MP-34—AUGUST 1965

BASIS FOR THE

DEPARTMENT OF DEFENSE

FALLOUT SHELTER PROGRAM

DEPARTMENT OF DEFENSE

OFFICE OF CIVIL DEFENSE

"AN EFFECTIVE CIVIL DEFENSE PROGRAM is an important element of our total defense effort.

It aims at the achievement of a nationwide fallout shelter system."

President of the United States

BASIS FOR THE NATIONAL FALLOUT SHELTER PROGRAM

The President in his message to the Congress on the state of our defenses which was delivered on January 18, 1965, said:

> "While confident that our present strength will continue to deter a thermonuclear war, we must always be alert to the possibilities for limiting destruction which might be inflicted upon our people, cities and industry -- should such a war be forced upon us.
>
> "It is already clear that without fallout shelter protection for our citizens, all defense weapons lose much of their effectiveness in saving lives. This also appears to be the least expensive way of saving millions of lives, and the one which has clear value even without other systems. We will continue our existing programs and start a program to increase the total inventory of shelters through a survey of private homes and other small structures."

A nationwide fallout shelter system is an integral part of the over-all defense program of the Department of Defense. Secretary of Defense McNamara has underscored this concept on many occasions. On February 18, 1965 he made the following statement to the House Armed Services Committee:

> "This year for the first time we are including in a single chapter the discussion of the three major programs which constitute our general nuclear war forces: The Strategic Offensive Forces, the Continental Air and Missile Defense Forces, and Civil Defense.

"I have made this change, not as a matter of style, but, rather to facilitate our analysis of the general nuclear war problem. It was clear last year that because of the close inter-relationship and, indeed, the inter-action of the three major components of our general nuclear war posture, the only practical way to deal with this problem is to incorporate all three components in a single analytical framework. Only then can the true character of the general nuclear war problem in all its dimensions be fully grasped and the relative merits of available alternatives be properly evaluated.

". . . In the event of general nuclear war, attacks might be directed against military targets only, against cities only, or against both types of targets, either simultaneously or with a delay. They might be selective in terms of specific targets or they might be general.

". . . A meaningful capability to limit the damage of a determined enemy attack. . . requires an integrated, balanced combination of strategic offensive forces, area defense forces, terminal defense forces and passive defenses. Such a structure would provide a 'defense in depth', with each type of force taking its toll of the incoming weapons, operating like a series of filters or sieves, progressively reducing the destructive potential of the attack. . . .

"Since we have no way of knowing how the enemy would execute a nuclear attack upon the United States, we must also intensively explore alternative 'defensive' systems as means of limiting damage to ourselves. The problem here is to achieve an optimum balance among all the elements of the general nuclear war forces, particularly in their Damage Limiting role. This is what we mean by 'balanced' defense.

"Although a deliberate nuclear attack upon the United States may seem a highly unlikely contingency, . . . it must receive our urgent attention because of the enormous consequences it would have. . . .

"Several points are evident from our analysis of this problem. First, it is clear that with limited fallout protection, an enemy attack on our urban areas would cause great loss of life, chiefly because of the heavy concentration of population in our large cities which I noted earlier. Second, the analysis clearly demonstrates the distinct utility of a nationwide fallout shelter program in reducing fatalities, at all levels of attack.

". . . a transfer of resources from fallout shelters to other defensive systems would result in substantially less effective defense postures for any given budget level. . . .

". . . any Damage Limiting program which excludes a complete fallout shelter system would cost at least twice as much as a program which includes such a system -- even under the favorable assumption that the enemy would not exploit our lack of fallout protection by surface bursting his weapons upwind of the fallout areas. In addition, fallout shelters should have the highest priority of any defensive system because they decrease the vulnerability of the population to nuclear contamination under <u>all</u> types of attack. . . .

The following sequence of charts presents the basis for the national fallout shelter program.

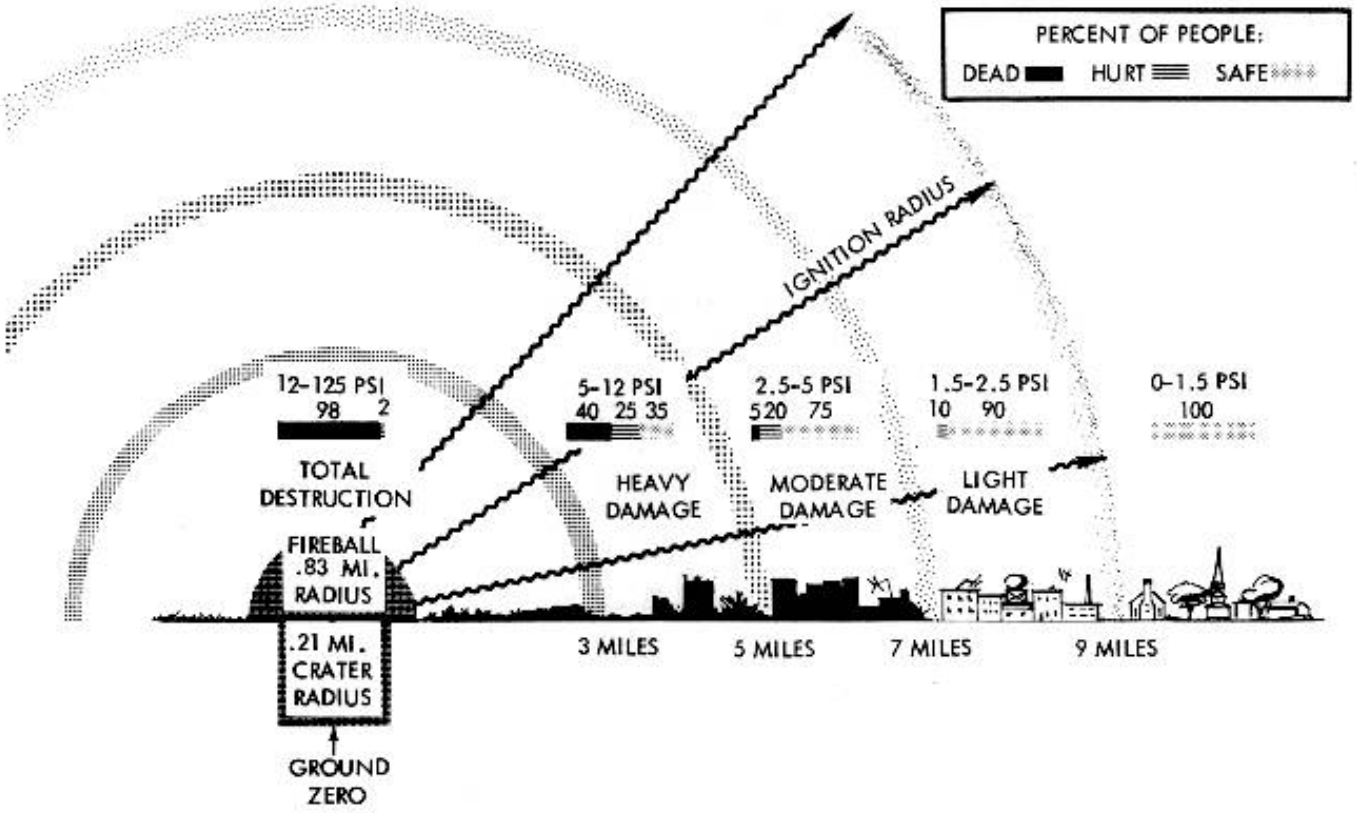
EFFECTS OF A 5-MT BLAST

Chart 1 shows the blast and thermal effects of a 5 megaton surface burst. People close to the detonation, within 3 miles of ground zero, are not likely to survive the blast and thermal effects. There is little that can be done for the population in this area as protection against the close-in blast effects of nuclear weapons is beyond the present capabilities of military or civil defense.

As you move out from the total destruction ring, however, chances for survival improve markedly. In terms of probabilities, the percentage of the population surviving blast and thermal effects increases rapidly as the distance from ground zero increases.

While millions of people could survive these initial effects of nuclear detonations, a large portion of the survivors would be exposed to the lethal effects of radioactive fallout.

EFFECTS OF A 5 MT BLAST



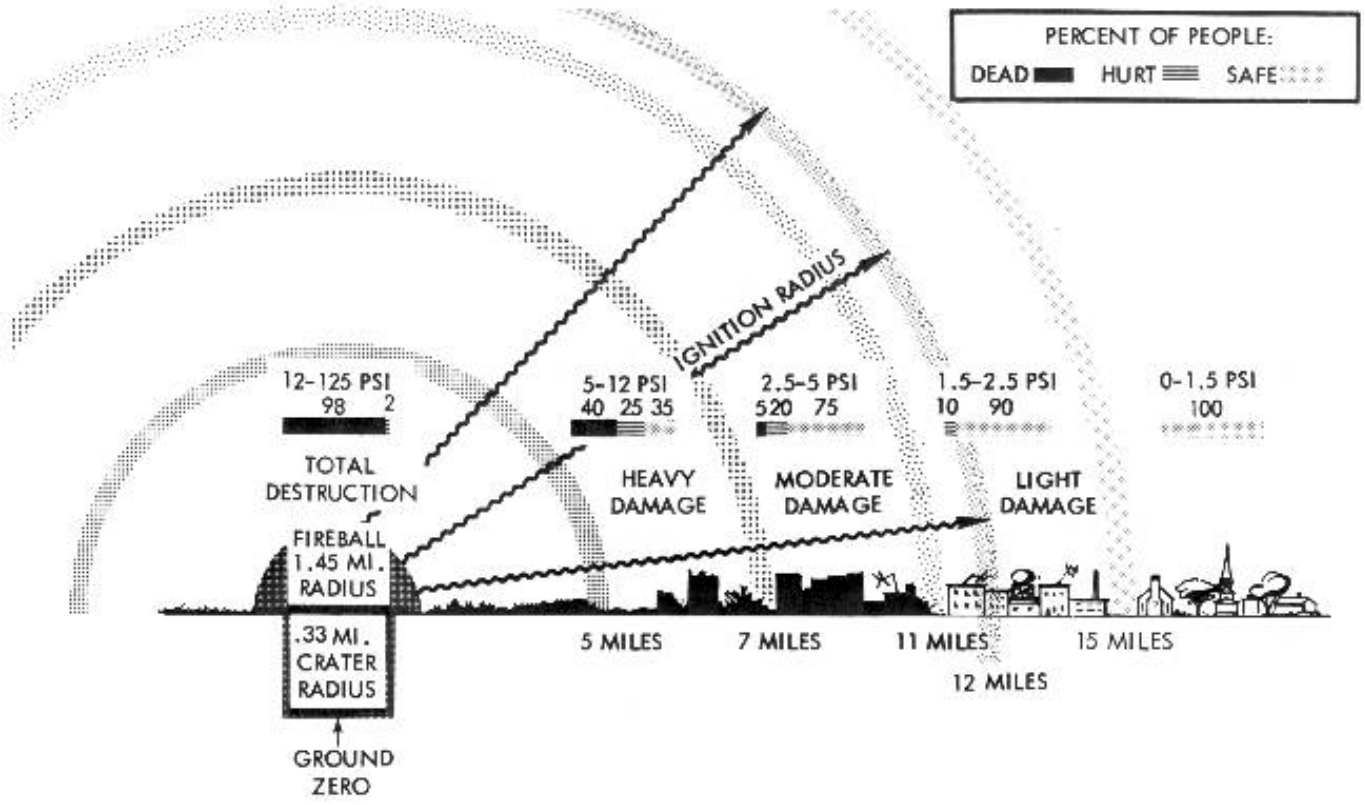
If burst is elevated to altitude maximizing reach of blast damage:
"Moderate Damage" from blast is extended from 7 to 11 miles
"Ignition Radius" (ignites newspaper) is extended from 9 to 10 miles

EFFECTS OF A 20-MT BLAST

Chart 2 shows the effects of a 20 megaton surface burst. While this amounts to a fourfold increase in megatonnage over the five megaton weapon the same blast and thermal effects occur at less than twice the distance from ground zero. As in the case of the five megaton weapon, millions of people could survive these initial effects.

EFFECTS OF A 20 MT BLAST

Chart 2



If burst is elevated to altitude maximizing reach of blast damage:
"Moderate Damage" from blast is extended from 11 to 17 miles
"Ignition Radius" (ignites newspaper) is extended from 12 to 17 miles

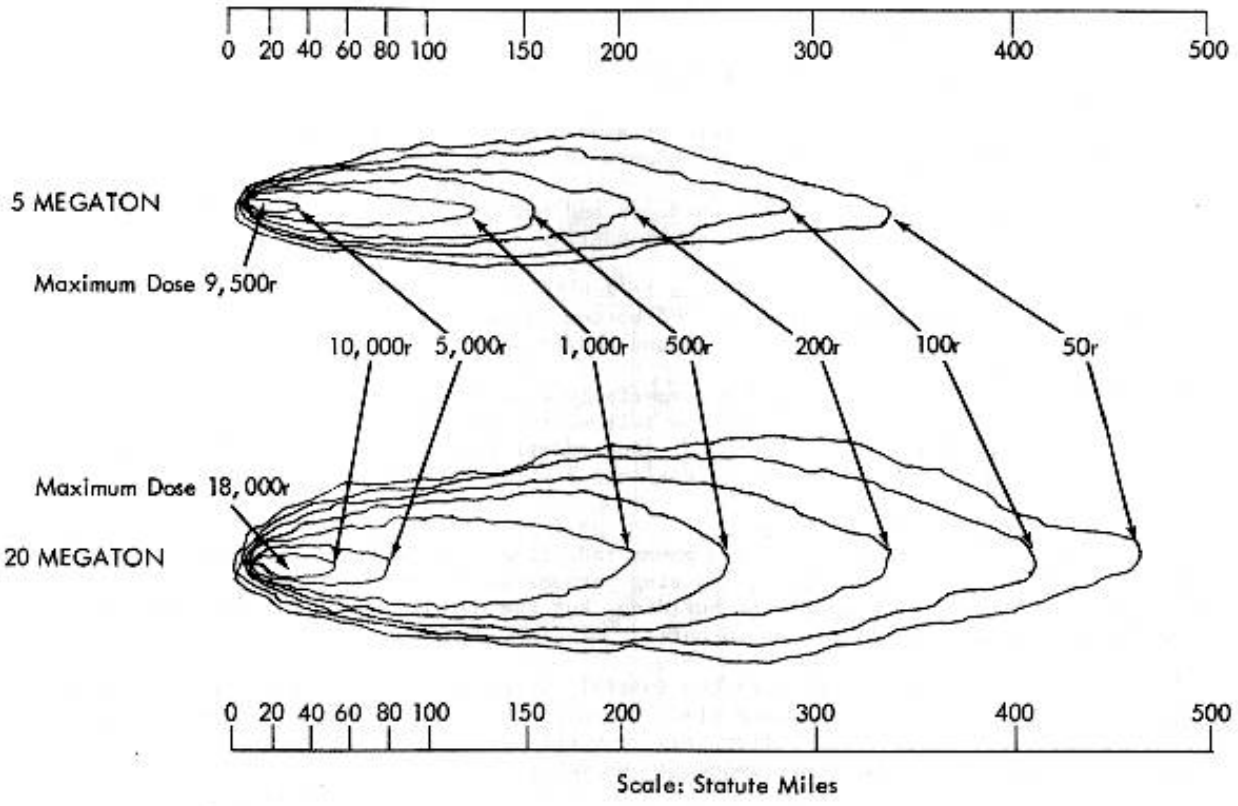
UNSHIELDED MAXIMUM EQUIVALENT RADIATION DOSE CONTOURS

Chart 3 illustrates the extensive geographical coverage of fallout radiation from 5 and 20 megaton surface blasts. Based on a 25 mph upper air wind, significant amounts of fallout from these weapons would be deposited over thousands of square miles of area down wind.

A dose of over 200r could cause disabling illness. At 450r there is a 50-50 probability of death and over 600r death is almost certain.

In an actual attack fallout from several weapons could overlap further increasing radiation levels.

UNSHIELDED MAXIMUM EQUIVALENT RADIATION DOSE CONTOURS
50% Fission - 50% Fusion
Average Wind Speed (25 mph)



FALLOUT RADIATION EFFECTS

Chart 4 illustrates the effects of fallout radiation upon occupants of a typical 10-story commercial building.

A few facts about the physical nature of fallout:

1. The fallout particles are like salt or sand; they have weight and settle on the ground; they are not likely to be indoors in harmful amounts.

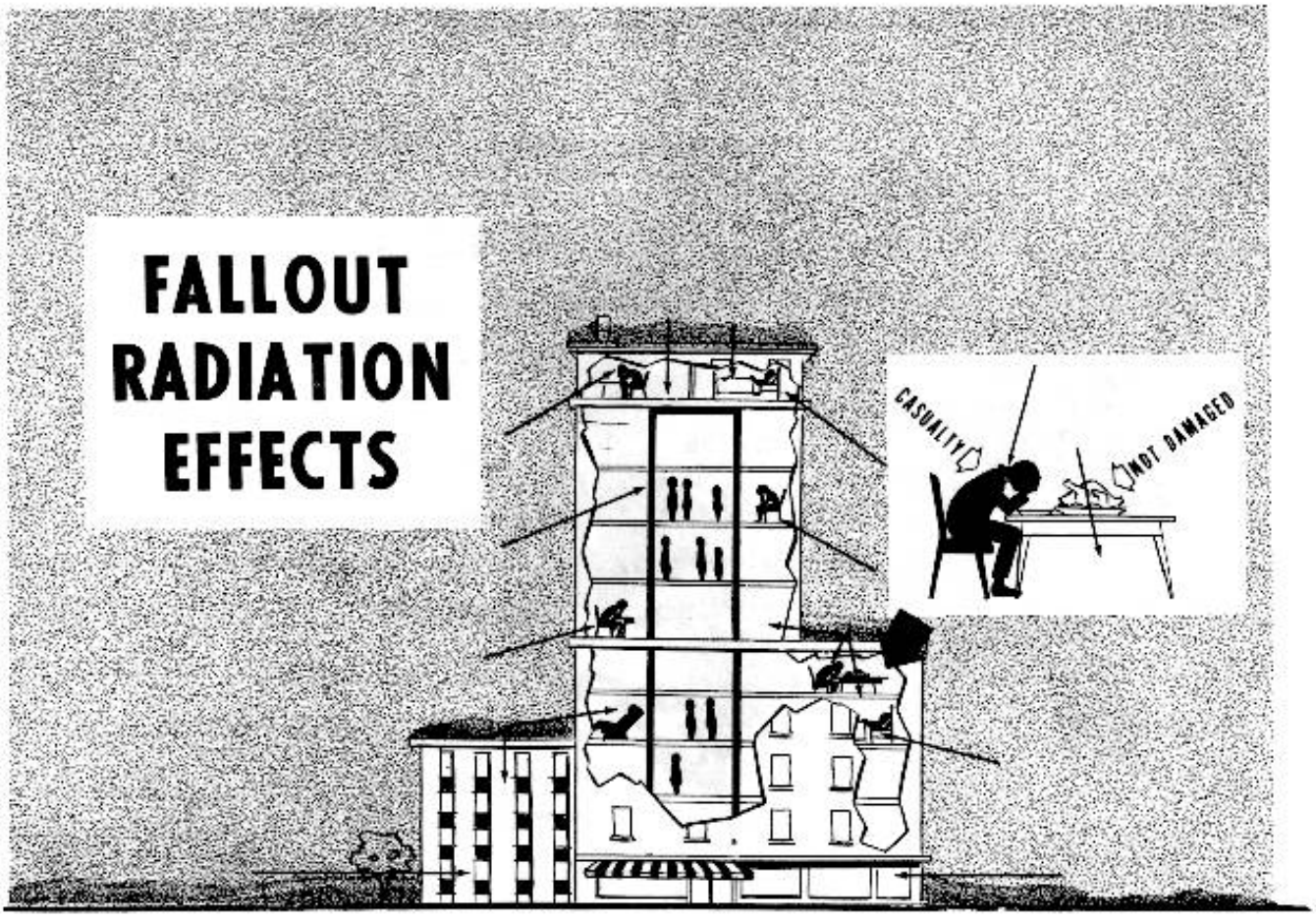
2. Food is not contaminated unless outdoors and covered by fallout particles; the particles can be removed by washing or peeling.

3. Only a small fraction of radioactive fallout is soluble in water. In addition, fallout particles sink rapidly to the bottom and potable water sources are protected by passing through the ground and by water purifying systems.

4. Fallout radiation decays rapidly, especially soon after the burst. Much is given off harmlessly in the air before the fallout reaches the ground. Even after reaching ground, decay continues to be rapid. For example, by the end of the third day the fallout radiation level would be less than a third of what it was at the end of the first.

In the chart, arrows represent the damaging gamma radiation from fallout particles. The arrows show radiation penetrating the outside walls, injuring persons in the outer rooms. Some radiation would penetrate the protective core area of the building, but the density of building material would reduce the radiation to levels doing little or no harm.

To the right of the building are pictured the initial effects of too much radiation on the human body; destruction of body cells is taking place, soon to result in intense illness. Depending on the amount of the dose, death could follow days or weeks later. However, the same radiation is shown passing through food without contamination or damage.


FALLOUT
RADIATION
EFFECTS
CASUALTY
NOT DAMAGED

FALLOUT CONDITIONS FROM A LARGE NUCLEAR ATTACK
(A Spring Day)

Chart 5 shows the geographic distribution of various levels of radioactivity resulting from an assumed attack. The targets attacked were a full range of military, industrial and population centers. Targeting variables included such matters as how war starts, enemy abort rates from malfunctions, attrition of incoming weapons from U.S. military action, duration of attack, weapons accuracy, and upper wind direction and velocity.

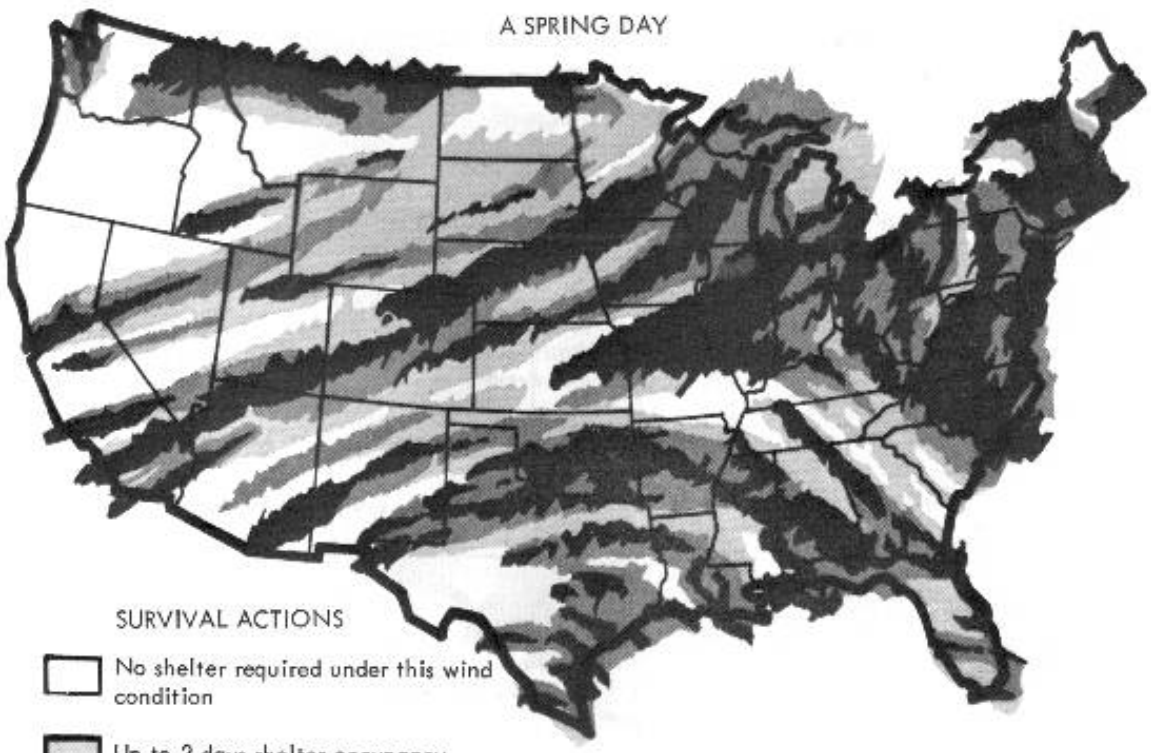
The level of attack is in excess of 5,000 megatons detonated on target, about 65% surface bursts which generate fallout.

About 75% of the land would be covered with dangerous levels of radioactive fallout if average winds prevailed. Areas shown to be free of serious fallout could virtually all be covered under different wind conditions.

The darkest areas would require a week to two weeks stay in shelters. Less dark areas would require two days to one week. The light gray areas would require shelter only for the first day or two.

FALLOUT CONDITIONS FROM A RANDOM ASSUMED ATTACK AGAINST A WIDE RANGE OF TARGETS: MILITARY, INDUSTRIAL AND POPULATION

A SPRING DAY



SURVIVAL ACTIONS

- No shelter required under this wind condition
- Up to 2 days shelter occupancy
- 2 days to 1 week shelter occupancy
- 1 week to 2 weeks shelter occupancy followed by decontamination in exceptional areas

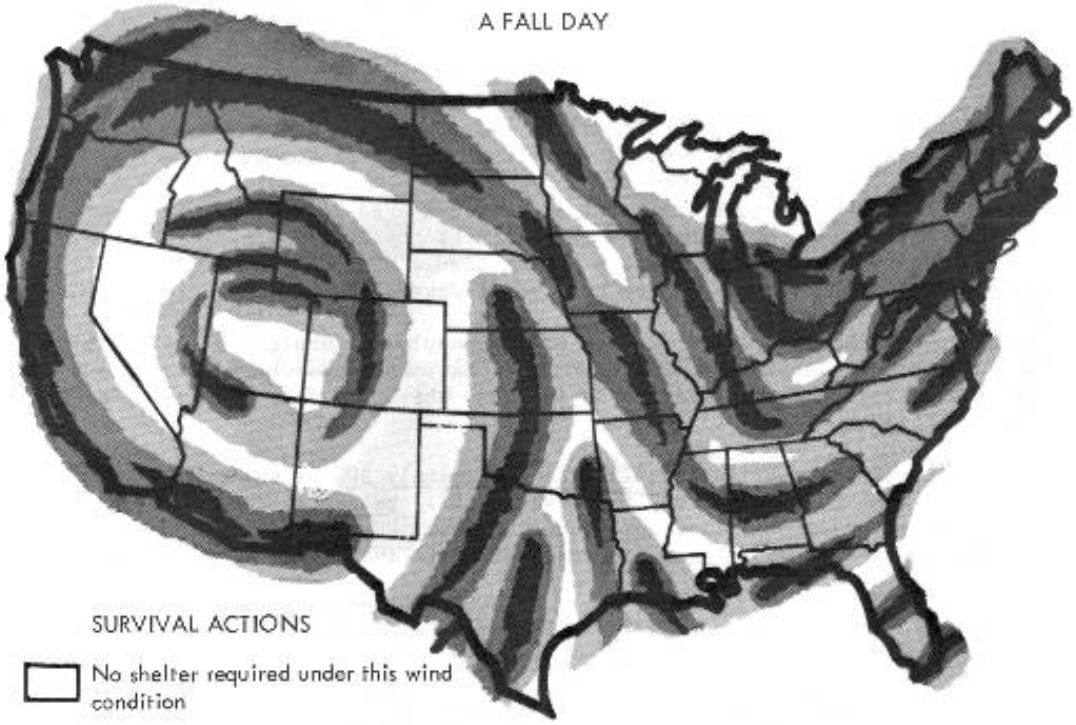
FALLOUT CONDITIONS FROM A LARGE NUCLEAR ATTACK
(A Fall Day)

Chart 6 shows the distribution of various levels of radioactivity resulting from the same attack used for Chart 5 but with the wind conditions of a randomly selected fall day. Much of the area which was free of fallout with the spring day winds is covered with serious amounts of fallout under the fall day conditions.

Even if targets, enemy intentions and offensive capabilities could be accurately predicted, the winds as of any day on which a potential attack might occur, could not be so predicted. Therefore, we must plan on providing fallout protection everywhere.

FALLOUT CONDITIONS FROM A RANDOM ASSUMED ATTACK AGAINST A WIDE RANGE OF TARGETS: MILITARY, INDUSTRIAL AND POPULATION

A FALL DAY



SURVIVAL ACTIONS

- No shelter required under this wind condition
- Up to 2 days shelter occupancy
- 2 days to 1 week shelter occupancy
- 1 week to 2 weeks shelter occupancy followed by decontamination in exceptional areas

POPULATION AND AREA AFFECTED BY HYPOTHETICAL HEAVY ATTACK

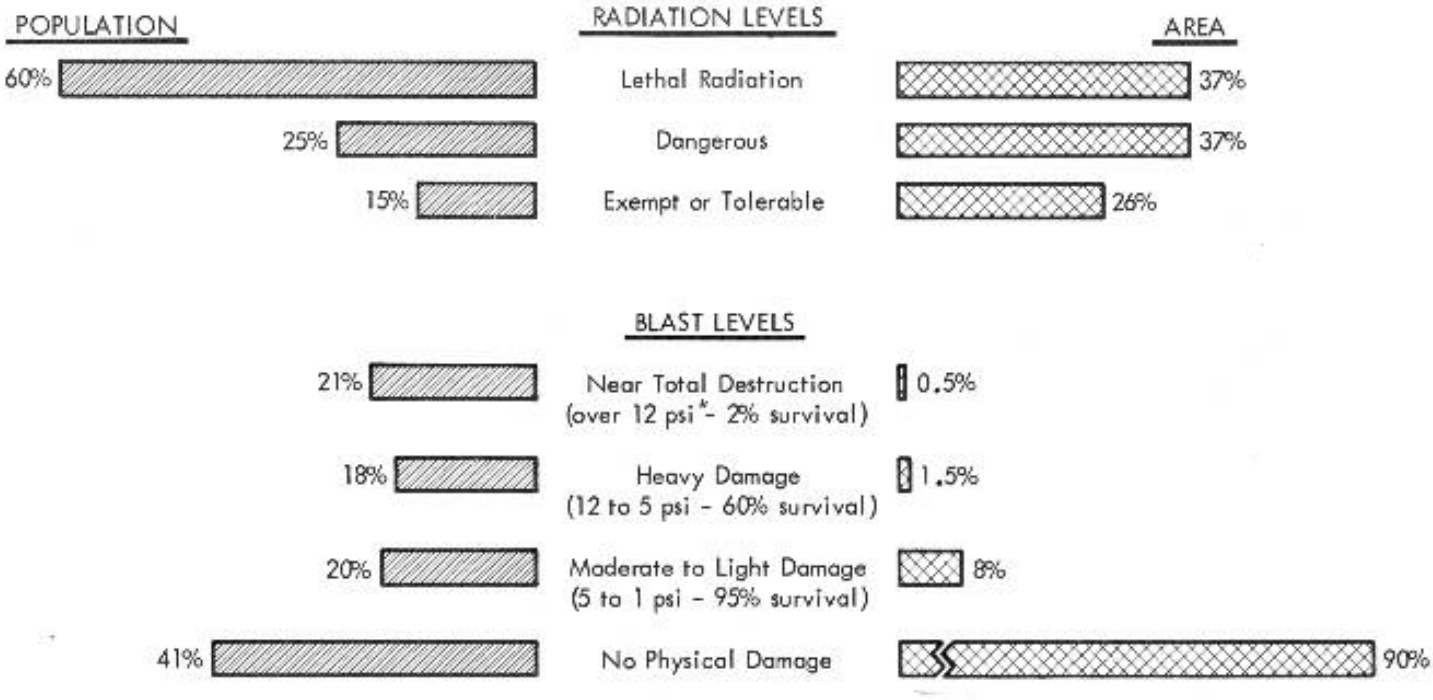
Chart 7 compares the effects of fallout and blast on the population and the land area of the country, using a series of attacks comparable to those shown in Charts 5 and 6.

Blast levels. Under these assumptions, 90% of the land area and 41% of the population would not be subjected to damage or injury. Another 20% of the population has an excellent probability of surviving the attack. 18% has a better than a 50/50 chance for survival. 21% of the population would be in the area of near total destruction.

Radiation levels. Although a large portion of the population would survive the blast effects, 85% would be subject to lethal or dangerous radiation levels which cover about 75% of the land area. Only 15% of the population is in areas which are free of fallout or have a tolerable range of fallout.

Even if we assume that all those killed by blast (approximately 30% of the population) were also included in the lethal radiation area, there would still be 30% of the population who would have survived blast and need fallout protection to survive the radiation hazard. In addition, 25% of the population would need such protection to avoid disabling radiation sickness.

EXPOSURE TO BLAST AND FALLOUT
HEAVY HYPOTHETICAL ATTACK ON
MILITARY.INDUSTRIAL AND POPULATION TARGETS



*Pounds per square inch of blast pressure

LIFESAVING POTENTIAL OF IMPROVED STRATEGIC DEFENSE

Chart 8 The facing chart depicts the effectiveness of various defensive postures in terms of lives saved. As in the preceding charts the data for this chart are taken from Department of Defense studies, but the assumptions used here are far more extreme. It was assumed that a very severe attack occurs against population targets. All damage limiting defensive systems are measured against this very pessimistic assumption.

No Shelter. In the absence of an effective shelter program for the protection of the population, about 144 million people would become fatalities.

Full Fallout Shelter (I). On the assumptions that 10% of the people would fail to use available shelters and others would improperly use the shelters (e.g., late entrance and early exit), the full fallout shelter program would save 48.5 million people. It was also assumed that there would be an increasing population shift to urban areas - about an 18% shift by 1970. Certain offsetting factors were not included for lack of adequate data; the blast protection afforded by fallout shelters, buildings, terrain and other local characteristics; fatalities from fire spread beyond the impact area.

To date at total program cost of about $600 million (FY 1962-1965) over 130 million fallout shelter spaces have been identified. Projecting the present program through FY 1970 would result in fallout shelter for 2/3 to 4/5 of the estimated 1970 population at a cost of less than $1.0 billion.

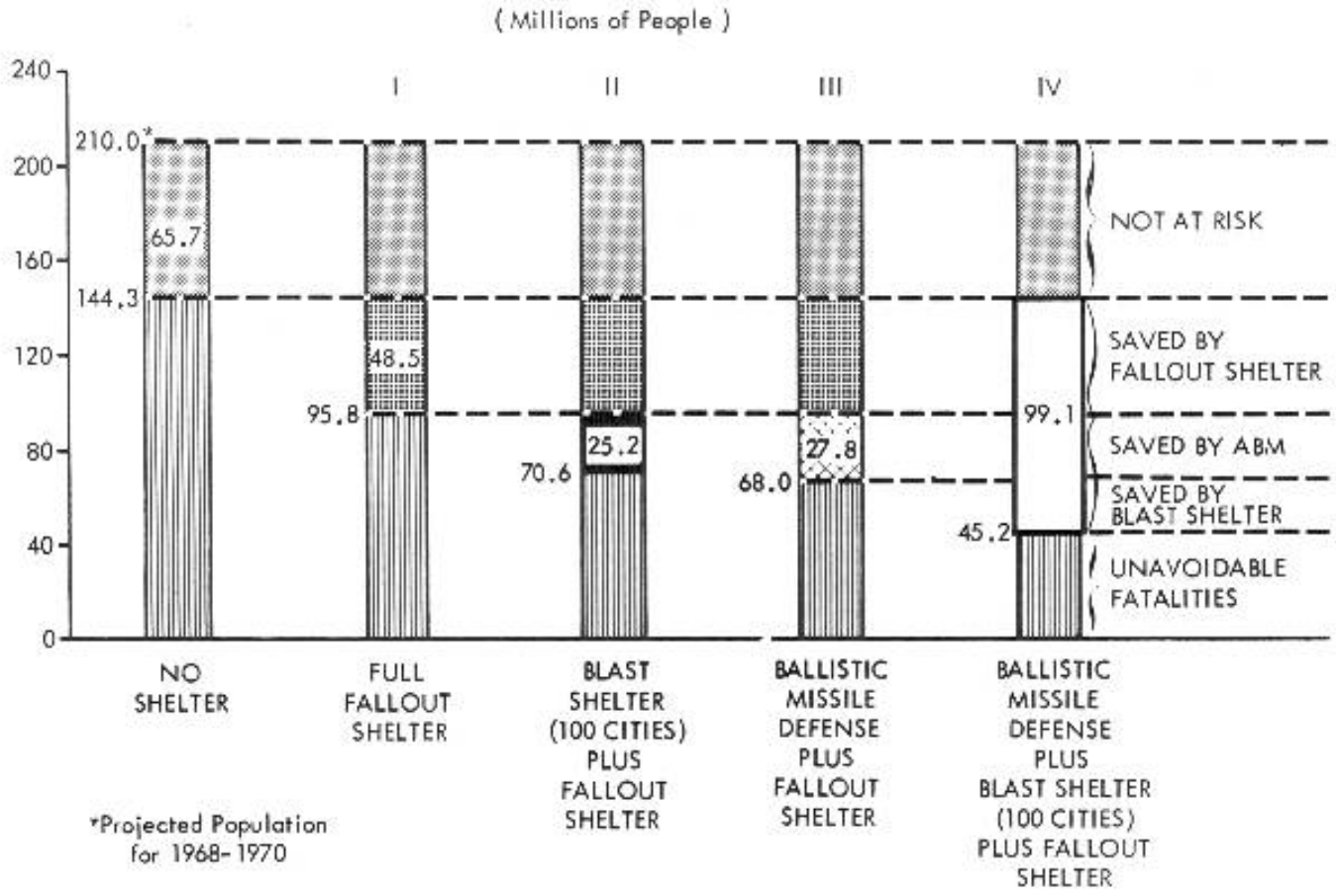
Blast Shelter (II). This posture includes 30 psi blast shelter in the central cities of the 100 largest metropolitan areas, 10 psi blast shelter in the suburban areas surrounding these cities, and fallout shelter for the rest of the country. Approximately 25 million lives would be saved over the full fallout shelter posture at an additional cost of approximately $19.0 billion.

Ballistic Missile Defense (III). Provides protection for 22 cities at a 5-year cost of $18.0 billion. (Arbitrarily selected median of various studies of hypothetical systems ranging from 20 to 25 cities defended and costs of $16 to $20 billion.) This posture would save 27.8 million people in addition to those saved by the full fallout shelter posture.

This system must be combined with the full fallout shelter system as an enemy could detonate a weapon upwind, outside of the defended areas, and kill those without fallout shelter in the ABM protected cities.

All Systems (IV). All of the preceding postures added together could save a total of almost 100 million lives.

LIFESAVING POTENTIAL OF IMPROVED STRATEGIC DEFENSE



ANTIBALLISTIC MISSILE SYSTEM AND SHELTERS

Chart 9 This chart depicts the relationship between antiballistic missile systems and shelters. While shelters have value with or without an antiballistic missile system, an antiballistic missile system has little value for protection of population without shelters for two reasons:

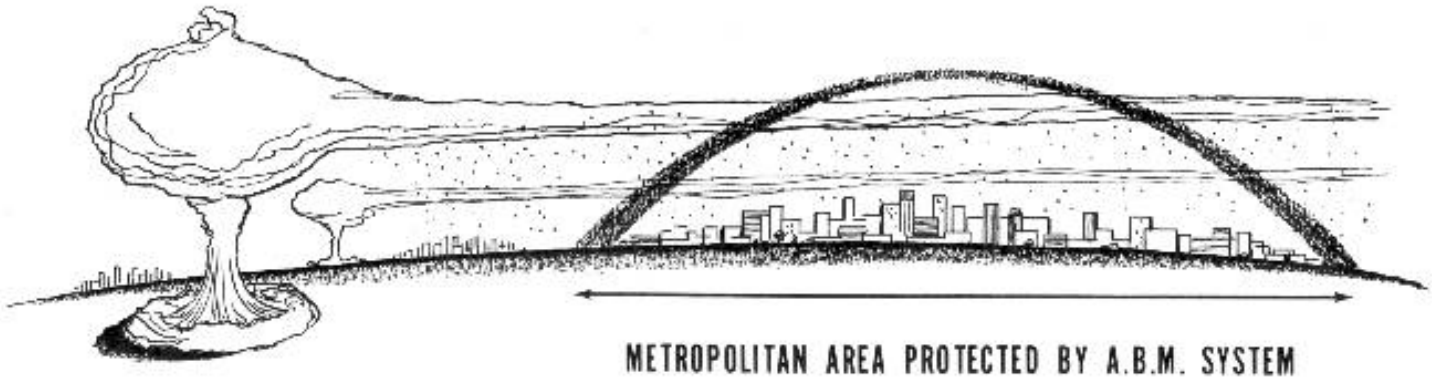
First, the people in areas protected by ABMs can be exposed to lethal fallout radiation even though enemy weapons do not penetrate the protected areas. Surrounding groundbursts, as illustrated on the left of the chart, could be targeted to kill those without fallout shelters in a city.

Second, a series of industrial and population centers protected by effective antiballistic missile systems (which are under development) may result in a shift in targeting to unprotected industrial and population centers. Although lower priority, the unprotected target areas may be fully justified by military, psychological and deterrent objectives.

The relationship of shelters and antiballistic missile systems illustrates the necessity for integrating civil defense and other defense programs. Maximum protection of our people and values is the purpose of all of our defense efforts. This objective requires a balanced and coordinated mix of civilian and military defense systems.

ANTI - BALLISTIC MISSILE SYSTEM AND SHELTERS

SURROUNDING GROUND BURSTS KILLING
THOSE WITHOUT FALLOUT SHELTERS



METROPOLITAN AREA PROTECTED BY A.B.M. SYSTEM

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