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RECOVERY VEHICLES

Abstract: *Armored Recovery Vehicles (ARV's) are very important in nowadays military organizations because of the need to maintain its vehicles operable and ready to fulfill its tasks. Because of the evolution of military vehicles, ARV's evolved and diversified also leading to different approaches, which are treated in this article. In order to make you understand these approaches, some information were put together in order to make a comparison between this different kinds of ARV's. The article shows, that it is hard to say which is better, but makes the reader understand the pros and cons of every approach. In the end, a possible solution is presented leaving to decision into the reader's will.*

Key words: *military logistics, maintenance, recovery vehicles*

INTRODUCTION

Starting with the use of technique in military operations, a new branch of logistics was needed: the maintenance of weapon systems. At the beginning, the maintenance of catapults, charts, rams and later cannons etc. was assured by carpenters, smithers and other craftsmen, but starting with the introduction of vehicles on the battlefields, special maintenance was required. The problem was not significant and could be dealt by technicians at the beginning but became significant once with the introduction of complex weapon systems and a “help” was needed especially for recovering and technique from the battlefield.

Vehicle recovery is a type of military operation conducted to extricate both wheeled and track vehicles, that became immobile due to condition of the soil, nature of terrain in general, loss of traction, due to an attempt to negotiate an obstacle, having broken down, or from sustaining non-combat or combat damage². The recovery can be performed using manual or assisted methods of recovery, using ground or vehicle mounted recovery equipment (mostly winches and cranes), with the recovery of heavier vehicles conducted using wheel and track recovery vehicles, including recovery with the use of the Fifth Wheel Towing Device or with Allied Kinetic Energy Recovery Rope (AKERR). The AKERR is a multi-strand, woven, nylon rope used for like-vehicle recovery. The rope is connected to the mired vehicle and the towing vehicle. The towing vehicle accelerates, stretching the rope, which creates potential energy. When the rope is fully stretched, it transfers the energy to the mired vehicle, giving it a strong, sudden pull³. Vehicle recovery can be performed by the vehicle itself.

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² STANAG 2399 Battlefield Recovery/Evacuation Operations.

³ FM 4-30.31(FM 9-43-2) MCRP 4-11.4A(FMFRP 4-34) Recovery and battle damage assesment and repair 2-16.

1. HISTORY OF ARMoured RECOVERY VEHICLES

Vehicle recovering became a serious problem on 15 September 1916, when some British tanks conducted the first ever tank attack, got stuck in trenches, ditches and artillery shell pits. The British realized the need of recovering vehicles and after some researches were the first, who introduced them. During World War I, some British Mark IV heavy tanks were fitted with jibs to produce "Salvage Tanks", but the majority of their work was at the tank parks (Fig. 1).

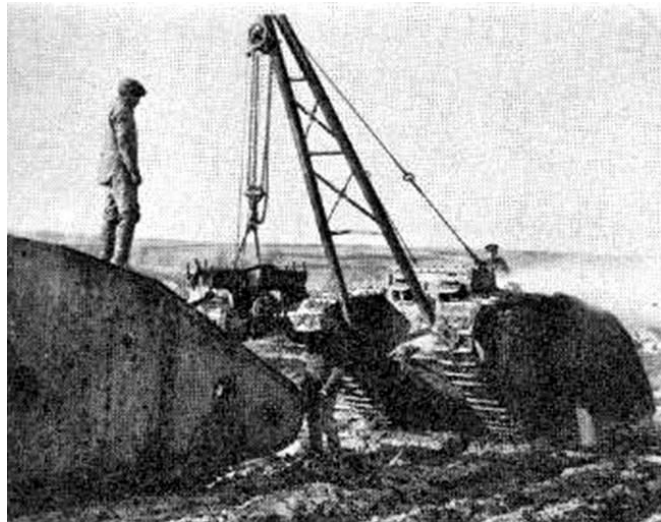


Fig 1. Modified Mark IV tank for being a recovery vehicle

Source: <http://mailer.fsu.edu/~akirk/tanks/GreatBritain/GB-MarkIV-RecoveryTank.JPG>

The roughness of the WW 2 battlefields proved the commanders that the most adequate recovery vehicle should be armored and based on tanks chassis. The main reasons were:

- one of the basic principle of towing is that the towing vehicle must be at least as heavy as the towed vehicle, so tank based ARV (armored recovery vehicles) could recover almost every vehicle.
- tanks had powerful enough engines to provide power to the crane and winch, which meant greater recovering capabilities for tank based ARV.
- most of the times recovery had to be done very close to the front line so the ARVs were often exposed to enemy fire meaning that armor was very important. Tank hulls already had the required armor.

The first true ARVs were introduced during the World War II, often by converting obsolete or damaged tanks, usually by removing the turret and installing a heavy-duty winch to free stuck vehicles, plus a variety of vehicle repair tools. Some were also purpose-built in factories, using an existing tank chassis with a hull superstructure to accommodate repair and recovery equipment. Many of the latter type of ARV had an A-frame or crane to allow the vehicle's crew to perform heavy lifting tasks such as removing the engine from a disabled tank.

2. TRACKED VS WHEELED DILEMMA

After the World War 2 different approaches to ARV concept started to show up so in this time appeared for the first time wheeled ARVs built on APCs or truck chassis, which were easier and cheaper to exploit compared to tank based ARVs, so the latter ones were used in cases of major force. A very good solution proved to be the IFVs based

RECOVERY VEHICLES

recovery vehicles, because of being a very good combination between power and economy. They are pretty cheap to exploit and powerful enough to support almost all kinds of vehicles, except much heavier tanks. When these new kind of vehicles had their apparition argues began for choosing the best solution and the discussions had the same arguments as “tanks vs. wheeled armor” discussions.

Of course, it is totally inappropriate to say, which kind of ARV is the best, but many armies had to decide which of them suits best to its needs and lot of key factors are taken into consideration like: financial possibilities, needs, political factors, geo-political situation, geography etc. Depending on all those factors every organization can decide whether to choose light ARV based on trucks or heavy ones (Fig. 2, 3, 4, 5).



Fig. 2. Polish Recovery Vehicle “Mammut” built on Tatra truck chassis⁴



Fig. 3. Romanian TEHEVAC 84 built on Romanian IFV 84 chassis⁵



Fig. 4. TERA 77 Romanian ARV based on chassis⁶



Fig. 5. Polish WZT 3 built on T 72 APC 77 chassis⁷

Time experience has shown that though wheeled ARV can lift almost the same weight (12t for Mammoth⁸ and 15t for WZT 3), the tracked vehicles have the great advantage of being able to lift parts without using anchors and move while carrying something with their crane (Fig. 6) unlike the wheeled vehicles, which can get a tire

⁴http://www.armyrecognition.com/almex_2011_daily_news_albania_defence_exhibition/polish_company_szczeniak_presents_its_new_armoured_recovery_truck_kwzt_mammoth_at_almex_2011.html (04.05.2013).

⁵ <http://www.forter.ro/content/tehevac-mli-84> (03.05.2013).

⁶ <http://www.scale4x4rc.org/forums/showthread.php?t=52119> (04.05.2013).

⁷http://www.military-today.com/engineering/wzt3_images.htm (04.05.2013).

⁸http://www.psszczeniak.pl/en/heavy_wheel_evacuation_and_technical_rescue_vehicle_mammoth_on_tatra_chassis,p55.html (04.05.2013).

explosion and can lift things only using anchors. This is because tracks distribute the weight on the ground much better than wheels where all the force pushes on the wheels closest to the weight. Talking about towing possibility, wheeled ARVs are no match against tracked because of the much greater grip the latter ones has due to high ground contact surface of the tracks. By example, Mammuth can tow a maximum of 13.5t compared to 50t towed by WZT 3⁹.

Another important aspect is protection. Mammuth has a STANAG 2 protection on the cabin, but it had to be specially armored to achieve that while the WZT 3 has original tank armor and the great advantage that it can be equipped with all the protection systems that are available for T 72 or PT 91. In fact, as seen in the picture, it already has mounted smoke and trap grenades launchers and DShK machine gun.



Fig. 6. Leopard 1 based ARV lifting a 4.7t Leopard 1 powerpack with full extended crane arm and without using any anchors also being able to transport it from a place to another¹⁰.

3. POSSIBLE FUTURE SOLUTION

Through the discussions choosing the best variant a new option has shown and it seems to be a compromise between power and cost efficiency, and this option might be the ARV and engineering vehicle together. It was already tried and it seems to be possible to have both in one vehicle, which means that army will not need both kinds of vehicles, but only a “multi-purpose” vehicle instead.

The Romanian Army has already in use the DMT 85 (Dragorul de mine pe sasiu de Tanc – Minesweeper based on tank chassis), which is basically a minesweeper but with multiple possibilities such as (Fig. 7):

- replacing the mine plough with a dozer blade and vice-versa;
- replacing the 6.5 t capacity crane with an excavator arm and vice-versa.

⁹ <http://www.military-today.com/engineering/wzt3.htm> (06.05.2013).

¹⁰ <http://www.armorama.com/modules.php?op=modload&name=Reviews&file=index&req=showcontent&id=8361> (06.05.2013).

RECOVERY VEHICLES

The protection of DMT 85 is ensured by a laser, radar and infrared illumination warning system which controls the smoke and trap grenades launchers. The “attack” power is ensured by a stabilized remote controlled machine gun. It also has NBC protection and automatic fire suppression system.



Fig. 7. Romanian DMT 85 a multi-purpose vehicle based on TR 85 tank chassis¹¹

The main advantage of this vehicle is that it can be easily turned from minesweeper to engineering vehicle or ARV so it has a 3 in 1 capability, which means that there is no longer need for three separate vehicles¹².

This concept can prove to be solution to the requirements of an heavy ARV in contrast with the budget restraints and cost efficiency need, unless you don't care about the money and would prefer the M88A2 HERCULES, the most powerful ARV in the world with a lifting power of 32t and towing power of 63t, all that from a 1050hp diesel engine (Fig. 8)¹³.



Fig. 8. The US M88A2 HERCULES¹⁴

¹¹http://www.armyrecognition.com/romania_romanian_army_tank_heavy_armoured_vehicle/dmt-85m1_combat_engineer_tank_mine_clearing_armoured_vehicle_technical_data_sheet_description_uk.html (06.05.2013).

¹² http://www.rft.forter.ro/2008_3/07-arm/04.htm (06.05.2013).

¹³ http://www.military-today.com/engineering/m88a2_hercules.htm (06.05.2013).

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CONCLUSIONS

Since the military vehicles diversified, so did the ARV's, offering the armies a great variety of which they can choose whether they can afford a powerful and well armored tank based ARV or they only need a cheaper and more cost effective truck-based one. Of course this is also related to the kind of technique it uses and the importance of maintenance as they see it. It still remains unknown if the future is one's or the other's, only future battlefield will show which is better adapted to meet the new requirements.

As the modern warfare is using intensively vehicles there is no doubt that proper logistics should be provided for them, so ARV's will always be needed and greater attention should be awarded to these vehicles. Their diversification is only the natural way of development and only one variant is less probable to be generally accepted, but proper efforts should be conducted on further research in this domain.

Future development of ARV's seems to be linked to making them more flexible and able to deal with multiple tasks in order to cover several functions. It is not impossible that in the future even more capabilities to be added to ARV's so that it will be quite hard to say that they belong only to one category of vehicles. Probably vehicle recovery will be conducted by general purpose vehicles.

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