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THE PROBLEMS OF THE DEVELOPMENT, USE, AND RETIREMENT OF WEAPONS: A STUDY IN CIVIL-MILITARY RELATIONS SUITABLE FOR USE IN SECONDARY SOCIAL STUDIES EDUCATION

DISSertation

Presented in Partial Fulfillment of the Requirements for the Degree Doctor of Philosophy in the Graduate School of The Ohio State University

By


* * * * * * * *

The Ohio State University
1967

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INTRODUCTION

The purpose of this dissertation is twofold: to present an historical study of military weapons since 1913 and to serve as an example and guide for the study of militarily oriented history at the secondary school level. Since the historical portion of this dissertation must be suitable for and directed at the school teacher and his pupils, it emphasizes secondary works. Because there are numerous scholarly books on each topic in this study and the primary sources have been minutely scrutinized and incorporated into these readily available secondary works, primary sources consist mainly of official statistics, reports, original works in hardcover book form, and other material available to teachers and their pupils. Less available primary sources are used as needed. This study examines the development, use, and retirement of the major weapons since 1913. In order to estimate the value of each weapon, their effectiveness in achieving war aims in the light of civil-military relations will be studied. The concluding purpose of this dissertation determines the need, if any, for a competent, independent, civilian organization to advise the president and congress on the development, use, and retirement of weapons.

The militarily oriented history materials for this dissertation are selected in the belief that pupils will become informed and, it is to be hoped, more rational on the subject of war and peace through the study of weapons with illumination on civil-military conflicts in regard to
national goals. The material itself is of great interest to most boys and to many girls. At the end of each unit of study, a chapter is devoted to ways and means of best teaching each study unit at the secondary school level. The final goal of each study unit is to teach the pupil certain insights into the material studied with emphasis on applying those insights to the present. Appropriate books are discussed briefly with suggestions as to what grade level and type of pupils they are best suited for.
CHAPTER I

SOME CAUSES OF THE GREAT WAR OF 1914

The National rivalries, diplomatic machinations, arms race, and other factors may be regarded as the sufficient conditions which precipitated World War I. The factor of optimism could well be considered a necessary condition for that war. This optimism resulted from an almost universal belief, supported by many well-known writers, that international economic interdependence rendered a long war impossible. Six months was considered about as long as a major war could last. Each nation thought that in the event of hostilities, its enemy would be the first to suffer economic collapse. The second cause of optimism was the war plans of the General Staffs of each nation which assured a swift victory because their architects totally failed to understand the defensive power of the machine gun which was regarded as an offensive weapon. Several factors which helped induce the major nations of Europe, and the United States, to become belligerents will now be reviewed. This will help the secondary school pupil to judge military goals by their cost in lives, and money. He should understand that the General Staffs, by their assurances of quick victories, encouraged their governments to pursue aggressive foreign policies. As the generals completely misjudged their weapons, their plans were rendered worthless. The governments, likewise, completely misjudged their generals. The secondary school pupil should understand that foreign policy, as happened in the Great War,
is often based upon what a nation believes its military and their weapons are capable of, and that failure to understand and evaluate weapons can lead to disaster. This happened in the Great War, for the generals totally failed to understand the defensive power of the machine gun.

The Franco-Prussian war of 1870 had lasted a little over six weeks. Germany had expected it to be a short war. France had also anticipated a brief campaign and their expectations of brevity, if not those of victory, were confirmed. Napoleon III was captured at Sedan along with 80,000 soldiers. German losses had been small. World War I was likewise expected to be a short one. The conflict which finally erupted in 1914 was, it was felt at the time, fortunately going to be of brief duration. Almost all the generals and admirals on both sides stated that they would prevail in short order. Even the rare pessimists felt that military operations of such magnitude had to end in a rapid decision one way or another. The French and German general staffs had been both equally optimistic about the prospects for victory. The former, under the influence of General Foch (who was a military writer among other things) felt that any morally righteous offensive had to triumph if pursued with sufficient zeal. He felt that the French army could win the war merely by undertaking their plainly righteous offensive with the zeal to triumph. The Germans also considered their cause just and righteous

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3 Ibid., p. 18.
and expected to dispatch their enemies with celerity. The British had 160,000 expeditionary troops in France when the Great War erupted. They were among the best regular troops in the world. The English were as optimistic as their counterparts in France, Germany, the Austro-Hungarian Empire, and Russia. They all expected to successfully solve the political ills of the Western world with one fell martial swoop.

Seldom had a war started with such grim confidence on the part of all concerned. The Kaiser, in an address to departing troops in the first week of August, 1914, stated "You will be home before the leaves have fallen from the trees."4 One Count Hochberg, an official at the Kaiser's court, told a colleague that the war would last eight weeks; his pessimistic friend, one Count Oppersdorf, thought it would last for at least ten weeks.5 Officers departing for the Western Front expected to be in Paris in six weeks while Russian officers believed they would be in Berlin in six weeks. The English Prime Minister, Asquith, told an English officer that the great powers, for economic reasons, could not last long.6 In St. Petersburg the question was not whether the Russians could win but whether it would take them two months or three. Those who hinted that the war might last six months were considered defeatists.7 Germany, expecting a brief war, had a stockpile of nitrates for making explosives sufficient for six months and no more. Only the later discovery of a method for fixing nitrogen out of the air enabled the German war effort to continue.8

5 Ibid., p. 119. 6 Ibid. 7 Ibid. 8 Ibid.
Unfortunately for the belligerents, the governments had paid more attention to the optimistic assurances of generals than to the writings of one Colmar von der Goltz. He had begun as a military writer in 1877 with a book entitled *Leon Gambett and His Armies*. He predicted that the war of the future would not be decided by a battle but by attrition due to the huge industrial potential of a whole nation in arms. From his studies of the American Civil War, he concluded that the power of the defensive had exceeded the power of the offensive and prophesied that extensive fortifications would play the determining role in a future war.9 Ivan Stanislavovich Bloch, a Polish banker, had written a six-volume work entitled *The Future of War in Its Technical, Economic, and Political Relations: Is War Now Impossible?* In this work, which was published in 1899, he accurately outlined the stalemate that was to characterize the Great War. The gloomy prognostications of these two astute gentlemen were lost amongst the confident predictions of the military men and their governments. As will be seen later in the discussion of the machine gun, the power of the defense, made possible by the machine gun and modern rifle, should have been so manifestly evident that none should have failed to grasp it. World War I was embarked upon because gross ignorance of the power of modern weapons gave rise to an irrational optimism. The fires of optimism were stoked by the war plans devised by the general staffs of the future belligerents.

In Germany, General Carl von Clausewitz had written a book entitled *On War* which was published circa 1833 by his widow. In it, he

prescribed a quick victory by a decisive battle as the first objective of an offensive war. The occupation of an enemy's territory and gaining control of his natural resources was a secondary objective. To hasten an early decision was of crucial importance, as was the element of time. Clausewitz censured anything which protracted a campaign. His greatest fear was a war of attrition to wear down the enemy. A devoted disciple of von Clausewitz was Count Alfred von Schlieffen, who was Chief of the German General Staff from 1891 to 1906. During his tenure as Chief of Staff, Germany's relations with its neighbors continued to deteriorate. They were reduced to such a nadir that it had by now become axiomatic for the General Staff that Germany would have to fight a two-front war. All planning was done on this assumption.\footnote{Ibid., p. 130.} Count von Schlieffen always considered Germany's encirclement as an accomplished fact to be accepted with as much stoicism as possible.\footnote{Ibid., p. 140.} Some diplomats suggested that instead of talking everlastingly about encirclement, Germany might set diplomacy to work to do something about it, but nobody listened to them.\footnote{Ibid., p. 140.} In order to win a decisive victory, as Clausewitz had ordained, Schlieffen derived a strategy from Hannibal's tactics at the Battle of Cannae. Although things had changed somewhat during the last 2,000 years, Schlieffen believed that "the principles of strategy remained unchanged."\footnote{Alfred (Fieldmarshal) Graf von Schlieffen, Cannae, trans. at Fort Leavenworth (Fort Leavenworth: Command and General Staff School Press, 1933), pp. 4ff.} The enemy's flank was the proper object for attack. After breaking through the flank(s), the attacking army would then fall upon
the enemy's rear and so crush him. Envelopment, rather than frontal attack, became the policy of the German General Staff's planning. Since Schlieffen was convinced that Germany would have to fight a two-front war, it became a matter of beating one opponent by concentrating the greatest possible superiority of force against him and then falling as violently and as rapidly as possible on the other foe. One Graf von Moltke had ensured the speed of such a blow, for he had made railway transport into something like a master weapon. Schlieffen tried to add the element of weight to that of speed, and so he continually advocated a strengthening of the army. He completed his great plan in 1906. In the two-front war which he expected, his plan called for Germany to hurl almost its entire strength upon the most powerful and dangerous enemy, which was France. For the conquest of that nation he allocated six weeks and seven-eighths of the German Army while one eighth of the army was to hold East Prussia against Russia. Since it was expected that Russia would take at least six weeks to fully mobilize, the army's weight could be rapidly transported by railroad to the Russian front after crushing the French. There were several reasons why the plan did not expect serious trouble from Russia for some time. It had always been Russian military policy to suck an invader into the depths of Russia and then strike at the enemy's flanks after his supply problem became critical. When the Schlieffen plan had been first adopted, fears for East Prussia were less because it was assumed that Russia, perpetually at odds with the Japanese, would have to keep a large portion of its armies in the Far

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14 Ibid., pp. 6ff.
15 Goerlitz, op. cit., p. 130.
East to guard against Japanese aggression. German diplomacy, despite its appalling record of ineptitude, was expected to overcome an Anglo-Japanese Treaty (which the Germans regarded as an unnatural alliance), and keep Japan neutral as a constant threat to Russia's rear. At any rate, the German General Staff would have rather risked losing East Prussia than to split their armies.

The only place offering geographical conditions favorable for a flanking maneuver against France was through Belgium. In 1832, Belgium had long been a contested area among the powers of Europe. In that year, Lord Palmerston got England, France, Prussia, Russia, and Austria to sign a solemn treaty guaranteeing Belgium as an independent and perpetually neutral state. Schlieffen knew enough history to recognize that an invasion of Belgium would very likely bring England into the war against Germany. But he believed that if British forces appeared in Belgium or in France, they would be sucked into the general catastrophe of the French Army and would be quickly eliminated. Since the war would be over in four months, British belligerency was discounted as of little or no significance. In fact, the economic impossibility of a long war was everybody's orthodoxy. While the German right wing was advancing south to the west of Paris, the German Army on France's eastern frontier was to engage in holding the enemy. If the French Army penetrated into Germany, so much the better because it would divert attention and French forces from the German advance through Belgium and northern France.

16 Tuchman, op. cit., p. 66.
18 Tuchman, op. cit., p. 118.
Any French forces entering Germany would soon find themselves attacked from the rear and the flanks. The execution of the Schlieffen Plan fell to General Graf von Meltke (the younger) who planned for a German left wing of eight army corps comprising about 320,000 men to hold the front south of the city of Metz along the Alsace-Lorraine border. The German center of eleven corps numbering about 400,000 men would invade France through the Ardennes and Luxembourg. This was intended to be a feint to attract the main body of French troops. Schlieffen's famous right wing of sixteen corps numbering about 700,000 men would pulverize the Belgian forts of Liege and Namur with siege guns, if necessary, and attack through Belgium. The Belgians, however, were not expected to fight, or if they did, German might was to persuade them to surrender quickly.19 The German time table designated the specific days on which Belgian roads, bridges, forts, and cities were to be taken. A tight and exacting schedule had to be adhered to if Paris were to be taken in six weeks time.

France was physically weaker than Germany, with a smaller population and a lower birthrate. Whenever the French General Staff thought about war, the idea of a defensive posture implied inferiority. Defensive war planning was therefore rejected. Napoleon had once stated that "the moral is to the physical as three to one."20 This was seized upon as a solution to France's military difficulties. It was given expression by Henri Bergson who called it élan, or the will to win. It would enable France to defeat its enemy. The mystical belief in élan was clothed in a

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19 Ibid., pp. 26ff.
20 Wolff, op. cit., p. 19.
lot of turgid verbosity by Henri Bergson, but translated into military terms it became the doctrine of the offensive.

After 1871, as emphasis shifted from the doctrine of the defensive to orthodoxy of the offensive (dissenters were not tolerated by 1914), increasingly less attention was paid to the Belgian frontier. France was unwilling to violate Belgian neutrality by launching an offensive drive through that country, and, since a defensive stance was frowned upon, everyone ignored the Belgian border. Instead, French attention and forces concentrated in the East for a breakthrough across the Rhine. This would enable the French Army to get to Berlin by the shortest possible route.\textsuperscript{21} The greater the enthusiasm for the offensive became, the fewer troops that were left on the Belgian frontier. The chief proponent and propagandist for this doctrine was General Foch, Director of the French War College which reflected his views. He was the maker of his country's military theory. His two favorite expressions were "The will to conquer is the first condition of victory," and "A battle won is a battle in which one will not confess oneself beaten."\textsuperscript{22} Any officer who dissented from this official doctrine was soon banished into an obscure post, his promotions stopped, and his person ostracized.

The plan finally adopted by the French General Staff was designated Plan 17. Its essence was the offensive to the limit. Unlike the Schlieffen Plan, with its meticulous schedule and carefully enumerated objectives, Plan 17 prescribed liberty of action which was to be attained by dominating the enemy by means of ferocious and constant attacks.\textsuperscript{23}

\textsuperscript{21}Tuchman, \textit{op. cit.}, p. 31.
\textsuperscript{22}Ibid., p. 33. \textsuperscript{23}Ibid., p. 17.
In October, 1913, the new French Army Field Regulations were published. They were full of truculent, bellicose, and savage exhortations to attack and keep attacking. There was little or no mention of material, firepower, enemy fortifications, or French geography which was more suitable to the defensive.\textsuperscript{24} The suitable instrument for the ferocious attack was the bayonet, which was seldom used even in the time of Napoleon. Reservists were regarded with contempt because their wives and families tended to make them circumspect, cautious, and hence poor material for the bayonet charge against rifle, machine gun, and artillery. (By failing to make full use of their reservists, the French were outnumbered by the Germans who used theirs on the front lines.) Attempts to clothe the French soldier in sombre colors (like the camouflage field gray of the Germans) instead of his bright red pants and other vivid colors, were rejected as unpatriotic, defeatist, and prideless. Heavy guns were frowned upon because they could not advance rapidly against the enemy. The generals were not entirely the blame for this asinine prescription for mass slaughter—of French soldiers. The President of the French Republic, M. Fallieres, stated that "the offensive alone is suited to the temperament of French soldiers... we are determined to march straight against the enemy without hesitation."\textsuperscript{25}

French strategy did not ignore a German invasion via Belgium. In fact, the French generals welcomed it, for that would mean fewer Germans on France's eastern frontier, where Plan 17 called for a breakthrough and the invasion of Germany straight to Berlin. The French Army, once in

\textsuperscript{24}Ibid., p. 36. \textsuperscript{25}Ibid., p. 33.
Germany, would swing north and cut off the German right wing. Plan 17, in fact, left two-thirds of the Belgian frontier, from the town of Hirson to the sea, undefended. One General Michel, who was vice commander of the Supreme War Council and commander designate in time of war, had submitted a prudent plan showing much military wisdom and perspicacity, but little knowledge of the psychology of his colleagues. The plan was designed to stop the Germans at the Belgium-French border. He was sacked for such faint-heartedness and lack of offensive spirit. Joffre, when he was put in charge of the French armies, found General Michel's plan and, after careful study, called it a lot of "foolishness." 26

Confident of speedy victory, the French high command spared no troops on what would have been a difficult defense of the Lorraine iron basin, but allowed the German army to take it on the assumption that they would regain it with victory. As a result, the French lost eighty per cent of their iron ore for the duration of the war (which itself was almost lost). Although French Army Intelligence, prior to 1914, had accumulated positive evidence of German military plans, Generals Joffre and Castelnau, Joffre's deputy chief of staff, rejected this evidence because (1) the Germans did not have enough men and (2) they would not risk a war with England by invading Belgium. They were wrong on both counts. They should have read The New Army by Jean Jaures, the French Socialist leader. His thesis was that the war of the future would have to use every possible citizen—and this meant throwing the reservists into the front lines. If France did not make use of massive formations, its army would be submerged

26 Ibid., p. 41.
by the Germanic hordes.\textsuperscript{27} This is exactly what happened. French Army Intelligence had given the approximate strength of the army the Germans were planning to send through Belgium, but Joffre and Castelnau refused to believe it. When the military Governor of Lille, a city located about ten miles from the Belgian border, asked General de Castelnau for some defending troops in case the Germans advanced through Belgium, the Deputy Chief of Staff said that the Germans could not extend themselves as far as Lille, which was forty miles from the channel. If they tried to do so, their line would be so thin that it could easily be cut in half. In fact, General de Castelnau said that he welcomed such a move by the Germans.\textsuperscript{28}

Great Britain feared that if Germany captured the Belgium and French channel coasts, the Germans could paralyze English shipping passing through the narrow straits by means of coastal guns, mines, and war vessels. The 1912 German Naval Law, intended to produce a navy second to none, had prompted the British to sign a naval agreement with France. It provided that, in case of a German attack on France, England would defend the French channel coast from an enemy attack thus leaving the French fleet free to concentrate in the Mediterranean. As this took the French fleet away from the Atlantic coast, it left a definite obligation upon Britain to defend the French channel coast. England thus became obligated to France through "military necessity."\textsuperscript{29} By the spring of 1914, the clandestine Plan W was completed by the British General

\begin{itemize}
  \item \textsuperscript{27}Ibid., pp. 41ff.
  \item \textsuperscript{28}Ibid., pp. 48ff.
  \item \textsuperscript{29}Goerlitz, op. cit., p. 134.
\end{itemize}
Staff for the British Expeditionary Force. It was pledged to complete cooperation with the French Army. One General Sir Henry Wilson, a Francophile, who was the head of Great Britain's General Staff College, had engineered this dangerous commitment on land without the full knowledge of Parliament. When the war started, General Wilson and the General Staff could plead for British Army intervention in France on the grounds that their country was already committed.

The Russian Minister for War was General Sukhomlinov, who had embraced the French doctrine of the offensive. As Minister of War, he once scolded a meeting of instructors at the Russian Staff College for interest in such innovations as the factor of firepower against the saber, lance and bayonet charge. He had led a cavalry charge in 1877 and was convinced that nothing had changed since that time. He often bragged of not having read a military manual for at least twenty-five years. He allowed no freedom of ideas and claimed that Russia's past defeats had been due to mistakes of commanding officers. Because of his firm belief in the superiority of the bayonet over the bullet, he did not bother to build up Russia's armament industries. When Russia's armies finally went to war, they did not have even enough rifles and cartridges let alone the minimum numbers of machine guns and artillery pieces. The Russo-Japanese war of 1905 had been minutely reported by observers of all nations who were astonished at the power of a single machine gun to stop hundreds of men. Both generals and politicians failed to profit from the lessons of this war, and General Sukhomlinov was a splendid example of this.

30 Tuchman, op. cit., p. 61. 31 Ibid., p. 63.
Russia and France had agreed to mutual military assistance in case of a war with Germany. Sukhomlinov’s plan was to launch a ferocious attack on East Prussia as soon as war began in order to draw troops from the German center, where the French intended to attack.

Many military writers, such as Barbara Tuchman in the *Guns of August*, give an explanation for the failure of the Schlieffen Plan much like the following. In the East, Sukhomlinov, true to his treaty, launched an immediate attack on East Prussia. General von Moltke panicked and transferred eight corps away from the German right wing to the East (the Germans did not weaken their center, where the French had expected the troops to be withdrawn). The weakening of the right wing was absolutely contrary to the very essence of the Schlieffen Plan (it turned out to be unnecessary, however, because the Russians were easily defeated at the Battle of Tannenberg).

In the West, the Belgians had surprised the Germans, but no one else in the world, by fighting the invaders, blowing up bridges and dykes, and cutting communication lines. This disrupted the German time table and made the movement of supplies difficult and inadequate. As a result, General von Kluck’s First Army, on the right side of the Schlieffen right wing nearest the English Channel, was under-supplied, over-marched, and exhausted before it reached its objective, the Seine river west of Paris from which it was to wheel east. Fatigue and lack of communications soon caused a gap to form between von Kluck’s First Army and his neighbor, General von Bülow’s Second Army, which was in no better condition than the former’s forces. In order to close the gap, General von Moltke ordered General von Kluck to wheel east, to the north of Paris, before he
reached his objective. This exposed his flank which was promptly attacked by an elderly French General named Gallieni who had been left in Paris after the government had fled. The French soldiers who stopped the Germans at the Battle of the Marne were just as exhausted and under-supplied as the Germans. This battle, which got strong support from the small British Expeditionary Force, stopped the Germans and compelled them to retreat to a line where they could consolidate their positions.

Writers such as Barbara Tuchman speculate about what would have happened if a gap had not appeared between the German First and Second armies, or if General von Kluck had not wheeled eastward too soon, or if General von Moltke had not taken eight corps away from the right wing. In my opinion, the Germans owed their initial successes in the invasion of France entirely to the foolish Plan 17. When the Germans finally met a solid, determined line, which made stout use of the rifle and machine gun (and did not decimate itself in suicidal, offensive attacks), they were immediately halted. The First Battle of the Marne would have been relatively bloodless for the Allies if they had had an adequate number of machine guns, instead of only two to a battalion. If General Michel's plan had been used, the French could have stopped the Germans at the Belgian border by digging a trench line there and setting up machine gun positions. Whenever the French took up a defensive position, fortified themselves, and did not engage in suicidal attacks, they held the line with tolerable losses and mowed down their attackers.

On France's eastern front, the French soldiers were attacking with dull battering-ram tactics and were being mowed down by the Germans.

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32 The Marne is a river.
who made good use of their machine guns. Such frontal attacks against
an entrenched foe always ended in a massacre of French soldiers with
nothing gained. Such attacks continued until 1918 and demonstrated the
incapacity of Joffre, Foch, Nivelle, and others whose mental processes
were confounded by the stalemate and the impossibility of flanking
maneuvers. All they could think of was frontal attacks and attrition.
Contrary to their optimistic reports, the attrition was French, not
German.33

During 1914, the doctrine of 6lan and "offensive to the limit"
cost the French Army 754,000 casualties. The Germans, the invaders,
suffered casualties of only about two-thirds of the combined French and
British losses. During 1915, the French Army, continuing its "offensive
to the limit," lost 1,549,000 men.34 In 1916, General Joffre's incompe-
tence became so evident that he was sacked and replaced by General Foch.
Foch, under the continuing delusion that sheer will power could break
through German barbed wire and machine guns, further squandered French
soldiers in vast, notorious battles which gained nothing. The worst one
of all was the Battle of the Somme. The losses here—without any gains
whatsoever—sealed the fate of the French Army and of France as a world
power.35 During 1916, the French doctrine of the offensive cost them
1,300,000 men.36 Failure to understand the defensive power of the machine
gun was to cost the French Army many more hundreds of thousands of
casualties.

33Wolff, op. cit., p. 20.
34Richard M. Watt, Dare Call It Treason (New York: Simon and
35Wolff, op. cit., p. 20.
36Watt, op. cit., p. 130.
CHAPTER II

THE MACHINE GUN

There had been few bayonet encounters even in the time of Napoleon. They had not been used in the Franco-Prussian war of 1870. Yet all of the military manuals of Europe emphasized the supreme importance of the bayonet. The generals simply could not accept the blatant fact that one man with a machine gun could mow down hundreds of troops armed with rifles and bayonets or, in the case of cavalry, with lances and pistols. This had been clearly demonstrated for all to see in the Russo-Japanese war of 1904. The Battle of Mukden was witnessed by numerous military observers from all over the world. The effectiveness of the machine gun could be readily observed, yet it made little impression on the military observers. The capacity of the generals to adjust to the new conditions of battle imposed by the machine gun proved to be almost totally lacking. The formula for victory remained the massive frontal attack, which became a formula for mass slaughter. The more ranks of troops in frontal attacks, the more rows of dead and wounded there were.¹ The land fighting in Manchuria clearly revealed the battle-field predominance of the machine gun, the impossibility of the frontal charge, and the decisive significance of entrenchment and position

warfare. The great size of both armies and their casualty lists should have dampened the optimism of the general staffs. Yet the stepping power of the machine gun was hardly noticed by the generals. (Perhaps the reason for this was that most generals expected, or were insensitive to, huge casualty rates. Few of them wanted to accept the fact that they were hopelessly stalemated. Others, like Haig, appeared to have acquiesced to a war of attrition.)

The rifle bullet had rendered the defense stronger than the attack; it had dismounted the cavalry, made the bayonet obsolete, and had driven the cannon out of the battlefield to the rear. During the American Civil War, when the muzzle loading rifle (slow loading and inaccurate) prevailed, the infantry spent a lot of its time digging earthworks. It had proved impossible to capture Richmond (until nearly the end of the war) because of the well fortified earthworks protecting the city. As early as 1861, the rifle bullet dominated the battlefield.2 Between then and 1914 the breach-loading rifle, with its hundred-fold greater firepower, accuracy, and range had replaced the muzzle-loading rifle. Yet so ossified was the thinking of the generals that all armies—and there were no exceptions—adhered in essentials to the tactics of the flintlock musket which took a minute to load and had an effective range of less than 100 yards.3

Hiram Stevens Maxim (1840-1916), an American engineer and inventor living in England, invented the first completely automatic,


3 Ibid., p. 8.
light-weight, self-powered machine gun. It was manufactured by Vickers and was known as the Vickers-Maxim machine gun. Sir Basil Zaharoff, the multi-billionaire arms merchant, saw to it that all the countries of Europe had a ready supply of these guns. A little later John M. Browning of Ogden, Utah, produced the Browning machine gun. It weighed less than the Vickers-Maxim model and was adopted by the American Army. In England the civilian Ministry of Munitions was quick to grasp the value of having a light machine gun which could be carried by an advancing force. The Lewis gun, recently invented, was an excellent light machine gun and was deemed an ideal weapon for the army. But it was rejected by the military authorities in 1912 on the grounds that it was undesirable to multiply the types of firearms, the rifle being considered to be perfectly adequate. It might be noted that before the end of the war every British battalion had thirty-two Lewis guns and when in action usually had from sixteen to thirty-two heavy machine guns. In 1914, the proportion of machine guns in the chief European armies was only two per thousand men. In several armies it was even less than this. Experience soon demonstrated that two machine guns in defense were often capable of paralyzing the attacking power of a thousand men, causing them to dive into the nearest hole or effectively pinning them in their trenches. After 1914, machine guns multiplied along with barbed wire and entrenchments causing the lines to become static.

The Allied generals were exceedingly slow to learn about new battle conditions imposed by the machine gun. General Foch continued to

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4 Hart, op. cit., p. 66.
5 Ibid., p. 28.
insist that any improvement in firearms was bound to strengthen the offensive.\textsuperscript{6} Although German machine gunners had for months paralyzed the Allied attacks, an attempt in the spring of 1915 to increase the British strength in machine guns was opposed by military authority. The proposal was referred from the General Staff to the army commanders, the idea being that they would be more knowledgable about battle conditions. General Sir Douglas Haig, then the third ranking general in the British Army, was soon to assume command of all British forces in France. He wrote that "the machine gun is a much over-rated weapon and two per battalion were more than sufficient."\textsuperscript{7} There were then less than three hundred machine guns in the whole British Army in France. Fortunately, a representative of the newly created Ministry of Munitions, Sir Eric Geddes, went out to France to discover the Army's requirements. He reported the power of the machine gun to Lloyd George, a member of the War Cabinet who later was to become Prime Minister. The two of them worked out a schedule which vastly multiplied the number of machine guns in the British Army and anticipated the gradual increase in the military needs for machine guns and ample reserves.\textsuperscript{8}

Sir Douglas Haig, the British Commander, was much more concerned with cavalry than with machine guns. He believed that "the role of cavalry on the battlefield will always go on increasing," and that "bullets have little stopping power against the horse."\textsuperscript{9} This was utterly false, as a brief perusal of past battles would have shown. Despite machine guns, wire, pillboxes, and deep mud, cavalry figured in

\textsuperscript{6}Wolff, op. cit., p. 19. \textsuperscript{7}Hart, op. cit., p. 66. \textsuperscript{8}Ibid., p. 66. \textsuperscript{9}Wolff, op. cit., p. 9.
all his battles to the detriment of the other arms, because of the enormous forage trains which blocked communications. These forage trains had precedence over ambulances. The modern rifled bullet had complete stopping power against the cavalry. Every cavalry charge during the Great War, if it encountered a machine gun or riflemen, promptly ended in a massacre of men and mounts. The cavalry, in the opening days of the war, had even proved worthless for reconnaissance. Although it was extensively used for this purpose, the cavalry rarely seemed able to determine the exact location, line of march, and numbers of the enemy army. A few riflemen, or a single man with a light machine gun, could stop a whole troop of cavalry. Joffre, for instance, depended upon his cavalry for information about the enemy's whereabouts and developments at the front. For this information, he employed one hundred thousand cavalry, but this enormous mass of men and beasts would seldom determine accurate information about enemy armies, and the French Armies were everywhere surprised by the invading Germans.10 Fortunately for the French, the Germans were also relying upon a prodigious mass of cavalry for information about the French Armies, and were equally uninformed whenever they encountered their enemy. The use of cavalry proved to be almost worthless during the Great War. Its supply needs seriously interfered with the other branches of the service.

After August 14, 1914, the first four great battles of Lorraine, Ardennes, Charleroi, and Mons were fought. The battles were carried out by the French in accordance with the French Field Regulations. These

10 Hart, op. cit., p. 35.
instructions calculated that in a dash of twenty seconds the infantry line could cover fifty meters before the enemy infantry would have time to shoulder their rifles, take aim, and fire. With the machine gun the enemy needed only eight seconds to fire, and not twenty. The riflemen could also fire in much less than twenty seconds. The French Field Regulations had also calculated that shrapnel fired by the French 75's (an excellent mobile artillery piece) would neutralize the enemy defense by forcing him to stay under cover in the trench where he would not be able to aim at the attackers. The Germans simply fired from loopholes under sandbag-covered parapets. Thus protected, they could fire at their attackers.11

Even this early in the war, machine guns were starting to be concealed behind loops of barbed wire. Enemy artillery then attempted to cut the barbed wire, destroy the trenches and other places where the machine gunners, and riflemen, might be hidden. They simply burrowed too deep to be killed by the artillery barrage. Later in the war, the machine gunners entrenched themselves in concrete pillboxes which were sandbagged and camouflaged. Artillery was never very successful because at the first sign of heavy shelling, the wary machine gunners would descend into deep bunkers which were usually immune even to direct hits. As soon as the artillery barrage was lifted, they would hasten above and set up their machine guns in time to mow down the enemy. No matter how strong the attacking forces, how intense the artillery barrage, or how valiant the attackers, the defense remained too strong to crack. This was proved

time after time at Ypres and at Loos in 1915, Verdun and the Somme in 1916, and finally in April, 1917, when General Georges Nivelle hurled the French troops at the German trenches in a stupendous effort to break through the German lines. It resulted in the usual appalling massacre of the French soldiers and little damage to the enemy. The slaughter was so terrible that it resulted in widespread mutinies in the French armies. After this, the mutineers stated: "We will hold the line . . . but we will not attack."12

About this time a German attempt was made to break the Allied line by the use of poisonous gas. The idea originated with one Professor Haber, a German chemist. The German High Command was slow to appreciate or recognize its potentialities. Because they would allocate little money to the project, Professor Haber had limited facilities and was forced to use cylinders instead of shells as the means of projection. The cylinders were taken to the front, placed into position, the men issued gas-masks, and the Germans settled down to wait for a favorable wind. By April 22, 1915, French Intelligence had absolute knowledge of the impending German gas attack. They even had samples of the launching apparatus and a gas mask proffered by a deserter. A prudent officer in the line, who had ordered precautions to be taken, was rebuked for it. The French High Command and Joffre refused to take gas attack seriously.13

When the wind finally shifted away from the Germans and towards the French, the poisoned gas was released. The effect was so stunning that

13Hart, op. cit., p. 69.
it left a four-mile wide gap in the front (to the left of the Ypres salient). The skeptical German General Falkenhayn had allotted no fresh reserves for the attack, and had even refused the request for extra ammunition. Thereby the Germans incurred the odium of introducing a horrible weapon without profiting from it.\textsuperscript{14} The use of gas also helped the defense, not only because it blistered and asphyxiated, but because it compelled attacking troops to advance through opaque gas in cumbersome equipment. For mustard gas, the entire body, in addition to the gas mask, had to be covered. The fogged mica of the masks made accurate rifle aiming impossible. Soldiers tired quickly, and moved slowly and vulnerably across no-man's land making perfect targets whenever they became visible.

The British infantryman carried sixty pounds of equipment on his back because each attack began with the expectation that the soldiers would soon advance many miles into enemy territory and would need to be prepared with rations, ammunition, and equipment, such as a can of brass button polish labeled "Soldier's Friend" and other non-essentials. The soldiers could barely struggle out of the muddy trenches, let alone charge across artillery pocked battlefields, often deep in mud and covered with debris and barbed wire. Instead, the British soldiers advanced in parade ground fashion. For instance, during the Battle of Loos, two British divisions were ordered to advance against the enemy. About 8,000 men climbed out of their trenches and advanced against the German lines over thousands of dead bodies and the dying, left there by an almost identical attack the day before. A German machine gun company was defending this

\textsuperscript{14}ibid., pp. 69ff.
particular part of the line. The German machine gunners held their fire until the enemy was only 1,000 yards away. Then they carefully and leisurely mowed down rank after rank of the slowly advancing British soldiers as they advanced across open grassland. The few survivors who reached the enemy lines were stopped by an impenetrable barbed wire mass over four feet high and nearly nineteen feet thick. Hundreds of soldiers were cut down while they attempted to surmount this prickly obstacle. The British casualties were 385 officers and 7,861 men. The Germans suffered no casualties. The attack was planned by Haig and was not considered a failure by him. Haig euphemistically, and incorrectly, referred to the one-sided attrition which characterized this battle as "wearing the enemy down." In 1916, the British were fighting along with the French at the Battle of the Somme. On the first day, the British lost 60,000 men and made no significant gains. The bloody offensive dragged on until November, 1916, with only a few square miles of tortured ground gained. The French and British lost 794,000 men and the Central Powers lost 538,000. The British alone lost 481,842 men and the Germans alone lost 236,195 soldiers. Unlike the unfortunate Battle of Loos, the British had inflicted heavy damage upon the enemy with their massive artillery barrages. Because of uneven ground, the Allied forces were able to penetrate into the German trenches. The Germans then would counter-attack. Artillery, infiltration, and counter-attack accounted for most of the German casualties, for to retake a trench meant to be

16 Ibid., p. 156.
17 Wolff, op. cit., p. 233.
decimated by the British machine guns. After the Somme fiasco, two and a half million Allied soldiers had been killed on the Western front out of a total of nearly seven million casualties there. And still the lines held. 18

In December of 1916, the incompetent Joffre was removed as Commander in Chief and replaced by General Robert Georges Nivelle. He thought that he could break through the German lines with a new method of attack which he had used successfully at the Battle of Verdun in 1916. This method consisted of making the maximum use of surprise, attacking the enemy's weakest point, using smoke screens, and by-passing the enemy's strong points—all novel ideas to the Allies. This scheme was unfolded to one Monsieur Paul Painlevé who had recently been appointed French Minister of War. He was a mathematician, an intellectual of the first rank, and a left-wing socialist. He judged Nivelle's grandiose plan for a new offensive to be the equivalent of mass manslaughter. Painlevé thought that the only French general fit for command was General Petain, who advocated that the exhausted French armies should assume the defensive for at least a year. 19

General Nivelle met the British Prime Minister, Lloyd George, when the latter was returning home, via France, from a dismal military conference at Rome. With his glib English and unctuous phrases, Nivelle prattled about the novelty of his plan. He spoke of a massive artillery barrage, smoke screens, surprise, and many feints and ruses. His infantry was not to be bogged down with heavy equipment and was to make

18 Ibid., p. 25. 19 Ibid., p. 58.
use of ground cover. He promised that if his plan did not succeed immediately, the attack would be broken off. Lloyd George was ordinarily wise and perceptive about military matters, but he seems to have suffered a temporary lapse of reason when he promised to secure full British support for Nivelle’s offensive.

Painlevé soon received incontrovertible evidence that the Germans, through captured documents, knew the minutest detail of Nivelle’s forthcoming offensive. The element of surprise, which was crucial to the plan, was completely gone. The Germans quietly withdrew from the place where Nivelle’s artillery barrage was to fall. They left a completely devastated area without roads or water (the wells had been poisoned). The new German positions were impenetrable. Nivelle now intended to attack them with troops which had to advance to the new front nearly without supplies, being shelled all the way over terrible terrain. Instead of attacking the German’s weakest point, he was now attacking the strongest. Instead of leaping out of trenches, the French troops, because of torrential rains which had lasted for weeks, now had to advance through waist-deep mud. Worst of all, everybody, including Nivelle, knew all about these new conditions. General Nivelle was simply too stubborn, or insane, to give up the attack. Why the French government permitted such an attack to take place will be discussed later. Even General Haig and his intelligence chief, General Charteris, who were usually as optimistic as Candide, thought the attack would be a mass slaughter of Frenchmen. It was. The German machine gunners simply mowed down what the artillery had left standing. The French made no gains—they lost ground in some places—and soon suffered 160,000 casualties. Nivelle, despite catastrophic failure
from the first moments of the attack, refused to call it off, as he had promised, until his army was decimated. This resulted in mutinies in the French Army involving 100,000 men. The French High Command solved this problem by arbitrarily shooting every tenth man in many of the mutinous regiments. In one instance, 250 mutineers were marched into a field and slaughtered by their own artillery.

Sir Douglas Haig, by this time Commander of the British Armies in France, decided to launch his own campaign to break through the German lines, make a wide breach, allow his cavalry to pour through, roll up the German front, and possibly be in Berlin in a few weeks. He ascribed the utter failures to break through the enemy's lines in the past to reasons other than the stout use of the machine gun by the Germans and their scientifically planned defenses. Such was the reasoning by the "expert" to whom the conservatives had entrusted the conduct of the war. The forthcoming bloody fiasco would be known variously to history as the 1917 Third Battle of Ypres, the Passchendaele Campaign, or the 1917 Flanders Offensive. As usual, Lloyd George knew that it was going to be a pointless slaughter. There was no element of surprise, as German newspapers had published the exact details of the forthcoming offensive and its timetable.

Haig believed that he could destroy the German line if the artillery attack were massive enough. He therefore pumped 4,283,550 shells, weighing 107,000 tons, into the German lines. It rained for

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20 Ibid., p. 10. 21 Ibid., p. 70. 22 Ibid., pp. 70ff. 23 Hart, op. cit., p. 106. 24 Wolff, op. cit., pp. 11ff.
weeks before the attack, the artillery shells churned the bogland into deep muck, and the infantryman had to advance with sixty pounds of equipment on his back. Every other British casualty was due to drowning or to suffocation in this porridge. Had the entire German Army suddenly volatilized, it would have been impossible for the British soldiers to advance very far because the mud made it impossible for the army to be supplied. During the course of this battle, Haig's intelligence chief, General Charteris, who made it a practice to tell Haig what he wanted to hear, touted every hundred yards of ground gained as a great victory. He fed his Chief false news and completely misled the British press and public.25 The Battle of Ypres ended about four and a half miles from its starting point. A very narrow salient had been gained which provided the up-land Germans excellent artillery practice for the next year. At one place, the British had set off a prodigious land mine under a ridge and were able to occupy the crater without too much opposition. The Third Battle of Ypres had cost the British nearly 500,000 casualties. As usual, the attrition was on the British side of the lines. Ten days later on November 20, 1917, 376 tanks led an infantry assault over unbroken ground, without a preliminary barrage. The tanks broke through the toughest German trench line in France with negligible losses. Although lack of reserves led to failure to exploit or hold the gains made, the battle proved that a half inch of armor plating was the solution to the problem of the rifle and machine gun bullet.

The French and British, by 1918, had lost so many men that they had at last become cautious with their remaining troops and no longer

25 Ibid., p. 10.
attempted massive frontal attacks, without tanks, against entrenched positions. The Americans did not profit by this experience, for General Pershing would take no advice nor listen to any suggestions from foreign generals. Pershing, a cavalry man, clogged supply lines with enormous forage trains for his huge masses of useless cavalry. Instead of integrating American soldiers with the French and British troops, according to President Wilson's wishes, he insisted on a completely separate, and independent, American Army. He did not want to expose his troops to the defeatism prevalent among the French and British troops. In the meanwhile, the Allies sorely lacked troops for defense (they had been squandered on foolish battles). The American soldier's morale was lowered by having to go through superfluous training day after day in France while Pershing was waiting for enough men and supplies to form his much desired separate American Army. Finally, in September, 1918, the American Army was ready and was assigned a section of the front. Then it was ordered to attack. The American troops suffered heavy casualties by frontal attacks against entrenched enemy machine gunners. They distinguished themselves, however, by capturing many stoutly defended objectives. American casualties at the end of the war were 126,000 dead and 234,300 wounded.

In the spring of 1918, the Germans launched a massive offensive. They made clever use of weather, poisonous gas, smoke screens, by-passing strong points and, most of all, surprise (the Allied generals believed that the Germans were tottering on the point of total collapse). The

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26 Hart, op. cit., p. 87.
attacking Germans were able to infiltrate past the inadequate numbers of Allied machine gunners and take them in the rear in many instances. Strong points were by-passed. The Allies were short of men because they had squandered them for years, and the remaining troops were not accustomed to being on the defensive. The Germans, by having made maximum use of all the tricks and techniques which could have been devised, advanced nearly forty miles in several places. But once the Allies had consolidated a line of defense and had discovered the German's new offensive techniques, they stopped them with the machine gun and the rifle bullet. The Germans had expended their last reserves of men and material on this effort, and were left in a weakened and exhausted condition. They had not been able to consolidate their erratic gains and were unable to supply their advanced troops. The Allies counterattacked. By October, 1918, the Allied forces, with the aid of tanks, had overrun the Hindenburg line. It was believed that once the Hindenburg line was broken, the cavalry would be able to break through into open country, create havoc in the German rear areas, and the infantry would roll up the German front all the way to Berlin. But the exhausted German troops began to recover and supplies again became adequate. After retreating past the Hindenburg line, the Germans were able to set up trench lines again and to install their machine gunners in appropriate places. The Allied troops had been slowed down somewhat by their supply problem and this had given the Germans a breathing space. While many German soldiers had surrendered, the machine gunners had not. By the time the Allies had gotten to the Hindenburg line, they had lost 140,000 troops. Past this point, the weakened and under-supplied Allied troops met a thin line of determined
machine gunners. Pershing, Foch, and Haig had counted on their huge armies to overwhelm the enemy with numbers. But the machine gun was a weapon which could riddle numbers, and the strategic calculations which had been based on numbers. The Allied generals were halted once again by the stopping power of this weapon.27

As the Allied armies were coming to a standstill, the revolution in Germany was gathering momentum. The ever increasing effectiveness of the British naval blockade had reduced the civilian population of the Central Powers to near starvation. Most people were without fuel or electricity. After the German offensive had expended itself, and the Allied counteroffensive had begun, Ludendorff had panicked, saw the condition of the German Army in the blackest terms, and made pessimistic prognostications. The army was described to the public, which had been fed on victory propaganda for years, as ready to collapse. This was a shock from which the German public never recovered. When Ludendorff realized that the German Army could prevent further Allied Advances—for the time being, for it was not known what would happen when tanks appeared in large numbers again—it was too late to restore public confidence. The shock of Ludendorff's prematurely announced defeat broke up organization, and checked any chance of reorganization. "With revolution in the streets, starvation in their homes, and disillusionment in their hearts, the Germans had become incapable of further resistance."28 The British blockade greatly contributed to German defeat by reducing soldiers and civilians to minimal rations and materials. Some writers, such as

28Ibid., p. 209.
Captain B. H. Liddell Hart, believe that the civilians were reduced to a state of near starvation and that the soldiers' rations were insufficient in quantity and quality to keep them fit for fighting.

During the Great War, average daily casualties were about 7,000 a day except when there was a big battle being fought. Various authorities estimate that nearly 80 per cent of the casualties were caused by the machine gun. There is little or no evidence that any of the Allied generals realized the full meaning of the machine gun as evidenced by the retention of hordes of cavalry until the armistice—and into the late 1930's.
CHAPTER III

THE TANK

H. G. Wells, in 1903, published a novel entitled The Land Ironclads. In it, the author illustrates his thesis that an army of amateurs, utilizing modern scientific technology, could defeat a large army led by traditional, professional soldiers. He describes the stalemate of trench warfare with both sides unable to storm the other's fortifications. The professional army is always able to mow down the attackers with small losses to itself. The amateur army, however, employs technology and invents what was later called the tank. Bullets could not penetrate it as the iron-advances over the enemy's trenches. Unfortunately, Mr. Wells was never in a position to assist in the development, testing, and evaluation of weapons for the British Army. Even after the tank had proved its worth in World War I, it did not occur to the majority of generals until many years after that the tank might be useful in a war of movement. The argument persisted that in a war of movement, cavalry was more useful because it was faster and less liable to mechanical failure. ¹

The tank is a mobile fort which enables one to attack the enemy with machine guns, cannon, and flame thrower while protected by armor from his weapons. It is able to advance over rough terrain and to deliver

fire down the length of the trenches. The Western front, in World War I, consisting as it did of elaborate trenches and barbed wire, was ideally suited to tank warfare. It could not have been built in practicable form before the year 1910 because there were no efficient engines to propel it. Steam engines were too bulky and had little power for all their vast weight. The steam driven tanks tested during the Great War were completely unsatisfactory.\(^2\) The caterpillar method of propulsion, first used in America in 1888, was readily adopted for the tank. By 1912, several designs for, and models of, tanks had been submitted to the British War Office. A working *schutzengrabenvernichtungsmobil*\(^3\) demonstrated in Berlin in 1914, but broke down after a few yards and was laughed out of court.\(^4\)

The story of the adoption of the tank by the British Army is a long, dreary, and extraordinarily complicated story. First, there was the responsibility for initiating and sustaining the action which led to the production of the tanks, and secondly, the task of solving the extremely difficult problems connected with designs as apart from the main principles. These services were entirely separate.\(^5\) During the early months of the Great War, Mr. Winston Churchill, and one Colonel Swinton, had both conceived of the need for armored fighting vehicles although neither knew of the other's work. Colonel Swinton, while an observer in France, noted the formation of static trench lines, and he visualized the tank (as it was later to be named) as a vehicle to break 


\(^3\) The German word for tank.

\(^4\) *Low, op. cit.*, p. 13.

through the enemy lines as an alternative to costly attrition. Mr. Churchill was in charge of armored cars used to protect the Royal Naval aerodromes located near Dunkirk. He visualized caterpillar tracks on the armored cars and thus conceived of the tank. Finally, one Sir William Tritton, an agricultural machinery specialist, cooperated with Mr. Churchill and this led to a caterpillar-tracked vehicle which could cross trenches. A Landships Committee of the Admiralty was created which designed, and constructed the first prototype tank. 6 When the project and plans for building this armored trench crossing machine were first submitted to the British Engineer-in-Chief in June, 1915, he commented somewhat sniffishly: "Before considering this proposal we should descend from the realms of imagination to solid facts." 7 Eight months later when the first tank demonstrated its powers before General Kitchener, the War Minister, he remarked: "A pretty mechanical toy," but that "the war would never be won by such machines." 8 On his own initiative, Churchill ordered six samples of the newly designed tanks to be built. Failure might have cost Mr. Churchill about 70,000 pounds out of his own pocket for his unauthorized order. After he was forced out of the British Admiralty in May, 1915, he stayed on the War Committee of the Cabinet and was thus able to prevent the whole experiment from being abandoned. At last Colonel Swinton, fighting against official disapproval, indifference, and lack of interest, was able to get a prototype built which

6Ibid., pp. 18ff.
8Ibid., p. 65.
became the mother of a whole series of tanks (after its impressive performance was demonstrated). The War Office and the Admiralty got together in June, 1915, and a demonstration of the new tank (mentioned above) was made before Lloyd George, Lord Kitchener (whose unimaginative lack of foresight has already been noted), Mr. Balfour, and other persons of note. A Joint Committee of incredible complexity was formed and the work was pushed on. One great difficulty which plagued the formation of tank units was the army's pretended lack of manpower for purposes other than mass massacre. The Joint Committee, which was in charge of forming a tank unit, decided to appeal for volunteers from the ranks of the Suffragettes to become tank operators. Sixty odd women immediately volunteered, but the idea was abandoned when the Admiralty was persuaded to give the Joint Committee an armored car reserve squadron and several hundred men became available. With the approval of King George V, an order for one hundred and fifty tanks was given. The first series was designed as Mark I's. The word "tank" was originally a code name intended to trick the Germans into thinking the vehicles were to be water carriers for use in the desert.

The two types of Mark I tanks were designated the male and the female because of the difference in armament. The male had two cannons which shot six pound shells, and four machine guns, and the female bristled with six machine guns and weighed a ton less than the male. It carried 31,232 rounds of machine gun bullets while the male carried 324 artillery shells and 6,272 machine bullets. The tanks were powered by a

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9 Low, op. cit., p. 22.
10 Ibid., p. 25.
105 h.p. Daimler six cylinder engine. The driving mechanism was rather complicated and required four men to operate it with the aid of a complicated system of hand signals.

In France, Colonel J. B. E. Estienne, a French artillery officer, wrote to the French Commander-in-Chief in December, 1915, suggesting an armored vehicle very much like the one conceived by Colonel Swinton, and asking for an interview. This was granted and Colonel Estienne greatly impressed his superior officers by his arguments. In cooperation with the Schneider works (in France), difficulties were solved and the factory began producing tanks. Surprisingly enough, Colonel Estienne did not know about the British tanks until 1916. The French tanks did not have wrap-around tracks and thus lost some of their climbing ability. They were powered by a sixty horsepower engine and carried a 75 mm. gun and two machine guns. There were also larger models of this tank. They were first used during Nivelles' ill-fated offensive and they failed because of lack of training, reconnaissance, poor terrain, and other factors.\textsuperscript{11}

The Germans had been tardy in recognizing the value of the tank—much more so than the Allies. It was not until August, 1918, when the Allies used tanks to strike the Germans a deadly blow, that they placed its manufacture in the urgent class of war material. General von Kuhl, Prince Rupprecht's Chief of Staff, considered that the help of German tanks would have made all the difference to the final issue in the great German push in 1918 if six hundred tanks had led the infantry. General von Kuhl stated that the fault lay with the obscurantist military leaders,\textsuperscript{11}

\textsuperscript{11}Ibid., pp. 49ff.
for the German industries had been capable of producing them. The first German tank, designated the A.7.V., was produced in late 1917. It was similar in appearance to the Mark I. It carried a crew of eighteen squeezed into a small space. Its armor enclosed its tracks like a carapace and it had springs for the tracks. It was powered by two 150 h.p. engines giving it a speed over flat ground of as high as 8 m.p.h. which was at least four miles per hour faster than the best heavy British tank.

In 1915, Winston Churchill had written a paper entitled Variants of the Offensive which accurately described the correct way to employ the new weapon. His main thesis was to omit the usual preparatory artillery barrage, which was used, among other things, to cut the barbed wire. The tank could flatten barbed wire and thus achieve the important element of surprise. Although it could only go a few miles per hour, this was faster than the infantry had ever advanced since the fall of 1914. It could overcome six-feet high obstacles and pass over a trench twelve feet wide. Mr. Churchill thought that the tanks should not be used until there were enough of them to crush the enemy and take him completely by surprise. There was considered to be no chance for a few tanks to achieve anything more than a small local advance. But three or four hundred tanks might make the elusive breakthrough, which was the dream of the belligerents. Such large numbers, however, would not be available

12 Hart, op. cit., p. 170.
14 Low, op. cit., p. 23.
until 1917. If Mr. Churchill's advice had been followed, the war might have ended a year earlier. But this advice was ignored by the high command in whom the conservatives put complete trust to win the war and who lost several hundred tanks through misuse in battle without achieving decisive results.

In the middle of 1916, it was decided to use tanks in the Battle of the Somme, which was going badly for the British. They needed about a million more artillery shells to cut the enemy's barbed wire and to pulverize his machine gunners. Alas, the shells were not available and so it was decided to achieve the effect of artillery with tanks.

Fortunately, the premature and hasty introduction of tanks into battle made little impression on the Germans for the following reasons: (1) the moderate artillery barrage had destroyed the element of surprise, (2) the artillery shells had turned the field of advance into deep mud in which tanks could not operate, (3) the tank crews had had only a few days of training. The Germans were so unimpressed by the performance of the new armored vehicles that they did not imitate them until it was too late. Only nine of the forty-nine tanks which had set out on September 14, 1916, reached their objectives. Forty of them were stopped by bad ground or mechanical failures. The ones that made contact with the enemy trenches proved their worth, however, for the Germans fled in panic whenever a tank appeared. The British infantry were favorably impressed with the tanks because they flattened barbed wire and shot or crushed machine gunners. Until the great Cambrai attack in November, 1917,

\[15\text{Ibid., p. 28.} \quad 16\text{Ibid.} \quad 17\text{Ibid., pp. 30ff.}\]
there were several small scale tank attacks. They were mostly successful when the terrain was fairly dry. In one instance, when tanks had broken through to their objective, a cavalry charge followed behind them. A hidden machine gunner soon slaughtered man and beast. The British learned to keep some tanks in reserve, some to act as gasoline, supply, and repair tanks, and some to follow the first wave. The lesson of omitting preliminary artillery barrages was belatedly noted, and laid the plan of action for the Battle of Cambrai. One Major Williams-Ellis summarized the lessons learned in a small scale tank battle in 1917; they were identical to the conclusions reached in Churchill's *Variants of the Offensive*. It was soon established that the German machine gunners, the toughest troops of any army, invariably abandoned their positions when tanks approached.

By the summer of 1917, the tank had proven itself to be the solution to the machine gun. It could flatten barbed wire and crush or blast pillboxes and their unhappy occupants. Even General Sir Douglas Haig, as great an obscurantist as ever lived, recognized the value of the tank. Yet the British War Office, by surreptitious maneuvers, false reports, and manipulation of personnel, ceaselessly attempted to sack the tanks. Only the wisdom and boldness of Lloyd George, Winston Churchill, and other civilians and reserve officers foiled the foolish designs of obscurantist generals in the War Office.

This was not the first time the War Office had rejected a fine weapon. The Stokes gun, a quick firing trench mortar, was submitted to

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the British War Office for approval in January, 1915. It was flatly rejected. In March, it was again rejected. It was demonstrated to Lloyd George in June, 1915 and made an instant impression on him. As the Ministry of Munitions was then limited to the manufacture of weapons which the War Office had approved, Mr. George had to use a money gift from an Indian Maharajah to get this mortar produced which later became the standard weapon of its kind.19

During the Third Battle of Ypres, the tanks were sent into a battle field where the goo was sixteen feet deep in places. Most of the tanks promptly oozed out of sight or, once stuck, were soon dispatched by German artillery which had a stationary target to zero in on. But a few tanks did reach their objectives which were, in the main, enemy pill-boxes. The capture of a German pillbox by infantry alone was estimated to cost between 600 and 1,000 troops. Tanks usually captured them without casualties. Nearly 200,000 soldiers suffocated to death in the goo at the Third Battle of Ypres. Most of the wounded were infected with the horrible gas gangrene bacteria which infested the Flanders soil.

The First Battle of Cambrai was the type of tank offensive that Winston Churchill had described in Variants of the Offensive and that Colonel Swinton had always advocated. The battle took place in November, 1917, after the Flanders offensive had ground to a halt with only a few miles of worthless ground gained at the cost of nearly 500,000 casualties. There were to be 472 tanks taking part in the attack. A number of these were reserves while others were supply tanks or carried a bulky mass to

19 Hart, op. cit., p. 65.
drop into the fifteen feet wide Hindenburg Line trenches to enable tanks to cross them.

A good report on this attack is General Sir Douglas Haig's official report, reprinted in the *London Gazette* on March 6, 1918. The delay in its publication was in consideration of military secrecy. Haig states that the object of the attack "was to gain a local success by a sudden attack at a point where the enemy did not expect it." (At the Third Battle of Ypres, he had attacked the enemy's strongest point with the object of rolling up German front all the way to the German border.) The Germans had concentrated heavy forces in Flanders the better to mow down Haig's armies in their fruitless attacks and thus left the Cambrai front with only normal forces. Next, Haig tells us that "the ground there was, on the whole, favourable for the employment of tanks." The tanks assembled without being detected because Allied aeroplanes buzzed the enemy trenches during the assembly period making it quite impossible to hear the tanks amidst the terrible din of their roaring engines. Haig's general plan of attack was "to dispense with the preliminary artillery barrage and thus achieve the element of surprise. The tanks would themselves crush and flatten the huge quantity of barbed wire. Haig thought that if ". . . secrecy could be maintained to the last moment, no large hostile reinforcements were likely to reach the scene of action for forty-eight hours after the commencement of the attack."22

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20 Sir Douglas (Fieldmarshal) Haig, Commander in Chief, British Armies in France, Dispatch to the Secretary of State for War, *London Gazette*, Third Supplement, March 1, 1918, Number 30554, p. 2717.

21 Ibid., p. 2717. 22 Ibid.
The attack was to feature close cooperation between infantry and tanks. After the attack began, the British artillery's task was to assist with counter-battery and barrage work; "but no previous registration of guns for this purpose could be permitted, as it would rouse the enemy's suspicions."²³

Haig's plan was that "the infantry, tanks, and artillery thus working in combination were to endeavour to break through all the enemy's lines of defense on the first day."²⁴ The German front was stoutly defended by two trench systems backed up by the formidable Hindenburg Line itself. The attack began at 6:20 a.m. on November 20, 1917, omitting the previous artillery bombardment as planned. Haig's report tells us that "... the tanks moved forward in advance of the infantry, crushing down the enemy's wire and forming great lanes through which our infantry could pass. Protected by smoke barrages from the view of the enemy's artillery, they rolled on across the German trenches, smashing up the enemy's machine guns and driving his infantry into the ground. Close behind our tanks our own infantry followed and, while the tanks patrolled the line of hostile trenches, cleared the German infantry from their dug-outs and shelters. For the first time in Haig's career, the attack achieved its objectives as scheduled. Haig gave full credit to the tanks for the unparalleled success of the attack. He states that the tanks, in combination with other arms, "helped to make possible a remarkable success."²⁵ The results of the Cambrai tank offensive were over 12,000 yards of former trench captured and 21,000 yards of the Hindenburg Line.

²³Ibid., p. 2718. ²⁴Ibid. ²⁵Ibid., p. 2720.
Also captured were three villages, 145 German guns, and 11,000 prisoners. The British advanced an average of five miles—a fantastic distance in those days—and entered the open country beyond. Their casualties, instead of being in the hundreds of thousands, numbered about 1500. Unfortunately, the men who should have rushed into the gap to consolidate the new positions and hold them against counterattack were lying under the Flanders mud.

During the winter of 1917-1918, new types of tanks were being produced. One was armed with a six-inch howitzer (i.e., it fired a shell six inches in diameter). Tanks designated as Whippet, or Medium A tanks, were being made which looked more like modern tanks. They were capable of 8 m.p.h. speeds and were intended to follow the breakthrough made by the heavy tanks and to act as cavalry by disrupting the enemy's rear communications and supplies. A Mark V tank, which could be controlled by one man, was under construction. The Americans were building a Mark VIII tank, but none arrived in time to be used in action.26

On April 24, 1918, the Germans launched a modest tank offensive of their own. They employed thirteen of their large models to the north and south of a place called Villers-Bretonneux. The Official British History states that "whenever tanks appeared the British line was broken."27 The British had neglected to develop an anti-tank weapon as had the Germans (although it was not very effective). Flame throwers were the terror of the British Tank Corps. It was difficult, however,

26Low, op. cit., p. 44.

27Pitt, op. cit., p. 150.
for a flame-thrower equipped soldier to get close to a tank without drawing a prodigious fusillade from its crew. When British and German tanks fought, the results were about equally destructive to each side. There was considerable cooperation between tanks and aeroplanes. The latter were used as reconnaissance and would drop notes to the tank commander. The drone of aeroplane engines was often employed to drown out the sound of assembling or approaching tanks.

On August 8, 1918, a massive tank offensive was launched at the Battle of Amiens. Nearly 700 tanks were used in this action. The first part of the offensive was very successful with the capture of 16,000 prisoners and 200 guns during the first two hours. Later on, the German resistance stiffened and a number of tanks were lost, but the Whippet type broke the German lines and did much damage in the rear. An armored car battalion was towed behind the lines by the heavy tanks. They created confusion everywhere behind the German lines and penetrated ten miles in places. Several of the armored cars captured a corps headquarters, loaded up with documents, and then safely returned to the British lines. At the end of the battle, all of the objectives had been reached with a loss of 200 tanks, many of which suffered mechanical failure. The tanks enabled thirteen British infantry divisions to defeat twenty German divisions. The former captured almost 22,000 prisoners and about 400 guns. The Allied line had been advanced nearly twelve miles in a vital sector. Nearly 2,000 tanks were engaged in the many actions between August 9 and November 5, 1918. Of these, 887 were disabled.

28 Low, op. cit., p. 48.
Owing primarily to the efforts of Colonel Estienne, a small French tank carrying a crew of two, weighing six and a half tons, and armed with a 37 mm. gun, or a machine gun, was produced by the hundreds. On July 18, 1918, they were launched during the Second Battle of the Marne. The tactics employed there were the same as those used at Cambrai by the British, and they were completely successful in their performance. The French XI Army, which used no tanks in this battle, failed miserably. From this time on, the light and speedy French tanks launched many attacks against the retreating Germans with great effect.

Allied tanks had made possible the unprecedented and astonishing Allied advances during the last year of the war and, together with the British blockade, were almost totally responsible for causing the German High Command to ask for an armistice.\(^{29}\) The German General Staff paid a high price for their fatal error in failing to understand that the British had discovered the counter-weapon to the machine gun.

\(^{29}\) Ibid.
In October, 1904, Admiral John Fisher became First Lord of the Royal Navy. At that time, the major powers were building battleships in large numbers. Typical of such vessels was the USS Connecticut. It weighed 16,000 tons, could attain a speed of 18 knots, and mounted a main battery of four 12-inch guns (i.e., they fired a shell twelve inches in diameter) and eight 8-inch guns. The larger cannons were notoriously inaccurate at long ranges, while the smaller bores were more accurate at short distances, and could fire more rapidly. But since 1898, ballistic engineers had been experimenting with naval artillery and had at last devised a large bore cannon which was accurate enough to prevent ships carrying artillery of lesser caliber to get into firing range with their smaller guns. Lord Fisher therefore concluded that the way to stay ahead of all other nations in naval supremacy was to build an all big gun ship. Britain proceeded to build such a ship which was christened HMS Dreadnought. After its auspicious launching, all further behemoths of this class were called dreadnoughts. Most of them carried ten to twelve 12- or 13.5-inch guns. Their armor was the minimum necessary to protect them against torpedo attack. Their speed was 21 knots or more. By 1905, America was building dreadnoughts.

The newly formed steel trust, the United States Steel Corporation, used its vast funds to get the press to agitate for a more powerful navy.
By vigorous lobbying it continually pressured Congress to accede to a navy second to none. On this matter, Theodore Roosevelt, the Trustbuster, and Judge Gary were in accord. The U. S. Steel Corporation was charging the American government half again as much for ship steels as it was charging European ship and armor builders. After having built up the U. S. Steel Corporation by tariffs and government contracts, the United States government was now being robbed by it.\(^1\) Congressional approval for a dreadnought navy was difficult because the United States in 1906 had no enemies or potential foes to use its navy against. Congress was still recovering from the shock of learning that its twelve most recent battleships were now obsolete because of the dreadnought. Despite the efforts of the proponents of Manifest Destiny, and the U. S. Steel Corporation, America's navy had fallen from second to third place among the world's navies in 1913.\(^2\)

When the Great War began in 1914, England had twenty dreadnoughts and Germany had thirteen of them. The former possessed twenty-four modern battleships while Germany brandished twelve. Germany correspondingly possessed proportionately smaller numbers of all other types of ships including submarines.\(^3\) Great Britain immediately gained control of the seas because His Majesty's more numerous dreadnoughts could theoretically defeat the Kaiser's less numerous ones. The German admirals did not put the English navy to the test and remained in the North sea.

\(^2\)Ibid., pp. 167 ff.
\(^3\)"World War I," Encyclopaedia Britannica, 14th ed., Vol. XXIII.
Meanwhile, German cruisers such as the *Emden*, and raiders (merchant ships outfitted as war ships) were sinking British merchantmen. After German raiders and cruisers had sunk over fifty merchant ships, the Britain's big ships in turn destroyed the cruisers. Until the end of the war, German cruisers and merchant raiders operated in small numbers on the high seas by cunning and stealth, but they were readily dispatched to the bottom once detected by Britain's big warships. Altogether, German surface ships sank 568,537 tons (well less than one-half of one per cent) of British shipping.

Since August, 1914, the German Admirals had determined to avoid risking their Grand Fleet in a decisive battle with Britain's Fleet. They intended first to reduce its numbers with mines and torpedoes. It was precisely the fear of such underwater weapons, especially their use in a trap, which caused British strategy to be so prudent and cautious.

The British had justifiable fears of traps and torpedoes. On September 13, 1914, U-boat 9 sank three British cruisers near Horne Reef in the North Sea. On October 3, a German U-boat entered Loch Ewe and so frightened the Grand Fleet that it fled in panic to Scapa Flow. On October 15, a U-boat crept into Scapa Flow and sank the cruiser *Hawke*. The Grand Fleet then steamed post-haste to Lough Swilly. On October 26, the battleship *Audacious* was sunk by a mine that a U-boat had released. On January 1, 1915, U-boat 24 sank the battleship *Formidable* in the North Sea. In the Turkish Dardanelles, on March 18, 1915, the Turks released a number of mines which promptly sank three older model battleships and heavily damaged three others. Altogether, German torpedoes and Turkish and German mines sank one dreadnought, eleven battleships, and
thirty-one cruisers. Only three British war ships (light cruisers) were sunk by German shell fire. The threat of the mine and the torpedo, justifiably feared, kept the British fleet from ever venturing out of harbor without an escort of nearly one hundred destroyers plus numerous mine-sweepers and other small craft. The German fleet was likewise bottled up by mines and the superior British fleet. Destroyers were deadly launchers of torpedoes and were difficult targets for the dreadnoughts; at night, they were often impossible targets. Each fleet’s swarms of destroyers kept the enemy’s counterparts from launching a torpedo attack. The destroyers also prevented an ambush by U-boats.

The two great fleets, in 1916, met for less than an hour at the Battle of Jutland in the North Sea. Three British cruisers were immediately sunk by shell fire. The Germans lost one cruiser. None of the dreadnoughts were seriously damaged. The dreadnoughts were so vulnerable to destroyer attacks that they barely got in range of each other before one side or the other would have to quickly retire to avoid the enemy’s torpedoes.

There was little civil-military conflict over the construction of the dreadnought (except in the realm of appropriations). Few people questioned the way that the admirals used them. Owing to their speed, great range, and powerful armament, the dreadnought, once on the open

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sea, was too fast to be caught by a U-boat (except by chance) and could be protected by destroyers from submarines and enemy destroyers. A few dreadnoughts could destroy virtually all of an enemy's merchant shipping on the open seas. The only thing which could stop a dreadnought on the open seas was another dreadnought. If the Germans had put the time, research, and effort that went into building the dreadnoughts into fast, long-range torpedo-launching destroyers, counter-destroyers, and better U-boats, they might have found the answer to Britain's superiority in capital ships. As it was, the dreadnoughts were an excellent investment by Britain, for they swept the seas of German commerce while at the same time protecting their own against enemy capital ships. The counter-weapon to the dreadnought had to wait twenty-three years and will be discussed in a later chapter.

As has just been related, the torpedo and mine were more destructive of capital ships than shellfire. The torpedo is a means of delivering an explosive charge. In 1880, it had been demonstrated that a small quantity of guncotton, exploded against the vulnerable underside of a battleship, could sink or cripple a vessel costing 4,000,000 dollars. The first practical torpedo was built in 1867 by one Robert Whitehead, an expatriate Englishman from Lancashire, at the urging of one Captain Lupuis of the Austrian navy. Mr. Whitehead discarded the previous mechanisms of steam and clockwork in favor of compressed oxygen. In 1870, England purchased non-exclusive manufacturing rights from Whitehead for 75,000 dollars and other nations quickly followed England's example. The proliferation of the torpedo resulted in measures being taken to protect capital ships. These took the form of elaborately wrapping the
anchored ships with steel nets which, together with their hoisting apparatus, affected the sea worthiness of the ship. Later, blisters of steel around the ship's hull were adopted. These slowed the battleship down. Finally, it was decided to keep the capital ships in a secure harbor and surround them with destroyers.

By 1910, the submarine, a torpedo launcher, had been adopted by the British navy with no civil-military conflict. The British intended to use them for coastal and harbor defense. Admiral Fisher saw great potential for the submarine as far more than a coastal defense weapon. The British did not develop the submarine as did the Germans because their dreadnought fleet more than sufficed to sweep the Germans from the sea. The Germans, unwilling to risk their dreadnought fleet in battle with the enemy fleet, turned to the U-boat to attack a vast seaborne merchant trade and any slow-moving, or anchored capital ship which presented itself as a target. A pre-war British investment in submarines would have been wasted and the lack of such an investment in dreadnoughts would have been fatal. For the Germans, a pre-war investment in dreadnoughts proved wasted and the lack of such an investment in U-boats proved fatal.

The German U-boat (1914 to 1918) was capable of about seventeen knots speed on the surface. Submerged, it was entirely dependent upon its batteries for power. They could last only about sixteen to twenty-four hours at extremely low speeds. The U-boat operated primarily by stalking a lone merchantman, whose speed was almost always less than that of the submarine. The German submarine sought out the unprotected merchantman, and when the merchantman was found, the submarine slowed to a stop and attacked with torpedoes, which it carried in its bow. The submarine then submerged, and the merchantman continued its course, often unobserved. Sometimes the U-boat would proceed in front of the merchantman, sometimes it would overtake the merchantman, and sometimes it would lie in wait for the merchantman, which was often the case. The German submarine operated primarily by stalking a lone merchantman, whose speed was almost always less than that of the submarine.

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of the U-boat. The surfaced submarine would maneuver into torpedo range—usually at night—and sink its victim. If enemy destroyers or other war vessels appeared, the U-boat would submerge and lie on the bottom until danger passed, or try to slowly creep away beneath the surface. Usually a combination of both tactics were used. Because of its relatively small size and low silhouette, the U-boat was almost impossible to see at night (as the view from a ship's deck made it difficult to silhouette the U-boat against the horizon). The submarine was also hard to detect in foggy weather. As torpedoes could be fired at distances of one or more miles, the U-boat, even in good weather, could only be seen as a speck in the distance. In addition to firing torpedoes, it could lay mines, especially in English harbors and other likely places. These were very effective, and even their suspected presence brought seaborne traffic to a halt and necessitated costly and time-consuming mine sweeping operations.

The U-boat was Germany's answer to Great Britain's control of the seas by the dreadnoughts. Since Germany could never have achieved parity in dreadnoughts with England, given the conditions of the times, Germany's investment in its Grand Fleet was entirely a waste of time. That nation would have fared much better had it concentrated on better U-boats, mines, and destroyers. There was no civil-military dispute, however, over the technical aspects of Germany's naval weapons development and use. The U-boat was a solution to the Kaiser's bottled-up fleet rather than a truly competing weapon of the dreadnought whose effectiveness as a merchant destroyer was much greater than the U-boat's. The U-boat was, however, a very effective ship sinker. In 1914, over 500,000 tons of British and world shipping were sent to the bottom (an average merchantman
weighed about 4,500 tons). Over a hundred commercial vessels were sunk in 1914; over 400 in 1915; and in 1916, over 400 more. By April, 1917, the U-boats destroyed one out of every four ships leaving or approaching the British Isles. Yet only five or six submarines, on an average, were operating around them at any one time. Sixty per cent of the ships sunk were British because neutrals were becoming wary of the waters around England, and with good reason. The German General Staff, with assurances from the admirals, decided that with this rate of sinkage, and with neutrals being more and more frightened to approach the British Islands, they could, with unrestricted submarine warfare, starve England into submission by the summer of 1917. The campaign appeared so promising that the Germans decided to sink all vessels approaching the British Islands without distinction. (The civil-military conflicts regarding this decision will be discussed later.) The British Admiralty's estimates agreed with the ominous predictions of the German General Staff (which was running things in Germany by that time). The new unrestricted submarine campaign was so successful that they sank over 2,200 ships in 1917. The English would have to act fast or lose the war through starvation on the home front.

Lloyd George had noticed that destroyers, and similar craft, could protect capital ships at sea from depredation by U-boats. Since the latter almost always had to stalk their prey and attack from the surface, this would prevent the U-boats from getting close enough to fire their torpedoes. The destroyers, by patrolling the waters around a

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7 Newbolt, op. cit., pp. 388ff.
convoy of merchantmen, could sink any lurking U-boats encountered by shell fire, ramming, or by depth-chargers. U-boats would be forced to submerge until danger—and the convoy—had passed. On the other hand, when merchantmen were alone, the U-boat could brazenly approach and sink them without fear of retaliation.

On November 2, 1916, Lloyd George asked the British Board of the Admiralty to try the convoy system. It was the Admiralty's unalterable and dogmatic opinion that merchantmen could never be kept in a sailing order, and would soon scatter and straggle out of sight. Admiral Jellicoe, the First Sea Lord Sir Henry Jackson, Admiral Durr, the Director of the Anti-Submarine Division—all of them—found a thousand excuses and rationalizations to "prove" that meddling civilian Lloyd George's idea of a convoy could never work. They flatly refused to even try one convoy. To demonstrate the impossibility of the convoy system, the Admiralty produced statistics showing that there were some 2,500 voyages a week each way—far too many to ever organize into convoys. Under the investigation of one Commander Henderson, it was discovered that the figures were grossly deceptive and included the repeated calls of small coastal vessels. The actual number of arrivals and departures of ships leaving or coming from the open seas was less than 140 a week.

On April 9, after America had entered the list of the belligerents, Admiral Simms went to London and saw Admiral Jellicoe who made this gloomy prognostication about the U-boat campaign: "It is impossible for us to go on with the war if losses like this continue." When Simms then

8 Hart, op. cit., p. 142.
asked him if any practical solution had been proffered to solve the problem. Jellicoe's mendacious reply was: "Absolutely none that we can see now." Jellicoe added that England's control of the seas had been rendered practically useless and that England was heading straight towards disaster. At this point, Lloyd George intervened and ordered the Admiralty to try the convoy system. The first convoy departed from Gibraltar on May 10, 1917, and arrived in England without loss. A trans-Atlantic convoy proved equally successful. Even then, the Prime Minister had to intervene once more before the Admiralty adopted the convoy as a regular practice. Only one per cent of the ships steaming in convoy were sunk. This dramatically proved the superior military perspicacity of Lloyd George.

Meanwhile, the anti-U-boat campaign was improved and intensified by special submarine chasers, reconnaissance aircraft, better underwater listening devices, and the new horned mines. During 1917, seventy-five U-boats were sunk. By the end of 1917, the U-boats no longer menaced Britain's war effort. Although U-boats continued to operate, they were forced to attack lone ships for any worthwhile results. As there were 3,000 destroyers and light craft continually searching for them, U-boats had to spend much of their time avoiding the enemy. In spite of this, they managed to sink over 600 vessels in 1918. But by this time Britain and the Commonwealth were building enough new ships to replace those sunk.

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9 Ibid., pp. 142ff. 10 Ibid., p. 143.

11 Newbolt, op. cit., p. 122.
By July, 1918, the Allied blockade of Germany, thanks to the
dreadnoughts, had tightened to a stranglehold. The civilian population
of the Central Powers was in a state of near starvation and the German
troops were reduced to a bare minimum of sustenance. The German soldiers
were suffering from diseases brought on by malnutrition. The troops
continually received pitiful letters from home describing the hunger
plight of family and friends. Many soldiers began to feel that the war,
which prolonged the blockade of Germany, ought to be ended. This reduced
fighting morale and determination at the front.\(^\text{12}\) In 1918, famine,
caused by the British blockade, greatly contributed to the defeat of the
Central Powers. Back in 1914, the *Times* of London, in an article by
their military writer, one Colonel Repington, had suggested that the
British Navy was worth 500,000 bayonets to the French. Generals Joffre
and Foch said that they did not value it at one bayonet. Such was the
mentality of the generals.\(^\text{13}\)

At the armistice, Germany surrendered ten dreadnoughts, six
battle cruisers, eight light cruisers, fifty destroyers, and all its
submarines. When the Grand Fleet had been ordered on a death-or-glory
ride against the British Navy, the sailors exhibited infinite wisdom and
good sense in promptly staging a mutiny. Their officers did not resist
the mutineers very vigorously.


\(^{13}\)Ibid., p. 56.
CHAPTER V

CIVIL-MILITARY CONFLICTS OVER THE CONDUCT
OF THE GREAT WAR

Thus far, civil-military conflicts have been sketchily presented because it was desirable to describe first the weapon technology of the Great War before going into the broader aspects of civil-military relations. As already explained, each nation had its master war plan which was supposed to assure it a quick victory. The belief in a short war was reinforced by various books at that time which "demonstrated" such economic dependence among nations that no war could last more than six months without bringing complete economic ruin to one or both of the participants. Most civilians in 1914 trusted the judgment and wisdom of the generals and admirals. Conservatives everywhere thought that war should be left to the "experts." Unfortunately, the generals were among those least qualified to conduct war because of their total failure to understand the machine gun and its counter-weapon the tank (the French generals being the exception in not having opposed the introduction of the tank). The ranking British admirals totally failed to understand the merchantman convoy system as the solution to the U-boat menace. None of the generals recognized the power of poison gas when it was first introduced.

After the war of movement had ground to a halt in late 1914, an unbroken wall of trenches stretched from the English channel to
Switzerland. The Germans had wisely assumed a defensive stance. The British generals, on the other hand, wanted to break through the trench system into the open country beyond which there would be room for their cavalry and armies to maneuver.

The British generals refused to accept the fact that their method would not work. \(^1\) That the generals had faith in themselves is evidenced by Haig who, like most of the generals, considered himself "the pre-destined instrument of Providence for the achievement of victory for the British armies." \(^2\) The generals sought to justify their appalling carnages by asserting that the Germans were almost exhausted by the battle just fought (their casualty figures for Germans belonged in the realm of fantasy) and that just one more big push would end in complete victory over a demoralized and decimated foe. The British generals, and their French colleagues until late 1917, were optimistic. In July, General Haig declared that they could not fight after January, 1916. Just before Haig's 1916 offensive in September, he forecast the end of the war before winter. \(^3\) Because Haig, Joffre, and the other Allied generals would not admit that their attacks in 1914, 1915, and 1916 were all wrong, they continued to squander whole armies in order to prove that massed frontal attacks on the Western front against the main enemy's solid defenses was the key to victory.

As a result of this policy of militarily neglecting other theaters of war, Bulgaria joined the Central Powers, Serbia was overrun, Austria's

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weakness was not exploited, and a great part of the Allied forces were pinned down in Salonika and the Near East because of half-way measures and the generals' refusal to adequately supply any armies except those on the Western front. If the Allies could have defeated Austria and cut off German supplies from the Balkins and the Ukraine, they probably would have starved the Germans into defeat by 1917. Such a policy would have accelerated and augmented the effect of the blockade. Those who advocated this course of action were called Easterners. They included Winston Churchill and Lloyd George. In 1915, an ill-prepared and poorly executed invasion of the Dardanelles, which was engineered by Winston Churchill, ended in disaster with 250,000 British casualties. The Turks, possessing favorable terrain, stopped the British (who tarried on the beaches thus allowing the Turks to dig in and consolidate their defenses) with rifle and machine gun. As a result of this fiasco, Churchill was dropped from the War Cabinet. Whether the Allies could have severed Germany's supply lines before the Germans could have stopped the Allied forces with a defensive line manned by determined machine gunners is open to speculation. At least it was an intelligent alternative, if prolonging a war can be called intelligent, to fruitless and costly frontal attacks on the Western front. Lloyd George was against the murderous offensives there and considered Haig a clumsy, incompetent fool. His own plan was to make the Western front a defensive operation and, by means of certain peripheral operations, to leave Germany isolated, heavily outnumbered, and set up for the final kill. As one writer so aptly puts it,

\[^4\text{Wolff, op. cit., p. 35.}\]
"Amateurish nonsense of this sort was determinedly resisted by Sir William Robertson, the Chief of the Imperial General Staff, as well as by Haig and other high British officers who felt that the only way to win the war was to apply continuous pressure in France and Belgium."\(^5\) This sort of mentality was typical of Haig, and most of the other British and French generals. Haig's qualifications for command may well be scrutinized. He came from an old and rich Scottish family who continue to be the distillers of Haig & Haig Whiskey. Haig, a good polo player, became a great favorite of the King and married one of the Queen's favorite ladies-in-waiting. It was the backing of King George V and the conservatives which secured Haig his rapid promotions which made him Commander in Chief of the British Expeditionary Forces and kept him there.

In 1912, during war games in England, Haig made one appalling blunder after another and was finally completely outmaneuvered. The official report declared that he dogmatically pursued fixed aims and completely ignored new information about the "enemy" army which finally worked its way behind him and theoretically annihilated Haig's forces. At a conference held at Cambridge following the maneuvers, Haig was asked to justify his actions. He "became totally unintelligible and unbearably dull. The University dignitaries soon fell fast asleep. Haig's friends became more and more uncomfortable; only he himself seemed totally unconscious of his failure."\(^6\)

During the retreat of the British Expeditionary Force in 1914, Sir Douglas, realizing that his person was within ten miles of the front, panicked and retreated so precipitously that he went in the wrong

\(^{5}\)Ibid. \(^{6}\)Ibid., p. 42.
direction. One General Smith-Dorrien stood and fought and saved the day. "Haig never forgave this exposure of his cowardice and managed to sack Smith-Dorrien when he came into power." He never tired of denouncing his superiors in clandestine and treacherous letters to his crony, the King. Since 1914, he believed that God had chosen him as a man of destiny. At spiritualistic seances he had been told so. He respectfully consulted his medium on matters of detail, such as whether a company or battalion clerical system was more efficient, how the Territorial Army problem should be solved, and so on. He believed that the spirit of Napoleon was always near to him. He frequently consulted God when planning a campaign. He wrote in 1916 that "I feel that every step in my plan has been taken with the Divine help." The plan referred to was for the Somme offensive where he lost 60,000 men the very first day of the battle for no appreciable gain in ground.

One can only conclude that Haig suffered from hallucinations or that the Divinity was deficient in military wisdom. All through the war, and until his death many years later, he continued to conceive of the cavalry as being the basic instrument of war, and in later years was to depreciate the machine gun, the tank (despite his former praise of it), and the aeroplane.

After the Somme debacle, Haig had thoughtfully written a paper for the Government summarizing his views. He stated that there was reason to believe "... that German casualties were far greater than those of the British and French [the actual situation was vice versa]. The morale

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7 Ibid., p. 43. 8 Ibid., p. 35. 9 Ibid.
of the enemy has shown marked signs of deterioration." He attributed his miserable failure on the Somme to bad weather alone. He believed that the battle had demoralized both German soldiers and civilians. And finally, he pleaded for another army to wage another similar campaign because he believed that the Germans were at the breaking point, and another offensive would crack their lines. (Haig was to write identical reports after the Flanders campaign in which he lost nearly 500,000 men.) This memorandum on the Battle of the Somme confirmed Lloyd George's view that the man was quite hopeless, and his marginal confidence in Haig sank to zero when he read a report of Haig's stating that he found casualties of 70 per cent "highly satisfactory."

Since the Prime Minister of England believed his Commander in Chief to be a murderous fool, and his strategy to be quite insane, why did he not sack him and begin defensive operations in the West and offensive operations in the East? The reason was to be found in politics. In December, 1916, Prime Minister Asquith resigned after the Somme massacre. Lloyd George obtained office by devious machinations and treacherous political maneuvering which alienated and split his Liberal Party. He commanded a bare majority in Parliament and could only remain in office by grace of the Conservatives who believed that the war should be left to the "experts" just as conservatives in America do today. The King energetically supported Haig. Lloyd George got into office on the solemn promise to prosecute the war in a vigorous manner until victory was achieved. His Conservative Party support was contingent upon

(1) retaining Haig and Robertson, Chief of the Imperial General Staff

10 Ibid., pp. 36ff.
and whom he considered even more of a "murderous fool" than Haig, and
(2) not allowing Winston Churchill, an Easterner, back on the War Cabinet.
In December, 1916, the Germans had made peace overtures, but the British
War Cabinet, and the majority of Parliament, rejected them. The press,
such as the London Times, also were against peace and demanded victory.
Lloyd George's hands were tied, and he would have been replaced as Prime
Minister had he attempted to (1) make peace, (2) sack his incompetent
generals, (3) fight against the generals and their conservative backers,
including the King, and shifted the war to the East. The English Prime
Minister had to allow the generals to continue applying pressure on the
Western front because he was pledged to a vigorous prosecution of the
war and was unable to control its strategy.

The French, like the British, had put all their faith in the
"experts." In 1914, the French government had turned the government
virtually over to the military and made a pusillanimous departure from
Paris when the German armies approached that city. It proved difficult
to wrestle the government back from the military. The tremendous pre-
war prestige of the generals, the backing of the French conservatives,
and the incessant glorification of the generals in the press gave them a
preeminence which enabled them to foolishly squander the life blood of
France until the Nivelle massacre resulted in mutinies and the complete
discredit of the French High Command. At that time, Clemenceau became a
strong Premier, Foch put the armies on the defensive, and the civil
government was once again firmly in control of France.

By early 1917, it had become apparent that the war was to be
longer than even the most congenital pessimists had predicted. Millions
were being butchered, the reasons for the war began to seem trivial, and the populace were losing loved ones and feeling the pinch of war. The generals of all nations assured the politicians, or the Kaiser, or Czar, of final victory, and this put a damper on any possible peace negotiations. Germany was worse than the other nations because its generals prevented the diplomats from submitting reasonable peace terms for Allied consideration. The Great War saw the complete destruction of the imperial balance of power in German civil-military relations. By the end of the war, the German General Staff, controlled by Generals Ludendorff and von Hindenburg, was running the government. After the famous victory over the Russians at Tannenberg, the Kaiser had lavished praise upon Hindenburg and Ludendorff, as had the press. Like other countries, people had faith in their "experts." The Kaiser, realizing himself unable to conduct the war, turned more and more power over to the General Staff. By 1916, it was concerning itself with control of the press, films, general propaganda, armaments, and food. The Emperor's function had hitherto been to hold the balance between competing authorities and thus keep the General Staff in its place, but he proved unequal to the task during wartime. His chancellor, Bethmann-Hollweg, was unable to control the growing power of the generals. The Reichstag was equally divided and ineffectual.11 Battles had transformed Ludendorff and von Hindenburg into heroes, and they transformed themselves into politicians. In the latter role, they were appallingly inept.

Ludendorff and Hindenburg had made their reputations on the Eastern front. When they were transferred to the Western front, they increasingly lost interest in other theaters of war. Nevertheless, Germany's half-hearted efforts in the Eastern theater had met with spectacular results, giving the Germans firm control of the East from Turkey and the Ukraine to just west of St. Petersburg in 1917.

In 1916, after hearing the details of the new British tanks, Hindenburg stated that the German infantry could get along without such things, and ordered defensive measures to be taken. One Colonel Bauer, on his own responsibility and personal risk, got Krupt to build a prototype tank. It was finally ordered into production by the General Staff in November, 1917, but by then it was too late.  

By 1917, the German General Staff's war aims (and peace terms) included and demanded parts of France, Russia's Baltic provinces, and all of Belgium. Ludendorff and Hindenburg wished to wage total war and accept a peace only if it included annexations. They had the German Chancellor, Bethmann-Hollweg, who opposed this ludicrous peace plan, promptly dismissed and a more pliable Chancellor appointed. In a memorandum dated September, 1917, Ludendorff's price for peace was the following: (1) strategic belts of territory in Poland, Lithuania, Courland, and Eastern Europe, (2) incorporation of Belgium into the German Empire, (3) the eventual incorporation of Holland into Germany, (4) Denmark to be economically tied to Germany, (5) an alliance between Germany and the Ukraine, and (6) an enlarged empire in Africa.  

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12 Ibid., pp. 189ff.  
13 Ibid., p. 187.
reason, which Ludendorff could never fathom, the Allies were not responsive to peace on these terms. He delayed Russian acceptance of peace terms by insisting upon the creation of an independent Kingdom of Poland—Germany's hereditary foe and most hardened enemy—which he believed would raise fifteen to twenty divisions which would fight for the Germans in the West. This was done at a time when the Czar had just appointed one Boris Stuerner, a man who wished for a Russo-German inter-dynastic understanding.

Ludendorff's greatest error was the decision to wage unrestricted warfare. He gullibly believed the sanguine estimates of the German Admiralty. He had a low opinion of President Wilson and considered American entry into the war to be a negligible factor. He believed that victory would be attained before America's forces, if any, could exert any effect. The one bright spot in Ludendorff's dull record was his decision to foment revolution in Russia by transporting Lenin there. He had him picked up at the Swiss border and sealed in a special railroad car for fear that he might get off in Germany and cause a revolution. The scheme was successful.

In a final evaluation of the Great War, it is evident that the generals of the principal belligerent nations produced their quick victory plans without an understanding of the machine gun. The convoy system, Stokes mortar, poison gas, and tank were all the creations of civilians. Only the French generals were receptive to the tank. The civilians saw the futility of the frontal attacks on the Western front and wanted to augment the naval blockade by cutting off Germany's allies and supplies on land. The civilian governments had to contend against the generals'
glib promises of victory. The enormous losses already suffered in the war effort made them partly unwilling, and partly unable (because of conservative pressure, especially as exerted by the patriotic press) to stop the war.

During the Great War, there were 8,538,315 soldiers killed, 21,219,452 maimed and gassed, and out of 7,750,919 taken prisoner or missing, over a million never appeared again. Thus the total number of soldier deaths approaches 10,000,000. The total number of dead, wounded, taken prisoner and missing was 37,494,186. The total number of men mobilized was 65,038,810. Estimates of civilian deaths by starvation, or by diseases due to malnutrition, range as high as 10,000,000. Thus civilian and soldier deaths may have been as high as 20,000,000. In France, one out of every twenty-eight persons were killed. Germany lost one in thirty-two, and Great Britain one in every fifty-seven.

After the Great War ground to a dismal halt and peace was restored, the reserve officers went back to civilian life leaving the hard core of professionals to tend the army. Many of these had risen to high rank and were to rise even higher by the time World War II began. Generally speaking, the professional officers left the war with their pure, pristine, pre-war ideas completely unaffected or unaltered by four years of modern warfare. One of them was reputed to have expressed the sentiments of the professional officer corps when he exclaimed, "Thank Heavens the war is over . . . now we can get back to real soldiering." 14

Most of the regimental histories state that after the war "a sound

program of training was immediately commenced.\textsuperscript{15} By this was meant a pre-war type of training. The British General Staff considered it unnecessary to modify their pre-war ideas because, after all, they had won the war. During the Great War, England had led the world in the use of tanks and armored cars. Yet ten years after the war, the British Defense Budget made provision for 607,000 pounds sterling for forage while only 72,000 pounds were set aside for gasoline, a large portion of which was used for transportation vehicles.\textsuperscript{16} In 1933, twenty cavalry regiments of the British Regular Army still rode horses, as did sixteen regiments of the Territorial Army. In the Indian Army, sixteen regiments mounted horses. In the entire Imperial Force, there were only four tank regiments. In 1937, mobilization orders for the 15th and 16th Queens Royal Lancers instructed officers to be sure to sharpen their sabres if war were declared.\textsuperscript{17} As late as 1940, a candidate for a war time commission was asked the three following questions (there were no others) by the interviewing board at Cambridge: (1) What school did he attend? (2) What was his father's income? (3) Did he ride a horse?\textsuperscript{18}

The French had learned their lesson and built the Maginot Line for defensive warfare. As the French generals believed that the Germans had learned their lesson about invading Belgium, the defensive fortifications did not extend along this border. As usual, the French Army was out-maneuvered by the Germans who went through Belgium again.

The Americans promptly demobilized. Their chief inter-war occupation was the fight of the Army Air Force for a strategic bomber.

\textsuperscript{15}Ibid. \textsuperscript{16}Ibid., pp. 299ff. \textsuperscript{17}Ibid., p. 299. \textsuperscript{18}Ibid.
The tactical airplane, submarine, and aircraft carrier received attention during this period and America entered World War II with relatively modernized plans and tactics. Only tank design lagged behind most other nations.

The Russians learned some lessons from World War I and made good use of tank designers and other experts in this field, as was evidenced in World War II.

The German Army came under Hitler's control in 1933 and was quickly modernized. Before this time, the army's chief concern had been with training, the maintenance of large horse cavalry forces, and evading the Versailles treaty.

The general staffs of the belligerent nations generally resembled the Bourbons who learned nothing and forgot nothing. Suffice it to say that in order to have commanded an army in the Great War, one had to have twenty to forty years practice in military routine. Such a principle, had it always been rigidly adhered to, would have excluded Alexander, Hannibal, Caesar, Cromwell, Marlborough, Napoleon, Trotsky, and Hitler from the ranks of commanders.
CHAPTER VI

A STUDY UNIT ON THE GREAT WAR FOR THE
SECONDARY SCHOOL

The history of the major weapons used during the Great War and their civil-military background has just been presented in order to illustrate the possibilities open to the secondary school pupil in relatively original historical research. Although there is a great mass of detailed material relating to all aspects of the Great War, little of it relates weapons to the broader aspect of that war in general and the civil-military issues and background behind them. Any of the foregoing chapters, or parts thereof, could serve as a study topic.

Many of the books and sources used in the foregoing study are available to the pupil, especially in paperback editions. The subject matter of works on the Great War offers a refreshing change to many students after years of intermittent study of the American Revolution and purified political history of the United States. The written materials in the war studies area are, generally speaking, eminently readable, straightforward, and objective. Most range from accurate to scholarly. All have the virtue of being adult in content and manly in tone. They are of perennial interest to most boys. Many girls are also interested in the subject of war and weapons, and the teacher should point out to them that women have written some of the finest books on military subjects. For example, Barbara Tuchman's The Guns of August is the finest
book on the early stages of the Great War, and Cicely Veronica Wedgwood wrote a massive scholarly volume entitled The Thirty Years War. There are other female writers in this area and most of them are highly competent. The resource materials used in these chapters about World War I, as well as other suggested readings, will be discussed at the end of the chapter.

Most libraries contain picture histories of the Great War. Life magazine has a series on this period. Horizon, a hard cover magazine, has devoted several illustrated editions to World War I. There are many other picture histories of that conflict. Ballantine Books will mail a long list of war books to the reader upon request. Most educational film indexes list many films on this area. The Public Information Officer at any Army, Navy, or Air Force installation will have a list of films and other audio-visual aids on World War I. They can be obtained free of cost. There are a number of excellent commercial films on this period such as "All Quiet on the Western Front," "The Blue Max," "Those Wonderful Men and Their Flying Machines," "Hell's Angels," and the best ever produced, "Paths of Glory." This last movie is not to be confused with several vulgar Hollywood productions of the same or similar title. This film deals with an historical French general who, for the sake of appearing aggressive enough to merit a promotion, attacks the "anthill," an impregnable German fortification. He tries to encourage the men with a creeping artillery barrage—behind them. A few survivors manage to crawl back to their own trenches and these are given a "trial" and promptly shot as cowards. The enterprising teacher will be able to spend many class periods acquainting the class with the Great War through a wealth
of audio-visual aids. Hobby shops usually carry a large selection of
scale models—suitable to various age and skill groups—of aeroplanes,
tanks, ships, and soldiers of the Great War. Most are inexpensive and
easy to build. They usually come with an interestingly written pamphlet
describing the weapon the model is scaled after and giving its history.
After thorough visual study of one or more weapons of the great war, the
pupil is ready to advance to written material.

The pupil's next step in the study of weaponry would be to study
the technical specifications of the weapon(s) in question. This material
would be suitable to the student's academic and grade level. Technical
information should be correlated to the pupil's interests, so as not to
bore him—or her. He could then read, according to his ability level and
interests, the literature concerning the development, use, and possible
retirement of the weapon. For below, or low average pupils, the teacher
would probably be wise to assign exciting narratives and other dramatic
literature, rather than more sophisticated reading matter. The teacher
might want to read more difficult material to a below-average class. At
any class level, the teacher should continually point out puzzlements,
strange things, possible comparisons and contrasts, especially between
the weapons of the Great War and modern arms, or anything that might
relate the subject matter to the pupil's life, or surroundings. All
material should be presented from the simple to the complex, and
patterned or structured, if possible. After the pupil has mastered first
the visual material, and then the written, he can move on to creative
work.

There are many topics for the pupil to work on. His interest
should be his best guide and only a few examples will be presented here.
One topic would be to compare and contrast various models of the same weapon, such as the light tank and the heavy tank, the bomber and the fighter, the water-cooled and air-cooled machine gun. Various weapons could be compared with each other, such as the destroyer versus the dreadnought, or cavalry versus the motorcyclists. The pupils might explore the effectiveness of various anti-tank weapons used during the Great War, such as the flamethrower and the armor piercing shell, and the counter measures taken by the tank corpsmen. The teacher could ask the class why, for instance, an army does not convert to machine gunners, and eliminate the riflemen, if the former are so effective. After the pupils have thought about the weapons themselves, they can begin relating them to such concepts as the offense and the defense. They could explain if the weapon in question was defensive or offensive in nature, and why. They could try to explain how each of these weapons contributed to the success or failure of the Schlieffen Plan, Plan 17, and the other military recipes for quick victory by the generals of each of the great powers. The students should examine each major belligerent nation and consider how each of the various weapons contributed to its defeat or victory. For instance, how did the dreadnought contribute to Germany's defeat? How did the machine gun contribute to the downfall of France as a great power? How did the tank contribute to Allied victory? Finally, the teacher might ask the pupils what they would have done to break the stalemate on the Western front. After the pupils have gained an understanding of how the weapons were related to the broader concepts of the Great War, they will be ready to study the men who commanded the weapons.
The teacher might begin by assigning biographical material on the generals. Most works of this sort are well illustrated and easy to read. Brief critical accounts of the generals can be found in Liddell Hart's *Reputations*. After the class has familiarized itself with biographical material, the teacher should then ask the class why the generals never understood the power of the machine gun or the fact that the cavalry was a total, utter failure both as a fighting instrument, and as reconnaissance. He could ask why the British admirals were so unwilling to even try the convoy system. To relate this material to the present, the teacher should ask, "What measures could be taken at the present time to determine if the generals and admirals understand their weapons?" and "What can we do to ensure that the highest ranking officers do understand their weapons?" The pupils should be reminded that Winston Churchill, a civilian, was largely responsible for the development and use of the tank, and that Lloyd George, another civilian, for the convoy system. Why were the generals and admirals, the "experts," not the first to come forward with new ideas? (The enterprising teacher may want to explore the underlying psychology of commanding generals from the Great War to the present. Such treatments are presented in Morris Janowitz's *The Professional Soldier* and Alan Clark's *The Donkeys* which deals specifically with the British generals in the Great War.) After the teacher has helped the class to examine the men of the Great War, many classes will be ready to move on to the issues.

\footnote{Discussed at the end of the chapter.}
The pupils can best develop their thoughts on various aspects of the Great War by the following sequence of activities: (1) class discussion, (2) committee discussions and reports on the conclusions reached, (3) class debate, (4) individual written and oral reports, (5) further class discussion, (6) a final debate. Some members of the class might want to profit from their study of the Great War by writing on a military topic for the school newspaper, or for a local news media. The teacher will probably want to assign either book reports, essays, or term papers to various members of the class, according to their abilities and needs. Throughout the entire period of study, the teacher will want to assist the pupil to gain certain insights. He will probably use some of the methods suggested above in addition to skillful questioning, and suggestions when necessary. The Great War should continuously be related to the present. The following are a list of insights which the pupil should gain from this study unit.

1. Much of the optimism which helped to generate the Great War was owing to reliance upon the "experts" who had no understanding of their weapons. The pupil should understand that each major nation had a war plan which ensured it a quick victory. The machine gun rendered these plans impossible to execute. The generals seldom understood the new weapons and continued to rely upon the old (i.e., the cavalry, the bayonet, and the bolt action rifle). Students might note that the generals learned little from the war, and cavalry was retained until World War II. The industrious pupil might gain certain insights by comparing the generals' understanding of weapons today with their counterparts during the
Great War. (This can be done after reading the last chapter of this work.)

2. Arms technology often reaches a point where weapons neutralize each other and victory is impossible. A war of attrition then results.

Until 1918, the machine gun rendered flanking maneuvers or frontal advances impossible. (Although the Germans made some notable advances in 1918, they were unable to consolidate them and quickly suffered serious reverses.) The tank, a technological innovation, was the solution to the stopping power of the machine gun. The convoy system was a technical innovation which proved to be the solution to the U-boat menace. The fighter plane was the answer to spying reconnaissance aeroplanes. And finally, the torpedo was a partial answer to the dreadnought.

A nuclear stalemate exists today. An atomic war would mean a war of vast attrition in which neither side would be likely to achieve a meaningful victory. For this reason, much faith is put in diplomacy, peaceful negotiations, and world opinion. The United States has sought to limit warfare to conventional weapons and to restrict it geographically. Recently, Russia announced its intention to construct a system of anti-missile missiles. The United States would also have to embark upon such a defense system if its foe does. The first nation to perfect a reliable and workable anti-missile system will have broken the nuclear stalemate. It will have its enemy at its mercy. Such an anti-missile defense system today would be equivalent to the tank in 1918.

3. Civilians and officers below the rank of general (mostly reservists) were responsible for the tank, the Stokes mortar,
poison gas, and the convoy system. The civilians wanted to win the war by cutting off Germany's supplies in the East as an alternative to the costly war of attrition in the West.

Winston Churchill and Lloyd George were largely responsible for the innovations mentioned above. Two exceptions to this generalization were the French High Command, which welcomed the tank, and the German Admiralty, which promoted the U-boat.

4. During the Great War, generals were so apotheosized by the press and government that when they proved incompetent it was virtually impossible to remove them. As the generals were no judges of weapons, the press was no judge of generals.

The pupil should be asked if this is still true today and be required to give the reason for his answer. Such an insight as the above will enable him to scrutinize movies, books, and television programs which glorify the military and "expert" opinion with greater critical acuity.

5. Weapons are the same as any other mechanical device. They are subject to exacting measurement, and civilians, and scientists in particular, may have keener insights into the possibilities of weapons than the "experts."

While this was true during the First World War, it does not necessarily apply today (consider such men as Admiral Rickover). This insight is meant to show the pupil that at present, civilians should not automatically be assumed to be incapable of understanding weapons, tactics, and strategy—as certain civilian and military circles assume Secretary of Defense Robert McNamara to be.

In order to properly evaluate a weapon, there should be an independent committee of scientists and other civilians who have the
time, money, and facilities for full-scale testing and evaluation of each and every weapon. They should have access to all service research, and to the battlefield in order to observe weapons in action. This would ensure that no service could cling to an obsolete or ineffective weapon, or pressure the committee's decisions.

6. When the German generals, who could barely manage their own area of military affairs, took over the formation of foreign policy, the results were disastrous.

It should have become apparent to the German government in 1917 that they were being bled white by a war of attrition against a numerically superior foe. The British blockade was beginning to have a telling effect on the civilian population. The Germans were, however, in an excellent bargaining position because of their conquests. If the German professional diplomats had had their way, Germany would have entered into negotiations with the Allies. President Wilson would have given his support to Germany if that nation had sought a reasonable peace without territorial gains in the West. Germany might have been able to keep at least some of its eastern conquest as well as recovered its colonies. It is almost certain that apt diplomacy by Germany could have persuaded the United States to limit its aid to the Allies to a minimum.

Instead, however, Generals von Hindenburg and Ludendorff gained control of their country's diplomacy. They made a negotiated peace impossible by their outrageous demands. They antagonized Wilson and finally brought America into the war with crude diplomacy, sabotage, and the resumption of unrestricted submarine warfare. The generals failed to understand that the Allies would never surrender and miscalculated the
effect that the entrance of the United States into the war would have against Germany.

7. General Haig and most other generals found casualties of 50 per cent, and sometimes higher, normal and acceptable.

Owing to the fact that many generals and admirals have advocated a pre-emptive war with Russia in the past, and that many at present do not appear hesitant about a massive thermo-nuclear exchange with Russia today, the pupil may well do some arithmetical calculations to determine if some generals and admirals would today find civilian casualties of 50 per cent or higher acceptable.

The class at this point will be ready to discuss the issues concerning the Great War. The teacher will achieve the best results in reflective thinking if he can continually relate the issues of the past to the present and present them as something which does, or could vitally affect each student personally.

The issues

Issue I. Was the national security of Great Britain and the United States best served by involvement in a land war of attrition?

Great Britain saved France with the British Expeditionary Force. Had France been defeated, Germany would have controlled that nation and a large part of Europe, including much of Russia. On the other hand, Great Britain was superior to Germany in naval strength. In view of this, the teacher should ask his pupils the following questions: (1) Should Britain have blockaded German occupied Europe, as it did during the time of Napoleon, while it concentrated on achieving technical superiority
over the enemy? (2) Could Britain have eventually become so strong on the seas that it could have directly attacked the German fleet and shelled German coastal cities and installations? (3) Should England have tried to build up the Russian armies, as it did in the Second World War, and then made use of a technically superior British Army (i.e., one with tanks and other advanced weapons) to assist the Russians, or to open a second front? (4) Should Britain have used a technically superior army only to supplement the naval blockade by attacking the Germans in peripheral areas?

Much would have depended upon the support of the United States for the British blockade. However, with the combined might of Britain and the United States, Germany probably could have been contained on the European continent and eventually forced to terms with immeasurably fewer casualties on all sides. During World War II, Britain and the United States first achieved ascendancy on the seas and in the air through superior production and technology (such as radar). By supplying and encouraging the Red armies, they had worn down the German armies and divided their forces. They had taxed Germany's strength through land attacks on peripheral areas such as Africa. By this policy of first weakening Germany and attaining air and naval predominance, the western Allies were able to speedily defeat that nation on land without engaging in a war of attrition such as happened in 1914.

Since 1945, the United States has become involved in two land wars of attrition. One of these wars, or police actions, was in Korea and the other is now in Vietnam. (The former war strangely resembled the Great War. It began as a war of movement and ended as a static war of
attrition fought from trenches.) The United States is somewhat at a
disadvantage because of its lesser population (it cannot put as many
soldiers in the field as can the orientals), its scruples about high
casualty rates, and its reluctance to use atomic weapons because of
various important considerations. A combination of America's superior
air force and its ultra-modern mobilized armies are able to contain the
enemy's army, or guerilla forces, but it cannot decisively defeat them.
The United States has avoided a large scale conflict with conventional
weapons in the Orient because of the enormous cost in lives and wealth
which it would entail.

Pupils should now consider if the best interests of the United
States are served by a land war in a particular area (taking all circum-
stances into consideration). They should also consider if the United
States should modify its military commitments to places defensible by
naval and air power, thus taking advantage of America's qualitative and
quantitative superiority in the air and on the seas. In considering any
particular American military commitment, the pupil should ask himself:
(1) Is this commitment really vital to the military and economic security
of the United States? (2) Will the United States be able to honor its
obligation by means of its superior air and naval power, or will it
become immersed in a land war of attrition as happened during World War I?
(3) Would it be able to achieve its objectives in a land war without
resort to atomic weapons? (4) Could involvement in a ground war of
attrition force upon the United States the alternatives of escalation or
humiliation?
Issue II. What do nations do when a war reaches a state of technological stalemate?

There are about five courses of action. They are—(1) negotiate a settlement, (2) fight a defensive war while simultaneously developing a technically superior weapon in sufficient quantity to be decisive, (3) fight a war of attrition, (4) seek new allies and induce them to attack the enemy, (5) fight the war in a medium where one has superiority (such as on the seas, or in the air). Number three and four characterized the Great War. The advent of the tank was more in the way of a windfall for the Allies rather than a conscious strategy undertaken to develop technical superiority. Number two and four, generally speaking, characterized World War II. After that war, the doctrine of "massive retaliation) gained popularity for a while and was based on number five. It was intended to avoid a ground war of attrition. In Vietnam, the United States is currently pursuing number one, three, and four.

The pupil should think about the above choices and decide upon the advantages and disadvantages of each one. Then he should try to determine which of the above courses of action would best implement a given military commitment.

Issue III. When do casualty rates become so great that a change in tactics, strategy, or diplomacy becomes necessary?

During the Great War, generals usually accepted very heavy casualty rates—often more than 50 per cent of an attacking force—as normal losses in warfare. Civilians grumbled over the enormous losses of life on the battlefield, but their complaints against the generals were more often based upon their lack of success rather than the large number of
casualties suffered by their armies. Such losses of soldiers caused a change in Allied tactics—from the offensive to the defensive—only when it became very difficult to obtain replacements for lost men. This applied to France more than to the other belligerents.

Today, high military casualty rates are no longer acceptable to the American government. This is one of the main reasons why the United States put its reliance upon the air force and atomic weapons after World War II. Such a strategy was intended to prevent the decimation of American soldiers in a ground war with a numerically superior enemy. As the Soviet Union developed its nuclear capacity, however, it became clear that a massive nuclear exchange between that nation and America would result in such a huge number of civilian casualties that a change in strategy was indicated. The United States began building up ultra-modern and mechanized conventional forces to deal with the enemy's forces on the spot, rather than sending nuclear tipped missiles to destroy the foe's country and thereby incurring atomic retaliation.

Issue IV. What factors accounted for the lack of understanding of weapons among the high commands during the Great War?

Before and during World War I, it was generally believed that shooting was the providence of the military and that civilians possessed neither the temperament, education, nor experience to enable them to interfere with, or make judgments about martial matters. As a consequence, the governing civilian body of each nation, when it made its annual appropriations, did not pass judgment on the competence of the generals and admirals to conduct their own affairs without outside interference. They
were not subjected to close questioning about their weapons, strategy, tactics, or battleplans.

Although men like Winston Churchill, Lloyd George, and Paul Prudent Painlevé violently disagreed with their high commanders' conduct of the war, they lacked sufficient backing from their legislative branches of government (or the King) to enable them to interfere with the military.

Most of the generals and admirals during the Great War achieved their positions of high command through adherence to the traditional military concepts, family connections, and popularity at court. Promotions frequently depended upon seniority. There was little inducement within each service for the technical understanding of weapons. Once the generals had committed their armies to battle, they were unable to bring themselves to admit that all of their pre-war theories had been erroneous. In order to have broken the ensuing stalemate, the generals and admirals would have had to enter upon large-scale cooperation with civilian agencies for scientific and technical research and experimentation. The high commanders would have had to vigorously apply the technical findings of scientists and engineers to strategy and to the battlefield. They would have had to be willing to accept advice from civilians. Such breaks with tradition, training, and strongly fixed habits of mind usually have been difficult for older men to make at any time in history. During the Great War, the generals and admirals found it impossible to break with traditional habits of thought and vigorously promote new military ideas and concepts.
During this era, there was rigid separation of the services. Admirals and generals concerned themselves with their own medium of operations and it was considered unthinkable for one service to criticize or interfere with another.

In summary, it may be said that there were three factors which contributed to the failure of the military during the First World War to understand their weapons: (1) it was considered improper for civilians to interfere in military matters, (2) generals and admirals reached positions of high command through adherence to traditional military concepts and by social, non-military means, (3) there was no interservice rivalry to engender critical examination of each service's ability to perform its mission with the weapons and plans which it intended to use.

The teacher might have the class speculate about the change in attitude which today makes huge military casualties repugnant to the former western Allies of World War I. Pupils should try to decide at what point the United States would be justified in embarking upon a nuclear war with the Soviet Union with the resultant enormous numbers of civilian casualties on both sides.

Selected key readings for teachers

The following scholarly books are designed to enhance the teacher's understanding of the Great War through familiarity with three original source books, and one excellent history.

On War by General Carl von Clausewitz. This book is a military classic and every teacher interested in the history of war ought to be acquainted with it. The author first defines the relationship of state policy to war. Then he tells the reader how to, and not to, conduct a
war. Many of his prescriptions, such as avoiding a war of attrition, are still true today.

*Cannae* by Graf Feldmarshall Alfred von Schlieffen (translated). This book is Schlieffen's prescription for quick victory garnered from a study of ancient military history, which he presents to the reader. It is technical, but rewarding, reading. The work is the theoretical basis and justification of the famous Schlieffen Plan.

*History of the German General Staff 1657-1945* by Walter Goerlitz. This is a massive book which deals not only with the German General Staff, but with the history of German generalship. About half of this work is devoted to the Second World War and its immediate prelude. There is much informative material concerning Adolf Hitler and how he first gained control over, and eventually destroyed, the traditional General Staff. An interesting account of the general's attempt to assassinate the Führer is given.

The book is eminently readable. It has a lot of purely literary merit and is illustrated.

*The March on Paris and the Battle of the Marne, 1914* by Generaloberst Alexander von Kluck (translated). This is a lively account of the fate and failure of Schlieffen's right wing by the general who led the most important army in it. Naturally, he does not attribute its failure to himself. The book is furnished with maps and illustrations. Although technical, the book is interestingly written.

**Selected readings for pupils**

Some of the books used as source material for the foregoing chapters on the Great War are recommended for pupil use. They will now be reviewed and suggestions made as to what academic and grade level they
are best suited. In parentheses, after the name of the book and its author, will be abbreviations to indicate the academic and grade level of the pupil: average (a), below average (b), above average (ab), grade level (7-12—as indicated). For instance, (ab 10-12) would mean that the book is recommended for above average pupils in grades 10 through 12.

The Donkeys by Alan Clark (a and ab 7-12, b 9-12). This book is a paperback which is 192 pages in length. It vividly describes the British generals and their machinations and maneuverings to achieve, or maintain, high command. The complete failure of Haig and others to understand the machine gun and the futility of the offensive is well presented. The Donkeys explains how the stupidity, obstinance, and incompetence of the British High Command resulted in the mass slaughters of whole armies. It is exciting reading for the pupil interested in military matters.

On War by General Carl von Clausewitz (a 11-12, ab 9-12). The teacher would best assign specific pages in this book, for it is verbose and deadly dull except to the exceptional student who is highly motivated in the area of German military history. It is a famous book by a late eighteenth century author.

Combat: World War I by Don Congdon (a 9-12, b 10-12, ab 7-12). This is a paperback of 448 pages. The book presents various land, air, and sea battles from 1914 to 1918. The editor gives a brief chronological account of the war from time to time followed by exciting narratives by individual authors used to illustrate the battle he has just described. The selections are by the best authors in the field such as Winston Churchill's "The Marne," and Alan Moorehead's "The Anzac Beachhead." As
the book is rather long, different sections might best be assigned to different individuals.

*Over the Top* by Arthur Guy Emper (a, b, and ab 7-12). This book gives a vivid, fast moving, colorful, and somewhat humorous account of life in the trenches by an American who had joined the British Army in 1915. Unfortunately, on political matters, the author is a jingoistic simpleton who regurgitates the most idiotic pronouncements ever made by the British propaganda experts and the American yellow press. Military subjects he describes with great accuracy.

*History of the German General Staff 1657-1945* by Walter Goerlitz (a 9-12, ab 7-12). (This thick volume is available in an illustrated paperback edition.) This book will be interesting in places to most secondary pupils, such as the chapter about the attempt to kill Hitler. The teacher should carefully select chapters or short readings to assign to his pupils, rather than assigning the entire book, which is too long and technical in places for the average pupil. This is the most authoritative book on the German General Staff.

*The London Gazette. "Dispatch to the Secretary of State for War,"* by Fieldmarshal Sir Douglas Haig, Commander in Chief, British Armies in France (b 9-12, a and ab 7-12). This is a primary source material which is easily obtained from many university libraries and from the Library of Congress. It is Haig's official report of the tank breakthrough at Cambrai in 1917. It is fairly brief and easy to read, but dreadfully tedious.

*Reputations: Ten Years After* by Captain B. H. Liddell Hart (b 9-12, a and ab 7-12). This book is very readable and interesting. It
contains a number of very critical biographies about the generals and admirals who were in command during the Great War. It may be assigned in its entirety, or by individual biographies.

**The War in Outline: 1914-1918** by Captain B. H. Liddell Hart (a, b, and ab 7-12). This is an easy to read paperback book in which the author gets a maximum of meaning out of a minimum of words. He gives a chronological presentation of the land, air, and sea war with frequent explanations. The style is interesting and exciting. This would be a perfect "textbook" for the study of the Great War as it is both a ready reference and will give the pupil a critical familiarization with the war in its entirety.

**History of the Great War (Based on Official Documents)** (ab 9-12, a and ab 7-12). This series of eight volumes is a ready reference source material. The teacher will probably have to guide all but the most diligent students who wish to use it. Once a pupil locates what he wants, it is written in a readable prose style.

**The March on Paris and the Battle of the Marne, 1914** by Generaloberst Alexander von Kluck (a and ab 7-12, b 9-12). This is an illustrated and lively account of the fate and failure of Schlieffen's right wing by the man who led the most important army in it. Naturally, he does not attribute its failure to himself. It would be better if the lower grades read only carefully assigned sections of the book, as it is technical and apt to bore the pupil.

**Tanks** by Professor A. M. Low (b, a, and ab 7-12). This is an illustrated book describing the birth and development of the tank. Exciting accounts of tank battles are given and the merits and demerits of various types of these vehicles are discussed.
July 114 by Emil Ludwig (b 9-12, a and ab 7-12). This book is written by the famous German author. It is an accurate and perspicacious history of the events causing the Great War. The book is written in a dramatic prose style and reflects good scholarship. It is probably the most interesting work on this topic available to the secondary pupil.

Facial Surgery, Volume IX of the Medical Department of the U. S. Army in World War I. This book shows facial wounds that American soldiers suffered during the Great War. Several men have almost their entire faces amputated. Others have lost everything below the eyes except the windpipe. Some have lost eyes, noses, and foreheads. This volume should give pupils a realistic concept of the unpleasant aspects of war.

"On Being an American" in Prejudices: A Selection by Henry L. Mencken (b 9-12, a and ab 7-12). This is a shocking, but amusing, account of America's entry into the Great War by an eminently realistic writer and journalist. It will disconcert and amuse pupils, but it will be very difficult for them to refute many of Mencken's contentions.

Arms and Men by Walter Millis (a 12, ab 10-12). This is a paperback book of 342 pages. It gives a scholarly treatment, by a recognized historian, of the men and forces behind American military policy from 1776 to 1956. The book deals with United States military problems in their social and political context as well as the problems created by new weapons, modern technology, and the atomic bomb. The book would be tedious and too sophisticated for all but the most motivated pupil. This book is best used as a source material in which the teacher makes carefully assigned readings.

Gallipoli by Alan Moorehead (ba 9-12, a and ab 7-12). This is an illustrated paperback of 314 pages. It is an account of Churchill's
fiasco on the Turkish peninsula in 1915. The British suffered 250,000
casualties, gained absolutely nothing, and finally made an ignominious
withdrawal because of the impossibility of accomplishing anything. The
book is interestingly written in easy to read prose and it is exciting
in content.

A Short History of Germany 1815-1945 by E. J. Passant. This
book can be used as a ready reference in the classroom. It gives very
brief summaries of Germany's general military history.

1918: The Last Act by Barrie Pitt (a, and ab 7-12, b 9-12).
This is an illustrated paperback of 333 pages. It tells the dramatic
story of the end of the war and of the last, desperate, great German
offensive which almost caused the Allies to lose Paris. It tells of
the causes for the defeat of the German Army and the personalities con-
cerned. It is scholarly and written in good prose style. It is fast
moving and exciting.

All Quiet on the Western Front by Erich Maria Remarque (a, ab,
and b 7-12). This is a 175-page paperback book presenting an account of
a German infantryman from the German point of view. It is probably the
best quality war novel ever written. It is fast moving, exciting, and
easy to read.

Iron, Blood and Profits by George Selder (ba 8-12, a and ab 7-12).
This is a very readable account of the part that munitions makers played
in fomenting the Great War and how they allegedly corrupted the press and
public officials. It gives interesting biographies of famous "merchants
of death" such as Sir Basil Zaharoff. It is a good book for girls who
may not be too interested in machine guns and such things.
The Guns of August by Barbara Tuchman (a 9-12, b 12, ab 8-12). This is an illustrated book and one of the best written, most interesting, and complete works on the political, social, and military origins of the Great War. It gives the history of the Schlieffen Plan and Plan 17. It vividly describes the events of the war in 1914 and the personalities involved. The book gives an explanation for the failure of the Schlieffen plan (it is not a good one).

Dare Call It Treason by Richard M. Watt (a 8-12, ab 7-12, b 10-12). This is an illustrated book which should appear soon in paperback form. It presents the socio-political-military events leading up to the disastrous Nivelle fiasco which resulted in the French Army mutinies in 1917 and the gruesome and ferocious way in which they were quelled. An excellent and somewhat humorous account of French politics, journalists, and politicians is given. The book is scholarly, written in excellent prose, fast moving, and exciting.

Mutiny 1917 by John Williams (a and ab 7-12, b 9-12). This book is an exciting account of the political, social, and military events leading to the French Army mutinies in 1917 and the brutal way in which they were put down. It dwells upon the incompetence of the French generals and their complete indifference to the sufferings of the enlisted men. An account is given of the completely inadequate and disgraceful French medical field service.

Tank by Arch Whitehouse (a, ab, and b 7-12). This is a scholarly, but simply written and illustrated history of the tank in war and peace. Exciting narratives of tanks in action are given. The fighting vehicles are evaluated in terms of their combat effectiveness.
In Flanders Fields: The 1917 Campaign by Leon Wolff (a 9-12, ab 7-12, b 11-12). This is an illustrated paperback of 250 pages. It describes the personalities of the generals and reluctant civilians involved in the Flanders offensive of 1917. The author describes the bankruptcy of British military thought and the political and military events leading to the loss of nearly 500,000 troops in the Flanders offensive without anything to show for it. It is an indictment not only of the British High Command but also of the politicians who knew what was going on and who permitted it to continue.
CHAPTER VII

WEAPONS AFTER THE GREAT WAR

The tank and armored warfare

During the period 1919-1939, most high-ranking professional army officers believed that the function of the tank was to support the infantry. This narrow doctrine greatly affected the post-war development of tanks. Little was done therefore toward increasing their speed and maneuverability until gross defects of design became apparent during the Spanish Civil War. The tank was still geared to the speed of a man on foot who carried a rifle with a fixed bayonet. As long as the tank stayed with the infantry, flattened the barbed wire, crushed strong points, and was capable of withstanding enemy weapons, it was fulfilling the limited duty required by the infantry generals, who were usually the officers to reach the highest positions of command.¹

In the early 1930's, Captain Charles de Gaulle, then an instructor at the French military college of Saint Cyr, wrote a textbook entitled Toward the Career Army in which he described France's poor geographic position in the European war scene. Translated into several languages with a more descriptive title, The Army of the Future, it became a classic for Hitler and his armies. In this work, de Gaulle set forth the

theory that a fully mobile and mechanized enemy army could attack France's scanty defenses in the north and by advancing one hundred miles a day soon overrun Flanders and northern France. Mechanized infantry divisions would consist of enough trucks and armored troop transports to reduce marching to an absolute minimum. Such divisions would have self-propelled artillery. They would work in close cooperation with armored divisions which would consist of coordinated tanks, dive bombers, and specialized infantry. Armored divisions would break through the French defenses in the East, penetrate deeply into French territory, and attack their forces from the rear. Other units would rush towards the main objectives. The mechanized divisions would consolidate the gains made by the tank units, attack strong points which the armored divisions bypassed, and grapple with the enemy's infantry and anti-tank units.

Captain de Gaulle's book was ignored by the French high command, but its ideas were seized upon by Hitler, and when he consolidated his power in 1934, he put them into practice in the German army under the direction of General Heinz Guderian, a former lieutenant of infantry with no technical training. Under Guderian and Hitler, this type of mechanized warfare became known as the blitzkrieg.

The French high command developed its war plan without considering the ideas of de Gaulle. This was done under the direction of Edouard Daladier (Minister of National Defense), General Gamelin, León Blum, and Marshal Pétain who had long been the leading advocate of defensive warfare. The plan called for French troops to be trained in such a way that careful movement and planned measures for attack or for defense could be

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2Ibid., p. 129. 3Ibid.
based on definite, pre-arranged circumstances. They wanted a full
description of the enemy's order of battle and intention before deciding
on any undertaking. A decision, once made, would be executed according
to one of a number of methodical plans previously arranged to deal with
any exigency which might arise. General Guderian states that "this
mania for planned control, in which nothing should be left to chance, led
to the organization of the armored forces within the army in a form that
would not destroy the general scheme of their assignment to infantry
divisions. Only a fraction of the French armor was organized for opera­
tional employment." French tanks, having been designed for the defense,
were slower and less mobile than their German counterparts with the same
weight and armament.

France had learned the lessons of the Great War which had taught
the dominance of the defense, and defensive weapons (a doctrine accepted
by most French soldiers and civilians alike). French defense strategy
was dependent upon (1) the recall of reservists, (2) an Allied blockade
and superior economic power, and (3) meeting the Germans at the Belgian
border and holding them there.5

Just as de Gaulle had predicted, German armored columns roared
out of Luxembourg. General Guderian's German Panzer forces first struck
for the source of the Oise river, the main weak point that de Gaulle had
warned about. This was the beginning of the blitzkrieg which crushed

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4. Heinz (General) Guderian, Panzer Leader (New York: Ballantine

5. Richard D. Challenger, "The Third Republic and the Generals:
The Gravediggers Revisited," Total War and Cold War, ed. Harry L. Coles
(Columbus: Ohio State University Press, 1962), pp. 91-105.
the static defenses of France in about six weeks. Two explanations are usually given for the fall of France and the failure of the Maginot line. The first is that the civil and military leaders of France had failed to develop a theory of warfare that was adequate to counter the blitzkrieg war that Hitler waged against France in the spring of 1940. The second is that until that time there was too much rapport and agreement between French civil and military leaders on the main points of national defense policy. After the war with Germany had started, there was too little agreement on how to meet the unexpected onslaught of the blitzkrieg. Generally speaking, there had been no important civil-military conflict over the concept of defensive warfare. The French had acted prudently and wisely on the lessons of the Great War, and the Maginot line and defensive warfare appeared eminently sensible. Only visionaries like Adolf Hitler and Heinz Guderian—or an impartial committee of researchers with sufficient funds to make extensive, large-scale tests—could have made a correct evaluation of de Gaulle's revolutionary ideas and those of General J. F. C. Fuller, to be discussed next.

In England, in 1932, a small handbook entitled Field Service Regulations, III was compiled from a number of lectures by Major General J. F. C. Fuller, who had commanded the British tanks during the Great War. Like de Gaulle's book, it had considerable effect on the concepts of armored warfare. It was widely read in Germany, and three months before the German attack on the Soviet Union, Marshal Timoshenko ordered the manual to be made a table book for the Red Army. Although the

6Ibid., p. 93.
7Whitehouse, op. cit., p. 134.
theories set forth in this manual were much the same as those expounded by de Gaulle, Fuller's theory called for the more extensive use of motor cyclists, combat car troops, and anti-tank artillery and infantry units. Hitler employed these same ideas in the blitzkrieg invasion of France. General Fuller never foresaw the thickening of armor and the increase in the caliber of tank guns. One author writes of General Fuller's theories:

Had these lectures been considered carefully by military tacticians of the British Empire and the United States, World War II might never have been fought. They should have realized that Hitler could not have attempted any but an armored war—one in which an one-hundred thousand man Panzer force could snatch, grab, and hold what would have required an army of two million men in World War I.

One of the reasons why the armies of the British Empire and the United States did not adopt the new theories of warfare was that there were neither funds nor a committee of judges who could have tested the new theories and evaluated the results as a guide to weapon production and the evolution of new tactics. In the 1930's, the Fuller and de Gaulle lectures were ignored (except in Germany) and most military colleges were still teaching the old Civil War-Boer War theories in which the infantry was the queen of battle. The work of the tanks at the 1917 Battle of Cambrai had been forgotten. Until 1939, the British Royal Tanks Corps was sorely lacking in funds. Its officers still thought in terms of trench warfare. British tank design was far behind the Germans,

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8Ibid., p. 135. 9Ibid., p. 136. 10Ibid.

11“Referred to hereafter as the “theoretical committee.”

both in speed, maneuverability, and gun caliber. Parliament had given only scanty funds to the tank corps and much money had been squandered on the cavalry. The British had no real civil-military dispute over tank design and tactics since 1918, and this is one of the reasons for the lagging development of the British tank.

When Great Britain went to war with Germany in September, 1939, plans for more modern tanks were utilized and British factories began producing the new armored vehicles. In the desert battles fought through 1942, however, the German tanks proved themselves vastly superior to their British counterparts and critics in the House of Commons berated the Army for not remaining abreast of the Germans in tank design. The English tanks were much inferior to German models both in gun caliber and in armor piercing ammunition. (Many British tank losses, however, were owing to Stuka dive bombers.)

When British Spitfires drove the German fighter planes from the skies, the Allied forces gained control of the air over the Mediterranean and north Africa. Allied aircraft attacked and virtually severed the German supply lines across the Mediterranean. Allied aircraft, no longer having to continually evade German fighter planes, attacked Rommel's ground forces. Planes such as the Hawker Hurricane were effectively used to destroy German tanks, transportation vehicles, and air transports. As German supplies and soldiers dwindled, those of the Allies increased until the Afrika Corps was finally defeated.

13 Ibid., p. 137.
14 Ibid.
In 1919, one J. Walter Christie, an American automobile designer, invented the modern tank track suspension system which consisted of six to eight large wheels in a row, a small geared drive wheel at each end of the tank, and steel and rubber treads. It allowed great speed, and was reliable, sturdy, and easy to repair. The United States Ordnance Department flatly rejected his invention because it wanted to retain the volute system. (The volute suspension system was inefficient, slow turning, and used many little wheels and delicate springs which were frequently popping out of place.) The reasons for this decision are obscure, although economy played a part. Christie, more of a mechanical genius than a patriot, promptly sold his suspension system to Russia and Britain. These two countries, unhappily for the Allied cause in World War II, did not combine the Christie suspension with big guns. Germany, which was evading the Versailles Treaty at that time by building and testing tanks in Russia, quickly adopted this means of suspension.

American tanks continued to lag behind the rest of the major powers in design (and still do). In 1939, the United States Army 7th Cavalry Brigade was the only armored unit in the American Army. In 1940, after the world had positive proof of the effectiveness of the German armored divisions in Poland and France, Generals Andrews, Chaffee, Magruder, and Colonel George S. Patton, Jr., sent a recommendation to Washington to the effect that the United States Army should have an armored force separate from the infantry. This decision was reached about twenty-four years after the first British tank attack on the

\[15\text{Ibid., p. 139.} \quad 16\text{Ibid.}\]
Western Front. In 1940, two armored divisions were formed. On May 1, 1940, the United States Army had 464 tanks, the sum total of all tank production since 1935. Most of them were light tanks (nine to eleven tons), unimpressively armed with a .5 caliber machine gun. In that same year, the standard light tanks being used in Europe carried a 76 mm. gun in addition to light and heavy machine guns. In 1941, the Armored Division's sixty-one medium weight tanks had a 37 mm. gun. This may be compared with the 90 mm. and occasional 105 mm. cannons mounted on Russian and German medium tanks. Also in 1941, America's heavy tank was the forty-one ton M-26, or Pershing, which carried a 90 mm. gun. This may be contrasted to the long barreled, high velocity, armor piercing 105 mm. cannon used on the German Tiger tank and the even more powerful 122 mm. cannon used on the Joseph Stalin tank. By 1942, ten years behind the Germans and Russians, the American tanks received a mediocre communications system. The German and Russian tanks used diesel fuel which was much less explosive and inflammable, under battle conditions, than the high octane gasoline used by American tanks. German and Russian tanks had low silhouettes and were difficult to accidentally overturn, while American tanks were shaped much like haystacks and were likely to overturn while negotiating rough terrain. Three to seven inches of American armored plating may be compared to the eleven inches of concrete, found between the massive armored plates of the Joseph Stalin tank, which afforded good protection from the panzerfaust.17

During the first months of 1942, 10,738 of the best tanks produced in Great Britain, the United States, and Canada were delivered to Russia

17 The German bazooka.
via the North Sea route to Murmansk, and overland from Persia. Some of these tanks were used by the Red Army for training purposes. What happened to the rest remains a mystery, although it is rumored that they were melted down for their metal content to be used in the manufacture of Russian tanks.¹⁸ The Russians preferred to make their own weapons, which were in almost every instance superior to those which the Allies were offering them except, of course, for aircraft. (The enormous amount of food, raw materials, radios, medical equipment, transportation vehicles, shoes, clothing, and other goods enabled the Soviets to concentrate on weapons production.)

America has never been able to sell its tanks to other nations because of their inferiority.¹⁹ Since the end of World War II, American military authorities have neglected a proper study of all European armor—especially Russian equipment. Garrett Underhill, the former technical and chief editor of the Military Intelligence Service, War Department General Staff, states:

No one in authority bothered to look into Russian development of the tank until some time in 1949, and whatever points of interest or value were brought up were pooh-poohed immediately by the high level staff. The Soviet design, manufacturing processes, and training problems were totally disregarded. Any information concerning foreign adaptations, improvements, or concepts that were in any way critical of United States Ordnance practice, were immediately pigeonholed.²⁰

Underhill further stated that Pentagon generals considered it an act of treason for anyone to look to the Soviets for modern tank design, or any hints toward the improvement of our tanks.²¹

¹⁹ Whitehouse, op. cit., p. 361. ²⁰ Ibid. ²¹ Ibid.
The best N.A.T.O. heavy tank in existence today is the British Centurian. It proved its worth in Korea, and has been improved since that time. The Russians believe it to be a match for their best heavy tanks. Yet this tank is completely written off by the United States Army on the point that it may be underpowered. The United States Army ignores the fact that it was considered the finest United Nations tank in Korea, and that it is as powerfully armed, and better armored, than the finest Russian heavy tanks. It is easier to repair and maintain than any other tank in its class.22

As tanks are a relatively inexpensive and grubby weapon, there has been little Congressional interest in them, unlike lively debates over missiles and bombers. The Americans won the Second World War without suffering any disastrous defeats on the ground, and fought no tank battles in Korea. There has been little public suspicion of the quality of American tanks, and no other service has stimulated tank design by declaring them to be obsolete. There is urgent need of a theoretical committee to evaluate the American tank before it is too late.

During the Great War, trench warfare had taught the Germans the importance of the offense for their easily blockaded country. Static warfare had worn down the Germans economically and this could not again be tolerated. The true importance of the tank as an offensive weapon was emphasized to the Germans when the Versailles Treaty forbade that weapon to Germany. General Heinz Guderian, an infantry officer, was drawn irresistibly to the forbidden fruit of the armored vehicle and decided to devote himself to the study of it. He was a fairly young officer with no

22 Ibid., p. 362.
commitment to older theories of warfare and this allowed him to evaluate objectively the new weapon. He soon developed new concepts for the employment, organization, and construction of armored units which were to result in the novel method of warfare known as the blitzkrieg. His ideas put Germany years ahead of its enemies and victims, and they were largely responsible for Germany's initial successes. Yet even by 1940, there were many General Staff officers who did not share Guderian's views.23 Hitler, however, had early reached the same conclusions about armored warfare as had Guderian and when he discovered this progressive minded general, he worked closely with him in developing the new concepts of mechanized warfare and gave Guderian his full support. After Hitler had repudiated the Versailles Treaty, he initiated a program of rapid tank production. He encouraged designers to make all German tanks resemble each other so that they could readily be recognized as friendly by the German infantryman. By 1938, some of Hitler's tanks boasted a 105 mm. cannon. In addition to the virtues already mentioned, German tanks were spacious inside and had well-placed auxiliary escape hatches.24

General Guderian and Adolf Hitler were confident that the French were committed to defensive warfare as a result of their terrible mistakes and losses in the Great War. The Maginot Line appeared to them to be conclusive evidence of France's defensive stance. France had the strongest land army in Western Europe and numerically the largest tank force in the world. The combined French and British armored forces in May, 1940, consisted of about 4,000 armored vehicles compared to Germany's 2,800. Only about 2,500 German tanks and armored reconnaissance cars

were available for the attack on France. As previously mentioned, the French expected the Germans to re-execute the old Schlieffen plan and intended, this time, not to be out maneuvered. They intended to stop what they supposed would be large German infantry forces at the Belgian and Holland border. They also expected the Germans to have a weak holding force in eastern France. Hitler and Guderian planned to smash through Sedan and Amiens in the east with the French channel ports as their objective. The Germans would strike the Allies deep in the flank of their armies as they advanced toward Belgium. Hitler correctly predicted that France would not have sufficient reserves to halt this attack on the Allied flank which, if successfully executed, would cut off all enemy forces moving up into Flanders. Paratroops, under the command of General Student, were to capture bridgeheads before they were destroyed so that German tanks could cross them in their rapid advance to the enemy rear. Hitler's and Guderian's plan was, of course, completely successful except in the case of Dunkirk. Some writers believe that Hitler expected his Luftwaffe to finish off the British Expeditionary Army, but it was unable to do so, thus allowing the bulk of the British regular army to escape. Exactly why Hitler did not allow Guderian to attack with his Panzer units is open to speculation. The Hitler-Guderian relationship typified the new trend which saw progressive minded civilians and soldiers working in harmony at the highest levels.

During the Great War, the Russians used imported armored cars built in England by Austin. Later, they imported the chassis and themselves supplied the superstructure. Until 1931, Russian tanks were

25 Ibid., p. 143. 26 Ibid. 27 Ibid., p. 148.
almost all purchased from the firm of Vickers in England. In the 1928-30 period, the Russians perfected superior tank designs. They then became fascinated with quantity production and produced these tanks after they had become obsolete. By 1941, the Red Army boasted 21,000 to 24,000 tanks, or about twice as many tanks as the rest of the world put together. As the result of this sacrifice of new designs to numbers, most of the Soviet tanks were obsolete and inferior to the main types of German tanks when the Nazis invaded Russia. The Soviet Army's inferiority in tank design was aggravated further by inept operational methods and recent changes in tank tactics, policy, and organization. The Russians had recently shifted from mass tank tactics, as used so successfully by the Germans, to small unit tactics, and did not shift back until the German invasion had demonstrated the superiority of mass tactics in late 1941. Such errors in tank design and tactics cost the Russians 15,000 tanks during the first months of the Nazi invasion. By late 1941, however, the Russians, according to General Guderian, were beginning to manufacture the T-34, the finest tank in the world. In November of 1941, the Russians began using a few of these fine tanks. The nearer the Germans approached Moscow, the more Russian T-34 tanks they encountered. This Russian armored vehicle was superior to the most powerful German tank of the time, the Panzer IV. The design, development, and production of this splendid Soviet tank was owing mainly to Stalin. It was

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28 Ibid.
30 Ibid., p. 228.
capable of high speeds and it was very mobile. It operated well in deep mud, and in sub-zero temperatures. (The German tanks operated only with great difficulty in below zero weather.) Most T-34 tanks were armed with a 90 mm. cannon, but others boasted a 122 mm. gun. It had a cast steel hull and turret. (Riveted hulls and turrets were much less resistant to shellfire.) The new Soviet tank was heavily armored--more so than the German tanks--and carried two excellent machine guns. It completely out-classed the German tanks and was resistant to the Wehrmacht's smaller anti-tank guns. The German army countered this new menace with Stuka dive bombers, which were able tank destroyers.

The T-34 started a technological race. The Germans countered it with the fifty-ton Panther of 1943--the finest of a long line of German Panther tanks. It was slightly superior to the T-34 owing to a better shell which it fired. The Russians replied with the Joseph Stalin tank, which possess almost impenetrable armor consisting of concrete (which resisted the Panzerfaust, the German bazooka) sandwiched between massive armor plating. Its 122 mm. cannon fired an improved shell. This tank was very rugged and reliable. It was easy to repair and service. The Joseph Stalin tank led the Germans to build a new heavy Tiger tank, and an extra heavy King Tiger. The latter, because of its vast weight and bulk, had to be moved by rail from one battlefield to another and could only operate on solid, dry terrain. In 1944, the Soviets gained an edge on their enemy by producing the massive Stalin III tank, which could operate in mud owing to its extra wide tracks. The Germans

\[31\text{Ibid.}\]
countered this with the Jagdtiger, a seventy-ton vehicle with a 128 mm. cannon and wide tracts. The Russians then introduced the Stalin IV tank into battle. It weighed eighty-five tons and carried a 142 mm. cannon. General Manteuffel, one of Hitler's leading armor experts, stated that "The Russians maintained their advantage in tank design and the Stalin IV tank, which appeared in 1944, was the best tank to be seen in battle, anywhere, up to the end of the war." General von Kleist, another tank expert with long experience on the Russian front, believed that the Russian T-34 was the finest medium tank in the world and was always better than its German counterparts.

In 1944, Hitler commissioned Dr. Porsche, the automobile designer, to design a German tank which would, until the end of the war, out-perform anything which the Soviets could produce. Dr. Porsche designed a 1,000 ton monitor with a 300 mm. and a 188 mm. gun. It was never produced, and it is doubtful if it would have been very maneuverable under battlefield conditions.

In 1941, Hitler had underestimated the manufacturing capacity of the Soviet Union and had attached little importance to intelligence reports which had placed Russian tank producing capacity at 600 to 1,000 vehicles a month. Hitler did not order full capacity production of tanks until 1943. In 1944, the Germans produced about 12,000 tanks while the Soviets manufactured approximately 20,000 of the armored vehicles.33

33 Ogorkiewicz, op. cit., p. 231.
Three important events occurred in 1943 which greatly contributed to the defeat of the Wehrmacht on the Eastern front. First, the Russians began producing and using tanks which were superior to their German counterparts. Second, the Soviets began producing more tanks than their enemy. Third, the Luftwaffe lost air superiority over the Eastern front owing to the depletion of its fighter force there (the planes were recalled in order to counter the Allied air offensive against Germany). Stuka dive bombers—the most effective tank destroyers—were no longer able to operate effectively because the Russian planes were able to attack them continually. The Soviets brought their own dive bomber, the Stormovick, into action against German tanks. From 1943 on, the Wehrmacht experience progressively disastrous defeats.

The German tank industry was afflicted with too many designs (many of which were too sophisticated for conditions on the Russian front) which made standardization of parts difficult and supplying tank components to the battlefield erratic. The Reich industrial program was plagued by numerous conflicting authorities, priorities, and high level disputes between grasping Nazi officials. Much of this was the result of Hitler's plan to divide and rule. The Russians, on the other hand, were coordinated in their tank production program. There were no conflicting authorities. The Soviets produced only two basic engines and chassis for their tanks, both of which were of superior quality. Instrum ents and other parts of Russian tanks were kept to a minimum and standardized. All this greatly facilitated Russian tank production and battlefield efficiency.

Clark, op. cit., p. 411.
In the Far East, the Japanese diligently copied tank designs from
the other major powers and entered the Second World War with a well-
organized and adequate armored force. Most of their tanks, however, were
armed with only a 47 mm. cannon and two light machine guns. There was
little improvement in Japanese tanks during World War II.

The doctrine of air power
and the aeroplane

In 1921, an Italian air force general, Giulio Douhet, published a
book entitled The Command of the Air. In this work, he theorized that
the war of the future would once more involve most nations and all their
resources. On land, war would again take on a static character very
similar to that of the Great War. The object of air power in a static
future war would be to break down the material and moral resistance of
the enemy and thus prevent another war of attrition. He predicted that
"in the future, war will be waged essentially against the unarmed popu-
lations of the cities and great industrial centers." General Douhet
considered preparedness essential, for in the next war "aerial warfare
will be waged and decided by the available means in hand. He who is
called unprepared will be irrevocably defeated in the air." A nation
must be sufficiently prepared in order to be capable of winning the
struggle for the command of the air. Once won, a nation must have suffi-
cient forces to enable it to crush the material and moral resistance of
its enemy.

35 Ogorkiewicz, op. cit., p. 157.
36 Giulio Douhet, The Command of the Air, trans. Dino Ferrari
37 Ibid., p. 281. 38 Ibid., p. 131.
For this purpose, Douhet advocated an independent air force which would not be tied to helping surface forces by bombing enemy military targets on the field of battle. The first task of an independent air force would be to destroy the enemy air force by (1) bombing aeroplanes on the ground, (2) destroying the enemy's airfields, (3) attacking the enemy's aircraft manufacturing factories. He advised against aerial combat as a waste of time and as ineffective. The next target for air power would not be the enemy army and navy, but his cities and factories. Air power would be used only for offensive—not defensive—operations. Each nation would have to condition its population to resign itself "to submit to enemy attacks in order to use all possible means for launching the greatest offensives against the enemy." General Douhet believed that the best way to break down enemy morale was by smothering his cities with poison gases. He stated that "it is claimed that with eighty to one-hundred tons of poison gas, it would be possible to envelop a great city like London or Paris, and that with a proportionate number of explosive, incendiary, and poison-gas bombs, it would be feasible to destroy completely great centers of population, because the poison gas would make it impossible to put out the fires." He said that all nations would regard the Geneva Convention treaties as "scraps of paper." Douhet advocated total, absolute warfare against all of the enemy's civilian population without exception. Self-defense against enemy air power consisted in destroying his forces on the ground. But in the meantime,

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39 Ibid., p. 98. 40 Ibid., p. 103.
41 Ibid., p. 109. 42 Ibid., p. 182.
the fundamental principle of aerial warfare was "to resign oneself to endure enemy aerial offensives in order to inflict the greatest possible offensives on the enemy." \(^{43}\) Finally, he reiterated that "the war in the air will be decided by those aerial forces which are in being and ready when hostilities break out." \(^{44}\) This last prophecy is considered to be eminently true at the present time. \(^{45}\) Douhet's theories and ideas were echoed by General William Mitchell in America, General Sir Hugh Trenchard in Great Britain, and by Hermann Göring and Adolf Hitler in Germany.

William Lendrum Mitchell was thirty-eight years old when he went to France in April, 1917, just in time to witness the Nivelle debacle in which there were 187,000 French casualties. He wrote that "The war is a slaughter house performance from beginning to end on the ground . . . it is not a war, it is simply slaughter. War is getting at the vitals of the enemy, that is, to shoot him in the heart." \(^{46}\) He served with distinction on the Western front and wrote home many long reports on the overall aspects of air operations. He had many acrimonious quarrels with General Pershing, for Mitchell wanted to establish an independent air force. On March 1, 1919, he was assigned to Washington, D. C., as the assistant to the new Chief of the Air Service, General Charles Menoher.

After the war, there was fierce fighting for military appropriations from a reluctant Congress. Mitchell wanted money for an independent air force. This was difficult to justify, because America had no

\(^{43}\) Ibid., p. 194.  
\(^{44}\) Ibid., p. 197.  
\(^{45}\) It was not true during the Second World War.  
enemies to bomb, and with the primitive state of aeroplanes at that time, no enemies were close enough to bomb us, except Canada and Mexico, and an attack from those quarters hardly seemed likely. Mitchell therefore decided to get some of the Navy's funds on the grounds that that service had done nothing noteworthy since the Spanish-American war, and that an independent air force would be cheaper and more effective than the navy, and could assume that service's traditional role. Mitchell particularly attacked the battleship which certain British admirals, who should have known, were proclaiming as obsolete. Mitchell and his loyal allies decided that the Navy should be their first target. In early 1921, secret experiments had been carried out on the old battleship Indiana. Fixed charges representing aerial bombs had been exploded on its decks, and flying boats had dropped dummy bombs on it. The Illustrated London News somehow obtained the story which it published. Because of the secrecy involved, and inconclusive nature of the tests, many influential persons claimed that the Navy was hiding the results and that the battleship had succumbed to air power. This induced the Navy to agree to another test, this time to be conducted in public in Chesapeake Bay.

In 1921, the United States had acquired five German warships including the German dreadnought Ostfriesland. The latter was to be the main target for General Mitchell's bombers. He prepared well for the tests. A new type gyroscopic bombsight was installed in the bombers. Special bombs weighing 2,000 pounds, the largest in the world, were readied. The trials began on June 21, 1921, and took place at a distance of about one hundred miles from the nearest shore, which handicapped the

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47 Ibid., p. 30. 48 Ibid., p. 32.
short-range bombers of that day. The tests were to be witnessed by large numbers of civil and military officials and dignitaries, as well as by the press. The first target was the large German submarine U-117. Three aircraft dived toward the old submarine and dropped their bombs from a height of 1,100 feet. Two salvos dispatched the U-boat. Next, a destroyer and the light cruiser Frankfurt were sunk in the second demonstration of air power. This was very accurate bombing, compared with the Navy's aeroplanes which were trying to drop bombs, that same day, on a radio-controlled target ship (the Iowa) in another exercise. Only two bombs out of eighty dropped by the naval aircraft hit the target. The final target was the heavily armored and modern dreadnought Ostfriesland.

If air power faltered, the battleship Pennsylvania would demonstrate naval power by destroying the German dreadnought with its 14-inch guns at spectacularly long range.

The bombing began on the morning of July 20 with a series of attacks by both army and navy machines carrying progressively heavier bombs. Each attack was followed by a careful examination of the damage caused. Six direct hits were made, but fifty per cent of the bombs failed to explode and the others caused only superficial damage. That afternoon, medium weight bombs weighing around 600 pounds were dropped from a height of 1,500 feet and these blasted holes in the Ostfriesland's upper deck. In a few hours, the battleship was listing in the water. The examining officers then inspected the ship and could find no evidence of fatal damage or the inability to steam back to base had this been a real combat situation. Fifty-two bombs had been dropped, the Ostfriesland was still

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49 Ibid., p. 33. 50 Ibid., p. 34.
afloat,\textsuperscript{51} and the reporters steamed for shore to report that the battleship had won. This was before Mitchell had dropped his largest bombs, however. The next day, he attacked with sixteen bombers, half of them loaded with thousand pound bombs, and the others carrying the experimental 2,000 pound bombs. Three thousand pound bombs hit the ship. It still remained afloat and capable of steaming back to port. Mitchell's bombers then dropped the big bombs on the Ostfriesland and it was finally sunk.

There were two interpretations of this demonstration of air power against the battleship. Navalists said that it was not a fair or realistic test to bomb a stationary target under ideal conditions of visibility and weather. The ship was unable to take evasive action, there was no anti-aircraft fire at the slow, low flying bombers, no naval fighter planes to take defensive measures, and finally, the ship was an obsolete old hulk anyway. The aerialists included Admiral Sims who had been a prominent naval officer in the Great War and was then President of the Naval War College and Admiral Fuller who stated that there was nothing so difficult to sink as a naval hulk. He maintained that a ship in combat would be groaning under the weight of high explosives on the inside and depth charges on deck. There would be the explosive power of steam boilers to consider as well as inflammable material. An operating ship, in the admiral's opinion, would have been easier to sink. Other aerialists maintained that with improved bombsights, heavier bomb loads, and better planes, a battleship could be sunk with ease.\textsuperscript{52} Admiral Scheer, the former German naval commander, stated that a fleet could not remain in

\textsuperscript{51}\textit{Ibid.} \hspace{1em} \textsuperscript{52}\textit{Ibid.}, p. 57.
motion indefinitely and when it docked, aeroplanes would have a good chance of sinking capital vessels.\textsuperscript{53} Advocates of air power maintained that a thousand aeroplanes could be built for the price of one battleship, and that an independent air force was an economy measure. (Ironically enough, the air force today is much more expensive than our navy.)

The official report of the Ostfriesland trials by the Army and Navy was published on August 20 and was signed by General Pershing. While recognizing that aircraft were capable of sinking battleships, it emphatically declared the capital ship to be the backbone of the nation's sea defense.\textsuperscript{54}

Between the First and Second World Wars, there arose a terrible fear of the new "ultimate" weapon, the gravity propelled high explosive, incendiary, and poison gas bomb. The appearance of bombers over Paris and London during the Great War had greatly impressed and frightened the populace who increasingly felt that no one would be safe in the next war. On July 27, 1923, one General P. R. C. Groves wrote a letter to The Times in London which typified much of the thought on the bombing of cities at the time. He wrote that "aerial bombardment of the great cities and other nerve centers of this country might bring about defeat within a few days."\textsuperscript{55} The fear of the bomb was heightened by its effective use against cities in Spain and China, by its employment against the Abyssinians by the Italian air force, and by the ability of the Royal Air Force to police successfully large areas of the Middle East and the Indian frontier. All this added to the belief that the bomber possessed the power to destroy a nation in a short space of time and was the "ultimate"

\textsuperscript{53}Ibid., p. 381. \textsuperscript{54}Ibid. \textsuperscript{55}Ibid., p. 57.
killer. Statisticians as well as romantic writers such as H. G. Wells forgot that the greater area of modern cities is open space, that efficient repair squads can soon restore utility services in heavily bombed areas, that factory production is little affected by high explosives unless a few vital points are hit, and that railroad marshaling yards can be restored almost as quickly as they are bombed. These were some of the errors of mathematics made by the advocates of the doctrine of independent air power. Almost everyone was amazed to discover that terror bombing, during the Second World War, augmented in certain cases, rather than weakened, the will of the victims to resist.

Such faith in the bomb as a weapon led, in 1935, to the creation of the General Headquarters Air Force which was to build for America an independent, strategic striking force. A guiding doctrine soon crystallized which incorporated most of the ideas laid down by General Douhet and by General Mitchell. It stated that bombardment was the fundamental concept of offensive air warfare. The enemy's air force and aeroplane industry were to be its first targets, then the foe's civilian population centers. In order to carry out this mission, long range, land-based bombers had to be built which could carry heavy bomb loads over long distances. They had to be able to defend themselves against enemy fighters because of the limited range of their own fighters which would not be able to accompany them deep into enemy territory. Quietly, as early as 1930, a small group of engineering and bombardment officers at Wright Field had been working on plans for strategic bombers. Officers such as Colonels Hugh Knerr and C. W. Howard had been promoting the
The conception of an all metal, low wing, multi-engined strategic bomber.\(^6\) The Boeing B-9 and the Martin B-10 were constructed along these lines. The Martin B-12 was next developed. Each new model incorporated improvements over those previously flown and experimented with.\(^7\)

After 1935, the Army Air Corps, having achieved quasi-independence and a suitable doctrine of air power, now had to perfect the weapon to carry out its mission. As the ground work for a strategic bomber had already been done at Wright Field, the Boeing B-17 was soon produced and the first experimental model was flown in 1935. Since the thought of involvement in foreign wars was very unpopular at that time, the B-17 was touted as a weapon capable of replacing the battleship as America's first line of defense. It was supposed to be capable, because of its great range, of seeking out hostile invasion forces far at sea and, by means of its great bomb load and super accurate Norden bombsight, to sink them from great altitudes, beyond the reach of a battleship's anti-aircraft artillery. The B-17 bristled with defensive machine guns, since fighters could not accompany it owing to their limited range. It carried from ten to twelve very rapid firing .50 caliber machine guns, and could train two or more of these guns at an enemy fighter plane attacking it from any direction. The bombers, by flying in formation, were able to train a large number of machine guns at an attacking fighter plane. Owing to a complicated system of struts, braces, duplicate controls and vital parts,


the B-17 was able, in the Second World War, to sustain incredible amounts of injury and still fly. The B-24 Liberator bomber was also developed at this time. This high winged plane had a longer range and carried a heavier load than the B-17, but was less heavily armed. Knerr and Howard had evolved a ten-year plan which would produce progressively larger, faster, longer ranged bombers which culminated in the B-29, the terror bomber of Japan.\textsuperscript{58} Production plans for every bomber built during World War II, and for every fighter plane, with one exception, had been drafted by 1940. The B-17 and its long line of successors were by far the finest bombers in the world. These big bombers were not, however, completely successful in fulfilling the functions expected of them. They could not successfully defend themselves during daylight, clear weather raids without fighter cover (the losses during the daylight bombing raids on Schweinfurt, Germany, made without fighter protection, proved prohibitive). They could not hit ships by pinpoint bombing. The B-17 and its successors were never very successful in evading hostile anti-aircraft fire. The concentrated effort on the development of the strategic bomber contributed to the neglect of the fighter plane and the fighter-bomber. When America entered World War II, its best fighter planes were obsolete.\textsuperscript{59}

From 1935 on, bomber development progressed under a firm doctrine and plan, but pursuit aviation (i.e., fighters and fighter-bombers) did not receive proportionate attention. Bomber doctrine contended that the B-17 bombers would not need a fighter escort because a formation of the

\textsuperscript{58} Ibid., p. 134.

\textsuperscript{59} Millis, op. cit., p. 214.
big planes could create a curtain of fire which would prevent effective fighter opposition.\(^60\) (The pursuit plane theorists disagreed.) Many thought that the pursuit plane should be used only for attacking ground targets, or for attacking enemy bombers. As a result, American fighter planes design were a compromise. They were intended to be able to perform three duties: (1) fight enemy pursuit planes, (2) attack enemy bombers, (3) bomb and strafe ground targets. They were designed to accompany strategic bombers at high altitudes. Aeroplanes such as the P-47 Thunderbolt were superior to Messerschmitts and Focke-Wulfs only at altitudes exceeding 25,000 feet. At lower altitudes, the Thunderbolts had to depend upon their superior numbers to counter Germany's and Japan's more agile pursuit planes.

The United States Navy, soon after Pearl Harbor, had in ever increasing numbers three good planes for attacking enemy shipping. Two of the planes, the Hell Diver and the Dauntless, were dive bombers. These proved very effective, during the Second World War, in attacking the flight decks of enemy aircraft carriers thus preventing the foe from launching his aircraft. The Avenger was a good torpedo launching aircraft. The American Navy started the war with a fighter plane called the Wildcat, which was inferior to the Zero. The Wildcat soon gave way to the Hellcat, which was also inferior to the Zero, but was available in such numbers that they could protect America's ships, and torpedo planes when the Hellcats accompanied them on missions. In 1943, the Vought Corsair was brought into action and could challenge the Zero on a one-to-one basis by taking advantage of its great diving and climbing ability.

\(^60\) Glines, *op. cit.*, p. 135.
The Zero, and its many modifications, remained the finest dog fighting aeroplane in World War II because of its excellent flight characteristics and maneuverability. It was often modified to carry a bomb which it would try to drop on the flight deck of American aircraft carriers.

During the Spanish Civil War, the German air force perfected the Stuka dive bomber, the Henschel, and other tactical aircraft used for ground support. The Stukas were regarded by many as the most rugged, dependable, and accurate dive bombers used during the Second World War. In the summer of 1934, the German government requested Professor Willy Messerschmitt, director of design with a German aircraft firm in Augsburg, to build a more effective fighter plane for the Luftwaffe. The design principle of this plane utilized the largest, most powerful aircraft engine available with the smallest air frame. The result was the Me 109B. Improved models had other letters of the alphabet after the number 109. This plane won all of the pursuit plane contests at the International Flying Meet held at Zurich in 1937. It was produced in large numbers throughout World War II and continued to be a superior aeroplane. By the summer of 1941, the Germans put into operation the Focke-Wulf(FW) 190 which was one of the truly great single-seat, all purpose planes of the Second World War. It was employed as a pursuit plane, a fighter-bomber, and a bomber destroyer. It was the last plane to be produced in Germany without acrimonious civil-military disputes over the basic question of an aeroplane's function. The Germans never developed an adequate strategic bomber, and the ones they did have were poorly armed, had a short operational radius, and carried too small a bomb load. They were scarcely protected in terms of armor. Although
Göring and Hitler embraced the air doctrine of Douhet, they never had the bomber to carry out the doctrine.

In 1935, the British Air Ministry published specifications for a new type of fighter plane. The pursuit plane called for would have to be a single seat fighter with a closed cockpit, a retractable landing gear, four Browning machine guns mounted in each wing, a speed of at least 275 mph at 15,000 feet, an endurance of one and a half hours, and a ceiling of 33,000 feet. Two firms, Supermarines, and Hawker, responded with detailed drawings, and one prototype monoplane was ordered from each firm. Reginald Mitchell designed the Spitfire from the Supermarine S.6, a seaplane which had attained the remarkable speed of 407 mph in 1931. The firm of Hawkers put the Hawker Hurricane into production in 1935. 61

During the Battle of Britain, there were more Hawker Hurricanes in action that Spitfires. The former were inferior in fighting characteristics to the Messerschmitt 109. They were modified and used as bomber destroyers and were better at this task than the Spitfires because the Hawker Hurricanes were more heavily armed (four 20 mm. cannons, or two 40 mm. cannons, or rockers) and were well armored. The tactic employed by the Royal Air Force was to have the slower Hawker Hurricanes attack the German bombers while the fast and nimble Spitfires tackled the Messerschmitts. Later, the Hawker Hurricane was used as a fighter-bomber in support of ground operations. The Spitfires underwent forty major modifications and were always as good—some thought better—than their German opponents. Owing to short range, they were unable to afford protection to bombers flying

The Royal Air Force never developed a bomber comparable to the B-17. Their heavy strategic bombers--Lancasters, Stirlings and Halifaxes--had the range and the bomb carrying capacity of the B-17 and the B-24, but were poorly armed and armored, and could not sustain as much damage as the American bombers could. As a result, the British were forced to bomb mainly at night. The doctrine of air power in England developed along much the same lines as it did in America, although the British were quieter about their intention to bomb civilians and soft-pedaled this aspect of their doctrine.

The German Luftwaffe went to war with 4,000 first line planes, the Royal Air Force with 1,900, France with 600 aircraft, mostly obsolete, Russia with 4,000 to 5,000 planes, all inferior to their German counterparts, Japan with 2,700 excellent, modern aircraft, and the United States with 2,900 planes, many of them very obsolete. 62

The aerial torpedo and the death of the battleship

In 1917, Parliament was so frightened by almost unopposed German bombing of London that Britain's air arm was made into an independent service in hopes of stopping the German bombers. After the war, there was in England, as in America, a scramble for scanty funds. General Sir Hugh Trenchard, the "father of the Royal Flying Corps"63 and Winston Churchill, who was Secretary of State for Air, tried to convince Parliament that air power was the cheapest and most effective method of


63Hough, op. cit., p. 41.
policing Britain's colonies, especially in the Middle East with its vast expanses of desert. \textsuperscript{64} (This proved to be true in later years.) General Trenchard and his airmen firmly believed that land based planes could replace capital ships.

When, in 1921, the British Board of Admiralty became alarmed at the extent of Japanese and American naval rearmament and managed to convince Parliament of the necessity for appropriations for four new battle cruisers, the men of the Royal Flying Corps considered this a blow against themselves. They decided to promote the air service by (1) attacking the battleship as obsolete, (2) gaining control of the navy's air arm. \textsuperscript{65} They were successful only in the latter. Faith in the battleship was too strong while aeroplanes in that day were far from impressive. The Royal Flying Corps thought primarily in terms of dropping bombs on ships. This method of sinking enemy battleships was extremely difficult and proved impossible against them while they were moving. Owing to the failure of the Luftwaffe during the later stages of World War II, the British bombers were able to make repeated, large scale attacks against the battleships \textsuperscript{66} Tirpitz, Lützow, and Admiral Scheer while they were anchored in harbor (the Tirpitz was out of fuel). They finally managed to sink all three ships at heavy cost to the attacking bombers from ship and harbor anti-aircraft guns. Only torpedo launching aeroplanes were to prove successful against sea going fleets of enemy capital ships.

\textsuperscript{64}Ibid., p. 4. \textsuperscript{65}Ibid., p. 41.

\textsuperscript{66}The term "battleship" includes the technical classifications of dreadnought, and battle cruiser.
In 1914, an experimental Sopwith seaplane dropped the Royal Navy's first airborne torpedo. Winston Churchill and Admiral Fisher became interested in the torpedo launching aeroplane and encouraged the formation of a flight of them. In 1915, fifteen of these planes were sent to the Dardanelles for combat testing. While there, one attacked a merchantman, another an ammunition ship, and a third a tug. Each vessel sank at once. On the evidence of 100 per cent successes, it seemed likely that the new weapon would be encouraged and that combat units of torpedo planes would be formed. Sopwith was ready to put a torpedo launching aeroplane into production. Then, Churchill and Fisher were suddenly ousted from power and the project was forgotten until the prototype aeroplane was discovered hanging from the factory rafters in 1918 and 200 of the aircraft were ordered, but they were completed too late to participate in the Great War.\[67\]

In 1917, the Germans sent a flight of Brandenburger twin engined biplanes across the North Sea. They were armed with seventeen-inch torpedoes. The Brandenburgers attacked the British merchantman Gena and sank it, but not before the Gena had shot down the aeroplane carrying Germany's leading proponent of the aerial torpedo. The experiment was not repeated.\[68\]

The primitive state of aeroplane development and navigation at sea, and rudimentary aerial torpedoes, argued against investing money into the torpedo carrier. After the war, few people could believe that a flimsy, slow moving aeroplane could menace a 40,000 ton steel armored dreadnought bristling with fearsome guns and speeding and zigzagging

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\[67\]Hough, op. cit., p. 60. \[68\]Ibid.
through the water. One writer points out that the friends of the battle-
ship did not wish to emphasize the power of the aerial torpedo, and at
sea war games, the admirals in charge saw to it that the airborne torpedo
launchers made a bad showing and when they did score a hit, there was
little publicity about it.\textsuperscript{69} The Admirals did this because they reasoned
that while the aeroplane could actually launch a torpedo, minus the war-
head, against the battleship, the battleship could not fire at the
aeroplane and hence was at a disadvantage in the war games.

Many older admirals, such as Fisher, supported the aerial torpedo
and wrote in favor of it. The lack of aerial torpedo development, and
the lack of knowledge and interest in such development in other countries,
such as Japan, was owing more to the Royal Flying Corps than to the
admirals. The air service controlled naval aircraft and was chiefly
interested in the bomb as the weapons of attack at sea. The aerial
torpedo was viewed as an expensive weapon and its carrier as slow, flimsy,
and vulnerable to anti-aircraft fire. At that time, capital ships were
being armed with the multi-barreled, two-pounder pom-pom anti-aircraft
gun which fired bullets at a prodigious rate, and it was most impressive
to see even one in action, let alone dozens of them firing from the side
of a battleship. A naval correspondent reported in the \textit{Daily Telegraph}
that "The new weapon has revolutionized the navy's methods of dealing
with low-flying bombing aircraft and torpedo planes... Its range far
exceeds that at which a torpedo plane could hope to launch a successful
attack. The stream of shells lashing the water... sets up a barrage
through which no machine could pass."\textsuperscript{70} To all appearances, this was

\textsuperscript{69}\textit{Ibid.} \textsuperscript{70}\textit{Ibid.}, p. 63.
true. Even today, it is difficult to understand how, in actual fact in World War II, torpedo planes were able to lumber within torpedo range of fiercely firing capital ships, launch their torpedoes, and often escape with only small losses. The Royal Navy maintained that if they had their own air service, they could use fighter planes to shoot down attacking aircraft and thus eliminate the danger to the battleship from aeroplanes. Reports of the trials conducted by General Mitchell in Chesapeake Bay, and the later air attacks against the battleship Utah off the Pacific coast, did little to further the cause of British air power at sea. The Royal Flying Corps was never able to demonstrate effective bombing of ships, and in the meanwhile had neglected the aerial torpedo. Each year, the big ships were able to demonstrate heavier and more impressive "curtains of fire" which most people believed would surely stop any attacking torpedo planes. A moving ship, of course, was expected to be able to dodge torpedoes. Another consideration was that the planes could not attack in inclement weather or at night.

The advocates of the big ships, on the one hand, and of the doctrine of air power on the other, had cogent, forceful arguments. Just as some admirals were convinced of the efficacy of air power against the battleship, so many aerialists doubted the effectiveness of the torpedo carrying plane. Only a theoretical committee might have determined the merits of the battleship and of the aerial torpedo had adequate testing been undertaken. As it was, the proponents of the battleship had many strong and impressive arguments in their favor while the arguments of the advocates of the aerial torpedo were few and unimpressive owing to the primitive state of the aeroplane and aerial torpedo at that time. In any
case, the Royal Flying Corps was expected to be able to attack and bomb enemy ships in the waters adjacent to the British Isles with its land-based planes.

When Britain entered World War II, its naval aviation was in a very primitive state with only 189 aeroplanes, 147 of them obsolete. Owing to England's primary concern with home defense, and considering the inclement weather conditions prevailing in the region of Britain and the North Sea and north Atlantic, Britain's battleships were useful in preventing German capital ships from breaking out into the Atlantic ocean and destroying Allied and British merchantmen (the Admiral Scheer, and other battle cruisers, did occasionally manage to break out into the Atlantic ocean, but it was difficult and risky for them to do so). The Graf Spee was scuttled because of fear of British capital ships, and the Bismarck—after being slowed down by an aerial torpedo—was destroyed by surface ships. The Scharnhorst was likewise sunk by shellfire. British battleships, by keeping Germany's capital ships bottled up on the North Sea and the Baltic, forced them to spend much time in harbor, thus allowing the Royal Air Force's bombers to attack them repeatedly, as previously mentioned. Britain neglect of the aerial torpedo and ignorance of its progress in Japan was to have dire consequences in the Pacific ocean with its usually clement flying weather and absence of long winter nights. Great Britain was not prepared to fight a modern naval force such as Japan's owing to the former's lack of modern torpedo launching aircraft and aerial torpedoes.

During the 1930's, America took note of the fact that the Japanese Navy, in order to compensate for its disparity in capital ships
with America and Great Britain under the limitations imposed by the Washington Naval Treaty, was putting its faith in air attack by bomb and torpedo. This induced the United States Navy to build the world's two most advanced aircraft carriers, the Lexington and the Saratoga. The planes that flew from them, such as the Curtiss Hawk fighter with its retractable undercarriage and speed of 250 mph, were among the most modern in the world. By 1941, however, the Japanese were definitely ahead of America in operational naval aircraft, and in aerial, ship, and submarine-launched torpedoes.

Before the Great War, the Japanese Navy was buying aircraft from Europe and conducting its own trials. In 1916, the Japanese air service received its first substantial appropriation. The leading proponent of naval air power in Japan was Isoroku Yamamoto, who was later to lead the carrier strike force that attacked Pearl Harbor in 1941. As early as 1915, he declared in an interview that the most important ship of the future would be a ship to carry aeroplanes. The Japanese air service continued to receive regular appropriations and in 1919 an admiring American gave the Japanese government 90,000 dollars "with the request that it be devoted to the purchase of flying machines and the training of pilots."

In 1927, a Japanese naval officer was taken on a tour of HMS Rodney. Upon seeing an oxygen generating apparatus near the ship's torpedoes, he incorrectly concluded that the British had perfected the previously dangerous and unpredictable oxygen powered torpedo. As a result of the report which he later wrote, the Japanese Navy resumed

\textsuperscript{71}Ibid., p. 65. \textsuperscript{72}Ibid.
their previously abandoned experiments with this medium of propulsion and soon perfected the oxygen propelled torpedo. This revolutionary torpedo was designated as the Type 95 Mk II. It had a diameter of 24 inches, a length of nearly 30 feet, a speed of 49 knots, and a range of 5,760 yards—more than three miles! The charge in its warhead weighed 1,210 pounds. It made every other torpedo in the world obsolete and Japan carefully, and successfully, guarded its new secret weapon. Unlike the economy minded British and Americans, the Japanese practiced with live torpedoes and sank obsolete ships with them. (So diligent were the Japanese in torpedo development and research that by 1941 most of their destroyers and submarines were equipped with a torpedo called the Long Lance which had a range of 22,000 yards—over twelve miles—and great accuracy. In 1941, Admiral Isoroku Yamamoto had under his command the aircraft carriers that he had campaigned for twenty-five years earlier. There were nine of them which made Japan the leading carrier force power in the world. Japanese air crews were skillful, resourceful, and aggressive. Crews of land based torpedo planes consistently achieved an average of 74 per cent hits against battleships on maneuvers, and once Japan had gone to war with America, this figure was officially estimated by the United States Navy to have become not less than 25 per cent.

But even in Japan the advocates of the battleship had won major victories. They built the Musashi and Yamato, both of 75,500 tons full load displacement (as compared to about 40,000 tons displacement for Britain's largest battleships), and with a main battery of 18.1 inch guns.

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73 See Table 1.  
74 Ibid. 75 Ibid., p. 67. 76 Ibid.
They truly were unsurpassed superdreadnoughts. (Later, they were both destroyed by aerial torpedoes launched by United States Navy aircraft.)

The confidence in the efficacy of the battleship by the three greatest naval powers may now be reviewed. Japan had the greatest confidence in the aeroplane, especially the torpedo launcher. This led Japan to build more aircraft carriers than any other nation in the world while at the same time accepting the need for the battleship. The United States Navy's attack strength still resided primarily in the battleship. Ten of these were being built or being completed in the summer of 1941, at the cost of around 100,000,000 dollars apiece. There were senior officers in Washington and with the fleet who believed that a Pacific naval war would be fought primarily from the decks of aircraft carriers and by submarines, but they were a definite minority.77 Great Britain was unprepared to fight an aerial war at sea for it possessed only 189 carrier based aircraft, 147 of which were obsolete.78

The first combat test of aeroplanes versus battleships at sea occurred on December 10, 1941.79 The background of this notable encounter is of considerable interest. In 1916, one of the two battleships to take part in this contest was launched and christened HMS Repulse. It had a speed of 32 knots, six 15-inch guns, thin armor plating, and blisters around its hull to protect it from torpedoes. It had fired at enemy capital ships after the Battle of Jutland. Following World War I, HMS Repulse had a major refit which cost nearly a million pounds. A thousand

77Ibid., p. 68. 78Ibid.
79As opposed to battleships attacked while moored at their berths in harbor, or a combined aircraft and capital ship attack, such as was made against the Bismarck.
tons of armor was added, including heavy deck armor to protect it from bombs. Anti-aircraft guns were installed. The other vessel was HMS Prince of Wales, Britain's newest battleship. It bristled with armament supposed to deal with high level bombers and low level torpedo carrying aircraft. At long range, it could fire sixteen 5.25-inch guns at the rate of eighteen rounds per minute from each gun, to a distance of 22,500 yards—over twelve miles. To protect the ship against intermediate and close range air attack, there were sixty-four two-pounder pom-poms, grouped in clusters of eight, and supported by a vast multitude of 40 mm. Bofors, 20 mm. Oerlikons, and light machine guns. There was armor plating up to six inches thick on the decks and other vulnerable places. The bulkheading was of remarkable intricacy and ingenuity. Indestructibility was the intention of the careful and clever designers. The Prince of Wales had taken part in the battle against the German battleship Bismarck, and had scored three hits against the enemy vessel while itself sustaining only minor damage.

The torpedo carrying planes which the two battleships were to fight were mainly built by Mitsubishi and nicknamed "Nells" and "Bettys" by the Americans and British. The development of very long range naval aircraft had begun in Japan in 1932. In 1936, the Japanese produced a plane designated as Type 96 which had a speed of 240 mph, strong defensive armament, and a range of 605 nautical miles. (The British Fleet Air Arm was still using 100 knot Swordfish planes long after Japan's entry into the war. They launched 18-inch diameter torpedoes from the unimpressive height of about eighteen feet.) The Japanese Navy Mitsubishi aircraft,

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80 Ibid., p. 77. 81 Ibid., p. 80.
in the late 1930's, were dropping their remarkable 24-inch diameter torpedoes from heights of up to 1,000 feet at the aeroplane's maximum launching speed of 190 knots.\textsuperscript{82} The aeroplanes and torpedoes were kept a secret from the rest of the world. There had been ominous evidence that the existence of the battleship was in serious danger from aerial torpedoes. In 1940, in the Mediterranean, twelve obsolete British Swordfish planes had attacked Italian capital ships in a strongly defended harbor and had sunk three battleships at the cost of only two aircraft lost.\textsuperscript{83}Shortly thereafter, several carrier borne Swordfish sank another Italian battleship and four cruisers with only one Swordfish shot down. By 1941, eleven battleships had been sunk, ten by torpedoes.\textsuperscript{84}

In the fall of 1941, the British Admiralty was ordered by Winston Churchill to deter further Japanese aggression in the Far East by frightening them with British capital ships. The Repulse and Prince of Wales were dispatched thither. The British had wanted to send a formidable squadron to the Far East, but they were overruled by Churchill who did not believe that this would be necessary.\textsuperscript{85} Furthermore, the Admiralty half believed reports from Naval Intelligence that Japanese aeroplanes were of good quality. There were even unconfirmed reports of a very fast and maneuverable fighter plane—the Zero (Zeke)—but few people in Singapore, where the two battleships were being sent, were inclined to take such reports seriously. As one writer puts it:

> The popular view of the troops and the civil population was that Japanese pilots were incompetent, wildly erratic, and even suicidal. The old jest that their machines were

\textsuperscript{82}\textit{Ibid.}, p. 101.  \textsuperscript{83}\textit{Ibid.}  \textsuperscript{84}\textit{Ibid.}  \textsuperscript{85}\textit{Ibid.}, p. 111.
imitations of western aircraft of First World War vintage, and built largely from bamboo and rice paper, still prevailed, and was taken seriously by many people.86

Air Marshal Sir Robert Brooke-Popham, the overall commander in Malaya, in order to counter the anxieties about the peninsula's defenses, had stated that Britain "could have her super-Spitfires and hyper-Hurricanes," for "Buffaloes87 are good enough for Malaya."88 The commander of the Repulse and the Prince of Wales was Admiral Phillips who believed that the Japanese air force was of about the same low caliber as the Italian and as markedly inferior to the Luftwaffe.89 He felt that he would be safe from torpedo planes because there were no known aircraft carriers in the area and he felt that if his ships remained more than 200 miles from land, he would be out of range of any torpedo planes which might have been operating from land bases.

On December 10, 1941, the Repulse and the Prince of Wales were attacked by planes of the Japanese 22nd Air Flotilla which had flown over nearly three hundred miles of ocean to reach the two battleships. The first wave of aeroplanes consisted of twin engine Mihoros which dropped bombs. Only one of these missiles struck its target. The much touted air defenses of both battleships did not score a hit against the nine attacking bombers. (World War II showed that bombers and battleships which were at sea seldom were able to injure one another.) Then the attacks of torpedo planes began. They attacked in groups of about fifteen to twenty aeroplanes each. Many of the planes dropped their

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86Ibid., p. 126.
87An obsolete fighter plane.
88Hough, op. cit., p. 126.  89Ibid.
torpedoes from as high as 500 feet. The two battleships were soon sent to the bottom. The Japanese lost only 4 per cent of their attacking planes.\(^9\) Winston Churchill accepted full blame for the whole business, which makes a strange contrast with his attempt to send a decisive force to the Dardanelles in 1915 and the Admiralty's extreme reluctance to send a single ship away from northern waters. Of course, the situations were entirely different, but the folly of sending an inadequate force to a peripheral theater of war remained the same.

Just three days before the attack on the two British warships, Japanese planes had managed to sink four American battleships at Pearl Harbor. They were the Arizona, California, Oklahoma, and West Virginia. The Maryland, Nevada, Pennsylvania, and Tennessee were heavily damaged. Remaining, repaired, and new American battleships played only a small role in the Pacific war. They were employed mainly to shell Japanese held islands prior to American invasion.

As previously mentioned, the great Japanese battleships Musashi and Yamato were dispatched by aerial torpedoes. A third sister battleship was half finished when it was decided to convert it into the world's greatest aircraft carrier. It was finished in November, 1944 and christened Shinano. It weighed 71,000 tons. This may be compared with the 59,000 ton Forrestal which was America's largest carrier until well after the war. On the Shinano's maiden voyage from Yokosuka to Osaka Bay, it was torpedoed and sunk by an American submarine.

The majority of Japanese ships, both war and merchant, were sunk by aerial and submarine launched torpedoes.\textsuperscript{91} In 1943, the American Navy acquired numerical equality with the Japanese Navy. The development of radar enabled United States warplanes to locate and destroy Japanese ships at night. The Japanese, on the other hand, were never able to develop effective airborne radar. While American submarines accounted for 63 per cent of all Japanese ships sunk, aircraft accounted for about 44 per cent. Fourteen per cent of this figure was caused by air dropped mines.

Most of the great Pacific naval battles (Coral Sea, Midway, Philippine Sea) were fought by planes launched from aircraft carriers which never caught sight of one another.\textsuperscript{92} Air power had become the necessary condition for naval supremacy. American submarines owed much of their success to the failure of the Japanese to develop effective airborne radar.

In recent years, American aircraft carriers have been useful, indeed crucial, for the conduct of small conventional wars, such as the Korean conflict and the present Vietnam guerilla war. Many Americans believe that in a nuclear conflict, aircraft carriers would play an important role. This is indeed a strange view, for a perusal of any recent text on rocket development will show that air and submarine launched nuclear tipped rockets are capable of seeking out and destroying any large surface ship. There is no known defense against these rockets. There are also incredible, nuclear tipped torpedoes which are capable of

\textsuperscript{91} See Tables 2 and 3.
\textsuperscript{92} See Table 4.
destroying an entire fleet of ships. It is very likely that Soviet submarines and surface vessels keep all American aircraft carriers under constant surveillance and would be capable of sinking them instantly in the event of an atomic war with the United States. It would be well for a theoretical committee to evaluate the usefulness of the aircraft carrier in such a war.

The German U-boat

In 1935, the Anglo-German naval agreement was signed and the Treaty of Versailles was rejected. The new treaty fixed the strength of the German Navy at 35 per cent of the British Navy while its U-boats were fixed at 45 per cent of the British submarine arm, which was of modest proportions. In 1938, the number was fixed at 100 per cent. Convinced that Germany and Great Britain would never battle one another again, Hitler thought that a German fleet of balanced proportions would be a good bargaining factor in case Germany wanted to ally itself with one of the great sea powers. In 1937, Admiral Doenitz, then in command of all U-boats, believing that war with England could not be delayed, advocated a vigorous expansion of the U-boat arm. Grand Admiral Erich Raeder, Supreme Commander of the German Navy, however, was convinced that in accordance with Hitler's repeated assertions, Germany would avoid war with England under any circumstances.

At the end of 1938, Grand Admiral Raeder proposed two naval plans to Hitler. They were designated as Plan Z and Plan X. The former called for a powerful balanced fleet by 1948, to be as large as that of Britain's. Essentially, it was to be composed of twenty-five battleships, forty-nine cruisers, only four aircraft carriers, and 249 U-boats. The Germans were
no more inclined to develop a substantial naval air arm than were the British, but clearly put their faith in the battleship. It may be wondered that Hitler could not foresee the British reaction to this challenge to its sea power. Apparently he had gathered no lessons from the First World War. Hitler accepted Plan Z because of the political prestige of big ships, his desire to have the most powerful force on the sea as well as on the land, and his belief that he could prevent hostilities with England in case of a continental war.

Admiral Doenitz strenuously objected to Plan Z on the grounds that it would take six years to complete and that England certainly would not sit idly by and maintain a static navy. Doenitz pointed out the extreme vulnerability of German naval bases and ships to attacks by the British air force. Finally, he maintained that England could bottle up a German surface fleet in the Baltic. He pointed out that England's supply arteries were in the Atlantic, where it would be difficult for German surface ships to operate without fuel bases. Admiral Doenitz proposed Plan X, which subordinated the German surface fleet and concentrated on U-boat construction. Doenitz considered the U-boat as the most effective type of weapon with which an inferior naval power might challenge a superior one. As early as 1937, Doenitz stated that if the enemy organized his merchantmen in escorted convoys, Germany would require at least three-hundred operational U-boats in order successfully to wage war against its shipping. Three hundred were required because at any time about one hundred would be in transit, one hundred would be in the process of being overhauled, and only one hundred would be operating at sea.
Admiral Raeder finally became skeptical of Hitler's promises and proposed modifications of Plan Z which would allow for the production of 372 U-boats by the beginning of 1942. Hitler refused to consider this proposal. In July, 1940, however, restrictions on U-boat construction were lifted and the German Navy aspired to the modest goal of twenty-five U-boats a month by 1941. Subordination of the naval construction program to the Luftwaffe caused production delays. When war with England began, there were only twenty-two U-boats fit for Atlantic duty. Over Christmas, 1939, only one U-boat was on offensive patrol in the Atlantic. The Germans never caught up with the war at sea. By the time the U-boats were available in sufficient numbers, they were obsolete and unable to cope with the Allied detection devices and new methods of search and destroy. The responsibility not only for the wrong kind of navy, but also for an inadequate one, rests squarely with the civilian Adolf Hitler.

Conclusion

It may be said that the introduction of technical machines into warfare brought stiff competition for funds among the services and inter-service rivalry stimulated progressive thinking to an extent hitherto unknown in the military. Men could no longer easily rise to high rank in the new services by the old traditional methods. Technical innovation became popular and soldiers in all services (except the cavalry) proposed radically new machines, such as the aerial torpedo. The navies of the

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world, to lesser and greater degrees, adopted the aircraft carrier and developed the naval air arm. The friends of the battleship had adopted radar, anti-aircraft guns, and had tried to get naval planes for fighter protection against enemy air attack. If the battleship was retained too long in all navies, it was with reason, generally speaking, rather than from reactionary obstinace. Soldiers were as progressive as civilians, and they worked together in close harmony in the development of weapons and detection devices such as radar.

The acceptance of the doctrine of independent air power by soldiers and civilians alike changed the nature of warfare and made it a battle of extermination (until unconditional surrender) between whole peoples.

Making use of these materials in the secondary school

The methods to be used to familiarize secondary school pupils with the development of weapons during the period 1919 to 1941 will be identical to those methods recommended in Chapter V. The teacher will discover, however, that the closer the weapons studied are to the present, the greater and more controversial will be the materials about them. The teacher may obtain a list of currently available films, slides, sound recordings, and pictures by contacting the public information officer at the nearest army, navy, or air force installation. Most of the material offered will be free and occasionally the officer in charge will have it delivered to a public school. Local recruiting officers often have a film listing and can procure materials. For all available listings of films and other audio-visual material, the teacher can write to the Superintendent of Documents, United States Public Printing Office in
Washington, D. C. This office is very prompt and will answer the teacher's questions in detail as well as send him whatever he requests. It is not likely that local film listings, or those contained in Coronet film listings will be pertinent to weapons development between the two wars. Depending upon the geographical location of a school, the class may be able to visit such places as the Wright-Patterson Air Force Museum, the Smithsonian Institute, the United States Army Ordnance Museum at Aberdeen, Maryland, or the Armor Museum at Fort Knox, Kentucky. Here the weapons which were produced and experimented with between the two wars may be seen and often handled.

There is a dearth of interesting books on this period suitable for secondary school pupils. Most of the written material is either too technical, albeit well written and often interesting, or is presented as background material in a work on the Second World War. There are, however, several works on General "Billy" Mitchell which would make good reading for pupils. These books differ somewhat in their conclusions and this may be used to raise problems and stimulate reflective thinking on issues to be mentioned later.

Insights to be gained from the study of this chapter

1. The scientific revolution affected the attitude of soldiers toward their weapons.

Of course, there continued to be many ultra-conservative generals, especially in the infantry and cavalry, and the navy was not without its share of obscurantists. But the trend now was towards adopting new weapons and improving the old ones. Inter-service rivalries (which were absent or minor during the Great War) and the competition for funds made
it necessary for generals and admirals to understand their weapons, and to be technical spokesmen for them if they expected to get appropriations. The navy, for instance, was forced by the challenge of the air force to develop its own carrier based air arm. The friends of the battleship had to adopt radar, anti-aircraft guns, fighter protection, and new tactics in order to prove to their governments that that capital vessel was not obsolescent. The outlook on weapons in the air service was so progressive that it was visionary.

2. The doctrine of strategic bombing was crystallized by General Douhet before the means of carrying out his theories were available.

When Douhet formulated his theories in 1921, there was no means of carrying them out. The B-17 bomber was not ready for operational use until the late 1930's. The deadliest of all poison gases--nerve gas--had not yet been invented. The moral climate did not change as quickly as Douhet had anticipated, for during World War II all of the belligerents shrank from using poison gas.

3. In order to gain the status of an independent service, American airmen first demanded independent power and authority, then they had to perfect a doctrine to make independence a valid demand, and finally they had to develop an aeroplane capable of implementing the doctrine.

This was the order of development of a truly ambitious and visionary service. The air service claimed to be able to assume many of the duties of the navy and of the army by winning the next war from the air rather than on the ground. This stimulated the navy to take a progressive view of weapons development and to improve the ones it did have. In the
United States, the army was technically in control of the United States Army Air Force during the Second World War. When the air service gained its independence in 1947, the army began planning for new weapons development. This resulted, much later, in the atomic cannon, short and intermediate range missiles, anti-aeroplane missiles, and the army helicopter.

4. Independent air power could operate only against the foe's civilian population and industrial complex.

The independent air force was not designed to help armies in the field to advance (although it did practice saturation bombing on areas where there were concentrations of German tanks and other military targets). Its target had to be the enemy's civilian population centers and industrial complexes. It was committed to terror bombing by default if it failed to destroy the foe's manufacturing base, and this is precisely what happened during the Second World War.

5. Lack of full scale testing and independent evaluation resulted in very unequal development of the aerial torpedo and its airborne carrier by the major world powers.

It is no discredit to soldiers and civilians who did not believe that a lumbering torpedo plane could ever fly through a maneuvering battleship's curtain of fire and launch a torpedo which would sink it. The Japanese military planners were indeed remarkable in their foresight, diligence, and success. America was probably second to Japan in this area of development, although its torpedoes remained sadly inferior until 1943. The United States Naval Air Force was able to accumulate quickly adequate numbers of torpedo launching aeroplanes owing to careful pre-war planning and vast industrial facilities.
6. The German Navy was unprepared to fight the Second World War owing mainly to Adolf Hitler's unrealistic insistence upon Plan Z.

The German Navy went to war with twenty-two U-boats rather than with 300. Yet even those twenty-two submarines seriously disrupted British shipping.

7. British battleships kept the German fleet bottled up during the Second World War and thus vindicated themselves. This was possible because Germany did not have an effective aerial torpedo and launching aircraft and never developed one. Had the Germans followed the example of the Japanese, it is possible that they might have broken Britain's monopoly on surface sea power just as Britain later used scientific technology to counter the German U-boat menace.

8. General Douhet's theory of air power was vitiated because poison gas bombs were not used to smother enemy cities during World War II.

Terror bombing was never able to kill civilians in sufficient numbers to seriously affect morale. Indeed, the terror bombing is believed to have stiffened the determination to resist. Even the great incendiary bomb raids which generated the fire storms which incinerated Hamburg, Dresden, Tokyo, Osaka, and lesser cities never killed over 125,000 persons in any one of these cities. The use of nerve gas might have vastly increased the number killed. It is possible that enough civilians could have been massacred to have had a fatal effect on war production. But none of the belligerents had hardened its own population, as recommended by Douhet, to passive acceptance of enemy attack with
poison gas bombs and none wanted to set a precedent by being the first to use this weapon on its foe's cities.

The issues

There are several issues in this chapter which apply to the past as well as to the present. The teacher should present each issue to the class in such a manner that it poses a problem which related to the present day. The teacher should bear in mind that the more he can relate a controversial issue from the past to the present, the greater will be class interest in the issue and the better the chances of stimulating reflective thinking. The issues should be discussed, reported upon, and debated. Finally, the teacher may want each pupil to give evidence, of his reflective thinking about the issues by crystallizing his thoughts in a written report.

Issue I. To what extent should a government impose military security regulations?

The development of German armored warfare was aided by Captain de Gaulle's book The Army of the Future (France), by General J. F. C. Fuller's handbook Field Service Regulations, III (England, by J. Walter Christie's tank suspension system (America), and by the building and testing of tanks in Russia. Germany's four principal future foes all contributed to that nation's initial victories in World War II. Italy's future enemies took advantage of General Douhet's theories of independent air power. On the other hand, the British and Americans, by keeping the development of radar detection devices a secret, gained a great advantage over their opponents which permitted them to defeat the German U-boats. The Japanese
gained their initial successes in the Pacific by the use of their secret weapons—the Zero and the aerial torpedo.

The teacher should acquaint the class with the great dangers involved in security censorship and how often it tends to be misused or to cover up unfavorable information about a service’s favorite weapon (or the class could search for this information themselves). The pupils should consider if the task of censorship should be in the hands of a theoretical committee independent of any pressure or influence from the military or the Department of Defense, but in a position to obtain any and all information that it should need from them.

Issue II. Should warfare be between whole peoples or should it be limited to their armed forces?

The teacher should read *Arms and Men* in order to familiarize himself with the changing nature of warfare. Using the techniques best suited to his class, the teacher should then acquaint his charges with the trend in warfare which has occurred over the last two hundred and fifty years. This trend began with small scale battles between small professional armies—often observed by civilians out on a holiday—and culminated in the Great War which decimated millions of the belligerents’ best men.

The teacher should now review Douhet’s theory for the class, or he could have his pupils do this for themselves. It should be emphasized that Douhet’s theory was designed to prevent a war of attrition such as occurred during the First World War. Since, according to Douhet, future

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94 See Key Reading for Teachers at the end of this chapter.
wars will be between whole peoples, the people—the civilians—must be terror bombed until (1) war production is fatally affected, (2) the people force their government to stop the war. The teacher should emphasize that terror bombing will kill infants, children, and old people as well as industrial workers. The teacher might ask the class to consider the following questions: (1) How do you feel about killing millions of helpless, innocent people—or are they all potential enemies? (2) During the Second World War, many people claimed that we were not fighting the German people but the Nazis. If this were true, then should the Allies have attempted to locate and bomb the rulers? (3) Would terror-bombed civilians be in a position to make their governments sue for peace, or would their deaths slow down production?

The great disadvantages of terror-bombing should also be explained to the class; it is reciprocal, as the Germans discovered during World War II. A nation's own population must endure terror-bombing, at least until its own air force has attained air superiority (today, this would entail destroying all of the enemy's aircraft and missiles, including his missile launching submarines). There is an article by the Secretary of Defense, Robert S. McNamara entitled "Why We Are Stronger Than Russia," and it should be noted that there is nothing negative about this title. In it, he states that "A full-scale nuclear exchange between the United States and the U.S.S.R. would kill 100 million Americans during the first hour."\(^95\) It should be pointed out to the class that if Douhet's advice can be followed, and the American population can be innured to accept

\(^95\) Robert S. McNamara, "Why We Are Stronger Than Russia," The Saturday Evening Post, April 14, 1966, p. 16.
stoically such losses, then the people of the United States could win a
total war against the communists, for McNamara assures us that a full-
scale nuclear exchange would kill an even greater number of Russians than
of Americans.

After the pupils have understood the full implication of Douhet's
theory, then they are ready to think about and discuss Issue II: Should
warfare be between whole peoples or should it be limited to their armed
forces. As will be seen in later chapters, the trend is now to limit
warfare to small-scale conflicts between military forces with conventional
weapons (guerilla forces are here included as military forces).

Issue III. In implementing Douhet's theory, why have nations
shrunken from using poison gas and yet do not hesi-
tate to use incendiary bombs (to produce firestorms),
napalm, and atomic weapons?

The teacher might point out to the class that death from nerve gas
is relatively quick and painless while death from the other weapons men-
tioned above is horrible (if it is not instantaneous). Recovery from
non-fatal exposure to nerve gas is usually complete.

Selected key readings for teachers

The following scholarly books are designed to give the teacher a
sophisticated grasp of the broad aspects of military theory and develop-
ment. Two of the books deal with various aspects of civil-military
relations, one is theoretical, and one is on the specific subject of

96See the Bibliography at the end of this dissertation for com-
plete information about all books suggested for teachers and pupils.
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armor. None of the books are limited to the period between the two wars, but all deal with aspects of it.

Total War and Cold War by Harry L. Coles. This is a well-edited book of essays by various authorities. The central theme of most of the essays is political control of the armed forces from various points of view. One of them, for instance, deals with the formulation of French military policy before the Second World War which resulted in the doctrine of static defense culminating in the Maginot line. In this instance, the lack of civil-military conflict among the French high command is explored. Later, this harmonious atmosphere gave way after the German invasion, and the resulting confusion contributed to French defeat. Another penetrating essay analyzes the relations between Hitler and his generals. While only a portion of this chapter is devoted to the period between the two wars, the entire essay explains the basis of Hitler's strategy of forbidding retreat under any circumstances which was typified by the loss of the German 6th Army at Stalingrad. The book concludes with a chapter on civil-military relations in communist China.

The Command of the Air by Giulio Douhet. In this book General Douhet's analysis of the Great War is especially enlightening and astute as is his prediction of the character of future wars. As the prophet of victory through air power, his theories are particularly helpful in understanding the aims of strategic bombing during World War II and in evaluating the results. His theories are more applicable today than when his book was first published in 1921. Douhet's advocacy of terror-bombing is forthright and he advises the means of doing this effectively.
Arms and Men by Walter Millis. This book is a history of the evolution of American military policy from colonial days to 1956. It describes and explains the military problems which the United States has had to grapple with. The author explains the changing nature of warfare. There is considerable material on the broad aspects of weapons and their development. A good portion of this book deals with the development of theory and weapons during the period between the two wars. The reading of this detailed and scholarly book is almost a necessity for the teacher interested in the evolution of American military policy and weapons.

Armor by Richard M. Ogorkiewicz. This book traces the evolution of the tank and armor tactics from the Great War to the present time. It is detailed yet broad in its presentation of this subject. Armor is well illustrated and is ideally suited for the teacher who would like an authoritative work on this subject.

Suggested readings for pupils

The following books will give the teacher an idea of what is available in the period under consideration. The local librarian will probably be able to find one or more books which are not listed here. There is a paucity of books on the period between the two wars suitable for pupil reading. Many of the numerous works on the Second World War, which may be assigned to the secondary student, give some attention to the development of theory and weapons between the two wars.

The Sea Wolves by Wolfgang Frank (ba 9-12, a and ab 7-12). This is an exciting and well-written history of the German U-boat especially suitable for pupil use. It begins with a short summary of German submarine
warfare during the First World War and then describes the development of this arm during the period between the wars. There is a complete treatment of U-boat warfare during the Second World War. The book is illustrated and contains a table listing the characteristics of various types of German submarines.

The Command of the Air by Giulio Douhet (a, ba, and ab 7-12). Although this book was recommended primarily for teachers, well selected passages of this original source book can be read by secondary students with profit. The sections which advocate smothering enemy cities with poison gas would be particularly interesting to this age group. The teacher can assign the key passages which will give the student a concept of the meaning of independent air power. Many pupils will profit from learning that the ideas in a book can have an effect on the world.

The Compact History of the United States Air Force by Carroll V. Glines, Jr. (a, ba, and ab 7-12). This book is partial to the United States Air Force and contains no critical passages. It is, however, interestingly written and fairly accurate in its discussion of men and machines. The teacher would probably want to assign sections of the book to the individual pupil rather than the whole work. It is a good ready reference book.

Panzer Leader by General Heinz Guderian (ba 12, a 9-12, ab 7-12). The author describes how he formulated the theory of the Blitzkreig with Hitler and built up German armored forces. The book concentrates on tank warfare throughout the Second World War, although other aspects of that conflict are discussed. Of particular interest to secondary school pupils is the running arguments and quarrels that Guderian had with Hitler over
the subject of withdrawal of German troops to what Guderian considered
more defensible positions. He gives interesting—and witty—sketches of
the leading Nazis. Among other things, he informs the reader that
Himmler was characterized by every known feature of racial inferiority
and that Goering's habit of using fingernail polish and rouge was
attributable to a glandular disturbance. The book is very readable.

The German Generals Talk by Captain B. H. Liddell Hart (ba 11-12,
a 9-12, ab 7-12). In this book, the German generals discuss Hitler's
plans for war and later describe the sectors and fronts they were responsi-
ble for. There are interesting chapters on such topics as the plot to
assassinate Hitler, and a young general's impression of the Fuhrer.
Although the subject matter is technical, it is eminently readable.

The Death of the Battleship by Richard Hough (ba 10-12, a 9-12,
ab 7-12). This is a well written, readable, and scholarly work which
traces the development of the battleship and its enemies—the torpedo and
its launchers—from the late 19th century to 1941. The period between the
two wars is concentrated upon. Special attention is given to air power
versus sea power. The book concludes with a description of how Japanese
torpedo launching aircraft sank the Repulse and the Prince of Wales. This
book should be read in its entirety by the interested student.

The End of the Imperial Japanese Navy by Masanori Ito (ba 9-12,
a 8-12, ab 7-12). This ranks among the finest short histories of the war
in the Pacific (1941-1945). It is 228 pages in length. The book,
although written by a former Japanese naval officer, is very objective.
It is exceptionally readable and interestingly written, and contains all
information about the development and use of Japanese battleships, sub-
marines, aeroplanes, aircraft carriers, and smaller vessels. It contains
tables giving the time, place, and by what means all cruisers and capital ships were sunk during World War II in the Pacific. The reasons for Japan's loss of the naval war are analyzed. There are short, interesting sketches of men in battle. While much of the book is devoted to World War II, the first part concerns the late 1930's and the evolvement of Japan's naval plans for victory and conquest, as well as weapon developments during that period. The book is illustrated.

*Full Circle* by John E. Johnson (a, ba, and ab 7-12). This very readable book describes the history of the fighter plane from the First World War to 1964. Much emphasis is placed on the period between the two wars. It emphasizes the evolution of fighter tactics as planes improved in speed and armament. The book is illustrated and should be read by the interested pupil in its entirety.

*Tank* by Arch Whitehouse (a, ba, and ab 7-12). This book is a readable and profusely illustrated history of the mechanical development of the tank, and its tactics, from the Great War to 1960.

*Billy Mitchell: Crusader for Air Power* by Major Alfred F. Hurley (ba 12, a 10-12, and ab 8-12). This is the best available book on the life of Billy Mitchell and his fight for an independent air service. The book examines the history of the doctrine of strategic bombing and the role it plays in the world today. The book contains a great deal of material which will promote reflective thinking about air power.
# TABLE 1a

**COMPARISON OF JAPANESE, AMERICAN, AND BRITISH TORPEDOES IN 1945**

<table>
<thead>
<tr>
<th>Nation</th>
<th>Diameter (cm.)</th>
<th>Speed (knots)</th>
<th>Range (meters)</th>
<th>Explosive Charge (kilograms)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Japan</td>
<td>61</td>
<td>36</td>
<td>40,000</td>
<td>500</td>
</tr>
<tr>
<td>United States</td>
<td>53</td>
<td>32</td>
<td>8,000</td>
<td>300</td>
</tr>
<tr>
<td>Great Britain</td>
<td>53</td>
<td>30</td>
<td>10,000</td>
<td>320</td>
</tr>
</tbody>
</table>


# TABLE 2a

**JAPANESE MERCHANT SHIP LOSSES BY TONNAGE AND CAUSE**

<table>
<thead>
<tr>
<th>Description</th>
<th>Tonnage</th>
</tr>
</thead>
<tbody>
<tr>
<td>In existence on December 7, 1941</td>
<td>5,900,000</td>
</tr>
<tr>
<td>Built during World War II</td>
<td>4,100,000</td>
</tr>
<tr>
<td>Total</td>
<td>10,000,000</td>
</tr>
<tr>
<td>Sunk during the war</td>
<td>8,617,000</td>
</tr>
<tr>
<td>Heavily damaged</td>
<td>937,000</td>
</tr>
<tr>
<td>Total loss</td>
<td>9,554,000</td>
</tr>
</tbody>
</table>

**Cause of losses by percentages**

- Submarine attacks: 54.7%
- Air attacks: 30.9%
- Mines and other: 14.4%
- Total: 100.0%

TABLE 3
JAPANESE CAPITAL SHIP LOSSES BY CAUSE

<table>
<thead>
<tr>
<th>Type of Action</th>
<th>Air and Surface</th>
<th>Surface</th>
<th>Air</th>
<th>Submarine</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>Battleships</td>
<td>1</td>
<td>3</td>
<td>5</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Aircraft carriers</td>
<td>1</td>
<td>0</td>
<td>10</td>
<td>8</td>
<td>0</td>
</tr>
<tr>
<td>Heavy cruisers</td>
<td>1</td>
<td>2</td>
<td>7</td>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td>Totals</td>
<td>3</td>
<td>5</td>
<td>22</td>
<td>13</td>
<td>1</td>
</tr>
</tbody>
</table>


TABLE 4
AIRCRAFT CARRIER LOSSES BY CAUSE OF LOSS DURING WORLD WAR II

<table>
<thead>
<tr>
<th>Cause</th>
<th>U.S.A.</th>
<th>Britain</th>
<th>Japan</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carrier launched air attacks</td>
<td>6</td>
<td>1</td>
<td>11</td>
<td>18</td>
</tr>
<tr>
<td>Submarines</td>
<td>3</td>
<td>7</td>
<td>8</td>
<td>18</td>
</tr>
<tr>
<td>Carrier, air and surface attacks</td>
<td>1</td>
<td>-</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Naval gunfire</td>
<td>1</td>
<td>1</td>
<td>-</td>
<td>2</td>
</tr>
<tr>
<td>Carrier, air, and naval gunfire</td>
<td>-</td>
<td>-</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Accidental</td>
<td>-</td>
<td>1</td>
<td>-</td>
<td>1</td>
</tr>
<tr>
<td>Total</td>
<td>11</td>
<td>10</td>
<td>21</td>
<td>42</td>
</tr>
</tbody>
</table>

*"World War II," Encyclopaedia Britannica, 14th ed., Vol. I.*
German air power

By 1940, it was evident to Adolf Hitler that England was not going to sue for peace. The Führer and Hermann Göring therefore sought to force England into peace negotiations by means of air attacks which initiated the Battle of Britain. During the first year of the war, Hitler hoped for a reconciliation with Great Britain. He therefore refrained from dropping bombs on inland England. His plan was to effect a total blockade of the British Isles by means of air and sea power. The Luftwaffe would attack ports and shipping, and would drop mines in sea lanes and harbor entrances. The U-boats would torpedo ships and likewise sow mines in shipping lanes and the mouths of harbors. By July, 1940, the German Air Force had sunk 950 ships (562 by direct bombing and 388 by means of aerial mines). During this same period, the U-boats sank 314 ships. The combined air and naval offensive against England's shipping became so grave that Winston Churchill later stated that "Had the enemy continued with these raids the situation of the Battle of the Atlantic, which was anyhow critical, would have grown worse." The Luftwaffe's attacks on shipping were not decisive for three reasons: (1) attacks were made

against ships by the inefficient method of bombing rather than by aerial
torpedoes, which the Germans had failed to develop, (2) there were not
enough bombers, especially of the long-ranged type, which could seek
their victims far out at sea, and (3) the Führer became impatient with
the slow process of severing Britain's supply lines and shifted to other
types of aerial attacks. Hitler ordered the Luftwaffe's concentrated
attacks on British merchantmen stopped on July 23, 1940.

The Battle of Britain entered its second phase on July 24, 1940.
The Messerschmitt 109 fighter planes were ordered to attack and destroy
the British fighter force in the air and on the ground. This operation
was intended to be primarily a duel between pursuit planes, as Hitler
still hesitated to ruin the expected peace talks with England by bombing
their inland territory.

The Royal Air Force enjoyed the advantage of a vast, coordinated
radar system which gave them the number, location, direction, and speed
of attacking German planes. The Spitfires were thus able to engage in
aerial combat only when they had a distinct advantage over the enemy.
The Royal Air Force moved many of their airfields out of range of the
German fighters and thus prevented their planes from being destroyed on
the ground. Aircraft on forward airfields were warned by radar of the
approach of German planes and this enabled them either to disperse or to
take off and intercept the enemy. The German Me-109's were not numerous
enough, or of sufficient technical superiority over the Spitfires, to
carry out their mission of achieving command of the air over England.

On August 9, 1940, Hitler decided to achieve command of the air
over Britain by attacking the English airfields, aircraft, and motor
industries. The Luftwaffe would use one and two-engined Stuka dive-bombers, and medium bombers which all had some Stuka characteristics, such as the necessity of low level, aimed attacked rather than dropping bombs from high altitude, level flight. The Stukas carried only one or two small bombs and were designed to attack small objectives, such as tanks, on the battlefield. On the eastern front, they made many sorties each day, and thus could drop many bombs. They could fly over England only two or three times a day at most and consequently were able to drop only a few small bombs a day. When attacking a battlefield objective, the Stukas were able to reach their targets and fly back again in a very short time, thus avoiding enemy fighter planes. Over England, however, their long period of time in the air coupled with their very slow speed enabled the Hawker Hurricanes (which concentrated their attacks on bombers) to attack the Stukas for long periods of time. Their diving techniques made them very vulnerable to anti-aircraft fire.

The other German bombers were medium, twin-engined aircraft. They were relatively slow, of limited range, poorly armed and armored, and carried at most a 5,000 pound bomb load (as compared to the ten ton bombs later carried by American B-17's). The Me-109's were unable to accompany the bombers owing to that fighter's limited range. The British moved many of their air fields still farther back in order to be out of reach of the German bombers whose range was limited. Forward airfields were effectively camouflaged and the British radar system warned the air bases of approaching German planes in time for them either to disperse or to take defensive measures. The results of these German daylight operations against British air power were so poor and the losses so heavy that in
September, 1940, Hitler and Göring ordered the Luftwaffe to discontinue this phase of the Battle of Britain.

In that same month, the Luftwaffe was ordered to devote itself to attacks against industrial targets deemed vital to the British defense effort. These raids were unsuccessful because (1) there were not nearly enough bombers to do more than minor damage to British industry, (2) the bomb load of the individual bomber was too small, and (3) the German fighters were neither good enough nor numerous enough adequately to protect the bombers. The raids were abandoned because of negligible results and heavy plane losses. The Germans dropped only about 1,000 tons of bombs during several of their heaviest attacks.² (This may be compared with scores of raids later made by Allied aircraft in which 5,000 tons of bombs were dropped.) The raids against industrial targets were stopped on October 20, 1940.

On October 21, 1940, Hitler and Göring decided to put Douhet's theories into practice and to terror-bomb the English people into submission. Almost nightly terror-raids were begun. Up to 800 bombers participated in several of the raids.³ Only moderate damage was done to Coventry and to London. Instead of inducing the British people to demand that their government begin peace negotiations with Germany, the raids had the opposite effect and strengthened the British will to resist—and thirst for revenge. The terror-raids were virtually discontinued in April, 1941, owing to heavy plane losses (35 per cent of the bomber force and 25 per cent of the fighter force had been destroyed). The

²Ibid., p. 32. ³Ibid., p. 44.
planes were shot down faster than the Germans could replace them. The reasons for the failure of the Luftwaffe in the Battle of Britain and its loss of command of the air for the remainder of the war will now be examined.

Hitler's role in the Luftwaffe was more than formal. He personally supervised its strategy, tactics, and aircraft and weapon design (his supervision became more detailed and strict as the failures of the German Air Force multiplied and as Göring devoted himself less and less to his duties as head of the Luftwaffe). Hitler was directly responsible for the successes and failures of his air arm.

The Führer's initial successes with the Stukas and other bombers in the Polish and French blitzkrieg campaigns had confirmed his faith in the power of the offensive. He believed that the only way to fight a war was by relentlessly attacking the enemy, rather than by dissipating military strength on defensive operations. This is precisely what Douhet had prescribed. The idea of annihilating the enemy from the air held a great fascination for Hitler. His strategical thoughts were directed exclusively toward the offensive. General Wever, the first Luftwaffe Chief of Staff, was a devotee of Douhet and, in agreement with Hitler and Göring, stressed the bomber. Fighter planes were to play a subordinate role because they were essentially a defensive weapon. They carried no bombs, were not adapted to effective strafing, and shot down enemy fighter planes only in order to protect their own bombers.

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4 Ibid., p. 11.
The German air arm was regarded as an instrument of attack. Hitler therefore insisted that it be composed primarily of bombers. In 1940, for instance, out of 6,618 aircraft produced in the Reich, only 1,693 were fighters. In early 1940, it was believed that if, contrary to Hitler's and Göring's expectations, the English Air Force could not be destroyed on the ground, then the bombers would be forced to fly with fighter protection. This is indeed what happened. It was also thought that the short range of the Me-109's would restrict the operational range of the bombers they were protecting. This too proved to be the case, owing to technically inadequate pursuit plane.

It may be considered odd that Hitler never ordered the building of a truly superior strategic bomber such as the B-17. In 1936, General Wever had presented the Führer with many good designs for big bombers, but Hitler, not anticipating a war with England, saw no use for them. In 1940, however, it became evident that a strategic bomber might well be needed and Hitler gave his permission for some prototypes to be developed. The Weapons Development Department of the Luftwaffe finally decided upon a plane designated as the Heinkel 177. It used four engines to power two massive four-bladed propellers (one on each wing). Hitler did not believe that it would be an efficient aeroplane because of this engine arrangement, but gave his reluctant consent for its production at the insistence of Göring. His forebodings proved to be justified, for the difficulties with the He-177's engines were not corrected before 1943. When the plane was finally produced in modest numbers, it was used as a transport to supply General Paulus's encircled 6th Army at Stalingrad.

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5 Ibid., p. 12.
After this, Hitler became enthusiastic about the V-1 and the V-2 rockets and lost interest in a strategic bomber. The He-177's were converted into troop carriers.

Until 1943, Hitler depended somewhat upon Hermann Göring for advice about the design of fighter planes. After all, the Reichsmarshall had been a decorated fighter pilot during the First World War and was considered to be an expert on such matters. But Göring, and the old fighter pilots from World War I on his staff, had lost contact with the rapid development of aviation. They were convinced that maneuverability in banking was primarily the determining factor in air combat, rather than speed and rate of climb. Until 1940, they believed that the Me-109 was too fast for such fighting (in modern aerial combat, however, the tight turn was the exception rather than the rule). It was feared that the high landing and take-off speed of the Me-109 would present insolvable aviation problems. This accounted for the sluggish fighter production which reached its peak only in 1944 when the war was practically lost. Monthly fighter production was 125 in 1940, 250 in 1942, 1,000 in 1943, and finally 2,500 in 1944 when it was too late to supply them with fuel. Adolf Galland, former Chief of the Fighter Arm of the Luftwaffe, believed that Germany would have maintained control of the air if German fighter production had been high at the beginning of the war. He further states that "It was fundamental ideology of the German leadership with regard to aerial warfare which prevented the early manufacture of fighters in quantity—not technical reasons nor shortage of raw materials." The

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6Ibid., p. 10.  7Ibid.  8Ibid.  9Ibid.
failure of the Luftwaffe to attain air superiority during the Battle of Britain was owing to an insufficient quantity of fighter planes. Without command of the air, the German bombers were not able to carry out their mission with tolerable losses.

In 1941, owing to an almost incomprehensible misjudgment of the actual situation of the war, especially the air war in the West, all research into new weapons that would take longer than a year to complete was ordered halted by Hitler and many able experts were drafted into the armed forces. Later, when this research ban was lifted and work resumed, a delay of nearly two years of basic scientific research had resulted and in most fields the loss of time could not be remedied. Only the Army Weapons Research Department evaded this order and continued work on rockets. Reichmarshall Göring saw to it that the order was obeyed in the Luftwaffe's weapons research department and in related industries. As a result, the quality of the two best operational German fighters, the Me-109 and the Focke-Wulf 190 which was introduced in combat in 1943, had fallen behind that of the new Spitfires. The American Thunderbolts were superior to the German fighters at altitudes greater than 20,000 feet, the level and above at which the strategic bombers usually flew. The North American Mustang, which became numerous in 1944, was superior to the Me-109 and the FW-190 at all altitudes. Attempts to increase the armament of the Me-109 adversely affected its flight characteristics. The armament was later removed. The FW-190 was heavily armed (two 30

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caliber machine guns, and either four 20 mm. or two 30 mm. cannons). The plane operated poorly above 20,000 feet, the altitudes at which it was most needed. The German planes were always behind the Allied planes in radar detection devices, and this was a great disadvantage.

In 1942, Air Chief Marshall Sir Arthur Harris ordered a 300 bomber terror-raid on Lübeck and shortly thereafter one on the town of Rostock. These first two large-scale raids were a great shock to the German public. General Galland hoped that Hitler and Göring would now see the necessity for more and better fighter planes with which to repel such raids. Fieldmarshal Milch, Chief of Aircraft Production, had arranged plans for intensive technical research into improving German fighters and then putting them into large-scale production.\textsuperscript{11} Hitler and Göring, instead of approving Milch’s plan, ordered an immediate retaliation raid which was carried out against the English city of Exeter with insufficient strength, heavy losses, and little effect. Hitler’s and Göring’s resolve was now more bombers for retaliation and fewer fighters for defense. This resolve was adhered to until the collapse of Germany in May, 1945. When Cologne was attacked by 1,000 bombers on May 30 and 31, 1942, Hitler ordered a retaliation raid on Canterbury, again with heavy losses and little effect. It is almost unbelievable that Hitler expected such puny retaliatory raids to cause the British to cease their terror-raids on German cities.

In July, 1943, Allied bombers attacked Hamburg with 80,000 high explosive bombs, 80,000 incendiary bombs, and 5,000 phosphorous canisters. Nearly 250,000 houses were destroyed (nearly half of the city). About 40,000 people were killed, and 5,000 of these were children. One

\textsuperscript{11} Galland, \textit{op. cit.}, p. 125.
million people were bombed out or fled. The glow of the firestorm which consumed Hamburg could be seen for days from a distance of 120 miles. Rumors inflated the damage and the German people were terrified. The staff of the Luftwaffe, production managers, scientists, technicians, and other experts soon met with Göring. Everybody finally agreed that Germany had to commence immediately a vigorous program of fighter production and development to counter the Allied strategic bombers. The Reichmarshall agreed that the new program was a necessity, and he went to see the Führer in order to obtain his permission for it. Hitler flatly refused to even consider such a program. A defensive stance was out of the question. Instead, the Führer demanded a resumption of air attacks against England, but this time on a larger scale. Terror could only be smashed with counter-terror. This was the way the Führer had always dealt with his political enemies. Göring decided that he had been wrong, and supported the counter-terror raids. He ordered the Luftwaffe's strength to be concentrated on an assault formation to attack England. The ensuing raids were unsuccessful because the Allies had control of the air owing to the inferior quality and numbers of German fighter planes.

The importance of command of the air may be seen in the fact that Allied fighters soon shot down several hundred bombers which Hitler sent to repel the Normandy invasion. Allied fighter-bombers, operating under the cover of American fighter planes, prevented effective Panzer opposition to the advancing Allied armies. By destroying transportation vehicles, Allied air power paralyzed the Wehrmacht's supply system to Normandy.

12Ibid., p. 163. 13Ibid., p. 162.
In March, 1944, the Luftwaffe's fighter command received two paralyzing blows. The first blow took the form of an order by General Spaatz, commander of the 8th Army Air Force. It ordered the American fighters and fighter-bombers to abandon the bomber formations and to seek out and attack German fighters wherever they could be found. The German pursuit planes were continuously attacked on the ground from that time until the end of the war with devastating effect. The range of the North American Mustang was extensive enough to cover the Reich in search of its victims.\textsuperscript{14} The second blow that the German fighter arm received was the partial destruction of the German synthetic petroleum industry. Allied attacks had reduced the minimum allotment of aviation gasoline to the Luftwaffe from 160,000 tons to only 30,000 tons, and the bombers got much of that.\textsuperscript{15}

Göring and Hitler did not believe that the reasons for the cumulative difficulties of the Luftwaffe's fighter arm were quantitative and technical. They sought to improve its efficiency by rapid changes in command.\textsuperscript{16}

By 1943, only two weapons could have protected the Reich from heavy bomber attacks. One was perfected rockets with proximity fuses to be fired from fighter planes at attacking enemy aircraft. The other weapon was a truly superior fighter plane to fire the rockets. This plane could not be merely an improvement over existing Allied pursuit planes, but rather it had to be a completely superior aircraft. Such an aircraft existed in 1943, and could have been put into mass production by

\textsuperscript{14}Ibid., p. 206.  \textsuperscript{15}Ibid., p. 210.  \textsuperscript{16}Ibid., p. 167.
the tens of thousands. This remarkable aeroplane was the Messerschmitt 262. Its development and history are as follows. On August 27, 1939, the test pilot van Chaim flew the first jet aircraft in the world, the Heinkel 178. Only a small number of people directly concerned knew of this event. England and America did not put their first jet plane into the air for another eighteen months. Germany was clearly well ahead of the rest of the world in jet aviation.17

In January, 1942, General Adolf Galland met with Fieldmarshall Milch, the designers Messerschmitt and Heinkel, and a test pilot. The question was raised: "Should the new jet planes be fighters or bombers?" It was unanimously agreed that they should be fighters. In May, 1943, Messerschmitt, with Heinkel's assistance, had perfected his Me-262 prototypes and asked General Galland to fly one and decide if they should go into mass production. Galland was so impressed by the jet plane's performance that he immediately recognized it as the pursuit plane that would give the fighter arm of the Luftwaffe a superior aircraft. Allied strategic bombing raids were increasing in strength and number owing to the increased range and overwhelming numbers of American fighter planes escorting them.19

The Me-262 was a single-seat fighter plane with a jet engine mounted under each wing. Its flying speed of 520 mph in horizontal flight was an advance of at least 120 mph over the fastest propeller driven aircraft. Inferior diesel-like oil could be used as fuel instead of high octane gasoline, which was becoming scarce in Germany, and became progressively more so. The Me-262 was easy to service and repair.

17 Ibid., p. 252. 18 Ibid., p. 253. 19 Ibid.
In June, 1943, Göring and the staff of the Luftwaffe decided to develop the Me-262. Hitler's approval was needed, and he was invited to witness a demonstration of the plane in East Prussia. The Führer, upon learning that it was theoretically impossible for the plane to get off the ground with a one or two thousand pound bomb, immediately decided that this was the superblitz bomber that he had been waiting for. He believed that it could bomb and strafe the enemy's ground forces without being shot down by the foe's fighter planes. (The plane had been designed as a fighter and its characteristics were the very antithesis of those desirable for a bomber.)

In January, 1944, Fieldmarshal Galland was relieved as General of the Fighter Arm because of his uncompromising demand for more and better fighter planes with which to repel the Allied bombers. The bomber proponents now gained power and the Me-262 was given to the General of the Combat Fighters (bombers).

The conversion of this superior fighter plane into an inferior bomber was not completed until August, 1944. Several hundred of them were sent into action against the Allied armies in France with negligible results. Many of them were shot down by flak and Allied fighters, contrary to Hitler's expectations, because they could not attain superior speed with a heavy bomb load slowing them down. The entire bomber wing composed of Me-262's was soon destroyed on the ground by American aircraft owing to a lack of German fighter protection.

After the dismal and utter failure of the Me-262 as a fighter-bomber, Hitler finally gave his permission to form squadrons of Me-262's

\[20\text{Ibid.},\ p.\ 257.\ \ 21\text{Ibid.},\ p.\ 263.\ \ 22\text{Ibid.},\ p.\ 263.\]
to be used as fighter planes. This involved further readjustment on the production lines which required time which Germany could ill afford to squander. This effort was dissipated by a plan to mass produce a small jet fighter by the thousands, made of cheap and non-essential materials, called the Volksfighter. They were to be piloted by sixteen, seventeen, and eighteen year olds of the Hitler Youth Organization, who were to have a brief course in glider training before being sent into action. Professional fighter pilots were appalled by this scheme which was originated by Artur Axmann, head of the Hitler Youth Organization, backed by Göring, and approved by Hitler. "The Volksfighter," states Galland, "was in every respect an inferior plane to the Me-262."23

In late March, 1945, the Me-262 squadron was ready for action. The jet fighters were at first armed with four 30 mm. cannons with 240 rounds of ammunition. Later (too late, in fact), they were equipped with twenty-four rockets located beneath their wings. Several versions carried forty-eight rockets.24

Adolf Galland was put in charge of Germany's first squadron of Me-262's. During one of the first actions flown to test this aircraft in battle, six of them shot down fifteen heavy bombers which were part of a large formation. None of the Me-262's were lost in this action. Galland's squadron flew several other equally successful missions before they ran out of fuel. Many of the Me-262's were destroyed on the ground by continuously marauding Allied fighter-bombers.

Another superior aircraft which could have been mass produced in 1944 was the Arado, or Ar-234. It was a single-seat, four-engined, jet

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23 Ibid. 24 Lusar, op. cit., p. 69.
propelled fighter plane with a top speed of 670 mph and a range of nearly 700 miles. It had excellent flight characteristics, maneuverability, range, and stability. Hitler, however, demanded that the Ar-234 be converted into a bomber to carry a two-ton bomb. It was a failure as a bomber and the war was over before it could be reconverted into a fighter.  

Mass production of the Me-262 in 1943, and the Ar-234 in 1944, had been sacrificed to the idea that the bomber was the most important weapon in warfare. Douhet's idea of the constant offensive had been adhered to by Hitler without sufficient means to destroy his enemies. Bomber production without command of the air proved to be a waste of time for Germany, at least in the West. On the eastern front, however, owing to a weak Russian fighter force, the Stuka bomber proved itself to be an invaluable weapon until nearly the end of the war.

There were several other interesting developments in German weaponry which might have helped the air war had not Hitler made the wrong decisions. Germany built the first fighter plane in the world to exceed the speed of 600 mph. It was a rocket powered plane built by Messerschmitt in Augsburg in April, 1939. It was designated as the Me-163. On May 10, 1941, Adolf Galland, flying this remarkable rocket-plane, attained a speed of 601 mph. The plane soared to a height of 25,000 feet in less than three minutes (its altitude limit was 30,000 feet). The rocket plane's operational radius was about fifty miles. Production of the Me-163 was halted in 1941 for two reasons. First, it was considered defeatest, indeed almost treasonable, to speak of the need

25 Ibid., p. 216.
of air defense for the Reich (the plane, owing to its limited range, would by necessity be restricted to home defense). Second, Hitler's order concerning research stopped experimentation on the plane.

In 1944, however, Hitler clamored for their manufacture in order to protect the synthetic oil works, and several dozen were belatedly manufactured. The plane's range had been increased to about sixty-five miles, and its ceiling to 49,212 feet, which it attained in 210 seconds. In October, 1944, one Me-163 attacked a bomber formation and shot down four bombers in an action which lasted about five minutes. From January, 1945, until the end of the war, the Me-163 was used, with great success, to protect the Leuna synthetic oil works. The majority of these excellent rocket planes were captured by the Russians at the end of the war. Although a total of 364 were completed, there was only fuel enough for a few dozen of them to engage in action.

The German V-1 "buzz" bomb and the V-1 rocket are of great interest. The former was a jet propelled, gyro-piloted, horizontal flying bomb with a high-explosive load of 2,000 pounds, and an average speed of 400 mph. It was therefore relatively easy to destroy. The British destroyed 46 per cent of them before they reached their target (5 per cent by balloon barrage, 17 per cent by anti-aircraft guns, and 24 per cent by fighter planes). Approximately one fourth of the total amount of bombs dropped by the Allies on Europe were expended on the V-1 rocket sites. Production, as a result of this intensive bombing, dropped from 3,000 V-1's to 2,667 per month—an insignificant drop for the amount of bombing. In September, 1944, the launching sites were finally

26 Ibid., p. 72. 27 Ibid. 28 Galland, op. cit., p. 235.
captured by the Allied armies. Later that same month the first V-2 rockets exploded on London.

The V-2 was a gyro-piloted rocket. Its fuel consisted of hydrogen-peroxide (its source of oxygen) and alcohol fermented from potatoes. Its trajectory was a parabola through which it traveled at an average speed of about one mile per second. Its average error of misses was four miles off its aiming point, but London was a large city. There was no defense against the V-2 rockets. The Allied bombers barely curtailed its production despite heavy air attacks on the V-2 sites. The rocket was often fired from special railroad cars which were difficult for Allied planes to locate. Every V-2 in mass production, surprisingly enough, cost thousands of marks less than a torpedo and less than one-thirtieth of the price of a German twin-engined bomber. Each V-2 rocket cost about 38,000 marks to build. There was never any loss of a valuable flying crew. The V-2 rockets did not alter the course of the war owing to three factors: (1) only hundreds of thousands of them might have terror-bombed Allied cities to the point where the Allies might have been willing to come to a settlement with Hitler, (2) its aim was too poor for use against military targets, and (3) it was not produced in time owing to Hitler's order concerning research. As it was, the V-2's were worse than a waste of time because they prevented the early perfection of superior tactical rockets.


30 Ibid., p. 118.
In 1939, Dr. Werner von Braun had designed an aircraft interceptor rocket capable of rising to a height of 35,000 feet in 60 seconds. It was launched from an upright position and was guided by a small radio remote-control set which was operated by a technician on the ground. The prototypes were amazingly accurate and carried a fifty-pound flak shell. The weapon would have been ready for mass production in 1940, but it was flatly rejected by Göring on the grounds that it was defensive and hence "defeatest," and that "Our fighters will look after air defense." General Dr. Walter Dornberger, Chief of the Wehrmacht Weapons Research Department, adapted the principles of von Braun's rocket to ground warfare and perfected the Panzerfaust. It too was rejected by the Army Infantry Board on the grounds that it was defensive and hence "defeatest." (Later, it was demanded in a rush order after the Americans had demonstrated the effectiveness of the bazooka on the Tunisian front.)

It was not until October, 1943, because of Hitler's order concerning research, that the Luftwaffe developed an operationally effective aircraft launched rocket for use against enemy bombers. About 450 Allied aircraft were destroyed by these rockets. About 20,000 of these tactical rockets were produced, but only a few of them were ever delivered to the air force. (Most of them were given to the Wehrmacht to be used as artillery in imitation of the Russian's Stalin Organs which were multiple rocket launchers.) The rockets had a caliber of 55 mm. and radically arranged stabilizing fins. They achieved a speed of 750 feet per second, and could be fired a mile away from their target. Unlike the

31 Ibid., p. 118.  32 Ibid.  33 Lusar, op. cit., p. 119.
superior American rockets, they had no proximity fuse and thus had to hit their target before exploding. A well aimed salvo, however, would often hit several Allied bombers simultaneously and thus break up a bomber formation.

The Allied invasion of Europe succeeded mainly because of overwhelming air superiority. The concentration of fighter planes for the defense of the Reich against Allied bombers caused the Luftwaffe to lose command of the air over the battlefields. This was of immense help to the Allied armies (including the Red army). Hitler's bombers, in contrast to Allied bombers, remained ineffective because they were few in number and because the Germans did not have command of the air owing to a lack of enough superior fighter planes. Only the mass production of the Me-262 and the perfection of the air-launched rocket in 1943 could have regained control of the air for the Germans. Germany lost the war primarily because there was no theoretical committee to properly and correctly evaluate German weapons and the defensive and offensive needs of the Third Reich.

During the Second World War, Germany dropped 74,172 tons of bombs. This small figure may be compared to the 10,996,036 tons of bombs dropped by the Allies (1,360,000 tons within Germany's borders). German attempts at strategic bombing were a waste of materials and effort. German aircraft were so hopelessly outnumbered or outclassed that only the production of the Me-262 in mass numbers, and armed with superior,

\[34\] Ibid., p. 114.

\[35\] See Table 5 at the end of this chapter.
proximity fused rockets, could have regained German air supremacy over the Reich. Until Germany lost the command of the air, its results with tactical bombers were excellent. After the Luftwaffe's loss of air supremacy, it became almost impossible for its tactical bombers to operate in the West.

**Allied air power over Europe**

On December 20, 1941, President Roosevelt and Prime Minister Churchill, with a large staff of political and military advisers, met together for the Arcadia conference. The two heads of state laid down the fundamental principles for the combined Anglo-American conduct of the Second World War. It was mutually agreed that Germany was the major enemy. Roosevelt and Churchill were particularly anxious to avoid a long land war of attrition such as had characterized the Great War. It was therefore decided to conduct a massive air war against Germany. After that nation had been sufficiently weakened by air power, then Britain and America would launch an invasion of Europe in overwhelming strength.

In 1940, the Royal Air Force experimented briefly with daylight attacks on German industrial targets. The attacks were soon abandoned because of very heavy bomber losses and poor results. British strategic bombers were poorly armed and armored. They were more vulnerable to shell fire than were the American B-17 bombers. In 1941, twenty B-17's were sent to England with the hope that they would assist the Royal Air Force in its daylight precision raids on the Reich. There were not enough of the B-17's to fly in strong defensive formations and they were forced to fly without fighter escorts because of the Spitfire's limited range. The bombers were vigorously attacked by German fighters and flak and this
resulted in heavy losses. The British then decided to fly at 30,000 feet and above in order to be out of reach of the German fighters and flak. At this altitude, however, they were unable to hit their targets with any accuracy. The British soon abandoned daylight raids with strategic bombers and changed over to night time attacks on industrial targets.

This too had to be abandoned because it was not possible to locate the targets often enough. The results were poor even when the targets were properly located because fewer than 10 per cent of the bombs dropped fell within 1,000 yards of the target. Winston Churchill and Air Chief Marshal Sir Arthur Harris then decided to terror-bomb the Germans into submission. They felt justified in this type of warfare against civilians because the Germans had set the precedent by their indiscriminate bombing of London and other English cities. (The Allied publics were told that the central urban districts of Cologne, Hamburg, Berlin, Dresden, and later Tokyo and Osaka contained important military, industrial, and transportation targets.) The Royal Air Force mounted its first thousand bomber raid against downtown Cologne on May 30, 1942, and two nights later it struck the city of Essen with almost equal force. On three nights in late July and early August, 1943, British night bombers launched an incendiary attack on Hamburg that caused a firestorm which incinerated the city's downtown area. Nearly one-third of the city was destroyed and about 45,000 persons perished in the flames. Little damage was done to the city's military, industrial, or transportation centers.

36. The United States Strategic Bombing Survey (Summary Report) - European War (Washington, D. C., September 30, 1945), p. 3.
37. Ibid., p. 4.
38. Ibid., p. 3.
At the Yalta conference, Roosevelt and Churchill, embarrassed by the lack of success on the western front, decided to simultaneously aid the Red Army and impress Joseph Stalin by an intensified air war against eastern Germany. The virtually unbombed city of Dresden was finally selected as the target on which to demonstrate Allied air might. (Dresden contained no targets of military importance, but was a cultural city devoted to the arts, porcelain, and tourism. The city was virtually undefended and was full of refugees who had fled from the advancing Red Army.)

On the night of February 13, 1945, 773 British four-engined Lancaster bombers dropped 650,000 incendiary bombs on the city. These created a raging firestorm that could be seen for 200 miles. In the morning, 1,350 American B-17's blasted the still flaming city with high explosives while escorting P-51 Mustang fighters strafed the fleeing survivors who clogged the roads.39 The central portion of Dresden was totally destroyed. Between 110,000 and 135,000 persons were killed. Few military personnel, except Allied prisoners of war, were killed. There were several military barracks in the suburbs of Dresden, but these were untouched. The railway marshaling yards and such minor military targets as the Zeiss-Ikon lens company were not affected by the raid. The victims had no say in the German government, nor were they, in the main, valuable industrial workers.40 After the nature of the raid became known, Churchill tried to shift the blame onto Air Chief Marshall


40 Ibid., p. 262.
Sir Arthur Harris, Stalin disclaimed any part in the affair, and Roosevelt claimed that Dresden was a legitimate military target. 41

The city attacks of the Royal Air Force (including the joint Anglo-American raid on Dresden) did not substantially affect the course of German war production. 42 Although it often received a moderate setback after a terror-raid, this was mainly owing to the severing of utility and communication lines, the blocking of roads, and the absenteeism of workers looking for relatives who might have been the victims of a raid. Production usually recovered within a few weeks since German industrial plants were mostly located at the perimeter of German cities and were therefore relatively undamaged. 43 In the latter half of 1944, the Royal Air Force, discouraged with the poor results of its terror-bombing, and now able to locate its targets with some degree of accuracy by the aid of new navigational devices and airborne radar, returned with part of its force to attack industrial targets. There is little evidence that the terror-raids weakened the will of the German people to resist. Those whose will was weakened usually said nothing for fear of the Gestapo. It is certain that the will to resist of Hitler, the Nazi party, the SS, and the Gestapo was not weakened, and this was what mattered in German politics.

The United States 8th Army Air Force initiated American operations over Europe on August 17, 1942 with attacks on railway marshaling yards

41 Ibid., pp. 353 ff.
42 Strategic Bombing, op. cit., p. 3.
43 Ibid., p. 3.
in northern France. Its object was to weaken or incapacitate the German military effort by destroying selected industrial targets by means of daylight precision raids. The American Air Force's effort was weakened, however, by the transfer of most of the B-17's to the north African campaign. Air attacks by the Americans had little effect on the German war effort until July, 1943. 44 Up until that time, the German U-boat pens were the chief objects of attack, but bombs could not penetrate their twelve feet thick concrete roofs. After the summer of 1943, the Americans and British perfected an airborne radar set which allowed them to locate German U-boats cruising on the ocean surface. These submarines traveled and operated 99 per cent of the time on the surface, and usually attacked only at night and while surfaced. They were very slow under water, and their batteries were exhausted in a few hours of cruising at a speed of seven knots. The U-boats usually submerged only to evade enemy destroyers or aircraft. British tactical bombers, equipped with the new radar detection sets, would locate a U-boat at night. Guided by its radar, the plane would dive upon its prey, which could not hear the aircraft because of its own engines. At the last instant, the aircraft would switch on a powerful search-light and visually drop a large bomb on the thin-hulled U-boat. Most German submarines operated out of the French Bay of Biscayne, and it was here that most of them were destroyed. So effective was the combination of radar and tactical aircraft that the U-boats were soon forced on the defensive and by 1944, only .4 ships were sunk per U-boat lost. This dropped to .2 in 1945. By the end of the war, the Germans had perfected a submarine which used hydrogen peroxide as the

44 Ibid., p. 5.
source of oxygen for its diesel engines and thus never had to surface. This W-boat was tested in battle during the last day of the war. It proved itself capable of crippling Allied sea power had it been produced in numbers. It could completely avoid enemy aircraft because it never needed to surface, and its speed was so great that it could out-maneuver attacking destroyers. Owing to Hitler's order concerning research, however, it was not completed in time to be used in the Battle of the Atlantic.

There were a number of targets selected for destruction by the American Air Force. Three of these have been selected for discussion. In the summer of 1943, it was decided to fatally weaken the Luftwaffe by attacking the German aircraft industry. This would enable the Allies to gain command of the air over Germany. The air frame plants were considered the most vulnerable part of this industry. In the summer of 1943, the attacks commenced. In that year, 5,092 tons of bombs were dropped on fourteen plants. Production from 1,050 fighter planes in July to 560 in December. The Germans, because of these attacks, began a vigorous program of subdividing and dispersing aircraft plants and this is the main reason for the decrease in production. Poor weather also prevented the testing of fighter planes, and until such testing, they were not considered "produced."

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45 Walter boat, named after the inventor.
47 Strategic Bombing, op. cit., p. 6.
48 Ibid., p. 6.
In February, 1944, 3,636 tons of bombs were dropped on German aircraft plants in a single week. In that and succeeding weeks every known aircraft factory in Germany was repeatedly bombed. But in that year, the aircraft industry produced 39,807 aeroplanes of all types—comparing with 8,295 in 1939. Production rose even higher in March, 1944, the month after the heaviest attack, and it continued to rise until January, 1945.\(^49\) Although air frame factory buildings were destroyed, there was little damage done to the machines. Recovery was improvised almost as quickly as the factories were destroyed.\(^50\) Although the attacks on this industry did not lower production, it certainly prevented its more rapid rise.

The Germans made lavish use of ball-bearings in all of their machines. Their aircraft engines used nearly twice as many ball-bearings as those of Allied planes. It was believed that the destruction of the ball-bearing factories would be fatal to German industry and hence to the military effort. This industry was considered an ideal target because approximately half the output came from plants in the vicinity of Schweinfurt.\(^51\)

The raids began on August 17, 1943. About 12,000 tons of bombs were dropped on the Schweinfurt plants. Production was reduced to 35 percent of the pre raid level. Out of 200 attacking B-17's, 36 of them were shot down. These casualties were considered moderate. Another unescorted bomber attack was made on October 14, 1943, with 228 B-17's. They were fiercely attacked by waiting German pursuit planes and pelted by flak. The attacking force lost sixty-two planes and 138 were damaged, some

\(^{49}\) Ibid. \(^{50}\) Ibid. \(^{51}\) Ibid., p. 5.
beyond repair.\textsuperscript{52} Repeated losses of this magnitude could not be sustained for long. Deep penetrations over the Reich without fighter escorts were suspended and the bomber attacks on Schweinfurt were not renewed for four months. Like most raids of this nature, the machines and machine tools were damaged far less severely than the factory buildings. The Germans repaired and replaced their damaged machinery, dispersed their ball-bearing factories, and used their reserve stock to tide them over until this was done. Although there were further attacks, the production of ball-bearings was back to pre-raid levels by the autumn of 1944. There is no evidence that the massive attacks had any measurable effect on essential war production.\textsuperscript{53} Only about 30 per cent of the bombs hit within 1,000 feet of their intended target area (this figure was increased to 70 per cent in February, 1945).\textsuperscript{54}

Throughout the war, petroleum was difficult for the Germans to obtain and was a controlling factor in military operations. The two major sources of crude oil were the Hungarian and the Rumanian oil fields which together accounted for about a quarter of the total supply of liquid fuels in 1943. In August, 1943, Floesti, the Rumanian oil field, was attacked by B-24 bombers with little effect and heavy bomber losses.\textsuperscript{55} Petroleum shipments to Germany increased until 1944. The dropping of mines in the Danube River, however, disrupted some deliveries from Rumania. When the Russians occupied that country in August, 1944, the Germans became dependent upon their synthetic oil factories. There were thirteen major plants and several small ones which started production in

\textsuperscript{52}\textit{ibid.} \textsuperscript{53}\textit{ibid.}, p. 4. \textsuperscript{54}\textit{ibid.} \textsuperscript{55}\textit{ibid.}, p. 8.
late 1944. They were (and always had been) the only source of aviation gasoline available to the Luftwaffe.

The American bombers began attacking the synthetic oil plants in May, 1944. By July of that year, every major plant had been bombed. These plants had been producing an average of 316,000 tons a month when the attacks began. By September, the monthly production had fallen to 17,000 tons. Aviation gasoline fell from 175,000 tons in April to 5,000 tons in September. Accumulated stocks were rapidly consumed, and in six months were practically exhausted. The loss of oil soon affected the armed forces. In August, 1944, the final breaking-in time for aircraft engines was decreased from two hours to half an hour. Pilot training was drastically curtailed for lack of fuel. The movement of German Panzer divisions in the field was restricted more and more seriously as a result of losses in combat and increasing transportation difficulties. On December 16, 1944, a Panzer attack against the Allies failed when the tanks had expended their fuel, for there was no replacement. In March, 1945, the Germans massed 1,200 tanks on the Baranov bridgehead on the Vistula River to check the Russian advance. They were immobilized, however, for lack of diesel fuel and soon overrun.

The bombing raids on the synthetic oil plants also cost Germany much of its synthetic nitrogen and methanol supply. These two compounds were produced along with the oil at the synthetic fuel plants. They were essential ingredients in the manufacture of explosives. It soon became necessary to fill shells with a mixture of explosives and non-explosive

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56 Ibid. 57 Ibid. 58 Ibid., p. 9.
rock salt extender. There was a serious shortage of ammunition on all fronts at the end of the war.\textsuperscript{59} There was also a serious shortage of flak ammunition. The soldiers manning flak guns were ordered not to fire on planes unless they were attacking the installations which the guns were specifically designed to protect and not even then unless "they were sure of hitting the planes."\textsuperscript{60}

Although the output of many German industries reached a peak in the late summer of 1944 and declined thereafter, total output of the economy was well maintained through November. Tank production, despite massive attacks, rose until December. In this same month, however, there was a sharp decrease in production in most other industries which continued until the end of the war.\textsuperscript{61} Much of the industrial decline may be attributed to the loss of territory to advancing Allied armies.

In January, 1945, all but jet planes were dropped from production because of fuel shortages. By May, 1945, 1,400 Me-262 jets had been produced.\textsuperscript{62} Only a fraction of this large number ever became airborne owing to heavy losses of experienced pilots, a critical shortage of fuel, and the heavy destruction of planes in transit and on air fields.\textsuperscript{63}

The Allied air forces won control of the air over Germany by destroying in aerial combat, or on the ground, more than 57,000 German aeroplanes at a cost of 18,000 American and 22,000 British planes lost or damaged beyond repair. Strategic bombing failed until the last months of the war to lessen the Luftwaffe's strength in planes.\textsuperscript{64}

\textsuperscript{59}Ibid.  \textsuperscript{60}Ibid.  \textsuperscript{61}Ibid., p. 13.  \textsuperscript{62}Ibid., p. 7.  \textsuperscript{63}Ibid.

In the months before D-Day in Europe, the American tactical air force used its thousands of medium bombers and fighter-bombers against air fields, radar sites, locomotives, river boats, rolling stock, and gun emplacements. Their success was spectacular. Before D-Day, German access to the Normandy area by rail had been blocked as far back as the Seine River. The tactical bombers had driven German air fields back into the Reich. Attacks by tactical bombers soon began on Germany, and by late 1944, the rail transportation system had been two-fifths put out of commission. Fighter-bombers were very effective in destroying locomotives and rolling stock. They were greatly aided in this task by the development of a new weapon of great power for strafing. Early in 1944, the fighter-bombers were armed with 4.5 inch rockets which were very effective against transportation vehicles (particularly locomotives and boats) and even industrial centers. The tactical bombers were next provided with a very large High Velocity Aircraft Rocket developed for the Navy. The Thunderbolts usually carried four of these rockets. They were very effective at destroying tanks, and were the best anti-tank weapon developed during the war.\textsuperscript{65}

It may be wondered how the Germans were able to repair their industries so quickly (with the exception of the synthetic oil factories, which were extraordinarily complex, and were bombed repeatedly at a time when the contracted borders of the Reich made dispersal impracticable). Even though there was constant pressure throughout Germany for manpower for the armed forces, the industrial labor supply was never lacking.

\textsuperscript{65}\textit{Ibid.}, p. 88.
There were hordes of voluntary and conscripted laborers from western Europe. There were huge numbers of slave laborers from eastern Europe. Thus debris could be cleared, factories built, machines repaired, and plants dispersed with relatively small sacrifice of essential production.66

Despite constant massive bombing attacks on Germany after 1943, and with wars raging on three fronts, German civilian consumption remained adequate. Until 1942 it was high. The Nazi Regime continued to maintain a high standard of living. The Germans entered the period of the intense air war over the Reich well stocked with clothing and other consumer goods. Although food was strictly rationed in 1945, it remained nutritionally adequate. The German’s diet in 1945 had about the same number of calories per person as the British.67

During the war, the bombing of Germany destroyed 3,600,000 dwelling units. This was about 20 per cent of the total housing in Germany. There were 300,000 civilians killed during air raids, and 780,000 were wounded. The number of persons made homeless numbered about 7,500,000. The Reich maintained a large number of air raid shelters equipped with bunks and lavatory facilities where homeless persons could live.68 "However dissatisfied the German people may have been with the war, they lacked either the will or the means to make their government negotiate a peace settlement."69

Several conclusions may be reached about the Allied air offensive against Germany. First, the strategic bombers kept the German air force

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66 Strategic Bombing, op. cit., p. 2.
fully occupied and greatly detracted from its strength on the eastern front, thus helping the Soviets. The Luftwaffe was kept so busy fighting Allied strategic bombers that few of its aircraft were available to repel the Normandy invasion. Second, Allied tactical aircraft neutralized the U-boat menace. And third, the destruction of Germany's transportation system, and synthetic oil industry, greatly curtailed the activities of the German war machine. The attack on synthetic oil factories and transportation complimented each other because scarce oil supplies were often destroyed in transit. It should be noted that the destruction of U-boats, and of the German transportation system was mostly done by tactical aircraft (fighter-bombers and medium sized, low altitude attack bombers). The destruction of the synthetic oil plants was mostly done by strategic bombers.

American air power over the Pacific

Until late 1942, the Japanese enjoyed command of the air over the Pacific because they had superior aircraft in adequate numbers. Their early spectacular victories were owing to their superior air forces. After 1942, however, the Americans attained control of the air with their large numbers of aircraft (American fighters did not achieve technical parity with Japanese fighters until late in 1943).  

America's greatest advantage over the Japanese was radar which, after 1943, enabled our planes to locate and shoot down enemy aircraft at night, and to accurately attack Japanese ships and submarines during the hours of darkness. The Japanese were two years behind the Americans in

70 The United States Strategic Bombing Survey (Summary Report) - Pacific War (Washington, D. C., July 1, 1946), p. 12
the development of radar, and never caught up in this field.™ Radar helped American naval planes to destroy a large portion of the Japanese Air Force by late 1944. Japanese industry, suffering from the effects of strategic and tactical bombardment, was not able to make good the losses sustained.

Japan's most vulnerable point was its shipping. The Japanese had to import 70 per cent of their food, 95 per cent of their oil, and 94 per cent of their iron ore. Large percentages of most other materials were also necessary to the industrial survival of Japan. Up to the end of 1942, Japanese ship losses exceeded new acquisitions by a small margin. After this, Nippon's merchant fleet shrank rapidly because of intensified aeroplane and submarine attacks upon it. With their ability to penetrate deeply into enemy-controlled waters, submarines accounted for about 60 per cent of sinkings up until the final months of the war. At that time, aeroplanes began to sink more ships than submarines. Carrier borne planes accounted for most of the Japanese merchantmen sunk or damaged. After April, 1945, when Japanese shipping was restricted to the Korean and Manchurian runs, and to shallow inland waters, mines dropped by B-29 bombers in these waters accounted for 50 per cent of all vessels sunk or damaged (9.3 per cent of the total). Tactical aircraft sank large numbers of valuable barges and vessels smaller than 500 tons gross weight.™ In 1943, 17 per cent of army supplies shipped from Japan were sunk. This


™Strategic Bombing (Pacific War), op. cit., p. 11.
figure increased to 30 per cent in 1944, and to 50 per cent in 1945. 73
By the summer of 1945, less than 10 per cent of Japan's shipping remained
afloat. By this time, Nippon was practically without a navy. After the
Americans had captured Okinawa, oil imports into Japan were completely
cut off. Oil stocks had been exhausted, and the few remaining Japanese
war vessels were without fuel.

With 90 per cent of its merchant marine on the ocean bottom,
Japan was rapidly approaching a state of helplessness. The writers of
The United States Strategic Bombing Survey believe that if tactical air-
craft and B-29's armed with Azon guided bombs and mines had concentrated
exclusively on bridges, ferries, shipping, and transportation vehicles,
Japan would have been helpless and paralyzed by late 1945. 74

Before March 9, 1945, only 7,180 tons of bombs had been dropped
on Japan. They were aimed mostly at industrial sites. The B-29's had
bombed from approximately 30,000 feet and less than 10 per cent of the
bombs had hit their targets. Bomber losses averaged 3.6 per cent of the
attacking force. Most of the attacks were on aircraft engine factories,
and production was substantially lowered owing to dispersal, an earth-
quake, and shortages of metal imports.

By March, 1945, most of Japan's merchant and war fleet had been
destroyed and the home islands were effectively blockaded. It was
decided to simultaneously reduce Japan's ability to resist invasion and
to terror bomb the Japanese into a state in which they would accept
unconditional surrender. 75 In order to increase the effectiveness of the

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B-29 bombers in accomplishing their mission, it was decided to bomb the four principal Japanese cities at night from altitudes below 7,000 feet. Japanese weakness in night fighters and anti-aircraft guns made this method of attack feasible. All machine guns, except the one in the tail, were removed in order to increase the bomb load. The low level attack would increase the amount of bombs carried in each plane, because it took less gasoline to fly at low altitudes. Instead of flying in formation, the B-29's headed directly for the target after take-off.

Tokyo was attacked on the night of March 9, 1945, by 334 B-29 bombers which dropped 50,000 firebombs on the city. Fifteen square miles of Tokyo's most densely populated area was burned to the ground. Nearly 130,000 people were roasted to death in the conflagration which swept the city. On April 13, 327 B-29's again attacked Tokyo and burned out more than eleven square miles of the city. Heavy raids, which continued in rapid succession, culminated in two great attacks on May 24 and May 26 which destroyed another 22 miles of the city. This last attack left Tokyo so desolated that further raids were not considered worthwhile. Other raids nearly destroyed the cities of Nagoya, Osaka, and Kobe. Sixty-three lesser cities were also attacked with incendiary bombs. Over 50 per cent of forty-two cities were completely burned out.

The terror-raids were climaxed on August 6 when the first atomic bomb was dropped on Hiroshima, and on August 9 when the second one destroyed Nagasaki. Approximately 60,000 to 70,000 people were killed in Hiroshima.


_77_ Ibid., p. 156.
50,000 were injured, and 65,000 out of 90,000 buildings were destroyed. Big plants on the edge of the city were almost completely undamaged, however, and 94 per cent of the plants' workers were uninjured. These factories accounted for 74 per cent of the industrial production of Hiroshima. Two days after the attack, the railroads and utilities in the center of the city were again functioning.

In Nagasaki, about 40,000 Japanese were killed or missing, and about the same number were injured. Out of 52,000 residential buildings, 14,000 were destroyed and 5,400 were badly damaged. About 68 per cent of the Mitsubishi company's munition factory and steel works were destroyed (these plants were operating at fraction of their capacity, however, because they lacked raw materials). The effect of the atomic bomb on the confidence of the Japanese civilian population outside of the two cities was small. After the devastating raids on Tokyo and sixty-two other cities, the people were inured to such losses. It is doubtful if many Japanese understood the true nature of the raid.

Total Japanese civilian casualties during the last nine months of the war from air attack, including those from the atomic bombs, were approximately 806,000, of which about 330,000 were fatalities. These deaths and injuries exceeded Japan's combat casualties which were approximately 780,000 during the entire war. The principal cause of deaths was burns. The Strategic Bombing Survey states: "The realization that the Japanese armed forces had lost their ability to protect the people and that under the impact of direct air attack and lowered livelihood their

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78 Strategic Bombing (Pacific War), op. cit., p. 23.
79 Ibid., p. 23. 80 Ibid., p. 24.
confidence in victory and determination to continue the war were rapidly declining. There is little evidence, however, that the people of Japan had any part in causing their government to surrender, or that they stopped working as hard at their defense jobs. American aircraft were ordered not to bomb the Emperor's palace because of its cultural value.

American planes dropped 314,600 tons of bombs on Japan. This may be contrasted with the 1,360,000 which were dropped on the Third Reich.

The attacks on Japanese railways, locomotives and rolling stock, ships, barges, bridges, ferries, and vehicles disrupted the war effort immeasurably more than did the terror-raids against the cities. The stopping of oil imports paralyzed the Japanese war machine, just as lack of fuel critically affected the German war effort.

Making use of these materials in the secondary schools

The study methods to be used to familiarize secondary school pupils with airborne weapons during the Second World War will be identical to those methods suggested in Chapters V and VII. The teacher will discover that there is a prodigious amount of material on this period. Popular educational film companies, such as Coronet, list dozens of films on this era. Armed forces installations can likewise supply several dozen films—including captured enemy films—in this area. In most junior and senior high schools, the shelves fairly groan under the weight

81 Ibid., p. 20.
of books on the period covered by this chapter. They range from scholarly reading to a vast array of picture books, such as the series put out by *Life* magazine. By writing to the Superintendent of Documents, United States Public Printing Office, Washington, D. C., lists of scores of films and books suitable for secondary pupils may be obtained for a few cents. Most of the materials on these lists can be ordered from the Library of Congress, or the Smithsonian Institute in Washington, D. C. by the local school librarian. The only cost is usually postage. The materials are usually sent out the day after the order is received. Companies such as Ballentine Books, Inc., will send a free list of nearly a hundred paperback books on the Second World War. Each book is briefly reviewed in the list. Many of these books are suitable for slow learners. All are illustrated, and most are written in exciting prose style. The writer once counted thirty-one paperback war books in a Columbus school bookmobile.

Most of the books on this period—being written by men from all the belligerent nations—differ somewhat in their emphasis and in their conclusions, and this may be used to raise problems and stimulate reflective thinking on the issues of World War II.

**Insights to be gained from the study of this chapter**

1. Adolf Hitler expected a short war and this was a major factor in Germany's defeat.

   Like the German Kaiser before him, the Führer expected to bring World War II to a rapid termination. He depended upon his blitzkrieg campaigns to do this. In 1941, he gave the order that no scientific research was to be undertaken which could not guarantee concrete results.
in eighteen months. (The German high command had expected a rapid
trophy in 1914. They had not seen the necessity of stockpiling reserves
of nitrogen compounds which were a necessary ingredient of explosives.
When Germany was cut off from Chile, its sole supplier of nitrates, its
supplies dwindled rapidly. Only the fortuitous discovery of an artificial
way of making nitrogen compounds from the air enabled Germany to continue
the war after the first six months.) This order prevented the develop­
ment of a superior U-boat, adequate radar, a strategic bomber, the
proximity fuse, and the hydrogen bomb in time to play a part in the war.
Germany did not even begin full-scale war production until the middle of
1943. The Reich's ally, Japan, likewise expected a quick victory and was
not prepared for a prolonged struggle. The Allies, on the other hand,
were pessimistic and prepared for a long conflict. A vigorous early
program of scientific research gave the Allies radar, airborne rockets
with proximity fuses, the P-51 Mustang, and the atomic bomb (there were,
of course, many other contributions of basic scientific research, after
1941, to military technology).

Today, many persons predict that a thermo-nuclear war would last
only a few hours, or days at most. Because the United States can deliver
the most hydrogen bombs, a quick victory by our side is confidently
expected. In light of the long duration of World Wars I and II, and the
disappointment of those who expected a quick victory, it might be prudent
for a theoretical committee to give the war of the future some very
serious consideration and attempt to calculate its probable duration.
If America expected to fight a short war, and Russia and China a long one,
the consequences could be tragic.
2. The best targets for aircraft during World War II were transportation and fuel.

The Luftwaffe's attacks on British shipping in 1939 and 1940 seriously affected that nation's war effort. Although the Führer saw the need for an intensive and continuous U-boat campaign against English shipping, he soon lost patience with the involvement of the Luftwaffe in so tedious a process of warfare as slow strangulation of supply arteries. Instead of vigorously applying all of Germany's scientific inventiveness and industrial capacity to the development of the aerial torpedo and its carrier, he unsuccessfully sought to bomb England into submission. This was a great mistake because it halted a successful method of defeating England by destroying its commerce, and it gave the Allies a reason and an excuse to terror-bomb Germany in retaliation.

Out of all the millions of bombs (and rockets) directed against the Third Reich, only the relatively small number aimed at two targets seriously crippled the German war effort. One of these was transportation, which included railways, locomotives and rolling stock, bridges, vehicles, barges, boats, and canals. (The strategic bombers dropped aerial mines in rivers and harbors.) All kinds of army vehicles were attacked. Transportation was a relatively easy target because there was little or no anti-aircraft fire to contend with. Allied planes practically severed Rommel's supply lines across the Mediterranean by constant attacks on German shipping. This was a major factor in Allied victory in north Africa.

The other target was Germany's synthetic oil factories. Attacks on this target practically paralyzed the Luftwaffe and the Panzer divisions. The attacks on oil and transportation complimented one another.
The raids on Japan's transportation system (the largest part of this was its merchant marine) drastically reduced that nation's war production by cutting off essential imports. The importation of oil was completely halted. A continuation of the attacks on Japan's transportation would have soon immobilized its war machine.

Pupils might be asked if the United States has discovered Russia's and China's most vulnerable target, and the best means of destroying that target. Warfare demands patience if lives are to be spared. When the American Civil War began in 1861, it would have been possible for the Union, by taking a defensive stance behind fortified lines, to have soon effected a total blockade of the Confederacy. In ten years, it is likely that the Union could have forced the South into submission without the necessity of costly land battles. The same was the case with Japan. The American government intended to invade the home islands even though it was estimated that this would cost us hundreds of thousands of casualties. (A combination of Japan's desperate lack of imports and the atomic bomb made this invasion unnecessary.) It should have been apparent that continued attacks against Japan's merchant fleet would have sunk all its ships, and it was a well-known fact that Japan could not survive without imports. It could not raise nearly enough food to feed itself.

The teacher should ask the pupils "What was the hurry?" in the Civil War and in the war with Japan. The class might speculate if, in the Vietnamese war, escalation or patient and persistent striking at one or two selected targets would be the best solution to that conflict.
3. Failure to gain command of the air was a major factor in Germany's defeat.

The Messerschmitt 109 was developed and produced slowly because Göring did not understand the principles of modern aerial combat. When the Battle of Britain began, Germany did not have enough fighter planes to achieve air supremacy. After 1940, Hitler was mainly responsible for the failure of the Luftwaffe. The Führer took Douhet at his word and did not intend to dissipate Germany's strength on defensive warfare. Hitler was interested only in bombers with which he hoped to achieve great successes. When the British staged their first terror-raids on the Reich, Hitler demanded vengeance rather than protection. What he never seemed to understand was that his bombers could not effectively carry out their mission without command of the air. It should have been evident to the Führer that if the massive Allied raids on Germany were defeating that nation, nor causing its population to demand negotiations, then it was unlikely that the Luftwaffe's feeble retaliation attacks would affect England's conduct of the war. The German lack of air superiority allowed not only continuous strategic and tactical raids on Germany, but made possible the Normandy invasion. Despite all this, Hitler refused to build up the Luftwaffe's fighter arm (with the exception of the hare-brained scheme to mass produce the Volksfighter to be piloted by teenagers).

The teacher should ask his charges how such an arbitrary misjudgment of weapons can be prevented by the United States. Would a theoretical committee be the best means of doing this?
4. In order to have effectively attacked the enemy with bombs, the Luftwaffe needed either a superior bomber or fighter.

Germany never developed a superior strategic bomber. When the need for a strategic bomber became evident, Hitler lost interest in such an aircraft and dissipated Germany's war effort on the ineffective V-1 and V-2 rockets. This effort at big rockets prevented the Luftwaffe from receiving much needed tactical rockets until it was too late. Even then, the German tactical rockets were inferior to the Allied air borne rockets because they lacked a proximity fuse (which caused the rocket to explode in the proximity of its target if it failed to make a direct hit).

The German Stukas and medium sized bombers might have had greater effect if they could have operated in air space commanded by the fighters. But the Germans did not have command of the air, and as a consequence, their bombers sustained such heavy losses that they operated with little effect, except on the eastern front where they met with little air opposition from the Soviets.

By 1944, the German fighters were no longer able to protect the Reich, and the situation was becoming worse daily. At this time, the Me-262 could have been put into mass production. This would have given the Germans command of the air space over Germany again. With the proper development of superior airborne rockets, the Reich might have been able to control the air all over Europe. Hitler apparently did not understand the situation and ordered the Me-262 converted into a blitz-bomber. As such, it was an utter failure, partly because of its poor flight characteristics as a bomber, and partly because Allied fighter planes, which controlled the air, could bomb and strafe the Me-262's on the ground whenever they could find them.
During World War II, American fighter planes had also been designed as fighter-bombers. Although they were better than their opponents above 20,000 feet, all of them were poor at aerial in-fighting. They had to depend on their diving and climbing speed. If the enemy maneuvered, they could not follow, but had to regain attitude and attempt another diving attack.

Today, the United States is developing a plane which is called the TFX. An attempt is being made to equip it with a variable-sweep wing, and other components, which will allow it to be either an interceptor, a fighter-bomber, or a medium-range nuclear strategic bomber. It is also designed to operate from aircraft carriers as well as from airfields. It seems dubious that an aeroplane could give superior performance in three such different capacities. Students might consider if the United States is making the same mistake that Hitler made with the Me-262.

5. England was determined not to be drawn into another war of attrition, and in this it was successful.

England (and the United States) agreed to weaken Germany to such an extent through air power that Allied ground forces would be able to defeat the enemy quickly and without terrible casualties. This is exactly what happened. Of course, Germany was worn down by the Red Army, but the Reich probably could have prevented the Allied invasion and held off the Soviets if it had had air supremacy. American strategic bombers and their fighter escorts shot down thousands of German interceptors. Our command of the air prevented a war of attrition by allowing a fairly rapid advance of the Allied armies. How utterly dependent the American
Army was on air power is demonstrated by their setbacks during the Battle of the Bulge, a period of prolonged inclement weather which prevented our planes from flying. The situation had become desperate by the time the weather cleared. American tanks were no match for German tanks and were dependent upon our fighter-bombers to destroy their opponents.

6. The B-17's needed air superiority in order to effectively bomb the Reich.

At first it was believed that the protective armament of the B-17's would allow them to achieve air superiority over any attacking fighters. When the Schweinfurt raids proved this idea to be erroneous, the bombers had to wait for a long-ranged fighter plane before they were able to risk deep penetration into Germany again. They were able to operate so effectively over the Reich because of their fighter escorts.

7. The British, failing in their bombing offensive against industrial targets, resorted to terror bombing. The Americans also took this course of action against Japan.

The British attempted daylight attacks against German industrial targets, but they lost so many bombers that they had to terminate the operation. They next attempted night time raids on industrial targets, but often failed to locate their objectives. Their aim was appallingly bad. The Royal Air Force therefore resorted to terror-bombing. Their target was the center of German cities. In 1944, the American bombers were unable properly to destroy Japanese industrial targets, and they too resorted to terror tactics. The victims of terror raids, however, were mostly elderly men, women and children, refugees, and clerical workers. Few soldiers were stationed in the cities and most industrial workers
lived near their factories on the outskirts because of the difficulty of commuting in wartime Germany. The victims of fire storms were not in a position to make their governments negotiate. The Gestapo and the Japanese Political Police discouraged defeatist talk and worker absenteeism. Terror bombing should have been directed at Germany's and Japan's leaders, police stations, and military barracks. As it was, these raids were a waste of money, time, lives, and effort. The war with Germany would have ended sooner if the effort expended upon terror-bombing had been directed against transportation and fuel producing targets.

If cities are terror-bombed by hydrogen bombs in World War III, it is very likely that the leaders will die. The class may speculate if this is one of the reasons why governments are so anxious to avoid war today.

The issues

After carefully thinking about the insights into World War II, and exploring some of their own, the pupils will now be ready to consider the issues which apply to the past as well as to the present. The teacher should present each issue to the class in such a manner that it poses a problem, or puzzlement, which related to the present day. The more that the teacher can connect the problems of the past to the present and the future, and present them as something which affects each student personally, the greater will be the chances of stimulating critical thinking. The issues should be discussed, debated, and reported upon. Finally, the teacher may want each pupil to give evidence of critical thinking by crystallizing his thoughts in a written report.
Issue I. What was the difference between World Wars I and II in terms of civil-military relations?

During the First World War, the military ran the war. They were, generally speaking, extremely conservative about adopting new weapons and tactics. Civilian leaders, on the other hand, were usually progressive in their military thinking and helped win the war in the Allied countries with the introduction (generally against the opposition of their high command) of the convoy system and the tank. Germany, under military rule, did not benefit from civilian inventiveness, and this was a major factor in that nation's defeat.

During World War II, the civilians were fully in control of the Allied nations. In England and the United States, military men sought the aid of scientists for the improvement of old weapons and the introduction of new ones. Seldom have soldiers, civilian leaders, and scientists worked in such harmony for the advancement of weaponry. In the Soviet Union, Stalin was firmly in control of his military. During the early stages of the war, many writers are of the opinion that Stalin's meddling disrupted the war effort. His ideas on weapons, however, were progressive and he was responsible for the development of the series of Stalin tanks, and the Stalin organ, a device which fired multiple salvos of rockets. These new devices were welcomed by the Red Army, which proved very adept at using them.

In Germany, the military leaders, such as Fieldmarshal Adolf Galland, and Admiral Karl Doenitz (who wanted ultra-modern U-boats) continually clamored for modern weapons and tactics. They correctly judged the true nature of Germany's needs in the air and at sea. They were constantly rebuffed by Hitler (and Göring). General Dr. Walter
Dornberger, head of German research for rocketry, attempted to use the full resources of his department for the research and development of tactical rockets. His progressive ideas were rejected by Göring.

During World War I, the military in Germany hindered the research and development of new weapons and tactics. During the Second World War, the situation had completely reversed itself.

The pupil may speculate if the trend today is toward civil-military harmony in the development of new weapons, or if professional military men and civilians are diverging in their ideas about weapons. The teacher should ask his class if a theoretical committee could prevent America from making gross miscalculations in its weapon systems and tactics, or if they can think of some alternative to a theoretical committee. He should ask them if military men should be included on this committee, and why.

Issue II. How does a civilian government keep a firm control over its armed forces?

The solution to this issue is relatively simple, it promotes inter-service rivalry, or else it creates a rival organization to its armed forces. During the Great War, the services made it a point of honor not to meddle in each other's affairs, or to criticize one another. All this changed after that war with the rise of a new service (the air force) and in the ensuing competition for scarce appropriations. Inter-service rivalry raged between the two wars. By the time of the outbreak of the Second World War, the Allied civilian governments were firmly in control of their armed forces.
In the Soviet Union, the principal military force was the Red Army. The secret police (MVD) and the Communist party were the counter-balances to the Army. Stalin took advantage of the power of the MVD and the Communist party (both of which he controlled) in order to gain firm control over the Red Army by three methods: (1) in the 1930's, he executed, imprisoned, or dismissed the majority of the high command, (2) Stalin put political commissars (members of the MVD and Communist party) into every unit and command level of the Red Army to watch the regular officers and shoot, imprison, or dismiss them if it were deemed necessary, and (3) used the threat of revenge against officers' families by the MVD.

Hitler's task of subduing the Wehrmacht was more difficult. In Germany, the Army and Navy had never been rivals, nor had they ever engaged in criticism of one another. The German General Staff was a powerful organization owing to the prominent aristocratic or social position of so many of its members. Hitler opposed the Wehrmacht with two organizations. These were the Luftwaffe and the schutzstaffel (more commonly referred to as the SS). The former was headed by the loyal party politician Hermann Göring. It was given control of all anti-aircraft guns. These were powerful, rapid firing weapons which could easily stop an army regiment. The Luftwaffe also had its own ground combat divisions. In case of an army revolt, the Luftwaffe could oppose the army with aeroplanes, anti-aircraft guns, and ground troops. It would be assisted by the SS which Hitler had loyal party member Heinrich Himmler organize in the 1930's. It consisted of the Gestapo (political crimes), the SD (security police and personnel in charge of concentration camps), and the Waffen SS. The later organization was composed of combat
military divisions, especially SS Panzer divisions. The Waffen SS usually had first priority on new tanks and other good equipment. It was distinguished by its intense devotion to the Nazi ideology. The Waffen SS contained a large number of Nazi party members. Its divisions were filled with tough, well disciplined, efficient soldiers. It could easily crush a limited Wehrmacht revolt with the assistance of the Luftwaffe. In the end, Hitler succeeded in shooting, imprisoning, dismissing, or disgracing most of the old German General Staff members.

In the United States, inter-service rivalry has always promoted civilian control of the armed forces. It has also sparked real competition in the development of newer and better weapons. The armed forces present no united front. Each fears an increase in the other's power.

The teacher should now inform his class about one of the proposed plans for complete unification of the armed forces under one command and uniform. He should then ask his pupils two significant questions: (1) would unification affect weapons development? and (2) would unification affect civilian control of the military? The pupils should be asked to elaborate upon their answers.

Issue III. How can an industrially inferior nation win a war?

During World Wars I and II, no industrially inferior belligerent achieved final victory. But the defeat of Germany and Japan teaches one vital lesson: a lesser nation must be technically superior to its opponent, and must maintain that lead. Although the combined might of England and the United States was greatly superior to Germany's in industrial power and in manpower, the two former nations were determined to avoid a land war of attrition, such as had happened in World War I.
intended to weaken Germany by any and all technical means available. They put their scientists to work on weapons and detection devices. Allied scientists, unlike many of those in Germany, received rewards and encouragement rather than threats and arrests.

It is almost certain that if Germany had pursued a vigorous policy of scientific research and development before and after embarking upon the field of Mars, and had made the right decisions about weapons, it would have won the war in Europe. The United States was only about eighteen months ahead of the Germans in atomic energy development. The Germans were attempting to by-pass the atomic bomb and develop a hydrogen bomb. They had nearly perfected an intercontinental ballistic missile capable of hitting the United States with a hydrogen bomb when the war ended (the bomb was still a very long way from perfection because Germany's heavy water supply had been destroyed). The Soviet Union, industrially and demographically inferior to the alliance of N.A.T.O. nations, has pursued a vigorous course of scientific development. Russian rocketry is thus far ahead of the United States. They have exploded an eighty-megaton hydrogen bomb, a feat that the United States has not attempted to imitate. Indications are that until recently Soviet rockets were the only ones powerful enough to carry such a bomb. In recent years, however, America has begun to achieve technical parity with its opponent. Our rockets are claimed by the Department of Defense to be sufficiently numerous and accurate to reduce the Soviet's cities to ashes.

Industrially inferior nations usually engage the foe in guerrilla warfare which has shown its effectiveness in Algeria, Africa, and Vietnam. The United States does not show to advantage on terrain where it cannot make proper use of its superior weapons. Pupils should consider whether
the United States should either improve its jungle fighting techniques, or else refrain from commitments to defend poor terrain.

Issue IV. Does terror-bombing win wars?

The futile attempts at victory by means of terror-bombing, first by Italy, Japan (in China), and Germany, and then by the Allies show that it had little effect upon the course of the war. The heavy terror-bombing of North Korea appeared to have done little towards ending that conflict. Finally, the terror-bombing (by napalm and phosphorus bombs) of Viet Cong villages in south Vietnam has not deterred the rebels.

It is now believed by many that hydrogen bombs have made terror-bombing a feasible method of winning wars. Much of this may depend upon the likelihood of the leaders and generals being incinerated. (It might be noted that most German generals and Nazi party leaders did not obey their own orders to the German soldiers and people to fight to the death. Neither did the Japanese leaders.)

The teacher should ask the class four questions: (1) how could the destruction of a nation's cities win a war if its armed forces survived? (2) if a nation's military might were destroyed, would it be superfluous to destroy its cities instead of capturing them with an unopposed army? (3) in a hate-filled struggle between opposing ideologies, would the surviving military forces fight on until they had exhausted their supplies and ammunition? and (4) could a nation afford to take a chance on expending all of its missiles on the foe's population and armed forces and then finding itself faced with the invading remnants of the enemy's army, and perhaps the army of a former friendly or neutral nation?
The lessons of World War II, the Korean conflict, and the guerrilla war in Vietnam indicate that terror-bombing does not win wars. It would seem logical to suppose that if America destroyed Russia's cities, but missed some of its armed forces, the war would not be won. If the United States annihilated the Soviet Union's military power, it would be pointless to destroy that nation's cities (unless retaliation and revenge are deemed to be worthy goals). This is not meant to dispute the present value of the threat of destruction to Soviet cities.

Issue V. Are atomic weapons worse than other kinds of weapons?

If possible, the teacher should acquaint the class with the horrors experienced during the fire-storms which consumed Hamburg, Dresden, Tokyo, and Osaka. Pupils should also be acquainted with the effects of flame-throwers, napalm, and phosphorus on living tissue. The teacher should then ask his charges if, as many writers claim, the attacks on Hiroshima and Nagasaki were immoral. How did they differ in their effects from some of the incendiary attacks on other cities which roasted to death more people per city? The class should also be informed that there is no greater hereditary aberrations in Hiroshima and Nagasaki than in any other Japanese city. According to the prominent radiologist Dr. Harold Pettit, sufficient radiation from an atomic explosion to affect a person's genes would make him too sick to reproduce. If he recovered, so would his genes.

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82 The bombing of suspected enemy villages. Some attempt is made to spare innocents, however.

83 Dr. Pettit told this to me in June, 1964.
Selected books for teachers

The five books listed below are intended to give the teacher a working knowledge of air power during the Second World War. They give a fairly comprehensive coverage of the air war from the German, Japanese, and American viewpoints. The teacher will find them very interesting reading. Three other books are recommended for the interested teacher. One gives a minute description of Germany's war with Russia. The second book describes Germany's war at sea and the part radar played in the defeat of its navy. The third work concerns itself with the development of German weapons (especially experimental "wonder weapons" during the war).

V-2 by Walter Dornberger. General Dr. Walter Dornberger was the scientist who was in charge of the development of German rocketry from 1929 to 1945. He gives a detailed account of the technical development of the V-1 and V-2 rockets and the civil-military conflicts which plagued their development. The author appraises the large rockets and comments on their effectiveness towards the German war effort. The book is translated into good English prose and is very interesting reading. It is an illustrated paperback and readily available from Ballantine Books.

The First and the Last by Adolf Galland. Germany's former commander of fighter forces presents the detailed history of the German fighter arm and its struggle first for air supremacy and then for its very existence. The book is written in narrative form with descriptions of Galland's many personal adventures in air battles. The author dwells at length upon the civil-military conflicts that plagued the fighter arm and which were mainly responsible for its failure. The book is
translated into good English prose. It is readily available as an illustrated Ballantine paperback book.

The Destruction of Dresden by David Irving. This is a scholarly and detailed account of the political events which led to the massive incendiary raid on Dresden and the ensuing fire-storm which destroyed the city. There are vivid descriptions of the fire-storm itself and its effects upon the city and its inhabitants. The last part of the book is devoted to the civil-military conflicts which took place after the incineration of the city. This book is essential for the teacher who wishes to understand the nature of terror-bombing. The book is well written and is readily available in an illustrated paperback from Ballantine Books.

Zero by Masatake Okumiya and Jiro Horikoshi. The former author was the commander in most of the air-sea battles in the Pacific, and the latter was Japan's leading aeronautical engineer and designer of the Zero fighter. Throughout the book, there are many eye-witness accounts of battles and terror raids by B-29 bombers. The book emphasizes how the quantitative inferiority of the Japanese Air Force and its lack of radar resulted in Japan's defeat. The civil-military conflicts which prevented a superior Japanese fighter plane from being produced in sufficient quantities in time to affect the course of the war is presented in detail. The book comes in a Ballantine paperback and is well illustrated with maps, tables and pictures.

The United States Strategic Bombing Survey (Summary Reports). This report comes in twenty-eight volumes which are indexed by subject matter in an index volume. Fortunately, there are two slender volumes
entitled "Summary Report." One is on the European war and the other is on the Pacific war. These reports are the teacher's best source on the effects of bombing.

There are three more books which should be of interest to the teacher, although they do not pertain to the air war over Europe and Japan. They are reviewed as follows.

**U-Boats at War** by Harold Busch. This book is mainly concerned with tracing the failure of Germany to develop a superior U-boat, and the civil-military conflicts behind this failure. The book presents detailed technical information about various types of U-boats including the superior submarines which Germany completed just before the war ended. The book is very readable and is published as a Ballantine paperback complete with illustrations and tables.

**Barbarossa: The Russian-German Conflict 1941-45** by Alan Clark. This is the most scholarly and detailed account of the war on the eastern front. Although the style is very technical, it is enlivened by accounts of savagery committed by both sides. The author discusses the civil-military relations between Hitler and his generals, and between Stalin and the Red Army. Alan Clark believes that Hitler was right and his Wehrmacht generals wrong most of the time. The book is a Signet paperback and is furnished with pictures, maps, and tables.

**German Secret Weapons of the Second World War** by Rudolf Lusar. This is a detailed and very technical account of the development of weapons by the Germans. It is primarily concerned with the experimental "wonder weapons" with which Hitler hoped to reverse the course of the war. The book contains numerous illustrations, tables, and charts.
The teacher may wish to assign the books listed above, or portions of them, to his pupils. They are best suited for able learners, or average pupils in their junior and senior years.

Books for pupils

Dozens of illustrated paperback war books are published by Ballantine Books. The company will send upon request a free list of all their war books. The teacher should write to Dept. CS, Ballantine Books, 101 Fifth Avenue, New York 3, New York. Cost varies from fifty to seventy-five cents a book. Each book is reviewed in the company's list. Because this list is so adequate, it will not be duplicated at length here. Only a few sample books will be briefly reviewed.

**The Thousand Plane Raid** by Ralph Barker (ba 9-12, a and av 7-12). This book tells the story of the first massive terror-raid by 1,000 British bombers against the city of Cologne. It is written in a conversational style. The book is illustrated.

**Torpedo Bomber!** by Ralph Barker (ba 9-12, a and av 7-12). The author narrates the story of the daring Royal Air Force pilots who flew low-level attacks against German battleships in World War II. The book is illustrated.

**Defeat at Sea** by C. D. Bekker (ba 10-12, a 8-12, ab 7-12). This book narrates the history of the German Navy from 1939 to its defeat in 1945. The book is technical but interesting reading.

**Black Thursday** by Martin Caidin (ba 9-12, a and ab 7-12). This is the history of the Schweinfurt raid. It is an illustrated paperback full of drama, conversation, and excitement. The book is accurate and informative.
A Torch to the Enemy by Martin Caidin (ba, a, and av 7-12). This is the story of the great terror-raid on Tokyo. It is written in an exciting narrative form which will especially appeal to slow readers. The book is accurate and is well illustrated.

Sink the Bismarck by C. S. Forester (ba, a, and av 7-12). This is the story of the last nine days of the German battleship Bismarck. The book is written in an easy-to-read conversational style which is especially suitable for slow learners.

The Fatal Decisions, edited by Seymour Freiden and William Richardson (ab 12). This book presents the inside stories of the six great European battles of World War II as written by the German generals who lost them.

The German Raider Atlantis by Wolfgang Frank and Captain Bernhard Rogge (ba, a, and ab 7-12). This is the very readable account of Germany's most successful merchant raider (a merchant ship armed for destroying enemy merchantmen) as told by its captain. This book is especially suitable for slow learners.

The Sea Wolves by Wolfgang Frank (ba 11-12, a 9-12, and av 7-12). This is a factual history of the German U-boats during World War II. It is illustrated and contains charts and tables.

The Rise and Fall of Hermann Goering by Willi Frischauer (ba 9-12, a and av 7-12). This is an interestingly presented biography of the Nazi party leader who was in command of the Luftwaffe. No sordid detail of Goering's life is overlooked. There is nothing objectionable in the book, however. It is accurate, well written, and should appeal to boys.
Commando Extraordinary by Charles Foley (ba, a and ab 7-12). This is the exciting wartime biography about Otto Skorzeny, Germany's most ferocious commando. (He was the man who rescued Mussolini from Gran Sasso castle.) The book is a good one for slow readers.

Japanese Destroyer Captain by Captain Temeichi Hara (ba, a, and av 7-12). Captain Hara narrates his experiences during World War II and gives his reasons for Japan's defeat. The book is well written and informative.

Kamikaze by Yasuo Kuwahara (ba, a, and av 7-12). This is a Japanese pilot's own story of the suicide squadrons which were supposed to stave off Japan's defeat. It is told in narrative form and is especially suitable for slow readers.

Stalingrad by Theodor Plievier (ba 9-12, av and ab 7-12). This is the history, partly in conversational form, of the defeat of the German 6th Army at Stalingrad. It is interesting reading for pupils who are very interested in military subjects.

The Life and Death of a Japanese General by John Deane Potter (ba, a, and ab 7-12). This book is a startling profile of the military genius Tomoyuki Yamashita who was hanged as a war criminal. The book is illustrated, exciting, and written in an easy-to-read style. It is recommended for slow readers.

Stuka Pilot by Hans Ulrich Rudel (ba 9-12, a and ab 7-12). Germany's leading Stuka pilot tells his own story. He destroyed 500 Russian tanks. The book is very interesting and is illustrated.

Hitler's Secret Service by General Walter Schellenberg (ba, a, and av 7-12). This book is narrated by the ex-chief of the German
intelligence service. It is an interesting account of espionage and sabotage. It is interestingly written.

*U-Boat 977* by Heinz Schaeffer (ba, a, and av 7-12). This is a German U-boat commander's personal account of the Battle of the Atlantic. It is especially recommended for slow readers.

*Defeat in the East* by Juergen Thorwald (ba 10-12, a 9-12, av 8-12). This is a history of German defeat in the East from January to May, 1945. The book is informative and interestingly written.

*The Last Days of Hitler* by H. R. Trevor-Roper (av 11-12). This is a very scholarly, and often witty account, of the final days of the Third Reich. The book gives a detailed history of Hitler's last days in the Führer bunker under Berlin. Other Nazi leaders are dealt with.

*Kaiten* by Yutaka Yokota (ba 9-12, a and av 7-12). This book is narrated by a former petty officer in the Japanese Navy who was trained to be a suicide torpedo pilot, but was never sent on a mission. The book gives an interesting account of the suicide torpedos (kaitens) and the men who volunteered to pilot them.

*Rommel the Desert Fox* by Desmond Young (ba 9-12, a and av 7-12). This is an exciting account of the leader of Germany's Afrika Korps. The book is written in good prose style.

*The Road to Stalingrad* by Benno Zieser (ba, a, and av 7-12). A survivor of the battle of Stalingrad narrates his experiences. The book is full of blood and thunder and is written in an easy-to-read style. It is especially suited to slow readers.
TABLE 5

NUMBER OF FIGHTERS AND BOMBERS PRODUCED BY THE UNITED STATES, GREAT BRITAIN, AND GERMANY DURING WORLD WAR II

<table>
<thead>
<tr>
<th></th>
<th>Fighters</th>
<th>Bombers</th>
</tr>
</thead>
<tbody>
<tr>
<td>United States</td>
<td>99,742</td>
<td>33,743</td>
</tr>
<tr>
<td>Great Britain</td>
<td>37,000</td>
<td>26,391</td>
</tr>
<tr>
<td>Allied Total</td>
<td>136,742</td>
<td>60,134</td>
</tr>
<tr>
<td>Germany</td>
<td>53,729</td>
<td>18,635(^b)</td>
</tr>
</tbody>
</table>


\(^b\)Germany also produced 12,359 fighter-bombers, about half the number produced by the Allies.
CHAPTER IX

AIR POWER SINCE WORLD WAR II

The bomber after 1945

After the Second World War, the size of America's armed forces was drastically reduced. By 1946, however, the United States faced the prospect of armed conflict with the Soviet Union. Rather than engage in a land war with the Red army, the Truman administration decided to take advantage of its monopoly on atomic bombs and a superior air force. If Russia provoked war, then American bombers would destroy Soviet cities by atomic terror-bombing. Other vital targets would likewise be vaporized. This strategy, under the Eisenhower administration, became known as the doctrine of massive retaliation. The air force was made responsible for carrying out this strategy with its bombers.

The heavy bomber had been the great weapon of the United States since the beginning of the Second World War. After that conflict, America's deterrent power was built successively around the B-50, the B-36, the B-47 (which was the first all-jet bomber), and then the heavy, long-ranged B-52 bomber (which is the aging mainstay of the Strategic Air Command), ¹ and the smaller supersonic B-58. ² The B-52 bomber became

¹Hereafter referred to as "SAC."


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a part of SAC in June, 1955. In its twelve year history, over 600 of these large aeroplanes were delivered to SAC.

The B-52 bomber has eight jet engines under its wings and flies at 600 to 700 mph at 50,000 feet. It is capable of greater altitudes. The B-52H bomber, a slight modification of the B-52, became operational in 1961. It carries two jet-propelled Hound Dog air-to-ground nuclear tipped missiles. One is located under each wing of the bomber. This supersonic missile is intended to destroy anti-aircraft emplacements in the path of the B-52 as it approaches its target. The Hound Dog has a range of about 600 miles. The B-52H also carries two Quail decoy missiles which are designed to confuse enemy radar defenses with their electronic counter-measure equipment. The air force has not revealed the effects which a load of two Hound Dog and two Quail missiles have upon the flight characteristics of the B-52H bomber. In addition to this bulky load of defensive missiles, the big bomber also carries its full compliment of bombs in the bomb bay.

In 1960, the B-58 Hustler bomber was delivered to the air force. This bomber is capable of speeds of 2,000 mph and can fly at altitudes above 60,000 feet. Because of its limited range, it needs mid-air refueling in order to strike Russia. Its bomb load is limited.

On December 8, 1965, Secretary of Defense Robert McNamara announced that the older models of the B-52's and all the B-58 aircraft would be phased out of service. The older B-52's would be retired over a period

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3 The reader is referred to look under "Air Force" in the Encyclopaedia Britannica for pictures and descriptions of these various bombers.

of five years, and the B-58's in 1971. This will leave about 240 B-52's in operation at the end of 1967.

By 1960, the vulnerability of SAC bombers to a Soviet missile attack became a matter of vital concern. In order to counter this danger, SAC began to keep a portion of its bombers in the air at all times and one-half of them on a fifteen minute ground alert. The bombers still remained highly vulnerable to a sudden massive attack as did the command control system on which the entire force depended for its launching and direction. The effectiveness of SAC's retaliation against the enemy depended on whether its commander received adequate, reliable, and timely warning of approaching nuclear-tipped rockets.

As Soviet air defenses (interceptor planes and anti-aircraft missiles directed by a large radar network) were increasingly perfected, the ability of the manned bomber to accomplish its mission effectively came into question. The rapid development of both anti-aircraft missiles and of intercontinental ballistic missiles caused many people to begin to believe that the manned bomber was obsolescent. President Kennedy and Secretary of Defense McNamara favored phasing out the bombers. Air Force generals Thomas S. Power (former commander of SAC), Curtis LeMay (a member of the Joint Chiefs of Staff until 1964), and Nathan Twining (former Chairman of the Joint Chiefs of Staff) have vehemently championed the manned bomber. Their reasons for this position will now be examined.

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6 Ibid.
7 Referred to hereafter as ICBM.
The arguments for the retention of the strategic manned bomber (in addition to the air force's ICBM's) are set forth by General Power in his book Design for Survival. They are as follows. First, he argues that when an enemy attack is suspected, at least one third of SAC's bombers can be launched in addition to those already in the air. If the "attack" should prove to be a mistake, or if the war should be halted, then the bombers, unlike missiles, could be recalled to their bases. (It would have taken them several hours to reach their targets.)\(^8\) Next, he argues that only manned bombers can be used to find targets whose location is not known accurately enough to direct missiles against them and for movable targets such as missile launching railroad cars, or those so compact and hard that they require precision bombing. He tells us that the strategic bombers can drop small nuclear or conventional bombs within feet of their aiming point. Power asserts that the manned bomber can hit a target with "the utmost discrimination, destroying not more and not less than the mission calls for."\(^9\) (He gives no evidence that bomb sights or airborne radar aiming devices have improved much since World War II.\(^10\) Power neglects to mention that the manned bombers would not be able to operate against precision targets at night or in bad weather.)

Power argues that the manned bomber is versatile. It is able to carry any type and combination of payload such as nuclear weapons, conventional bombs, special purpose stores, or photographic equipment. It

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\(^9\) Ibid.

\(^10\) His book was published in 1963.
is useful in conventional wars. It was employed during the Korean conflict and it is now being used to bomb targets in Vietnam.

The General points out that SAC's long-range bombers become unlimited-range bombers through aerial refueling which allows them to reach any target on earth from their home bases. Routine aerial refueling permits SAC aircraft to remain on airborne alert for twenty-four hours or more.

Power states that manned bombers can change their target or route if this becomes necessary, and that they are more dependable than missiles. He further states: "Bomber crews can be trained while [missile] site personnel cannot be trained to hit the target by practice." Power believes that the bombers, while on airborne alert, are far beyond the enemy's reach and counter-measures, and are virtually invulnerable, even without any warning whatsoever, to a surprise, massive nuclear attack. Such is the faith of General Power in the manned bomber that when he was SAC commander he made the statement, in February, 1964, that "The B-47 in the hands of professionals could deliver weapons in the year 2,000."

He also argues that the Soviets may develop an anti-missile defense system which will necessitate the use of manned bombers. He states that "Our manned bombers, at their altitude range would not be vulnerable to anti-missile defenses."

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11 Ibid., p. 167.  
12 Ibid., p. 162.  
14 Power, op. cit., p. 162.
General Curtis LeMay was a member of the Joint Chief of Staff until 1964. He was also the Air Force Chief of Air Staff. He too was convinced (and apparently still is) that the manned bomber is not obsolescent and that it can and should continue to be a main part of America’s deterrent force. He ardently wants a new bomber to replace the rapidly aging aircraft of SAC. His belief that the next war will be similar to the last one is evidenced by his remark to the news reporter Stewart Alsop when asked if the manned bomber would be effective in a modern war: "The only difference between this coming war and the last, Alsop, is that some of you civilians are going to get hurt." While LeMay was Chief of Staff, the air force tried to prolong the life of the manned bomber by the development of the Skybolt. This was a two-stage, solid-fueled air-to-ground ballistic missile. It carried a nuclear warhead and could be launched 1,000 miles from its target. As designed, it would have had the lowest accuracy, reliability, and payload of any of the strategic missiles. The Skybolt rocket possessed all of the disadvantages of the manned bomber and the ballistic missile, and none of the advantages. The Skybolt program was cancelled and with it the hope of rejuvenating the manned bomber.

When it became evident in 1963 that the Soviets were perfecting an accurate surface-to-air anti-aircraft missile system, General LeMay proposed that a new bomber be built which could fly under the enemy’s radar defenses. It would have to be able to fly at a height of about

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15 Alsop, op. cit., p. 87.
16 Kaufmann, op. cit., p. 218.
fifty feet.\textsuperscript{17} The air force took its case for the manned bomber to Congress and funds were appropriated for the development of a new bomber. The B-70 was selected to be the prototype of this bomber. This large aircraft, of which one prototype was produced, was to fly at both low and high altitudes at speeds up to 2,000 mph. Owing to its high speed, which was necessary to maintain in order to avoid Russian air defenses, it would have been unable to perform any of the functions which are considered to be the advantage of manned bombers over missiles.\textsuperscript{18} It could not search for targets, maneuver any better than a missile, perform on-the-spot reconnaissance work, or effectively drop conventional bombs.\textsuperscript{19} At a speed of 2,000 mph, no existing electronic equipment would have enabled it to do more than drop a bomb in the general vicinity of the target area—hardly an advantage over a missile.\textsuperscript{20} It would be unable to use the Hound Dog, Skybolt, or Quail decoy missiles owing to its great speed.\textsuperscript{21} The B-70 would be much more expensive than a missile and less reliable.\textsuperscript{22} The prototype B-70 could barely remain aloft because of mechanical and electrical failures. It finally crashed. At present, there are no plans to build any more bombers.

LeMay has also advanced other arguments for the manned bomber. He believes that a bomber crew could give a first-hand report of the results of their mission. Bombers are more likely to hit their targets because they can use stand-off missiles, decoys, and their ability to

\begin{itemize}
\item \textsuperscript{17} Alsop, \textit{op. cit.}, p. 87.
\item \textsuperscript{18} Kaufmann, \textit{op. cit.}, pp. 220ff.
\item \textsuperscript{19} Ibid., p. 220.
\item \textsuperscript{20} Ibid.
\item \textsuperscript{21} Ibid., p. 221.
\item \textsuperscript{22} Ibid., p. 222.
\end{itemize}
approach their target from any direction at high or low altitudes. He believes that under most conditions the accuracy of bombers in hitting targets probably exceeds that of missiles. He argues that strategic bombing has been developed to a high degree by the United States, first in wartime and later during the post-war period. Bomber crews, he says, have a high record of success and the reliability of this system has been excellent in the past. There has been no experience with the use of ICBM's under wartime conditions and their reliability in combat is unknown.

The pro-missile, anti-bomber forces are led by Robert McNamara. His arguments against the strategic bomber began in 1964 with the assumption that bombers would never again drop bombs. (Owing to the present large-scale use of B-52 bombers to drop conventional bombs on targets in North Vietnam, this argument has undergone modification. The air force generals proved to be correct in their prediction that the B-52 bombers would someday be needed to drop conventional bombs.) McNamara next argues that the bomber starts out with three major handicaps compared with the modern long-ranged missile. First, a bomber on an air field is very vulnerable to attack. One hydrogen warhead could vaporize an entire SAC base. The air force claims, as previously noted, that it could get at least half of its bombers off the ground in the frantic fifteen minutes after Soviet missiles were picked up by the radar of the Ballistic Missile Early Warning System which is strung across the northern edge of the North American continent. But the Secretary of Defense answers this

\[23\text{Donnelly, op. cit., p. 1.}\]
\[24\text{Ibid., p. 2.}\]
argument by the air force generals by maintaining that Soviet submarines off either the east or west coast could launch missiles which would not be detected until they exploded. In contrast, the Minuteman and the Polaris missiles are specifically designed to survive a surprise attack. The Polaris, of course, is concealed by the sea and the Minuteman is protected by a blastproof concrete silo that is imbedded in the ground.\(^{25}\)

McNamara's second argument is that even if SAC's bombers survived a surprise missile attack, they would be decimated by Russian anti-aircraft missiles. Defense Department experts are convinced that ICBM's could penetrate Soviet defenses far better than bombers, even if the Soviet Union deploys a massive anti-missile system.\(^{26}\)

In 1958, the American Hawk missile demonstrated its power and accuracy by intercepting both jet target drones flying at tree-top levels and on short-range ballistic missiles in supersonic flight at altitudes above and below fifty feet. The Nike-Hercules anti-aircraft missile in that same year intercepted targets traveling at three times the speed of sound at more than 100,000 feet above the earth.\(^{27}\) In 1960, the Russians shot down American Francis Gary Power's U-2 at an altitude of more than 60,000 feet with a single missile. By 1962, the Nike-Zeus, an improvement over the Nike-Hercules, successfully intercepted the latter when it was fired as a target.\(^{28}\) The Russians are believed to be as advanced in

\(^{25}\text{Alsop, op. cit., p. 87.}\)

\(^{26}\text{Ibid.}\)


\(^{28}\text{Ibid., p. 40.}\)
anti-aircraft and anti-missile rocketry as the United States. If
American rockets can shoot down bombers at any altitude, including tree-
top level, then it is almost certain that the Russians can do likewise
with their rockets.

McNamara contends that even if the manned bombers did survive
the initial attack, and even if they did successfully penetrate enemy
defenses, the bomber would not be as effective against targets as the
ICBM. He maintains that no airplane has any chance of finding a mobile
target, such as a missile hauled by a truck, and the air force offers no
convincing proof that it could. McNamara believes that fixed targets,
whose location is known, can be attacked more effectively and cheaply by
ICBM's.\footnote{Alsop, op. cit., p. 87.} Although a B-52 can carry up to a fifty megaton bomb (one
megaton is equivalent to 1,000,000 tons of TNT), McNamara believes that
the Titan II, which can carry a ten megaton warhead, and the now opera­
tional Titan III which carries a fifteen megaton hydrogen bomb will be
able to carry out any assigned task. If necessary, more than one missile
can be directed at a single target.

The Secretary of Defense believes that reconnaissance satellites
or aircraft could locate targets better than manned bombers could. Once
located, the targets could then be destroyed by ICBM's.\footnote{Ibid.} McNamara states
that the accuracy of the missile is such that it can pinpoint a target
after a flight of thousands of miles about as well as a bomb dropped from
an aircraft. To the air force's argument that the bombers could destroy
targets remaining after all of the ICEM's have been expended he asks
"What is the role of a bomber after you place 1,000 to 2,000 missiles on
the Soviet Union? What have you left to mop up?" 31

Partly in response to clamorous demands for a manned bomber by
the air force and their friends on Capitol Hill, McNamara has approved
the development of the swing-wing TFX, operationally known as the F-111.
Its variable wing length and slant will allow the plane to operate at
relatively slow speeds at low altitudes as a fighter-bomber, or as a
medium range strategic bomber at high altitudes. It is also to be used
as an interceptor (the new name for fighter planes, especially those
whose function it is to attack bombers). The F-111 can fly nearly
3,000 mph at altitudes in excess of 90,000 feet. This plane is designed
to operate both from aircraft carriers and from land bases. 32 General
Nathan Twining has criticized the F-111 because he believes it to be a
compromise aircraft and that it will give only mediocre performance in
each of its intended tasks. Others believe that the interceptor is
obsolete. If an interceptor flying 1,000 mph sees an approaching enemy
bomber flying at the same speed, the pilot will only be able to maintain
visual contact for several seconds, and would be within gun range for
less than half a second. Before the plane could turn around, the bomber
would be too far away to be seen visually. 33 The F-111, at a speed of
3,000 mph, would not be able to maintain visual contact with an approach­
ing bomber for much more than a second.

31 Ibid.
33 Parson, op. cit., p. 170.
Rockets

The Strategic Air Command's first ICBM was the Atlas which became operational in September, 1959. It was a liquid fueled missile (a long and tedious process) and it could not be protected in silos because it had to be fueled before a flight. In 1962 and 1963, two new rockets began replacing the obsolescent Atlas and other rockets which had to be fueled just before firing. The first was the Minuteman. It is a solid fuel rocket and can be stored for almost indefinite periods of time in underground concrete silos which are highly resistant to nuclear attack.\(^{34}\) The Minuteman can be fired instantly, as it is always fully fueled, loaded with its five megaton nuclear bomb, and internally adjusted to automatically fly to its target. In 1963, the Titan II came into operational use. It uses a storable liquid fuel and carries a ten megaton bomb. This liquid fuel, unlike solid propellants, enables the Titan II to negotiate a complicated flight pattern in order to confuse the enemy's defense system. The Titan III, an improved version of the Titan II, is now becoming operational. It releases decoy devices as it approaches its target. The Titans are stored in underground silos and can be fired thirty seconds after the firing order is given. The Department of Defense reports complete success in seven out of every ten firings of the Titan and Minuteman.\(^{35}\)

The Polaris solid-fueled missile became operational in 1960. Each atomic submarine carries sixteen of these missiles and there are now

\(^{34}\) Power, op. cit., p. 148.

about forty-one of the undersea craft. The range of the Polaris rocket has been increased to 2,500 miles and soon all of the atomic submarines will be equipped with the improved models.

Curtis LeMay and other advocates of the manned bomber have advanced several arguments against reliance upon the ICBM. They argue that the nuclear test-ban treaty has made it impossible to test out atomic warheads under simulated wartime conditions. For instance, they believe that it is still a matter of conjecture whether the operability of the ICBM's guidance system will be adversely affected, or even fatally impaired, by the effects of nuclear explosions on the ether as atomic bombs are exploded over the United States and the rest of the world.

Thus far, no missile has been launched with an operational warhead from its silo to its target (but launches made from test and training sites, with dummy warheads, have proven reliable and the accuracy of the ICBM's increases with each passing year).

Interceptor rockets

In July, 1962, Soviet Premier Khrushchev said that Soviet interceptor rockets (anti-missile missiles) could "hit a fly in outer space." In November, 1963, the Red Square parade revealed the Soviet equivalent of the American Nike-Zeus interceptor rocket which is a two-stage missile with a jettisonable tandem booster. In November, 1964, the Red Square
parade displayed the Galosh, a fifty foot interceptor rocket. It presumably is a multi-stage, solid-fuel missile. These rockets now protect Moscow and Leningrad.

The Nike-Zeus interceptor rocket was perfected in 1961. It carried a small nuclear warhead. During 1963 and 1964, the Army, in charge of air defense (with the exception of fighter planes), showed that it could destroy incoming Atlas and Titan nosecones which were fired from Vandenberg Air Force Base over the Pacific. The Nike-Zeus anti-ICBM rockets were launched from Kwajalein Island and reached velocities of 8,000 mph. This feat was much the same as hitting one bullet with another. It was never tested against an ICBM with a nuclear warhead, however. The Nike-Zeus lacked the ability to distinguish between decoys and warheads in time to destroy the right one. This made it vulnerable to saturation attacks which would have hopelessly confused the Nike-Zeus rocket.

To overcome these weaknesses, development of the Nike-X was started in 1962. The Nike-X is actually two rockets. One is the Zeus, the long-ranged rocket which will intercept enemy ICBM's out in space. The other is the Sprint which will attack incoming missiles once they have re-entered the earth's atmosphere. With the help of a new radar system (on the ground and in the rocket) which will have to be developed, interception will be delayed long enough to enable the Nike-X to

39 Ibid. 40 Ibid.
distinguish between decoys and warheads. It will be difficult to confuse Nike-X with penetration aids such as course changes, electronic jamming devices which disrupt radar, or the dropping of metal strips to confuse the radar system.\textsuperscript{43}

The Sprint, because it will have to attack warheads traveling at 15,000 mph only a few miles above American cities, will require fantastic acceleration speeds, and incredibly complex new types of electronic systems to enable it to distinguish the warheads from the decoys.\textsuperscript{44} The radioactive debris that would be produced by the low-altitude destruction of enemy warheads by Sprint would contaminate a large part of the United States. The Zeus and the Sprint would destroy missiles and warheads by means of a nuclear explosion. How often this explosion would detonate the enemy's nuclear warhead is uncertain. McNamara believes that, because of the amount of radiation which would be generated by mid-air thermonuclear explosions, the Nike-X defensive system would be ineffective without fall-out shelters.

The entire research and development of the Nike-X system will cost between thirty and forty billion dollars. Even so, large numbers of enemy missiles would penetrate a fully operational anti-ballistic missile system. But with such a defensive system, plus shelters, it is estimated, by army generals and their industrial contractors, that American deaths in a massive thermo-nuclear exchange would be reduced from 135,000,000 to 75,000,000.\textsuperscript{45} The strongest advocate of the Nike-X system is General


\textsuperscript{44)Von Braun, op. cit., p. 145.

\textsuperscript{45)Alsop, "Birds," \textit{op. cit.}, p. 83.
Earle Wheeler, present Chairman of the Joint Chiefs of Staff. McNamara, however, is not convinced that even with a fully operational defense system deaths can be reduced below 100,000,000. He believes that the Soviets will simply produce more rockets and improve their penetration aids. Hundreds of hydrogen bombs detonating over the United States would produce prodigious amounts of heat and radiation with incalculable results. McNamara also fears that the Russians, instead of aiming at the defended cities, might aim at the undefended open spaces. To kill the people of Chicago, it is not necessary to hit the city. A large thermo-nuclear weapon exploded several hundred miles upwind of Chicago, for instance, could kill every inhabitant not protected from radiation.

The Secretary of Defense also points out that the Soviets have three types of strategic offensive weapons; land-based missiles, submarine-launched missiles, and manned bombers, each of which, by itself, can inflict severe damage on the United States. An effective defense against only one of these types would be of limited value since it could be outflanked by another type of offense.

McNamara hopes to make an agreement with the Soviets that neither side will install an extensive anti-ballistic missile system.

Strategy

In October, 1946, the Air Force Secretary said in a prepared statement that "In the future, if America is attacked, our retaliatory

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46 Ibid.
47 Ibid.
48 Donnelly, op. cit., p. 23.
attacks will be immediate.\textsuperscript{49} In 1954, John Foster Dulles, the Secretary of State, declared that if the Soviets attacked any of America's allies, then the United States would attack Russia with atomic weapons. The Air Force Association declared in 1961 that "National policy must make it abundantly clear that the United States will not hesitate to empty its nuclear strength in response to Soviet aggression--whether that aggression takes the form of nuclear attack, non-nuclear attack [or] nuclear blackmail..."\textsuperscript{50} A foremost advocate of the doctrine of massive retaliation has been General LeMay. In early 1963, before a Congressional committee, he defended the thesis that the threat of nuclear war would by itself act as a deterrent to a wide range of hostile acts. He attributed the Korean war to America's refusal to threaten the invaders with nuclear weapons. He believed that the Russians backed down in Lebanon, in Berlin in 1958, and in Cuba because of the threat of nuclear war.\textsuperscript{51} During these hearings, Congressman Flood asked LeMay if he wanted to settle every South American revolution and little border dispute anywhere in the world with atomic weapons. LeMay was somewhat befuddled by this question. He was also unable to indicate if he thought that atomic weapons should be used if the Russians harassed Berlin or its access routes.\textsuperscript{52} LeMay once stated: "I do not understand why a force that will


\textsuperscript{50} Ibid.


\textsuperscript{52} Ibid., p. 504.
deter a big war will not deter a small one too, and if we want it to and say it will... I think we are going to have to build for the worst cases and then use that for all the others.\textsuperscript{53}

General Power also has championed the doctrine of massive retaliation. He also believed that SAC's B-52's could settle border disputes and internal attempts by Communists to take over a country's government. Conventional bombs, instead of atomic bombs, would serve the purpose. His ideas on this subject deserve quotation at length in order to assist the teacher and his pupils to evaluate an air force general's (who was also a Chief of Staff) understanding of his weapons. In his book \textit{Design for Survival}, published in 1964, Power states:

Let us assume that, in the fall of 1964, we would have warned the Communists that unless they ceased supporting the guerrillas in South Vietnam, we would destroy a major military supply depot in North Vietnam... If the Communists had failed to heed our warning and continued to support the Rebels, we would have gone through with the threatened attack and destroyed the depot. And if this act of persuasive deterrence had not sufficed, we would have threatened the destruction of another critical target and, if necessary, would have destroyed it also. We would have continued this strategy until the Communists had found their support of the Rebels in South Vietnam too expensive and agreed to stop. Thus, within a few days and with a minimum of force, the conflict in South Vietnam would have ended in our favor... \textsuperscript{54}

General Power goes on to state that the B-52 bombers would have destroyed their targets "with the utmost accuracy and discrimination."\textsuperscript{55}

According to the figures of Senator Stephen H. Young of Ohio, American bombing of North Vietnam has had the intensity in explosive

\textsuperscript{53}\textit{Kaufmann, op. cit.}, p. 13.

\textsuperscript{54}\textit{Power, op. cit.}, p. 224.

\textsuperscript{55}\textit{Ibid.}
power exceeding all of the bombs dropped by the Allies in World War II.\textsuperscript{56}

By the early 1960's, it had become apparent that Russia would be able to destroy large portions of the United States in the event of an atomic war. America no longer had a monopoly on atomic weapons and their delivery vehicles. Although the United States could destroy more of Russia than Russia could of America, a meaningful victory was no longer possible. Americans began to think about the effects of atomic weapons landing on the United States. One five megaton bomb—a weapon of very modest proportions—would create a crater about 350 feet deep and some 3,700 feet in diameter. Beyond this enormous crater, a rim of radioactive debris would extend outward for approximately 1,800 feet and to a height of eighty-five feet. The bomb's fireball would be about four miles in diameter, and temperatures within that fireball would approach those on the sun's surface. All matter within the area of the fireball would be vaporized. Lingering radioactivity would make it impossible to rebuild in the stricken area for scores of years. Buildings as much as six miles from the point of impact would be blown down by the ensuing shock wave. Secondary fires caused by gas, electricity, and exploding chemicals would do great damage. Radiation, for forty-eight hours, would cut a lethai fall-out pattern about eighteen miles wide and up to 130 miles long. One Russian fifty megaton bomb would be capable of vaporizing the entire metropolitan area of New York or Chicago.

Dr. Ralph Lapp in \textit{Kill and Overkill} estimates that the American stockpile of nuclear bombs equals at least 30 billion tons of TNT, and

that it is rising. The Russians have an atomic capacity of at least 20 billion tons of TNT and it too is rising. The radioactive fall-out from a full exchange of nuclear weapons (the equivalent of 50 billion tons of TNT) is likely to have unwholesome effects upon life. According to current, revised Department of Defense estimates, a full nuclear exchange in which the Soviets struck first would kill between 130 and 135 million Americans. McNamara says that these figures "are almost certainly conservative." He says that they do not include thermal effects such as fire storms. And they do not include fatalities resulting from chaos, disease, starvation, and other factors. One of these other factors would be birds. These creatures are very sensitive to small doses of radiation. It is likely that most birds would be killed from radiation poisoning in a nuclear war. Insects, on the other hand, are extremely resistant to large doses of radiation. This would result in hordes of insects, ordinarily eaten by birds, devouring man's remaining sustenance. This, of course, would result in mass starvation.

What is not known is how many generals and strategists in Washington (and Moscow) understand this. Not many people comprehend the fact that the end of civilization is threatened. According to the studies of Dr. Leslie Grinspoon, a Harvard psychiatrist, the truth is not acceptable, and people "cannot risk being overwhelmed by the anxiety which might accompany a full cognitive and effective grasp of the present world situation and its implications for the future."
America has been confronted with potentially explosive situations in Quemoy and Matsu, Korea, Lebanon, Berlin, the Middle East, Cuba, and Indo-China. The various administrations have either refrained from action (for fear of atomic war) or have sought for the conventional forces with which to manage the situation. Because of Soviet retaliatory capacity, America has been less and less willing to start an atomic war over minor conflicts. Army General Maxwell D. Taylor, a former Chairman of the Joint Chiefs of Staff, has written a book entitled The Uncertain Trumpet. In this book, he maintains that in the past the doctrine of massive retaliation has endangered American national security by limiting military action to major wars. He advocates mixed, well balanced, and powerful conventional forces which will be able to deal with all military contingencies short of all-out nuclear war.

This strategy has been embraced by McNamara. He believes that since a nuclear exchange leads to mutual suicide, a military structure must have sufficient non-nuclear power to avoid an atomic war if at all possible. Under McNamara, American conventional forces have been greatly strengthened (more than 100 per cent since 1961).

The Secretary of Defense believes that nuclear superiority has only a limited application in that all it deters is mutual suicide. Lesser military threats are not prevented. A military structure wholly based on atomic superiority is, he believes, a bankrupt establishment. McNamara has tried to limit nuclear warfare by what is called the controlled response. If both sides were to retain full command and

60 Kaufman, op. cit., p. 27.
61 Atwater, "Last Stand," op. cit., p. 11.
control of their nuclear striking forces, even during an atomic war, there might then be "a possibility of avoiding a full nuclear exchange." This would avoid mutual suicide. He believes that the United States and Russia might exchange a Minsk for a Hartford and then stop there. This theory is violently disputed by Tristram Coffin, a noted news correspondent and author of a book and several articles on military affairs. He states:

To suppose that an enemy so idiotic as to attack the United States would spare cities is foolish. Whoever strikes this blow will do so with hate in his heart and suicide accepted; he will wish to hurt and kill and destroy. The idea that any communication will be possible between missile bases or submarines or bombers after a massive first strike or return strike is just silly.63

The United States is now involved in a guerrilla war in Vietnam which is being fought with conventional weapons. There is every indication that American forces are going to become increasingly involved in this type of warfare in the future. The following quotations will give the teacher and his pupils some idea of how well the Department of Defense understands the military nature of Communist wars of liberation:

Admiral Radford (an admiral who was a Chief of Staff):

(1953) "The French are going to win in Vietnam."64

(1954) "The French are winning the war in Vietnam. The forces of General Giap are on the run."65 Dienbienphu surrendered the month after this statement was made and France then withdrew its army of 240,000 men.)

62 Ibid., p. 12.
63 Coffin, op. cit., p. 245.
65 Ibid.
White House:

(1963) "Secretary McNamara and General Taylor report that the major part of the U. S. military task can be completed by the end of 1965." 66

Assistant Defense Secretary Arthur Sylvester:

(1963) "The corner definitely has been turned toward victory in South Vietnam; Defense Department officials are hopeful that the 12,000 man United States force there can be reduced in one to three years." 67

Defense Secretary McNamara:

(1962) "1962 has been a year of decision. The corner has definitely been turned and the United States will shortly achieve the goal in Vietnam." 68

(1963) "We are winning the war in Vietnam." 69

(1963) "American troops will start being withdrawn before the year ends." 70

(1964) "We have every reason to believe that U. S. military plans will be successful in 1964." 71

(1964) "The U. S. hopes to withdraw most of its troops from South Vietnam before the end of 1965." 72

(1965) (After increasing the number of American troops in South Vietnam from 15,000 to 175,000), "We are no longer losing." 73

66 Ibid.
68 Ibid. 69 Ibid. 70 Ibid. 71 Ibid. 72 Ibid. 73 Ibid.
General Westmoreland (American commander in Vietnam):

(1965) "Now I can say at last we have stopped losing the war."\(^{74}\)

The reader may want to compare these optimistic statements with similar ones made by General Haig and others in 1915, 1916, and 1917.

There are today serious civil-military conflicts over the development, use, and retirement of weapons. Even in areas where there is substantial civil-military agreement—such as the war in Vietnam—there seems to be little understanding of the nature of guerrilla warfare and the means of winning such a war (if victory is indeed possible). As the forces of war grow more destructive, it becomes more important for the United States to correctly judge its weapons and to be as free from error as possible. This task should be given to a theoretical committee which is urgently needed today to pass judgment on weapons and weapon systems. It should be given the task of examining military strategy in order to determine if our weapons can achieve stated goals and objectives.

This theoretical committee should be absolutely independent of the Department of Defense, or any other governmental agency. None of its members should have any interest in any particular armed service. No member should have any financial or other interest in industries which might directly or indirectly supply the armed forces. This committee should be organized much like the Pure Food and Drug Administration is in America. It would advise the President and Congress. The committee's members should be composed of several hundred scientists, engineers, technicians, and writers specializing in military subjects. They should be well paid for their services. The method of selecting members, and

\(^{74}\) Ibid.
their terms of service and other details would be left to political scientists and others who specialize in these matters. The committee should be in a position to command the three armed services to submit all information that the committee might need, and to execute all prescribed experiments and tests. The committee should have adequate funds at its command in order to achieve complete and adequate research and testing. This would give the United States a systematic and scientific method, free of special influence or bias, of judging weapons, weapon systems, and the ability of these weapons to carry out any particular strategy.

**Applying the topics of this chapter to the classroom**

In previous periods, weapons and civil-military disputes concerning them were a matter of history. The pupil tried to gain insights into what had already happened, and then sought to apply those insights to the present. Since the Second World War, however, the student will be required to think about unsettled controversies concerning weapons. He must depend for answers upon his own inner resources, rather than on historical writings. The pupil will find himself confronted with living issues each time he reads about weapons in current news media. It is to be hoped that the pupil can call upon his experience with past wars for help in gaining insights into present issues. The bright pupil, in command of the facts, may be able to judge weapons as well as a general. The teacher should point out to his charges that they will be challenged by living issues each time they read a newspaper. He should have no difficulty in relating the prospect of nuclear war, the war in Vietnam, and disputes over weapons vital to national defense directly to the
personal life of his students. He will be assisted in this task by the large number of controversial news items and articles appearing daily in local news media. The teacher may want to have his pupils make a scrapbook of news items and articles relating to weapons, civil-military disputes, and other items concerning national defense. Some students may want to specialize in a particular military topic while others will wish to keep well balanced scrapbooks. All of them could be kept in the classroom and be made available for research projects and as a ready reference source for military topics. The teacher may want to give an award for the best scrapbooks, or he might wish to grade them. This project will give all pupils valuable experience in learning to read the news media, how to scan written material, and familiarity with different types of news reporting.

The teacher should teach his charges how to distinguish factual, well written news from sensationalism, biased reporting, and articles catering to special interests. The teacher should instruct his class about propaganda, misinformed editorials, and letters to the editor. Pupils may want to keep a special scrapbook of bad news reporting. This could be compared to a scrapbook of good reporting and the differences noted. He should encourage his charges to write letters to the editor concerning issues of national defense. The best ones could then be mailed in. (It would be difficult for a pupil to write a worse letter than some of those which appear daily in the Columbus, Ohio, newspapers, and even in national magazines.)
Insights to be gained into air power since World War II

1. The doctrine of massive retaliation was rationally conceived.

The United States had relied upon its superior air power to prevent a war of attrition with Germany and Japan. This policy was continued after the war in regard to the Soviet Union. With a monopoly on the atomic bomb and the world's best strategic air force, America clearly had a vast technical advantage over the Soviet Union. After the Soviets began manufacturing atomic bombs and acquired the means of delivering them, the doctrine of massive retaliation began to lose its value as a military strategy because of the ever increasing ability of the Soviet Union to inflict great damage upon the United States.

Air Force generals Twining and LeMay still appear to consider seriously the doctrine of the preemptive strike (preventive war) against the Soviet Union as a good way to settle troublesome quarrels with that nation. They seem to feel that if they could exterminate Communism once and for all, the world's problems would be settled in one fell swoop. It is my impression that they would cheerfully accept the deaths of tens of millions of Americans in a nuclear exchange with Russia over a Berlin border dispute as a matter of course.

2. ICBMs could easily be classified as artillery and assigned to the Army.

As long as the manned strategic bomber reigned supreme, the air force was the foremost of the services. The pilot was a glamorous, envied, and much honored warrior. He was indispensable, for only the air force pilot could fly the strategic bomber. The missile, however,
needs no pilot. A missile site can easily and efficiently be managed by a crew of technicians and the officer in charge. It makes no difference if that officer is a member of the Army, Navy, or Air Force.

The manned interceptor is also being rapidly phased out of service in favor of the anti-aircraft missile. In recent years, the Army has begun building up its own transportation and tactical air service, and its high command feels that their service should officially be given control of all battlefield support aircraft. The Navy is also gaining increasing control over tactical aeroplanes, as the aircraft carrier is found to be the best air field from which to conduct air operations against the enemy in places like southeast Asia and the Middle East. The air force pilot's position is being challenged from all sides.

The pupil should seriously consider if the air force's loss of importance and prestige influences the opinion of its generals about the usefulness of the manned bomber.

3. Air force generals claim that only the manned bomber can locate certain targets and bomb them with the necessary accuracy which missiles lack.

They argue that only the piloted bomber can be used to find targets whose location is only vaguely known, or movable targets such as missile launching railroad cars. But during World War II, the American (and British) air forces, despite continuous air operations over Germany, were never able to locate and bomb a V-2 missile launching railroad car. The strategic bombers during that war on occasion had difficulty even bombing the right country as witness accidental bombing attacks on Switzerland and Russian occupied territory. Pupils should note that
bombsights and airborne radar have improved but little since the Second World War. The air force's most advanced planes, despite their radar, are continually being downed in mid-air collisions. They often crash into ground objects. The strategic bombers have a poor record of bombing accuracy over North Vietnam despite the claims of General Power that the manned bomber can hit a target with "the utmost discrimination."

The pupils should be asked to offer an opinion regarding the chances of success of an American bomber circling over the Soviet Union looking for a target. Would darkness or inclement weather decrease its chances of success?

It is also claimed that bomber pilots will be able to report the extent of damage to their targets—a feat which they were unable to do during the Second World War, the Korean conflict, and which they seem unable to do at present in Vietnam.

3. Air force generals argue that at least one half of SAC's manned bombers will escape the effects of nuclear blasts.

They claim that at least a fifth of SAC's bombers remain airborne at all times, and that one half of them could become airborne within the few minutes warning time they would receive of an impending missile attack. (There would be no warning if the attack were submarine launched.) Air force generals argue that atmospheric disturbances caused by multiple massive thermo-nuclear explosions would confuse the guidance system of the ICBM. Pupils should try and decide if these same nuclear explosions would affect the guidance systems of manned bombers. It is inconceivable that a manned bomber could reach its target thousands of miles away without the pilot using the plane's navigation instruments. The teacher should
ask the class: "What would be the effect of nuclear blasts on planes in the process of refueling?"

General Power argues that bombers will escape the effect of nuclear blasts by flying at great heights while General LeMay argues that they must fly at tree-top altitudes in order to escape detection by the enemy's radar. LeMay wants an aeroplane that can fly high to avoid nuclear blasts and then fly low to avoid the enemy's radar screen and missiles. How American ICBM's landing on Russia would affect SAC's bombers as they winged their way toward their targets at tree-top levels under this nuclear barrage is not explained by LeMay.

4. The understanding of the probable nature of World War III by the air force general who completed his term as Chief of Staff in 1964 is aptly illustrated by his remark that the next war will be just like the last one except that some civilians will get hurt.

The teacher should ask his pupils if the next war, in which a probable 125 million Americans, 100 million Europeans, 150 million Russians, and perhaps 400 million Chinese will be killed during the first few hours will be just like the last war, as LeMay believes that it will be. Does the class think that LeMay has a proper understanding of his weapons? During the period preceding 1914, most generals thought that the next war would be like the last. They failed to understand the nature and power of the machine gun. Today there is a new weapon that has created a new stalemate—the atomic bomb. The class should consider how many generals realize that a technological stalemate has been created. When LeMay made his remark, he was thinking about World War II. He
should have said it would be like the Great War, except that it would be characterized by instant rather than slow attrition.

5. SAC bombers would probably not receive even a ten minute warning of an impending enemy attack.

As the number of Soviet missile launching submarines increases, it will become increasingly easy for them to destroy SAC air bases by missiles launched from just off the shores of the continental United States. They could strike many SAC bases in less than three minutes. There would be little if any radar warning of their approach.

6. The American military radar networks claim to be able to track Russian bombers even at tree-top levels. The Army claims that it can intercept Russian bombers with its anti-aircraft Hawk and Nike-Hercules rockets. The Air Force is likewise confident that their interceptor aircraft can stop the Russian bombers.

It is well known that the Soviet Union equals (if not leads) the United States in the field of anti-aircraft rocketry. Russian interceptor planes are about on a par with their American counterparts. There is every reason to believe that the Soviet anti-bomber defense system is about as well developed as that of the United States. If the American anti-bomber defense system can destroy most incoming Russian bombers as is claimed, then by analogy the Soviets can do the same thing to America's bombers.

7. The chief argument against sole reliance upon ICBM's is that they have never been adequately tested.

The need for a theoretical committee to pass judgment on the reliability of the large rockets is clearly indicated. Only prolonged,
large-scale testing of these weapons by impartial scientists will reveal each rocket's weaknesses and strengths.

8. The proposed Nike-X anti-missile system will not be effective against submarine launched missiles.

It would not be able to intercept more than about half of the enemy's ICEM's. It would not be able to intercept any of his submarine launched missiles. What is destroyed in numbers of ICEM's could be compensated for by matching numbers of submarine launched rockets. The one half of the Soviet's ICEM's which escaped destruction by the Nike-X system could still be a very large number. Combined with perhaps hundreds of submarine launched missiles, the Nike-X system would be neutralized and forty billion dollars would have been wasted. Even without submarine launched missiles, the Soviets could nullify the Nike-X system by exploding highly radioactive cobalt bombs. The fallout from this type of bomb would kill everything downwind for hundreds of miles.

9. The Pentagon plans for a mutually controllable atomic war appear dubious.

Morris Horowitz, in a book entitled The War Games, reports that Pentagon planners have devised schemes for limiting nuclear war. McNamara believes that this is possible. The Secretary of Defense and his planners believe that the United States and Russia may fight several nuclear wars, but will stop each time with an exchange of twenty-five to fifty million people killed. The limited nuclear war plans are very elaborate and assume a large amount of rationality on the part of the political leaders of the belligerent nuclear powers. Horowitz, an eminent sociologist, considers the limited nuclear war plans to be worse than absurd; they are dangerous because they encourage false hopes. The teacher
should ask his class if a controlled, limited nuclear exchange is likely, or if when hatreds reach the point where nations are willing to accept mutual suicide, they will stop the killing at a certain place according to a war plan. A limited nuclear exchange would not resolve the conflict which provoked atomic war in the first place. It is doubtful if either side would back down before it had expended its entire atomic arsenal.

The issues

The pupils, after studying the insights into air power since the Second World War, and perhaps adding some of their own, are now ready to study the issues. They should try to relate the lessons of the past to present situations. The teacher should continually try to demonstrate to his charges how the past affects the present and the usefulness of historical example in helping men to think more clearly about present problems.

Issue I. Do the generals and civilians of today understand their weapons better than they did during the Great War?

It appears that the air force generals continue to grossly overestimate the powers of the manned bomber. The performance of the B-52's in the Vietnamese war has been poor and, contrary to the expectations of the air force generals, they have not ended that conflict. The performance of this weapon in the past and at present should give the secondary school student a clue as to which side in this controversy makes the correct estimation of the manned bomber.

The teacher should ask his pupils the following question: "Do the air force generals, with their insistence on the retention of what some critics believe is an obsolescent weapon, resemble the generals of
the Great War who insisted on clinging to the cavalry?" "Have the air
force leaders changed from being ultraprogressive to being ultraconserva-
tive?" "Do they, like the old cavalry officers, dread to see the
retirement of their favorite weapon, the manned bomber?"

The army generals, led by General Wheeler, the present Chairman
of the Joint Chiefs of Staff, are in favor of immediately spending forty
billion dollars on the Nike-X anti-missile defense system. (This would
add enormously to the power and prestige of the army.) In view of the
fact that this system will not be effective against submarine launched
missiles, or against highly radioactive bombs dropped up-wind of popula-
tion centers, the judgment of the generals who wish to spend such an
enormous amount of money on this dubious weapon comes into question.

There is great disagreement concerning the TFX (F-111) fighter
plane and its capabilities. In this case, McNamara favors the develop-
ment of the plane while the air force opposes it as a compromise air-
craft. (Could it be that since this plane is also intended for the navy,
the air force generals fear that they might lose control of it?) This
points out the need for a theoretical committee to study such weapons.

The optimistic statements by both the civilian and military
leaders concerning the Vietnamese war shows as woeful a misunderstanding
of guerrilla warfare as the generals (but not the civilian leaders) had
of trench warfare during the Great War.

It would appear that both the generals and McNamara have been so
mistaken about the Vietnamese war that the need for a theoretical
committee is indicated.
Issue 2. Is Secretary of Defense McNamara making a mistake by discouraging inter-service rivalries?

During the First World War, the services spoke with one voice. This prevented the civilian governments from having much control over the armed services. The British army and navy, for instance, always rallied to one another's support against civilian "interference" with military affairs. After that war, inter-service rivalry prompted most of the innovations, improvements, and new concepts which appeared in the armed forces between the two wars. While politically influential generals emerged from the Second World War, they represented different branches of the armed forces. This has greatly aided civilian control of the military. Since the Second World War, inter-service competition has stimulated basic scientific research and the development of rival weapons, and alternative weapon systems. While an air force general such as Power was advocating reliance upon strategic bombers, army general Maxwell Taylor was calling for a balanced force, and Admiral Rickover was urging the administration to rely upon the atomic submarine as the most important element in national defense.

McNamara favors unification of the services in order to avoid waste and duplication. A theoretical committee would have to decide if political control of the armed services by civilians and the vigorous development of rival weapon systems are worth the waste and duplication involved.

Issue 3. Who should judge weapons?

Throughout this work, a theoretical committee with great powers has been suggested as one alternative to the chaos and dissension over
the development, use, and retirement of weapons. No impartial and competent authority for testing and judging weapons has ever yet existed. It is hard to believe that each of the three services, the executive branch of the government, or the President's scientific advisors will ever be able to objectively evaluate America's weapons. It would be too difficult for a President or a Secretary of Defense to say "We have spent twenty billion dollars on this weapon and it has proved to be a complete failure."

The teacher should ask the pupils for an alternative to a theoretical committee. It is likely that they may be able to offer a better means for judging weapons. Whatever kind of an agency is decided upon, the class should spend several periods discussing its personnel, responsibilities, funds, legal powers, and duties.

**Selected key readings for teachers**

The following suggested books are intended to give the teacher a firm grasp of the civil-military controversies over air power since the Second World War. The teacher will discover, however, that the best source of information on present military topics is current periodicals and newspapers. The periodical literature which is recommended is interesting to read, fairly accurate, and easily obtainable.

**The Armed Society** by Tristram Coffin. This book explores the financial and other interests which various segments of the population have in weapons, weapon systems, and military strategy. The reading of this book will show the teacher how personal interest in weapons often prevents proper, objective evaluation of them. The book is written in a very readable prose style and is documented.
The McNamara Strategy by William W. Kaufmann. This is a history of McNamara as Secretary of Defense. It goes into all of the significant civil-military conflicts between McNamara, the military, and Congress since he assumed office. There is considerable discussion of the development, use, and retirement of various weapons and weapon systems. The evolvement of American military strategy is given a thorough treatment. The book is well documented.

Design for Survival by General Thomas S. Power. This book is written by a retired air force general who was a Chief of Staff. In the first chapter, the author gives his analysis of Communism. Power finds it such an embodiment of all that is evil that he is stimulated to explore the advantages of preventive nuclear war. (His analysis of Communism would not pass muster in a high school freshman civics course.) He then proceeds to vigorously defend the manned bomber and to argue for its continued retention as America's principal retaliatory weapon. All of the arguments against sole reliance upon ICBM's are given in this book. The teacher will learn much about the thought processes of the typical air force Chief of Staff from studying Design for Survival.

Aviation Week & Space Technology (A McGraw-Hill bi-monthly publication). This illustrated magazine may be obtained by writing to Fulfillment Manager, P.O. Box 430, Hightstown, N. J. 08520. Although more than half of the magazine is devoted to items about civilian aeroplanes, it also contains most current news about military aircraft and the civil-military conflicts concerning them. The articles are brief and well written. They are usually accompanied by illustrations.

The Saturday Evening Post. Although this magazine usually caters to business interests, its articles on military controversies appear to
be well written and objective. The teacher need not squander his money by buying this magazine (owing to its appallingly low quality articles on non-military subjects), but can usually obtain each week's copy from the school librarian.

**U. S. News & World Report.** Each week's edition of this magazine carries most of the news about current military affairs. The articles tend to foster the views of the air force generals, but the civil-military controversies behind weapons are fully presented.

**Selected books for students**

The pupil is advised to rely upon a good newspaper, and the magazines recommended for teachers, for information about modern weapons and the controversies concerning them. The teacher may want to assign all or parts of one of the books recommended for them to selected pupils.

Almost all secondary school libraries are well stocked with books on modern military aircraft, missiles, and other weapons. This is a very popular subject, especially with boys, and these books are in large demand. The school librarian can provide the teacher with most of his needs on this subject.

**Spaceport U.S.A.** by Martin Caidin (ba, av, and ab 7-12). This is the history of the air force missile test center at Cape Canaveral. It is profusely illustrated with pictures, tables, and charts. The book is accurate, interesting, and written for the secondary school pupil.

**Man and Space** (*Life Science Library*) (ba, a, and ab 7-12). This is a well illustrated book containing much information about all of America's rockets. It traces the development of rockets from 1933 to the present. It is especially well suited to junior high students.
History of Rocketry and Space Travel by Wernher Von Braun and Frederick I. Ordwar (ba 9-12, a and ab 7-12). This is a complete, profusely illustrated, well written history of rockets and missiles. Much attention is given to military rockets of all types, and the controversies about them. The problems involved in various weapon systems, and their advantages and disadvantages, are thoroughly discussed. This book is especially well suited for the secondary school pupil. The pictures in the book are exceptionally good.

The Strategic Air Command by Richard G. Hubler (a 11-12, ab 10-12). This is a history of SAC. There are a number of good pictures and illustrations in the book. The Strategic Air Command does not discuss the controversies behind various airborne weapons. The book is rather tedious and should only be assigned to pupils in the upper grades.

Dew Line by Richard Morenus (ba, a, and ab 7-12). This is an illustrated history of the radar stations in northern continental America whose function it is to identify and track all airborne vehicles. This network will give the United States a fifteen minute warning of an impending Russian missile attack. The book is well written and is well suited for secondary school pupils.

New Era of Flight: Aeronautics Simplified by Lewis Zarem and Robert H. Mattley (ba, a, and ab 7-12). A large portion of this book is devoted to military aircraft. There is a picture of an aeroplane or a piece of flight equipment of every page accompanied by a brief description of it. The book is well written and is especially good for slow learners.
**TABLE 6**

**COMPARISON OF AMERICAN AND SOVIET MISSILE STRENGTH AS OF FEBRUARY 9, 1967**

<table>
<thead>
<tr>
<th></th>
<th>American</th>
<th>Soviet</th>
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<tbody>
<tr>
<td>ICBM's</td>
<td>934</td>
<td>340 plus b</td>
</tr>
<tr>
<td>Submarine-launched missiles</td>
<td>624</td>
<td>130 plus</td>
</tr>
<tr>
<td>IRBM's</td>
<td>?</td>
<td>750</td>
</tr>
<tr>
<td>Long range bombers</td>
<td>over 600</td>
<td>circa 200</td>
</tr>
</tbody>
</table>


b Soviet ICBM's carry a larger nuclear warhead than do American missiles.
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