Defence Science Journal, Vol 50, No 3, July 2000, pp. 273-279

Viability Study of Concept of Hybrid Antitank & Air Defence Armoured Vehicle

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ABSTRACT

In the past few decades, tanks have been developed into a highly effective weapon system, particularly useful in the short, intense and highly dynamic scenario of modern warfare. However, with the advent of new technology, tanks would definitely have to undergo improvements to remain cost-effective as well as combat-effective. Such evolution is already taking place with new designs being developed as well as those still on the drawing board of advanced nations. In the race for technological domination, only those nations with a tradition of indigenous innovations and courage to tread new paths, can hope to remain dominant in the field of military technology.

INTRODUCTION

The tank as a weapon system has dominated the battlefield ever since the second world war. As we enter the third millennium, we can be proud to have ascended as a nation capable of developing not only tactical nuclear weapons and effective missiles, but also state-of-the-art modern main battle tanks (MBTs). However as in the case of any weapon system, a technological advantage can be maintained only if one innovates in quantum bounds while keeping a clear view of the battlefield scenario of the future. It may be about time one broke loose of the defeatist loop of merely emulating the existing concepts and technological systems of other nations with the inevitable result of outdated developments and economic burden due to non-saleability of obsolete military hardware. To further ones efforts for development of innovative and indigenous state-of-the-art technologies, the original conceptualisation of a design idea, which could uplift one to technological forefront as far as mechanised war-machines for the 21st century are concerned, is described here.

2.

Some of the features of the proposed armoured fighting vehicle (AFV) are:

(a) Missile launch system is mounted within the chassis under a revolving turret. The design envisages the missile launch system to be light as well as highly stable (Figs 1-4).

(b) Very low silhouette as the height of the turret needs to be slightly more than the diameter of the missile (Figs 1 and 2). It is also amenable for being integrated with the facets of stealth technology in terms of shape and reflectivity to minimise detection by automated surveillance systems of the enemy.

Revised 27 April 2000

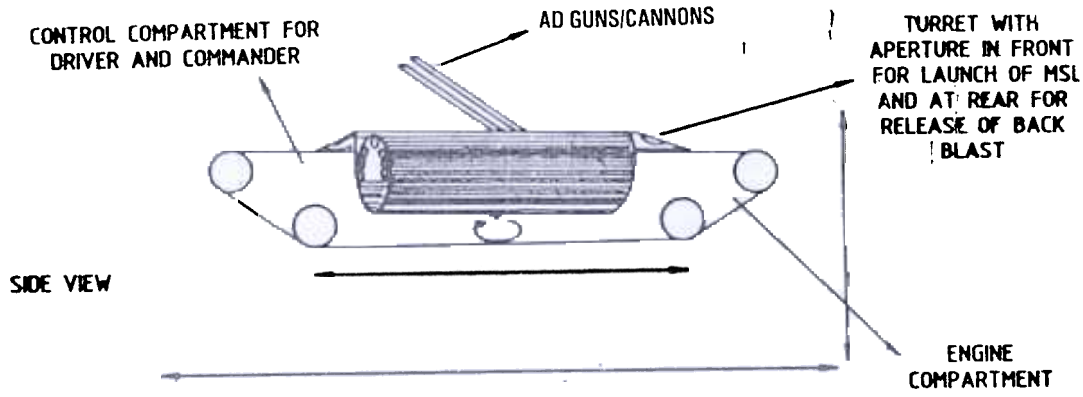

Figure 1. Design of hybrid antitank & air defence armoured vehicle

(c) Auto-loadable anti-helicopter/antipersonnel twin air defence guns are mounted within the chassis with elevation up to 90° (Figs 4 and 5)

(d) Crew of two personnel, e.g., commander and driver. Commander would also control the weapon systems assisted by advanced optronics and fire control systems.

(e) The chassis itself would be considerably small in size compared to a MBT. Apart from this, substantial reduction in weight and armoured volme would be achieved due to nonexistence of the main gun systems as well as gun operating crew.

(f) Armour protection is available to all sub-systems, including missiles equivalent to a standard MBT in the frontal arc.

(g) Automatic loading and fire control system for antitank missiles as well as twin air defence guns.

(h) Fire-and-forget missiles can be launched directly from their protected stowage position.

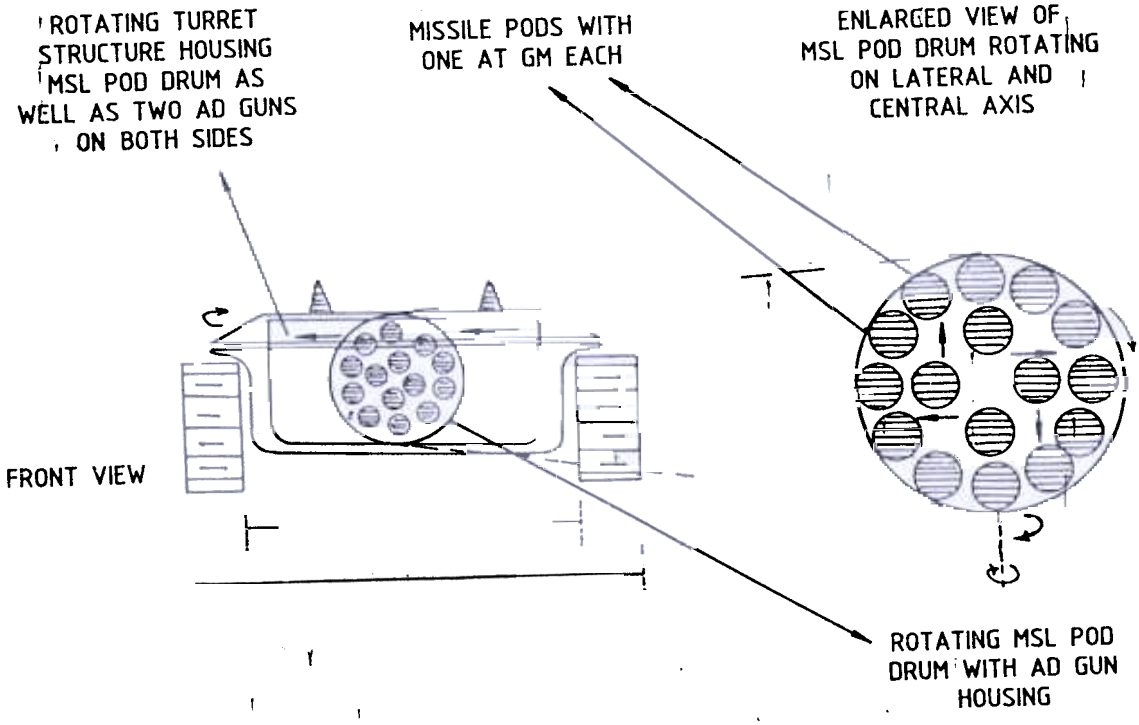

Figure 2. Front view of hybrid antitank & air defence armoured vehicle

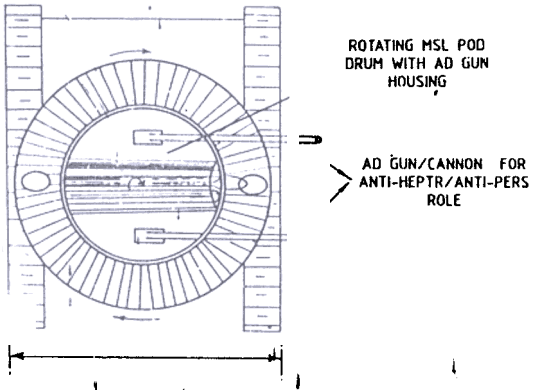

Figure 3. Top view of antitank & air defence armoured vehicle

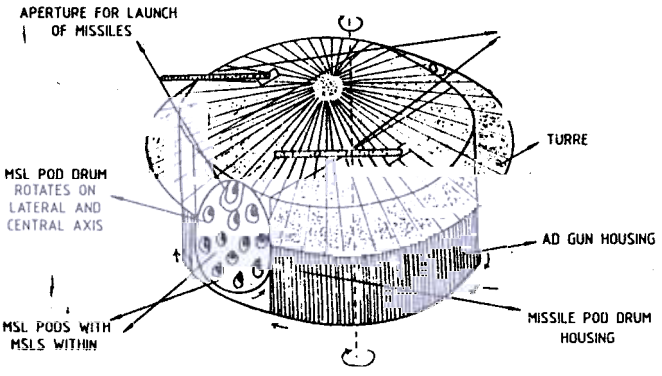

Figure 4. Tank turret with rotating MSL pod drum under it

(i) Desired protection levels.

Even with the protection level comparable to a MBT, because of the relatively small size/low volume of the proposed hybrid AFV (achieved due to high compactness, small size and lightweight of the weapon systems packed within it as per the design) it could be considerably light as compared to a MBT.

3. EMPLOYABILITY, COMMAND & CONTROL

Based on the employability of the hybrid AFV, a suitable command and control structure can be developed. Some of the suggestions for its employment are:

(a) It would be ideal for reconnaissance and support role due to its high mobility, longer range of engagement and longer radius of action as well as self-sufficient active air defence protection system.

(b) Amalgamation with existing MBT groups to enhance their effectiveness in terms of longer range of engagement and protection from aerial platforms.

(c) As a separate/additional exclusive formation of hybrid AFVs for employment at locations inaccessible to MBTs, but where hybrid AFVs can be airlifted (due to their small size and weight).

4 JUSTIFICATION

(a) The missile technology available till recently, had inhibited employment of antitank missiles as a primary weapon system from within a tank. However, with the advent of fourth-generation fire-and-forget antitank missiles, it has now become possible to employ missiles as a primary weapon system of the tank. This is possible because while using such missiles, the tank doesn't have to remain stationary for the duration of flight of the missile as required in the earlier generations antitank missiles. The missiles can be launched even while the hybrid AFV is on the move at any speed, (without the requirement of any complicated stabilisation system), once the target has been acquired. The missiles can even be launched from beyond the line of sight range if it is provided with suitable target information from automated battlefield surveillance systems. The

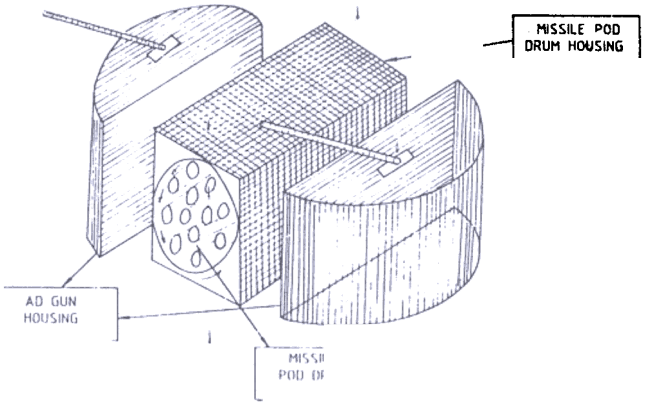

Figure 5. Rotating MSL pod drum and air defence gun housing (detached view).

unique facet of being able to launch missiles while on the move even under enemy fire, without the requirement of a stabilisation system could give the proposed hybrid AFV better mobility, flexibility and manoeuvrability as well as other tactical advantages when compared to a conventional tank.

(b) The AFV-based missile platforms, as existing now, are unsuitable for being employed in the traditional role assigned to MBTs as an offensive manoeuvre element spearheading exposed contact battle with enemy's mechanised elements or antitank fortifications. This is so because they lack adequate armour protection as also because the missiles and their launching platform are exposed to the enemy fire during the period of launch of the missile. As per the present design of missile launchers, these cannot be given armour protection equivalent to MBT since such an effort would make it prohibitively heavy. There is a need to develop a missile-launching vehicle, with adequate protection and design features suitable for employability, alongside a MBT, as part of the mechanised spearhead with sufficient protection level and combat capability.

(c) Attack helicopters with their fast, three-dimensional mobility and effective antitank missile systems have emerged as a serious threat for employment of tanks with impunity without co-opted air defence elements. However, providing air defence protection to each and every small tactical grouping of tanks is not practicable. It would therefore be best if such air defence protection is made available inherently within the tactical grouping itself.

4.1 Advantages of Proposed System

The proposed system has the following advantages:

(a) Multiple missiles can be launched at a fast rate directly from their armour-protected stowage position within the hybrid AFV. There is no need to erect the missile into an exposed launch position before launching. Fast rate of launch makes it possible to address multiple targets simultaneously. A single hybrid AFV can therefore match multiple targets of the enemy at any point of time.

(b) The hybrid AFV would provide an effective inherent protection from aerial platforms of the enemy not only for itself but also for co-opted MBTs due to the air defence gun system of the hybrid AFV.

(c) Increased range of engagements since missiles would have far longer range, compared to the main gun systems of the MBTs.

(d) There is similar or better mobility, manoeuvrability and flexibility for employment as compared to conventional tanks.

(e) Additional firepower has been achieved due to fourth-generation missiles as well as air defence guns.

4.2 Tactical Advantage

As of now, no missile-based system can be employed in a tactical grouping along with MBTs yet to meet the requirements of adequate protection level and manoeuvrability. The missile carrying the AFVs, as existing now, are only suitable for employment in a support role as a missile launching platform is not located at the front of a mechanised offensive similar to another MBT but on defended locations/pivots. They can, therefore, be employed only as a defensive or support weapon and not as a manoeuvre weapon suitable for tank-to-tank battle or as part of the mechanised spearhead. The proposed system, however, not only meets the requirements of operability like any other MBT but also provides additional advantages of protection from air platforms, more firepower and longer range of engagement. In tactical terms, a highly versatile system like the proposed hybrid AFV which can be employed along with tank formations in a suitable grouping as part of the manoeuvring force would definitely act as a force multiplier.

4.3 Comparison with Conventional Air Defence Systems

Unlike the proposed hybrid AFV, twin barrel/multiple-barrel air defence systems mounted on AFVs, as existing now, are suitable only for

exclusive employment as air defence weapons within a sector. Due to inadequate armour protection and lack of versatility for employment in multitude types of roles, they are unsuitable for co-opted grouping at the level of small tactical armoured formations.

4.4 Comparison with Tank Gun Launched Missile Systems

The tank gun launched missile systems, as existing now, does not match with any of the following advantages of the hybrid AFV system:

(a) Protection from aerial platforms

(b) Smaller size of the hybrid AFVs

(c) Lower weight of the hybrid AFVs

(d) Total number of missiles that can be launched from the main gun of an MBT over and above its gun munitions is considerably small due to space restrictions, whereas the hybrid AFV would hold at least 16 fourth-generation missiles in a highly compact manner.

(e) Rate of fire of tank gun launched missiles would remain as slow as the gun system itself.

5. SPECIAL FEATURES OF HYBRID AFVs

(a) Small size due to low internal volume

(b) Low profile/silhouette

(c) Lighter weight even with armour protection, comparable to a tank

(d) Faster mobility due to lighter weight and therefore better manoeuvrability

(e) Simplicity of design

(f) Lower centre of gravity as a design feature would provide it with high stability

(g) Versatility in employment, as it can be employed in more number of terrain profiles. Its small/compact size makes it very useful for employment in built up areas, jungles as well as relatively plain mountain valleys. With the availability of twin barrel air defence guns, these can be employed in anti-terrorist role as well

(h) More suitable for airlifting or hele-lifting due to the above-mentioned reasons, and therefore can be deployed faster at locations inaccessible to MBTs.

(i) Design envisages missiles to be fired directly from their armour protected stowage position without having to raise them to an exposed launching position as in conventional missile-based AFVs.

(j) Smaller size and lighter weight makes it better suited to cross terrain-based obstacles as well as negotiate roads/bridges with lower classification than that required for MBTs. This also makes it easily transportable by rail as well as by tank transporters.

(k) Very high hit probability on target for 16 engagements with fire-and-forget fourth-generation missiles

(l) Protection from aerial platforms as in a tactical grouping, it would extend protection from attack helicopters to associated MBTs also. Twin barrel air defence guns can also be employed in antipersonnel role or against soft-skinned enemy vehicles.

(m) Higher firepower of the missiles as well as of air defence gun systems can be unleashed simultaneously on a target.

(n) Faster rate of fire of fire-and-forget fourth-generation missiles as well as of twin air defence guns. Rate of engagement and fire can be further enhanced using automated acquisition and fire control systems.

6. MISCELLANEOUS PARAMETERS

6.1 Back Blast Zone

This can be determined after detailed validation. However, it may be possible to totally eliminate the rear aperture and back blast as in the case of gun launched missile systems.

6.2 Expected Design Parameters

Actual parameters in terms of exact dimensions and weight can be determined only after detailed design analysis. However, the minimum

size and therefore weight of the hybrid AFV, would be directly dependent on the minimum dimensions of the antitank missile. The volume and weight of the hybrid AFV could be further reduced with the employment of custom-designed missiles, which can be tightly packed and launched from within the chassis of the hybrid AFV. The air defence guns could be of small calibre which already exist in conventional multibarrel air defence systems.

7. GLOBAL SITUATION

(a) As is obvious from the type of equipment being developed the worldover, the effort has been towards integration of different types of weapon systems to enhance their versatility and flexibility for employment as well as cost-effectiveness. Advancement in technology is making it possible to create unique combinations of weapon systems which are highly efficient and versatile in their employment, yet highly effective in the battlefield. However, ideas of defence technologies projected for future, which are at their inceptive stage now on the secret drawing board of advanced nations may come to light for analysis by developing nations only after they are at advanced stages of the development cycle. By then, it would be impossible to catch up with the pace of such developments through re-development before their obsolescence.

(b) The tank systems presently under development by advanced nations are envisaged to be small sized, lightweight, and operable by a crew of two personnel with weapon systems packed in a highly compact manner. These tanks would have very low silhouette/profile as well as employ stealth technology to evade detection by land and air-based surveillance systems of the enemy. Virtual reality mode of display is also under development for enhanced sensor integration and view from within the crew compartment.

8. AMENABILITY TO ACCEPT FUTURE DEVELOPMENTS/CONCEPTS

The proposed system will have another primary advantage in the form of its amenability to accept future developments/concepts that would reduce its chances of obsolescence for a long time even in the high technological environment envisaged for 21st century. Some of these are:

8.1 Missile Development

This is a field that is progressing at a very fast rate. In the beginning of 21st century, one would see a variety of highly effective anti-armour missile systems with enhanced range, accuracy and effectiveness. The proposed system would be well-suited to harness these developments.

8.2 Integrated Air Defence Gun System

It can be easily visualised that in an automated and highly responsive air defence environment of future, all air defence resources are likely to be integrated for their usage as a single unit in the most optimum manner. Even though the twin air defence guns are designed as an inherent protection system to the proposed vehicle, when it is not actively involved in its primary task, it could be integrated to the air defence setup of the sector with the inclusion of suitable communication and control systems.

9. CONCLUSION

The proposed system would be well-suited for employment in the highly dynamic battlefield environment of 21st century, where large quantum of information, automated decision making, very fluid situations, fast actionsand reactions, large-scale employment of precision weaponry, etc. are likely to be the order of the day. It would be wise, prudent and pragmatic to be prepared and plan-effective weapon systems like the proposed one, to obviate technological obsolescence that would be the inevitable fate, if one merely emulates the existing weapon systems or just looks out for technological handouts of the dominant nations. The proposed system provides a simple, viable and cost-effective, yet state-of-the-art solution to maintain ones technological relevance in the years to come. As such, all the technological infra-structure required for the development of the hybrid AFV, including a nearly developed antitank missile

system are already available. If one is to aim for achieving technological superiority in the coming years, one has to definitely tread new paths and conceive innovative ideas to overcome lag in indigenous developments, or even overtake other technologically dominant nations of the world.

Contributor

Maj Mohan Vizhakat was commissioned to the Corps of Signals from Indian Military Academy, Dehradun, in 1983. He did his BTech in Electronics and Telecommunications Engineering and is also a graduate of Technical Staff Officers Course from the Institute of Armament Technology (DRDO), Pune. During his career in the Army, he had been involved in conceptualisation, design, planning, implementation and operation of various types of static as well as mobile, network-based automated communication systems at a variety of locations, including built up area, deserts, jungles and mountains around the country. Presently, he is posted to the Snow & Avalanche Study Establishment, at Chandigarh.