

Ödön Harka<sup>1</sup>

# Combat Support Armament of the Rapid Forces in the Hungarian Royal Defence Forces

## A Magyar Királyi Honvédség gyorsan mozgó csapatainak harctámogató fegyverei

### Abstract

*Besides the combat-arms assets, the rapid troops of the Royal Hungarian Defence Forces also had field artillery (light howitzers), air defence artillery and anti-tank guns.*

*The order of battle of the motorised units required the existence of one (after the autumn of 1941, two) artillery battalion(s) with vehicle-drawn assets for providing combat support. The motorised artillery battalions initially had four batteries with light howitzers, while the armoured divisions had two motorised artillery battalions. There were two artillery battalions with four (six) batteries in the mobilised organisation of the cavalry brigades (division).*

*For ensuring defence against air attacks, vehicle-drawn air defence artillery battalions were introduced in the armoured divisions and the 1<sup>st</sup> Cavalry Division with one light and one heavy battery.*

*Against tank attacks, there were 4–6 anti-tank guns in service used by each of the anti-tank companies of the infantry and reconnaissance battalions (in the motorised rifle brigades and hussar regiments of the armoured divisions) and the 1<sup>st</sup> Cavalry Division.*

**Keywords:** *Royal Hungarian Defence Forces, rapid troops, artillery, air defence, anti-tank gun, mechanised warfare*

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## Absztrakt

*A Magyar Királyi Honvédség gyorscsapatai az elsődleges csapásmérésre alkalmas hadfelszerelés mellett tábori tüzérségi és csapatlégvédelmi eszközökkel, valamint páncéltörő lövegekkel is rendelkeztek.*

*A magyar honvédség gépesített egységeinek harcrendje a gyorscsapatok harcainak támogatása érdekében egy (1941 őszétől kettő) gépvontatású tüzérosztály meglétét írta elő. A gépvontatású tüzérosztályok kötelékébe kezdetben négy könnyűtarackos üteg tartozott, a páncéloshadosztályok kötelékébe pedig két gépvontatású könnyűtarackos osztályt állítottak be. A lovasdandárok (hadosztály) mozgósított szervezetébe egy lovas- és egy gépvontatású tüzérosztály került összesen négy (hat) üteggel.*

*Az egységek légitámadások elleni oltalmazásának szükségessége miatt a páncéloshadosztályok, illetve az 1. lovashadosztály mellé egy-egy gépvontatású légvédelmi tüzérosztályt osztottak be egy könnyű- és egy nehézüteggel.*

*A harcok elleni védelem érdekében a páncéloshadosztályok kötelékében harcoló gépkocsizó lövészdandárok gyalogos és felderítő zászlóaljainak, valamint az 1. lovashadosztály huszárezredeinek páncéltörőágyús-századai 4-6 darab, különböző űrméretű páncéltörő löveggel rendelkeztek.*

**Kulcsszavak:** Magyar Királyi Honvédség, gyorscsapatok, tüzérség, légvédelem, páncéltörő ágyú, gépesített hadviselés

## 1. Introduction

In addition to the primary combat-arms assets – tanks, tank hunters and armoured cars – the rapid troops of the Royal Hungarian Defence Forces had field artillery (light howitzers) and air defence weapons, anti-tank guns, mortars, engineering, signal and traffic control units (combat support units) as well, in order to meet the requirements of interservice operations. The standard combat support assets at the armoured and cavalry units of the Defence Forces (field, anti-tank, and air defence artillery), the light weaponry of the mechanised ground troops and cavalry regiments are presented in the light of the 1942–43 order of battle<sup>2</sup> of the 1<sup>st</sup> Hungarian (field) Armoured Division, through the 1944 order of battle<sup>3</sup> of the Hungarian 2<sup>nd</sup> Armoured Division and that of the 1<sup>st</sup> Cavalry Division. In the present paper I do not intend to touch upon the organisational issues of the artillery units in detail, or the industrial development thereof, and I refrain from presenting the field artillery tractors and transport vehicles of the mechanised units. I will present only the development of those weapon systems that were used by the rapid forces.

<sup>2</sup> Péter Szabó and Norbert Számvéber, *A keleti hadszíntér és Magyarország 1941–1943* (Debrecen: Püedlo Kiadó, 2003). 156.

<sup>3</sup> Péter Szabó and Norbert Számvéber, *A keleti hadszíntér és Magyarország 1943–1945* (Debrecen: Püedlo Kiadó, 2003). 278–280.

The stipulations of the Trianon Peace Treaty – which were ratified by Act 33 of 1921 – did not allow the Royal Hungarian Defence Forces to commission artillery pieces with calibres exceeding 10.5 cm (heavy artillery). Consequently, the Defence Forces could only have light artillery, with no more than 105<sup>4</sup> cannons.<sup>5</sup> In such hard conditions the military and political leaderships were able to keep the Defence Forces and the remaining military industry alive, but as a consequence of the limited financial possibilities and due to the continuous investigations by the Allied Military Control Commission before March 1927, it seemed an impossible mission to establish and maintain artillery units that could have been suitable for the requirements of those ages.

The 'softening' in the political climate after the spring of 1927 allowed to achieve cautious progress in the field of military development. On March 1, 1930 the Royal Hungarian Institute of Military Technologies was established, subordinated to the Ministry of Defence, tasked with the development of new weapons, types of ammunition, and other military equipment for the Defence Forces. The high command had two options for the rearmament of the Defence Forces: a) to improve the existing industrial capacities by employing Hungarian labour force and using scientific results in order to produce domestic-made weaponry based on the knowledge and know-how from the lessons learned during World War I; or b) to import foreign weapons and manufacture them within the framework of license agreements. In the 1920s the MÁVAG Plant in Diósgyőr was at the forefront of domestic production of artillery equipment. At that time the gun plant most probably bypassed the international control and produced some 280 artillery pieces (with calibres from 75 mm to 150 mm) designed in the period of World War I. The foreign procurement opportunities were reduced to neutral countries (for example Sweden or Switzerland) and German and Italian companies of military industry. The Italian–Hungarian eternal friendship treaty signed in 1927 provided an excellent basis for the Hungarian–Italian military-industrial cooperation.<sup>6</sup> As a result of the improving Italian–Hungarian relations, the primary import opportunity to the Kingdom of Hungary was offered by the military industry of the Italian party; however, the Defence Forces managed to procure military equipment from German sources too. A total of 84 (128) artillery pieces (40 guns were horse drawn, another 44 were vehicle towed ones) (according to other sources 96 guns were horses drawn and 32 were vehicle towed<sup>7</sup>). These were exclusively 1937M 'Göring' type howitzers manufactured by the Rheinmetall-Borsig AG, and introduced at the artillery units.<sup>8</sup>

In order to strengthen the air defence capabilities of the mechanised troops, the military leadership did not primarily aim at the modernisation of the obsolete guns, but the production of new, Swedish-designed guns, so they discovered the opportunity of advance in licensing the production of the brand new 40-mm anti-aircraft gun.<sup>9</sup>

<sup>4</sup> Tibor Balla, Tamás Csikány, Géza Gulyás, Csaba Horváth, and Vilmos Kovács, *A magyar tüzérség 100 éve* (Budapest: Zrínyi, 2014). 155.

<sup>5</sup> *Ibid.*, 148.

<sup>6</sup> *Ibid.*, 154.

<sup>7</sup> *Ibid.*, 165.

<sup>8</sup> Lóránd Dombrády, Pál Germuska, Géza Péter Kovács, and Vilmos Kovács, *A magyar hadiipar története* (Budapest: Zrínyi, 2016). 164.

<sup>9</sup> Balla et al., *A magyar tüzérség*, 162.

## 2. The development of order of battle 'Huba I'

After the successful procurement of the 'Göring' light howitzers from Germany, in 1938 the General Staff of the Defence Forces made a decision which of the artillery calibres to decommission or keep. As a result, the 80-mm and 100-mm calibres were removed from the system, while the 75-mm, 105-mm, 150-mm, 210-mm, and 305-mm calibres were commissioned in further functions.<sup>10</sup>

The high command intended to spend 95.5 million Hungarian pengő on the development of the artillery, partly through the procurement of foreign-made guns (40 new howitzers of type 'Göring'), and partly through manufacturing domestic produced military assets in the Diósgyőr Plant (twenty 150-mm type 1931M truck towed howitzers; forty-eight 210-mm type 1939M tractor towed heavy howitzers; thirty-two 80-mm type 1929M anti-aircraft cannons; one hundred and fifty-one 40-mm type 1936M anti-aircraft guns; and one hundred and fifty-six 150-mm type 1914/35M horse drawn howitzers<sup>11</sup>). The Diósgyőr Plant managed to increase the volume of the production from the summer of 1939. Between the autumn of 1938 and the end of December 1939 the plant produced one hundred and twenty-six 40-mm anti-aircraft guns and 260 replacement barrels for them, thirty-six 80-mm anti-aircraft guns, and eight 150 mm vehicle towed howitzers.<sup>12</sup>

The order of battle of the Defence Forces' motorised units (1<sup>st</sup> and 2<sup>nd</sup> mechanised brigades, and the 1<sup>st</sup> and 2<sup>nd</sup> armoured divisions formed on their basis) required the establishment of one (two, after the autumn of 1941) vehicle towed artillery battalion(s). The Rapid Corp's mechanised brigades included four batteries equipped with light howitzers, while the 1<sup>st</sup> (Field) Armoured Division deployed in combat at the River Don and later the armoured divisions that fought in the battles of 1944 had two vehicle towed artillery battalions. The mobilised structure of the cavalry brigades included one horse drawn and one vehicle towed artillery battalions with a total of four batteries. The 1<sup>st</sup> Cavalry Division maintained this organisational model, however, the number of the batteries increased from four to six.<sup>13</sup>

In the structure of each mechanised and cavalry brigade – similarly to the structure of the infantry divisions established after 1943 – an anti-aircraft gun battery was also integrated. Both to the 1<sup>st</sup> and the 2<sup>nd</sup> armoured divisions and the 1<sup>st</sup> Cavalry Division one anti-aircraft battalion was assigned, that consisted of one light and one heavy battery.<sup>14</sup>

<sup>10</sup> Ibid., 165.

<sup>11</sup> Lóránd Dombrády, *A magyar hadigazdaság a második világháború idején* (Budapest: Petit Real, 2003), 259–260.

<sup>12</sup> Dombrády, *A magyar hadigazdaság*, 265.

<sup>13</sup> István Ravasz (ed.), *...És újfent hadiidők! (avagy: a „boldog békeidők” nem térnek vissza) 1939–1945* (Budapest: Petit Real, 2005), 174.

<sup>14</sup> Ibid.

### 3. The artillery assets of the Hungarian armoured and cavalry divisions

#### 3.1 The 75-mm type 15M and 15/35M mountain gun

This type of cannon was fielded with subordinated artillery units in the 1<sup>st</sup> Cavalry Division (the 2<sup>nd</sup> horse artillery battalion consisted of three batteries with a total of 12 cannons). The type 15M cannon, used by the cavalry and the mountain troops, had 75 mm calibre, the length of the barrel was L/15. The mountain gun was developed and manufactured by the Skoda Works, and was commissioned by the Austro–Hungarian Monarchy in 1915. The characteristic feature of the mountain gun was its so-called „jacket” around the gun barrel, which increased the recoiling mass, protected the crew from barrel explosion, guided the barrel during backward sliding, and stabilised the gun during firing. The backward sliding of the barrel was slowed down by a hydraulic break, while the barrel was pushed forward by a spring mechanism. The gun-carriage could not be split, but it could be rotated around the supporting spurs. The barrel could be turned sideways (traversing) by 3.5–3.5 degrees, and its vertical aiming (elevation) was adjustable from –9 degrees to +50 degrees. The gun needed 16 soldiers to operate, a 4.2 mm gun shield protected them from shrapnel and bullets. In order to make it easy to move, the cannon could be transported in 7 dismantled parts. Its maximum firing range was 7.6 km. The model was redesigned in 1935, as a result it was fitted up with a so-called ‘load-bearing structure’ in order to avoid damage to the sights from vibrations and during movement, furthermore, the axle of the gun carriage was equipped with springs and the horse drawn version of the gun received a new limber carrier.<sup>15</sup>

#### 3.2 The 80-mm type 5M and 18M field guns

This type of cannon was in service with the 1<sup>st</sup> Horse Artillery Battalion of the 1<sup>st</sup> Cavalry Division, the organisation and the weaponry of which was similar to that of the 2<sup>nd</sup> Horse Artillery Battalion. This horse drawn, 80 mm (in fact 76.5 mm) calibre cannon was the first field gun built with recoiling barrel commissioned in the forces of the Austro–Hungarian Monarchy. The gun was manufactured by Skoda Works. The recoil of the barrel was slowed down by a hydraulic brake while it was pushed forward by a spring mechanism. The gun-carriage could not be split, it was equipped with movable spurs. The gun used fixed ammunition with a range of 7 km, and was operated by a 6-strong crew protected from shrapnel and bullets by a 4-mm gun shield. The weight of the cannon in firing position was 1.02 metric tons. The L/30 calibre bronze gun (the 5/8M model's barrel was made from steel alloy) had a barrel length of 2,295 mm, and it could be easily transported in three dismantled parts. The gun had a barrel elevation range of –7.5 degrees to +18 degrees, its barrel could

<sup>15</sup> Ödön Csellár, *A tábortüzérség lövegei a második világháború idején*, Kézirat, Budapest, 2000. 1, 1, 1, 9.

be turned sideways (traversing) by 4–4 degrees. The main features of the 18M model (calibre, ammunition, number of operators, manufacturer, cannon braking and pushing forward mechanism, gun-carriage design, and barrel length) were identical to those of the 8M model. The model was produced by Skoda Works until 1938, meanwhile its weight increased to 1.33 tons in firing position, the thickness of the gun shield also increased to 4.7 mm and its maximum firing range extended to 8.4 km. It was adjustable sideways 3.2 degrees to left and 3.2 degrees to right, and the angle of elevation of the double-walled barrel (jacket and guide tube) was variable between –10 degrees to +45 degrees.<sup>16</sup>

### 3.3 The 105-mm type 37M field howitzer ('Göring' howitzer)

The vehicle towed version of the howitzer appeared both in the arsenal of the horse artillery battalions and in the armoured divisions. The leFH 18 type, 105 mm calibre, horse drawn or vehicle towed howitzer was a redesigned, improved version of the leFH 16 type deployed in the First World War. It was produced by the German Rheinmetall-Borsig AG. The weapon was introduced in the German Army in 1935. The gun fired variable-charge, unfixed ammunition in metal cartridge. The gun had a single-walled barrel (without a jacket tube) made of chrome-nickel steel, its length was first L/25 calibre, later L/28 calibre, the muzzle velocity of its shell reached 470 m/s, the maximum firing range of the howitzer was 10.68 km. The axle of the gun carriage was equipped with springs, the weight of the howitzer was almost 2 tons and it was operated by a 6-man crew. The barrel of the gun could be elevated between –5 and +42 degrees,<sup>17</sup> its horizontal movement was possible 28 degrees to left and 28 degrees to right. The recoil of the gun barrel was slowed down by a hydraulic brake built in the gun's cradle the while it was pushed forward by a pneumatic counter-recoil mechanism mounted above the gun barrel. The split-trail carriage had spurs, which could stabilise the gun during firing and could ensure both the high velocity of the bullet and longer maximum firing range. Several types of shells were developed for the gun (for example armour piercing shells). The howitzer had excellent sighting system that made both direct and indirect fire possible. The gun became the dominant light howitzer of the German Army in World War II, although in case of firing at maximum range – at steep barrel elevation – the carriage tended to crack.<sup>18</sup>

### 3.4 The 105-mm type 40M light howitzer

The import of 'Göring' howitzers had only partial results due to the reluctance of the German party. The Hungarian adaptation of the Swedish-made 105-mm Bofors howitzer was not successful because of its short (below 11 km) maximum firing range, although the gun proved to be stable and easy to move during the tests. However,

<sup>16</sup> Ibid., 2, 1, 3, 11.

<sup>17</sup> Ibid., 5, 1, 5, 4.

<sup>18</sup> Hans Halberstadt, *Tüzérségi eszközök a középkortól napjainkig* (Debrecen: Hajja & Fiai Könyvkiadó, 2003). 82.

as a result of the cooperation between the Institute of Military Engineering and the gun plant in Diósgyőr, in 1940 a new, Hungarian-made 105-mm calibre, horse drawn, light howitzer was developed, equipped with a muzzle-break, mounted on an obsolete, non-split carriage. After the accurate field and live firing tests, the howitzer was introduced in the Hungarian Defence Forces in early 1941 under the name 1940M 105-mm light howitzer. The barrel had a characteristic muzzle-break, its breaking and return mechanism was built in the gun cradle under the barrel. The maximum elevation of the barrel was 45 degrees, the angle of depression was –5 degrees. It could be traversed in both directions to 4–4 degrees. The ammunition of the howitzer was identical to that of the 37M howitzer. The weight of the gun was approximately 1.5 tons in firing position, and it had a maximum firing range of 10.76 (10.4) km.<sup>19</sup> The gun was operated by a 6-strong crew, the length of the barrel was 1.671 m, and its shell had a 471 m/s muzzle velocity.<sup>20</sup>

The series production of the light howitzer started in 1942. A total of 141 cannons<sup>21</sup> were manufactured, including those 41 guns<sup>22</sup> which were made for the Zrínyi II assault guns. The modified, 105 mm calibre howitzer, equipped with modern, split-trail carriage went to field trials in the same year. The new version of the light howitzer was presented in October 1942, its 11.25 km maximum firing range exceeded that of the 40M type, and the modified howitzer became easier to tow. The new gun was commissioned under the name of 42M 105 mm light howitzer, but it never went into mass production due to the lack of production capacities,<sup>23</sup> although the order of battle 'Szabolcs' envisaged the production of 430 guns with modified gun carriage.<sup>24</sup>

## 4. Anti-tank weapons of the rapid troops

### 4.1 The 37-mm calibre type PaK 36 anti-tank gun

All three battalions of the 1<sup>st</sup> Hungarian Motorized Infantry Brigade (after 1<sup>st</sup> December 1942 – rifle regiment) of the 1<sup>st</sup> Hungarian (field) Armoured Division, and also the 1<sup>st</sup> reconnaissance battalion had in their units an anti-tank gun company, equipped with two 50-mm and four 37-mm anti-tank guns.<sup>25</sup> The PaK 36 model, manufactured by the German Rheinmetall-Borsig Plant, was commissioned in the Royal Hungarian Defence Forces at the beginning of World War II only in small numbers.<sup>26</sup> The anti-tank gun went into service in the German Army as early as March 1936, and its first combat deployment took place during the Spanish Civil War. The gun was also put into action during the French campaign by the German Army in 1940, but its weaknesses soon came into light as the shells of the gun

<sup>19</sup> Balla et al., *A magyar tüzérség*, 199.

<sup>20</sup> Csellár, *A tábori tüzérség*, 6, 1, 6, 10.

<sup>21</sup> Dombrády et al., *A magyar hadipár*, 165.

<sup>22</sup> Dombrády, *A magyar hadigazdaság*, 278.

<sup>23</sup> Balla et al., *A magyar tüzérség*, 169.

<sup>24</sup> Dombrády, *A magyar hadigazdaság*, 275.

<sup>25</sup> Szabó and Számvéber, *A keleti hadszíntér és Magyarország 1941–1943*, 156.

<sup>26</sup> Dombrády, *A magyar hadigazdaság*, 271.

proved to be unable to penetrate the armour-plating of the well-armoured British Matilda Mk IIs, the French Char B1s or Somua S-35s. Thanks to its dismountable structure, however, the gun became the fundamental anti-tank gun of the German airborne troops, its standard shell could penetrate a 36-mm thick armour-plate in 500 meters. The length of its barrel was 1,766 mm, the weight of the cannon was 440 kg, and a 6-strong crew was needed to operate it. The gun's maximum firing range was 6,200 meters, it had a rate of fire of 15–18 rounds per minute. The armour penetration ability of the gun was moderate with standard shells, but with the use of special, shaped charge shells (Stielgranate 41) developed specifically for this model it could pierce a 180-mm thick armour in 500 meters. Around 5,340 of this model were produced by the Rheinmetall-Borsig Plant until 1943. The KwK 36 L/45 version of the gun was built into some series of Panzer III tanks and other vehicles (SdKfz 251) were also equipped with this gun.<sup>27</sup>

## 4.2 The 40-mm type 1940M anti-tank gun

The lack of import opportunities encouraged the General Staff of the Hungarian Defence Forces to establish the opportunity of the domestic production of anti-tank weapons. As a result of the pressure from the General Staff, in 1939 the workers of the Institute of Military Engineering began to develop a gun with 40-mm calibre, which was similar to the 37-mm calibre anti-tank gun. The field demonstration of the new, 40-mm type 1940M anti-tank gun took place in 1941. The gun had a 32-mm penetration ability in 1000 meters, which was almost twice as much as that of the 37-mm calibre gun (17 mm), but considering the enormous development of main battle tanks, it seemed to be inadequate from practical aspects. Lacking other options, the Defence Forces put the model into service, the Ministry of Defence placed an order for 822 of this type between 1940 and 1942. The gun was manufactured by MÁVAG (Hungarian Royal State Railroads' Machine Factory) and by the members of the production cooperation (Diósgyőr gun plant, Electric Metal and Iron Foundry, Metal Goods and Weapons and Machine Plant, Hungarian Steel Plant, Gun Repair Shop, and Agricultural Machine Plant). The production topped relatively late<sup>28</sup>, only in 1943. The reasons of the delay were the difficulties in supply and the large number of scrapped components. Between 1941 and 1944, 616 guns<sup>29</sup> were manufactured of the ordered quantity. Basically, the 1940M model was the Hungarian enhancement and adaptation of the German PaK 36, used in order to make the basis model capable of using the 40-mm armour piercing shell in service with the Defence Forces. Although the gun's barrel was longer (1,780 mm) than that of the PaK 36, and the muzzle velocity of its shell (824 m/s) was also higher, despite all these improvements, the gun was only effective against tanks of the period when it used special armour piercing shells within a distance of 250 metres. The weight of the gun was 495 kg, its rate of fire was 15–16 rounds per minute, and a 6-man crew was needed to operate

<sup>27</sup> 'PaK 36 37 mm-es páncéltörő ágyú', *Második világháború*.

<sup>28</sup> Dombrády, *A magyar hadigazdaság*, 272.

<sup>29</sup> Dombrády et al., *A magyar hadiipar*, 167.



it.<sup>30</sup> The gun's maximum firing range was 5,900 metres. All three battalions of the 3<sup>rd</sup> Motorised Rifle Regiment of the 2<sup>nd</sup> Hungarian Armoured Division and also the 2<sup>nd</sup> Reconnaissance Battalion had their anti-tank gun company. The anti-tank gun platoon of the 2<sup>nd</sup> Reconnaissance Battalion had four 40M anti-tank guns, while the anti-tank companies of the motorised rifle battalions had two 50 mm and four 40 mm anti-tank guns.<sup>31</sup>

### 4.3 The 75 mm type PaK 40 anti-tank gun

In order to increase the antitank capabilities of the Hungarian Defence Forces, the Ministry of Defence and the General Staff made serious efforts to import German 75-mm anti-tank guns. As a result of such efforts, the Germans promised to deliver 160 of this model in 1942, offsetting thereby the purchase price of the Hungarian-made 40-mm automatic guns exported in Germany. In fact, that year the Rheinmetall-Borsig Plant was permitted to transfer the production rights of this anti-tank gun to the Hungarian party for 2 million German Imperial Marks. Ignoring the reality, the Ministry of Defence ordered to produce altogether 770 of the model in 1943 from MÁVAG and its cooperating partners, however, the assembly of the gun failed because only some of its components were completed.<sup>32</sup> Of the quantity to be delivered there was only 4 guns<sup>33</sup> delivered to the Hungarian troops by December 25, 1942.

The German Pak 40 model was the advanced version of the type PaK 38. It had larger calibre and was kept in service until the end of World War II by the Germans. Because of its low profile the gun could be easily concealed, the gun shield was made from double armour-plate flexed back in steep angle so it was able to provide appropriate protection for the crews against small arms bullets. The main features of the gun were the following: its calibre was 75 mm, its barrel length was 3,700 mm, it weighted 1,425 kilograms, the barrel could be elevated between -5 degrees and +22 degrees, its traversing angle was 65 degrees and the gun had 2,000 meters of effective firing range. The standard armour-piercing shell of the gun weighted 6.8 kilograms and reached 792 m/s muzzle velocity. The gun's shell was able to penetrate 116-mm thick homogeneous armour plate in a 1,000-metre distance at the 90-degree impact angle of the shell.<sup>34</sup> The gun was in service with the anti-tank companies of all three hussar regiments of the 1<sup>st</sup> Cavalry Division and also with the anti-tank platoons of the 15<sup>th</sup> Cycle Battalion and the 3<sup>rd</sup> Reconnaissance Battalion. Based on the data of the establishment table of the cavalry higher unit,<sup>35</sup> 15 of this model belonged to it in 1944.

<sup>30</sup> 'M1940 40 mm-es páncéltörő ágyú', Második világháború.

<sup>31</sup> Szabó and Számvéber, *A keleti hadszíntér és Magyarország 1941–1943*, 278–279.

<sup>32</sup> Dombrády, *A magyar hadigazdaság*, 273.

<sup>33</sup> Szabó and Számvéber, *A keleti hadszíntér és Magyarország 1941–1943*, 126.

<sup>34</sup> Halberstadt, *Tüzérségi eszközök*, 84.

<sup>35</sup> Szabó and Számvéber, *A keleti hadszíntér és Magyarország 1941–1943*, 279–280.

## 4.4 The 50-mm type PaK 38 anti-tank gun

There were 77<sup>36</sup> of these German-made 50-mm calibre anti-tank guns delivered to the Hungarian troops during the combat operations at the River Don in 1942–1943, out of which 54<sup>37</sup> were delivered to the troops as early as July 1942. The PaK 38 model was developed by the engineers of the Rheinmetal-Borsig Company as the replacement variant of the type PaK 36 with the aim to enable the destruction of the more heavily armoured targets. As a result of the development process, the 50-mm calibre gun could enter into service in December 1940. The gun's armour piercing shell was able to knock out soft targets (armoured cars, light tanks, and so on) in 1,000 meters, while the Soviet T-34 and KV tanks were knocked out by the gun in a 500-metre distance. The anti-tank guns could be towed by trucks (for example by the Hungarian truck called 'Botond') or jeeps.<sup>38</sup> The combat weight of the gun was 1,062 kilograms, its operation needed a 5-man crew, it had a maximum firing range of 2,200 meters and its theoretical rate of fire was 12–15 rounds per minute. The gun's armour-piercing grenade left the barrel at an 835 m/s muzzle velocity, its penetration ability was 67 mm in 100 meters, and 43 mm in 1,000 meters.<sup>39</sup>

## 5. Means of army air defence

### 5.1 The 80-mm type 1929M anti-aircraft gun

The 80-mm, 1929M model air defence gun was manufactured in three variants, depending on the type of auxiliary predictors – or directors – it was equipped with. Its barrel length was 3,770 mm, the barrel could be elevated between –3 degrees and +80 degrees, the gun had a 14,900-meter effective firing range, and its effective shooting altitude was 9,800 meters. The shell left the barrel at a 750 m/s muzzle velocity.<sup>40</sup> The Hungarian defence industry produced a total of 102 of this model<sup>41</sup> between 1938 and 1944, which were delivered to the defence troops. The gun was in service with the 2<sup>nd</sup> Air Defence Battalion of the 1<sup>st</sup> (field) Armoured Division, the battalion had 8 of such guns. Both the 52<sup>nd</sup> Air Defence Battalion of the 2<sup>nd</sup> Armoured Division and the 55<sup>th</sup> Air Defence Battalion of the 1<sup>st</sup> Cavalry Division had 3 of this model each.<sup>42</sup>

<sup>36</sup> Ibid., 126.

<sup>37</sup> Ibid., 123.

<sup>38</sup> Ravasz, ...*És újfent hadiüdők!* 281.

<sup>39</sup> 'PaK 38 50 mm-es páncéltörő ágyú', *Második világháború*.

<sup>40</sup> '169. A 29.M 8 cm-es légvédelmi ágyú'. *Karosszék tábornok*.

<sup>41</sup> Dombrády, *A magyar hadigazdaság*, 279.

<sup>42</sup> Szabó and Számvéber, *A keleti hadszíntér és Magyarország 1941–1943*, 156; Szabó and Számvéber, *A keleti hadszíntér és Magyarország 1943–1945*, 279–280.

## 5.2 The 40-mm anti-aircraft automatic cannon type 1936M

The development and the introduction of the 1929M model proved to be as great an achievement as the production of the Bofors-based, 40-mm air defence automatic cannon. The gun's primary role was to provide air defence for the ground troops, its production licence was obtained by the Diósgyőr gun plant under the licence agreement concluded in 1935. The Royal Hungarian Defence Forces introduced the gun in 1936 as 1936M 40-mm light air defence automatic cannon. The model was manufactured in the period between 1938 and 1944, and a total of 878<sup>43</sup> were made. According to other sources,<sup>44</sup> in the same period of time 652 cannons were definitely delivered to the troops and another 245 (including 135 guns manufactured for the Hungarian self-propelled anti-tank guns called Nimród) were allegedly delivered. The muzzle velocity of the gun's shell was 850 m/s, and its rate of fire was 120 rounds per minute. The maximum shooting range of the gun was 7,000 metres, its combat weight was 2,100 kilograms.<sup>45</sup> The automatic gun could be made ready for fire in one minute, and its primary purpose was to knock down low and medium altitude air targets flying at maximum 3,000-metre altitudes. It could be elevated to maximum 90 degrees, its depression angle was -5 degrees, and the gun could be traversed in 360 degrees.<sup>46</sup>

In addition to domestic use, the weapon also had serious export markets, since many of the automatic cannons produced were sold abroad (Latvia, Finland, Norway, United Kingdom, Netherlands, Lithuania, China, Egypt and Germany).<sup>47</sup> The model was adopted both by the 52<sup>nd</sup> Air Defence Battalion of the 2<sup>nd</sup> Armoured Division and the 55<sup>th</sup> Air Defence Battalion of the 1<sup>st</sup> Cavalry Division, and each of the battalions had 6 guns of this type.

## 6. Conclusions

Among the army air defence equipment of the rapid forces of the Royal Hungarian Army, the 40-mm anti-aircraft automatic cannon type 36M has also achieved international success as it was used by the armies of many countries. The 105-mm type 40M light howitzer is also worth mentioning among combat support weapons. This cannon also served as the main weapon of the Zrínyi II assault gun. Its improved version (type 42M light howitzer) was equipped with modern, split-trail carriage, with a maximum firing range exceeding that of the 40M type.

<sup>43</sup> Dombrády et al., *A magyar hadipar*, 167.

<sup>44</sup> Dombrády, *A magyar hadigazdaság*, 279.

<sup>45</sup> Balla et al., *A magyar tüzérség*, 193.

<sup>46</sup> 'Bofors 36 M 40 mm-es', Arcanum.

<sup>47</sup> Balla et al., *A magyar tüzérség*, 190.

## References

- '169. A 29.M 8 cm-es légvédelmi ágyú'. Karosszék tábornok. Online: [http://karosszektabornok.blog.hu/2015/08/18/169\\_a\\_29\\_m\\_8\\_cm-es\\_legvedelmi\\_agyu](http://karosszektabornok.blog.hu/2015/08/18/169_a_29_m_8_cm-es_legvedelmi_agyu)
- Balla, Tibor – Tamás Csikány – Géza Gulyás – Csaba Horváth – Vilmos Kovács: *A magyar tüzérség 100 éve*. Budapest, Zrínyi, 2014.
- 'Bofors 36 M 40 mm-es'. Arcanum. Online: [www.arcanum.hu/hu/online-kiadvanyok/Lexikonok-magyarorszag-a-masodik-vilaghaboruban-lexikon-a-zs-F062E/b-F07EE/bofors-36-m-40-mm-es-F0833/](http://www.arcanum.hu/hu/online-kiadvanyok/Lexikonok-magyarorszag-a-masodik-vilaghaboruban-lexikon-a-zs-F062E/b-F07EE/bofors-36-m-40-mm-es-F0833/)
- Csellár, Ödön: *A tábori tüzérség lövegei a második világháború idején*. Kézirat, Budapest, 2000.
- Dombrády, Lóránd – Pál Germuska – Géza Péter Kovács – Vilmos Kovács: *A magyar hadiipar története*. Budapest, Zrínyi, 2016.
- Dombrády, Lóránd: *A magyar hadigazdaság a második világháború idején*. Budapest, Petit Real, 2003.
- Halberstadt, Hans: *Tüzérségi eszközök a középkortól napjainkig*. Debrecen, Hajja & Fiai Könyvkiadó, 2003.
- 'M1940 40 mm-es páncéltörő ágyú'. Második világháború. Online: [www.masodikvh.hu/haditechnika/tuzerseg-legvedelem/magyar-tuzerseg/1514-m1940-40-mm-es-panceltoer-agyu](http://www.masodikvh.hu/haditechnika/tuzerseg-legvedelem/magyar-tuzerseg/1514-m1940-40-mm-es-panceltoer-agyu)
- 'PaK 36 37 mm-es páncéltörő ágyú'. Második világháború. Online: [www.masodikvh.hu/haditechnika/tuzerseg-legvedelem/nemet-tuzerseg/856-pak-36-37-mm-es-panceltoer-agyu](http://www.masodikvh.hu/haditechnika/tuzerseg-legvedelem/nemet-tuzerseg/856-pak-36-37-mm-es-panceltoer-agyu)
- 'PaK 38 50 mm-es páncéltörő ágyú'. Második világháború. Online: [www.masodikvh.hu/haditechnika/tuzerseg-legvedelem/nemet-tuzerseg/1229-pak-38-50-mm-es-panceltoer-agyu](http://www.masodikvh.hu/haditechnika/tuzerseg-legvedelem/nemet-tuzerseg/1229-pak-38-50-mm-es-panceltoer-agyu)
- Ravasz, István (ed.): *...És újfent hadiidők! (avagy: a „boldog békeidők” nem térnek vissza) 1939–1945*. Budapest, Petit Real, 2005.
- Szabó, Péter – Norbert Számvéber: *A keleti hadszíntér és Magyarország 1941–1943*. Debrecen, Püedlo Kiadó, 2003.
- Szabó, Péter – Norbert Számvéber: *A keleti hadszíntér és Magyarország 1943–1945*. Debrecen, Püedlo Kiadó, 2009.