PHYSICS

Which of Three H-Bombs?

No information is available concerning the type of "fusion" bomb developed by the U. S. or by Russia. Several kinds are possible.

➤ ASSUMING THAT Russia does have the hydrogen superbomb (and we must credit Soviet science with the capability), the question is what kind of a hydrogen bomb do they have? What kind do we have?

For there are several possible "fusion" bombs that operate by what is called "thermonuclear reactions."

They are all hydrogen bombs, but there are three kinds of hydrogen: 1. The ordinary and plentiful kind. 2. Deuterium, the double weight kind, rare but occurring in nature. 3. Tritium, the triple weight kind that is radioactive and has to be manufactured.

From highly secret tests at Eniwetok, our scientists probably know now which kinds can be used for superbombs. For there is little doubt that we have exploded one or more hydrogen bombs.

Most of those engaging in more or less informed guessing believe that tritium is the superbomb material of choice. Two atoms of tritium (H^3) brought together with sufficient violence would fuse into and form a helium atom (He^4) and give off two neutrons. Neutrons are the uncharged atomic particles that trigger the atom bomb.

There would be a terrific release of energy due to the fact that mass of the two tritiums is slightly more than that of the helium and the neutrons, and that this mass is converted into energy.

But two deuterium atoms similarly thrown together should also fuse, giving in one reaction a tritium atom and an ordinary hydrogen atom, and in an alternate reaction a mass three helium atom and a neutron. Both would release large energy.

There could also be reactions between atoms of deuterium and tritium, which should be violently explosive. Participation of ordinary hydrogen would be likely to slow things down too much.

All the hydrogen bombs presumably would need extremely sudden and high temperatures to be kicked off. A fission bomb of uranium 235 or plutonium (the conventional atomic bomb if anything atomic can be called conventional) is used to trigger a hydrogen bomb. It creates sun-like temperatures, a million degrees or so.

The speed of interaction of the hydrogen material is all important. For the violence of the explosion will throw the material apart and it must do its combining in a few millionths of a second.

The hydrogen bomb is cheaper and more practical from a production standpoint if its material is deuterium, or double-weight hydrogen. This isotope of hydrogen is separated from water, in which a small amount occurs. The process is somewhat like the way in which the fissionable uranium, isotope 235, is separated from the most plentiful uranium 238 with which it occurs in the natural deposits. Deuterium can be obtained without use of materials that enter into the production of fission or ordinary A-bombs.

But the production of tritium is a drain on the uranium supply. It must be manufactured, probably from lithium metal, by bombardment with neutrons. The fissioning of uranium, or plutonium made from uranium, is the only practical source of neutrons for this purpose. This would be done in an atomic reactor of the same sort that is used to make plutonium, by bombarding uranium 238 with the neutrons from a slowed-down reaction such as occurs in the atomic fission bomb.

Tritium for hydrogen bombs can be made only at the sacrifice of atomic bomb production and a large sacrifice of total explosive power. It is necessary to forego some of the total punching power to obtain the super-punch of a bomb that is perhaps a thousand times that of the Hiroshima bomb, a superbomb capable of devastating vast territory.

If deuterium can be made to explode, hydrogen bomb production is not dependent upon the uranium supply except to provide the triggering fission bombs.

Tritium is radioactive and half of its disintegrates in about 11 years. Making it and stockpiling for use in the distant future is wasteful because of this natural disintegration.

All of the hydrogens as elements are gases which are unhandy to use, but they can be combined with other elements into solids. Plutonium tritide or plutonium deuteride would give both the fissionable and the fusionable atomic energy elements in the same compound. Perhaps they are packaged in this way for the hydrogen bomb.

A hydrogen bomb would probably be detectable by the large amount of radioactive carbon created in the gigantic explosion. The nitrogen in the atmosphere bombarded by neutrons given off by the superbomb would be turned into carbon 14, just as the cosmic rays create continuously this kind of carbon in very small amounts in the upper atmosphere. This radioactive material comes down to near the earth's surface and can be used to date things that contain carbon.

If a hundred or so superbombs were exploded, they might so poison the atmosphere with radioactivity as to affect human life, increasing the cancer incidence. If cobalt were added to the hydrogen bomb with fiendish intent, the radioactive cobalt-60 produced and spread in the air would

NAVY'S SEA-DART—The first combat-type aircraft to use water skis for improved rough water take-off and landing operations is the Navy's XF2Y-1 Sea-Dart, experimental delta-wing jet fighter shown here. Retracted, the hydro-skis disappear into the hull to give the plane a missile-like look. *(See SNL, Jan. 3, p. 6.)*