

## INTRODUCTION

The atomic era began with a test conducted by the United States on 16 July 1945 at Alamogordo, New Mexico. The test confirmed the conclusions reached by a team of scientists that an explosion several orders of magnitude greater than that brought about by conventional explosives was possible. Such an explosion can be produced by an assembly of fissile material exceeding a critical mass. The critical mass is the smallest mass needed for a self-sustaining chain reaction, in which the number of neutrons released from fissile nuclei and absorbed by other fissile nuclei equals the number of neutrons lost by absorption in non-fissile material or by escape from the system. At Alamogordo, for the first time in history, an amount of energy equal to that released by 20,000 tons of the conventional explosive TNT was released by fissioning the nuclei of plutonium in an instantaneous chain reaction. The first US bomb that released energy by splitting the nuclei of uranium was exploded over Hiroshima three weeks later. It had an explosive yield of about 13 kt. In 1949, the Soviet Union ended the US monopoly in the field by exploding its own atomic device. Subsequently, Britain (in 1952), France (1960) and China (1964) joined the "club" of atomic weapon states.

Even more powerful explosive devices, so-called thermonuclear (or hydrogen) weapons, were developed and successfully tested in the 1950s. These rely on the fusion of light nuclei, such as those of hydrogen isotopes, brought to the extremely high temperatures which are produced by the fission of plutonium or uranium. Even more energy can be released in a fission-fusion-fission process, in