450kg GOLF BOMB

This bomb, developed for and by the Rhodesian Air Force, was employed operationally from early 1977. The 450kg version was designed for use by the Hawker Hunter FGA9. A smaller version nicknamed 'Mini Golf' was introduced later to give light propeller driven aircraft a huge punch off a low level attack profile. As it happened only the Reims-Cessna F337, converted by Rhodesia for armed use, employed the Mini Golf. This modified aircraft was known as 'Lynx' The 'proboscis' of the Golf Bomb (and later mini Golf) was designed to detonate the bomb above ground in a manner that limited energy losses to ground and upper airmass. Simultaneous initiation at front and rear of the explosive charge provided a 'squeeze' effect that concentrated energy low and flat across target ground.

The 450kg Golf Bomb employed double steel plating to sandwich thousands of pieces of chopped 10mm steel rod. The double skin and chopped rod driven by the high-volume gas generating explosive, Anfo, when added to shredded vegetation proved Golf Bomb to be a truly devastating weapon. A pair of these bombs gave a bush flattening-pattern 90 metres wide by 135 metres in the line of attack with lethal effects extending beyond.

BACKGROUND TO THE GOLF BOMB

Group Capt. 'PB' Peter Petter-Bowyer MLM (Ops) DCD, MFC (Ops) was head of the project for the Rhodesian Air Force. These projects were named sequentially Alpha, Bravo etc. The result of Alpha was the spherical bomb also displayed here.

In Project Foxtrot the Rhodesians attempted to produce fuel-air explosive (FAE) bombs, which American military journalists describes as having 'near nuclear' effect. One military article was supported by dramatic photographic records of the total destruction of an old US naval destroyer from just one of these FAE bombs. However, destruction of ships was not America's real interest in FAE. The weapon had been developed to clear large pathways through enemy minefields by detonating hidden mines with excessive over-pressure of ground.

Ethylene oxide was the medium the Rhodesians employed. There were two reasons for the choice of this liquid gas. Firstly, it explodes with as little as two per cent of air inclusion and as much as 95 per cent of air inclusion, whereas most other gases will only detonate within a very narrow gas to air ratio. The second advantage of ethylene oxide is that, when ignited, it produces gas volumes many times greater than any high-speed explosive, such as TNT.

Each American FAE bomb was dropped at relatively low level and descended to ground on a parachute. A ground-sensing device perforated a pressure disc to release the bomb's pressurised liquid contents at about 20 feet above ground and simultaneously fired flares upwards. The upward and downward flight time of the flares allowed the ethylene oxide gas skirt to widen to around 25 metres in radius before the first of the flares contacted the gas skirt setting off a vicious explosion. Lethal over-pressure from a mere five gallons of ethylene oxide dispersed and detonated in this way extended way beyond the edge of the gas skirt.

Very often the precise positions of Communist Terrorists (CTs) firing from dense bush were not known and Rhodesia had no single weapon that could produce lethal effect over relatively large areas to cater for such situations. FAE seemed to offer a perfect solution to this on-going problem.

Considerable time, effort and cost went into Project Echo during which the Rhodesians succeeded in making huge expensive fireballs before eventually, achieving two terrific detonations. The first of these broke many windowpanes in the Kutanga Range domestic area that was over 500 metres from the blast. What interested them about successful detonations were the sound effects they produced and the fact that they totally stripped vegetation, including substantial trees, up to 45 metres radius from blast centre. The ground around was pulverised and powdered to a depth of several inches. The sound of each detonation was not a sharp bang, as from TNT, but a loud deep-noted *Crruuump* from an explosion followed immediately by the *Cruump* of an implosion.

Ethylene oxide is a very dangerous substance to store and with Rhodesia being under UN sanctions it was also very expensive and difficult to source. Considering these issues, and realising that weapons that descend on parachutes would be difficult to deliver accurately, even in the lightest of wind conditions, it was decided to drop the FAE project. Nevertheless, they were still determined to produce high-pressure bombs. They decided to investigate the use of ANFO (the Rhodesian name for Amatol, a mixture of diesel fuel and ammonium nitrate fertiliser) which they could produce very cheaply and easily.

Project Golf was initiated by making a direct comparison between an imported 500 lb. TNT-filled medium-capacity bomb and an ANFO-filled 6mm steel casing having equal mass. Both units were mounted vertically on three-foot stands pointing nose down for command detonation from a safe distance. The imported bomb was detonated first. It went off with the usual bright flash, black smoke and a very loud bang with plenty of dust drifting away on the wind. The ANFO bomb was nothing like as impressive to the eye or ear. The explosive flash was nowhere near as bright as the TNT bomb and pasty-grey smoke mingled with dust was drifting off before a deep *Crrrrump* was followed immediately by a second *Crrump*.

Inspection of the sites showed clearly that they had a winner in ANFO. Loud bangs, such as thunder from lightning, are the product of huge energy releases to atmosphere. In the case of bombs filled with high flame-rate explosives, bright flashes and loud bangs of surface bursts are products of wasted energy following the disintegration of steel casings. When used against buildings, bunkers and other targets where detonation occurs within confined structures, the same energy is highly destructive, but not so in the unconfined conditions of open bush.

In the case of ANFO, the steel containers swell in size, as do the high-explosive containers; but ANFO, having a much slower flame-rate, continues its heaving detonation well beyond case disintegration. An ANFO mix, when confined in a steel container and given a hefty thump by an initiator charge such as Pentolite, ignites spontaneously to generate enormous amounts of high-pressure gas in a heaving EXplosion which forces air outwards from the generated gas bubble. The gas cools immediately, creating a void into which the air flows at supersonic speed, causing an IMplosion.

The implosion following an atomic bomb blast causes more damage to structure that the initial explosion. In the case of ANFO, explosion and implosion are equally damaging.

The production of ANFO, a commonly used mining explosive, simply involves the thorough mixing of a small quantity of diesel fuel into prilled ammonium nitrate fertiliser. In the beginning this was done very basically with a shovel in a wheelbarrow. The process later progressed to a simple motor-driven concrete mixer for large quantity production.

ANFO offered a special advantage. From the start the Rhodesians realised that it would not be necessary to use special ammunition dumps for the safe keeping of ANFO bombs. Unlike standard high explosive units that had to be filled in specialised conditions, ANFO bombs could be stacked in the open and only filled when they were needed.

Further static 500 lb. ANFO trials were conducted before making a direct comparison between an imported 1000 lb. bomb and an ANFO unit of equivalent mass. The imported bomb explosion had no noticeable effect on the pressure pots and pressure discs beyond 15 metres. Following detonation of the ANFO unit the pressure pots within 25 meters suffered distortion and satisfactory over-pressure readings extended out to 35 metres.

Following detonation of the ANFO unit, the Rhodesians had a medical examine the bodies of snakes and frogs that were found on the surface following every single ANFO detonation. All of these cold-blooded creatures, though dead, appeared perfectly normal until dissected. Over-pressure had destroyed their lungs and other vital organs without any damage to outer skin. The frogs, which lived more than one foot below surface, were always found on top of the powdered earth lying belly up.

Our first ANFO bombs produced weighed 450 kg, which was equivalent to the imported 1000 lb. bombs. Canberras and Hawker Hunters released these in a series of tests. Although the tests themselves were successful, the Rhodesians were not at all happy with the loss of energy evidenced by large craters in the ground where they detonated.

Operational considerations clearly identified Hawker Hunters as the main user of high-pressure bombs, so they turned all their attention to fighter/bomber style steep-dive (60-degree) profile attacks. To maximise blast effect each bomb was fitted with a one-metre long proboscis to ensure airburst. To minimise energy losses downward and upward, and to maximise ground over-pressure, simultaneous initiation of Pentolite booster charges at the front and rear of the ANFO charge resulted in a very satisfactory ‘squeeze’ effect. In doing this, each bomb flattened everything around the point of contact and no energy was lost to punching out ground craters. The entire tailpiece was usually found at the centre of detonation proving that almost no energy was going skyward.

During early tests each pair of bombs landed close together; so the Rhodesians decided to improve the 90-metre diameter bush-clearing effect by retarding one bomb to force it to fall short of the un-retarded one. Spring-loaded metal paddles were used initially but these were clumsy and inefficient. They were discarded as soon as the Rhodesians learned how to absorb the high shock loading involved in deploying their own designed and manufactured drogue chutes. The drogue chutes worked well and forced the retarded bomb to fall about 35 metres short of the streamlined unit. From then on a pair of ANFO bombs gave a bush flattening-pattern 90 metres wide by 135 metres in the line of attack.

450 kg Golf bombs were cleared for operational use in March 1977. Testing continued for some time thereafter, resulting in the ANFO bombs being upgraded with double steel cylinders sandwiching thousands of pieces of chopped 10mm steel rod to give lethal shrapnel effect beyond the over-pressure boundaries. Although officially termed 450 kg HP bombs, the project title stuck and everyone knew them as ‘Golf Bombs’.

This information is extracted from ‘Winds of Destruction’ by P.J.H. Petter-Bowyer