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DEVELOPMENT OF VEHICLES WITH A DISTINCTIVE MARK APPLIED TO THE POLICE ON THE BASIS OF PERCEPTUALITY CONSIDERATIONS FROM THE 1960'S TO THE PRESENT

A RENDŐRSÉGNÉL RENDSZERESÍTETT, MEGKÜLÖNBÖZTETŐ JELZÉSSEL FELSZERELT SZEMÉLYGÉPJÁRMŰVEK FEJLŐDÉSE ÉSZLELHETŐSÉGI SZEMPONTOK ALAPJÁN AZ 1960-AS ÉVEKTŐL NAPJAINKIG

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Abstract

Vehicles used by the Police have many functions in the organizational structure. Vehicles that maintain public order and provide quick intervention provide distinctive signs and signs and signs for visibility. The visibility, that is, perceptuality means the distinctive light and acoustic signal (light bulb or blinking, light signals and acoustic signal, siren), as well as a variety of vehicle body elements, that is, on the outside of the vehicle with a polishing or glue technique applied - bright colors, mostly reflective properties (paints, films, self-adhesive). Observability is the most important parameter for a vehicle with a distinctive sign, as these signals inform other road users about the occurrence of an unforeseen or potentially dangerous traffic situation. Timely detection and security are closely linked, as sooner a car is detected with a distinctive sign, the more time the traffic entrants are able to relieve the sudden traffic situation. The purpose of the article is to present and analyze the signaling systems and technologies used in police cars that contribute to the achievement of safer transport by advancing the technology.

***Keywords**: Police, policecars, perceptibility, Historical overview*

Absztrakt

A rendőrség által használt járműpark rendeltetését tekintve számtalan feladatkört lát el a szervezeti struktúrában. A járművek azon részét, melyek a közrend fenntartását, továbbá a gyors beavatkozást biztosítják, megkülönböztető jelzésekkel és a láthatóságot segítő jegyekkel, jelzésekkel látják el. A láthatóság vagyis az észlelhetőség eszközei a megkülönböztető jelzések, valamint a különböző – a gépjármű karosszéria elemeire, azaz a jármű külső felületére fényezési vagy ragasztási technikával felvitt – élénk színű, többnyire fényvisszaverő tulajdonsággal rendelkező anyagok. Az észlelhetőség a legfontosabb paraméter egy megkülönböztető jelzést használó jármű esetében, hiszen ezen jelzések informálják a közlekedés többi résztvevőjét egy nem várt, sok esetben veszélyes forgalmi helyzet kialakulásáról. Az időben történő észlelés és a biztonság szoros összefüggésben áll, hiszen minél előbb történik meg egy megkülönböztető jelzéssel közlekedő gépjármű észlelése, annál többi idő jut a forgalomban résztvevőknek helyesen lereagálni a hirtelen kialakult forgalmi szituációt.

***Kulcsszavak**: Rendőrség, rendőrségi járművek, észlelhetőség, történelmi áttekintés*

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FOREWORD

The essential purpose of police vehicles equipped with distinctive signs, ie blue or blue-red light and a blinker, with sirens, is to prevent the emergence of threats to life and property security or to quickly address and the already existing damages. In order to eliminate the emergency situation by police action, the location must be provided as soon as possible. However, the problem is complex, as additional hazards can occur during the process. Transport by a vehicle using a distinctive sign is a highly dangerous activity. If you make a mistake by the driver or the other party involved in the traffic (a traffic accident occurs), it seriously obstructs and, in the worst case, endangers the security. By examining this process, the efficiency parameters in the formula below may be more visible [1];

	Speed (Time)
+	Professionalism, preparedness (human+technical)
-	Emergency Hazards (Increase in intervention time, decrease of intervention force [efficiency])
=	Danger / damage elimination efficiency

Increasing efficiency and safety is therefore an important coefficient for the visibility of Police vehicles. Observation is currently being implemented using the five technical solutions below, the vehicle fleet currently in use must have these markings:

1. Primary Distinguishing Signal (360° light bar, beacon(s)),
2. Distinctive sound (alternating sound horn and/or siren),
3. Secondary Distinguishing Signal (Additional Flashers, Lamp Controls),
4. Additional lighting equipment (mostly headlamps, fog lights),
5. Visibility-enhancing surfaces on the bodywork of the vehicle.

But this was not always the case. Numerous developments and perhaps a change of attitude are the result of today's state. Before the change of the system there were no technological conditions from which modern materials and devices are being made today, and on the other hand, as the time passes, the directives and the technical requirements have changed a lot.

THE 1960'S

From the age and the previous period, it can be said in general that very minimalistic approaches were characteristic of Police vehicles in the use of distinctive light and acoustic signals. For a long time, the vehicle was mounted with a distinctive light (rotating mirror), typically a Polish-made Elektra LB-2 blinker with a 35 Watt bulb. Alongside the light signal, there is an electromechanical sounder (siren). However, the combination was not really a lucky construction because in many cases the 360^0 degree visibility of the flash could not be realized as the speaker prevented its perception. The appearance of the cars was not considered, the basic color of the cars was essentially dark, the dark blue polishing was offset by a thin white bar on the side of the vehicles where was the Police label. The vehicles shown

in Figure 1 show the signs that were on the police cars. In the picture, there is a positive fact, two of the three cars fitted with a front fog light, which is a feature of visibility [2].

Figure 1. Warsaw and Volga type Police vehicles [3]

THE 1970-1980'S

In the 1970's, the vehicles were replaced, the VAZ-2101 police vehicles appeared, their common name was „Zsiguli" (Figure 2). There was not much difference in the perception of the cars, the white lining on the dark blue primer and the distinctive sign of a tone and light mark remained on the vehicle. With regard to visibility, the vehicle appears to have increased the size of the white sidebar on these cars, which is in any case positive, but from the viewpoint of the car, dark blue is still dominated. Considering the distinctive signs, there is no difference compared to the previous generation vehicles, it is worth mentioning that the electromechanical siren so far has been replaced by an electronic siren. The appearance of the electronic siren was an important step forward in the development of sound signals, but the Elektris H50S Speaker of the Hungarian brand and the Elektris Preston 7512 type siren amplifier, which provides the sound, is less than the performance of the electromechanical sirens. As a sign, the Polish type Elektra LB-3 type or the Hungarian type Villtesz 1.019 rotary mirror blower was used, which were not distinct from each other's construction, both types of lamps were fitted with a 35 Watt bulb.

Figure 2. Vaz-2101 type Police vehicle [4]

As time progressed, the basic color of the vehicles was changed. I do not know what caused, but one thing is certain: in terms of visibility, the service cars with distinctive signs have changed. Figure 3 shows that the vehicle's refinement was reconsidered, the base color of the car changed to white and the sidebar changed to blue.

Figure 3. Vaz-2101 type Police vehicle [5]

The vehicle type and the blue paint on the white background did not change, but over time, the light and acoustic equipment was mounted on the vehicles (Figure 4). The signals were started in pairs on the car, which was also an important changes in the perception of the vehicles. The light signal was replaced by two blinkers instead of one, making the attention-enhancing effect more efficient as the duplication of the light source resulted in more light at the same time, and 360 degree visibility could be achieved, which is the most important criterion for the use of a distinctive light signal. The two speakers are located between the two light signónals, which emitted twice as much volume as a single speaker. The siren was produced by the Eriston-150 150 Watt siren amplifier manufactured by the Elektris Industrial Co-operative.

Figure 4. Vaz-2101 type Police vehicle [6]

The Vaz-2101 era approached the end and replaced this with Vaz-2107 (Figure 5). The exterior appearance (on blue on a white background) remained in the old, but unfortunately there was a problem in the field of distinctive light signals. Rotating mirrors with a 35 Watt bulb were replaced by the flashlights of the Hungarian Electric Industry Co-operative (VV

1205). The basic idea was not bad, as the consumption of these flashes was lower (5 W / s), but in the brightness these lamps did not even approach traditional rotary flashes. (Note: Blinking is a decisive parameter because the vehicle battery can be discharged within a short period of time when the light signals are used with a stationary engine.) Modernization did not affect the beep, the siren sound was still produced by the classic two speaker siren amplifiers. For the visibility, the front fog lamp mounted on the bumper on the vehicle shown on the picture, however, was not standard. Also a rarity is the light-signaling device mounted on the trunk lid. This unit was a luminous labeled "STOP, ELLENŐRZÉS".

Figure 5. Vaz-2107 type Police vehicle [7]

THE 1990'S

Following the change of regime, the Soviet-type patrol cars have disappeared and the German Volkswagen Golf II have appeared. New vehicles no longer had the customary custom paintwork, they were fitted with self-adhesive "Rendőrség" inscriptions (which were faded over time, their adhesives were aging). In my opinion, the design according to the economic aspects was modest. By contrast, the word "Police" label appeared on cars, which also made it clear to a foreign citizen the purpose of the vehicle. Significant changes have also occurred in the field of distinctive signs. The changes also revealed the emergence of more modern light and acoustic signalers on the Hungarian market, which were made by the German and the American. However, in the long run this resulted undermining the Hungarian manufacturers. Unfortunately, they were not able to compete with foreign suppliers (even though they would have been able to meet the technical requirements). The Golfs were fitted with a German Hella-type KL 700 rotating mirror or blinkers (one or two) in which 55 Watt halogen bulbs emitted the light. (Note: The Elektris Industrial Co-operation also produced a 55 Watt halogen flash bulb (FV 1255), but it could not be sold in large numbers.) The sound signal was also delivered by German Hella or American PSE CODE3 Inc. Also visible on the picture, there are no speakers on the top of the vehicle, the unit was placed in the vehicle's engine room, which was capable of delivering ~100 Watts of sound power.

Figure 6. Volkswagen Golf II. type Police vehicle [8]

The German brand is proven. Volkswagen Golf II has been replaced by Golf III (Figure 7). There was no change in the light and sound signals, and the appearance of the vehicle did not change,too. The only, but still very important, innovation is visibility and visibility in the dark. They used to apply reflective stickers. On both sides of the vehicle and on the back, white-colored (American company (3M)) self-adhesive prisms were placed, showing the position of the patrol car in the form of a dotted line running through a car. This solution was very innovative at that time in our country.

Figure 7. Volkswagen Golf III. type Police vehicle [9]

Later, Volkswagen Golfs were replaced by nearly a thousand Opel Astra F cars (Figure 8), which were manufactured in Szentgotthárd and were specially made for the Police (reinforced chassis, shock absorbers, rims, etc.). In the appearance of the vehicle, the external parts of the vehicle did not change much, the adhesive stickers in their style remained unchanged in the vehicle body. The international "Police" has, however, disappeared from the hood, although it can be explained by the fact that in the shield can still be read. On the side of the car, the self-adhesive signals with white reflective properties were still applied. As a distinctive light and acoustic signal was first installed on the Astra. It was the LP-6000 light bars produced by American PSE CODE3 Inc.. In these light shades there were 4 rotating mirror units (two or two on each side) with a 55 Watt halogen bulb and a 100 Watt speaker. Among the flash units, additional mirror lenses helped to lighten the light, thus achieving even better efficiency using the light bar. The siren amplifier was also manufactured by the American company and

its model number was 3692. This amplifier was already equipped with a microphone at the factory, so it was possible to voice the voice. (Note: older siren amplifiers also had a microphone input, but the microphone was not included in the unit.) The siren amplifier and light bar used by the Opel Astras were both a modern and epoch-making solution for the use of distinctive signals.

Figure 8. Opel Astra F type Police vehicle [10]

THE 2000'S

With little irony, for the appearance of today's police cars we had to wait for two thousand years. After the Opel Astra F police cars, the Skoda Octavias appeared on Hungarian roads (Figure 9). The Czech wagon showed a new picture of the organization, and the type and appearance of the car were equally authoritative. Blue and white bands appeared on the front and side of the white base vehicles, giving a more prominent appearance to police cars. The blue color paralelogram painting on the doors has now become a trademark of Hungarian police vehicles, but beacuse of the blue surface did not yet have retro-reflection and the visibility of the low light conditions continued to be reflected on the sides of the vehicle. Distinctive signals have also been exchanged, the procurement procedure was won by the Spanish Federal Signal Vama, thus the Federal Signal P7000 / 8000 light bar and the AS320 siren unit were added to the new police cars. The signs indicate that they were characterized by more aesthetic and modern design, but in their operating principle and performance there was no significant difference with CODE3 products.

Figure 9. Skoda Octavia type Police vehicle [11]

By around 2005, the fleet was again upgraded and replaced. The Skoda remained (Figure 10), Federal Signal Vama signals were removed from the top of the cars, and the CODE3 LP-6000 light bars returned to CODE3 MicroCom-2 siren amplifiers. In the operation and technical parameters of the right red lampshade of the light bar signified a significant difference. The red lampshade has also signaled the beginning of a new era, as blue-red distinctive light signals have now been completely displaced by blue-blue signals. The use of the red light signal was justified by technical and professional considerations since the wavelength of this light is the largest in the visible range (human eye), so the red light goes to the farthest. Thanks to the conventional painting method, luckily in this case the use of more modern materials justified this decision. Instead of polishing the bodywork, the polarity of the vehicle was developed with the use of long-lasting, plastic-based, self-adhesive and reflective properties (eg Reflexlite). During this period, the final "uniform" of the patrol cars was developed, which was later recorded in the ORFK instruction. Apart from the use of a slightly lighter bar from time to time, the quality and quantity of materials and devices used in the car have changed in every direction. Visibility - beyond the red and two blue flashing lights of the light bar - were provided with blue, yellow and red reflective self-adhesives covering a large part of the bodywork, making it virtually recognizable by the vehicle (by light).

Figure 10. Skoda Octavia type Police vehicle [12]

THE 2010'S

Skoda was replaced by Ford Focus in 2009-2010 (Figure 11). The appearance and position of the reflective self-adhesive did not change because of the design. The distinctive mark on the first Ford Focuses was still the usual CODE3 system, but on later vehicles, the already obscured Federal Signal Vama P7000 / 8000 light bars and the AS-320 sirens have been re-released. It is not visible at first sight, but the inner structure of the light bar has become more modern, with two LEDs (one side at the edge of the light bar) of the four rotating mirrors, alternating with a LED blinker (module). The Ford Focus was the first type of car for which a (partly) LED distinguishing light was fitted. The front fog lamp has also become standard on the type.

Figure 11. Ford Focus type Police vehicle [13]

Finally, the good old Opel Astra returned in 2013 (Figure 12). The design for Astra did not change, perhaps it is worth mentioning that the base colors of the vehicles used by the Standby Police were silver (metallic gray), and these cars had a gray reflective adhesive foil. The distinctive light has been replaced, though they have stayed with the Spanish brand, this time the Federal Signal Vama Phoenix LED light bar was chosen. There are only one LED module per side in this light bar, and on the two ends of the light bar a so-called „alley light" or „work light" of a white light (halogen bulb) has been designed by the manufacturer. Behind the windshield, an additional LED is also fitted with a distinctive light signal, while the Viper S2 Solaris indoor blinker is also a member of the Federal Signal family and emits a strong blinking blue light when the light bar is operated[14].

Figure 12. Opel Astra H type Police vehicle [15]

CONCLUSION

Looking over the past 50 years, we can see how today's technical equipment and materials have evolved, which can be found in modern police vehicles without exception and their application is essential for road safety.
Briefly summarized the changes during in the ages:

- a rotating mirror flashing and electromechanical speaker;
- modification of vehicle paintwork;
- appearance of electronic siren amplifier;

- duplication of sound and light signaling devices;
- flashing blinking;
- the appearance of distinctive signs by Western manufacturer;
- use of engine room speakers;
- use of white reflective foils;
- appearance of light bars;
- use of colored reflective foils;
- LED displays distinctive signs;
- use of additional distinctive signs.

In my opinion, the currently-used Opel Astra H types of police vehicles are appropriate to the age, modern distinctive signs and high-quality reflective foils contribute greatly to improving the safety of traffic, but I find it important to note that these devices are not guaranteed against an accident, therefore it is indispensable for everyone involved in responsible behavior. Finally, there is always room for improvement. I trust that the technical standard and approach that characterizes this area is not stop at the current level, and there is a constant need for innovative tools and solutions.

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