



László Szilvássy¹

AVIATION ANTI-TANK MISSILE AT-16 "SCALLION" (9A4172 "VIKHR")²³

For many years contradictory descriptions appear about the Soviet/Russian anti-tank missile AT-16 "Scallion" (9A4172 "Vikhr"). Many sources confuse it with AT-9 "Spiral-2" (9M120 "Ataka") anti-tank missile. Considering concerning data published I intend to clear up all misunderstandings and give accurate pieces of information about AT-16 missile.

AT-16 "SCALLION" (9A4172 "VIHAR") PÁNCÉLTÖRŐ RAKÉTA

Évek óta ellentmondásos leírások jelennek meg a szovjet/ orosz hadiipar az AT-16 "Scallion" (9A4172 "Vihar") repülőfedélzeti páncéltörő rakétájáról. Számos helyen keverik össze az AT-9 "Spiral-2" (9M120 "Ataka") rakétával. Ebből az információ halmazból igyekeztem, a fellelhető leírásokat felhasználva, olyan ismertetőt elkészíteni, amely pontosítja a leírásokat.

Instead of a preface

I agree with the opinion below:

"There was much confusion toward the end of the 1980s regarding the latest Soviet anti-tank systems. The end of the Cold War cleared much of this up, but also led to a general failure to properly publicise new information. This has resulted in a large portion of Western literature including incorrect information.

The most common error is simply confusing the 9M120 Ataka-V complex with the 9A4172 Vikhr system. These are completely different systems that have been competing for the Russian market. Mil Moscow Helicopter Plant favours the former, while Sukhoi and Kamov favour the latter. As some foreign Mi-24 derivatives have actually been fitted with the 9A4172 the most reliable way to tell them apart is to look for the number of barrels: Eight per launcher for the helicopter borne 9M120 and the fixed wing version of the 9A4172 and six per launcher for the helicopter version of the 9A4172. A four barrel launcher is typical of the Igla short range anti-aircraft missile. Russia does not use currently four barrel launchers for airborne anti-tank systems although this will possibly change with the next generation of missile (which will probably weigh considerably more).

The next most common error is in understanding the guidance systems:

- *The 9M120 is a radio command SACLOS (Semi-Automatic Command to Line-Of-Sight)*

¹ engineer lieutenant colonel, PhD, associate professor, National University of Public Service Department of Military Aircraft, szilvassy.laszlo@uni-nke.hu

² Pub reader: Gyula Ovári engineer colonel (ret.), CSc, professor, National University of Public Service Department of Military Aircraft, ovari.gyula@uni-nke.hu

³ Pub reader: Béla Varga engineer lieutenant colonel, PhD, associate professor, National University of Public Service Department of Military Aircraft, varga.bela@uni-nke.hu

missile and an improved version of the popular 9K114 Shturm system carried on the Mi-24V and by some ground units. This system gradually loses accuracy at longer ranges (as each as radii as viewed from the launch platform encompasses more space) but can be fired in any condition where a target can be spotted.

- On the other hand, the 9A4172 is a "laser beam riding missile". When this first became known, it caused much confusion in the West. Analysts simply assumed that the Soviet designers (KPB Instrument Design) had produced a weapon similar to the AGM-114 Hellfire, which uses semi-active laser homing (similar to laser-guided bombs). Early artist impressions even went so far as to show what appears to be a miniature copy of the Kh-29L (or "AS-14 Kedge", a large semi-active laser-guided missile that borrows its aerodynamic design from the R-73).

When the first good photographs appeared they led to still more confusion: There was no visible seeker (causing some analysts to believe it to be an unguided rocket system)." [9] See picture 1.



Pic. 1. 9A4172 "Vikhr-M" missile [3]

The System

The air antitank missile system was developed in Instrument Design Bureau "Accuracy" (Научно-производственное объединение «Точность») in 1980. Its chief managing designer was A. G. Shipunov. Industrial experiments began to be carried out in 1982 and in 1989 army groups piloted the system [2][4]. The first serial 9K121 was delivered to the Army in 1992. It was shown to the public for the first time at the 1992 Farnborough Airshow.

The air anti-tank missile system 9K121/9K121M and line-of sight beam riding guidance (LOSBR) [11][17] anti-tank missile 9A4172 "Vikhr"⁴/"Vikhr-M", NATO reporting name AT-16 "Scallion" are to be launched from helicopters Ka-50⁵ "Black Shark", Ka-52⁶ "Alligator" and aircrafts Su-25T, Su-39 (Su-25TM), and missile "Vikhr-K"⁷ is to be launched from ships [2][5][9][12].

⁴ Vikhr is the Russian word, means Whirlwind

⁵ Hokum-A [12]

⁶ Hokum-B [12]

⁷ корабельный – ship on board [2]

Composition

The anti-tank missile system 9K121 "Vikhr" includes:

- supersonic, ACLOS⁸ anti-tank missile 9A4172;
- automatic sight I-251 "Skval"⁹ (Ka-50), I-251 "Skval-M" (Su-25T) working both by day and night [3];
- aviation moveable¹⁰ launcher APU¹¹-8 (Su-25T with 8 missiles) or APU-6 (Ka-50/52 6 missiles).

The system allows to launch single missile and two missiles volley. Supersonic speed missile (up to 610 m/s) reduces the operating time of the helicopter allowing for one entering to hit more targets. The missile system is designed to destroy non-armoured, semi-armoured and armoured ground targets, including reactive armoured targets and low-speed air targets, which fly at a speed up to 800 km/h.

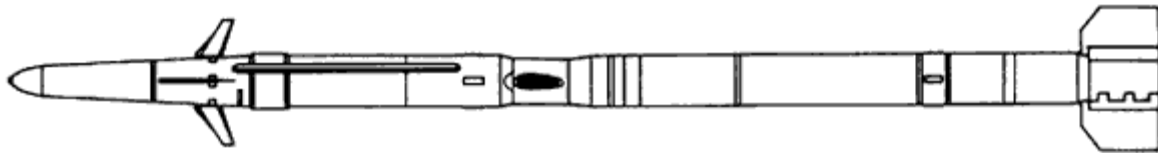


Fig. 1. 9A4172 missile [11]

The missile guidance system is Line-Of-Sight Beam Riding Guidance (LOSBR) and it uses a "beam" of laser, which is pointed at the target. I think this beam riding system is Automatic Command to Line-Of-Sight (ACLOS). LOSBR suffers from the inherent weakness of inaccuracy with increasing range as the beam spreads out. Laser beam riders are more accurate in this regard, but are all short-range, and even the laser can be degraded by bad weather conditions [11][17][18].

The automatic sight is provided with TV (daylight) and IR (night) channels for target sighting. Missile control and target tracing are automatic and the automatic sight is provided with a laser beam channel for missile control, a laser range-finder and with an automatic target tracking unit. The automatic sight completes target detection and identifies that by day and night. After tracking the target automatically it generates exact information for missile launching or gun firing.

The multi-purpose warhead consists of a high explosive anti-tank tandem-charge and an additional fragmentation sleeve with proximity and contact (impact) fuse. The warhead allows the missile to be used against armoured, semi-armoured and non-armoured targets alike, for example tanks, vehicles, airborne and other area targets.

The target hit probability is reported to be about 0.95 against stationary targets and 0.8 against moving targets. That is provided by the automatic target tracking system and the highly accurate missile control system that makes allowance for changes in the parameters of the carrier and the target in the course of firing.

⁸ ACLOS – Automatic Command to Line-Of-Sight: Target tracking, missile tracking and control are automatic [17].

⁹ Шквал (skval) – squall (flurry)

¹⁰ launcher is moveable in elevation plane to 10°

¹¹ APU – АПУ – авиационное пусковое устройство – aviation launcher



	Missile 9A4172 "Vikhr"	Missile 9A4172 "Vikhr-1"
Range of launching <ul style="list-style-type: none"> • day • night 	0.5–10 km up to 5 (6) km	
Altitude of launching	from 5 to 4,000 m	
Flight time <ul style="list-style-type: none"> • to maximum distance (10,000 m) • to distance 8,000 m • to distance 6,000 m 	28 s 23 s 14 s	
Flight speed	up to 610 m/s	
Target hit probability	0.95 (0.8)	
Dimension of missile <ul style="list-style-type: none"> • length • maximum diameter of fuselage • canards span • stabilizer span 	2750 mm 125–130 mm 240 mm 380 mm	
Launch weight	40–45 kg	
Dimension of TPK ¹² <ul style="list-style-type: none"> • length • width 	2,870 mm 140 mm	
Weight missile width TPK	59 kg	
Operating temperature	from – 50 C° to +50 C°	
Warhead <ul style="list-style-type: none"> • type • weight • explosive • fuse type • operating radius of proximity fuse 	Tandem HEAT ¹³ 8–12 kg 4–5.5 kg proximity and contact 2.5–3.0 m	
Armour penetration	1,000 mm (RHA) ¹⁴	
Propellant	solid fuel	
Remote control guidance I-251 "Skval" <ul style="list-style-type: none"> • daylight channel • night channel • target tracking 	TV thermal imaging automatic	

Table 1. Technical dates of the missile 9A4172 "Vikhr" [2][9][10][11]

¹² TPK – ТПК – транспортно-пусковое контейнер – transport and launch container

¹³ HEAT – High Explosives Anti-Tank

¹⁴ RHA – Rolled homogeneous armour [16]

	Launcher APU¹⁵-8	Launcher APU-6
Carrier	Su-25T, Su-39 (Su-25TM)	Ka-50, Ka-52
Missile on the launcher	8	6
Weight launcher <ul style="list-style-type: none"> • empty • with 8 missile 	60 kg 535 kg	60 kg 414 kg
Length	1,524 mm	
Width	720 mm	
Height	436 mm	
Pointing angle in the EP ¹⁶	-10°	

Table 1. Launchers APU-8 and APU-6 [2][9][10][11]



Fig. 2 Launcher APU-6 [9]

Storage, transportation and launching are to be carried out in transport and launch containers, providing warehousing without maintenance up to 10 years.

LITERATURE

- [1] Szilvássy László: A harci helikopterek fegyverrendszerének modernizációs lehetőségei a Magyar Honvédségben, ZMNE Budapest, 2008. szeptember 11. url: http://portal.zmne.hu/download/konyvtar/digitgy/phd/2008/szilvassy_laszlo.pdf
- [2] Ракетная техника: Противотанковый комплекс 9К121 Вихрь (online) url: <http://rbase.new-factoria.ru/missile/wobb/vichr/vichr.shtml> (2014.11.10)
- [3] БАСТИОН Военно-технический сборник: Авиационный противотанковый ракетный комплекс 9К121 «Вихрь» («Бихп-М») Aviation antitank Missile system 9K121 «Vihr» («Vihr-M») (online) url: <http://bastion-karpenko.ru/vihr/> (2014.11.10)
- [4] MILITARY RUSSIA: 9К121/9К121М Вихрь - AT-16 SCALLION (online) url: <http://militaryrussia.ru/blog/topic-46.html> (2014.11.10)
- [5] MILITARY RUSSIA: 30 мм установка АК-306 (online) url: <http://militaryrussia.ru/blog/topic-164.html> (2014.11.10)

¹⁵ APU – АПУ – авиационная пусковая установка – launcher

¹⁶ EP – elevation plane



-
- [6] Уголок неба: ГШ-6-30 (9А-621) (online)) url: <http://www.airwar.ru/weapon/guns/gsh630.html> (2014.11.10)
- [7] Военное обозрение: Авиационный противотанковый ракетный комплекс "Вихрь" (online) url: <http://topwar.ru/20457-protivotankovyy-kompleks-9k121-vihr.html> (2014.11.10)
- [8] Армейский вестник: Авиационный противотанковый ракетный комплекс «Вихрь» (online) url: <http://army-news.ru/2012/11/aviacionnyj-protivotankovyyj-raketnyj-kompleks-vixr/> (2014.11.10)
- [9] Wikipedia The Free Encyclopedia: 9K121 Vikhr (online) url: http://en.wikipedia.org/wiki/9K121_Vikhr (2014.11.10)
- [10] Encyclopedia of safety: aviation antitank missile system "Whirlwind" (online) url: <http://survincity.com/2013/07/aviation-antitank-missile-system-whirlwind/> (2014.11.10)
- [11] Уголок неба: 9K121 Вихрь (М) (online)) url: <http://www.airwar.ru/weapon/aat/vihr.html> (2014.11.10)
- [12] Wikipedia The Free Encyclopedia: Kamov Ka-50 (online) url: http://en.wikipedia.org/wiki/Kamov_Ka-50 (2014.11.10)
- [13] Youtube.com: New-2009 - Russian Attack Helicopter Ka-50 Black Shark vs Mil Mi-28 Havoc – HD, 2:40–2:44 s, (online) url: <https://www.youtube.com/watch?v=IFOYmeiY4jA> (2014.11.12)
- [14] Youtube.com: Ka-50 "Black Shark": action in special operations, 1:00–1:04, 1:15–1:20 s, (online) url: <https://www.youtube.com/watch?v=jzkO1OTIAbs> (2014.11.12)
- [15] Youtube.com: Ka-50 "Hokum", 3:15–3:20 s, (online) url: <https://www.youtube.com/watch?v=ykI7-vG7Nos> (2014.11.12)
- [16] Wikipedia The Free Encyclopedia: Rolled homogeneous armour (online) url: http://en.wikipedia.org/wiki/Rolled_homogeneous_armour (2014.11.10)
- [17] Wikipedia The Free Encyclopedia: Missile guidance (online) url: http://en.wikipedia.org/wiki/Missile_guidance (2014.11.10)
- [18] George M. Siouris: Missile Guidance and Control Systems, 2010 Springer-Verlag New York Inc., ISBN 978-1-4419-1835-2, pp. 162-174