avoid battles of attrition and seek victory through a quick stroke. American industry was not prepared for World War I and American forces used British and French equipment early in the war. For the most part, United States industry was not ready for war when World War II started. However, there was time for the production base to mobilize and when the industrial base achieved production increases, the output was monumental and earned America the title of the "arsenal of democracy." In spite of the performance of industry, not all required materiel was always available because the quantities of supplies and equipment requested was so great. The strategy to fight in Europe first and then in the Pacific was strongly influenced by the availability of equipment and the operational commanders were faced with shortages that affected operational plans.

The response of the industrial base to demands for increased production to support an anticipated or actual conflict is incremental. The first increment of increased production, surge production, is followed by partial mobilization then full and total mobilization. Each increment, beginning with surge, requires the application of a greater portion of the industrial base than the preceding increment. Except for the term surge, the preceding levels are defined in The Army Mobilization and Operations Planning System (AMOPS) Volume I: System description, responsibilities and procedures.

Industrial surge is the first level of industrial response and is the inherent capacity to increase production without new facilities or equipment. Surge is accomplished by lengthening the workday, by adding workdays to the week, and by adding work shifts.[2] Surge can include almost any expansion of production.

Partial mobilization is an expansion of the armed forces by Congress, through activation of some reserve component units that for industry would necessitate some production increases and might require opening new production facilities to sustain. There is no concomitant reduction of goods and services available to the civilian sector during partial mobilization. Based on the high levels of defense spending, American industry has been described as producing at partial mobilization levels since the end of World War II. Certainly, industry was producing at partial mobilization levels during the Korean and Vietnam conflicts.[3]

Full mobilization includes expansion of the industrial base production to support an expansion of the armed forces directed by Congress that includes activation of all reserve component units as well

as individual ready reserves and retired military personnel. Full mobilization is a transitory phase to total mobilization.[4]

Expansion of the armed forces to levels required to fight a global war is total mobilization and includes generation of new units from the civilian sector and the commensurate expansion of the industrial base necessary to support the expanded force. This is a total commitment by the nation and might include placing federal needs above public needs, retooling peacetime production lines to produce military material, building new plants and production lines, and diverting people from other industries.[5]

The response of the industrial base to increased demands of the military services is to surge to meet the needs. Industrial mobilization transforms peace time industry to a war time footing upon declaration of a national emergency by the President. Without declaration of a national emergency, industry can support the increased demands of the military by surging within existing facilities. Surge capacity can expand to meet almost any need when it is in the best (profit motivated) interests of the supplier. On the other hand, mobilization at any level is driven by congressional mandate and will be accommodated even if profit potential is unclear. Replacement of weapons lost by allies or support for U.S. active, standing forces will normally be accomplished by surge production. That is, if the armed forces are not expanded by mobilization, industry will not be mobilized.[6]

Recent in-depth analyses of defense industrial capabilities and ongoing actions and statements by the Department of Defense provide some insight into potential shortcomings. The analyses indicate that industry may be incapable of providing the materiel necessary to sustain

the armed forces in conflict. However, the determination of true requirements is problematic. There are many variables which affect the amounts of materiel a supported force will require. Perhaps the most significant of the determining factors is the nature of the future conflict.

If the analysts have made an accurate assessment of surge or mobilization capability and military requirements do exceed the capacity of the industrial base, the armed forces will operate with a strategy that reflects the differences and the operational commanders will be forced to devise methods of warfighting with less than the optimum amounts of materiel.

The impact of industrial base shortcomings will be examined in light of the effect on combat capability , and the ability of the operational commander to accomplish the desired ends using means that are available. Indicated differences between requirements and production capability will be mitigated by the potential for alternative sustaining bases, the anticipated duration of conflict, the available backlog of stocks, and the ability of the operational commander to determine and execute alternate means to accomplish missions in light of the shortcomings

In his *1990 Annual Report to the President and the Congress*, Secretary of Defense Cheney described the importance of a strong industrial base and its essentiality to the strength of the nation's defense. He cited the vast natural resources of the country, sophisticated manufacturing capability, and well educated citizenry, available to man both the military forces and the sustaining base in an emergency, as significant contributors to the military strength of the United States.[7] The importance of a strong industrial base is

reinforced by Yale historian Paul Kennedy, author of *The Rise and Fall of the Great Powers.* Kennedy indicated that in order to be a great power, the U.S. must have a flourishing economic base because a nation must be able to go to war if it becomes necessary. Kennedy also cautioned that even in light of this requirement for a manufacturing base that is capable of supporting the country's military requirements, there is a danger that drawing off too much of the economic energy and producing military equipment will weaken the economy by supplanting the production of consumer goods. Thus, there must be a balance in the manufacturing sector between defense and non defense production to allow growth in the economy while providing adequate defense materiel.[8] Kennedy also provides a more basic function of industry in concluding that in any protracted conflict between powers or coalitions of powers, the side with the more flourishing production base has consistently been victorious.[9]

National strategic decisions are made and national strategy is formulated from the considerations of balancing defense and non defense spending and production. After the national security strategy is formulated, the national military strategy which supports it is then determined. Within the stated military strategy, the operational commander is limited by what the strategy is and by what materials the industrial base can provide. This relationship and the impact of industrial capability can be illustrated by historical example.

II. HISTORICAL EXAMPLES

The relative strengths of the industrial bases of the opposing sides in the American Civil war were a significant consideration for

each side in determining strategy and the operational concept. The literature about the period establishes that the bulk of the industrial and manufacturing capability of the United States before the Civil War was in the northern states. Therefore, when the southern states seceded from the union, the amount of industrial power in the northern and southern states was unbalanced in favor of the north. Because northern commanders had a more extensive and robust industrial capacity producing supplies and materiel, they had more options than did commanders for the southern forces. Conversely, southern commanders, supported by a more limited industrial base were forced to operate in the face of materiel shortages. In order to compensate for the limitations in its industrial base the south needed to gain recognition of foreign governments.[10] It was essential for Confederate commanders to consider the need for recognition, one result of which would be industrial support from outside the continent.

When the Union Army initiated its rapid expansion from about 16,000 to 800,000 men, northern industry was not prepared to expand at the rate necessary to supply the required arms, ammunition, clothing, and equipment. Even with major industrial production capability in New York, Philadelphia, Pittsburgh, Cincinnati, and Boston, domestic industry could not immediately supply all of the necessary materiel. Supplemented by foreign industry and an aggressive procurement program-- chiefly for clothing, individual equipment and munitions-- the industrial base expeditiously accommodated the needs of northern commanders.[11] The Quartermaster General of the Union Army recognized that industry was not capable of equipping the Union forces and implemented a procurement system to obtain equipment beyond the capability of industry. He later stated that a mobilization of the

scale accomplished by the north had not been previously accomplished and could not have been without the procurement program.[12]

As a country, the Confederate States of America had a weak industrial infrastructure and depended more on imports from other countries than would be expected of similarly sized nations.[13] This potential weakness had strategic implications for Union commanders and contributed to the development of the concept to blockade the south in order to exploit southern resupply deficiencies. The ability of northern industry to equip and supply the Union Navy made the strategy possible. The superiority of the northern material resources and industrial capacity also contributed to an expectation on the part of Union soldiers that they would be provided personal equipment, arms, and ammunition. Providing the expected standard of living to the huge Union Army placed significant demands on the northern industrial base and contributed to the morale and capability of the forces employed by Union commanders.[14]

The superior resources of the northern forces and the advantage they had over Confederate forces influenced General Grant's campaign plan after he became commander of the Union forces. Buttressed by his materiel advantage, General Grant was able to pursue a strategy of annihilation in the spring of 1864. His objective was to destroy the Confederate armies by pursuing them relentlessly and pressing them at every turn. His instructions to his subordinate generals, Meade and Sheridan, were to go wherever Confederate forces went. The instructions were carried out by Meade, in Virginia against General Lee's army, and Sheridan, in the Shenandoah Valley against General Early's Confederate Force.[15]

In 1864 similar instructions to General Sherman also sought to improve the industrial and material advantage of the north over the south by destroying the "war resources" of the confederacy in the interior of the south. This attack on the industrial base was an innovative operational concept. The objective was to attack key portions of the industrial base and reduce the ability of the enemy to continue the fight. While the march through the south and destruction of infrastructure along the route was partially motivated by the effect it had on morale and the population, it was also a continuation of the north's attack on the Confederate industrial base. General Sherman's successes contributed to a generally shared opinion among the Union high command that an attack on infrastructure had great potential.[16]

During Grant's Vicksburg campaign, after Union forces had taken Jackson, Mississippi, he and General Sherman went together into one of the city's factories which was producing bolts of cloth for the Confederacy. After observing the women working in the factory for a short time, Grant had them removed and the factory destroyed in order to prevent further production.[17]

The effects of industrial shortcomings in the north and to what extent they hampered northern operational commanders in executing their plans might have been significant if they had to depend solely on the industry of the Union. However, the effect of industrial shortcomings was insignificant because the shortcomings were offset by a thorough and effective foreign procurement program until northern industry was producing at full capacity in 1863.[18] The relative advantage in ability and capacity to manufacture military material enjoyed by the north played an important role in shaping the strategy, impacted on the operational commanders charged with executing the strategy. General

Grant's operational plan included attacking the Confederate war-making capability. Missions given to subordinate commanders reflected General Grant's intent.

Conversely, the relative and real shortcomings of the industrial base in the south had significant impacts on operational commanders of the Confederacy. As previously stated, the Southern Confederacy was more dependent on outside supply sources than was to be expected. Given the large land mass of the south, it should have been able to supply itself. In addition, the shortcomings became more acute as the war proceeded. By 1863, when industry was making supplies plentiful for Union commanders, Confederate commanders were faced with growing shortages of almost everything. This situation was exacerbated by the losses of successive battles as Confederate commanders were increasingly affected by growing supply problems emanating from deficiencies in factories, farms, and distribution.[19]

In his first field campaign with the Confederacy, General Robert E. Lee experienced the impact of the south's inadequate industrial base. After Union forces attained a deep penetration into western Virginia, General Lee conducted a campaign to push them out. The inability of Confederate logistics to support his operations to regain the lost territory in western Virginia or to force the federal units to withdraw was the basis of his failure.[20]

In seeking a means to overcome the industrial shortcomings faced by the confederacy, General Lee pursued a strategy of operational maneuver warfare. At the Second Battle of Manassas, through brilliant maneuvering, he gained advantage over the Federal forces and defeated them decisively. Between late June 1862 and the end of August, after Second Manassas, Lee forced the Federal units to withdraw from positions

overlooking Richmond back to Washington. Again, Lee was hampered by the inability of his industrial base to provide materiel support and the consequent supply shortages in his units. The Confederates had not destroyed the Union army in this action and while Confederate losses were fewer than Union losses, they were greater than Lee could continue to absorb. Had a robust industrial base been providing supplies and materiel, his Army would have been better equipped and capable of continuing to press the Union forces. Consequently, while he was not strong enough to assault the prepared defenses around Washington, he believed he could not go passively to the defense, risking further attrition. Lee believed that his only option was to invade Maryland. He began this offensive in spite of being short of arms, ammunition and equipment.[21] By doing this, he hoped to achieve operational success through a campaign of maneuver and convince Maryland to join the Confederacy and the north to recognize Confederate independence. It was his hope to do this and avoid excessive losses without placing undue strain on his support base.[22]

During the campaign in Maryland, Lee was hampered by fatigue among his soldiers, reluctance to invade the north on the part of many Confederates and by a weak supply system. He was forced to continue the campaign in spite of having no real prospect of destroying the Union army with a good chance that his own would be destroyed.[23] The Confederates could not afford to abandon the invasion. Abandonment would affect the credibility of the Confederacy and damage their chances for recognition by foreign governments. Recognition was more important to the Confederacy because of the inability of the industrial base to support them without outside assistance. The culmination of the Maryland invasion was the battle of Antietam which resulted in Lee and

his Army withdrawing back into Virginia. While Union losses during the Maryland campaign exceeded those of the Confederates, the battle of Antietam and the Maryland campaign are viewed as the turning point in the Civil War in favor of the Union.[24] It was a course of action that was forced on Lee at least in part in an attempt to overcome weaknesses in his industrial base.

In the west, southern commanders were not only attempting to overcome weaknesses in the industrial base but were directly defending it.[25] Union operations in the west threatened first the primary grain and meat producing state of Tennessee, then the mining, industrial and munitions producing resources in Georgia and Alabama, and finally the industrial center of Atlanta. Southern operations were marked by changing strategies in the west as General Albert Sidney Johnston initially defended Tennessee in a thinly spread passive defense, attempting to hold decisive ground. After most of the critical logistics assets in Tennessee were lost, General Johnston switched to a strategy of concentrating and counterattacking to repulse the Union forces. The Confederates again changed strategies and changed commanders in an attempt to save their industrial strength from Union capture and destruction, and to husband scarce resources. In 1863, General Joe Johnston was the Confederate commander. He adopted an operational concept of defense through maneuver. He avoided decisive engagement, kept his forces sufficiently concentrated to inflict damage on Union forces, and succeeded in slowing the union advance. General Johnston did give ground when it was necessary to conserve forces and continue the defense. His operations required space in order to continue to succeed. The space that he needed was eventually gone because he had withdrawn until his forces reached the valuable

industrial resources he was protecting and could give no more ground. While his defense was successful in delaying the Union advance, popular support in the north to continue the war was waning. By 1864, the Confederacy ran out of space and was forced to abandon this successful concept. General John Bell Hood was placed in command and with no maneuver room, waged a campaign of attack in order to protect the threatened logistics base of the south. Attacks at Peachtree Creek, Atlanta, and Ezra Church resulted in massive Confederate losses and the eventual fall of Atlanta.[26] Had these industrial resources not been so critical to the Confederacy, they would not have had to change commanders and strategy. They could have continued what had been a successful defense, giving ground for time.

Throughout the Civil War, Confederate commanders were forced to operate with inadequate equipment and a shortage of essential materiel, arms, and munitions. They were forced to undertake operational campaigns designed to protect their limited industrial base and attempt to overcome the shortcomings. In the east, General Lee attempted an offensive campaign to achieve a decisive victory and overcome materiel shortages. In the west, General Johnston was forced to abandon what had been a successful concept and revert to a desperate attempt to protect the southern industrial center.

World War I was to be more dependent than the Civil War on mechanization. Industrial support was complicated by this mechanization as well as oceanic separation of the conflict and the sustaining base.

During World War I, demands on the industrial base of the United States were complicated by the physical separation of the industrial base from the conflict, by increased sophistication of equipment and materiel, by increased quantities consumed by larger forces, and by the

necessity to coordinate production with other nations. During World War I the sophisticated weapons and machines had greater bearing on the outcome than any previous conflict.[27] Equipping and supporting American forces was a combined effort of British, French, and American industry. The American Expeditionary Force initially crossed the Atlantic ocean on British transports and during the war they used French tanks, artillery, and ammunition.[28] Whatever operational implication this had for General Pershing, commander of the American Expeditionary Force, and his subordinate commanders, it was a training challenge to be overcome before operations commenced.

American industry was not required to start supporting U.S. forces without prior preparation. Industry was able to prepare by initially supporting allied forces before the United States entered the war.[29] In spite of this head start, U.S. industry had not yet had a major impact on the war effort when the armistice was signed. The industrial base was expanding rapidly and would have taken one or two more years to be an important factor in the success of the allies. There were 23,000 tanks on order from American industry and only 76 had been completed when the armistice was signed.[30] This slow mobilization was not a failure of industry to expand production, but was caused by a weakness in planning and a lack of central control at the national level. It did not matter whether mobilization delays were caused by industry or government delays, the result was the same, delays in material being provided to military forces.[31]

The importance of industrialization and sophistication of weapons during the World War I was evident on the western front where rifled barrels and the machine gun prevented movement and resulted in a stalemate with neither side able to achieve any real success. This

stalemate situation created a role for tanks to protect the infantry and create gaps that infantry could advance through.[32] Thus, the stalemate and the requirement for sophisticated weapons required to break it made the operational commander more dependent than ever before on his industrial base.

When the United States entered World War I, the German U-boat campaign was achieving significant success at preventing material from being delivered to Great Britian. In the fight for command of the seas, Great Britian was losing ships two and a half times faster than the industrial base could replace them. One reason for the success of German submarines was the U.S. strategic decision to build battleships instead of destroyers which could be used to protect shipping. To overcome this problem, Rear Admiral William S. Simms devised an operational solution. He organized merchant shipping into escorted convoys, a technique which proved to be highly successful. Placing merchant ships in convoys not only required fewer escort ships but reduced the number of targets susceptible to detection by German submarines.[33]

The German commanders in World War I were also constrained by what their industry could provide. They had less industrial capability than the allies arrayed against them and knew that with a less extensive industrial base, they would be unable to win a war of attrition, thus they devised tactics which would minimize attrition and allow them to fight and win using maneuver. They attacked by infiltrating Allied lines and by bypassing Allied units in order to avoid the devastating losses associated with direct assault. The German defense was positioned in depth, which invited penetrations to be counterattacked, again avoiding direct confrontation. Both the offensive and defensive schemes

were designed to preserve resources and avoid undue demands on the industrial infrastructure.[34]

U.S. commanders during World War I, were not significantly impacted by the inability of U.S. industry to mobilize quickly because they had allied nations with industrial base support. The late addition of American industrial and military strength was a supplement to the allies and together they overtook the Axis coalition.

After World War I, domestic concerns became more important and the United States became somewhat isolationist. Commercial arms and military production capabilities were dismantled leaving only government owned facilities for guns, ships, ammunition, and some aircraft factories producing military materiel. This reduction was to have an effect on industries mobilization during World War II.[35]

Events of World War I illustrated that it was not always necessary for the nation's industrial capacity to stand alone in supporting the nation's forces. Industry of the United States was successfully supplemented by industry of allied nations. World War I also provided examples of shortcomings in the industrial base being overcome by innovative operational solutions. After World War I the industrial base demobilized, reconverting war industry to a peacetime status.[36]

The next time industry would be called on was to be prior to World War II. For two years before the United States entered the war it was supplying military equipment to the allies. The amount and sizes of orders for war supplies grew steadily during that time. This preparation and production for the allies initiated the mobilization of U.S. industry and gave industry an early beginning in preparing for the war.[37] The production of war materiel by U.S. industry earned America the title of the "arsenal of democracy." Between March 1941 and

December 1945, materiel support furnished to allies exceeded $48 billion and included equipment in every conceivable category required to prosecute the conflict. Aircraft, ships, combat vehicles, motor transport as well as raw materials, food and services were provided.[38]

Even with the head start provided by foreign orders, American industry was not fully mobilized and at peak production until 1944.[39] One reason that U.S. industry did not take better advantage of the available warning was that during 1940 and 1941 there was considerable uncertainty as to whether the country would enter the war. Without a commitment from the government, industrial leaders did not proceed wholeheartedly with mobilization.[40] When the United States began mobilizing it was "the leading industrial power in the world with tremendous potential for expansion."[41] The country, however was not prepared to provide the materiel required by the armed forces in a war. It would be necessary to increase available facilities in every way possible: expansion, conversion, and new construction.[42] There were factors at work that made mobilization proceed more smoothly. The United States was recovering from a depression which contributed to the amount of idle capacity available for expansion. Nevertheless, mobilization took time and production did not reach the levels it was capable of until America was a full fledged participant in the war.[43]

Mobilization during World War II also illustrated the difficulty of quickly producing new and more sophisticated items of material. While industry was able to produce large quantities of items such as rifles, machine guns, artillery pieces, and mortars relatively quickly, other items such as new kinds of aircraft, radar, improved tanks,and proximity fused artillery required time to develop, set-up for and finally produce.[44]

In his official report of allied operations in Europe, from 6 June 1945 to 8 May 1945, General Eisenhower highlighted a deviation from the intended plan which was necessitated by shortcomings in the industrial base. As initially conceived, Operation OVERLORD, the allied invasion at Normandy, was to be complemented by a concurrent operation called ANVIL. Operation Anvil was a planned amphibious assault from the Mediterranean on the southern coast of France. Sufficient landing craft to conduct both operations simultaneously were not available from the industrial base which by this time was producing at maximum capacity. To accommodate this shortfall, ANVIL was postponed until the following month.[45]

Prior to World War II, defense planners in the United States were willing to accept the risk associated with being unable to mobilize quickly. They felt that they could count on strong allies to deter aggression against the country or, in the event of aggression, give them time to mobilize. In addition, the Atlantic and Pacific oceans would be buffers to provide separation and protect the country from needing to mobilize quickly.[46] In spite of initial problems, World War II was a success story for American industry which produced materiel at a monumental rate. Operational commanders were limited by materiel shortages only infrequently. World War II illustrated that even an industrial base with considerable idle capacity and an available labor force from high unemployment could not mobilize and immediately provide for all the needs of the armed forces. In spite of the fact that conditions were favorable when American industry was first called upon to begin providing materiel to the allies, it took until 1943 for production to expand to match the levels of support required and until 1944 to reach full production. Thus, even a healthy industrial base

with available facilities and labor could not immediately provide the materiel requirements of the armed forces.

Planners and operators from the end of World War II to the present have studied and discussed the ability of industry to support the armed forces. Today, there is concern that the industrial base of the United States is not capable of expanding to support the needs of the armed forces in a sustained conflict. Part of the significance of the concern is that inadequate production or delays in expanding output will result in significant losses on the battlefield. Keeping in mind the historical impact of a questionable, inadequate or slow to mature industrial base, it is worthwhile to examine recent developments and the current condition of the industrial base in the United States.

III. THE INDUSTRIAL BASE

Mobilization potential and the productivity of the industrial base is a key determinant in any nation's capability to sustain combat operations. The United States is no exception and has included industrial readiness in its national defense strategy since immediately after World War II. As the national strategy on management of the industrial base has been changed during the years since World War II, the capability of the industrial base has been affected as well. For the operational commander, the impact of the increases and decreases in industrial capability has changed with the strategy. The National Security Act of 1947 established both an elaborate process and a bureaucracy designed to ensure that industrial readiness planning could support the total warfare requirements that the Joint Chiefs of Staff envisioned.[47] This process provided insight into industrial

deficiencies through a peacetime organization which was close to what was required during war.[48] The importance of the ability to mobilize was further recognized in NSC-68 in 1950 which argued that the military strength required to contain the Soviet Union was more than was available in the active forces. The mobilization capability of the country would also be necessary to build the defense capability for victory.[49]

That same year, to further strengthen the ability to mobilize industry, the 1950 Defense Production Act established the Defense Priorities System and the Defense Materiel System which were later combined into the Defense Priorities and Allocation System. These systems provided the authority for defense contracts involving strategic materials to be given higher priority than non defense contracts in times of national emergency. The provisions of the act are an important way to accomplish mobilization in peacetime.[50] The new laws, policies, and procedures in place by 1950 brought about much more complete industrial preparedness posture in the United States than had been the case in 1939. However the Government and industry were still not prepared for war.[51]

In 1953, economic considerations forced the government to begin taking apart the elaborate mobilization planning system although the provisions of the Defense Production Act remained in effect. Greater reliance was placed on using the active forces and on extensive nuclear capability to deter the Soviets or to win quickly and massively so that sustainment from the industrial base was not as essential.[52]

The concept of how the United States would manage the capability of the nation's defense industry was called the D-to-P plan. This plan envisioned the military forces stockpiling sufficient war reserve

material to last from when operations begin, D-day, until industrial production catches up with consumption, P-day. Based in part on the belief that any conflict would be a short war capable of being fought with existing stocks, industrial preparedness was deemphasized during the 1960's and 1970's. During the administration of President Jimmy Carter, the D-to-P plan was replaced with the D + 6 policy. The military services were to stock six months of supplies which were intended, under the short war concept, to be sufficient for any conflict.[53] It is apparent that changing national strategy required operational commanders to conserve on-hand materiels because they could not expect replenishment for six monthes.

Deemphasis of industrial preparedness continued until after the 1979 Soviet invasion of Afghanistan. At that point, concerns for the capability of the nations defense industrial base to provide material in a crisis rose abruptly when industry could not respond quickly to additional material requirements generated by increased defense spending.[54] Late in the Carter administration, a series of military exercises and defense studies validated the need for concern about the industrial base and its preparedness. The December 1980 House Armed Services Committee report, *The Ailing Defense Industrial Base: Unready for Crisis*, documented the unpreparedness of the industrial base to support the armed forces.[55] This Congressional report, together with exercise results and study results, cited a myriad or problems with the U.S. industrial base. There was too much reliance on single source and foreign source suppliers for critical subcomponents, subassemblies, and raw materials. Productivity was down and growth rates were the lowest of the free world industrialized nations. Lead times and costs had increased, and there were material capacity shortages. Industry was

faced with shortages in skilled labor and critical supplies and was using outdated production equipment and tooling.[56]

Shortly after Ronald Reagan became president, his administration began to take steps to correct the shortcomings by placing emphasis on strengthening the industrial base. Emphasis came in the form of appointing committed and qualified individuals to key positions and in the form of money to fund the corrections. When Dr. Fred Ikle was appointed as Undersecretary of Defense for Policy, he brought with him Mr. Sol Love who had been the CEO of Vought Aircraft to revitalize the Department of Defense industrial base management programs. Additionally, from FY 1984 to FY 1988, $100 million per year was committed to projects which would contribute to the ability of industry to surge production to required levels in a conflict.[57] Dr. Ikle was a central figure in improving industrial base capabilities by providing guidance, direction, and motivation. He believed that improving defense production capacity to acceptable levels was an essential element in the national security policy of the United States.[58]

In March 1982, a Department of Defense policy statement on industrial preparedness cited a strong industrial base as necessary for national security and was an important contributor to deterrence. This policy statement also established that improving the vitality of defense industries was part of the administration's economic recovery plan and a principal initiative of the Department of Defense.[59]

The revitalization policy and the detailed guidance that accompanied it focused attention on the problem, resulted in industrial base management programs executed by the services, and had the effect of strengthening the U.S. industrial base. The new policy and programs did not fix the industrial base shortcomings, but corrected much of the

deterioration that had gone on before. Implementation problems, as well as, the dynamics of industry in a capitalist system make the industrial base a subject for continuing concern.[60] The policies and strategies to improve the capabilities of industry that were implemented during the Reagan administration had the effect of improving the capability of the operational commander. These national programs, to improve the industrial base, allowed operational commanders to plan and function with the equipment they required. The condition and capabilities of the industrial base today is the focus of the next portion of this monograph.

The 1990 National Security Strategy of the United States cites the industrial base as a source of materiel for forces employed in an emergency and as a contributor to deterrence.[61] This strategy implies that if U.S. industry does not have the capability to surge production of military equipment within existing facilities or to mobilize by expanding or constructing new facilities and cannot meet the requirements of the armed forces, there are two principal consequences. First, strategic deterrence will potentially fail; thus, an aggressor will take advantage of the weakness and a conflict that might never have happened will occur. Second, operational and tactical commanders will be required to conduct operations without necessary materials and their combat effectiveness will be less than it could have been.

While the industrial base during World War II supported the needs of the U.S. forces and the needs of our allies, its ability to provide the same level of support today is affected by a variety of factors. Changes in the economic conditions of the United States and the world are making business more competitive and foreign competition is forcing American companies out of manufacturing. The increasingly competitive

world market makes it impractical to encumber assets by keeping them occupied in less profitable activities, prepared to shift from civilian to defense spending. Other factors which make the defense business difficult are complex government procurement regulations, which add to defense production costs, and military specifications that make it costly and difficult to apply material designed for the armed forces to the civilian sector.[62]

A recent in-depth examination of the adequacy of the mobilization base and mobilization preparedness indicated the continuing need for the United States to look critically at industrial preparedness and capability. Specifically, programs to improve readiness and effectiveness are still required.[63] The decreasing capability of the industrial base is a result of problems which plague industry in general and problems which are particular to the defense industries. One component of the decline is a lack of modernization in plants and equipment which hurts competitiveness with foreign producers and contributes to low growth in productivity. Other factors creating the decline of the industrial base are the complexity and sophistication of modern weapons requiring long production times, extensive personnel training, and complicated production systems. By virtue of their being complicated and unwieldy, procurement systems discourage buying and maintaining surge capacity or modernized equipment for use in defense contracts thus, they have contributed to the deterioration of the industrial base. Increasingly demanding state and federal regulations have also increased production costs throughout industry and have hampered growth.[64]

The industrial base which would support the armed forces in wartime is for the most part the same industrial base that provides sustainment

support to peacetime forces. In peacetime, the military demands on the industrial base are obviously not extensive. Military orders include only limited amounts of equipment to replace small quantities of losses or, occasionally, build new organizations. There are also infrequent military orders for initial production quantities of new equipment and weapons systems. Peacetime defense requirements, military procurement actions, and budget commitments are determined through the planning, programing, and budgeting system. This, in effect, sets a level of effort for the defense contractors.[65]

The Five-Year Defense Plan produces a reasonably constant level of purchases over time and allows companies which comprise the defense industrial base to conduct advance planning and improve efficiencies. Providing a reliable, even flow of resources to the industrial base through the procurement system and the manner in which defense procurement is conducted has caused the defense industrial base to evolve into a few large contractors who are dependent on the government procurement system. These large defense contractors who dominate the business of supplying major weapon systems are supported by a network of smaller secondary and tertiary companies producing components, secondary items, sub-components, supplies, and services. These smaller companies, referred to as second and third tier producers, operate in a more competitive environment as they supply the major contractors and some materials to the armed forces.[66]

The resulting industrial base system is relatively stable and is regulated in large part by market pressures within the framework of a well developed set of government regulations in which regular industrial base organizations are well skilled. The industrial base system includes large specialized suppliers providing most of the major weapon

systems. These specialized suppliers are then able to support their systems and realize the resulting income by providing components and services for specific weapon systems. While it is clear from peacetime experience that this industrial base can efficiently and effectively provide for the peacetime needs of the armed forces, the capability that these loosely structured suppliers have to expand is unclear. This arrangement evolved during a period when there was no requirement to rapidly surge production or to mobilize to support an expanding force; thus the capability has never been tested.[67] Bruce E. Arlinghaus, the editor of a comprehensive study on the defense industrial base, concludes that there are some apparent inaccuracies built into the estimates of production capability. He points out that while peacetime constraints cause estimates to be too low, estimates of production capability do not include possible substitution of readily available materials and the fact that simpler production techniques can sharply increase production.[68]

While the potentially debilitating influence of rising oil prices, inflation, high interest rates, and increasing competition from foreign producers has been recognized, government leaders have been unwilling to intervene directly and override free market principals. It is clear that to build a government owned and controlled industrial capacity that is capable of meeting the requirements of the armed forces would be interfering with the free market system; it would also be enormously expensive as well as politically unacceptable. It would require the United States to spend an inordinate portion of the Gross National Product on defense.[69]

In spite of the problems described above, the Department of Defense has not ignored the necessity to take whatever action it is able to in

order to assure that the industrial base can support the operational commander. Recognizing that there must be a degree of certainty that defense industries could support surge or mobilization materiel requirements, the Department of Defense has established and continues to use a system to survey defense contractors and have them estimate and report their ability to respond to emergency requirements. The government can then compare what industry believes it can produce against estimated requirements from mobilization plans. The system is called the "1519 system" because the form industry estimates are provided on is a DD form 1519.[70]

While the system provides very valuable information on industry's estimate of their capability, it is not fully sufficient because there are significant inaccuracies built into the process. One source of inaccuracy is that completion of the form is voluntary. Because there are no current means to force suppliers to provide the information, industrial base managers cannot be sure that the information they get is complete. Some contractors who do not provide an item in peacetime might be a supplier during mobilization, but they do not report. Another source of inaccuracy is that the information that is received is only an estimate; while there is no indication of deliberate falsehood, industry does not have to prove the capability they report and therefore are not careful or precise in estimating. A third source of inaccuracy is that the "1519 system" does not provide enough information on second and third tier suppliers. The process does not show where there are supply sources providing subcomponents for more than one manufacturer. If two manufacturers include the production of one subcontractor in their planning, one or both will experience delays because of insufficient capacity and it is difficult to determine the total

requirements for each subcontractor when production from a single subcontractor may be included in the estimates of more than one reporting supplier. Not all inaccuracies emanate from contractors; government agencies contribute to misleading information as well. In participating in the estimation process, contractors are responding to Department of Defense statements of requirements. When requirements appear to be unrealistically high or vary greatly from previous years, contractors and subcontractors lose confidence in the system. In addition, responding suppliers are frequently given too little time to report.[71] The sources of inaccuracy in the process used to estimate capability and manage the defense industrial system limit the utility of the system.

Evidence of the Department of Defense's lack of confidence in the "1519" estimates was provided during operation Desert Storm. The Joint Chiefs of Staff, uncertain about the ability of industry to provide the potentially massive amounts of supplies and spare parts which might be required, conducted surveys of industry to determine how they could increase production of these and other critical items.[72] Problems associated with estimating requirements have the potential to skew determination of industrial shortcomings and will be discussed in the following paragraph.

The Engineer Studies Center at Ft. Belvoir, Virginia recognized that in order to say that the industrial base was or was not capable of meeting the materiel requirements for mobilization, the military services must first describe the requirements industry would be required to meet. The Center conducted a study of requirements planning by the Army and found significant flaws in how materiel requirements to support war plans and mobilization are determined. The study indicated that

Army accounting of requirements is incomplete, omitting some significant segments; that statements of requirements fluctuate and make planning difficult; and that requirements are included for some less than essential materiel.[73] While the Engineer Studies Center concluded that the Army has no credible process to determine requirements for a mobilizing force in an extended conflict,[74] my interviews with Army planners indicated that requirements for essential materials are determined through sophisticated computer modeling. Thus, Army estimates are neither totally spurious or wholly accurate.

Difficulties which relate to materials, components or supplies provided by the second and third tier producers are especially dangerous because it is in the network of secondary and tertiary suppliers, who are most subject to the effects of competition, that the erosion of capability has been the greatest. Foreign competition has more significance to the smaller suppliers of components, parts, and production materials. This is due to the fact that they are smaller and are subject to more competition because the industry segment they are competing in has been heavily targeted by foreign competitors. U.S. intermediate industrial producers of forging and casting, machined metal parts, bearings, electronic components, electrical machinery, turbines, and small combustion engines have been significantly affected by foreign producers taking greater market shares in domestic and overseas markets.[75] According to a recently released report from the Joint Chiefs of Staff, while prime contractors for major items such as missiles, electronics, and aircraft will continue to provide supplies, they will be less capable of fielding systems on time because the number of subcontractors providing subsystems and components has dropped to the point that the major contractors will be forced to delay production

while waiting for components or subassemblies. The report, a "Joint Military Net Assessment Document" indicated that a principal cause of the losses of subtier contractors was reductions in defense spending.[76]

Reportedly, the number of suppliers of many components has dropped to what may be dangerous levels. The "Joint Military Net Assessment Document" indicates that there are only two, or in some cases, three suppliers of airborne radar, aircraft engines, aircraft landing gear, needle bearings, and specialty lenses. This erosion in small item suppliers will affect major producers when, because there are only a small number of suppliers, the major producers are unable to obtain enough components and are thus unable to provide the quantity of end items needed. The Joint Chiefs of Staff estimated that industry could provide surge level production of such items as the M1 tank, the AIM-7 missile, and the F-18 for only two months before running short of critical components.[77] When there are only two or three sources of a component, the loss, for any reason, has a major impact on the major producers and eventually on the operational commander. This effect could be felt most quickly in such major items as military aircraft where over fifty percent of production is subcontracted.[78]

Even producers of major items have been affected by foreign competition and economic pressures. Shipbuilding, automotive and transportation equipment, aerospace equipment, machine tools, and electronic equipment have all lost some competitive edge to foreign producers.[79] In May 1991, the Council on Competitiveness in Washington, D.C. reported that the United States has fallen behind or lost out to foreign competitors in over a third of the 94 technologies that will be most influential on productivity, economic growth, and competitiveness in the 1990s. The report characterized the country as "sinking into

second class status" in these technologies which are vital to the global economy.[80] Given the high technology contributions to modern weapon systems, any decline in the United States' capability in technology fields is significant for our national defense and the subsequent war plans process.

In his 1990 report to the President and the Congress, Secretary of Defense Dick Cheney cited several key indicators that indicate that the industrial base might be less capable than is desirable.[81] The United States has lost over half of its 1980 share of the world machine tool market and since 1973 over two thirds of the domestic market share for machining centers has reverted to foreign companies. In aggregate indicators, the productivity growth rate is less than foreign competitors. Greater amounts of foreign goods are being sold in the United States, while the U.S. share of worldwide trade in manufactured goods has declined. Secretary Cheney's report indicated that these key indicators are supported and reinforced by a series of major studies which document the declining capability of the defense industrial base. Three major areas were highlighted as cause for concern:

1. A decline in the overall number of defense contractors.
2. Accelerating penetration of foreign goods into U.S. markets and a growing dependency on foreign sources for vital components and subassemblies;and
3. Decreasing returns on fixed assets, declining capital investments, and lagging productivity in key defense sectors.

Secretary Cheney's report stated that if these concerns were not checked they would adversely affect the security of the nation.[82]

In November 1990, after the invasion of Kuwait by Iraq, the *Los Angeles Times* reported on concerns about the ability of the industrial base to keep the defense supply system capable of supplying the forces in the Middle East. Industry executives and government procurement experts were uncertain as to whether industry would be able to adequately accelerate production of spare parts if the Middle East war required them to do so. Their concern arose from the very rapid deployment of a large number of troops without sufficient advance warning time for industry to mobilize. Industry had not been required to fulfill most of the early demands for increased supplies because material and supplies for forces serving on Operation Desert Shield had been diverted from European based units instead of being added onto existing orders as new requirements. There was significant concern that supply shortages would affect operations if the conflict was prolonged. If an urgent request for immediate production of supplies could not be answered because of weaknesses in the industrial base, the operational commander would be affected.[83]

James Blackwell, an analyst at the Center for Strategic Studies, indicated that it was not possible to be certain of the defense industry's ability to respond to Desert Shield requirements. He predicted two year lead times to accelerate production of some ammunition items. Mr. Blackwell's comments were based on a study he had conducted which also showed that the number of defense contractors was shrinking.[84]

Some industry experts predicted that there would be shortages of repair parts even if there was no war in the Middle East. Demands for material and repair parts increased because of the amount of military equipment that was being used in Saudi Arabia. This increase in use of

equipment came at the same time that the military was increasing orders to build the levels of materiel on hand. Thus, it resulted in a heightened demand for parts and materiel that some believed industry could not fill. Shortages in spare parts for Apache helicopters and some Air Force aircraft seemed to support these concerns.[85] In addition to concerns about the ability of industry to provide repair parts, many felt that industry's challenge in producing major combat items was more significant. As an example, combat aircraft normally take three years to build. While it is possible to surge and produce aircraft in a year, the industrial base might not be able to keep up with operational losses.[86]

Paul Kennedy has described the challenge of producing sophisticated, technology driven weapons systems as appalling. He contends that combat losses of the sophisticated and expensive aircraft, tanks, submarines, or frigates would be virtually irreplaceable. Even if the country could afford the excessive replacement cost, "it is clear that today's complex weaponry simply cannot be replaced in the short times which were achieved during the Second World War."[87]

Steven Cover, Assistant Secretary of the Army for Research, Development, and Acquisition related another impact of the excessive cost of modern weapons when combined with reduced defense spending. The Army will not keep the industrial capability to manufacture main battle tanks after the M1 production line is closed down in the near future.[88] The U.S. Army Industrial Base Engineering Activity at Rock Island, Illinois has estimated that after the production line is closed it would take about 18 months to open a new tank plant.[89] The Joint Military Assessment Document released by the Joint Chiefs of Staff provided

estimates that it would take two to four years to restart other closed production lines.[90]

In spite of these examples, not everyone agreed that U.S. forces would experience shortages of supplies during Desert Storm. Joe Muckerman, Director of Emergency Planning for the Department of Defense, pointed to large inventories of supplies on hand as an indication that the concerns were not justified. Massive quantities of missiles and munitions, as well as repair parts and major items of equipment were stockpiled in the desert. Mr. Muckerman also felt that when increases in production were needed, industrial sources would provide the necessary surge. Rand Corporation Vice President Michael Rich, an expert in military procurement was also positive about the industrial base's ability to support a war in the gulf. He felt that the inventories of equipment and supplies on hand in the Middle East, coupled with the defense industry's ability to increase production would result in adequate supplies.[91]

In the 1990 National Security Strategy, the President cites a capable industrial base as essential to deterrence, the cohesion of alliances, and the strength of the country's defense. He presents the need for a strong industrial base that includes technologically advanced and flexible manufacturers. His strategy calls for continued research by industry and the government working together.[92]

This section has shown that management of the industrial base has been ongoing since World War II ended. The capability of the industrial base deteriorated until about 1980 when it began to benefit from increased government spending. The Department of Defense continues to implement policy designed to assure a viable industrial base in the face of market pressures and foreign competition. Given this ongoing effort,

it is germane to examine the probable nature of future conflict in which the industrial base must provide support. This and some impacts of maintaining an extensive industrial base will be discussed in the following section.

IV. FUTURE CONFLICT AND INDUSTRIAL SUPPORT

That there is a requirement for the industrial base to be ready and capable to provide material to the armed forces is not certain. The necessity depends on the need to replace losses and the premise that there will be a conflict which results in those losses. There are two scenarios upon which industrial preparedness planning is based: the short war scenario and the long war scenario. The debate about the probability of a short war versus a long war has been ongoing since post World War II planning and has been compounded by the probability of Third World or regional conflict.[93] Which of the two scenarios the United States plans for significantly affects strategy, military forces, and the operational commanders.

The short war theory, before the dissolution of the Warsaw pact, argued that Communist forces were capable of attacking with little or no warning. The conflict would be violent, produce high attrition and consumption rates, and end quickly. The quick end would come when U.S. stockpiles of war reserve materiel, and those of our allies were depleted and the the United States would be forced to resort to nuclear weapons or capitulate. An additional argument of the short war theory is that the U.S. cannot afford to prepare for an extended conflict because to maintain an adequate industrial base would create an unacceptable drain on the economy.[94]

The long war theory recognizes that wars have frequently lasted longer than expected. It holds that, regardless of shortcomings, the extensive military and industrial capability of the United States will not be overcome quickly. Further, an extended conflict is the most demanding scenario and if the nation is prepared for the "worst case" it is capable of supporting brief conflict. Planing for a short war is self-fulfilling, that is, stockpiles for an expected short war will be small and quickly consumed. Additionally, the long war theory is supported by the growing realization that nuclear exchange is unacceptable to either side.[95] It is not logical to spend approximately 85 percent of the defense budget on conventional forces in anticipation of a short conflict that ends in an nuclear exchange. Thus, to invest in significant conventional forces argues to invest in a strong industrial base for a long war.[95]

The dissolution of the Warsaw Pact changes the long war versus short war argument considerably. Without the Soviet Union as an opponent, the probability of a conflict shortened by a nuclear exchange is very small. Thus, the short war concept is less likely. However, without the Soviet Union as an opponent, there is no nation capable of engaging the United States in an extended conflict and the long war theory is equally unlikely.

One of the theses of Paul Kennedy's book, The Rise and Fall of the Great Powers is that extended excessive military or defense spending will inhibit overall economic strength of a nation. Defense spending at the appropriate level improves the activity level and will boost a civil economy. Defense spending at too high levels will, however, inhibit growth. A related premise is that an apparently strong military which is not supported by a viable economy and industry is at risk of

collapse.[97] Clearly, military and economic power are mutually supporting and both are necessary for national power. Kennedy shows that states which spend excessively on defense spending may attain short term military security but at the expense of the country's long term economic health. It is possible for a country to quickly go from superpower to mediocre economy.[98] In order to be viable, military power must have a strong economy behind it. In order to be a great power the United States must balance defense and non-defense expenditures. Sufficient resources must be devoted to maintain credible military power but not so much that the resources turn into a drain on the economy.[99] An example of the potential impact of overspending on defense is provided by the United States and Japan. If the United States continues to spend over seven percent of its gross national product on defense, while Japan, a major economic power, allocates a lesser portion, Japan will have more money available to strengthen the civilian sector. The result will be that the Japanese economy grows stronger while the U.S. economy is weakened.[101] With this example of the effect of defense spending in mind, maintaining excessive industrial capacity or large amounts of war reserves is not popular and the Congress is understandably reluctant to allocate additional funds without a discernible need.[102] In attaining a balance between defense and civilian expenditures a nation accepts some risk in defense. The potential result is that there will be material requirements that industry cannot fill and operational commanders will be forced to modify their plans.[101]

In a recent interview, General Colin Powell equated the money not allocated to the military services to risk. The armed forces could profitably spend as much as is allocated. To spend more, increases

strength of the force and reduces risk. To spend less on defense increases risk. Although the size and nature of the next conflict is uncertain, General Powell believed that the smaller force that the United States military is evolving to would be capable of responding successfully. [103] This indicates that the level of risk associated with reduced spending levels is acceptable. There are other indications that perhaps it is reasonable and healthy for the country to accept some risk. A large military force and the industrial base necessary to surge and build an even larger one may not be required.

The noted author, Chris Bellamy, writing on future warfare indicated that the operational shortages on the future battlefield will not be the sophisticated, technologically advanced weapons systems which are difficult for industry to replace. The materiel shortages that affect operations will be ammunition which is less sophisticated and can be manufactured more quickly and with less long term preparation.[104] This ammunition consideration was supported in an interview with Mr. David Berenreuther, an analyst with the Industrial Engineering Activity at Rock Island, Illinois when he indicated that in computer simulations of conflicts, ammunition was consistently an early constraining item.

According to the *Wall Street Journal*, Senators John Glenn and Sam Nunn also feel that maintaining a smaller military is a prudent risk in light of the threat faced by the United States.[105] The proposed smaller military force would continue to be large enough to execute an operation that is the magnitude of the Gulf War. Senator Glenn indicated that the country cannot afford to provide for a permanent force large enough to win World War II. The size of the force must be proper for the threat expected. In the same article, senior pentagon officials indicated that after the military forces were reduced to planned levels, the force

would still be large enough, by a wide margin, to defeat any foreseeable Third World threat. Although the Soviet Union has retained a military capability large enough to overwhelm the reduced U.S. military, the general consensus among observers is that the United States would have at least two years warning time to prepare for a Soviet attack.[106]

This section has illustrated that in a multipolar world, where the likelihood of direct conflict between the superpowers is very low, the United States is unlikely to get embroiled in an extended conflict of attrition. There does not appear to be a realistic opponent who could inflict sufficient damage to make a rapidly responding industrial base essential. Further, it may be in the best interests of the nation to accept some risk in the military forces and defense industry so that a greater portion of the nation's effort and wealth can be applied to strengthening the economy and improving domestic programs. What will the impact of the sustaining base be on the operational commander in combat?

V. ANALYSIS AND IMPLICATIONS

In the American Civil War, operational commanders for both the Union and Confederate Forces were cognizant of the relative strength of their industrial base. One author called it an enduring lesson of history that a nation that is not prepared to sustain its forces during war usually suffers grievous consequences.[107] A corollary to that statement might be that the nation with the greater capability to support its forces will usually emerge victorious. The opposing forces in the American Civil War illustrated the validity of these statements

as the Union, with its greater industrial strength, overwhelmed the Confederacy which was trying to overcome a weak industrial base.

The industrial base of the Union was not initially prepared to provide all of the support needed. In the early stages of the war, it was supplemented by foreign industry through an aggressive procurement program. The underlying strength of the industrial base influenced Union strategy to attack the weaker Confederate base. Union commanders conducted operations specifically to facilitate the strategy. Southern operational commanders were forced to design their campaigns with the objective of protecting the limited industrial infrastructure or overcoming material shortages. The strategic and operational center of gravity that had to be protected was the industrial base.

World War I was another example of the positive correlation between the stronger industrial base and victory. With the addition of American industry, albeit late, the combined strength of the allies exceeded the German axis and was instrumental in the victory. As in the American Civil War, two critical factors were repeated during World War I. Once again industry, even with early warning and an advance start, was slow to mobilize and unable to immediately provide necessary material. And, just as the Union supplemented its industry with procurement, no single nation had sufficient industrial capability to succeed alone, but the combined strength of the allies was sufficient to be victorious. World War I also provided examples of innovative techniques in response to industrial shortcomings. Allied convoys of ships were initiated to overcome the inability of industry to produce sufficient escort and cargo ships. Just as confederate commanders were forced to alter their campaigns, so too, German tactics were devised to compensate for the inability of German industry to replace equipment losses in combat.

World War II reinforced the conclusions from the previous examples. While a strong underlying industrial base was again instrumental in victory, no World War II combatant had sufficient industrial power to supply war needs alone. The value of foreign supplementation was again evident.

At the beginning of World War II, the industrial base with an early start provided by foreign orders, was slow to accelerate and required operational commanders to adjust to early delays. Throughout the war, German operations were revised to compensate for the inferiority of their industrial base. Additionally, even late in the war, in response to industry's inability to provide sufficient landing craft, General Eisenhower delayed a portion of his operation until he had the necessary equipment.

The historical examples establish the premise that the nation which is better prepared to support its forces will be successful in war. Consistent throughout is the slow start of a strong industry to support the armed forces and the need to share the industrial burden with allied nations. Consequently, operational commanders must implement innovative solutions to material shortages, or delay operations when necessary.

The connection between the capability of the industrial base and national policies is also important to the operational commander's execution of military strategy. The condition and capability of the industrial base has been a subject of interest since the end of World War II. Because of budgetary constraints, the capabilities of American industry to support the armed forces deteriorated. During the administration of President Reagan, additional emphasis on readiness and funding of procurement and management programs was applied. Today there are renewed concerns about the capability of industry to support the

sophisticated high technology weapons used by our armed forces. The companies of the industrial base have been affected by weaknesses in the economy and by bureaucratic complexities in the system to supply Government materiel. Specific deficiencies affecting the ability of industry to supply the armed forces include lack of modernized equipment, departure from the industry of many smaller secondary item producers, and decreasing productivity.

Other significant factors affecting industrial support to the armed forces are more complex equipment and excessive foreign dependence. The amount of time that it would take to resupply combat losses has extended because of the extreme complexity of modern weapon systems. The equipment required by modern armed forces cannot be produced quickly. In addition, the more complex equipment makes the rate at which equipment is produced difficult to accelerate. Thus, when conflict begins, industry could not immediately begin producing greater quantities. The increasing amount of subassemblies produced by companies outside the United States provides the scenario for the U.S. military to be dependent on potentially unreliable sources. Defense managers cannot be certain that the national interests of foreign countries will coincide with those of the United States and, unlike domestic companies, foreign producers cannot be compelled to react to defense requirements.

Although there are weaknesses in the industrial base, there are also reasons to believe that the needs of the military could be met. While dependence on foreign producers is a concern, the lessons of history are that cooperation with allied suppliers is a part of the success formula. The United States was not self sufficient in the historical examples and will probably fight with allies in future

conflicts. Many of the concerns about the inability of industry to supply defense needs are based on industry constrained by peacetime considerations. The capability to produce will increase as the peacetime constraints are lifted.

Another reason for the extensive concern about the capability of the industrial base is that the standard against which the capability is being measured is a full scale, protracted war of attrition. While it is prudent to be prepared for this "worst case" scenario, there are two reasons that it may not be wisest. First, the worst case scenario is unlikely. In a multipolar world where a superpower conflict is very unlikely, there is no nation which can exceed the capability of the United States to wage war. Therefore, regional conflict between coalitions is the most likely scenario. With its forces in being and support of its allies, the U.S. is capable of successfully prosecuting any regional conflict. Second, the impact of devoting a massive share of the country's economic wealth to defense may not be fiscally healthy. To accept some risk in defense spending, where the risk seems reasonable, will allow a greater portion of the economic effort to be applied to a wider range of segments of the economy.

Given the current condition of the industrial base, capable of supplying the military's peacetime needs, but unable to rapidly expand to meet wartime needs; the operational commander can then expect to enter a conflict with a full complement of equipment. He must be aware that beyond the equipment on hand and in war reserves, planning cannot include a resupply of all major items. This implies that in preparing for conflict, the operational commander should seek to prestock as much equipment as is feasible. There is no indication that the operational commander need plan for shortages of consumable supplies such as food,

fuel, or ammunition. Recognizing that replenishment of major weapon systems will be problematic for the industrial base, the operational commander must take precautions to preserve his fighting power. This implies that overwhelming strength must be quickly applied in order to take advantage of the synergistic effect of available weapons. The operational commander must avoid incremental employment which might lead to piecemeal losses which cannot be replaced. In instances when the operational commander is faced with shortages of equipment because it is not available from the industrial base, he must be innovative. He must find alternate means to accomplish the desired ends or he must resequence or delay operations until adequate means are available.

At the strategic level, implications are that while the U.S. must give attention to the needs of the industrial base, it would not be wise to pour national assets into building an industrial base that can stand alone in support of all contingencies. Secondly, the United States must continue to develop relations with aligned nations in order to supplement our industrial capability. Finally and perhaps most importantly, national leaders must be prepared to support operational commanders who will need to rapidly apply overwhelming force to any conflict in which the country is involved.

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