LIFE

COMPLETE STORY OF H-BLAST;
CITIES STUDY DISASTER PLANS

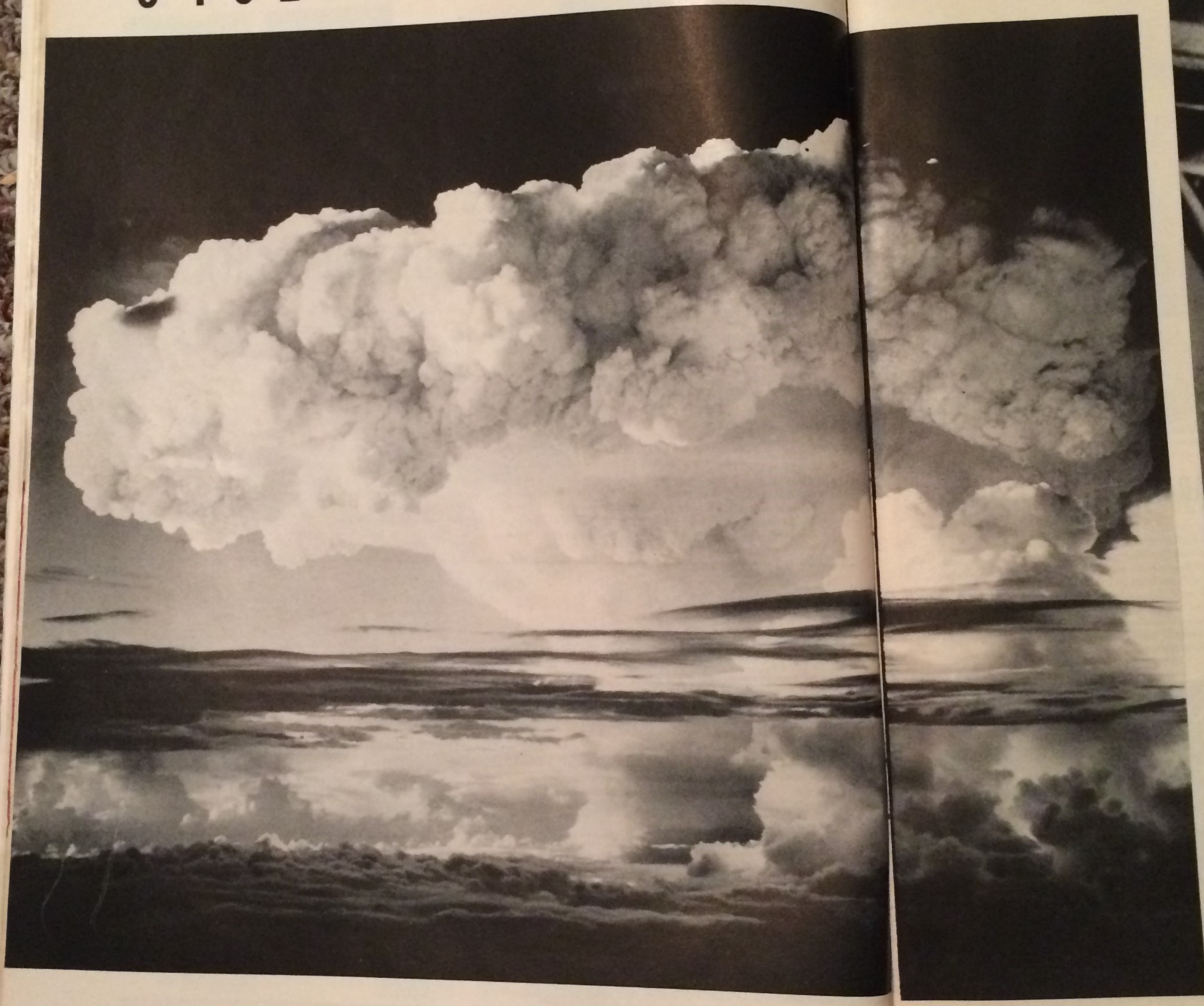
THE EIGHT LIVES OF A FAKE PROFESSOR

LIVELY FASHIONS
FOR SUB-TEENS

20 CENTS

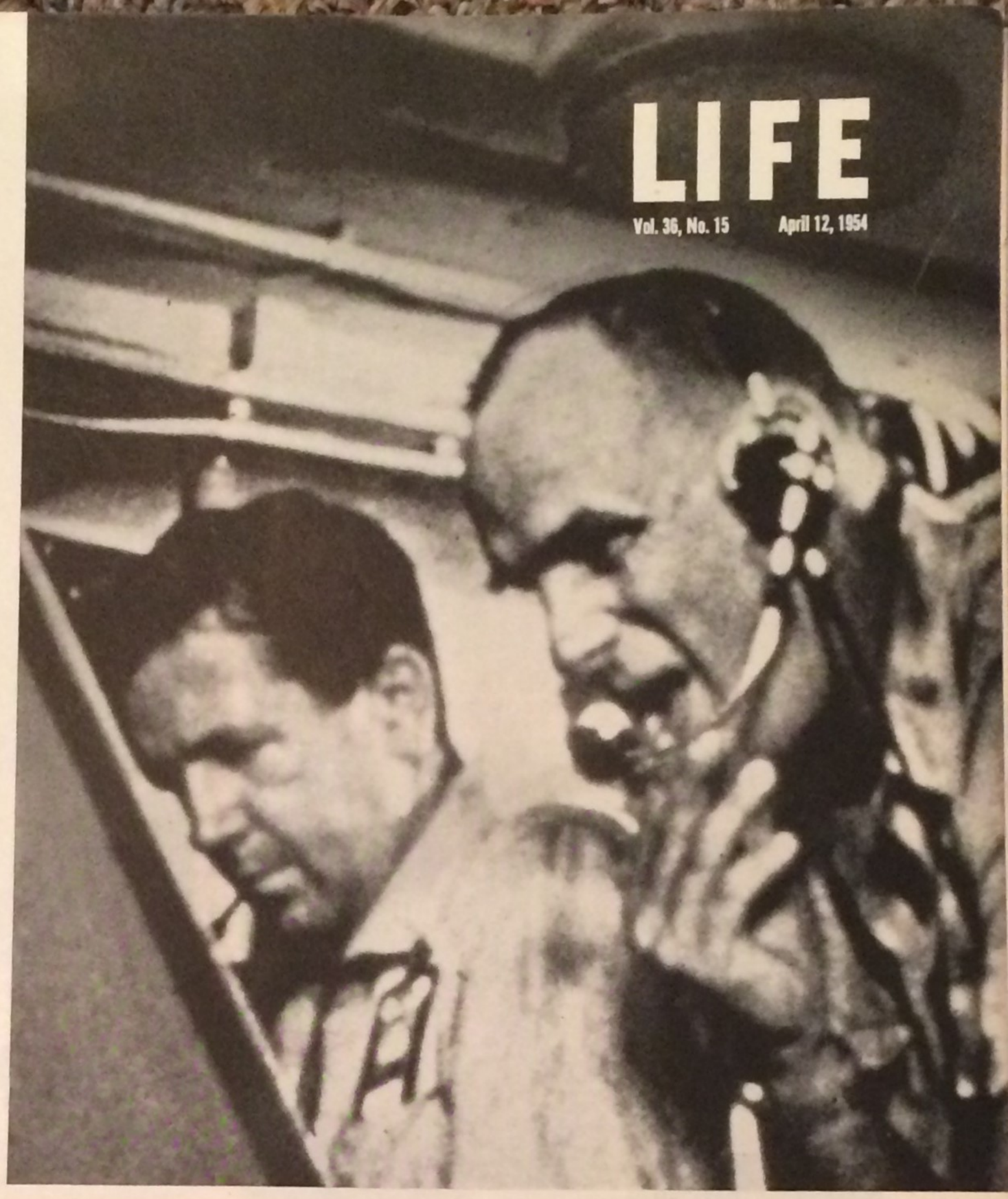
APRIL 12, 1954

5-4-3-2-1 AND THE HYDROGEN AGE IS UPON US



AGE

IS UPON US



LIFE

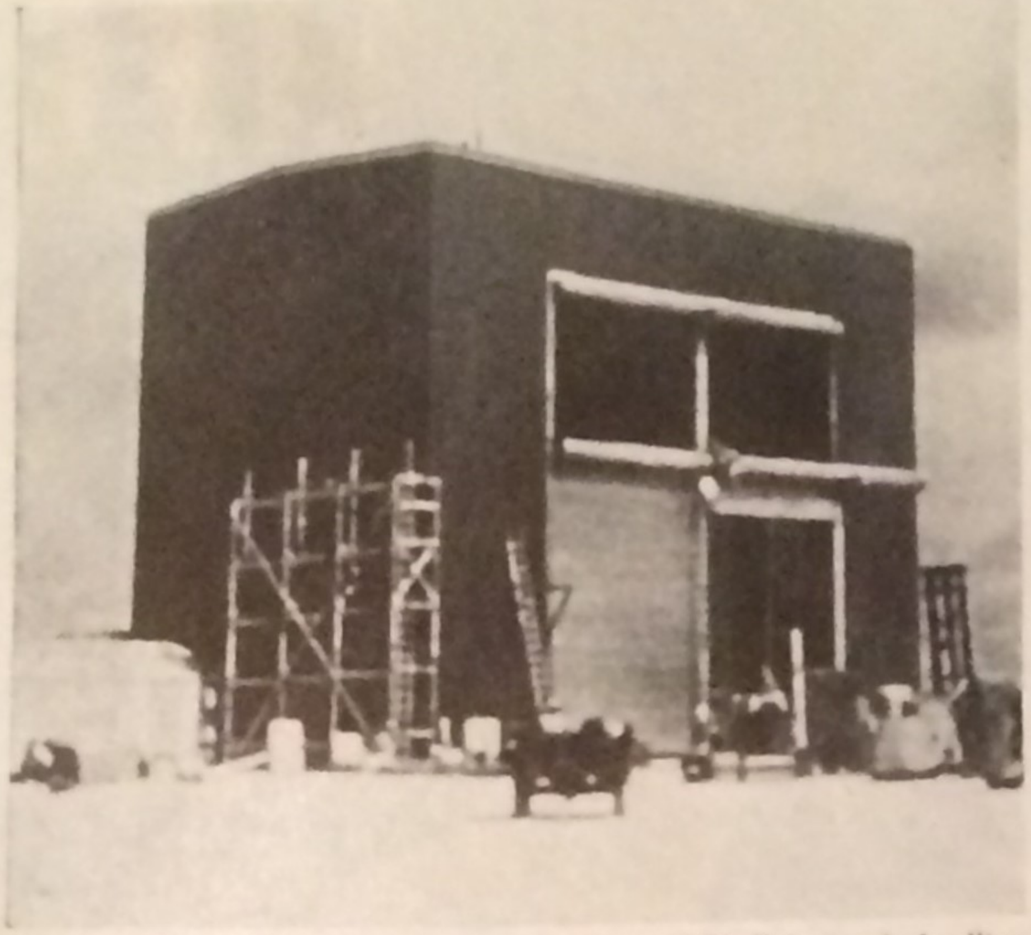
Vol. 36, No. 15 April 12, 1954

IT CREATES A NEW MAGNITUDE IN PROBLEMS

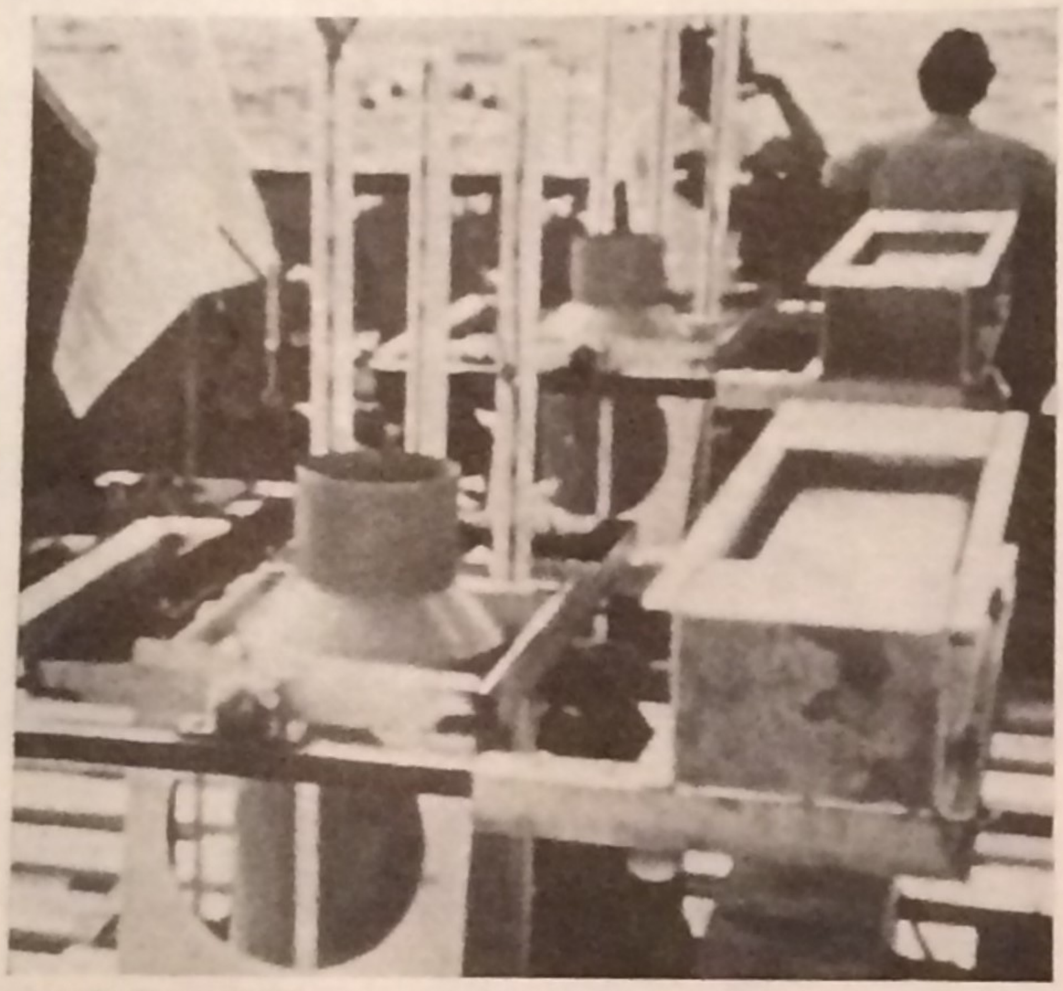
The hideous potential of the hydrogen age, a comparatively old story to nuclear physicists, became a personal problem for every American last week. Watching a film and listening to the metronomic voice of a U.S. Army colonel (*above, right*) count off—"five-four-three-two-one"—the last seconds that preceded a hydrogen explosion (*left*), television viewers knew that they were in an awesome new chapter in man's history.

These pictures, released last week by the Atomic Energy Commission and the Defense Department, show the explosion ("Operation Ivy") which in November 1952 blew a whole island out of the Pacific. Their impact overcame the crudity of the film, which stupidly sold American intelligence short by letting a professional TV actor fuzz up the full story of the weapon's destructiveness. More sobering was the knowledge that more powerful hydrogen devices exist and have indeed been set off. Another blast on March 1 showered radioactive ash over an unexpectedly wide Pacific area (LIFE, March 29); still another was exploded March 26. President Eisenhower confirmed that scientists were astonished by the power of the March 1 explosion. AEC Chairman Lewis Strauss informed a stunned nation that one H-bomb could incinerate a whole city, although he did cancel out the irrational notion that the tests had got out of hand and were liable to blow up the whole planet.

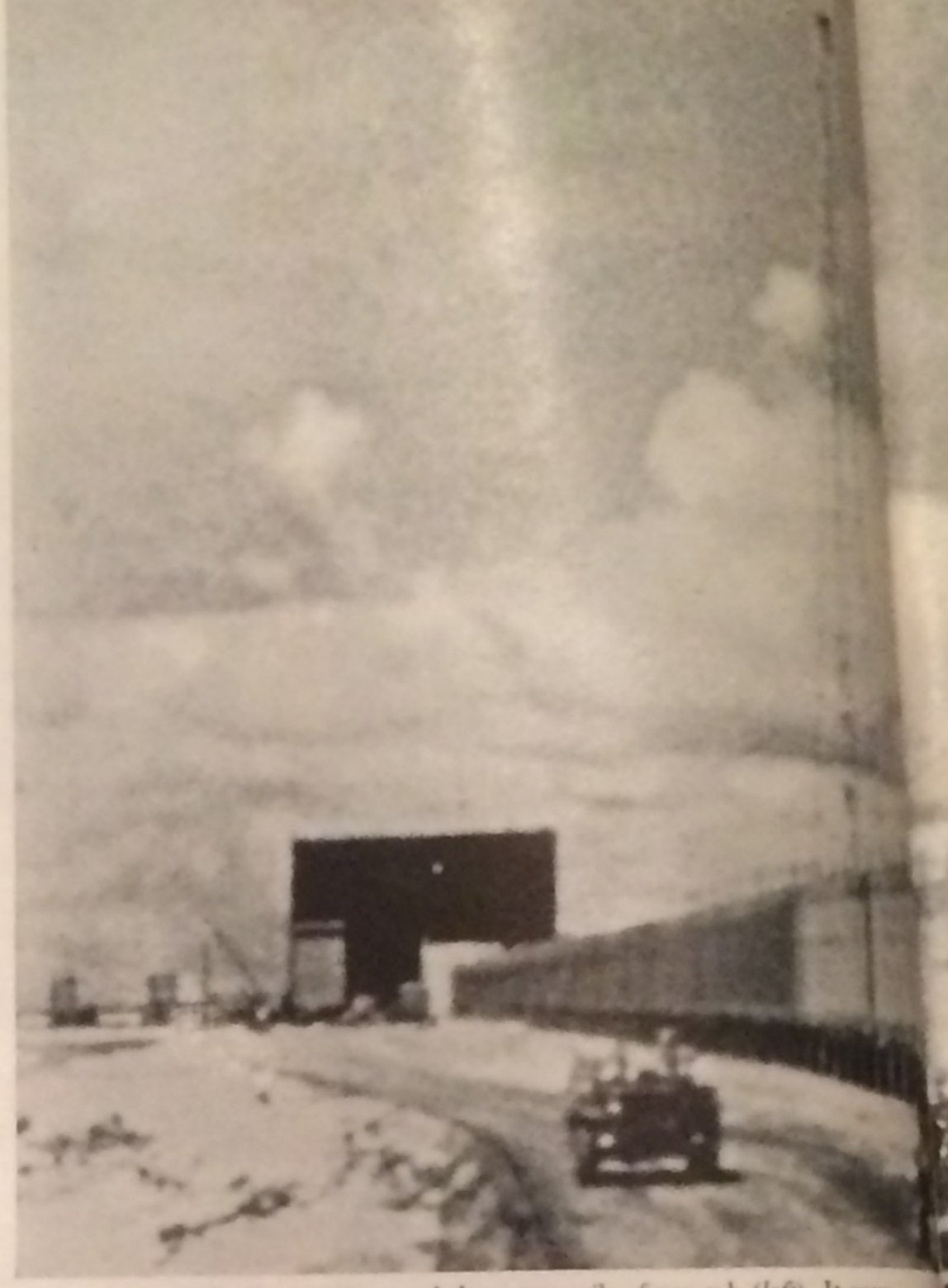
In Russia, Premier Malenkov admitted hydrogen bombs might well destroy not only capitalistic wickedness, but all civilization. *Red Star* started educating its readers on the ABCs of atomic energy. The New York *Times* correspondent in Moscow reported some Western diplomats there felt the Russians really wanted to end the atomic cold war. Whether they did or not, Americans knew that this, the hydrogen age, was vastly different from the atomic age. The very breadth of H-bomb destructiveness set planners to thinking about means for evacuating indefensible modern cities (*pp. 30, 31*). In making the menace more individual, it set people to wondering about the safety of their families and the supply of canned goods in the cellar. Men felt and said that averting the horror of the H-bomb was the responsibility of the same instrument that made it possible—the mind of man (*see Editorial*).



THE CAB, a 25-foot structure built to house the "Mike" device, had rolling doors, was filled with recording instruments. The device rested at ground level.



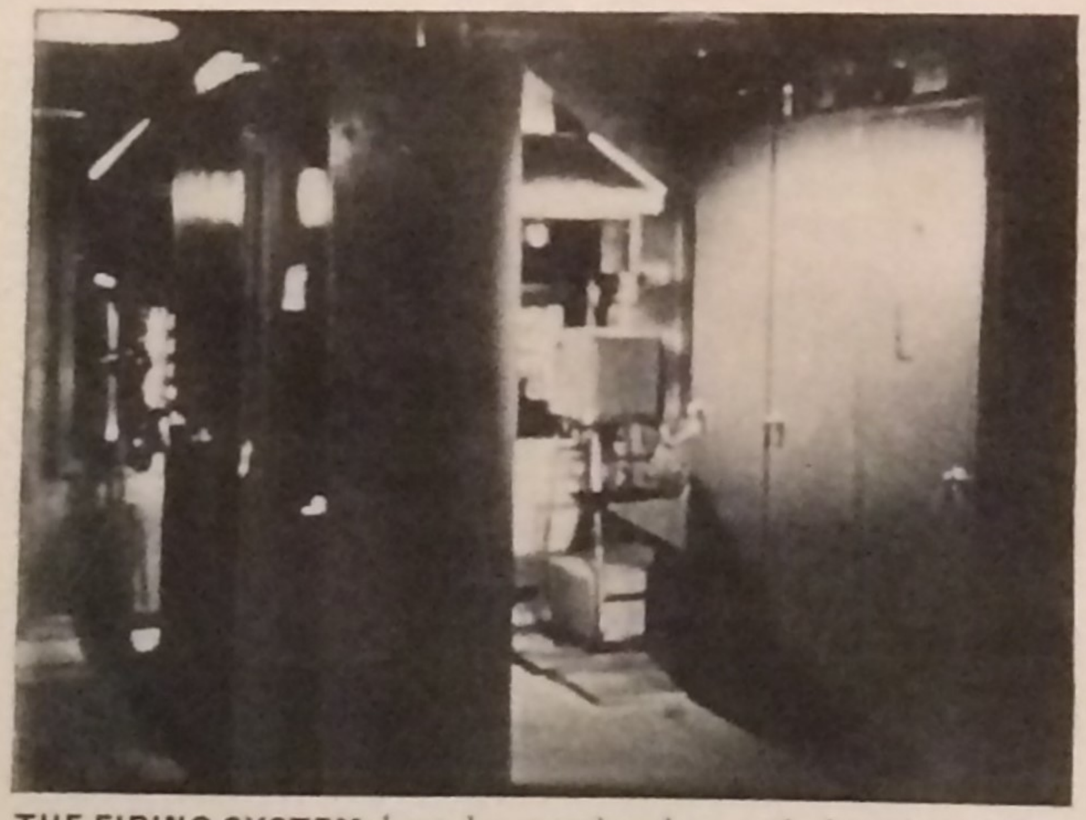
MYSTERIOUS VESSELS on task force ship are like low-temperature tanks used to hold liquid hydrogen or helium. White pipes are for removing samples.



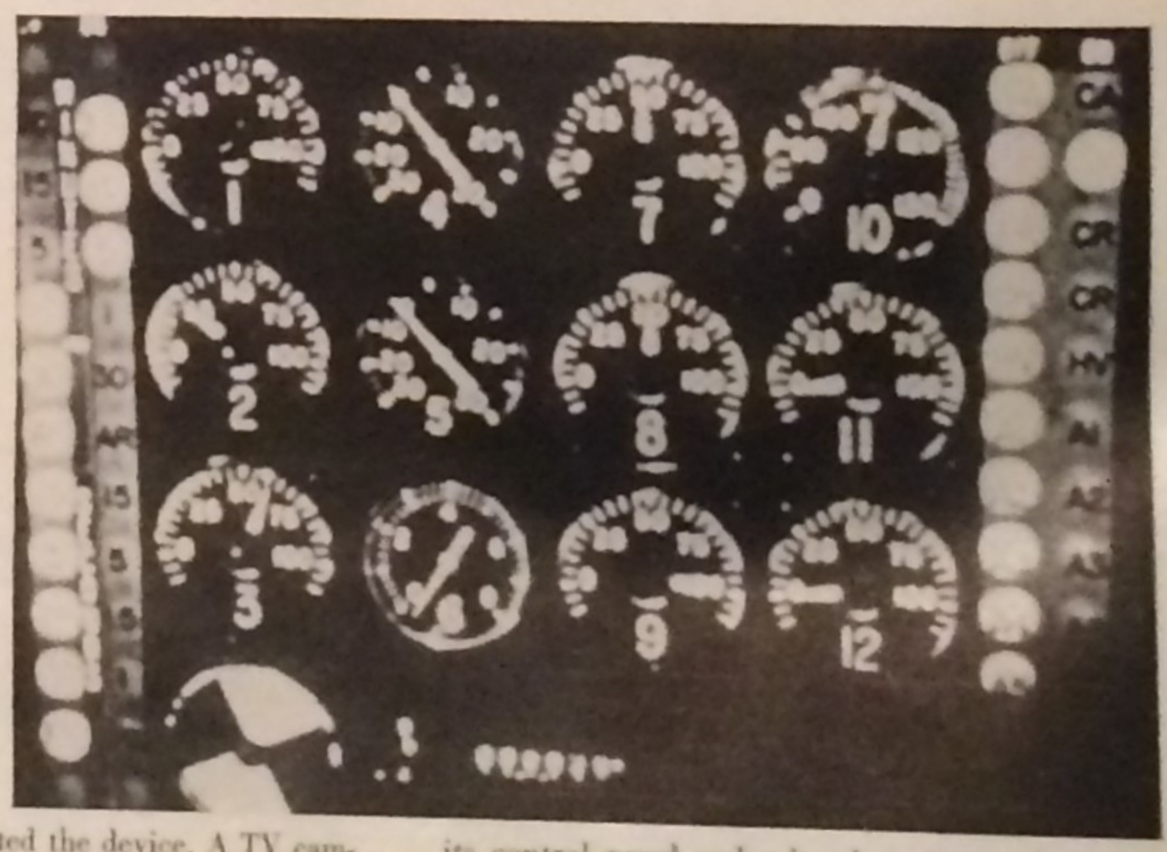
HELIUM-FILLED TUNNEL extended out two miles from cab (*left*). It may have been used to determine the weapon's efficiency by measuring the energies of

PREPARATIONS FOR H-BLAST

Operation Ivy began in the fall of 1952 when Joint Task Force 132 moved in to its base camps on Eniwetok atoll. For weeks construction crews, scientists and servicemen shuttled between the camps and the test islands —Elugelab, Teiter and Bogon—25 miles away. On Elugelab, the shot island, a large black "cab" was built to house the device, called "Mike." Next to it was the elaborate electronic equipment (*below*) which would detonate Mike. A sealed tunnel (*above*), probably to test the bomb's efficiency, extended two miles from the cab to Bogon. The atoll islands were cluttered with automatic cameras and scientific devices to record blast, radiation and heat. Some were shielded in concrete bunkers, others



THE FIRING SYSTEM, located next to the cab, operated automatically to close a series of switches,



the last of which detonated the device. A TV camera (center of picture at left) scanned the dials on its control panel and relayed a picture (*right*) to the command ship *Estes* until the blast vaporized it.

neutrons given off by blast. Neutrons travel easily in helium, could have reached transmitting instruments at the other end ahead of blast which vaporized tunnel.

INVOLVED STRANGE DEVICES

were exposed. Destined to vanish in millionths of a second, they were rigged to relay to safely located receiving stations their all-important record of the birth of the fireball before it engulfed them. Scientists, preparing to measure the force of the explosion in megatons (1 megaton is 1 million tons of TNT), measured the cost facetiously in megabucks.

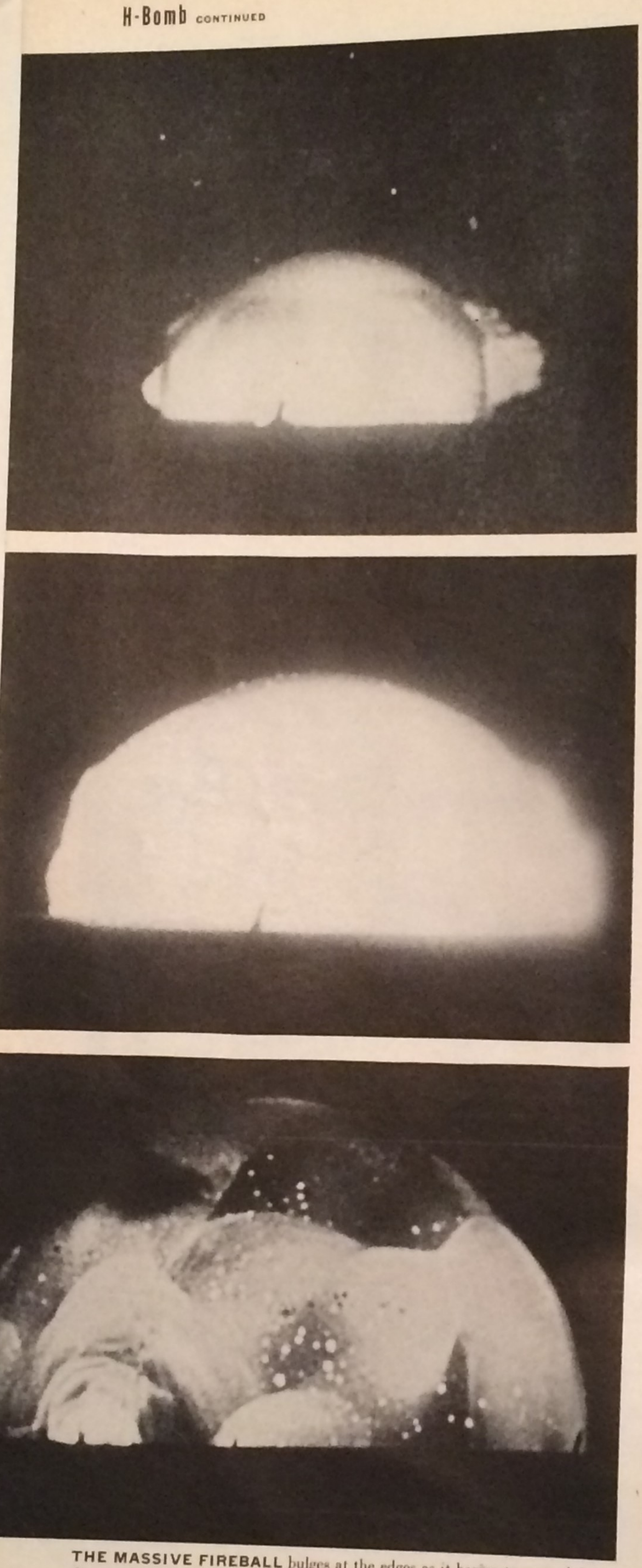
As H-hour approached, the automatic firing system was checked, and the firing party, last to leave the atoll, sailed out to the command ship *Estes*, 10 miles away. In the control room they watched the moving dials on the firing system control board, relayed by TV cameras on Elugelab. Then came the final second count and the fireball was born (*next page*).

INSTRUMENT POST, one of a series located at different distances from Elugelab Island, may have recorded energy of weapon's neutrons or its X-rays.

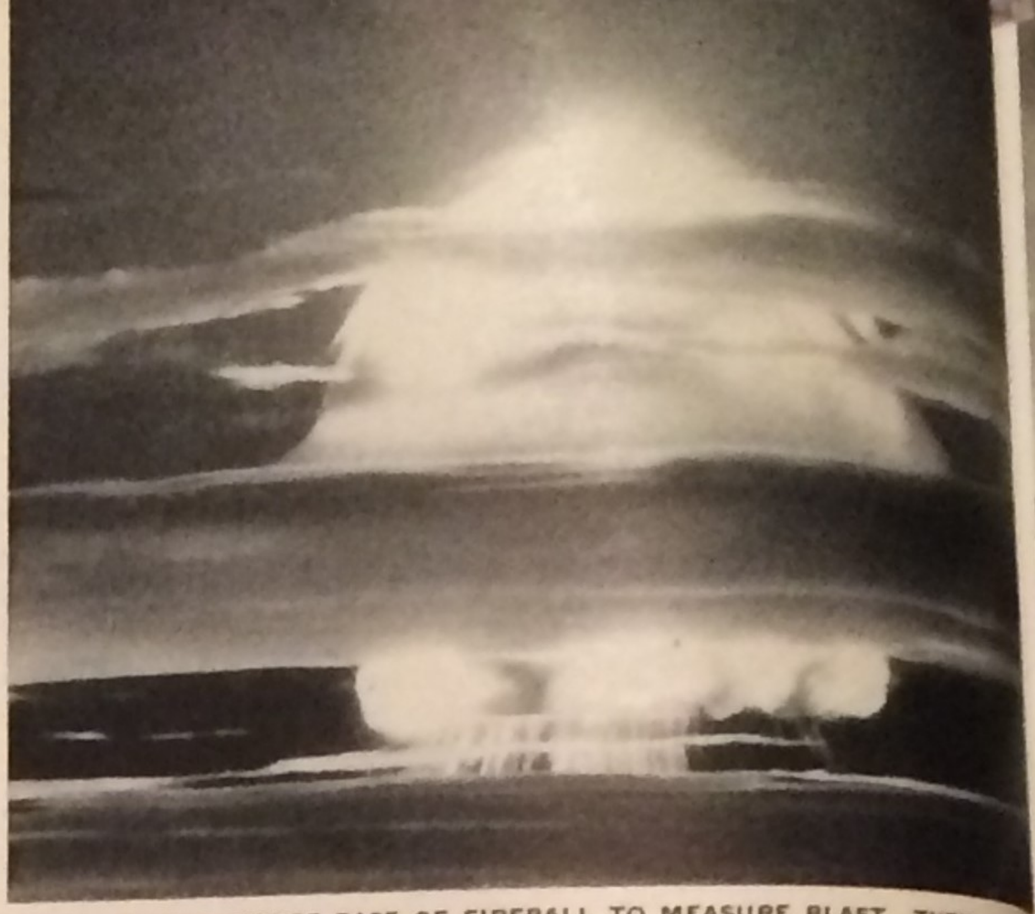
INSPECTING INSTRUMENT before explosion, a scientist lifts it from container. This may have been one of many devices which registered weapon's heat.

BLAST COULD BE PREVENTED if necessary by pressing a button to turn off the firing system.

BUT THE FIRST H-BLAST STARTED ON SCHEDULE →

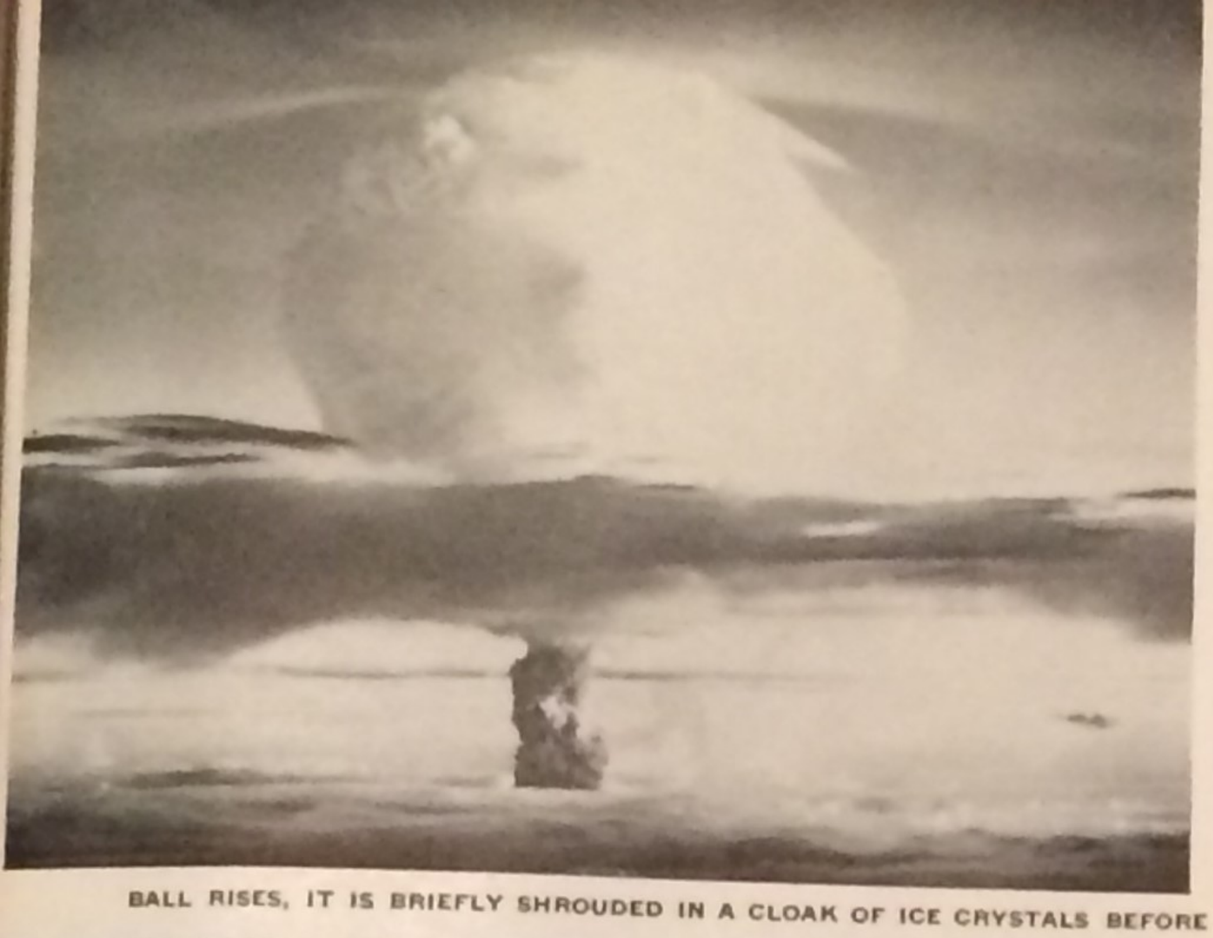


THE MASSIVE FIREBALL bulges at the edges as it begins to expand (*top*), then pushes out a hemispherical shock wave which continues to ignite the air (*center*) until it disintegrates into a strange geometrical pattern of spots and loops, caused, perhaps, by variations in the strength of the explosion (*bottom*).



ROCKET TRAILS PIERCE BASE OF FIREBALL TO MEASURE BLAST. THEN, AS

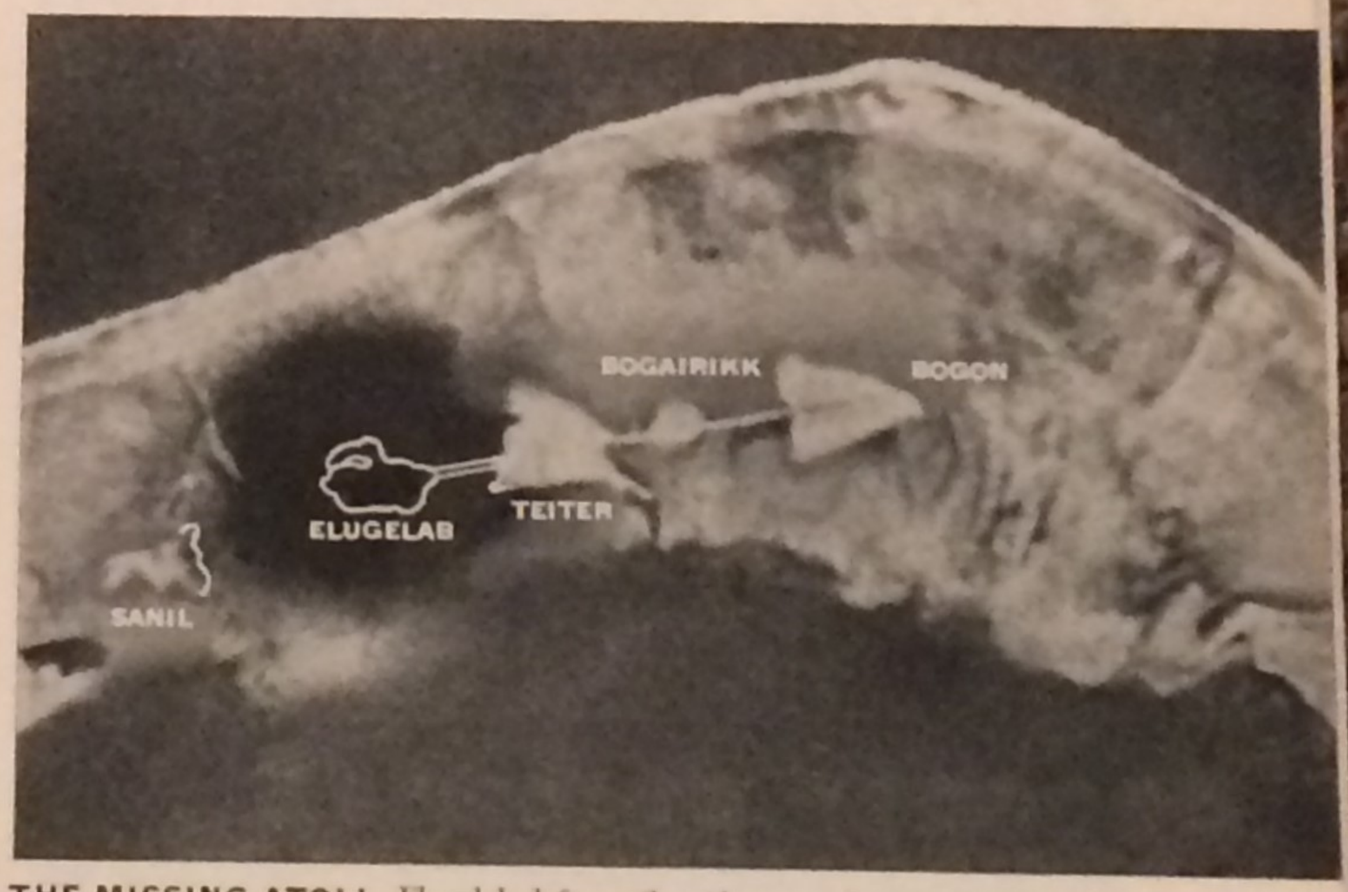
A SINISTER CLOSE-UP SHOWS THE POISONOUS CLOUD SURGING UP INTO



BALL RISES, IT IS BRIEFLY SHROUDED IN A CLOAK OF ICE CRYSTALS BEFORE SPREADING OUTWARD INTO THICK-STEMMED, BOILING MUSHROOM CLOUD

THE STRATOSPHERE, TURGID WITH THE REMNANTS OF ELUGELAB ISLAND

STEM APPROACHES ITS 25-MILE HEIGHT, MUSHROOM ITS 100-MILE WIDTH



THE MISSING ATOLL, Elugelab, left a mile-wide crater between Sanil and Teiter, parts of which were also carried away by the blast. The crater, 175 feet deep, is filled with sea water. All the neighboring islands were swept clean of all recording instruments except those that were housed in concrete bunkers.

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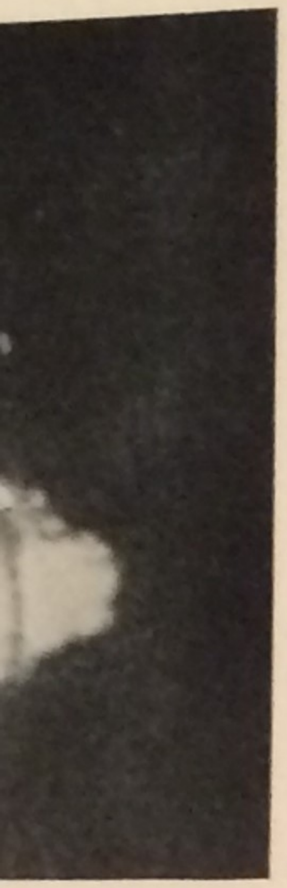
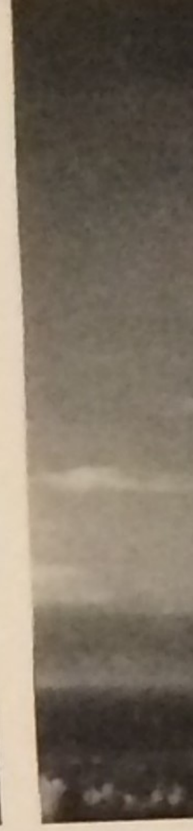
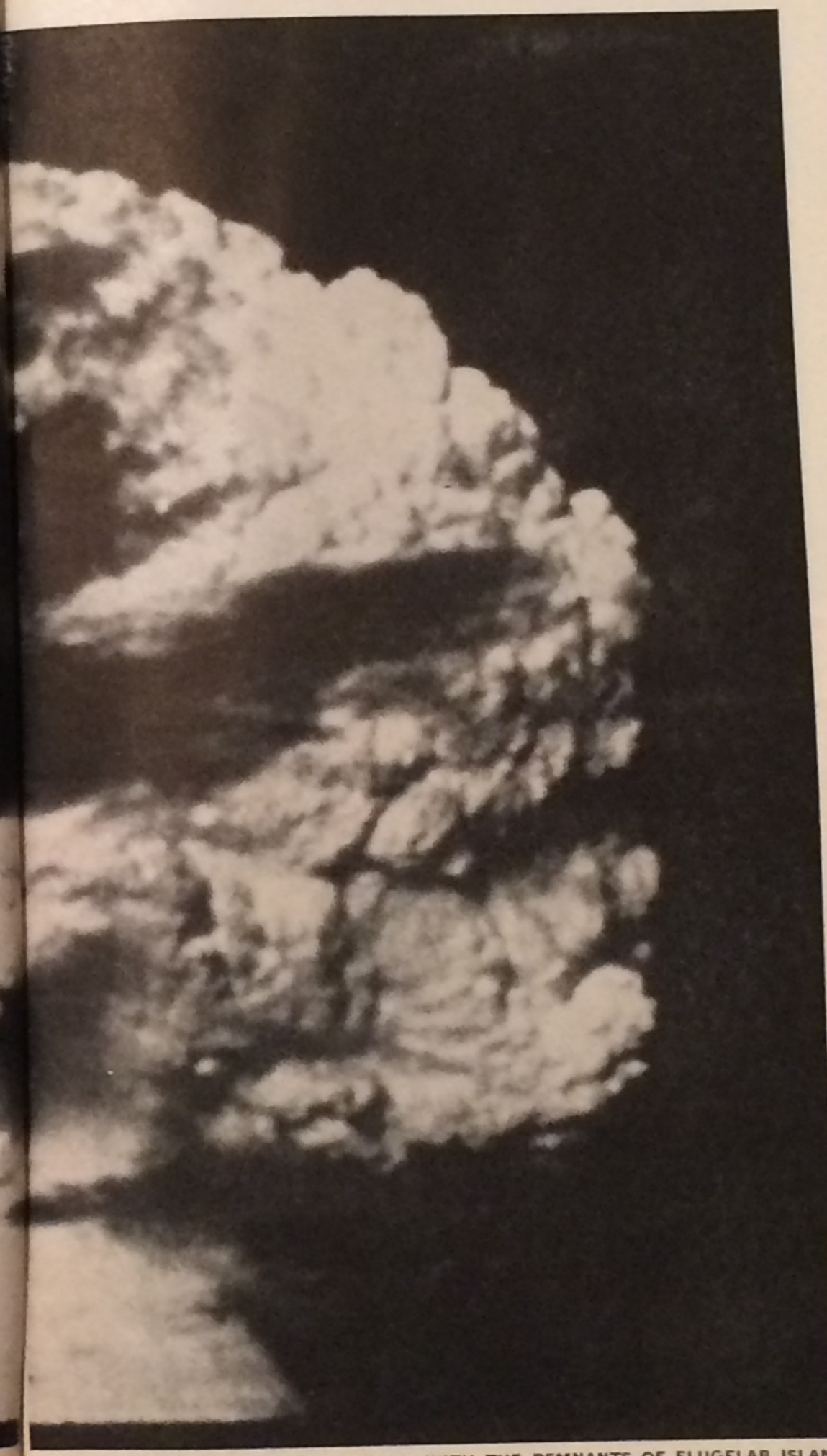


ROCKET TRAILS PIERCE BASE OF FIREBALL TO MEASURE BLAST. THEN, AS

BALL RISES, IT IS BRIEFLY SHROUDED IN A CLOAK OF ICE CRYSTALS BEFORE SPREADING





expand (*top*),
ignite the air
of spots and
sion (*bottom*).

A SINISTER CLOSE-UP SHOWS THE POISONOUS CLOUD SURGING UP INTO

THE STRATOSPHERE, TURGID WITH THE REMNANTS OF ELUGELAB ISLAND

STEM

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ALL PLANS TO EVACUATE CITIES FACE STAGGERING DIFFICULTIES

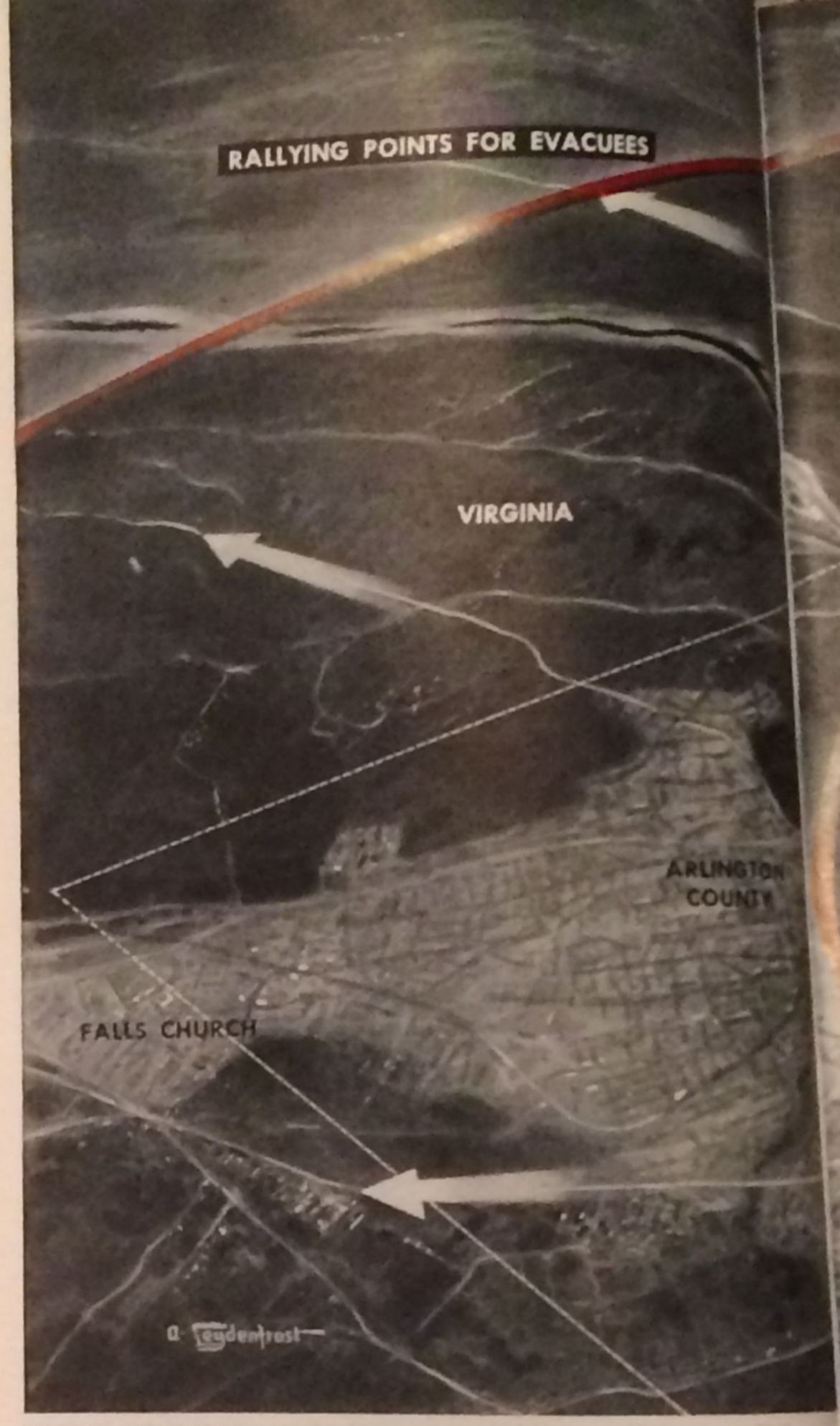
The device which vaporized Elugelab also obliterated all previous plans for U.S. civil defense, which were based on estimates of A-bomb damage. As fragmentary reports of the explosions arrived from the Pacific, state leaders asked the Civil Defense Administration in Washington what plan they should now follow to protect urban populations. Lacking information on the power and damage of the new bombs, CDA could not answer.

Then a few details were announced. The 175-foot crater gouged out by the 5-megaton Ivy weapon indicated that underground shelters would be crushed over a wide area. The 15-megaton March 1 bomb produced total destruction four to five miles from ground zero, instead of the A-bomb's one mile. Moderate damage extended 10 miles. The H-bomb could ruin any city and those considering plans are concentrating on evacuation.

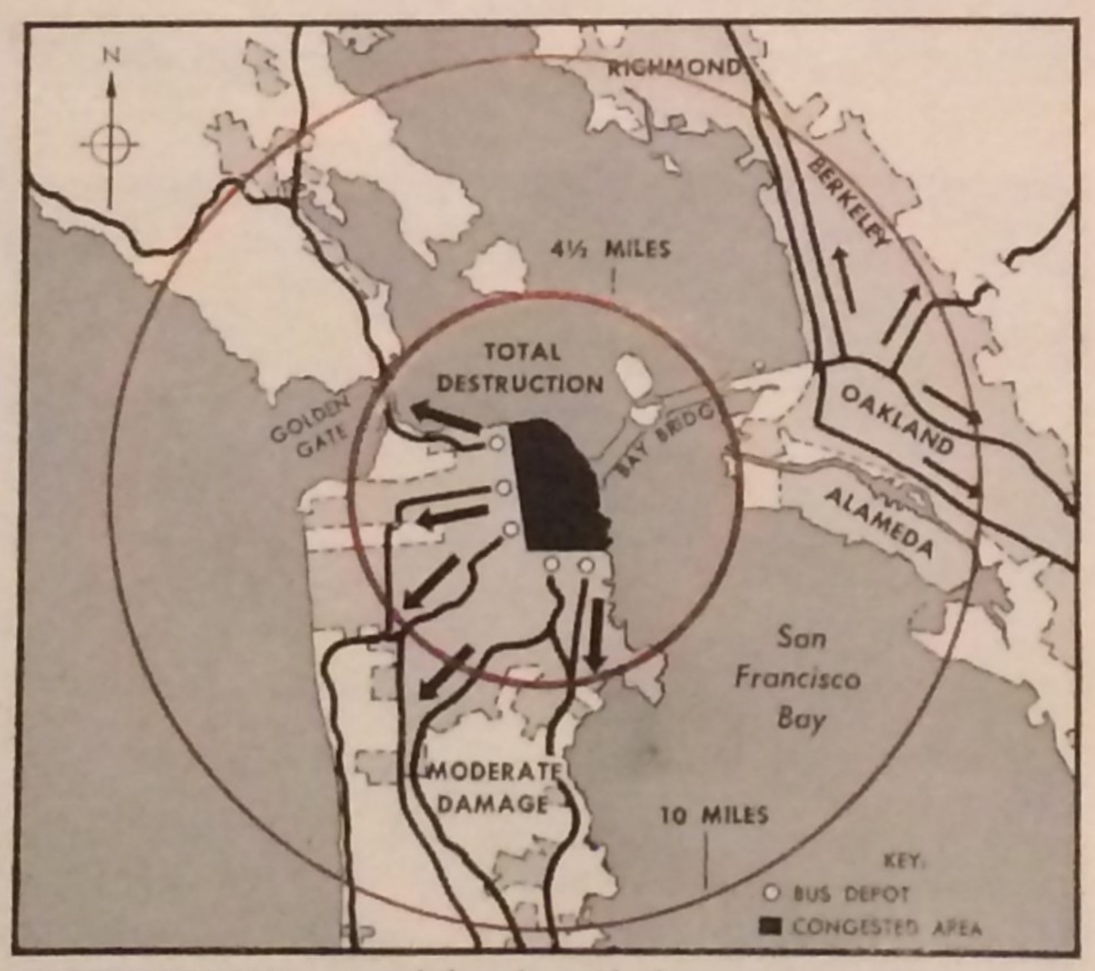
CDA has formulated a few principles of evacuation, shown applied to Washington, D.C. in the drawing at right. In the densely populated downtown area, traffic would be halted and people would walk outward to a loading perimeter, board assembled buses and streetcars to be carried out of town. People in residential and suburban areas could move outward on foot or in prearranged car pools, clearing the area for the passage of those coming from downtown. Following many routes, the population would gather at rallying points and receive aid from nearby towns.

Though some cities have started to work out plans (*below*), the problems of evacuation are so manifold that no major city in the U.S. will be prepared to move its people for at least a year. Before formulating plans, detailed urban studies will be necessary to answer the most basic questions: If all available buses and streetcars were dispatched to the loading perimeter, could they handle the crowds? Are there enough ambulances to evacuate bedridden hospital patients? (Washington ambulances can accommodate 60, but there are normally 3,600 bedridden in city hospitals.) How many trains can the city's railroads assemble and dispatch within two hours? There are a thousand other details to be assessed. Fundamental to any planning is some assurance that there could be several hours' warning. Some civil defense planners believe attack could come so suddenly that evacuation would only expose everyone to the blast.

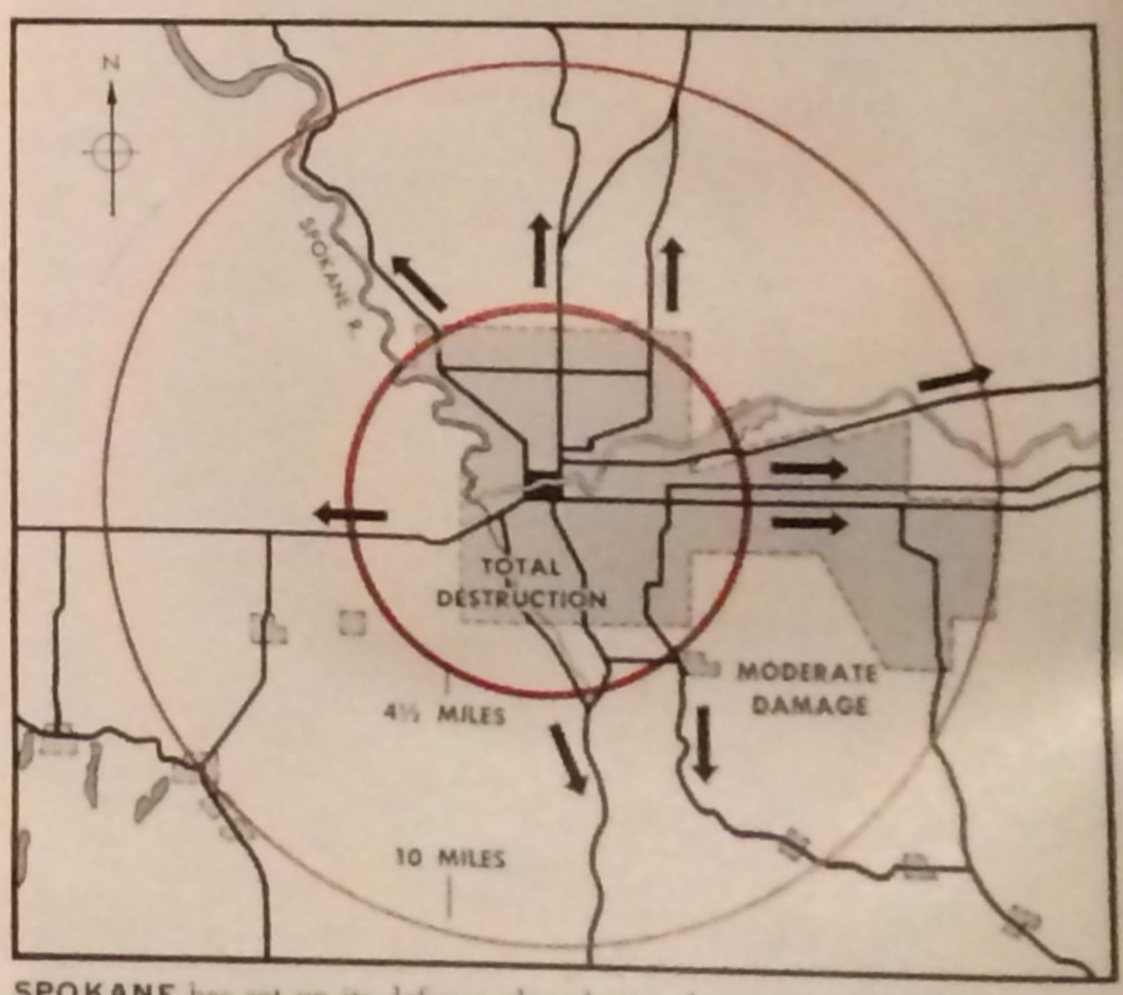
But far more serious than these problems is the prospect of panic. Evacuation would have to be carried out with military precision. Men's natural desire to reach their families, or to pile them into cars and go, would have to be curbed or traffic would be snarled hopelessly. To achieve discipline an urban population would have to be drilled like an army.



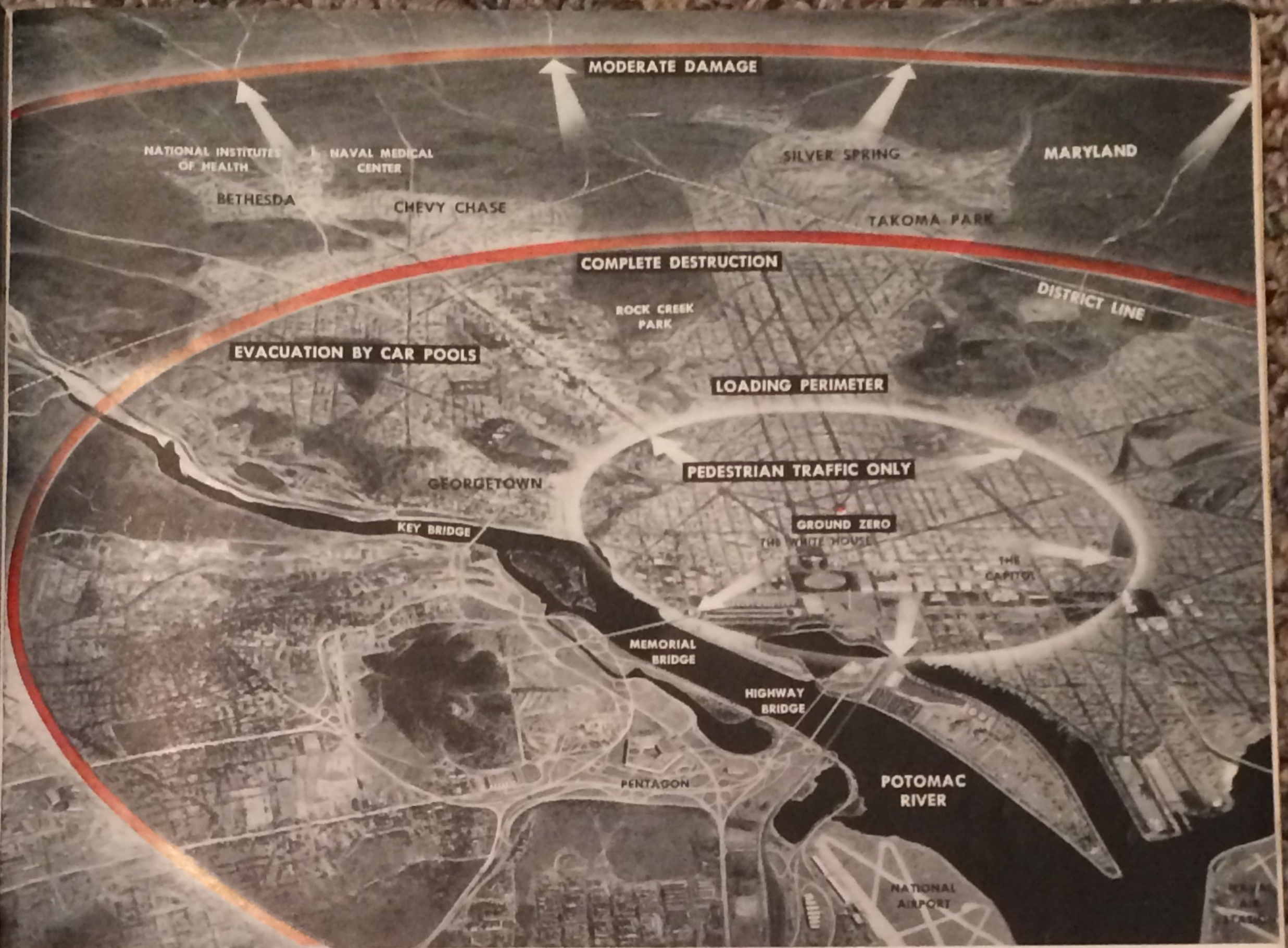
PRINCIPLES OF EVACUATION are shown in drawing of Washington, D.C. A 15-megaton bomb falling near the White House would destroy everything out to first red line (4½ miles). There would be heavy to moderate damage up to 10



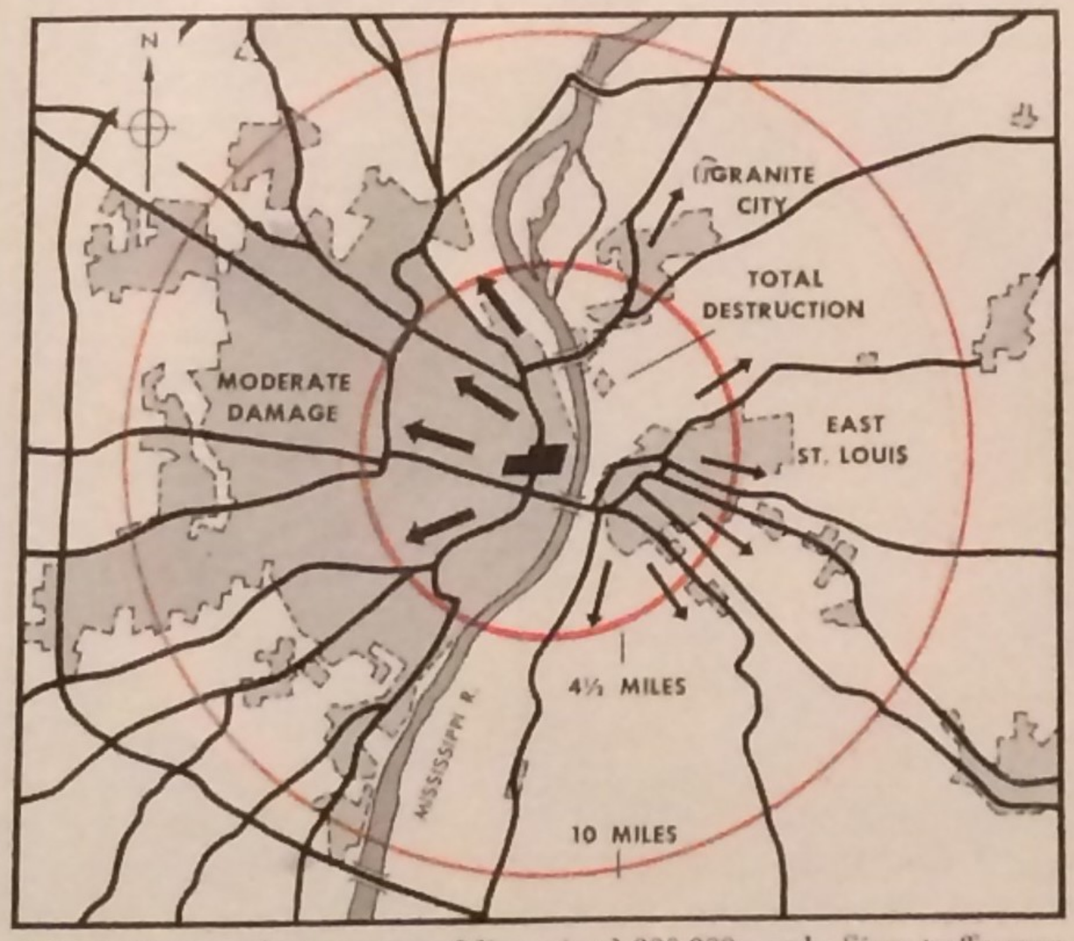
SAN FRANCISCO, surrounded on three sides by water, is particularly vulnerable to H-bomb attack. Its citizens must escape over two bridges and four highways. Present plans call for evacuation on foot of people in congested area to bus depots to south and west. Given an hour's notice, 1,350,000 people in city and environs might be gotten out to surrounding counties. But to insure shelter, city families should make their own advance arrangements with county families.



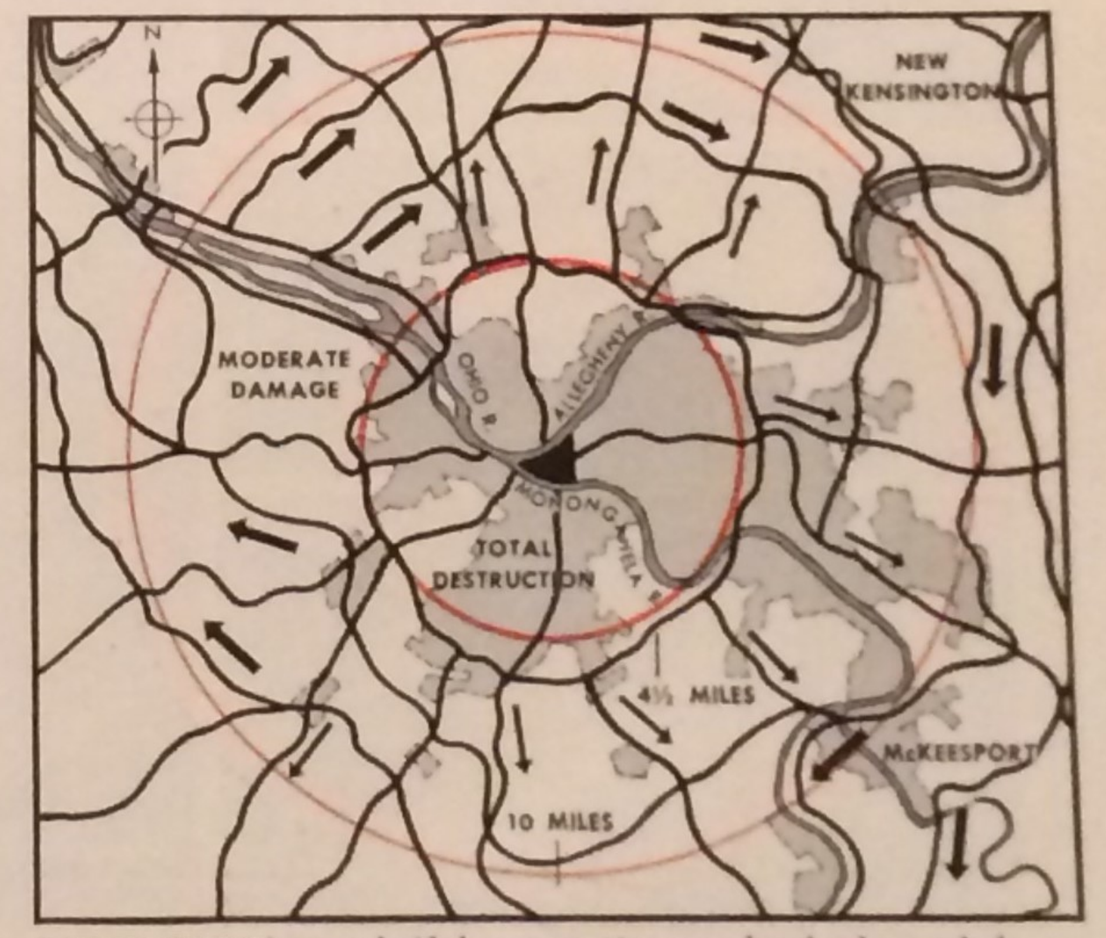
SPOKANE has set up its defense plans better than most cities. They call for evacuation on foot from the business district to a loading perimeter where buses would offer transportation to selected suburbs. People in the residential areas would drive three miles out. The city has agreements with nearby communities to house its 216,000 evacuees. But Spokane has planned only for an A-bomb attack. The H-bomb's destruction would destroy its present dispersal points.



miles. Two thirds of the daytime population of one million are within the loading perimeter. But the available 987 buses and 477 streetcars could, with a two-hour warning, handle only about 115,000, so most people would have to follow prearranged pedestrian routes. Potomac bridges might evacuate many through Arlington, whose 45,000 autos could theoretically move its population. At rallying points at the outer ring evacuees would be given help and sent on to shelter.



ST. LOUIS is exploring means of dispersing 1,300,000 people. Since traffic over Mississippi River bridges would be snarled, bulk of evacuees should move to the west, though some should go in other directions to insure best possible dispersion. Main radial streets would be made one-way streets, going out of town. But since any such operation would require far more warning than could now be given, St. Louis, like most American cities, has made no detailed plans whatever.



PITTSBURGH has not decided on evacuation procedure but has worked out a belt system of roads which run across main arteries and link the city's suburbs. Though they add distance to the trip out of town, they save time and congestion. The largest of these belts is some two hundred miles long and rims the entire county. Until their plans are solidified, however, officials feel that Pittsburgh's 1,056,000 people would do best to sit tight in case of an attack.

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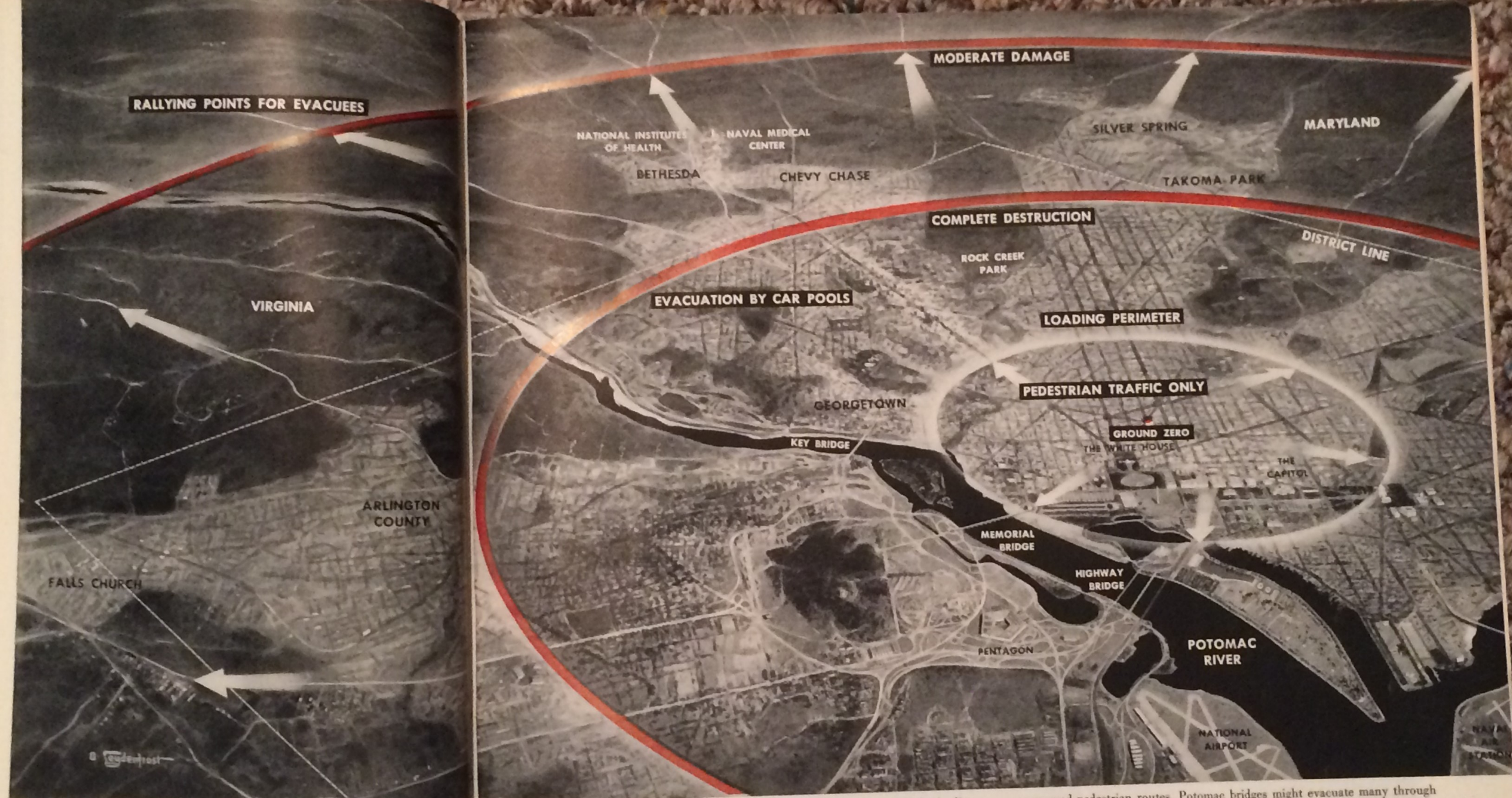
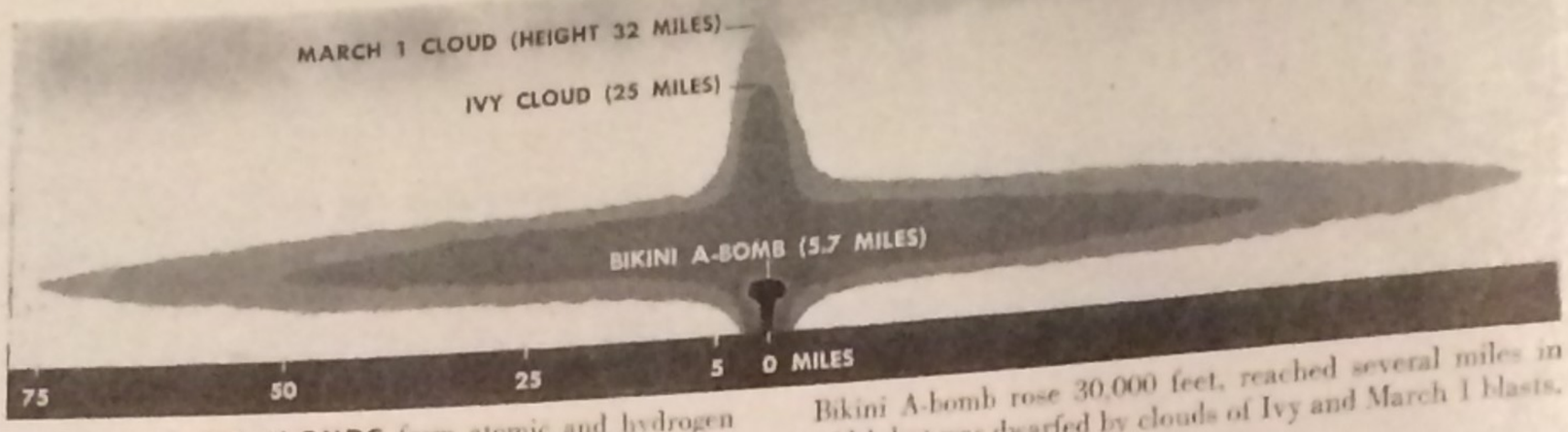


pedestrian routes. Potomac bridges might evacuate many through



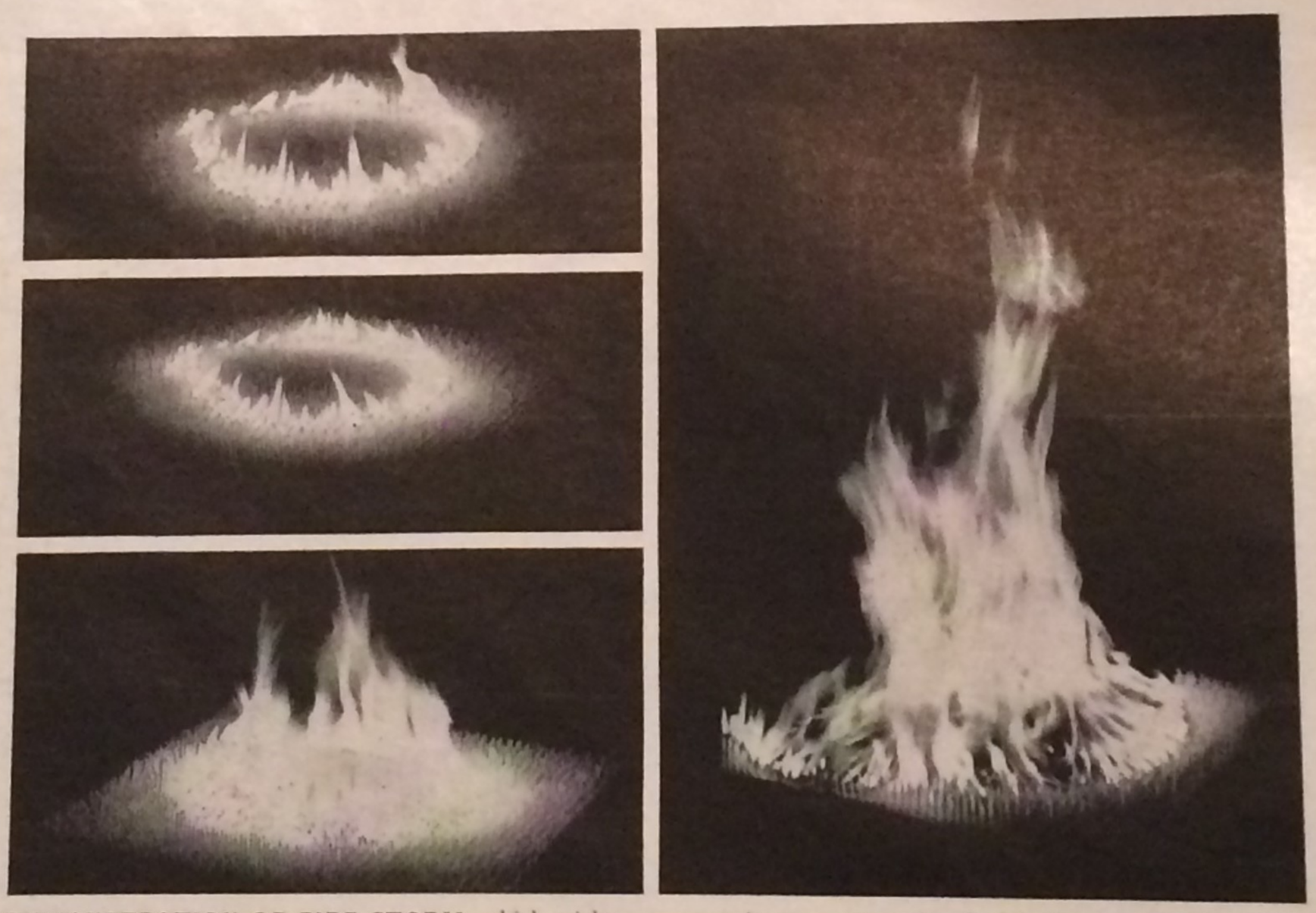
COMPARATIVE CLOUDS from atomic and hydrogen weapons are shown superimposed. The cloud from the first Bikini A-bomb rose 30,000 feet, reached several miles in width but was dwarfed by clouds of Ivy and March 1 blasts.

WORLD WONDERS ABOUT POTENTIALITIES OF BOMB

At the Bikini atomic bomb test in 1946 a Russian observer deprecated the whole operation. "Not so much," he said. In the light of what is now known of Operation Ivy and the bigger blast touched off on March 1, the Russian was closer to the truth than he knew. Last week a wondering world was trying to assess the significance of the new superweapons. Newly released information about the Ivy shot shows that the shock wave could pulverize anything within a three-mile radius and damage every structure within seven miles. Its heat flash could start fires over much of the damaged area, causing a wildfire storm like the one demonstrated below. It could spread radioactive dust to be carried from continent to continent by globe-girdling winds. Radioactive snow fell on Montana last week, and radioactive dust on Massachusetts, probably as a result of the March 1 blast. The radiation was harmless, but the explosion of 100 or 200 H-bombs in a short space of time might well raise new questions about pollution of the atmosphere. Although it is inconceivable that any nation would try, it is possible to make doomsday come to pass by seeding H-bombs with large quantities of cobalt. The cobalt would turn into a radioactive isotope, so long-lived that it would circle the globe again and again killing people by the millions. Of course it would also come back to kill those who exploded the bomb.

One of the most significant facts about the H-bomb has now become known: it can be made smaller—*i.e.*, more easily "deliverable"—and much more cheaply than previously thought possible. And there is no known practical limit to the area of destruction. Both in the U.S. and U.S.S.R. the effect of the H-bomb was compared to great natural catastrophes (*right*).

Western Europeans, for the most part, received the news of Ivy in a fatalistic mood. TIME-LIFE Bureau Chief Eric Gibbs cabled from Paris, "Whether or not the French like what goes on in the hell's kitchen of nuclear research, they know there is nothing much they can do about it." But there was a terrible shock in England. Prime Minister Churchill was hard put to maintain control of the House of Commons, but his real trouble was not so much with Labor's left wing as with British public opinion itself. London Bureau Chief Andre Laguerre cabled, "A wave of hysteria, which could easily grow to disastrous proportions, is sweeping Britain. There is no debate—only what the *Economist* calls 'a mood of alarm and bewilderment . . . the worst of all moods in which to pass sweeping judgments or to take fateful decisions.'"



DEMONSTRATION OF FIRE STORM, which might follow an H-bomb explosion, was worked out by Engineer Ralph Healey of the New York Telephone Co. using 2,000 candles. Fires started by bomb (*top left*) would heat air over city, cause it to rise. Cool air from outside is pulled in under the warm, fanning the flames inward, lighting further fires (*center and bottom*) to perpetuate the blaze. If unchecked, fire would consume everything within ring (*right*).

U.S. COMPARISON to H-bomb is Arizona crater (*above*) made by meteor about 50,000 years ago, which has roughly same diameter as Ivy crater—one mile. Shack (*arrow*) shows size of crater, which is about 600 feet deep. Ivy's crater is only 175 feet because most of weapon's power was expended up and out.

RUSSIAN COMPARISON to H-bomb was cited by newspaper *Red Star* which recalled meteor Tunguska. The largest in recorded history, it flattened 750 square miles of forest (*below*) in Siberia in 1908. Any H-bomb now known, however, would not incinerate that much territory, unless fires made their own headway.

EDITORIAL

AN AGENDA FOR THE HYDROGEN AGE

The arrival of the hydrogen age means that the great questions raised by the Hiroshima bomb of 1945 must be threshed out all over again—not necessarily to the same result. Is it true, as Lewis Mumford claims, that "what seems like unlimited power has become impotence?" Is the strategy of retaliation as realistic as it seemed before March 1? Since they are virtually indefensible, should our great cities be abandoned? These are newly legitimate subjects of argument and quite possibly matters of life and death for what Malenkov now calls "world civilization."

Americans have a lot of thinking to do about the hydrogen age, and will have for some time. A good place to begin is to think about what foreigners are thinking. The psychological tremors set up abroad by the March 1 test were almost all antagonistic to the U.S. The Japanese, who still fish near the enlarged Bikini danger zone, raise sharp questions about one of our own old causes, the freedom of the seas. Some West Germans say the U.S. reminds them of "our old Kaiser. You say no and rattle not a saber but an H-bomb." The British people are in a pre-Munich mood. Amid the clamor Nehru, with a four-point program for a "standstill" agreement on H-bomb experiments, sounds almost calm.

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The widespread demands that we call off the Bikini tests spring partly from the erroneous belief that the scientists cannot control them. They can, of course. The atom is not what Nehru likens it to, "the genie that came out of the bottle, ultimately swallowing man." It is a morally neutral instrument of destruction, not an autonomous agent of doom, and the knowledge that released it controls it still. If in panic we acclaim it the sole arbiter of life and civilization, we surrender the power of sound decision when we need sound decisions as never before.

But not all foreign alarm is thoughtless by any means. A fortnight ago Sir Winston Churchill warned a hushed House of Commons of the "stupendous problems and perils comprised in . . . atomic and hydrogen development. I only hope and trust that the nation and thinking people in it will not in any way underrate the overwhelming consequences. . . . They fill my mind out of all comparison with anything else." When he said this his voice was breaking, and it was not from old age. His island is peculiarly vulnerable to the H-bomb. So therefore is his government. A week later this greatest spokesman of Anglo-American unity almost crumbled before a hail of questions from anti-American Laborites: he had to confess that he was powerless to influence U.S. atomic policy, that he was even forbidden important information about it by our laws.

That is the most galling fact to all self-respecting Europeans: they are excluded from the decisions to be made about the H-bomb, even though these decisions may mean their life or death. Anthony Eden, whose voice has been the coolest in England during the recent near-hysteria, was at pains last week to give Europe reasons why the H-bomb has *not* made obsolete all Europe's own efforts toward unity and strength. It was uphill work, for he is combatting not only human sloth and fear, but that fateful belief to which President Eisenhower directed his U.N. speech in December: the belief that "two atomic colossi are doomed malevolently to eye each other indefinitely across

HEADLINES SHOW THE BRITISH PRESS REACTION

a trembling world." Every event that feeds this belief helps to demoralize and undermine the Western alliance.

It cannot be said that our worried friends have come up with any constructive plan for dealing with the new crisis. But neither have we. And the burden of proving that there is hope for civilization rests on us who have the power to destroy it.

What can we do? First of all, keep cool—as cool as Anthony Eden, who reminded Englishmen that the bomb *is* a deterrent that lessens the chances of war as well as of aggression. Second, distinguish between the really "stupendous" problems, which will take time and much high-level effort, and those within our grasp today.

The most stupendous problem is philosophical: can mankind pursue its familiar ways of thought and feeling in the face of potential mass massacre? Every people, perhaps especially Americans, will need to argue out a public philosophy of adjustment to the constant presence of this vast *memento mori*, just as every individual has (or needs) a private one.

Almost as stupendous is the political problem. The oldest of all political questions, how to guard the custodians of power, has an altogether new dimension. The heart of the only trustworthy solution, first suggested in the Baruch proposals of 1946, has been international inspection. Except in the unlikely event that a better solution is proposed, the U.S. will have to find a new way to frame and urge this solution, hoping against hope that the Soviet regime is also ready to adjust to the hydrogen age.

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But many not-so-stupendous problems also now have a new urgency. The information control section of the Atomic Energy Act has been scarcely amended since it was written in 1946 on the antique assumptions of a U.S. atomic monopoly. The President has asked for amendments which would enable us to impart to our NATO friends a little more information about the use of atomic weapons. They should be passed at once, or there will be more and more scenes like the one that embarrassed Churchill. As to secrecy, there is also grave question whether the American people are allowed enough information to participate in the decisions of the hydrogen age.

As for our announced policy of "massive retaliation," the H-bomb serves mainly to emphasize one fact about it: necessary though it is, it cannot be more than temporary. A world of two malevolent colossi is one in which none of this nation's political ideals can make itself at home. It is not a world of law nor is it a world of pluralistic balance in which freedom can thrive. It is a desperate world of survival, which requires us to be steadfast, but it also requires us to be politically creative, so that this world can change.

What kind of change? The H-bomb won't tell us. We had better consult the same long hopes and bold dreams we had before it came. Americans have a considerable nonmilitary agenda, both at home and abroad, for the improvement of the human lot. It includes the spread of economic freedom and the raising of real incomes throughout the free world, a start toward which was outlined in the Eisenhower economic message of last week. It includes making our farm policy rational and pacifying the Middle East. It includes the spread of hospitals and schools, of roads and houses, of justice and law. The H-bomb, so far from interrupting this agenda, ought to lend us sobriety and resolution in working at it. The avoidance of a hydrogen war is merely a precondition of civilized life, not a substitute.

BEVATRON IS IN CIRCULAR BUILDING ON BERKELEY HILL. ITS RADIATION IS NOT DANGEROUS TO THE COMMUNITY

NEW AND MIGHTIER ATOM SMASHER

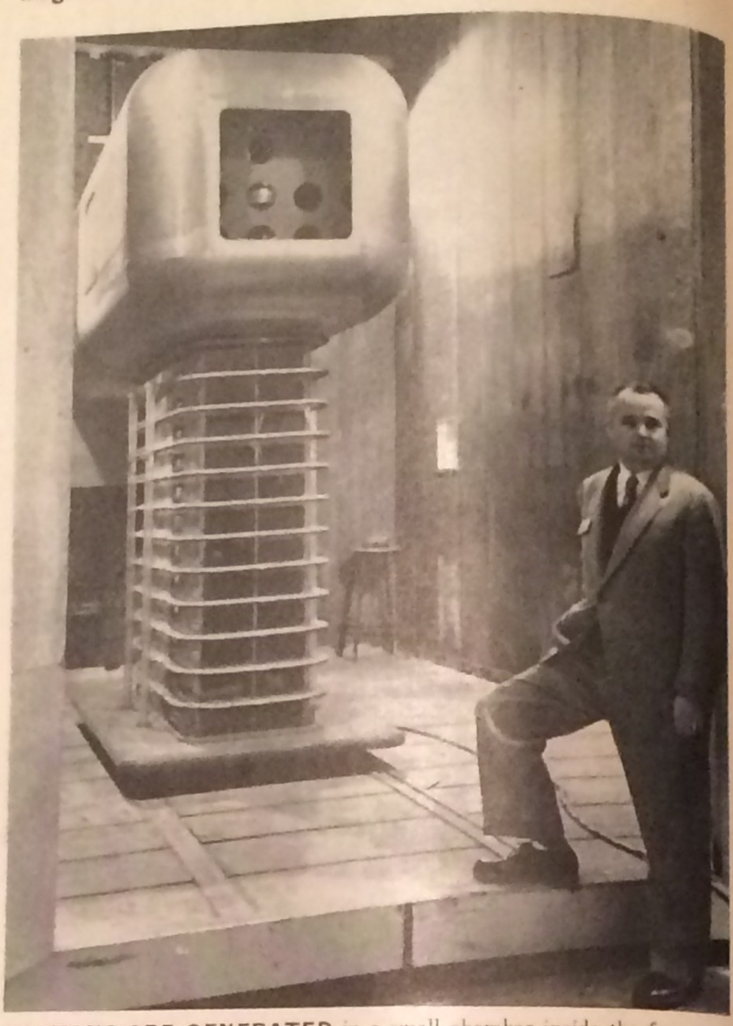
By creating cosmic rays, the Bevatron will help science discover how atomic nuclei are held together

At the University of California the biggest machine ever built for nuclear research has just begun to tear atoms apart with greater energy than any atom smasher has ever produced. In a vast room (*opposite*) protons, the nuclei of hydrogen atoms, are shot from a locomotive-shaped accelerator (*foreground*) into a vacuum chamber inside a gigantic hollow magnet (*rear*). There they are speeded to 184,400 miles a second. When they have attained the fantastic energy of 6.25 BEV (billion electron volts), they can be spun against metal targets, smashing the metal atoms and releasing their nuclear particles. The least known of these particles are mesons, which in free form appear as cosmic rays and in the atom are associated with the energy that binds the nucleus together. Because the machine, called a Bevatron since it gets up into the BEV range, splits atoms with such tremendous power, it will create more types of mesons than ever before possible and will explore the mystery of their function.

STEEL CASING OF MAGNET (ABOVE) CONTAINS VACUUM CHAMBER IN WHICH AN ELECTRODE GIVES PROTON BOOST OF ENERGY EACH TIME IT WHIRLS PAST

CONTINUED ON NEXT PAGE

THE BEVATRON'S IMMENSE CIRCULAR MAGNET WEIGHS 10,000 TONS AND MEASURES 135 FEET IN DIAMETER. THE COMPLETE APPARATUS COSTS $9 MILLION



PROTONS ARE GENERATED in a small chamber inside the front end (shown towering behind engineer) of device called Cockroft-Walton machine. Electric arc tears electrons off hydrogen atoms, leaving nuclei, or protons.

PROTONS ARE BOOSTED to 500,000 electron volts by charges generated in base of Cockroft-Walton machine. Hoops are voltage distributing rings which help pass protons down gun (above scientists) at rear of machine.

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ENGINEERING B-W PRODUCTION

BORG-WARNER HAS WORKED HAND IN HAND WITH MARTIN AIRCRAFT SINCE 1933

. . . 3 . . . 2 . . . 1 . . . FIRE! The Martin Matador B-61 pilotless bomber is launched in a fury of flame, its jet engine aided at take-off by a rocket.

For this noted builder of guided missiles and aircraft, Borg-Warner provides a wide variety of essential operating parts . . . just as it does for leaders in the automotive, farm machinery, marine, home equipment, and other major industries.

Almost any industry you can name is served by Borg-Warner. Take aviation. In this challenging world of speed and precision, *all* the leading builders of planes and guided missiles look to Borg-Warner for many vital operating parts.

The Glenn L. Martin Company ranks high among them. B-W's service to this famed maker is dramatized in the B-61 Matador, the pilotless bomber that is guided electronically. Special pumps made by B-W assure unfailing fuel flow to its jet engine and operate the controls that steer this missile unerringly to destroy its distant target.

Not only in missiles and military planes, but in every commercial plane as well, B-W parts are adding to efficiency. Borg-Warner creative talents, engineering skills and production equipment daily help America's aviation to pace the world. Each B-W contribution evidences an aim: "Design it better—make it better."

Martin B-57 night intruder. Designed for swift, surprise attack under cover of darkness, its high speed and maneuverability depend importantly on essential parts from B-W. In amazing planes and missiles now being developed, B-W research and production have an exciting and vital role.

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