

US Air Defence Vehicles



Illustration 1: The cancelled M247 DIVAD (US Army)

When the M247 DIVAD “Sergeant York” was cancelled in the mid 1980s due to issues with reliability and effectiveness, a number of alternatives were quickly adopted and a number of older vehicles remained in service to plug the gap.

In this article we have restricted ourselves and excluded air defence systems that are either man portable (such as Stinger) or intended as higher level air defence (such as Patriot).

LAV-AD

By 1990 the USMC were unhappy with the LAV-PIVAD. A move to improve the system resulted in the LAV-AD. This commercially developed version replaced the 20mm Vulcan with a five barrelled 25mm cannon and added two quadruple Stinger launchers, one on each side of the turret. With no suitable alternative in sight the USMC began upgrading LAV-PIVADs to this standard. By 1995 about half of the USMC LAV-PIVADs had been upgraded. Reserve Marine units did not receive the LAV-AD. The US Army did not adopt the LAV-AD.



Illustration 2: 2nd Marine Division LAV-AD in action, Baltic Coast Spring 2000 (USMC)

A version with Mistral missiles replacing the Stingers was developed for the export market. No sales had been made when the outbreak of war curtailed an production.



Illustration 3: LAV-ADATS straight from the factory.

LAV-ADATS “Jack”/”Marshall”

With the introduction of the M917, the USMC looked again at the requirements for air defence regarding the LAV-AD as an interim solution. As a result they quickly decided that the ADATS missile would be ideal for their uses, combining air defence and anti-tank missiles in one. With transport space being limited this was the ideal solution for the marines, enabling them to double the amount of air defence and anti-armour vehicles without increasing transport requirements. With the likelihood of war increasing the decision was made to add a LAV-ADATS battalion to each division to increase firepower in both air defence and anti-tank roles. Three missiles were attached on each side of the small turret. No gun is carried. The US Army was interested in purchasing the design but it was decided that all of the initial production run would be given to the USMC. The army was given the option to have a second run but the nuclear exchange limited production that badly (in particular of the ADATS missile itself) that none were delivered. It quickly gained the nickname Jack as it was a Jack of all trades. Officially

however it was known as the “Marshall.”

LAV-PIVAD

With the cancellation of the M247, no replacement for the M163 was available. The light divisions and USMC however had already been looking for an alternative as the M988 was too heavy for their needs. An interim solution had been developed in the LAV-PIVAD. Whilst it was not fully suited to their needs it did have the advantage that it



Illustration 4: LAV-PIVAD of the 2-62nd ADA of the 10th Mountain Division, British Columbia Summer 1997

would be easy to build and could be rushed into service. As a result the LAV-PIVAD was introduced in the late 1980s for the 62nd Air Defence Artillery Regiment which provided component battalions for the 25th Division (1-62nd ADA), 7th Division (2-62nd ADA), 10th Mountain Division (3-62nd ADA) and 6th Division (4-62nd ADA) and the USMC. Moderately successful it was rushed into service with other light units as the war went on.

LAV-PIVAD Plus

With the upgrading of the PIVAD with the addition of a stinger missile pod, the LAV-PIVAD was often also locally upgraded with the addition of either one or two Stinger pods to the turret. As these look almost identical to the LAV-AD (only the gun is slightly different), identification of which type it is is very difficult without a clear view of the gun. It is worth noting that these were never officially issued to the USMC although many seem to have had the upgrade (which was an identical pack to the M163A3E1).

M6 Bradley “Linebacker”

Mechanised divisions were badly hit by the cancellation of the M247. While the M691 looked set to fill the need it would be years before enough were available for the mechanised divisions who would have to continue with the M113 series based anti-aircraft vehicles (the M48 and M163). The difficulty of using M113 based vehicles with M2 Bradley equipped units had been shown in the Gulf War. As a result the simple expedient of replacing the TOW missile launchers on an M2 or M3 with a quad Stinger pod was undertaken. The M163 and M48 were retained at divisional level and four M6s were added at battalion level. Of limited use with the main gun in an anti-aircraft role, the missiles achieved a limited air defence package. M6s could be found in both A1 and A2 variants as the package was installed at depot level on any model of Bradley (except the M2/3A3).



Illustration 5: M6 Linebacker of the 5th Infantry Division, Battle of Kalisz 2000. This is unusual as by this point most M6s had been converted back to standard Bradleys. (5th Division Museum)

M12 LADA

Details of this vehicle are covered in the document on laser weapons.

M21/M22 LADA

Details of this vehicle are covered in the document on laser weapons.



Illustration 6: M48 in Korea 1998 - note that all four missiles have been fired. (ITN)

M48 “Chaparral”

Introduced at the same time as the M163 this was a modified M548 (itself a modified M113) chassis (the M730) with an M54 missile system (holding 4 modified AIM9 Sidewinder missiles). It was intended to provide longer range firepower while the M163 dealt with close range threats. By 1995 it was only in service with National Guard units (although a number were issued to regular units as replacements for destroyed units).

M163 PIVAD

A design dating back to the 1960s featuring an M61 20mm Vulcan (as fitted to US Air Force aircraft) mounted on an M741 chassis (a modified M113). The weight however required the vehicle to have sheet metal side panels over styrofoam panels to enable it to retain its flotation ability (and usefully providing spaced armour!). It was to have been replaced by the M247 DIVAD but with this being cancelled in 1985, the M163 soldiered on. Most National Guard and many regular army units were still using this at the outbreak of the war.



Illustration 7: M163 PIVAD of the 5-62nd ADA, School Brigade, 49th Armoured Division Oklahoma Summer 1999

M163A3 PIVAD

This was an upgrade of the M163 PIVAD on an M3 chassis.

M163A1E1/M163A3E1 PIVAD Plus

In 1995 with it becoming apparent that war was likely there was a crash programme to upgrade the M163 with the addition of two quad Stinger missile pods, one on each side of the turret. This was intended as a depot level upgrade and packs were issued for it to be done there. Supply however never met demand and not even all of the units in Germany had been upgraded by the start of the war.

M167 Vulcan Air Defence System

Despite this not being a vehicle but a trailer mounted system this is included for completeness.

Completely replaced in regular service by M998 or LAV variants. Numbers were pulled from storage to



Illustration 8: M163A3A1 captured in Iran by the Soviets - note the missing road wheel. Pravda

equip war raised light role units. Many were used for base defence instead of their primary purpose. At least some were sent to Europe possibly as an alternative to the official issue.

M167A2 Vulcan Air Defence System

This was an improved version of the M167 with an improved gun sight and an extra wheel on each side of the trailer. This was less common than the M167.



Illustration 10: M167A2 used in a ground defence role in Texas by members of the 85th Infantry Division (Light) in May 2000 (US Army)



Illustration 9: 80th Infantry Division M167 protecting the Divisional HQ, May 1999 (CIVGOV)

M690 “Burnside”

In 1995 as war loomed the need for increased air defence was apparent. Supplies of the M691 were limited (and each resulted in one less M1), as a result a programme was created to use the M48 hulls that were left in depots (ironically the first M690 used a hull that had been used for an M247). Other than the hull the vehicle was identical to the M691. While not as good cross country it was still an improvement on the vehicles in serve. Initially issued to M60 equipped units by 2000 it could be found in any unit. There was also an unofficial version that used M60 hulls, usually when the turret was damaged beyond repair. These are sometimes listed as the M690E1 but that was not an official designation.

M691 “Diana”

As the M1A1 came online to replace the M1 and IMPM1 (something which was never completed), a number of M1 hulls were modified to hold a pair of Oerlikon 25mm KBB cannons in a small turret. Popular with the troops due to its protection the Diana was issued to armoured divisions from 1993 (although it never completely replaced its predecessors). By 2000 it was often used as a fire



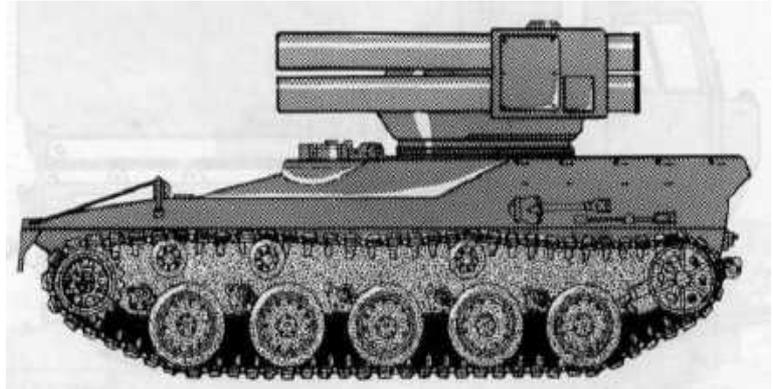
Illustration 11: M691 of the 4/5 Air Defence Artillery, 1st Cavalry Division Poland Spring 1997. The name Super Duster just visible on the turret is a reference to the M42 Duster twin AA vehicle of the 1950s.

support vehicle in the absence of aircraft, although its weak turret armour was often seen as a limiting factor in this role. The origin of the name Diana is subject to much debate as no official records of the origin exist. The most popular theory is that it was named after the daughter of the designer, Karl Adams.

A design using an identical turret on a Cheiftain hull was unsuccessfully entered in the British self-propelled AA gun trials in 1993.

M917 “Westmorland”

With the introduction of the M990, the 4th ADA had a light tracked anti-aircraft gun. However guns were really only suitable for close range air defence and ideally against helicopters. There was a need for a missile system. At the same time there was a need for a tank killing system to supplement the LAV75 and LAV75A1 with its 105mm gun. A quick fix for this was the M917 which used the LAV75 hull with the M990 turret



with 4 ADATS missiles that were designed for use against both aircraft and armour. Trials vehicles only had been completed by 1995 when the system was rushed into service as an emergency measure. Never manufactured in large numbers it was appreciated by the troops who used it for its versatility although the hi tec missiles could be hard to obtain. A pintel mount was often added in the field next to the commander's hatch. this had not been fitted to production vehicles over worries that anything mounted would interfere with turret traversing – troops using the vehicle tended to be less worried about this than being unable to defend themselves against infantry threats.

M975A3 Roland II

This was an attempt to replace the M163 and M48 with a missile system, the Franco-German Roland II. Cost increases however killed the project in the mid 1980s. Originally a modified M109 chassis was used with the missile launcher module mounted on it.



Illustration 12: 2-77th ADA firing at a Division Cuba Hind in September 1999. (Fox)

With the abandoning of the programme the launchers were moved onto the back of soft-skin trucks and issued to a National Guard battalion. By 1990 they had been mothballed. In 1998 they were pulled from storage and issued to the newly formed 77th Air Defence Artillery Regiment (using

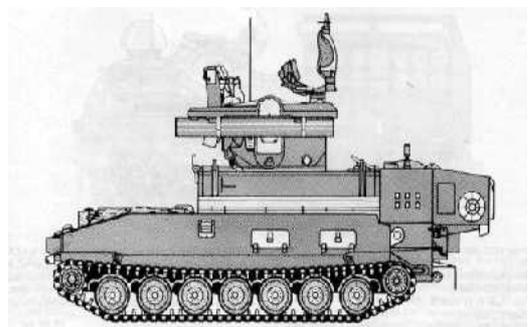


Illustration 13: The original tracked chassis with the large autoloader at the rear.

a mix of both hull types). They were rushed south where the missiles came as a nasty shock to the few Mexican aircraft available.

M990 “Custer”

With the introduction of the LAV75 into service, consideration was made as to using the hull for other variants. A number of anti-aircraft systems were trialled. The winner of the competition was a turret designed by Bofors that featured two 30mm cannon mounted one on each side of a lightweight turret containing the radar system (an off the shelf package created by Texas Instruments).

Despite some sources stating that it was the same radar as the M247, this is not the case (it had been considered but the radar on the M988 was one of its biggest problems). Despite the unusual calibre it was accepted for service and issued to ADA units supporting divisions equipped with the LAV75.



Illustration 14: M990 of the 1-4th ADA, 9th Infantry Division (Motorised) Iran Spring 1998

M998 “Avenger”

Whilst the light divisions were happy with the LAV-PIVAD and LAV-AD, the 82nd and 101st were in need of a lighter



Illustration 15: M998 Of the 49th Armoured Division. June 1999 (CNN)

vehicle. As a quick fix the M998 was developed. This used the HMMWV body with a small turret holding two quad stinger pods with an M3P HMG for local defence and use against slow moving helicopters.

Once the vehicle came into service the USMC looked carefully at its performance and



Illustration 16: Good close up study of an M998 turret. Unfortunately the close view means no identification details are visible. (BBC)

borrowed four for trials. Impressed at what they found they ordered a number. The US Army also ordered a large number for the light units to supplement the LAV-PIVAD. As production of the M691 proceeded slowly, additional numbers were ordered for the heavier divisions as a temporary fix. They proved so popular however they were often retained even after the M691s were available. By 1996 they were the most numerous of the US's air defence platforms. They were also ordered by the USAF for base defence.

M998A1

Despite the success of the M998, there was a problem in that the M3P MG did not have a 360 degree field of fire due to the mount (it was incapable of firing to the front). In an attempt to improve this the M998A1 was developed where one of the Stinger pods is replaced by the M3P MG. This allows a much better field of fire for the MG (a full 360 degrees) although at the expense of some of the ready missiles.

M998A1E1

After the success of the M998A1, a number of units experimented with changing the M3P and one of the pods for a Bushmaster 25mm cannon (usually taken from a damaged Bradley). These were never type standardised but were a common sight in all theatres.

M998 Unofficial modifications

In addition to the M998A1E1 which was semi-adopted, there were a number of other armament packages developed for the M998. Other than the typical HMMWV upgrades such as armour plating and winches, a number of unofficial armament packages were created. These usually involved the removal of one or both of the Stinger pods and their replacement by M3Ps, 25mm Bushmasters, 2.75" rocket pods or occasionally captured foreign equipment.



Illustration 17: US Air Force M1097 Armoured Avenger used for base defence in Iran. Note the sniper team on top. A common tactic was for the sniper to use a tracer round to direct the fire of the M3P onto the target. (USAF)

The design however never left the drawing board.

XM258 "Lion"

As production of the M691 fell behind, Ford suggested another interim measure. They proposed mating the turret and radar from the XM247E1 with either the twin



Illustration 19: XM258E2 mock up (Ford)

M1097 "Armoured Avenger"

With the success of the M998, a number of the armoured HMMWVs were converted into an air defence role. While there was little need of the armour in the conventional role, they were often upgraded to M1097A1 and M1097A1E1 standards (as per the M998) and used as surrogate HMMWV FSVs (although their higher silhouette makes them inferior in this role).

XM247E1 "Sergeant York II"

In 1996 a proposal to create another stop gap air defence vehicle was proposed by Ford Aerospace. This took the M48 hull and a new turret mounting a M61 Vulcan mated with a new radar.

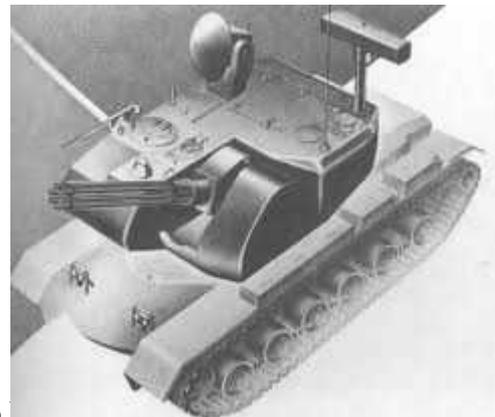


Illustration 18: Computer mock up of the XM247E1 (Ford)

either the twin Oerlikon 25mm KBB cannons (as used on the M691 as the XM258E1) or the 30mm Bofors cannons (as used on the M990 as the XM258E2). Better accepted than the XM247E1, 10 XM258s were converted from M1s for trial purposes (5 with each type of gun). These were all given to the US Army Air Defence Centre and School at Fort Bliss. Evaluation found that they were fit for service and superior

to many of the vehicles currently in service but pointed out the difficulty in procuring hulls for them and recommended no further turrets be purchased in the immediate future. When the unit was converted into the School Brigade these vehicles were issued to see combat mainly in the ground support role. When the unit was absorbed into the 49th Armoured Brigade the four remaining vehicles were scrapped to provide spares for the unit's M1s with the limited air defence needs being met primarily by M998 variants.