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GROUND ZERO, D.C.

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ONE WAY to understand the immense destructive power of nuclear weapons is to imagine a nuclear attack against targets in the Washington, D.C. area. This targeting exercise yields some disturbing conclusions. The most important is that nuclear war, in practice, wouldn't be as manageable as it may seem on a nuclear strategist's blackboard. The strategists talk in terms, suggestive of conventional war—about "limited nuclear options" and "warning shots across the bow" and "counterforce" targeting that seeks to destroy military facilities rather than population centers. But such bloodless discussions ignore the reality of

nuclear weapons, which are more devastating and less controllable than the theorists imagine. To put the problem simply: Any attack against "military" targets is likely to cause severe damage among the civilian population as well. In the Washington area, for example, a "limited" attack against Andrews Air Force Base could result in the destruction by mass fire of the southeast suburbs of Washington. The damage to civilians in such "limited" attacks would be compounded by the inevitable preference among military planners for redundant systems and "overkill."

The first step in planning a nuclear attack on Washington would be the selection of specific targets. Without giving away useful information to potential adversaries, we can safely assume that a hypothetical target list probably would include: bases for military operations (such as Andrews Air Force Base and National Airport); facilities that support military operations (such as the Central Intelligence Agency, the Defense Mapping Agency, the Pentagon, the Navy Yard, and the Naval Research Laboratory); and the headquarters of the political and military leadership (the White House, the Capitol, and the Pentagon).

The next step after selecting targets would be to set damage objectives for each. If the attack planner's objective was to destroy America's leadership and support structures, he would probably opt for a high level of damage in the Washington area. Setting damage objectives would involve a careful calculus of how to do the most damage in the most efficient way. Since the Capitol, the Pentagon,

and the Central Intelligence Agency are reinforced monumental structures, a large blast creating pressure of 40 pounds per square inch (psi) might be considered necessary to reduce these structures to rubble. Since the White House may have underground bunkers, a 40 psi blast might be needed there, also. The Defense Mapping Agency might require a 15 psi blast, which probably could knock down all but the most reinforced buildings, while the Naval Research Laboratory and Navy Yard might require a 10 psi blast, since those facilities are "softer" than the others.

The damage objectives for National Airport and Andrews Air Force Base would probably demand the destruction of all associated buildings that could be used to support dispersed aircraft, together with the cratering of runways so they could not be used after the attack.

Next would come the allocation of warheads. Let's assume the attack planner had a choice between using 50-kiloton or one-megaton weapons. To allocate them efficiently, he would carefully select the ground zero for each weapon. The attack planner might calculate as follows: A single one-megaton ground zero between the Central Intelligence Agency and the Defense Mapping Agency would result in a blast of more than 40 psi on the first and more than 15 psi on the second. Another one-megaton ground zero between the White House and the Capitol would result in a 40 psi blast on both and more than a 10 psi blast on the Navy Yard. And so on.

With a lower yield 50-kiloton weapon, a ground zero between the Capitol and the Navy Yard would barely cover both with appropriate levels of blast. Another ground zero north of the Naval Research Laboratory would cover that target and do additional damage to the untargeted air facility (Bolling Air Force Base) north of the laboratory. The attack planner's goal would be to mix the warheads efficiently, with some redundancy and "cross targeting" to make sure each target was destroyed.

To understand the effect of a nuclear attack, it's useful to imagine what a hypothetical attack on Washington would look like from ground zero, and how it would evolve over the first few hours. The first warheads to arrive at their targets in our scenario would be the 50-kiloton submarine-launched warheads. They would travel their course of about 3,000 nautical miles in about 20 minutes. The warheads probably would arrive about five to 10 seconds apart, first at the Central Intelligence Agency, then at the Defense Mapping

Agency, the Pentagon, National Airport, and the eastern or western runway at Andrews Air Force Base. For the postulated initial phase of the attack, five 50-kiloton warheads therefore would fall in the target area within 30 to 60 seconds.

The intense light from each fireball could set fires at a range five to six times greater than the contour of 40 psi damage. Thus the detonation at the Central Intelligence Agency could set fires at the Defense Mapping Agency; the detonation at the Pentagon could set fires at the White House, the Capitol, and National Airport; the detonation at National Airport could set fires at the Naval Research Laboratory and possibly at the Navy Yard. Independent of blast effects, the five initially arriving weapons could create mass fires over about 60 to 70 square miles of the target area.

Nearly all frame buildings within a range of four times the 40 psi contour would be knocked down. At yet greater distances, about eight times the radius of the 40 psi contour, the shock wave from each detonation would be severe enough to knock non-supporting interior walls out of buildings. Thus, 12 seconds after the fireball flash from the detonation at the Pentagon, the shock wave would arrive at the White House and Capitol, shattering windows and knocking out the non-supporting interior walls within each building. At still greater distances from each detonation, heavy general damage from the shocks would occur, possibly initiating many secondary fires from broken gas mains, electrical shorts, tipped-over stoves and the like.

During the next 10 minutes after the arrival of the 50-kiloton warheads, the mass fires would intensify. Because of smoke from fires and dust raised by the shock waves, visibility on the ground would be very low. Large amounts of smoke from the burning areas would begin to fill the sky, blocking out the sun. Black radioactive rain might fall in much of the target area as water vapor that was carried to high altitudes by the heated buoyant air from the fires condensed in the cooler air above.

Movement on the ground within the target area, even by very well equipped personnel, would probably be impossible. Winds on the ground would begin to increase as cooler air from regions surrounding the target zone became drawn in to replace the buoyantly rising heated air from mass fires. As the heat from mass fires intensified, air temperatures would begin to rise, perhaps to hundreds of degrees.

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It would start to arrive at about this time. Since they would come from the north, the two airfields would be struck first. Both air installations might be hit initially with cratering surface bursts, and then within two to three seconds by airbursts slightly offset from the targets so as to avoid the tremendous cloud of developing debris from the surface bursts.

Because these one-megaton detonations would have a much higher yield than the earlier 50-kiloton explosions, the blast and thermal effects would be considerably more intense and extensive. For example, the blast from a detonation between between the White House and the Capitol could knock down some buildings near the Defense Mapping Agency and could shatter windows and do heavy damage to buildings at Andrews Air Force Base.

Within 10 or 20 minutes of the near-surface detonations, pieces of intensely radioactive dust, rock, and clumps of earth would start falling over large sections of the target area. During the next few hours, intense fires would burn over hundreds of square miles. The fires would generate air temperatures above that of boiling water; toxic levels of carbon monoxide, carbon dioxide, and other poisonous gases; and winds of hurricane force. Radiation levels in much of this area might be sufficiently high to deliver a lethal dose to unsheltered people every 10 to 20 minutes.

Finally, the bombers and cruise missiles would arrive to take care of any targets that had not yet been destroyed. They would probably reach Washington about the time the fires began to subside, perhaps six or seven hours after the arrival of the first warheads. If the bombers assigned to drop gravity bombs successfully penetrated to the target area, the bomber crews might see that the missiles had already done the damage and refrain from dropping bombs, moving on instead to an alternate target.

Nuclear strategists sometimes argue that these scenarios of total devastation are unrealistic. In the modern era, they argue, American and Soviet attack planners would select limited nuclear options, designed to achieve specific military objectives, rather than launch a spasmodic, all-out attack.

These limited options, in theory, might leave the Washington, D.C. area unscathed. For example, attack planners might decide to spare communications facilities, so that an adversary could maintain control over forces that might otherwise be launched. Or they might decide not to attack leadership facilities, in the hope that officials would survive to negotiate an end to hostilities. Or they might decide to spare population centers, either for moral reasons, or to spare their own population from retaliation, or to hold the enemy's population hostage.

The problem with this approach is that it ignores reality. The very large scale and unpredictable nature of many nuclear effects may make it impossible to implement cleanly and unambiguously the restraining measures sought by policymakers.

to be certain that they destroy their assigned targets completely, they are likely to use more weapons—and more powerful ones—than would be appropriate for a truly "limited" strategy. For the same reason, planners are likely to overestimate the hardness of targets and to neglect some weapons effects.

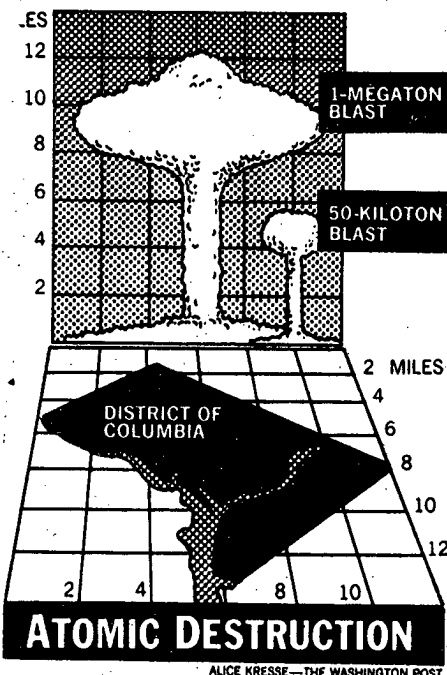
Consider, for example, the effects of a one-megaton airburst over Andrews Air Force Base. Under certain conditions such an attack might be considered limited, since rules adopted for damage assessment might consider the nearby population centers subjected to 5 psi or less to be "lightly damaged." The

same rules might also determine that fatality levels in the area beyond the 5 psi radius would be very low.

But if planners do not include the effects of fire in their assessments of unintended damage, a decision-maker would be unaware that his "limited" option could produce mass fires over a large area. These fires could be expected to generate high winds and air temperatures, perhaps as intense as those witnessed in the Dresden and Hamburg firestorms of World War II, and could quickly kill most or all of the population in the fire zone.

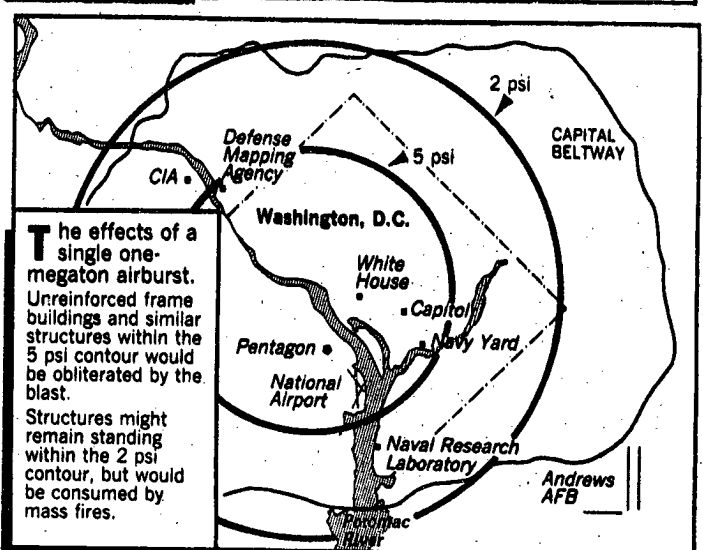
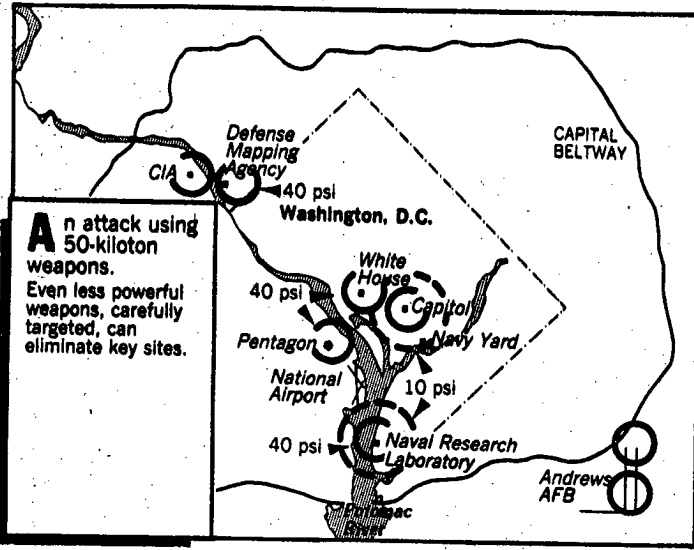
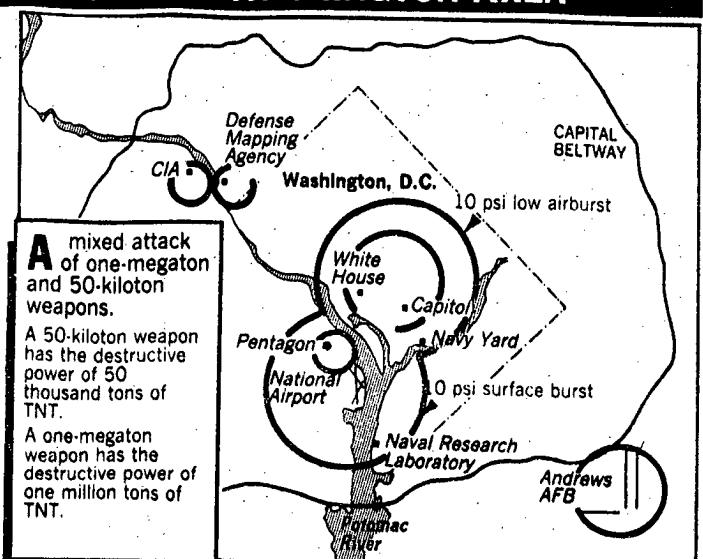
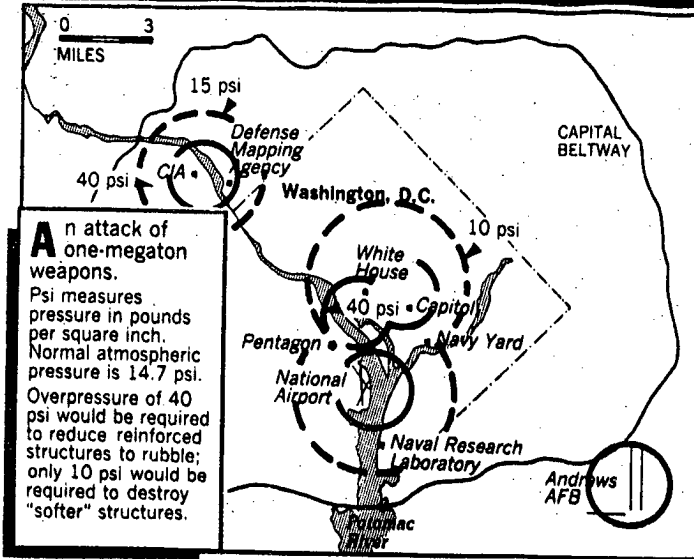
In contemplating nuclear weapons, it is important to bear in mind the enormity of the change they represent in the nature of war. When the atomic bomb was dropped on Hiroshima in 1945, the most revolutionary weapon ever introduced destroyed not only a city, but all classical concepts of warfare as well. Suddenly, temperatures and energy densities comparable to those that exist in the interior of stars could be achieved at the surface of the earth. Added to the tools of warfare was a weapon that could, in effect, deliver pieces of the sun's interior to the earth's surface.

The stunning power of nuclear weapons should make us wary of too much theorizing about them on blackboard battlefields. And it should remind us that in matters involving nuclear weapons, humility and caution are essential.



ALICE KRESSE—THE WASHINGTON POST

SCENARIOS FOR A NUCLEAR ATTACK ON THE WASHINGTON AREA



SOURCE: "Managing Nuclear Operations," The Brookings Institution.

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