47 mm AMMUNITION FOR BRITISH SERVICE

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The latter part of the nineteenth century saw a great deal of activity in the field of armaments, as a result of the development of improved chemistry and engineering standards combined with mass production. This enabled the design of quick-firing guns using one-piece ammunition with drawn brass cartridge cases, more aerodynamically shaped projectiles, and 'smokeless' propellants which generated a lot more energy than gunpowder.

Another influence on shell-firing ammunition was the St Petersburg Declaration of 1868, an international agreement banning the use of explosive projectiles weighing less than 400 grams. This led to the introduction of the 37 mm calibre by Hotchkiss of France, as this was the appropriate size of shell for that weight. The resulting 37 x 94R round became world-famous, being used in the Hotchkiss *'canon revolver'* of 1885 (a five-barrel manually-cranked rotating gun similar in appearance to the Gatling), the Maxim 'Pom Pom' – the first self-powered, belt-fed cannon – and various single-barrel manually-loaded guns. More powerful 37 mm guns with bigger cartridge cases followed, and Hotchkiss also applied themselves to scaling-up their guns to larger calibres, with the most successful efforts being in 47 mm and 57 mm. Other manufacturers largely followed Hotchkiss's lead in standardising calibres, and in some cases used the same ammunition.

The British adopted various guns and ammunition in these calibres but not their nomenclature, preferring their traditional 'pounder' system which rated guns according to the nominal weight of their projectiles. The 37 mm guns became the 'one pounders', the 47 mm the 'three pounders' and the 57 mm the 'six pounders', usually abbreviated on headstamps to 1^{PDR} or 1^{PR} etc. For the most part (with some exceptions as described below) the pounder designations for these calibres were adhered to regardless of the actual weights of the projectiles fitted.

British 47 mm to World War 1

Initial British interest in the 47 mm guns was almost entirely naval, as such a small calibre was of little use to armies until tanks and aircraft came along to provide suitable targets. The RN acquired them in order to deal with the menace of torpedo boats, which were initially small and easily destroyed, but very difficult to hit with the existing slow-firing and slow-training guns of larger calibre. At first, the torpedo boats were small enough to be dealt with by rapid-firing multi-barrel Nordenfelt or Gatling guns of up to 1 inch (25 mm) calibre, but as the torpedo boats (plus their larger predators, torpedo-boat destroyers, a title soon shortened to destroyers) increased in size so did the calibre of the guns: at first to 37 mm, then 47 mm, then 57 mm, and during WW1 the calibres grew even larger.

The 47 mm guns therefore had a short life on fleet warships, but survived for much longer on lesser vessels, in coast defence installations and as sub-calibre guns for low-cost training. Some were later fitted to high-angle mountings for the AA role. All of them were single-barrel manually loaded types, although some had a semi-automatic breech which ejected the fired case while still requiring manual loading.

47 x 376R ammunition:

The first 47 mm gun adopted by the RN was the 'Ordnance QF 3^{PDR} Hotchkiss Mk 1', which was ordered from France in 1885. Licence production at Woolwich followed, with the first orders placed in 1889. Over 3,000 Mk 1 were made (200 specifically for the sub-calibre role). Propellant was initially gunpowder, but this was soon replaced by cordite. The rate of aimed fire was around 15 rpm.

Guns using the same ammunition were also acquired from Nordenfelt (for coast defence only, and in time replaced by the more highly-regarded Hotchkiss) and Bethlehem (just 60 bought).

The 3^{PDR} Hotchkiss was gradually replaced by the more powerful 3^{PDR} Vickers (see below), but nearly 2,000 of them were still in existence at the start of WW2, when they were rapidly fitted to auxiliary and merchant vessels to give them some degree of self-protection – the benefit probably being more psychological than real.

3^{PDR} blank-firing saluting guns remained in RN service at least until recent times.

47 x 413R ammunition:

The Hotchkiss was limited in its performance through the guns being designed for a maximum chamber pressure of 12 tons per in^2 (26,900 psi) resulting in a low muzzle velocity. Vickers accordingly designed a new gun with a larger cartridge case (increasing the chamber volume by nearly 50%) which in conjunction with a longer barrel (50 rather than 40 calibres) and a gun capable of withstanding 16 tons per in^2 (35,800 psi), provided a considerable increase in velocity. Although the Mks I and II were stated to use interchangeable ammunition, the Mk II had a higher MV, probably due to more advanced cordite. Just over 600 of the 'Ordnance QF 3^{PDR} Vickers Mk 1 and 2' were made from 1905, the last one rather surprisingly being delivered as late as 1936. The high velocity made the guns better suited to the AA role, so many were installed on high-angle mountings.

Elswick made a different 3^{PDR} gun firing the same ammunition as the Vickers, but this saw very little use.

47 x 131R ammunition:

The third of the 47 mm ammunition types to see RN service during WW1 (another one of French origin) had a much shorter cartridge case and fired a lighter shell, causing it to be designated the $2½^{PDR}$ Hotchkiss. The guns had a curious history, being made by Elswick for the Japanese navy (they called it the Yamanouchi), with deliveries starting in 1894. Just over 250 were sent to Japan, of which 84 were sent

back to Britain early in WW1. They were used to arm auxiliary vessels. Although Hotchkiss did make a five-barrel *canon revolver* which fired similar ammunition, this one had a single barrel, 30 calibres long, with manual loading.

British 47 mm Guns from the 1920s to the 1940s

Only three 47 mm rounds were developed for British service during this period, and only one was successful: a tank gun. An airborne anti-tank gun was developed to the point of being tested, but a naval AA gun didn't even get that far. In addition, a different 47 mm tank gun was sold abroad.

47 x 351R ammunition:

Since the end of WW1, only one new model of 47 mm gun has entered British service: the 'Ordnance QF 3^{PDR} 2 cwt Gun' (the 2 cwt referring to the weight of the gun, excluding the mounting – about 100 kg, compared with 240 kg for the 3^{PDR} Hotchkiss). This was fitted to the Vickers Medium tank of the early 1920s, which had an important tactical development and training role during the formative period for armoured warfare but was obsolete by the start of WW2. The ammunition was a slightly shortened version of the 3^{PDR} Hotchkiss and was an unimpressive performer with a surprisingly low muzzle velocity (1,750 fps / 533 m/s); it appeared that a light gun weight was considered more important than a high performance. A Mk II version of the gun had a longer barrel (L/40 instead of L/32) and offered a slightly improved performance (1,840 fps / 561 m/s). The standard projectile was an APHE, with a delayed-action base fuze designed to detonate the small HE charge after penetration. In the Mk II gun it was said to be able to penetrate 25 mm armour at 30º impact at 1,000 yards (the Mk I managed the same penetration at 500 yards, striking angle unspecified); by comparison, the smaller but much higher velocity 2^{PDR} which replaced the 3^{PDR} in later tank designs could penetrate 40+ mm at 1,000 yards.

At the end of the 1920s Vickers developed a light tank – the Mark E or 6-tonner – one version of which (the Type B) was fitted with a short-barrelled 47 mm cannon. The tank was widely exported in small batches (including to Poland) in the 1930s but not adopted by the British Army. Information from a Polish source indicates that the cartridge measured 47 x 186R with a 57 mm rim, and fired a 1.5 kg AP shot at 488 m/s or an HE shell at 300 m/s. These dimensions are very similar to those for the Austrian Böhler light field/anti-tank gun which was also widely exported in the 1930s; its straight-cased ammunition came in a variety of case lengths from 185 to 235 mm. Possibly there was a connection, but no supporting information has so far emerged.

47 x 326R ammunition:

The success of the Vickers 40 mm Class S anti-tank gun fitted to some ground-attack Marks of the Hawker Hurricane aircraft prompted the development of a scaled-up 47 mm Class P (the RAF used metric calibre designations). The Vickers was the most developed of the competitors and two of them were fitted to a Hawker Tempest in 1946, but this project was subsequently cancelled. For more details see this article: http://quarryhs.co.uk/Pgun.htm

47 x 428R ammunition:

Apart from one factory ammunition drawing used to make the replica round shown below, the only information about this comes from Conway. The ammunition was developed for a 3½^{PDR} naval AA gun, two prototypes of which were made by Vickers Armstrong. Both were water-cooled, the barrel recoiling through the water jacket in one, and with it in the other. The automatic mechanism does not seem to have been fully developed. The barrel was 75 calibres long, the chamber volume 50 in^3, the propellant charge 613 g of NF/S 093-031. The project was cancelled in 1946.

*Photo: **47x376R** 3^{PR} Hotchkiss; **47x413R** 3^{PR} Vickers; **47x131R** 2½^{PR} Hotchkiss; **47x351R** 3^{PR} 2cwt (replica); **47x326R** Vickers Class P; **47x428R** Vickers 3½^{PR} (replica)*

Data Table

Ammunition	Rim diameter mm	Projectile weight kg	Muzzle Velocity m/s	Muzzle Energy kJ	Gun
47 x 376R	63.8	1.5	574	247	3^{PR} Hotchkiss
47 x 413R	68.0	1.5	788-817	465-500	3^{PR} Vickers
47 x 131R	59.4	1.13	433	106	2½^{PR} Hotchkiss
47 x 351R	63.8	1.475	533-561	210-232	3^{PR} 2 cwt
47 x 326R	59.7	2.07	808	676	47 mm Class P
47 x 428R	64.7	1.59	1,021	827	3½^{PR} Vickers

Foreign 47 mm Guns and Ammunition

Guns of 47 mm calibre, mostly for tank and/or anti-tank applications, were developed and fielded in various countries in the interwar period. For details, see the Ammunition Data Tables here: http://quarryhs.co.uk/ammotable6.html

Illustrations of many of the cartridges used can be found in the Ammunition Photo Gallery here: http://quarryhs.co.uk/tankammo.html

Two major countries which went their own way in developing calibres were Germany, which used AA, tank and AT guns in 50 mm calibre, and the Soviet Union which preferred 45 mm weapons.

Since WW2 these calibres have gone out of fashion; too large for the usual autocannon roles, too small for anything else. However, 50 mm might be making a comeback – the "Super 50" is advertised by Orbital ATK as a potential future upgrade for their 35 mm Bushmaster III.

Sources

Information concerning the naval guns comes from Friedman's *Naval Weapons of World War One*, Campbell's *Naval Weapons of World War Two*, and the NavWeaps site: http://www.navweaps.com/Weapons/WNBR_Main.php

The tank gun information is from Fletcher's *Mechanised Force* and the RAC Tank Museum's *Fire and Movement*, plus the BOCN forum: http://www.bocn.co.uk/vbforum/forum.php

The aircraft gun information is from Birch's *Rolls-Royce Armaments.*

With thanks to Norman Bonney for suppying the factory drawing of the 3½^{PR} Vickers, and to Mick Wilkinson for making the replica rounds shown.

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