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Earl F. Ziemke

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SUPERWEAPONS

by

EARL F. ZIEMKE

"Even a light sprinkling of persistent gas on Omaha Beach," General Omar N. Bradley wrote, "could have cost us our footing there." The Normandy landing was the first operation in the war in which gas masks were regarded as more than cumbersome insurances against a remote contingency. Bradley was "vastly relieved when D day really ended without a whiff of mustard."[1]

Another who awaited D day uneasily was Major General Leslie R. Groves, head of the Manhattan Project to develop an atomic bomb. Groves and his scientists assumed that the German work on nuclear materials, plutonium in particular, was at least as advanced as their own. If so, the reactors the Germans used to manufacture plutonium could generate radioactive by-products. Although useless for a bomb, such nuclear waste spread on the beaches could have created a barrier more dangerous and more lasting than any yet imagined. Groves informed General Dwight D. Eisenhower and a few others in the top echelon of SHAEF. He told them that he didn't believe the Germans would resort to using the radioactive waste, but he placed personnel with Geiger counters in the landing force, and field hospitals were ordered to report blackened X-ray film and any cases showing the symptoms of radiation sickness. Afterward, Groves wrote, "I was more than a bit relieved when the Allied troops made good their landing without any report of radioactive interference."[2]

In a battle a miss is as good as a mile, and in history what might have been is of next to no consequence. The conflict in Europe was fought to a finish as it had begun, without the slightest whiff of poison gas or the smallest burst of radioactivity. Yet, the fleeting shadow that chemical and atomic weapons jointly cast over Normandy on 6 June 1944 may have been as significant for the course of warfare as the events of the day were for the war then being fought. An era ended and an era began in ways possibly of more consequence for the actual conduct of war than the explosion over Hiroshima 14 months later. Three quarters of a century of evolution had brought together two superweapons with similar strategic and tactical characteristics. Of course, a batch of radioactive refuse would have been more effective than any poison gas, and that was only the most primitive use to which nuclear energy could have been put. In that potential employment, nuclear energy took on the role of the premier superweapon. In short, it acquired a past, and perhaps clues to the questions it has raised about the future can be found there.

CONVENTIONAL SUPERWEAPONS

The last third of the 19th century brought an unprecedented upsurge in scientific and mechanical inventions. Some, such as machine guns and smokeless powder, were specifically military, and most would have either military applications or improve arms manufacture. After more than 500 years of glacial progress, firearms from hand weapons to the heaviest artillery approached their optimal state.

In 1898, Ivan S. Bloch, a Polish financial magnate, published a book entitled *The Future of War*, which was later said to have been instrumental in Tsar Nicholas II's decision to sponsor the Hague Conference the following year. Bloch had studied weapons

and war for many years, and he concluded in his book that recent developments had converted firearms, particularly the rifle and the cannon, into superweapons. Of the two, he gave first place to the magazine rifle using smokeless powder and firing a small-caliber, high-velocity bullet. Rating it as capable of dealing out certain death to a distance of more than 600 yards and inflicting heavy casualties for several thousand more, he saw it as the ultimate in lethality (to which the machine gun would add little). But, in his opinion, a battle was not likely ever to get down to 600 yards. The sides would begin pounding each other with artillery at four miles. At more than a mile, the rifles would take strong effect. In the last mile, which would be saturated by bullets and exploding shells, he predicted:

> The moment will approach when half the combatants will be mowed down, dead and wounded will lie in parallel rows, separated one from the other by a belt of a thousand paces swept by a crossfire of shells which no living being can pass.[3]

In the hands of multimillion-man armies, Bloch contended, the new weapons would so enhance the defensive that war would degenerate to a grueling, futile contest for trench lines and fortifications. The area of the battlefield would expand to engulf whole regions; property destruction would be staggering; and resources would be consumed at calamitous rates. Bloch's thesis was:

> It is impossible for the modern State to carry on war under . . . modern conditions with any prospect of being able to carry that war to a conclusion by defeating its enemy on the battlefield. War therefore has become impossible, except at the price of suicide.[4]

Bloch attracted favorable attention among peace groups but was otherwise regarded skeptically because he was an amateur and because his arguments seemed to support the Russian attempts at the Hague to mitigate their own financial and technological weaknesses by persuading other nations to accept arms limitations. Military professionals were aware that the improved weapons strengthened the defensive, which Carl von Clausewitz, whom they regarded as the true prophet of modern warfare, had several generations earlier declared to be the naturally stronger form of war. But they ignored Bloch and centered their attention on Clausewitz's more attractive dicta pertaining to the war of annihilation and the primacy of battle. The German general and military theorist Friedrich von Bernhardi conceded that the magazine rifle and the machine gun substantially enhanced the defensive, but he attributed at least an equal gain for the offensive to the artillery. In sum, he concluded,

> The defense as a form of fighting is stronger than the attack, but in the conduct of war as a whole the offensive mode is by far superior to the defensive mode, especially under modern conditions.[5]

Jean L. A. Colin, Commandant of the French War College, also recognized that the technological advances had benefited the defensive, but he asserted, "There are dangers to be guarded against, and that is all. And we will guard against them, and we will attack!"[6]

Since there were no European wars of consequence between 1871 and 1914, the closest approach to the employment of these new weapons was in the earnest speculative works of Bloch, Bernhardi, Colin, and others, and in imaginary wars and battles devised by fiction writers. The latter probably

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Earl F. Ziemke is a Research Professor of History at the University of Georgia, in Athens, Georgia. During World War II, he served with the US Marine Corps in the Pacific. Dr. Ziemke holds the M.A. and Ph.D. degrees from the University of Wisconsin. His books include *The German Northern Theater of Operations, 1940-1945*; *Stalingrad to Berlin: The German Defeat in the East*; and *The U.S. Army in the Occupation of Germany, 1944-1946*.

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did the most to form popular conceptions of future wars. They wrote much and were widely read because they had a compelling theme: the necessity for technological and moral preparedness, which they could make explicit by depicting the consequences of failure to keep up with the times. The advance of technology was seen as a race fueled by avarice and envy which afflicted all peoples, excepting, of course, one's own. (Bloch said that he wrote *The Future of War* because another great surge in the destructive capacity of weapons was impending, and the Russian program for the Hague Conference called for a freeze on firearms and explosives at their existing levels of performance.)[7]

While writers of realistic fiction found enough to work with in conventional weaponry, more esoteric arsenals were being imagined in what would now be called science fiction. In *The Coming Race* (1871), Edward Bulwer Lytton described an all-purpose substance, vril, which

> . . . lodged in the hollow of a rod directed by the hand of a child could shatter the strongest fortress, or cleave its burning way from the van to the rear of an embattled host. If army met army, and both had command of this agency, it could but lead to the annihilation of each. The age of war was therefore gone.[8]

H. G. Wells equipped the Martians in *The War of the Worlds* (1898) with poison smoke and a heat ray, and brought a war with atomic bombs into *The World Set Free* (1914).

When war came in 1914, professionals and public alike believed that it could not do otherwise than confirm their previous expectations. Technological proficiency and national preparedness and spirit would make it violent but brief. The outcome would be clear-cut and decisive. The best available example was the Franco-Prussian War of 1870-71, which had been the model for the general staffs and in various guises also for the fictional wars, and it seemed to indicate that the majority of those who answered duty's call would soon be marching home laden with glory and enough of the defeated enemy's property to guarantee a bright future for themselves and their countrymen.

By 1916, after a year of bewildered impotence, the parties were tied in almost exactly the kind of deadlocked trench war Bloch had predicted. And Bloch's vision of a war without victory might well also have materialized had the United States not come in with enough men and resources to tip the balance in favor of the Allies. Had the war not ended in a bail-out victory, it probably would have been thought of as having proven the incontestable superiority of the defensive. At the very least, it did reveal that those in charge had fallen woefully short of fulfilling Colin's promise to be aware of the dangers and know what to do about them.

GAS, THE UNWELCOME CONTENDER

Poison gas, although its production and use had been prohibited in 1907 by a declaration of the Second Hague Conference, almost came to be accepted as a conventional weapon by both sides in World War I after the German Army introduced it in the spring of 1915. Although gas was thought of as a means for breaking the paralysis of the trenches, its employment in the war proved it to have a greater defensive utility than any other weapon. Nonpersistent gases, such as phosgene, could be used offensively, but they were effective (other than as harassing agents) only on the rare and unpredictable occasions when they could be used with complete surprise or in sufficiently intense concentrations to overload and "break" the enemy's masks.[9] Mustard, eight times as lethal as any of the nonpersistent gases, had virtually only defensive potential.[10] All in all, gas was at its best in the war simply in acquiring an exceedingly evil reputation. Professor Fritz Haber, Germany's leading expert on chemical weapons, explained this phenomenon in terms of a profound psychological antipathy that overrode man's ability to become desensitized, as he had to such other threats to his existence as gun and artillery fire.[11]

In the interwar period, especially the decade following the Armistice, gas became the prime contender for superweapon status. Anticipated advances in aircraft promised to give it a strategic capability that it had not possessed during the war. Even before such advances, Major Victor Lefebure, who had been a chemical liaison officer in the war, contended that the German bombing of British cities would have accomplished more if mustard gas had been dropped instead of explosives.[12] General Giulio Douhet's strategic bombing theory projected a mix of high explosives, incendiaries, and gas in which the gas would do double duty by inducing casualties and preventing the survivors from putting out fires and repairing damage.[13] After their 1928 maneuvers, which were designed in part to test London's vulnerability to air attack, the British "revealed" that 42 tons of mustard gas, an amount that could be carried in 12 bombers of the types then in service, would be theoretically enough to kill every man, woman, and child in the city.[14] While those bombers would have needed the means to deliver the minimum fatal dose to each person, the job, it seemed, could have been made easier simply by increasing the tonnage of gas and the number of planes.

If a few bombers loaded with mustard gas could theoretically bring on an Armageddon, what might the same planes carrying some as-yet-unknown chemical agent do? This appeared to be the real question. And it seemed that the world would not have to wait long for an answer. A US invention, Lewisite, put in production too late for a tryout in the war, was reputed to be in all ways more vicious than mustard. Indeed, the chemistry of war gasses was still in its infancy, and Lefebure predicted:

> In organic chemistry a single worker, following up some rare family of compounds, may stumble upon a substance not far removed from related compounds yet infinitely more potent for war.[15]

And General Horst von Metzsch, a German armaments specialist, observed:

> Chemical experts assure us, it is true, that nothing new has been discovered by fresh experiments with a thousand new chemical compounds upon hundreds of thousands of animals; but it is difficult to believe that the news of Compound No. 1001, far more deadly than all the others, will not one day be broadcast to the world by wireless.[16]

Both Lefebure's comments and those of Von Metzsch were to foreshadow a discovery in 1936 by Dr. Gerhard Schrader, who, while working on insecticides, produced the first G-agent nerve gas, tabun.

In the popular literature, science fiction was being preempted by journalism. *The New Republic* printed the following on 7 February 1932 under the headline "Mankind Prepares to Die":

> Let us visualize, for a moment, the surprise air attack as the experts plan it. Instead of an entrenched army, a crowded metropolis would be the objective, with its skyscrapers, its canyon-like streets and subways, no longer protected by such oceans or mountains as once set barriers in the path of invasion. Its tall buildings would offer excellent targets for explosive and incendiary bombs which could easily be administered by a fleet of a hundred airplanes. The loosened and burning debris would topple into the streets, which would be choked with automobiles, with terrified mobs, with the bodies of the mutilated and dying. The subways, the subterranean passages under buildings, would offer no safety to the frenzied masses who would die like rats, as a wave of gas followed the bombardment and fire.[17]

The Geneva Protocol of 1925 had prohibited the use of poisonous or asphyxiating chemicals and gases in war, but it was taken to be an act of such futility as to be scarcely worth either hopeful or cynical regard. Surely nations at war would use every available means to win; therefore, as a leading specialist in international law and justice, Nicolas Politis, observed, it would "never be possible, by regulating war, to

avoid or reduce its horrors and cruelties."[18] The protocol did not figure in attempts to envision the next war. General von Metzsch wrote:

> The unrestricted use of every available weapon of violence will be a feature of a future war. This will be so from the instant war is declared, for failure of the preliminary operations will endanger the outcome of the whole war and nothing will be gained by moderation of any kind.[19]

Lord Halsbury, who had been in charge of British gas production during the war, told a conference on armaments in London:

> Let any country know that . . . we should carry out reprisals [if attacked by gas]. Let the world know that an attack by one country on another would mean the obliteration of both. That is the only way we can preserve civilization.[20]

Since passive protection of civilian populations was considered impossible, deterrence appeared to be the only defense, and Great Britain, France, the Soviet Union, and a number of other states reserved the right of reprisal in their ratifications of the protocol.[21] Believing the lives of millions to be tied to the least trustworthy government's interpretation of its right of reprisal, a Swiss biochemist and student of gas warfare, Dr. Gertrude Woker, later concluded, "Our aim and our only possible hope must be the complete abolition of war."[22] But on paper that had already been done in the Kellogg-Briand Pact of 1928, regarded by Politis in the same light as he saw the Geneva Protocol: "One cannot undertake to regulate what is not susceptible of being regulated."[23]

On the other hand, one body of opinion accorded gas in its tactical aspect the status of a *benign* superweapon. Although the Geneva Protocol made no distinction between tactical use and strategic use in the prohibition of gas, the public discussion centered on strategic employment, which seemed pointless to many professionals since it assumed capabilities that did not actually exist. In 1927, Major General Amos A. Fries, Chief of the US Army Chemical Warfare Service, told the convention of the American Chemical Society that no gas able to "lay waste communities" had been developed, but he predicted that in another war "gas would be universal in every branch of the Army and Navy."[24] In 1934, the Geneva Protocol not having been ratified by the Senate, the US Joint Army and Navy Board (predecessor to the Joint Chiefs of Staff) stated US policy to be:

> The United States will make all necessary preparations for the use of chemical warfare from the outbreak of war. The use of chemical warfare . . . from the inception of hostilities is authorized.[25]

In his speech to the Chemical Society, General Fries had characterized gas as an agent "not to be used to kill but to incapacitate." In advance of the US entry into World War II, Brigadier General Alden H. Waitt, Assistant Chief of the Chemical Warfare Service for Field Operations, wrote a compendium of gas warfare, the first chapter of which was entitled "The Ideal Weapon." Gas was ideal, he contended, because it did not destroy property and it killed or maimed far less frequently than bullets or explosives. He cited casualty statistics from the World War that showed gas to have had a two-percent fatality rate, compared with a 25-percent rate for the other weapons.[26] On this he was in concurrence with the world's two most prominent theorists of war, J. F. C. Fuller and B. H. Liddell Hart. Liddell Hart even foresaw a vast savings of life because nations would be forced to abandon gas-vulnerable infantry armies and shift to more easily protected fleets of armored vehicles and aircraft.[27] The most trenchant comment on tactical gas, however, may have been made in the book *The Art of War Today and Tomorrow*, published by a colonel in the German General Staff, Hermann Foertsch. He enumerated the arguments for gas as a humane weapon and added, "While these observations may be

entirely valid, it remains indisputable that all soldiers regard gas as an especially unpleasant weapon."[28]

SUPERWEAPONS IN WORLD WAR II

Although the Geneva Protocol generated little confidence with regard to its observance and did nothing to diminish contemplation of future gas warfare, it did ensure that in a war involving nations with a chemical capacity the decision on first use would not be made anywhere but at the absolute top. In June 1934, when the German Army undertook to accelerate work on chemical weapons it had been conducting in secret for 10 years, and when it still regarded itself as very much an independent entity within the German state, the army recognized that whether chemical weapons would be used in a war would be up to Adolf Hitler and "could depend decisively on political and other considerations."[29] While the United States was not bound by the Geneva Protocol, the Joint Board's policy was superseded in 1937 when President Franklin D. Roosevelt stated that his Administration would "do everything in its power to outlaw the use of chemicals in warfare."[30] Further evidence that a resort to gas warfare would at least not be automatic came on 3 September 1939 when the British government, having declared war on Germany that day, inquired whether its adversaries proposed to observe the Geneva Protocol and received affirmative answers from Germany and Italy, as well as from Japan, which had not ratified the protocol.[31]

It is probably attributable to the Geneva Protocol that there is a dearth of information on chemical warfare planning other than in the United States and in Germany (the latter information being more limited and largely from East German sources). The information that does exist indicates that gas was thought of as a potentially decisive weapon if it could, on a sufficient scale, meet the criteria established late in World War I, namely, complete surprise and the concentration needed to penetrate the enemy's protective devices. Best of all would be a new agent against which the enemy had no protection. And such an agent would not have to be deadly, since the objective, according to General Waitt, would be to "terrify," to "strike at the mind and the spirit."[32] On the other hand, in the words of the Chemical Warfare Service historians,

> It would seem that the large majority of the people who had faith in gas as a viable system, capable of contributing to success in battle, was centered in the Chemical Warfare Service. There was little support for it in the combat arms.[33]

While this condition can likely be in good part attributed to the antipathy Foertsch remarked on, the German experience indicates that more was at play.

The German Army had the one new means of gas delivery developed between the wars, the *Nebelwerfer* rocket launcher; the only really new gases, tabun and sarin (the latter discovered in 1939); and the world's best-organized supplier, the I. G. Farben chemical cartel. In 1937, German Lieutenant Colonel Hermann Ochsner, Chief of Inspection 9 (chemical warfare) of the Army Weapons Office, submitted a plan for a surprise gas war so massive and continuous that the enemy would not be able to protect itself and would be swamped by gas casualties. "Once a force gets to feeling that the means of protection are inadequate and cannot be sustained," Ochsner wrote, "then the psychological collapse will soon follow."[34] Ochsner added that I. G. Farben believed that it could produce enough gas on relatively short notice "to decide a war quickly."[35]

What Ochsner proposed, in the classical vein of chemical warfare theory, was gas as the alternative to conventional weapons. In that mode, if gas fully lived up to its promise and did so with sufficient dispatch to minimize retaliation, it might bring a fast and relatively cheap victory. But in other modes, it seemed likely to be anything but economical. Persistent gases would impair mobility; nonpersistent gases would not necessarily improve it; and ground forces would have to make tactical adjustments,

endure psychological strains, and be loaded down with chemical ammunition and protective equipment. The German General Staff concluded that in a combined-arms situation, gas would slow the tempo of operations and interfere with offensive concentrations; and having devised other promising methods of attack, the General Staff was not disposed to rely on a solo weapon.[36]

As the aggressor in the war, the Germans reserved to themselves the predominant voice in the decision on introducing gas. While they held the initiative, they could introduce it offensively, if they wished, at their own pleasure. As long as they did not choose to introduce it, they could also be fairly certain of keeping it out of the war, since the gases most effective in the tactical defensive, such as mustard, were also most suitable for the strategic offensive, and an enemy who tried to save his front by using gas would have to take into account the consequences for his bases and cities.

After the tide of the war turned, the Allies were not certain how much the latter consideration would then restrain Germany. General Groves and his scientific advisors believed that "it would be perfectly natural" for the Germans to think of laying down a radioactive barrier on the Normandy beaches, and General Bradley thought that Adolf Hitler "might risk gas in a gamble for survival."[37] Although Groves had good reason to assume Germany could employ some sort of nuclear weapon, that was not in fact the case. But gas was an altogether different matter. Based on lessons learned in 1918, the German Army's work with gas during the interwar years had concentrated on tactical defensive employment. And if there was one place in the whole war where a resort to gas could have been both feasible and potentially decisive, Normandy was it. Hitler knew that the war would be irretrievably lost on the day the Allies secured a solid beachhead, and his strategy for the previous eight months had been entirely directed at preventing just that. He had attempted to bring every possible means to bear, but not gas.[38] The omission has been attributed, no doubt correctly, to the massive retaliatory capability of Allied air power. Nevertheless, it is remarkable that as desperate as he was and as irrational as he was thought to be, Hitler seems hardly to have toyed with the idea, either before the invasion or after, of staging a chemical last stand.

Gas might also have been used earlier in the war as an alternative weapon to break the spirit of an enemy who had been reduced to tactical and strategic impotence by other means. In May 1942, responding to an express Soviet concern over such a contingency, Prime Minister Winston Churchill threatened British retaliation in kind by air if Germany employed gas against the Soviet Union.[39] A month later President Roosevelt pledged the United States to do the same against the Japanese if they used gas in China.[40] Practically, a chemical coup de grace engendered the same requirements and uncertainties as a chemical offensive would have.

All in all, gas was effective only in deterring itself. It did not offer the first user the promise of a result sufficiently swift and certain to warrant the risks its introduction into the war would have entailed. Although mass slaughter by explosives and fire became one of the war's routines, no government or people, whether in pursuit of quick victory or in the throes of defeat, could bring itself to regard gas as an acceptable weapon. The overwhelming psychological effect anticipated by Waitt, Ochsner, and others would have required a defenseless victim and an immune user. Those conditions existed for only one weapon in World War II, the atomic bomb.

THE MATURE SUPERWEAPON

Nuclear explosives measured in kilotons and megatons and customized for delivery by means ranging from field artillery to intercontinental ballistic missiles have reduced the apocalyptic visions of previous generations to somewhat quaint commonplaces. Reality has surpassed imagination. H. G. Wells's Martians, Bloch's double lines of corpses, and even the prospect of 42 tons of

mustard gas on London are outdone in the pages of the Department of Defense *Annual Report*, where prospects such as the following are to be found: three quarters of a million casualties from a one-megaton nuclear explosion over a city, one third dead instantly and another third too badly burned to survive; as many as 22 million US fatalities from a "limited" nuclear attack; and from 155 to 165 million Americans dead in a massive exchange.[41] Bulwer-Lytton's "vril" is no great marvel in a time then the acronym MAD denotes an existing condition. Nuclear reality has also outstripped other superweapon realities. Gas had potentials. Nuclear weapons have capabilities. As of 1914, conventional weapons were near the maximum of power for their class. Nuclear weapons have opened an entire new range of power. In short, they are mature superweapons, ready to do all that has been expected of armaments in that category, and then some.

According to General André Beaufre, two parties possessing full nuclear panoplies will have reached a state of mutual deterrence adequate in all likelihood to prevent either one from initiating a general nuclear war.[42] While serving as US Secretary of Defense, Harold Brown stated that mutual strategic deterrence is "in effect" between the United States and the Soviet Union.[43] The Soviet Union does not accept the concept of mutual deterrence at any level, but its strategic theory maintains that a general war cannot be successfully resolved by nuclear means alone.[44] The nuclear weapon has apparently outclassed its predecessors only to fall heir to their principal strategic disabilities. Like poison gas, it offers bleak prospects as *the* alternative weapon: an inconclusive military outcome and perhaps even mutual suicide. Like the conventional arms of World War I, it has produced an offensive-defensive stalemate with the trenches, in the form of missile silos and submarines, already dug and manned.

Although nuclear weapons do not appear at present to hold the potential for a grand-slam victory on anybody's part, it seems likely that they would have a central and probably decisive role in a future war between major nuclear powers. Although Soviet doctrine allows for the possibility of a nonnuclear conflict in a "continental theater of war,"[45] it also maintains that "mass nuclear-rocket strikes . . . will be the main, decisive method of waging war."[46] The US and NATO policy of flexible response rests upon tactical and strategic nuclear readiness[47] and incorporates a conventional phase of warfare extending up to an unspecified nuclear threshold. Both sides hold an escalation to nuclear war to be more than likely—if for no other reason than, as Nikita Khrushchev once put it, neither side could be expected "to concede defeat before resorting to the use of all weapons, even the most devastating."[48] On the other hand, while such an assumption of inevitable use may be part of the raison d'être of the superweapon, experience has shown it to be conditioned by the perceived nature of the weapon, the military utility of the weapon, and the strength of the compulsion to escalate.

No matter what else it may be, a superweapon is bound to be looked upon as a "most unpleasant" instrument of war. There being no Geneva Protocol pertaining to nuclear weapons, no government is under any legal or explicit moral obligation to refrain from their use. On the other hand, no government has shown an inclination to leave the decision on first use to anyone but the highest authority in the state. The most compelling reason for such close control has been

> a world-wide sense of moral revulsion against nuclear weapons, a conviction that they are not legitimate military weapons, that they belong in a class with bacteriological weapons and poison gas.[49]

It is arguable that nuclear and conventional explosives are roughly comparable in certain configurations, but nobody has argued, as was done in the instance of gas, that nuclear weapons will make war less violent or more humane. Former Soviet Minister of Defense Marshal A. A. Grechko has said:

> The constant awareness of a nuclear threat will unquestionably have an effect on the morale of the army and the people. It will give rise to an enormous strain on their spiritual and physical forces.[50]

Superweapons have tended to be self-deterring. If a strategic standoff is in effect, the nuclear weapon can be employed as a weapon of rational choice only at some lesser level and in a combined-arms role. Since in this century a war of movement has afforded the only escape from stalemate and attrition, the nuclear weapon can be an effective offensive weapon only if it promotes—or at least does not impair—mobility. Soviet theory extols the ability of nuclear weapons to demolish enemy defenses to their fullest depth with one blow and thereby open the way for a decisive sweep by mobile forces. It also tacitly recognizes, however, that a tactical nuclear exchange would impose heavy initial losses on both sides, would complicate offensive concentrations, and would require the mobile forces to contend with major obstacles in the form of devastated and contaminated areas.[51] Since mobile, blitzkrieg-like operations do not appear to gain in economy, efficiency, or certainty of result with the use of nuclear weapons, an aggressor may well find a nonnuclear offensive to be by far his best option.

If the nuclear weapon has created a strategic standoff, it ought to be able to do the same at other levels and thus primarily benefit the nonaggressor. General Beaufre believed that the introduction of tactical nuclear weapons had done that some years ago.[52] But the analogy is weak. Given the present distribution of power in the world, the strategic nuclear stalemate prevents a war that could not be fought by other means; tactical and theater nuclear weapons do not. A continental war on the scale of World War II could be fought solely by conventional forces unless one party elected to impose a nuclear stalemate. And that party would most probably have to be the one who least wanted war in any form.

Escalation has been part and parcel of 20th-century war, and superweapon theory has maintained from the first that war is a desperate enterprise in which the warring parties will not forego the use of an effective weapon. In the nuclear age it is taken for granted that a chain reaction exists in war—that any conflict engaging the vital interests of the nuclear powers will begin to escalate the minute the first shot is fired and will probably run the full course. This is the Khrushchevian thesis and the foundation, in one way or another, on which all current general war doctrine stands. Yet while such theory cannot be disproved, neither does experience with superweapons over the years confirm the existence of such a linear progression. For two decades after 1918, military opinion generally held that conventional weapons, as they were employed in World War I, had determined the nature of war for all time; and every nation in Europe built as much of a Maginot Line as it could afford. Poison gas was thought of as a cheaper and faster-acting instrument of attrition at the tactical level and a weapon potentially capable of decisive tactical and strategic applications. When war came, the internal combustion engine, coupled with appropriate tactics, subordinated the older conventional weapons to a war of movement. Gas retained its superweapon status and was excluded from the war. Spontaneous escalation did not occur, nor did deliberate escalation, although both were to some extent evident in at least the aerial bombing aspect of the war. In the most destructive war ever fought, the most potent superweapon then available could not qualify as an acceptable means of intensifying violence.

CONCLUSION

If a global war is unwinnable, and a continental theater war cannot be won by nuclear means alone, it appears that the purposes of aggression would probably be best served, and be attainable at a less-than-prohibitive price, only by a reversion to mobile conventional warfare. The opera-

tional characteristics of superweapons as a class indicate that the aggressor may keep out of contention a weapon less useful to him than it could be to his victim. The option to repel conventional aggression by nuclear means may be open to the defender, employing those means as a trip wire or in a flexible-response pattern, if the defender is prepared to turn the conflict into one of nuclear attrition at some point. Past experience with superweapons and present circumstances suggest that the decision to do so would be exceedingly difficult and perhaps not even possible. It would appear, therefore, when one examines the nature of superweapons past and present, that readiness to meet and defeat conventional aggression by like means would be the most effective deterrent and, having been challenged, by far the best response.

In a period of conventional readiness, the nuclear superweapon might possibly someday be subjected to the judgment once passed on a lesser offspring of the breed, DORA. The most powerful artillery piece ever built, DORA was a late-blooming flower of conventional superweaponry, the German reply to the Maginot Line. It had a barrel 101 feet long, a bore of 31½ inches (800 mm.), and it fired a seven-ton shell to ranges up to 30 miles. In tests, it demolished reinforced concrete walls 24 feet thick and punched through 90 inches of steel with single rounds. But the Maginot Line did not need such ministrations; thus the Chief of Artillery in the German Army High Command, after failing to find another suitable mission, pronounced DORA "an extraordinary work of art but useless."[53]

NOTES

1. Omar N. Bradley, *A Soldier's Story* (New York: Henry Holt & Co., 1951), p. 279.
2. Leslie R. Groves, *Now It Can Be Told* (New York: Harper & Brothers, 1962), pp. 199-206.
3. Ivan S. (Jean de) Bloch, *The Future of War in Its Technical, Economic and Political Relations* (New York: Garland Publishing, 1972), pp. xvi, 29, 49.
4. Ibid., p. xxxi.
5. Friedrich von Bernhardi, *On War of Today* (New York: Garland Publishing, 1972), pp. 1-32.
6. Jean L. A. Colin, *The Transformations of War* (Westport, Conn.: Greenwood Press, 1977), p. 35.
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