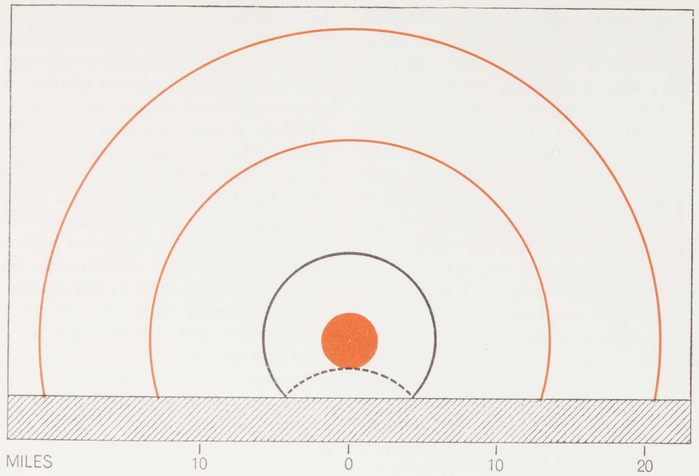
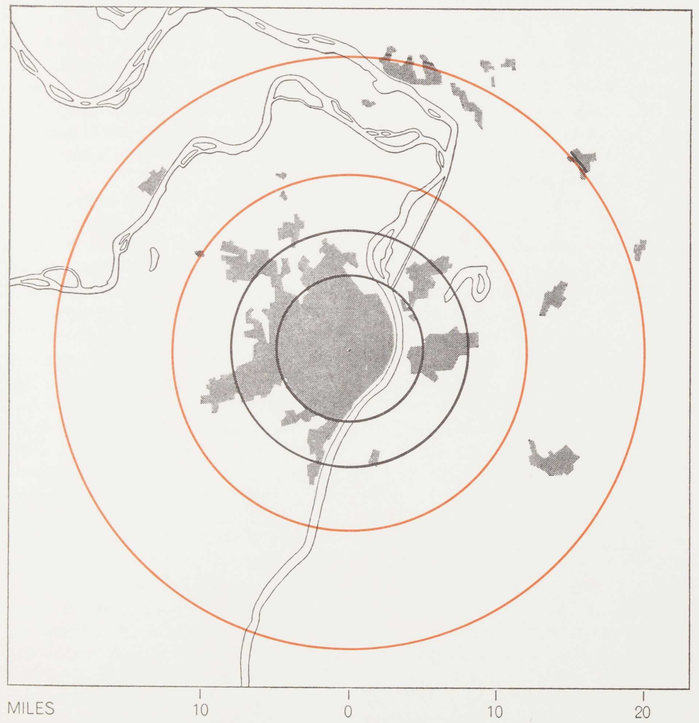


AIR BURST of a nuclear bomb would maximize its effects on a city, the most widespread of which would be due to heat. This drawing outlines the effects of a 10-megaton bomb set off at 20,000 feet. At 12 miles (*inner colored circle*) from "ground zero" the fireball, 3.4 miles in diameter, would deliver 30 calories per square centimeter at a rate sufficient to ignite virtually all flammable building materials. At 20 miles (*outer colored circle*) from ground zero the heat would be 12 calories per square centimeter, enough to cause third-degree burns and start many fires. Arc extending upward from ground below the burst is a reflected shock wave that would amplify blast effects of the explosion (*see drawing below*).



RADII OF EFFECTS of a 10-megaton air burst are superimposed on a map of St. Louis and the surrounding area. The two colored circles correspond to the colored circles in the drawing at the top of the page. The black circles concern effects due to blast. At a distance of five miles (*inner black circle*) from ground zero virtually all buildings would be destroyed. At eight miles (*outer black circle*) virtually all wooden buildings would be destroyed.

sion that "enough is enough." In today's jargon this is the policy of the minimum deterrent—that is, the possession of a nuclear force adequate only for a retaliatory attack on enemy cities but incapable of successful attack on the enemy's nuclear delivery system. It is clear that only a small nuclear delivery system is necessary for a minimum deterrent. One big hydrogen bomb dropped on a big city could kill several millions. The small delivery system must, however, be highly invulnerable. Otherwise the enemy might think it possible to bring off a successful "counterforce" first strike, aimed at the destruction of the system. Little operational intelligence is needed for such a minimum deterrent policy because this involves attack on cities, whose locations are known, and does not involve surprise attack on nuclear bases, whose locations therefore do not need to be known.

On the political plane, it was thought, the resulting period of relative stability would be favorable for a serious attempt to negotiate a substantial measure of disarmament, both nuclear and conventional. Far-reaching disarmament was seen to be highly desirable, if only because such a balance of terror is stable solely against rational acts of responsible governments. It is not stable against irresponsible actions of individuals or dissident groups or technical accidents. A few suitably placed individuals—a missile crew or the crew of a nuclear bomber on a routine flight—could kill a few million enemy city dwellers on their own initiative. The best way to reduce this danger is to reduce drastically the number of nuclear weapons on both sides.

The second and quite different doctrine was that the balance of terror was not even stable against rational acts of responsible governments. This was based on the view that a determined nuclear power might be able to launch a surprise counterforce attack on the enemy's nuclear delivery system of such strength that the enemy would not be able to retaliate. The aggressor, without suffering unacceptable casualties, would then have the enemy at its mercy. The practical consequence of this doctrine is to strive for maximum superiority in number of weapons, maximum invulnerability of one's own nuclear delivery system and maximum intelligence about the enemy's nuclear system.

Plainly a successful counterforce attack would require knowledge of the location of all the enemy's nuclear missile and air bases and the power to dispatch several weapons against each, so as to ensure that at least one reached its target. A counterforce strategy thus implies the necessity for a many-fold nuclear superiority over the enemy. Moreover, to have the slightest chance of success such an attack must come as a complete surprise to the enemy: it must be a first strike. This policy has various pseudonyms: maximum deterrent posture, first-counterforce-strike capability, or, in plain English, preparation for nuclear aggression.

Since the possession of nuclear armament raises the possibility that either side could adopt either one of these strategies, both of them must have been discussed in military circles in Moscow and Washington during the years after the explosion of the first hydrogen bombs in 1954. Let us try to find out how the discussions went by studying what shape the nuclear-defense policies of the U.S.S.R. and the U.S. took in the subsequent years.

If the Washington figures for Soviet nuclear strength are valid, it is clear that the U.S.S.R. has planned for a purely retaliatory nuclear role and has definitely not planned for a surprise attack on the U.S. delivery system. As long ago as 1956 the U.S.S.R. was believed to have the capability of making 25 long-range bombers a month. It appears today to have only some 150, compared with the 1,700 U.S. long-range bombers able to reach the U.S.S.R. Even though Soviet medium-range bombers could reach the U.S. on a one-way flight, this is much more than counterbalanced by the 1,500 or so Western fighter bombers, carrier-borne aircraft and medium-range missiles able to reach the U.S.S.R. It is also probable that the U.S.S.R. could have made many more than the 50 or so ICBM's with which it is now credited, since its space program indicates substantial industrial resources for making missiles. The evidence is that the U.S.S.R. has based its safety on the retaliatory power of a small number of missiles and aircraft operating from bases whose exact locations are kept as secret as possible. The deterrent value of its missiles is certainly enhanced by the prestige of its space program.

That the U.S.S.R. believed the danger of a major war, intentionally initiated, had been reduced by the advent of hydrogen bombs seems indicated by the fact that it reduced the total number of men in its armed forces from 5.8 million in 1955 to 3.6 million in 1959. In January, 1960, Premier Khrushchev announced the U.S.S.R.'s intention to reduce this to 2.4 million by the end of 1961. The U.S.S.R. needed fewer troops because it no longer had to rely on a retaliatory land blow in Europe to counter a Western nuclear attack. Its concern about the danger of accidental, irresponsible or escalated war is probably one of the reasons for its strong espousal in 1955 of a drastic measure of comprehensive and general disarmament.

Turning to the history of U.S. defense policy over this period, it is to be noted that the total service manpower fell slowly from 2.9 million in 1955 to 2.6 million in 1960. The development of improved nuclear weapons, missiles and aircraft continued, but not at a great rate, even after the Soviet launching of an artificial satellite in 1957 and much boasting by the U.S.S.R. of its missile prowess. Although subjected to considerable public pressure to engage in a crash program to close the alleged missile gap, President Eisenhower maintained that the existing program was adequate for the safety of the nation. In his last State of the Union Message in January, 1961, he declared: "The 'bomber gap' of several years ago was always a fiction and the 'missile gap' shows every sign of being the same."

As 1954 was the year of the hydrogen bomb, so 1961 was for both sides in the cold war the year of the Great Rearmament. In the U.S.S.R. the decrease of total armed forces to 2.4 million projected for 1961 was deferred and the arms budget was markedly increased. In July the Soviet Government went on the diplomatic offensive to bring about changes in the status of Berlin and to get the division of Germany recognized. In August it began testing nuclear weapons again, in spite of a promise in January, 1960, by Premier Khrushchev that the U.S.S.R. would not be the first to do so. No doubt there were some political motives behind these drastic moves. Possibly heavy pressure was put on Khrushchev from China and from the opposition elements in the U.S.S.R. to admit that his policy of coexistence had not produced political gains commensurate with its possible military risks. But such drastic changes, with the inevitable adverse reaction of much of world opinion, would hardly have been made unless there were strong military reasons for them. To get at these reasons it is necessary to recall in more detail the circumstances in which the changes took place.

In the first place the flights of the U.S. reconnaissance U-2 aircraft must have had decisive importance in shaping the attitudes of Soviet military leaders. Although the over-all nuclear strength of the U.S. is now, and was then, much greater than that of the U.S.S.R., Soviet leaders could reckon that one vital factor would make a U.S. nuclear attack on the U.S.S.R. exceedingly risky: the secrecy as to the location of the Soviet nuclear bases. Obviously one of the main objectives of the U-2 flights was to locate those nuclear bases. The Soviet command knew that the U-2 flights had been going on for some years before the first aircraft was shot down in the spring of 1960; presumably they reacted by greater dispersal and camouflage. What must have disturbed the Soviet military staff was President Eisenhower's justification of the flights as essential for U.S. security. This implied that U.S. security could only be maintained if the U.S. had sufficient information as to the location of Soviet nuclear sites to make possible a successful surprise attack on the Soviet retaliatory force.

If these were the Soviet fears, the rejection by the U.S.S.R. early in 1961 of the British-American draft of a treaty to ban the testing of nuclear weapons finds explanation in the same jealous military concern to protect the country's geographical security. A detailed study of this document makes it clear that the elaborate international inspection system proposed for the prevention of underground tests could conceivably have served to reveal the location of at least some of the Soviet missile sites. It would be hard to convince a military staff officer of any nationality that this possibility was negligible. If the West had been content to monitor only the atmosphere against test violations, a much less comprehensive inspection system would have sufficed and a test-ban treaty might well have been signed. The Soviet fear of inspection may have been the more acute because there was so little in the U.S.S.R. to inspect.

The resumption of testing by the U.S.S.R. in September, 1961, would seem to fall into the same pattern of motivation. Although its timing may have been influenced by the Berlin crisis, which Khrushchev himself brought to a head, the testing of war heads with an explosive force of up to 60 megatons and the simultaneous well-publicized success of putting seven ICBM's on their target in the Pacific at a range of some 7,000 miles was an effective way of reestablishing the U.S.S.R.'s confidence in the few deployed ICBM's that formed its main retaliatory force. Soviet spokesmen