MILITARY SCIENCE

Atomic Bomb Countries

More and more countries may soon possess atomic bombs, but the U.S. and USSR are the only powers with the means to launch them in case of war—By Watson Davis

➤ MORE COUNTRIES, possibly Mainland China and even Israel, may in the next year or so be added to the countries that possess atomic bombs. Four countries, U.S.A., USSR, England and France, definitely have atomic bombs.

The explosion of an atomic bomb in test by an additional nation should not disturb the world too much unless it was taken to be a threat to some antagonist nation. Compared with the hundreds of bombs existing in the U.S.A. and USSR arsenals, two or three more in the hands of a new atomic country will pose no serious threat unless they are used desperately or insanely, or unless their secret exploding would set off mistaken retaliation by one of the major atomic nations.

The "Nth country problem," as the spread of nuclear weapons to additional countries is called, has been much discussed. Experts consider that only the United States and Russia have what they call "major atomic capability." Only these two countries have not only large quantities of A- and H-bombs but the means for delivering them in quantity.

The crux of the atomic bomb manufacture lies in whether a nation has access and can produce plutonium sufficiently pure to be fissionable or explodable among those available. Only the chemical elements plutonium and uranium isotope-235 are fissionable. One or the other of them is necessary to make the earlier sort of atomic bomb, the fission variety. But the fission bomb is the trigger to set off the fusion or H-bomb.

Obtaining the ingredients for a hydrogen bomb once a fission bomb is in hand is believed relatively simple, since the heavy hydrogen, deuterium, which is used in the hydrogen bomb, is rather widely available and obtainable in the world market at about $30 a pound.

For a time, the Russians were believed to have been working with the Communist regime in China on atomic energy and bomb building. But after the recent rift between the two factions of the Communist world, research and scientific cooperation seems to have been withdrawn and this is likely to delay the production of a Red Chinese atomic bomb.

The key to production of plutonium is its separation from the "ashes" of nuclear power reactors in which it is manufactured from natural or slightly enriched uranium as fuel. Plutonium is a by-product of the chain reaction in the reactors. A plant for producing plutonium in this way is estimated to cost about $50 million capital and $20 million annual operating costs for producing two to four bombs a year. Only a very prosperous country would undertake to spend this amount of money for this purpose. Experts believe that although perhaps a dozen countries are rich enough, only China would be likely to enter the atomic bomb race.

Making bombs is only a first step toward launching them in war. The delivery system of missiles for the United States is estimated to require about 20 times the annual cost of nuclear explosives manufactured and to be roughly equivalent to the cost of maintaining a 2.5 million-man army. Only the United States and Russia can afford such expenditures.

• Science News Letter, 83:359 June 8, 1963

PHYSICS

World's Most Powerful And Hottest Beam

See Front Cover

➤ ENGINEERS have developed one of the most powerful and hottest continuous beams of light. In two or three seconds it can burn through a piece of steel as thick as that in an automobile fender.

This tremendous output of heat and light is what makes the radiation source useful in studying a major problem of the Space Age: reentry heating.

The beam, developed by Westinghouse Research Laboratories, is so hot and powerful, it burns in two or three seconds right through the steel frying pan held by research engineer L. S. Frost, seen on this week's front cover.

The energy closely simulates that encountered by space vehicles during reentry into the earth's atmosphere at speeds near their escape velocity—about 25,000 miles per hour. At such speeds, both heat and light are generated when the falling vehicle heats the atmosphere just in front of it white hot.

The new light source is no ordinary lamp. Instead, it employs a new concept in radiation sources. Its radiant energy comes from a high-pressure plasma jet, hotter by far than the surface of the sun. The jet is sealed inside a stainless steel vessel designed to operate at pressures up to 600 pounds per square inch—40 times the pressure of the atmosphere at sea level.

Also sealed inside the pressure vessel is a deep elliptically shaped mirror which collects three-fourths of the jet's radiation and beams it out through a quartz lens.

The plasma jet exists between a negative electrode (cathode) and a positive electrode (anode), both of which are water cooled. An inert gas, such as argon, xenon or a mixture of them, streams continuously through the device, forming the plasma jet and flushing out evaporated metal, which would blacken the mirror.

The new radiation source produces enough electric power to brightly light 100 five-room homes with standard incandescent lamps.

The radiation is also rich in ultraviolet rays. Welders' goggles must be used in working with it and a deep tan is soon obtained simply by being in the laboratory in which it operates.

Mr. Frost and H. C. Ludwig developed the radiation source in cooperation with J. K. Wolfe of the Westinghouse industrial systems department. They predict a variety of uses for the device in addition to the study of reentry heating. High-intensity searchlights, laser pumping, simulation of radiation from the sun, furnaces for melting metals and ceramics, welding, airport illumination, and advanced military applications are some of the uses foreseen.

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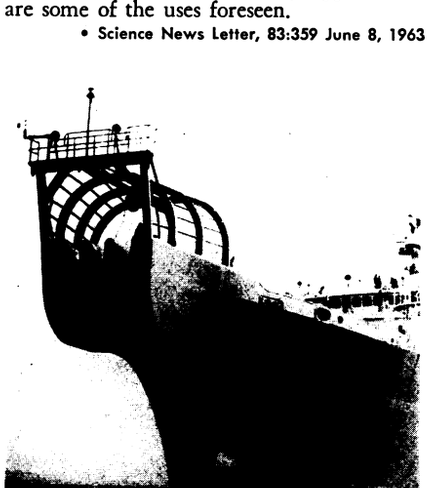

American Telephone & Telegraph

CABLE-LAYER—The bow of the world's newest cable-laying ship is shown with sheaves used for cable-laying and grappling. The C. S. Long Lines ship will start her first project work in mid-summer on a new transatlantic telephone cable between New Jersey and England. She will place nearly 16,000 miles of deep-sea cable during the next three years.

TECHNOLOGY

More Economical Color TV Tube Developed

➤ A NEW COLOR TV tube uses a single electron gun instead of three as is now the standard practice in industry. It dispenses with the selection device that cuts down the brightness of the picture.

The tube, developed by D. M. Goodman of New York University's engineering research division, patent 3,081,414, is expected also to have wide application to information and electronic data presentation systems. The expected price is $40 in quantity.

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