

Issue Brief

September 2026
No: 550

The Magic of Small
Tubes: Where Are
We?

Lt Gen (Dr.) VK Saxena
PVSM, AVSM, VSM (Retd)



The Magic of Small Tubes: Where Are We?

Abstract

The article examines many unique combat virtues of MANPADS in various battlefield scenarios both as an integral part of the overall air defence 'fire-arm' as well as, in the stand-alone mode. The operation of Ukrainian MANPADS against the Russia's attack helicopters in the early months of the ongoing Russo-Ukraine War has been analysed to drive home the utility of this weapon. As a fruit-of-labour, the work also examines the MANPAD scenario in our armed forces and suggests a way ahead.

Keywords: MANPADS, Air Defence Weapons, VSHORADS, Atmanirbhar Bharat

Introduction

Recently, while watching the Netflix series—*Operation Safed Sagar*, one saw a man-portable shoulder-fired missile menacingly chasing the aircraft of our brave heart, Sqn Ldr Ajay Ahuja. A thought flashed – how deadly this little tube can be if for once it is shown its prey 'correctly' and 'steadily' for a few moments – quite deadly indeed; almost a sure kill.

This work examines many unique virtues of the above type of missiles that are commonly referred to by two acronyms viz. the MANPADS and VSHORADS. MANPADS or the Man Portable Air Defence Systems, and while VSHORADS or the Very Short Range Air Defence Systems is more inclusive and refers to air defence weapons (guns and missiles) in the range bracket of up to 10 km.

Talking of MANPADS

Very basically, MANPADS are 'fire-and-forget' weapons generally covering a range bracket from 0.5 km to 6 km and an altitude span from 10m to 3.5-4 km. Most of the MANPADS lock on to their target using their heat (IR) signatures (mainly engine exhaust)—some other types 'ride' the laser beam trained on the target by the firer. Older versions demanded the firer to track the target manually generating commands that keep the missile on course (ACA, 2023).

Place of MANPADS in the Air Defence Matrix

MANPADS along with air defence guns form the terminal end of the fire arm of ground based air defence weapons that extend outwards to include Short Range, Medium Range and Long Range missiles. This fire arm is the ‘kill chain’ that extends well beyond 100s of km and is tasked to destroy adversary’s air threat like aircrafts, attack helicopters, missiles and more.

MANPADS play a unique role both as a part of the air defence ‘fire arm’ as well as, in stand-alone mode.

Figure 1: MANPADS in Action



Source: <https://www.google.com/search?q=MANPADS>

Unique Role at the Terminal End

This is how the magic of MANPADS works at the terminal end of the kill chain: -

- These weapons provide the all-important gun-missile mix at the last line of defence, sharply enhancing what is called the cumulative kill probability (CKP) of the mix. To understand it better, if the MANPAD has an 80% chance to kill the target and the gun has 70%, the duo will have 94% CKP (technical calculations not stated) {Khanna, M. 2026}.
- Such enhancement in kill probability works wonders in taking on the air threat at the last line of defence. Worth mentioning is that, this line actually sees such a

determined threat that has successfully crossed/evaded all the preceding layers and is now headed for the final kill.

- Another fact relates to radar-controlled air defence guns deployed along with MANPADS. Such guns are dependent on the limitations of radars. For instance, a dead zone in the immediate vicinity of the radar wherein radars cannot detect and hence cannot shoot the guns; limitations on target detection and tracking due to bad weather, ground clutter, earth's curvature etc. MANPADS with their extended range/altitude envelop can largely cover these gaps and can take on what cannot be addressed by guns.
- Then there are critical assets especially in the high altitude area (ammunition dumps, war-waging stores, bridges/narrow passes etc.) where conventional guns can cover only the single or few avenues from where the asset can be attacked; for the rest of the approaches there is no area for guns to reach and deploy being inaccessible. Attacking aircrafts exploit such inaccessible approaches to get a free run. MANPADs deny that as these enjoy the flexibility of stand-alone deployments on cliffs/hill tops etc., all by itself. Just a foothold is enough.
- MANPADS are ideal weapons to take on opportunity targets. In the forward zone where opposing forces engage in tactical manoeuvres and tank-to-tank battles happen, the most deadly threat to the mechanised assets is from attack helicopters (AH), drones and loitering munitions. While the latter two are addressed by tailor-made anti-drone weaponry, for the former there is MANPAD. In fact, the AH have the capability to fly ultra-low in the nap-of-the-earth thus avoiding radar detection. These can pop up suddenly at dangerously close ranges headed for their prey. MANPADs just require a few seconds on the cross-wires to get a lock on the AH. The duel is evenly balance thereafter.

Unique role in TBA: The Magic of Far-too-Many

Both Ukraine and Iran have shown the world what drones can do in a combat. The little monsters have re-written the rules of combat in scenarios of asymmetric warfare. Herein, the lesser player need not match its militarily and technologically superior adversary aircraft-to-

aircraft or bomb-to-bomb so long as it can continue to bleed the latter with waves and waves of cheap drones (besides ballistic and cruise missiles) that keep pounding critical assets and inflicting disproportionate costs on the enemy.

What else can explain a nation like Ukraine with no Navy sinking/damaging some 26-30 naval vessels of Russia in the Black Sea (Saxena, V.K. 2024) or lately, knocking out some 20-40% of the oil giant's refining capability (Shkarlat, K. 2026).

Consequently, MANPADS can also show a similar magic and this unfolded in the early months of the Russo- Ukraine war. Here is a brief account: -

During the initial months of war, Russia had significant quantum superiority in terms of strike aircrafts and attack helicopters vis-à-vis Ukraine. Open source puts this figure as 1150-1390 strike aircrafts vs 100-125 and some 399-500 AHs vs 34-52 (Przetacznik, J. and Tothova, L. 2022).

This brut superiority allowed the Russian to undertake bold deep strike missions in the opening weeks of the war.

This was particularly visible in AHs carrying out hunter-killer missions going as deep as 50-70 km and hitting Ukrainian armoured and mechanized columns, ammunition depots, key storage facilities and critical infrastructure and more (Saxena, V.K. 2024).

However, the situation started to change as MANPADS entered the scene:-

- Ukraine chose to ingest the Tactical Battle Area (TBA or forward zone where the battle is joined) with preponderance of MANPADs.
- Ukraine had a large number of MANPADS. This included the Russian Igla and Igla 1M, Strela 2, Strela 3 besides many from the US/western nations – Stinger FIM 92 (US, Germany, Netherlands, Denmark and others), Mistral (France), Starstreak (UK), Grom-M (Poland) and more. According to some estimate, the quantum of MANPADS with Ukraine in April 2022 was around 20,000-50,000.
- The proliferation of MANPADs in the forward zone was very intense. Ukrainians had deployed them at every nook and corner of the TBA taking advantage of the

deeply forested areas in the TBA or even obscured deployments in the urban areas.

- These MANPADS were pitched against an expansive arsenal of Russian AHs which included the Mi series viz. Mi28N and Mi28UB and the gold class Kamov Ka- 52 featuring the very identifiable contra-rotating twin rotors (MWM, 2026).
- Normally the AHs have multiple means on board to counter the MANPADS. For instance, both Ka 52 and Mi28 have a defensive suite (Vitebsk L370) that warns the pilot of a missile launch and deploys successive countermeasures. The detection of missile launch is executed along two paths. There are ultraviolet (UV) sensors which can detect the flash, ionization and heat bloom on MANPAD launch and laser sensors which can detect a laser beam riding MANPAD in chase (MWM, 2026).
- The countermeasures consist of either jamming the laser beam on which the MANPAD is riding or firing a laser beam directly on to the seeker of the MANPAD thus overloading and confusing its capability to remain locked on to the IR source of the target.
- Besides the active countermeasures, there are passive means like the chaffs and flares that are dispensed by the pilot to loom in the atmosphere and present strong heat signatures mimicking those of the AH's rotors. These aims to dodge the heat seeker MANPAD to lock on the false target.

Despite all the above measures Ukrainian MANPADS succeeded in claiming many a kills of the Russian AHs. Why? (Romanenko, V. 2023).

Figure 2: Ukrainian MANPAD brings down a Russian KA 52



Source: <https://www.google.com/search?q=Ukrainian+MANPADS+downs+a+KA+52+Feb-Apr+2022>

- Since MANPADS emit no identifiable signatures before launch, these provided no pre-tell-tale warnings to the detection and countermeasure systems of the Russian AHs.

In continuation of their tactical mistakes of the initial blitzkrieg of February-March 2022 (long-winding armoured columns stretched over miles, air defence fire units not deployed to leap frog tactically, poor communication and connectivity etc.), Russian AH machines chose tight formations and broad daylight hours to strike, giving an optimal launch environment to the MANPADS that required seeing the target visually.

Ukrainian MANPAD success was facilitated due to other contributory factors such as the following:-

- Since the Russian Air Force failed to achieve even a favourable air situation, leave aside air supremacy over the Ukrainian skies, the air defences, both in the air, as well as, ground remained alive, thus forcing the AH to fly at low altitudes to avoid radar detection. This brought them closer to MANPAD fires enabling them to lay and launch accurately (Business Insider, 2022).

- Reportedly, the Kamov design had a flaw of excessive vibration of the hull due to twin rotors. This forced the AH to hover over the target to accurately lay and launch their rockets and missiles on their targets. This presented ideal ‘near stationary’ targets to the MANPADS to prey on.

The results were catastrophic for Russia. If Ukrainian records are to be believed, Russia lost some 120 AHs between 24 February to late March 2022. Another report suggests Russia lost 100 AHs in the first two years of war (Perry, D. 2025). One more has it that Russia lost some 30% of its AH fleet by early 2023 (DSA, 2025).

The numbers may vary, but the message is clear — MANPADS claimed disproportionate kills. Deployed in numbers with tactical advantage, these successfully overwhelmed the defensive suite on board Russian attack helicopters.

Where Do We Stand?

If that be the power of MANPADS, it will be worth the while to examine where we stand in this capability? Here is a brief attempt.

- Our mainframe MANPADS are the Russian-origin Igla 1M (range 5 km, altitude 3.5 km). Earlier in the day, some small quantities of Strela 2M MANPADs were also held. These came along with a Russian MRSAM system meant for their close defence covering the dead-zone of longer range missiles.
- To build our MANPADS to the scales required by the three Services, and to replace the ageing Igla 1Ms, in 2018, Igla IS was proposed to be inducted (Peri, D. 2022).
- This followed limited induction of Igla 1S in the forces in the period from 2021-2024
- Thereafter, after years of successful trials, the Defence Research and Development Organisation (DRDO) announced a successful completion of its trials for a VSHORAD system (Tiwari, S. 2025).

Figure 3: VSHORAD Testing



Source: <https://www.youtube.com/watch?v=GOG0MSCU4bE>

- In recent months, open source reported that India is planning to import some 250 Verba MANPAD systems from Russia to address immediate voids.
- Verba is a fourth generation MANPAD that will replace the previous generation Igla 1S systems. It reportedly has higher range and altitude strike envelop than Igla 1M.

Reflections

Here are some points of analysis:-

- The critical importance of MANPADS as a terminal-end weapon in the air defence fire arm cannot be overstated.
- Their ideal suitability of deployment in stand-alone mode in higher altitude mountainous terrain along the Line of Actual Control makes them 'weapons of choice'. These are equally relevant to ward off the AH threat to the armoured and mechanised forces in the Tactical Battle Area along the western border.
- We need to have adequate stocks of MANPADS for simultaneous deployments in a multi-front war.

The crunch issue, however, is that, while we can continue with Igla 1Ms and keep importing the Verba for the short term, the solution lies in building indigenous capability as that is the only way to self-reliance. Following points are stated in this regard: -

- Our development programme has been six years in the run. Notwithstanding, it is very praiseworthy that we have reached the flight trials stage in 2026. Staring 2022, the missile has been put through 14 flight trials. In 2026 alone, the weapon has seen three successful trials.
- The next steps to follow are user evaluation under various terrain and weather conditions before clearance can be accorded for bulk production. Going by the current pace, we should reach this stage in another 2-3 years.
- Consequently by the time the Services start to receive the indigenous MANPADS, it could be anything up to 5-6 years.

It is this critical gap which needs to be filled. Some points:-

- Currently, the production partners for the DRDO designed VSHORAD are Adani Defence and Aerospace (ADA) and ICOMM Tele. Why?. Why the technology transfer has not taken place to multiple Industry partners allowing capability building to scale?

As per an open source assessment the requirement of MANPADS by the Indian Armed Forces is to the tune of 900-1000 launchers and 5500-6000 missiles. We need to build this capability at scale (exact voids not stated) {Peri, D. 2022}. Two other factors must also be kept in mind:-

- Experience of the recent wars has it that not only the MANPADS will be required in large numbers to achieve their optimum proliferation in the TBA— a la-Ukraine style, but also, when the battle is joined, missile expenditure will be steady and sustained if favourable air situation is to be maintained throughout the period of conflict.
- The claimed technical capabilities of our MANPAD already pips most other MANPADS in the market. It is also clear that we will also pip them in economical terms. Where is the doubt then that MANPADS hold a promising ‘good-for-export’ tag for the whole world? The demand is already huge and it is likely to remain so given the need for this ‘air defence gem’ in multiple scenarios folding out in a war-torn world.

That said, neither one set of production partners will be able to fill this gap, nor getting small consignments of MANPADS from world over (Igla1S, Verba, Stinger) is the solution. The solution lies in building indigenous MANPADS at scale here in India. Creating sovereign IP is the clarion call of Atmanirbhar Bharat.

Also, the indigenous solution is many times better than producing Igla1S or Verba or any other missile on Transfer of Technology. We need to move from 'Make-in-India' to 'Owned by India' thus directs our Procurement Rule Book — the Defence Acquisition Procedure 2026.

Combat Readiness

Let's now focus on the issue of building combat readiness of the crews to the level of 'Ek goli ek Dushman' a.k.a. 'one missile one target'. While it looks all very simple to just aim the MANPAD and let go, in actual, it demands the following:-

- Laying on a target moving in 3D and zooming past at supersonic speeds or thereabouts.
- Maintaining the lay steady at cross-wires for some amount of time to generate a positive lock amidst all the battlefield chaos.
- Accurately judging the launch zone (and the resultant kill zone) to initiate the engagement for a sure kill.

While none of the above is impossible, achieving a level of perfection required for split second lay and launch calls for hundreds of launches for practice. This implies that we require hundreds of MANPADS for each firer besides the requirement of realistic targets for lay and launch. This is where the problem lies. A brief sample:-

- As per open source this is the comparative cost of one MANPAD system —Mistral (France)- \$600K, Stinger (US) - \$400k, Star Streak (UK) -\$330K, Verba (Russia)- \$ 220K (NL, 2026).
- Keeping in mind such high costs, the training scales of missiles for air defence firers is typically low world over — something like 0.25 or 0.5 or at best 1-2 missiles/firer/per year. This means that in most cases it could be anything from 6 months to two years when a firer will get a live missile to fire.

By no stretch of imagination such scales can lead to building the level of combat readiness required. This makes missile launch simulators inescapable. However, the good news is that today Indian Defence Industry has reached a level of technological maturity to address every type and shade of simulators which may be required now or in the future by our armed forces. MANPAD simulators are no exception.

Take for instance, an Indian private sector company called Zen Technologies Limited — a market leader in combat training solutions with a 1000+ systems deployed globally, provides the MANPAD simulator called the Anti-Aircraft Air Defence Simulator (3ADS). This simulator is tailor-made for building combat readiness of MANPAD crews. A brief glimpse: -

- This lightweight, modular and upgradable simulator is configured on a replica of a typical MANPAD with identical switches and controls as on the original equipment.
- The system provides realistic target scenarios featuring threat vehicles as expected from our adversaries (not any ad hoc targets) configured as synthesized 3D targets presented against virtual or real terrain backgrounds which can also be customized to operationally specific terrains.
- Alternatively, 3ADS can also provide unlimited simulated fire training against friendly targets using the optical or TV tracking channels. The training is totally immersive as the firer gets the same ‘feel of fire’ (lay vibration, shock and jerk etc.) as if firing the original missile.
- Most importantly, the trainee skills are assessed digitally based on any number of user-defined perimeters such as time taken to lay on target, accuracy and steadiness of lay etc. and presented as combat readiness score or CRS. CRS as a digital count gives the exact training readiness of a soldier and is indicative of his/her instant employability in the battle.

Figure 4: 3ADS for Virtual/Live Training



Source: www.google.com/search?q=3ads+simulator+zen+technologies+limited

What does all the above mean for us? Probably the following:-

- Simulator-based training is inescapable for building the combat readiness of our MANPAD crews as is for other weapon systems. Such simulators must be proliferated down to the fire-unit level in the three Services.
- Such a step will be in consonance with the government policy titled *Framework of Simulators in the Armed Forces* promulgated way back in September 2021. This policy is anchored on the vision of implementing simulator based training across all military domains.

That brings the reader a full circle on MANPADS, bringing to light the so called ‘magic of the small tubes’ and what we need to do to keep that magic alive in our scenario.

Works Cited

Critical Cost Analysis of U.S. and European SHORAD systems (2026, March 22). *Norsk Luftvern*. <https://norskluftvern.com/>.

From Flying Coffins to Killers: How Russian Attack Helicopters Became Ukraine's Worst Nightmare (2025, May 6). *Defence Security Asia*. <https://defencesecurityasia.com/en/from-coffins-to-killers-how-russian-attack-helicopters-became-ukraines-worst-nightmare/>.

Khanna, M. (2026, August 24). Integrated Air Defence: Preserving Combat Power in Modern Warfare. *ORF*. <https://www.orfonline.org/expert-speak/integrated-air-defence-preserving-combat-power-in-modern-warfare>.

MANPADS at a glance (2023, August). *Arms Control Association*. <https://www.armscontrol.org/factsheets/manpads>.

Peri, D. (2022, April 3). Army indicts Russian MANPADS. *The Hindu*. <https://www.thehindu.com/news/national/army-indicts-igla-s-shoulder-fired-air-defence-systems-from-russia/article65284695.ece>. Accessed on 20 Sep 2026.

Perry, D. (2025, February 26). Russia lost over 100 attack helicopters in first two years of Ukraine war, study suggests. *Flight Global*. <https://www.flightglobal.com/helicopters/2025/02/russia-lost-over-100-attack-helicopters-in-first-two-years-of-ukraine-war-study-suggests/>.

Przetacznik, J. and Tothova, L. (2022, March 4). Russia's war on Ukraine: Military balance of power. *European Parliament*. <https://epthinktank.eu/2022/03/04/russias-war-on-ukraine-military-balance-of-power/>.

Romanenko, V. (2023, January 27). National Guards tell how they destroyed Russian helicopter with Igla MANPADS. *Ukrainska Pravda*. <https://www.pravda.com.ua/eng/news/2023/01/27/7386809/>.

Russian fighter jets can't control the air over Ukraine, and Russia's attack helicopters are paying for it (2022, November 14). *Business Insider*. <https://www.businessinsider.com/russia-losing-attack-helicopters-because-it-lacks-air-superiority-2022-11>.

Russia's Top Attack Helicopter Takes Out Ukrainian Drone Fleet in Air-to-Air Combat Over Black Sea (2026, September 3). *MWM*. <https://militarywatchmagazine.com/article/russia-top-attack-helicopter-ukrainian-drone>.

Shkarlat, K. (2026, July 9). Up to 40% of Russia's oil refining capacity disrupted by Ukrainian drones: Fuel crisis spreads. *RBC-Ukraine*. <https://newsukraine.rbc.ua/news/up-to-40-of-russia-s-oil-refining-capacity-1783618726.html>.

Saxena, V.K. (2024, April 15). Russia- Ukraine Conflict: The Down End of the See-Saw. *VIF*. <https://www.vifindia.org/article/2024/april/15/Russia-Ukraine-Conflict-The-Down-End-of-the-See-Saw>.

Saxena, V.K. (2024, June 17). Russo-Ukraine Conflict: Some Inferences on Air and Air Defence Aspects. *VIF*. <https://www.vifindia.org/article/2024/june/17/Russo-Ukraine-Conflict-Some-Inferences-on-Air-and-Air-Defence-Aspects>.

Tiwari, S. (2025, February 4). Bang On The Buck! India Tests New Air Defense System With ‘Exceptional’ Capabilities To Hunt Low-Flying Jets & Drones. *The EurAsian Times*. <https://www.eurasiantimes.com/bang-on-the-buck-india-tests-new-air-defense-system/>.



About the Author

Lieutenant General (Dr.) V K Saxena, PVSM, AVSM, VSM (Retd) is former Director General of the Corps of Army Air Defence. He is a Distinguished Fellow at VIF and a Visiting Fellow at CLAWS besides being a UN and a Law scholar. The General is a prolific writer who has authored five books and regularly publishes in the Defence media of the country. He is also regular at TV shows contributing on many defence issues.



All Rights Reserved 2026, Centre for Land Warfare Studies (CLAWS)

No part of this publication may be reproduced, copied, archived, retained or transmitted through print, speech or electronic media without prior written approval from CLAWS. The views expressed and suggestions made in the article are solely of the author in his personal capacity and do not have any official endorsement. Attributability of the contents lies purely with author.