



South Africa's Nuclear Weaponization Efforts : Success on a Small-Scale

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The case of South Africa, which developed a relatively small nuclear weaponization program, shows the rudimentary facilities needed to make gun-type nuclear weapons. A terrorist group would need only a subset of these facilities to accomplish its goals.

South Africa's first efforts to research and develop gun-type nuclear weapons were conducted in a small building under tight security at a propulsion laboratory at the Somchem establishment in the Cape Province. At that time, Somchem was a military facility involved in the development and manufacture of explosives and propellants.

At Somchem, South Africans worked on the mechanical and pyrotechnic subsystems for a gun-type device. The team designed a scale model which, with a projectile constructed of non-nuclear material, was tested at Somchem in May 1974, demonstrating that a nuclear explosive was feasible. The team working at Somchem tested the first full-scale model of the gun-type device using a natural uranium projectile in 1976. This test proved the mechanical integrity of the design.

Soon afterward, South Africa constructed a series of buildings in a valley in the southwestern section of the Pelindaba nuclear research site, west of Pretoria. These nondescript facilities were isolated from the main site. In these building, the weapons program concentrated on making gun-type devices, but also studied implosion-type nuclear explosives.

The South African effort to make a working, gun-type device took about eight years to accomplish. The relatively long development time, however, resulted primarily from the difficulty South Africa experienced in getting its uranium enrichment plant to produce sufficient highly enriched uranium for its first nuclear explosive device. The actual time needed to develop and prove a gun-type device was considerably less.

The main weaponization facilities were the following:



Building 5000

Building 5000 - This facility contained a pulse reactor for the experimental verification of theoretical computer models. In 1979, the reactor was used as a fast critical assembly in an experiment often referred to as "tickling the tail of the dragon" that proved the design of the gun-type device. The reactor was never again used as a pulse reactor and the facility was shut down in the early 1980s.



Building 5100

Building 5100 - This building contained the control room for Building 5000, offices, research and development laboratories and machining facilities for uranium metal.



Building 5200 (right) and 5300 (left, green roof)

Building 5200 - This building housed a critical facility to verify separately the multiplication factors of the two parts of a nuclear explosive device, providing confidence that the gun-type design would work. The first nuclear explosive device was also assembled in this building in 1979.

Building 5300 - This building was designed exclusively as a laboratory for high explosives. In the early stage of the South African nuclear weapons program, small quantities of high explosives were pressed and machined into shapes at this facility.

In order to develop a rudimentary, working gun-type device, a terrorist group would need a small test facility like that at Somchem, a facility similar to building 5200, and at least a portion of building 5100. However, the group would need to acquire the highly enriched uranium to fuel the nuclear explosion.

[Note:] On the ISIS web site, we have annotated a KVR-1000 image (purchased from [Terraserver](#)) of Pelindaba and Valindaba. The resolution of the image is approximately 2-meters. The date of the image is December 30, 1991. This image and more information about South Africa's nuclear weapons program can be accessed at <http://www.isis-online.org>.