PHYSICS

New H-Bomb Speculation

A half dozen different types of fusion bombs probably exist today, some of which are made up of A-bomb and newer fusion devices.

➤ BECAUSE THE exact nature of the hydrogen bomb has not been revealed by the Atomic Energy Commission, there is continued speculation as to its composition, particularly that of the thermonuclear device exploded with spectacular results on March 1, 1954.

There are probably a half-dozen kinds of so-called hydrogen or more properly fusion bombs in which lighter chemical elements react to makes heavier ones, releasing some of their mass as energy.

Some of these bombs are really combinations of the A-bombs first devised and the newer fusion devices.

In fact, the light elements are started fusing by a trigger that provides extreme heat. This most easily, perhaps, is a conventional A-bomb made of uranium 235 or plutonium. Thus any superbomb or H-bomb is necessarily larger than an A-bomb, in which the materials fission or split into lighter elements instead of fuse or build up heavier elements.

Just what "fuel" or material is fused is not known, but it may be the heavier kinds of hydrogen, deuterium of mass two and tritium of mass three. These may be combined with lithium, a light metal, six or seven times as heavy as hydrogen, which theoretically should fuse with release of energy.

If we do not know just what the H-bomb contains, we do know that it produces a tremendous explosion and can spread its products over a 7,000 square-mile area, to accept the probably conservative AEC statement. These products or fall-out are intensely radioactive debris of the explosion that will give people in the area doses of radiation that would sicken or kill them.

Inspired by the emphasis of the recent AEC report on fall-out debris that most logically can originate in fission of heavier uranium elements, the suggestion has been made that the 1954 blast was that of a fission-fusion bomb around which was wrapped more uranium. The outer coating is speculated to be natural uranium, mostly the isotope 238, which does not fission when hit by slow neutrons, which are the atomic particles that trigger the A-bomb.

Perhaps fast neutrons would come from the H-bomb in such profusion that the uranium 238, the most common sort, will fission under these conditions, although it has been known that high-speed neutrons could be absorbed by uranium without any nuclear reaction taking place.

It is known that there are three heavy elements that are fissionable. One of these is uranium isotope 235 which is contained in small amount in natural uranium and which is separated from it by expensive extraction processes. This was the original A-bomb material.

Then there is the man-made element plutonium which is made from the more plentiful uranium 238 by a "breeder" reaction in which neutrons from slow-fissioning material change the 238 isotope into plutonium. This is done at the immense plant at Hanford, Wash.

The much more plentiful element, thorium, can in a similar way be transmuted into uranium 233, which is fissionable.

Such conversion of naturally non-fissioning uranium into plutonium might take place at great speed under the intense heat of the fusion H-bomb. Then the plutonium would immediately fission, adding to the explosion and providing the debris or "fall-out" that is so properly feared.

Just as logically the 1954 explosion may have been a thorium bomb, in which this element was provided as a sort of wrap-around to be turned into uranium 233 which then fissioned.

These speculative natural uranium and thorium additives to H-bombs are different from the cobalt bomb speculation of some years ago, because the uranium and thorium would add to the explosion, while cobalt added presumably would only become intensely and lingeringly radioactive.

The Russians and the British have solved the mystery of at least one or more of the H-bombs. Perhaps the first technical information will come from outside the United States, released for propaganda purposes. Those who can still speculate, minds unsealed by Q-clearances, can at best only project past knowledge into the secretive present and future.

Science News Letter, March 19, 1955

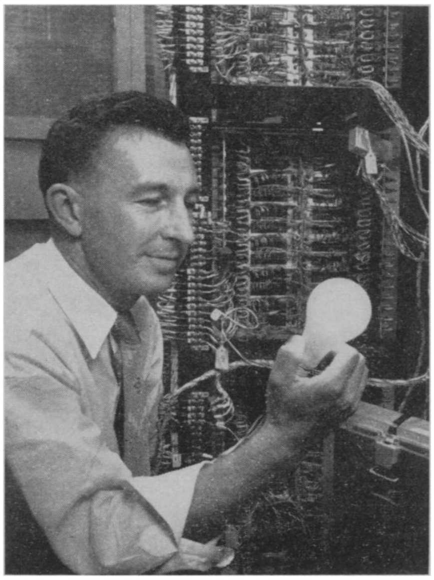
ELECTRONICS

Tiny High-Speed "Brain" To Fly With Pilots

➤ A TUBELESS electronic "brain" to help Air Force pilots make split second decisions has been developed, it has been revealed.

The tiny, all-transistor computer that can perform its high speed calculations during supersonic flight might be used to flash out solutions to gunnery, bombing or navigation problems.

Developed by Bell Telephone Laboratories, the digital computer, called TRADIC (TRansistor-DIgital Computer), is expected to take up less than three cubic feet of critical aircraft space and will run on only about 100 watts of electricity.



AERBORNE COMPUTER — Bell Telephone Laboratories' new tubeless electronic "brain," part of which is shown in the background, needs about the same amount of power for operation as the ordinary 100-watt bulb held by engineer E. F. Allgeyer. The device uses transistors instead of vacuum tubes.

Eight hundred transistors, first cousins to the crystals in the old "cat whisker" radios, are used in the device instead of vacuum tubes. The computer, which also contains about 11,000 germanium diodes for circuit-switching, is believed to be the first all-transistor "brain" designed for airplanes.

The device can perform 60,000 additions or 3,000 multiplications a second and can handle as many as thirteen 16-digit numbers at a time. It is faster than the National Bureau of Standards' most modern digital computer, DYSEAC. The transistor calculator, however, can only solve a specific set of problems and has very little memory capacity.

One of the main advantages of transistors in "brains" is that they give off an insignificant amount of heat in comparison to vacuum tubes with their red-hot filaments. When DYSEAC, for instance, works on a problem, it generates so much heat that a refrigerating unit with the cooling capacity of 12 tons of ice a day must be used to keep the temperature down.

Plug-in units that look like small breadboards give TRADIC its mathematical instructions, while specific numbers are inserted into the circuits with simple switches.

Answers to trigonometric problems are flashed graphically on an oscilloscope screen, similar to the common television tube.

Science News Letter, March 19, 1955

The Atomic Energy Commission will help private industry in the commercial development of a portable *X-ray* unit that uses radioactive thulium.