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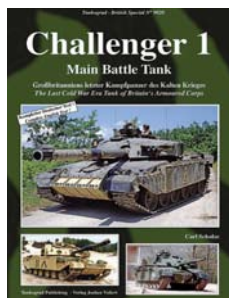
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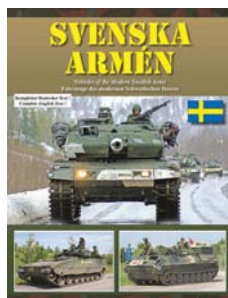
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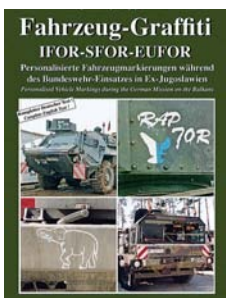
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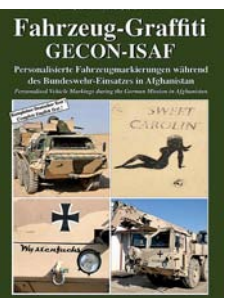
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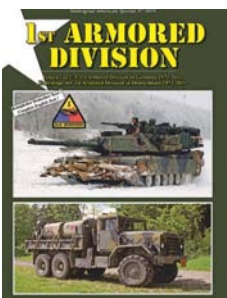
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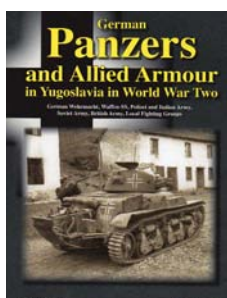
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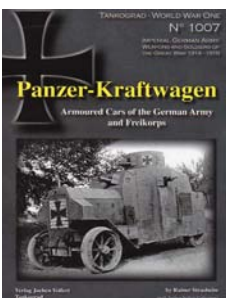
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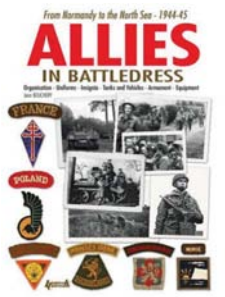
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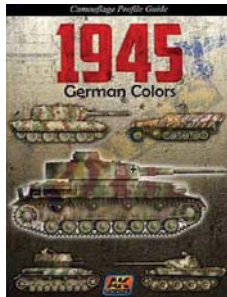
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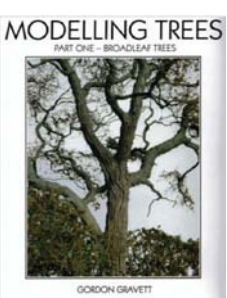
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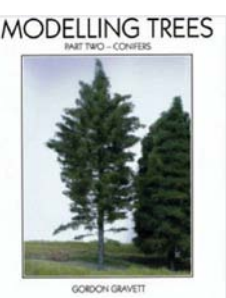
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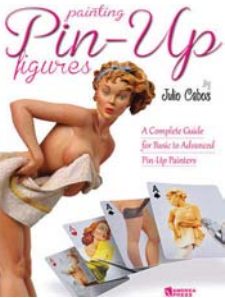
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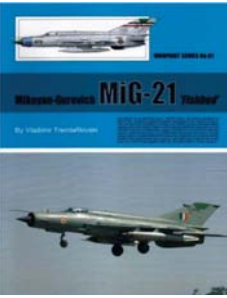
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EDITORIAL

Here at MMI we pride ourselves in listening to what our readers say and do our best to respond to any requests we might get, and in response all those who completed our Reader Survey in the April issue, we have started to include articles on subjects specifically requested by you the reader. One thing that came out of the survey very clearly was a

request for more articles on Russian equipment and in this 100-Page Russian Military Machine Special we're showing our appreciation of that feedback with a bumper crop of articles on Russian military vehicles and equipment, and over the coming months we'll be introducing new features and articles requested by you the reader, after all it's your views that matter - Ed.



Ian Young
Ian Young
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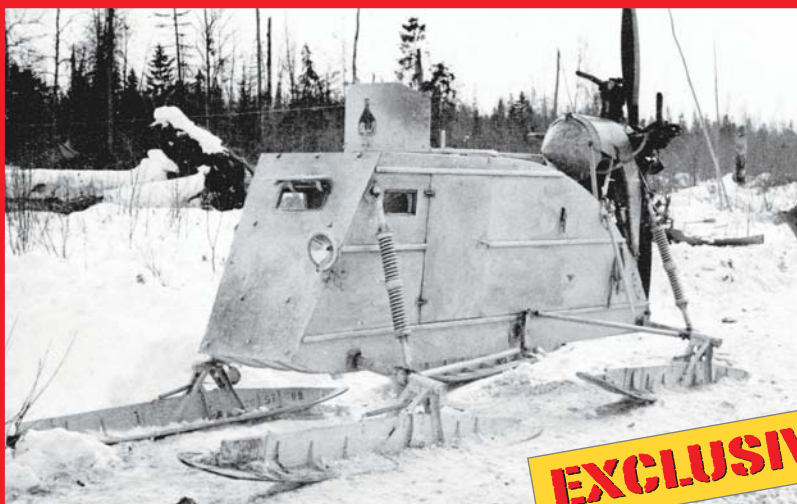


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UP FRONT

NEWS and REVIEWS...

The War & Peace Revival 2013



Organiser Rex Cadman is best known for The War and Peace Show, which was at The Hop Farm in Kent for 25 years, moving after celebrating its 30th anniversary in 2012. Rex organised this with his team from 1989, taking it from a small club show started by the Invicta Military Vehicle Preservation Society (IMPS) with just 100 vehicles in 1982, to the world's biggest military vehicle event. The War and Peace Show was the first to feature living history, military vehicles, trade stalls and battle re-enactments together and to introduce vintage entertainment, fashion shows and dance lessons/demonstrations.

2013 sees the move of War and Peace to RAF Westenhanger, Folkestone Racecourse. Featuring military and vintage civilian re-enactors, living history, battle re-enactments and arena events, vintage entertainment, shopping, funfair and models it's a great family day out. Brand new for 2013 is the Vintage Village with civilian displays from the 1930s to the 1960s including Home

Front, classic cars and support vehicles and much more - something for everyone whether you're into the military side or just the vintage living. Live music day and night gives a real festival feel to the world's biggest military vehicle event.

Travel is very simple with the new show ground being just a couple of minutes off J11 of the M20 and the mainline Westenhanger station immediately next door with direct access from London stations. The High Speed train will stop at Westenhanger for the weekend of the show. For those travelling from the continent, the Channel Tunnel terminus is 5 minutes away and Dover ferry port about a 20-minute drive.

Saturday 11th May saw an open day taking place at the new venue in order to introduce people to the new facilities, which include a vast array of purpose-built buildings including the former main grandstand, which will play host to numerous exhibits, restaurants and displays during the show. Three replica aircraft (Spitfire,





Hurricane and Me109) were parked outside the tea rooms with re-enactors on hand to complete the wartime scene, and a number of military vehicles and classic cars were brought in for the day to give just a flavour of what this year's War & Peace Revival is going to be like and in the car park I found a number of Jeeps and Dodges that people had turned up in and there was even a Chieftain tank – it's amazing what lengths people will go to just to get to events such as this!

Though difficult to envisage without the many thousands of vehicles, living history displays, arena activities, traders and the like, it's fair to say that the site is huge, but looks to have a great infrastructure in place that will enhance the show and enable it to grow even bigger in the coming years. The potential for this new venue is huge and I, like the many regulars to the show, are eagerly anticipating this year's show.

The War and Peace Revival will be held at Folkestone Racecourse near Hythe, Kent CT21 4HX (just off the M20 Junction 11) from 17-21 July 2013.

For further details check out the website at:

www.thewarandpeacerevival.co.uk



Mark-1 Tanks 1/6 4x4 Willys Jeep



Mark 1 Tanks has just announced a new 1/6th Willy's Jeep. Using a true four-wheel drive, all-metal geared mechanical system to actually drive all four wheels together so no independent wheel slippage and fitted with front and rear fully floating axles, they have created what they believe to be the most capable 1/6th off-road radio controlled four-wheeled military vehicle anywhere in the world. With up to 2" [5cms] of one wheel clearance before another becomes airborne, its off road abilities are amazing, more so when fitted with the optional softer and wider "traction" wheels and

tyres. The standard Jeep will come with fairly hard compound authentic looking Jeep wheels and tyres. Using these, whilst looking correct, very slightly reduces off road traction, but does make the Jeep more enjoyable to drive.

Being low geared, the Jeep is easily driven at barely moving speed whilst still having plenty of power to climb up steep slopes and cover large obstacles easily. It is very smooth at these low speeds making it very realistic, however, the Jeep can still move along at 6mph if required, and on rough ground without taking off!

Using the standard 3800-milliamp 7.2v Nicad battery

pack, the Jeep will run for at least an hour, depending on conditions and speed. If driven like a Jeep, 1.5 hours is possible on a full charge. Due to the design of the transmission and motor mounting, some interior space is compromised. There is a realistic interior cover with the Kit available, or you can supply your own. This has been done to allow optimal performance over interior accuracy, as like all Mark-1-Tank products, performance is king.

All Jeeps are built to order with prices starting from £695 and includes: a 2 channel 2.4Ghz "steering wheel" RC, with forwards,

brake and reverse proportional speed controller, steering using a metal geared hi torque servo, 7.2v battery holder cradle. The basic Jeep body is bolt mounted for easy removal and fitted with the standard Willy's wheels and tyres. Add 7.2v battery and 4 x AA batteries to the RC and the Jeep is driveable. This level is for those who want to complete the build kit for the Jeep body, which is very well detailed, and paint and adapt the interior themselves.

Other options include: a set of 4 x traction wheels and tyres; Willy's Jeep proportional engine sounds with an automatic start and shut down function, requiring no additional RC control. Working steering wheel, fully proportional with front wheel steering movement. When you steer the front wheels the steering wheel will move automatically with them; modified suitable 12" figure with arms attached to the steering wheel so looks like the figure is steering the Jeep (subject to figure availability) or we can also modify and fit your own supplied figure; brass front bumper; working lights; and optional 6 channel 2.4Ghz RC with extra sounds, including a gear change, various MG's, horn, static engine rev. etc.

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CAT Goer Reader Feedback



Following my request for information about the American Goer 4x4 all-terrain vehicle in the May issue I've been contacted by several people. First to contact me was Steve Larner who had this to say and also sent along three photos taken in the mid 90s.

Hi Ian,

I was interested to see your appeal about Goers in the UK. No, I haven't got one but I thought you might be interested in the attached images taken at Leavesley International's yard at Arlewas, Burton upon Trent - I guess about the mid 1990s. They had all three kinds of Goer, cargo, tanker and wrecker and all seemed in good shape (better than the example you photographed).

Leavesley's yard was always interesting, mainly ex-MoD stuff, but I recall at times seeing a load of MAN tractors and wrecker vehicles (ex-USAF Cruise Missile or US Army Pershing) and on one occasion an M746 HET in excellent shape. What happened to all these? They could possibly be in a private yard or barn somewhere in the UK but probably went overseas.

Your Goer might have escaped from Leavesley's or was among the same disposal batch from the US DoD - via RAF Burtonwood or Molesworth, Germany or when the POMCUS sites in Holland and Belgium were drawn down after the first Gulf?

Regards - Steve Larner

I also had a reply from Jim Hampton, owner of the scrapyard mentioned, but unidentified in the original request in the May issue and this is what Jim had to say.

Good afternoon Ian,

I write to you with reference to your article on page 7 of the May 2013 issue of Military Machines. The two pictures of the CAT Goer in the grass/bushes were taken at my yard - Hamptons in Newcastle-under-Lyme, Staffordshire in the early 2000's. The CAT Goer in the pictures was the last of several that I had purchased from J. T. Leavesley who in turn had purchased them from the American Army in Germany. The Goer tankers and cargo trucks were painted and sold mainly to opencast mining sites in Scotland for refuelling the plant on site. The cargo trucks were fitted with a modern 20-ton crane so that the fitters could work on site.

The vehicle in the picture was sold to J. Gertz & Sons many years ago. I spoke to John to see if by chance he still had the vehicle, unfortunately he had sold the vehicle but sadly he can't remember where it went.

I hope that the above is of interest to you.

Regards - Jim Hampton

And finally I had another email from MMI reader Alan Miller regarding the Goers and this is what Alan had to say on the subject.

Hi Ian,

Regarding the photo of the truck, I think I have seen this before in yours or another publication. It may be in Dick Hampton's yard as he and other dealers had quantities of these in the late 80s early 90s when released from storage on the continent. These vehicles were overhauled by Zeppelin (German Caterpillar dealer) and had never been used, stacked high in racks in warehouses, and on release all bilge pumps had been removed and assurances sought that there would be no amphibious use.

I worked for a large open cast mining company at that time and was involved in purchasing several vehicles, the tanker and truck versions. Initially they were excellent but within weeks problems began with their light construction when used off road. The fuel tanks cracked, dripping into the prop shaft tunnel for the rear drive, a sealed assembly, making repairs difficult; the front axle casing welded into the front hull was another awkward repair. The main difficulty, which eventually caused many to be cannibalised, was the transmission that was unique to these machines, being semi-automatic it could not down shift when braking, causing frequent stalling and loss of steering etc. finally snapping a small internal shaft or gear housing.

The engine on the other hand, the D333 straight six was one of Caterpillar's best and the forerunner of the D3306, a universally acclaimed unit fitted to vehicles, boats, gen sets etc. As a Caterpillar engineer for forty years I am



qualified to sing their praises! When Goers were broken up the engine usually found its way into something else, water pumps and the like. The crane version was never purchased as when examined they were very complicated and no spares would be obtainable, also manual support legs would inevitably have led to an accident, lazy operators would not have bothered with them.

As to survivors, well a Scottish dealer still has several examples in a shed in 'as released' condition, I think he has a crane, tankers and perhaps a truck, while outside are several rusted through trucks.

Remember these vehicles were released around twenty-five years ago and were lightly made, no armour plate there! I have checked in my loft and although I cannot find the original driver's handbook, I found photocopies and workshop manuals, liberally illustrated with busty blond cartoon characters highlighting points of interest - no P.C stuff there!

Well, you asked for information on the Goers and I hope that the above is of some interest or use to you.

Regards - Alan Miller

My thanks to Steve, Jim and Alan for getting in touch with me regarding the fate of the CAT Goers, the information is much appreciated though sadly it would seem that we're unlikely to see any Goers on the show scene any time soon, and while it's good to know that there are a few vehicles in preservation it would be nice to see one actually driving around rather than static - Ed.

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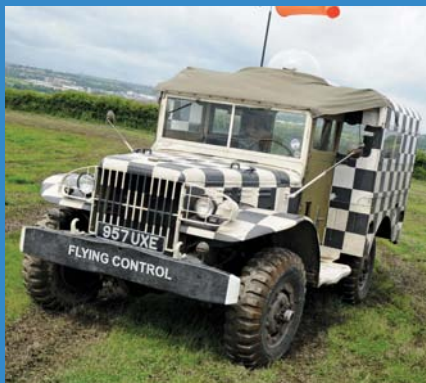
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For more information about the event check out Mission Briefing or log onto the website, which lists the vehicles booked in for the event and includes a great many rare wartime vehicles. The website is at: www.ywe-event.info/





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Russian A

THE SECOND WORLD WAR SAW SOME UNUSUAL VEHICLES BEING USED ON BUT THE AEROSAN HAS TO BE ONE OF THE STRANGEST OF THEM ALL!



AEROSANS

IN THE BATTLEFIELD,



The Russian aerosan may not be familiar to all our readers, but it was a surprisingly popular mode of transport and latterly mobile weapon platform during both world wars. The problem is that the subject is so big that I simply don't have the space to be able to offer a full-blown article covering every type of aerosan to have been built. To do the subject full justice it would require an entire book, so instead I will be offering a brief insight into the subject, covering just a few of the better known aerosan types to have been produced.

Of course should you want to find out more about the aerosan once you've read this piece I can thoroughly recommend getting hold of a copy of a book published by Tankograd Publishing and written by one of MMI's regular contributors, Jim Kinnear.

The 84-page book, 'Tankograd Soviet Special No.201 – Aerosan', is packed with rare black and white images and masses of information on the many different aerosans to have been built during the first and second world wars. Some of the images featured here are also featured in the book, but they are only a small selection of the many photos and

illustrations packed into the book, and come courtesy of Jochen Vollert, publisher of the Aerosan book, whom we thank for sharing them with us.

HUGE SUBJECT

Once you begin to scratch the surface of this fascinating subject it soon becomes evident that there were many different variants of the aerosan built by numerous manufacturers in the Soviet Union during the first half of the 20th Century. When you couple this with the fact that the aerosan was also built and used by other countries, including the German and Finnish armies who created vehicles of similar design to the original Russian vehicles in World War Two, it soon becomes apparent just how big a subject this is.

The frozen wastelands of the Soviet Union and the long harsh winters encouraged the design of vehicles capable of crossing the inhospitable terrain, especially the large expanses of water that would freeze in the winter, and while both wheeled and tracked vehicles were often capable of performing the same tasks, they were often limited to existing roads and tracks and so a simpler, more cost

MAIN PHOTO...

One of the better-known Aerosan types was the NKL-26, which was lightly armoured with an armoured glacis plate and enclosed bodywork to afford some protection to the crew from enemy fire and the elements. The NKL-26 features a central fulcrum pantograph steering arrangement. (Photo courtesy – Jochen Vollert Archives)

BELOW...

A rare view of a German Propellerschlitten WH/WL showing it fitted with an 7.92mm MG34 machine gun, although it is mounted to the front of the cabin rather than on a ring mount to rear, as seen on many Soviet and Finnish aerosans. (Photo courtesy – Jochen Vollert Archives)



RIGHT...

This aerosan has been destroyed to prevent advancing German troops from putting it to use. In the summer months many aerosans were abandoned and left behind as they were of no use to the Russians without snow and ice!

(Photo courtesy – Jochen Vollert Archives)

BELOW...

A rear view of an NKL-26 Aerosan clearly showing the large, two-bladed propeller and air-cooled radial engine mounted high up at the rear. The vehicle would appear to have either been destroyed or abandoned. The ski troops in the photo are German.

(Photo courtesy – Jochen Vollert Archives)

BOTTOM...

A destroyed NKL-26 Aerosan with the dead crewmembers lying beside the wreckage. There is little evidence of damage on the crew compartment, but the wooden propeller has been shattered.

(Photo courtesy – Jochen Vollert Archives)



effective vehicle was sought, resulting in the creation of the aerosan.

Developed in Tsarist Russia between 1904 and 1905, the early aerosans (Russian for 'aero-sleigh' or propeller driven sleigh) were little more than development exercises created by engineers and enthusiasts of the time. The earliest use of the aerosan was as a practical means of transport in the harsh winter conditions that would typically last for many months of the year, but latterly they were used for winter endurance races. In today's terms they could probably be seen as the early ancestors of the ski-doo!

As interest in these new machines grew more and more engineers began to design and develop aerosans, which by now had proven to be a workable mode of transport for these very specific conditions and by 1911/12 many designs of aerosan had been created, in fact some were even exhibited and trialed at events staged by the Vserossiyskiy Avtomobilny Klub

the All-Russian Automobile Club, further generating interest in this unusual mode of transport, the likes of which had not been seen before.

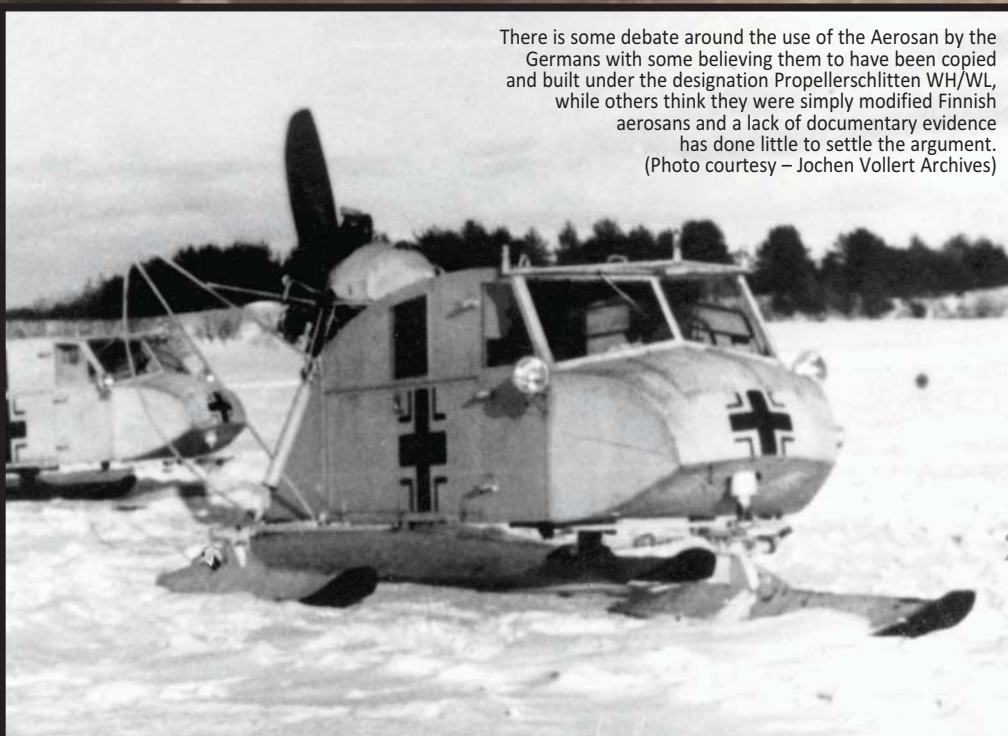
As is so often the way with new designs, the first production orders came not from the civilian sector, but from the military and in 1912 the Imperial Russian Army ordered a Sikorsky-designed transport aerosan under the designation M-1912. The M-1912 aerosan was a simple, open 4-seater vehicle using a four-ski layout and featuring a wooden body and quickly established itself as a useful vehicle within the army. They had their first taste of combat during the First World War, with several different types being built and used successfully in numerous engagements.

The success of the aerosan ensured it would be used once again when the Second World War broke out, albeit it in greater numbers and with updated designs, but all aerosan designs had a basic flaw – they could only operate in snow and ice and once the summer thaw set in they were either abandoned or returned to maintenance units for refurbishment and servicing ready for the following winter. Some experiments took place with some aerosan designs being fitted with wheels instead of skis, but this was purely an expedient due to the vehicles being developed and tested in the summer months, and because they had no great advantage over conventional wheeled and tracked vehicles the idea of fitted them to aerosans to extend the operational window never got off the drawing board.



The aerosan went on to become a useful vehicle, but in the post-war years was rendered redundant by the advent of newer technology. Today the same role can be carried out by a range of vehicles, from the tracked snow cat type vehicles, the smaller ski-doo snowmobiles and the larger and more technologically advanced hovercrafts, which the Russians use in large numbers to transport everything from soldiers to tanks.

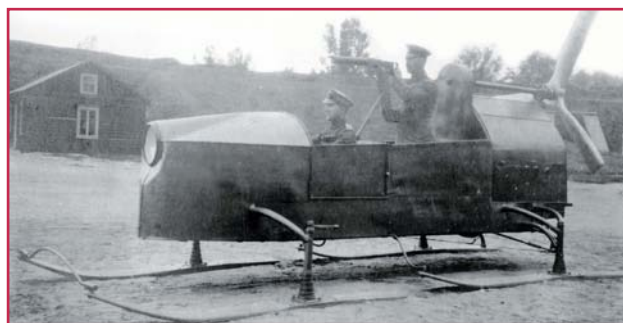
The aerosan was a vehicle of its time and one that ultimately would be relegated to the history books, although some updated, experimental civilian craft have been developed for the leisure industry over the years, continuing the legacy of these remarkable vehicles. Featured here are just a small selection of the aerosans to be built during WW1 and WW2, but a great many more aerosan variants are featured in the Tankograd book mentioned earlier so if you have found the subject of interest would thoroughly recommend picking up a copy of the book.



There is some debate around the use of the Aerosan by the Germans with some believing them to have been copied and built under the designation Propellerschlitten WH/WL, while others think they were simply modified Finnish aerosans and a lack of documentary evidence has done little to settle the argument. (Photo courtesy – Jochen Vollert Archives)

VZS (VSEROSSISKIY ZEMSKIY SOYUZ)

One of the first aerosans to be built was the VZS or Vserossiskiy Zemskiy Soyuz. VZS developed and built a number of aerosan variants that were destined for use by the Tsarist forces in the Great War and featured a simple in-line seating arrangement for the two-man crew with no roof or weather protection. Unlike later aerosans with a similar layout, the driver sat in the front seat with the gunner behind and the machine gun mounted on a raised gun mount directly behind the driver. The VZS used a four-ski layout with the three-bladed wooden propeller. Following its capture by the Imperial German Army this aerosan was examined and assessed by the Germans, but didn't lead to any further developments on their part. (Photo courtesy – Jochen Vollert Archives)



ANT-IV & OSGA/NKL-6

The designers came up with numerous different aerosan designs and two contrasting types were the ANT-IV (shown left) and the OSGA/NKL-6. While both types utilized a three-ski layout and both had enclosed bodywork, both demonstrate different attitudes towards the design of the aerosan. The ANT-IV (possibly an ANT-VII) was one of a series of aerosans developed by the TsAGI Institute in Moscow in the 1920s and 30s. The aircraft industry influence is clear to see with the use of the corrugated aluminium panels in the design and interestingly the driver sat in an open cockpit forward of the main crew compartment to ensure good visibility in cold-weather conditions with the only protection a small aero screen mounted on the nose. These machines were largely hand built and throughout their production and service life were subject to constant changes, making the identification of some types particularly difficult.

By contrast the OSGA/NKL-6 followed what would become the conventional form of construction for most aerosans and was constructed from aviation plywood. The NKL-6 also featured fully enclosed bodywork with a side entrance for the driver and another for the rear crew compartment. It was built in several variants with little to distinguish between them other than the number and layout of the side windows. The NKL-6 was mainly used for the transportation of cargo and ski troops, but some were fitted out as specialist 'raider aerosans', fitted with a machine gun in a ring mount on the roof. An ambulance or medical evacuation variant was also constructed and featured a larger side door to aid the loading of stretcher cases. The two vehicles demonstrate the different approaches to aerosan design by the different design agencies involved with production. (Photo courtesy – Jochen Vollert Archives)



RF-8-GAZ-98

One of the best-known aerosan designs of WW2 was the two-man, RF-8-GAZ-98, which followed a four-ski layout with the GAZ-M1 engine mounted high up behind the driver and the gunner sat in the front seat. It was primarily used in the raider or reconnaissance role. The RF-8 featured aviation plywood bodywork with tubular steel reinforcement and a tubular steel framework to mount the engine, or enemy fire. (Photo courtesy - Jochen Vollert Archives)



NKL-26

Another well-known aerosan type from World War Two is the NKL-26. Once again it followed a four-ski layout, which proved to be a stable platform, especially when used as a gun platform. Unlike the RF-8, the NKL-26 had an M-11G radial aircraft engine, though early prototypes did originally use the GAZ-M1 engine. The largely wooden enclosed body also featured a steel armoured glaucis plate for added protection and mounted a machine gun in a small, protected cupola on the roof. The NKL-26 was primarily used in the raider or reconnaissance role.



ABOVE...

German troops examine an NKL-26. The aerosan was an unusual vehicle in every sense of the word and attracted a great deal of attention when encountered. (Photo courtesy - Jochen Vollert Archives)

LEFT..

Captured Aerosans were on occasion used by the Germans. It is possible that this abandoned NKL-26 was being used by the Germans, but no markings have been applied. (Photo - Jochen Vollert Archives)

LEFT...

The aerosan was ideally suited to the wide-open frozen lakes found in Russia, it was not suitable for use on any other surfaces and the melting snow might suggest that this NKL-26 has been abandoned due to the change in weather. (Photo courtesy - Jochen Vollert Archives)



"...there were many different variants of the aerosan built by numerous manufacturers in the Soviet Union..."

FINNISH PR-40

In World War Two Finland developed their own range of aerosans and while they were clearly based on the designs of the Russian vehicles, were in fact quite different. The PR-40 was one of the biggest of the aerosans to be developed by Finland and featured a large, armoured body and a four-ski layout. Unfortunately it was found to be too heavy and had the unenviable knack of breaking through thin ice! The PR-40 only saw limited service before it was replaced by more conventional aerosan types. (Photo - Jochen Vollert Archives)



RIGHT...

Here we see a Finnish NKL-6S/MR-42S ambulance aerosan. The red cross marking can be seen on the side of the body, as can the elongated side hatch used to load stretchers. (Photo courtesy - Jochen Vollert Archives)



FINNISH MR-42S

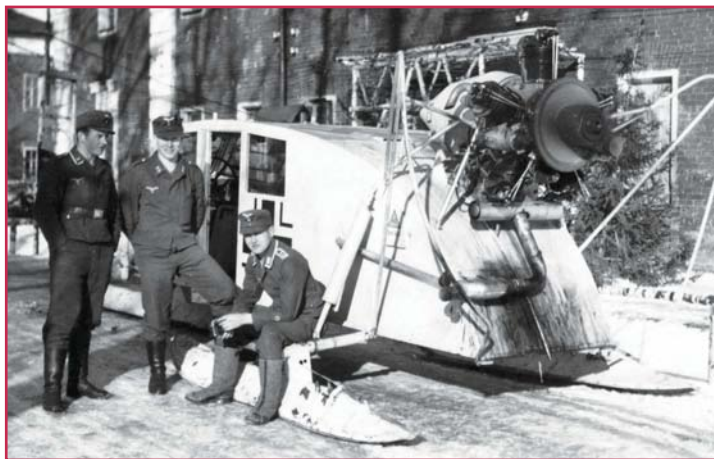
The MR-42S was in essence a copy of the Soviet-designed NKL-6/NKL-16 aerosan and was produced by the Finnish State Aircraft Factory. The design was somewhat simplified, but followed the three-ski layout and featured enclosed bodywork and a rear-mounted aircraft radial engine. Several variants were built, including a medical evacuation vehicle that featured a large oblong hatch in the side of the bodywork to accept stretcher cases.



The Finnish also used the aerosan and the Finnish State Aircraft Factory copied the Russian NKL-6 and NKL-16 Model 1937 to produce the MR-42. (Photo - Jochen Vollert Archives)



(Photo courtesy – Jochen Vollert Archives)



GERMAN PROPELLERSCHLITTEN WH/WL

There is some controversy surrounding the supposed production of German aerosans under the Propellerschlitten WH/WL and little supporting data has come to light. In WW2 the Germans were very efficient at recording the design, development and service life of any item of military equipment, even experimental designs, so the lack of paperwork and photographic evidence to support claims of a German-built aerosan design would suggest that it may not have happened. It is more likely that captured or repaired vehicles saw German service, or vehicles were manufactured by the Finnish State Aircraft Factory to suit the requirements of the Germans. Above right we see the rear view of a German Propellerschlitten WH/WL that appears to have the engine running and shows the square type windows, a design simplification over the original Russian and Finnish designs, which featured oval windows. (Photo courtesy – Jochen Vollert Archives)

ODD BALL AEROSAN...



These rare photos show a most unusual aerosan, about which very little is known. It appears to have been modified to create an aerosan with an almost car-like appearance with no sign of any weapons or weapon mounts. The German soldier beside it would suggest that it's in German service and you have to wonder if it was been created for a high-ranking officer? (Photo courtesy – Jochen Vollert Archives)

MODEL KITS

The aerosan has attracted the attentions of various model manufacturers, with Chinese manufacturer Trumpeter embracing the subject with gusto by offering 1/35th scale plastic model kits of three different types of aerosan, namely the RF-8-GAZ-98, NKL-26 and NKL-16, while Dragon Models now offer a large 1/6 scale model of the RF-8-GAZ-98 (above right) to compliment their highly popular action figure range, so there's plenty of scope for the model maker.





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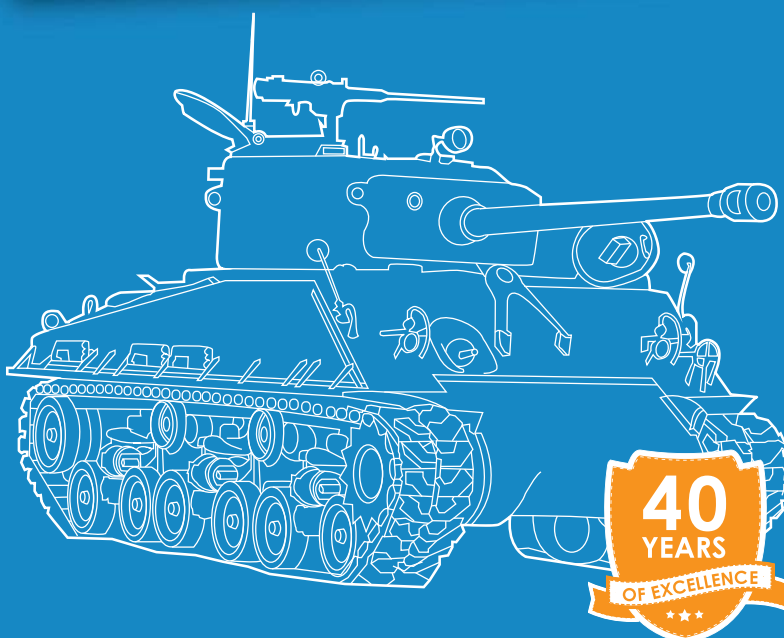
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Stalingrad 2013



Jim Kinnear brings us an exclusive **report on a re-enactment** of the Battle of Stalingrad

In the Russian Federation, 23rd February is celebrated as “Defender of the Motherland Day”, or ‘Men’s Day’, in order to provide balance for (or drinking practice for) ‘Women’s Day’ celebrated on 8th March. Russia is not a land of equal opportunity for all, and as such there is a public holiday for the women on their day but not for men on theirs. However, on 23rd February 2012, ‘Men’s Day’ fell on a Saturday, and with it being the weekend the Technical Museum at Chernogolovka, about an hour’s drive outside Moscow, arranged a battle re-enactment in commemoration of the 60th Anniversary of the surrender of the German 6th Army at the Battle of Stalingrad on February 2nd 1943. The Technical Museum is a very unusual

and interesting museum collection, amalgamated from several other diverse collections with everything fire engines, taxis and trolleybuses to tanks and military vehicles of mainly Soviet origin but with a surprising number of foreign sourced exhibits.

The Battle of Stalingrad re-enactment was conducted near the Chernogolovka Technical Museum in fields covered with deep snow and at a temperature of about minus 10°C (un-seasonally “warm” for the time of year), but with clear blue skies and a bright sun, perfect re-enactment weather and comfortable enough for the warmly clad audience standing on purpose bulldozed snow-banks.

Reaching the re-enactment was not simple, as the museum and the

museum is located along a small country road, which was absolutely blocked with traffic heading for the show – pop festival style – such that the last kilometre had to be undertaken on foot as the police advised drivers to abandon their cars on either side of the road and walk!

The Red Army was obviously well represented, with a collection of immaculately restored Soviet military vehicles, including two GAZ-MM trucks, one mounting a now very rare 4M quadruple anti-aircraft system, a reproduction BA-64 armoured car but a genuine wartime era T-34 M-1943 flamethrower tank, which belongs to the museum. Katyusha MR on a post-war ZiL-157 chassis, which did launch model rockets into the arena.



FAR LEFT...

The museum's restored wartime T-34 with its crew awaiting starting orders. The tank is actually an OT-34 flame-thrower tank, with the flame-thrower installation replacing the glacis-mounted DT machine gun.

BELOW...

The Russian contingent advances to meet the German forces in their Soviet BA-64 armoured car with a fabricated replacement turret in a typical Russian winter setting. The crowd is standing on a specially bulldozed snow-bank.

SCOUT CAR



"The Red Army was obviously well represented..."





"...People were pounded by shrapnel and



TOP LEFT...

Two GAZ-MMs, a pre-war production model followed by a simplified wartime production model.

ABOVE & RIGHT...

An extremely rare, a quad 7.62mm "Maxim" water-cooled anti-aircraft system, on the rear of a GAZ-MM. The system is believed to be the only one surviving in the world.



The pyrotechnics were somewhat realistic in the manner Russians love and enjoy - and not a yellow health and safety jacket in sight - such that the searing heat from some blasts was rather notable, while people were pounded with 'shrapnel and sods of earth' from some of the closer blasts - ah the Health & Safety Inspectorate free life the Russian people enjoy!

The battle re-enactment was standard fare, but the setting was more open field than arena in nature, with the deep snow on the ground, plenty of pyrotechnics and significant numbers of re-enactors and equipment involved, which made for a good show.

It was interesting to see a genuine wartime 76mm gunned T-34 (actually an even rarer OT-34 flamethrower tank) on the prowl crossing deep snow, though the tank for obvious safety reasons was kept well away from the crowds.

With the seasonal cold weather and deep snow setting, the battle re-enactment was very different to most of those that I have attended outside Russia, and yet the crowds were there in force despite the biting cold, but then there's a saying the Russians have, "there is no such thing as cold weather, only a lack of warm clothing!"



The OT-810 (SdKfz-251) comes off worst in a duel with the BA-64.



LEFT...

Wartime artillery to go with the wartime AFVs, and here we see the 76.2mm ZIS-3 dual-purpose gun - an efficient tank killer.

BELOW...

A 'Katyusha' rocket launcher awaits firing orders. Note the pyrotechnic rockets on the launch rails.

and sods of earth from some of the closer blasts..."



PT-76 LIGHT TANK

We take a closer look at the PT-76 amphibious light tank - a relic from the Cold War

The potential third world war between the United States of America and the Soviet Union was a very serious threat in the decades following World War Two, and the proliferation of nuclear weapons added a new dimension to 20th Century warfare that seriously raised the stakes. The Cold War as it would soon be known, saw the Soviet Union and America and those allied to both sides, building weapons and equipment on an unprecedented scale, and while those weapons were thankfully never used in anger despite the many threats and constant posturing from both sides, the perceived threat was enough to ensure that neither side wanted to be left behind in the arms race.

With the exception of the Inter Continental Ballistic Missiles being built in great numbers, one of the key areas that all sides concentrated on when it came to weapon design and production were land based tanks and armoured vehicles. The Soviet Union differed significantly in its attitude towards the design and capabilities of these vehicles in a number of areas when compared to the west, with vehicles being built quickly, cheaply and in huge numbers, and while they weren't always as technologically advanced as their Western counterparts, they were more than a match for them in terms of numbers.

One area where the Soviet design bureaus excelled right from the word go was in the design and production of amphibious armoured vehicles. At the time the small, 4x4 BRDM-1 and BRDM-2 armoured scout cars, and the larger 8x8 BTR-60 armoured personnel carrier as well as numerous other vehicles had been designed to be fully amphibious from the outset, usually powered by a single or twin water jet system via a power take off on the engine. The decision to follow this design philosophy stemmed from the belief that should war break out with the west, a full frontal assault would take place across Europe and given the amount rivers criss-crossing the region, and the assumption that many bridges would probably not be viable due to demolition or destruction, the only way





ABOVE: in these views we can see the twin covers over the two water jet outlets in the rear hull. The large ventilator dome on the turret is also visible, which is replaced with a snorkel on Russian naval vehicles.

"...The Soviet design bureaus excelled right from the word go was in the design and production of amphibious vehicles"



Hull Details

RIGHT...

The circular driver's hatch swings away when the vehicles isn't being driven closed down.



RIGHT..

In addition to inlets on the underside of the PT-76's belly plate, there are two sets of 'gills' on the hull of the vehicle.



RIGHT...

Later production versions of the PT-76 were fitted with these flattened type auxiliary fuel tanks. Early vehicles used cylindrical type tanks instead.



RIGHT...

Here we see the front bow deflector to keep the water from washing up the glacis plate and into the driver's hatch when swimming.



to ensure a continued push across Europe was to have a fleet of amphibious vehicles that didn't need bridges.

This didn't escape the attentions of the Western military planners and as a result a great many amphibious vehicles were designed and built in the west during the Cold War period, but none of the countries in the west embraced the use of amphibious technology to the same degree as the Soviets. In the event the perceived threat diminished and many modern military vehicles now in service are without any sort of amphibious capability, with the west opting instead for amphibious bridging ferries capable of moving vehicles across a river without going to the added expense of

having to design specific amphibious vehicles, which often come with inherent maintenance requirements that can make the expensive to keep.

LIGHT TANK

One interesting amphibious vehicle to be used by the Soviets and Warsaw Pact countries in large numbers during the Cold War was the PT-76 amphibious light tank. Developed in the immediate post-war period, the PT-76 entered service in 1952 and immediately provided ground troops with a reasonably heavy weapon in the form of the 76.2mm main gun that was capable of keeping up with them on the battlefield regardless of obstacles such as rivers. Despite being a

Running Gear

BELOW: the PT-76 uses a rear drive sprocket (below left) and front idler with no return rollers. The running gear has been used on a great many other Russian AFVs over the years, including the MT-LB APC.



Turret



ABOVE: The flat conical turret was a recognisable feature of the PT-76 and similar looking turrets were used on other vehicles such as the BRDM-2 Scout Car and BTR-60 APC.

LEFT: with the main turret hatch open there is good access into the interior. Here we see the breech of the 76.2mm main gun as well as some of the other items of equipment.

comparatively large vehicle at over 7.5 metres in length, the PT-76 only had a crew of 3 and weighed just 14.6-tonnes. The conventional steel armour on the vehicles was surprisingly thin, capable of protecting the crew from little more than heavy machine gun fire and shrapnel, but was seen as being enough to do the intended job of supporting the infantry.

The hull of the PT-76 is divided into three sections in a conventional manner with the driver sat at the front of the vehicle, the crew compartment in the centre complete with ammunition storage for the main gun, and the engine and transmission located at the back of the vehicle. This rear compartment also housed the two water jet propulsion units, one either side of the vehicle. The water jets would suck water from openings in the belly plate of the tank and force it through a pipe to exist the vehicle on either side of the rear hull plate. The

rear water jet exits were protected by two, hinged covers that could be swung out of the way when entering the water. A bow deflector was also mounted on the front of the vehicle for use in heavier swells or when operating in the sea.

Interestingly the Soviet Naval Infantry forces used a considerable number of PT-76 tanks, launching them directly from assault craft to swim ashore and provide heavy firepower on the ground once ashore. The naval version of the PT-76 was little changed from the standard army version, but did include the fitting of a raised snorkel on the rear of the turret to allow the PT-76 to operate in rough seas. Navigation lights were also fitted when operating in large-scale amphibious manoeuvres.

The large, conical turret housing the main gun and a co-axial 7.62mm machine gun was home to two of the crewmembers and a large oval hatch

on the roof provided excellent access to the interior and doubled as a shield when raised. A smaller hatch for the commander was also incorporated into the larger hatch for use when operating closed down.

The large domed ventilator on the side of the turret was removed and replaced by a snorkel device on those PT-76 tanks used by the Soviet Naval Infantry forces.

WIDELY USED

The PT-76 was widely used by Soviet and Warsaw Pact countries as well as numerous other countries over the years and underwent various improvements and modifications throughout its service life, but on the whole there were just two main models, the original PT-76 and the later PT-76B introduced in 1962 and the subject of the photos in this article. As a vehicle it was generally well liked

"...The Soviet Naval Infantry Forces used a considerable number of PT-76 tanks, launching them from assault craft to swim ashore and provide heavy firepower..."



Specifications - PT-76B

| | |
|-----------------------|---|
| Date in Service: | 1962 |
| Crew: | 3 |
| Weight: | 14.4-tonnes |
| Length: | 7.625m |
| Width: | 3.14m |
| Height: | 2.255m |
| Armour: | 17mm max |
| Engine: | V-6 Multifuel-Diesel in-line six-cylinder developing 240hp @ 1,800rpm |
| Transmission: | Manual 4 fwd 1 rev |
| Suspension: | Torsion Bar |
| Armament (Main): | 1 x 76.2mm |
| Armament (Secondary): | 2x 7.62mm MG |
| Speed (Road): | 44kph |
| Speed (Water): | 10kph |
| Range: | 450km with auxiliary tanks |

Family Tradition



ABOVE LEFT: The PT-76 at IWM Duxford is a Soviet-built, Ex-East German Army vehicle and has been performing at the annual military vehicle show for many years now. The driver here is Brian Harris, a long-time volunteer and member of the Duxford Aviation Society Military Vehicle Wing who provide much of the manpower for the show as well as restoring and maintaining the collection's vehicles. Photographed here circa 1998, Brian is seen at the controls of the PT-76 in the off-road arena with his son Richard sat up in the turret during the annual show. Interestingly Richard, now 31, is pictured above right driving the very same vehicle at last year's military vehicle show, and the driving of the PT-76 has become something of a family tradition, and while dad Brian continues to drive the vehicles, he has moved on to bigger vehicles now!

by crews, being a manoeuvrable tank with a reasonable turn of speed, and generally reliable, although the lack of any heavy armour protection might have been cause for concern had the tank been involved in an all out war.

While the PT-76 may not have been involved in the expected Third World War, it did participate in a number of other conflicts and wars and PT-76 light tanks were seen on the streets of Prague in 1968 during the Soviet invasion of Czechoslovakia. Having been widely exported it also saw widespread use during the various Middle East Wars plus the Vietnam War, Indo-Pakistan War, and various local conflicts in Africa, in fact it is believed that as many as 25% of the

total number of PT-76 light tanks ever built were exported.

While it was still the Soviet Union that used the PT-76 in the greatest numbers, it was a popular tank with other Warsaw Pact countries, especially Poland and East Germany who used the amphibious light tank in large numbers. The hull and running gear was also the basis of a number of other armoured vehicles such as the MT-LB armoured personnel carrier.

Today the PT-76 has largely been replaced in service by newer vehicles, but some remain in service with the internal security forces of the Russian Federation and no doubt there are others still in use with third world countries. With most PT-76s now

retired from active duty surviving examples have been reassigned to a more sedate life with numerous examples now preserved in museum collections around the world.

The example featured here now leads a comfy life at the Imperial War Museum Duxford, performing for the crowds on occasion, but spending most its time as an exhibit or being fettled in readiness for the annual military vehicle show.

Obviously a large number of the preserved PT-76 tanks to be found are in Russia and the Ukraine, but others are displayed in Poland, Egypt, Israel, Germany and probably elsewhere so widely used was this remarkable little amphibious tank.



LEFT...

Richard Harris, seen here driving the PT-76 at the 2012 Duxford Military Vehicle Show, has been coming to Duxford since he was a child and is now one of the volunteers that restore and maintain the vehicles at Duxford.

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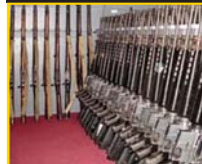
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Old Faithful



We look at one of the most widely exported tanks in the world, the Russian T-54/55 Medium Tank

For decades the Russian military followed a doctrine of producing cheap, mass-produced tanks that could hugely outnumber the enemy, and while they weren't always as technically sophisticated as their counterparts, were reliant on the sheer weight of numbers to overcome the enemy. The practice began with the T-34, which was produced in huge numbers during the Second World War and while the T-34/76 and later T-34/85 were more simplistic in design than their German counterparts,

went on to defeat the likes of the Tigers and Panthers thanks to their new sloped armour and the fact that they were produced in such huge numbers.

This practice of building cheap to produce tanks in great numbers continued after the war and into the Cold War period and one of the tanks to be produced in this way was the T-54. Right at the end of the Second World War Soviet designers made attempts to improve the popular T-34 and eventually came up with the T-44. While the T-44 followed similar design

practices to the T-34 it incorporated numerous improvements and sadly some of those so-called improvements also led to the tank being less reliable. The T-44 used a modified T-34/85 turret and saw limited service at the end of the war, but having gained a reputation for being unreliable the designers were soon looking at new designs to replace the T-44.

NEW PRETENDER

Although the tank is comparatively modern in appearance, the design of the T-54 actually began in late war years, with the first prototype



MAIN PHOTO...

Photographed at Duxford, this privately owned T-55 is a regular in the arena.

LEFT..

While this may look very much like a T-54, it is in fact a Chinese-built Type 59.

TOP & BELOW...

A T-54 performs for the crowds at the War & Peace show, one of many in private hands.



appearing in 1945 and full production following soon after in 1947. The new T-54 was built at the Kharkov plant in Ukraine, while the development of the T-55 some years later took place at the Kartsev Bureau at Nizhnyi Tagil, and incorporated a number of improvements over the original T-54 including a new turret.

The T-54/55 would go on to be built in huge numbers with an estimated production figure in excess of 50,000 being built by the Soviet Union and yet more built under licence in China (as the Type 59), Czechoslovakia and Poland, and many more tanks exported around the world. The original T-54 was a simple design with an all-welded steel hull



with a typical three-compartment layout that saw the driver seated at the front, the remainder of the four-man crew in the centre fighting compartment and the engine and gearbox at the rear of the vehicle. While the side armour didn't have the pronounced slope of the earlier T-34, the frontal armour was steeply sloped.

The transversely mounted engine in the T-54 was a V-12 water-cooled diesel engine developing 520hp at 2,000rpm, which was later replaced in the T-55 by another V-12 water-cooled diesel engine, this time uprated to develop 580hp at 2,000rpm. The engine was coupled to manual gearbox with five forward and 1 reverse gears using a multi-plate clutch and was typically 'agricultural' without the finesse often found on western tanks, but was robust and reliable and in the heat of war that is what counts.

The running gear featured five, large 'starfish' pattern double road wheels either side of the hull with the front wheel spaced slightly further forward than the remaining four and all mounted using torsion bar suspension with hydraulic shock absorbers on the first and last road

wheel. A small idler wheel was positioned at the front of the hull and the drive sprocket was at the rear with no return rollers between. The tank was also fitted with steel tracks, in fact it is rare to find a Soviet tank with anything other than steel tracks, I'm guessing they didn't really care if they ripped the tarmac up during an invasion!

An interesting feature of the T-54's tracks was the fact that the pins holding the track links together were not fastened in the same way as western tanks, instead they were left loose on the outer edge and free to move towards the tank's hull, but a special plate on the hull close to the rear drive sprocket pushed the pins back into place each time they passed, thus ensuring that the track pins were always free, making them easier to work on when changing or repairing the tracks in the field.

The new turret was of cast construction and followed a dome-shaped pattern that would be the basis for shape of many tanks designed in the following decades. The top of the turret roof included a pair of D-shaped flat panels let into the roof to

"The transversely mounted engine in the T-54 was a V-12 water-cooled diesel..."

TOP LEFT...

The T-54 and T-55 (shown) saw the new dome-shaped turret being introduced, which would influence Soviet tank turret design for many years.

ABOVE LEFT..

Note the lack of a bow machine gun in the front glacis plate, something most WW2 tanks had.

BELOW...

Privately owned T-54 leaving the arena at the War & Peace Show. This angle offers a good view of the turret shape and the gap between the first and second roadwheels, a distinctive feature of the T-54/55 series.



accommodate the two roof hatches and while the rounded shape offered good ballistic protection and was easy to produce, it was cramped inside for the three-man crew operating within the turret.

The main gun mounted in the turret was a 100mm D-10T rifled gun and the original production models of the T-54 did not feature a fume extractor on the gun. The same main gun was also used on the T-55, albeit in a slightly modified form under the designation D-10T2S, which was actually introduced with the T-54B in 1957. A 7.62mm coaxial machine gun

was mounted beside the main gun within the turret and a 12.7mm DShKM anti-aircraft machine gun was mounted on top of the turret above the right hand hatch.

COMBAT SERVICE

Although the T-54 was originally designed for use across the Soviet Union and Europe, and would probably have been used in huge numbers in massed full frontal assaults had war ever broken out between the Soviets and the West, in the end it spent most of its time

The various Warsaw Pact countries were big users of the T-54 and T-55. Over the years the tank underwent many modifications and conversions, including one for the recovery role, which saw the turret removed, and mine clearing variants with mine ploughs bolted to the front, as shown below.

Warsaw Pact



War Veterans

The T-54 and T-55 have seen extensive action, but not in the hands of the Soviets. The Arab-Israeli wars in the Middle East and the first Gulf War saw many examples being captured, many of which are now displayed in museums around the world.





TOP LEFT...

The Israelis used small numbers of captured T-54/55 tanks. The rubber tracks are a later addition by the private owner, presumably to allow it to be driven on the road.

TOP RIGHT..

The VT-55 was a recovery variant of the T-55 with a crane and winch replacing the original gun turret.

ABOVE...

The T-54/55 was also used by the Vietcong forces during the Vietnam War.

taking part in peacetime duties and various exercises and training. During its service life the T-54 underwent a whole raft of changes and improvements, which responded to the advances being made by western tank designers and eventually resulted in a change of designation to T-55 in 1958, before it was finally replaced by newer tanks such as the T-62 and T-72.

Despite the lack of combat use in the hands of the Soviet forces, the T-54/55 also served with a great many Warsaw Pact/Soviet Bloc countries as well as the Chinese under the designation Type 59, and more than 60 other countries around the world! It is widely believed that the T-54/55 was the most widely exported and widely used Soviet tank to have ever been built, and even today there are a great many examples still in use with some smaller countries.

The lack of combat use by the Soviets didn't mean that the tank didn't see any action, quite the reverse in fact. During the various Middle East wars the T-54/55 saw extensive use with varying success, being pitted against western-designed tanks such as the Sherman, M-48, M-60 and Centurion. The tank also saw action in the Vietnam War, Cambodia, as well as the Balkans War and more recently in the Gulf War.

Although the T-54/55 was feared by western armies when it first appeared, and actually resulted in the American designing and building tanks to combat the perceived threat, the use of the T-54/55 in the Middle East wars and the Gulf War showed the tank not to be as good as first thought. When fighting opposing tanks and artillery of a similar era the T-54/55 would fair comparatively well, however, when they encountered the likes of the Challenger and Abrams tanks during the Gulf War they were found to be no match for the more modern MBTs in terms of both protection and armament and were swiftly dispatched by the deadly accurate 120mm guns of their enemy.

With so many examples of the T-54/55 having been built over the years it's no great surprise to find that numerous examples have found their

way into museums and private collections and while a large majority of them are preserved in museums in Russia and various Warsaw Pact countries, there are also a great many in European and even US museums. A number of T-54/55s have also found their way into private hands in the last couple of decades, with many turning up at military vehicle shows.

EXPORT SUCCESS

There's little doubt that the T-54 and T-55 tanks were a huge export success and with the amount of them still in existence, it could be argued that the design should be classed as one of the greatest tanks in the world. It may not be the most heavily armed, and it may not have the most potent of weapons, but it has seen service with more than sixty countries around the world and therefore has been a huge export success.

The original T-54 and T-55 were cheap to produce and more than matched any rivals at the time of their introduction and the fact that the design was rugged, easy to maintain and very reliable ensured that it was well liked by all those who used it, and while there may have been bigger and better tanks available to all those countries that chose the T-54/55, they were probably more expensive to buy, required more maintenance and possibly less reliable.

The fact that it underwent so many modifications throughout its life was less to do with any faults in the original design and more to do with the end user wanting to keep the tanks as long as they could because they were so successful. There's little doubt that the T-54/55 was a highly successful design in its day and yet it receives very little recognition, usually being dismissed as an inferior tank, but had they been used in great numbers as originally intended in a full frontal attack across Europe during the Cold War, the history books may well have been rewritten and it may not have been just insurance-selling Meerkats talking with a Russian accent!



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BIG TROUBLE DROPS IN!



JIM KINNEAR PROFILES THE RUSSIAN 2S9 'NONA-S' FAMILY OF TRACKED ARTILLERY SUPPORT VEHICLES

TOP LEFT...

An early 2S9. Note the BTR-D derived lengthened chassis, large (relative to the vehicle size) turret with five return rollers.

CENTRE LEFT...

An overhead view of an early 2S9 on parade in Red Square, Moscow.

ABOVE LEFT...

The BTR-D was derived from the BMD-1, and designed as a tracked APC to accompany BMD-1s in airborne operations.

The Russian 2S9 is a widely deployed and yet little understood tracked artillery support vehicle, one of several vehicle types developed as a direct result of early Soviet combat experience in Afghanistan during the decade long Soviet conflict in the country. The initial Soviet assault on Kabul in 1979 was led by Soviet VDV airborne infantry deployed in BMD-1 airborne light tanks, which had at the time been in service for a decade. The BMD-1s were air-landed at Kabul airport and driven to the Afghan presidential palace in a prelude to the land-launched invasion of the main Soviet contingent in Afghanistan, which would remain in the country, suffering staggering losses in personnel and equipment, for the next decade. Soviet experience in the

Afghanistan war directly prompted the development of armoured vehicles with high angle fire capability capable of returning fire in mountainous regions, one such vehicle being the 2S9 'Nona-S', based on a BMD series derived chassis.

More than thirty years after the Soviet withdrawal from Afghanistan, the unique airborne deployable BMD-1 light tank (some might say MICV as it crosses conventional classification boundaries) remains today a highly effective airborne combat vehicle, and all of the variants developed on the original chassis remain in service.

The unique airborne vehicle, with the combined features of a light tank and an airborne MICV, was originally armed with the same 73mm 2A28 low pressure gun and 'Malyutka' (AT-3



"...The Afghan war directly prompted the development of armoured vehicles with high angle fire capability capable of returning fire in mountainous regions..."

MAIN PHOTO...

The 2S9 'Nona-S' was modernized in 2003, with improved fire control and satellite navigation. This vehicle was pictured in Moscow in 2008.

Sagger) anti-tank guided missile system. Although the BMD-1 was later upgraded as the BMD-2, fitted with the same 30mm 2A42 automatic cannon and 9P135 ATGM (Anti-Tank Guided Missile Launcher) as the ground forces BMP-2, the original BMD series of airborne light tanks was hindered by its small size, which had been dictated by the dimensions and airlift capability of concurrent Soviet transport aircraft, and not least the need for the BMD series to be parachute deployable using the PRS series of drop platforms, which used rocket braking to soften final landing impact. The resultant restricted internal space limited the vehicle capacity to a crew of two plus five desant infantry, as compared with a total crew of three plus eight

respectively for the BMP-1. In order to allow parachute divisions to deploy under armour while keeping the overall number of AFVs requiring airlift for any given operation to a minimum, a tracked airborne APC version of the BMD-1 was developed, the BTR-D, capable of being air dropped and deployed alongside the BMD-1.

For its new role, the BTR-D was lengthened 0.48m with the additional armour weight distributed by the provision of an additional roadwheel and return roller set. The BTR-D had overhead armour but was turretless, and was armed with bow-mounted 7.62mm PKT machine guns and later with the AGS-17 automatic grenade launcher and ATGM systems. The BTR-D was, however, developed not only as a tracked airborne APC to accompany the

BMD-1, but also as a universal chassis that could be used to mount a variety of weapons systems.

The later BTR-3D 'Skrezhet' was a specialised version for transporting six 'Strela-3' SAM missile systems, though the vehicle was deployed with the ZU-23-2 on its carriage mounted on the deck for providing close support in the ground role. An armoured recovery vehicle, the BREM-D was also developed. By the end of the 1970s, an entire family of vehicles had been developed on the lengthened version of the original BMD chassis.

With such an array of specialised armoured vehicles at their disposal, Soviet VDV airborne forces were particularly well provided for by any worldwide measure, what was lacking, however, was an artillery support vehicle with high-angle fire capability enabling

TRACKED ARTILLERY SUPPORT



ABOVE...

The BMD-1 was introduced into service in the early 1970s. This vehicle is seen in service in Abkhazia in 1998.

Soviet airborne forces to engage enemy forces located in often steep mountain valleys and gorges where conventional weapons were confined by their limited gun elevation.

The requirements for mobile artillery and anti-tank gun support for VDV airborne forces has been a high priority for Soviet airborne forces since their very inception. In the immediate post-war years a plethora of tracked light artillery/anti-tank support vehicles such as the ASU-57, the ASU-76, the ASU-57P and others had been designed, but ultimately only the

diminutive ASU-57 entered service with post-war Soviet VDV airborne forces, with artillery and anti-tank support being provided by towed light artillery.

Though relatively well armed when introduced, the ASU-57 rapidly became obsolescent, and was duly supplemented by the 85mm D-70 gun armed SU-85 (known in the West as the ASU-85). The latter vehicle was, however, a tank destroyer rather than a tracked artillery vehicle, and despite early experiments proved not to be parachute-drop deployable. And so the

situation remained until the availability of the BTR-D chassis allowed the development of a new generation of tracked, air droppable artillery support vehicle for Soviet VDV airborne forces.

The ASU-57 was entirely obsolete by the late 1960s and what the Soviet VDV forces (and Soviet Naval Infantry) of the late 1960s demanded was a universal artillery support vehicle, capable in the case of VDV service of being air-dropped on PRS rocket-braked parachute descent systems and able to engage various target types. Being fully amphibious such a new vehicle would be useful for deployment with naval infantry, with the ability to act as a tracked light artillery tractor being an added plus.

Early experiments on such an artillery support vehicle based on the BMD chassis resulted in the 2S2 'Fialka' and the 2S8 'Landish', neither of which progressed beyond development trials as the short tracked chassis proved unstable as a firing platform. Work therefore began on the development of a "universal" artillery system on the stretched chassis originally developed for the BTR-D tracked APC.

In typical Soviet style, work on the new system was undertaken as a

RIGHT...

Ukrainian Army 2S9 (right) and 1V119 artillery control vehicles photographed on a railway flat car in 2009.



"The 2S9 has a combat weight of only 8-tonnes..."

which 20 rounds are conventional HE-Frag mortar rounds, with the option of rocket-assisted projectiles (RAPs) for increased range, and 5 are cumulative anti-tank rounds with an armour-piercing capability of the equivalent of 600mm of RHA at 500m. The weapon has a significant sustained maximum rate of fire of 10 rds/min.

The 2S9 has a combat weight of only 8 tonnes, with the armour sufficient to provide protection against small arms ammunition. The vehicle has a crew of four. Power is provided by a 6 cylinder 5D-20-240 diesel engine of 15.90 litres capacity, developing 240hp @ 2400rpm, with power transmitted to the drive sprockets via a four speed transmission. The running gear consists of six road wheels with five return rollers, with rear drive sprocket and front idler. The 2S9 has a 60km/h road speed with a road range of 500km. The vehicle is fully amphibious with a water speed of 9km/h and a water range of 75-90km.



COMBAT SERVICE

The 2S9 has seen considerable combat service, primarily with Soviet (and latterly Russian) VDV airborne forces, but also with some other former Soviet bloc countries. The 2S9s combat debut was in Afghanistan at the end of 1981 where they served with the 103rd VDV Airborne Division and the 345th Independent Parachute Desant Regiment. The vehicle's high trajectory fire ability made it particularly useful in mountainous areas, being able to bring fire to bear on targets located high above vulnerable mountain gorges in which Soviet Army columns were

ABOVE...

A 2S9 pictured at a defence equipment exhibition in Omsk, 2001.

BELOW...

Many 2S9s have now made their way into museum collections, such as this early example that is located at the Ekaterinburg Artillery Academy.

collaborative effort between several design bureaus. The 120mm 2A51 mortar system was developed at the PMZ artillery plant in Perm; the turret and armament system was developed at TsNII Tekhmash design institute located at Klimovsk near Moscow; and the specialised ammunition for the new weapon at the 'Basalt' plant. The turret and its new armament was mounted on a chassis derived from the BTR-D. The vehicle was developed and later known in service as the 2S9 'Nona-S'.

2S9 DESCRIPTION

The 2S9 is an efficiently packaged and powerful artillery support vehicle, if not a particularly handsome one. At 6.02m in length, 2.63m wide and 2.30m in height, the vehicle is relatively small, while the suspension can be adjusted to give between 0.1m and 0.45m ground clearance.

One of the most important design features of the 2S9 is the high fire angle capability of the 120mm 2A51 mortar installed in its cylindrical turret has a high fire angle capability, providing a near vertical maximum elevation of 80°. The 2S9 has a 25 round ammunition complement, of





LEFT...

A 2S9 ready for drop, with its parachute deployment system installed.

BELOW...

The BTR-D was used as the chassis for the 2S9 'universal' airborne artillery support vehicle.

BOTTOM...

The 125mm armed 2S25 'Sprut' is an SPG on a stretched BMD-3 chassis, in the style of the ASU-85.

An altogether larger 'airborne' vehicle, based on a stretched BMD-3 chassis is the 2S25 'Sprut', which mounts a 125mm 2A75 tank gun as armament. This vehicle is however a tracked tank killer in the ASU-85 tradition rather than a direct replacement for the 2S9.

The 2S9 turret could be mounted on the new elongated chassis for use in a more conventional artillery support role, as the chassis it is certainly big enough, and, as with the current BMD-3M and BMD-4 airborne light tanks, is as a light airborne vehicle far removed from the original diminutive BMD series which spawned the 2S9.

frequently ambushed. The 2S9 was deployed in Lithuania as the former Soviet Union began to break up as the post-Soviet 1990s era dawned, and in the following decade the 2S9 was subsequently deployed with VDV airborne forces in both wars in Chechnya, where the vehicle was frequently used in a direct fire role against buildings to dislodge snipers. Most recently the 2S9 was deployed in Georgia during the short, but for Georgia catastrophic war with Russia in August 2008, during which Georgia also fielded a handful of 2S9s. There are approximately 1000 2S9s in service today, the majority used by Russian VDV airborne forces, with others serving in Azerbaijan, Belarus, Kazakhstan, Kyrgistan and Ukraine. A few are located in service in Vietnam and Afghanistan.

Development of a new weapons platform designed for a similar role for land forces began in the 1980s, resulting in the 2S31 'Vena', mounting the 120mm 2A51 gun, the first prototype of which was completed in 2006 and displayed at the IDEX exhibition in Abu Dhabi the following year. The 2S31 is based on the larger BMP-3 chassis and is significantly larger than the 2S9.

"...most recently the 2S9 was deployed in Georgia in the short but catastrophic war..."

REPLACEMENTS

The 2S9 remains a viable weapon system although there have been developments of other systems that may in time replace the 2S9. The 2S9 was modernized from 2003, with up-rated armament stabilization and satellite navigation as standard.





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**JIM KINNEAR & YURI PASHOLOK REVEAL THE CANADIAN
ARMOURED SNOWMOBILE MK I IN RUSSIA**

Various weapons installation variants were tried, including the Thompson and Bren machine guns, as shown here.
(Photo - TsAMO)





LEFT..

Testing of the Bombardier Armoured Snowmobile Mk I took place at Kubinka, in March 1945. (Photo - TsAMO)

BELOW...

Front and rear views of the Bombardier Armoured Snowmobile Mk I. These photos were taken while it was undergoing trials at Kubinka in 1945. (Photos - TsAMO)

"Bombardier developed the B1 and B2 military snowmobiles for the Canadian Army..."

Russia and northern Canada share practically identical weather conditions, with long cold winters and deep snow on the ground for several months of the year. Unsurprisingly therefore the countries also share a common development of over-snow vehicles, with the vehicles designed and built by the Joseph Armand Bombardier's Canadian based company being predominantly known in the West.

As with engineers in Russia and some other countries, Bombardier initially worked on the development of aerosans as a means of over-snow transport, but quickly understood the limitations of such vehicles so began experimenting with the development of other vehicle types.

In 1928 the Bombardier Company built its first prototype half-track snowmobile with steering by means of front mounted skis, which entered production in the winter of 1936-37 as the B7. The B7 was in turn followed by the B12 on the chassis of which Bombardier developed the B1 and B2 military snowmobiles for the Canadian Army.

After World War Two, Bombardier went on to develop the light Ski-Doo light snowmobile, but in the meantime some of the company's military vehicles had endeared themselves not only to Canadian forces serving during World War Two, but also to the Red Army.



RIGHT...

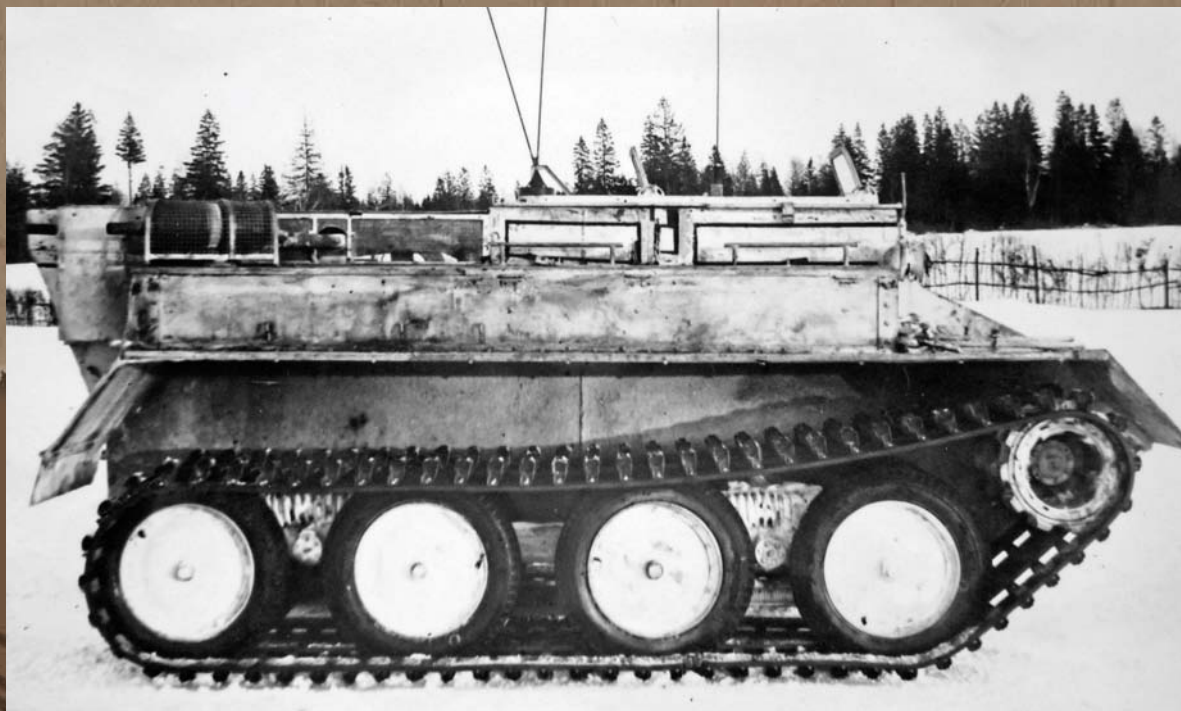
View of the right hand side of the Bombardier Armoured Snowmobile Mk I whilst undergoing testing at Kubinka in 1945. (Photo - TsAMO)

BELOW RIGHT...

View of the left hand side of the Armoured Snowmobile Mk I. (Photo - TsAMO)

BELOW...

Various weapons were tested, including the Thompson and Bren machine guns. (TsAMO)



A rare and interesting photograph showing the Bombardier Armoured Snowmobile Mk I towing a 76.2mm OB-25 regimental gun and an NKL-38 aerosan during testing.





"Series production of the Mk I armoured snowmobile was undertaken at Ferand and Delorme Ltd in Montreal between 1944 and 1945..."

TOP LEFT...

Here we see a .303 Bren in front and Thompson fired from troop compartment. (Photo - TsAMO)

BELOW LEFT...

An extremely rare image showing a Mk I knocking over a tree! (Photo - TsAMO)

BELOW...

Armoured Snowmobile Mk I crossing a snow track in deep snow. (Photo - TsAMO)



PLANS FOR NORWAY

Germany's occupation of Norway in 1940 provided Germany with not only its most northern naval base and year-round access to the output of Swedish mines, but also a location from which it planned to produce heavy water for Germany's atomic bomb programme. The strategic significance of the Norwegian annexation was well understood by Allied intelligence, and from at the beginning of 1942 preparations got underway for a large-scale commando sabotage operation, codenamed 'Plug'. The operation was planned for the winter of 1942-43; to include the use of specialised vehicles for traversing snow covered mountain regions. The operation was never launched, but an experimental all-terrain vehicle developed for the role, the Studebaker T15, was later to enter general service as the M29 Weasel. Another 1942 plan, Operation Jupiter, envisaged landing a series of commando sabotage troops in Norway to attack German airbases which were being used to attack the northern Arctic convoys to Russia, for which Canadian troops were to be deployed, complete with snowmobiles. Operation Jupiter was also ultimately cancelled but in response to the military requirements for such planned operations Bombardier at the beginning of 1943 built a prototype

fully enclosed semi-armoured tracked snowmobile designated Kaki, to provide fast reliable transport in deep snow. Though the Kaki did not enter series production, elements of its construction were used in later Bombardier snowmobile designs.

Meanwhile, in the spring of 1943, Great Britain defined the specifications for an armoured snowmobile with a reduced two-man crew. The new vehicle was to have a watertight hull and be able to climb a 45° slope while providing protection from small arms fire. Over a period of three months, Bombardier reworked the Kaki prototype to meet the new British specifications, with the resultant vehicle being taken into military service as the Armoured Snowmobile Mk I.

Series production of the Mk I armoured snowmobile was undertaken at Ferand and Delorme Ltd in Montreal from the beginning of 1944 to March 1945, during which time 410 Mk Is were built, of which only 11 vehicles were taken into service in Canada, the balance of 396 vehicles were built for Great Britain, though their ultimate fate is a story in of itself. At the beginning of 1945, 10 of these vehicles were used by the 3rd Reconnaissance Regiment of the 5th Canadian Tank Brigade of the 5th Canadian Tank Division, which since November 1943 had been engaged in combat in the

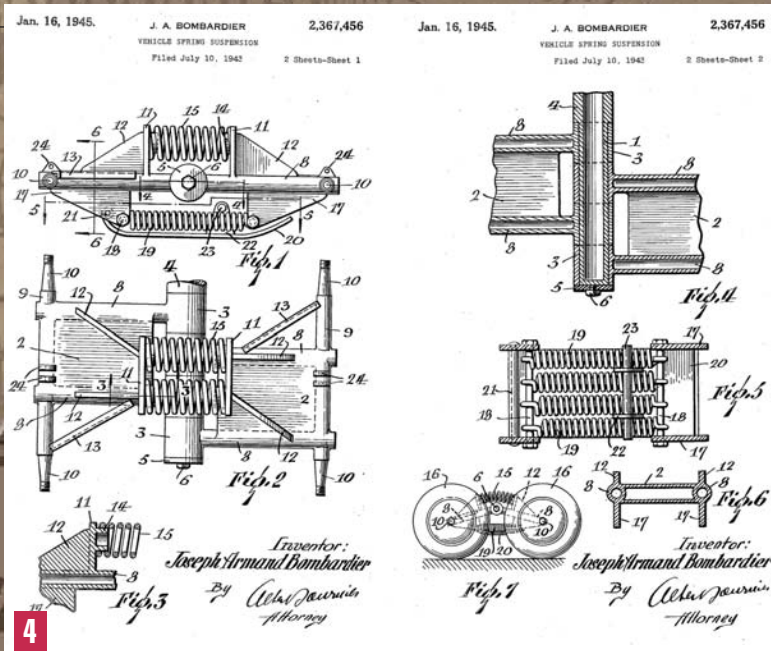
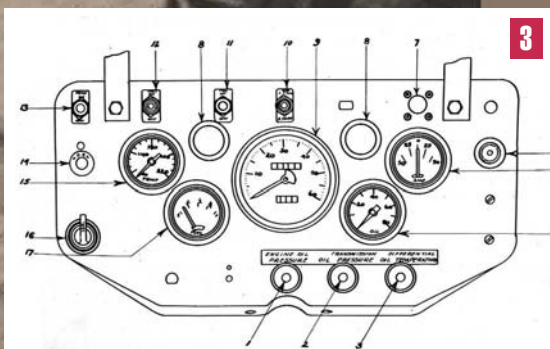
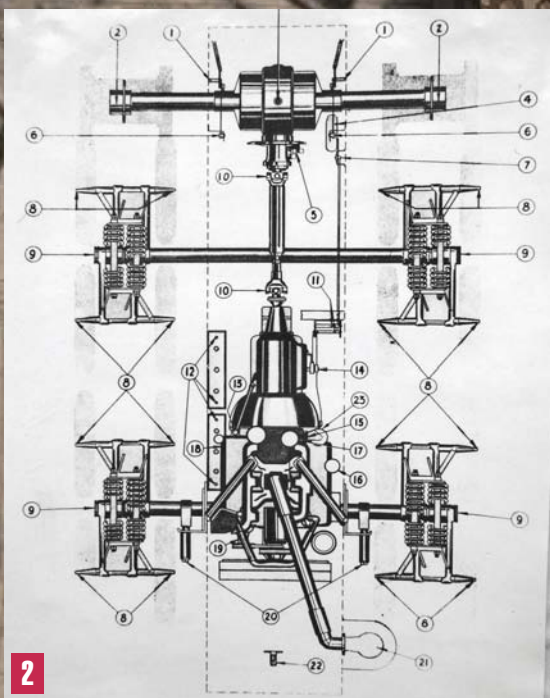
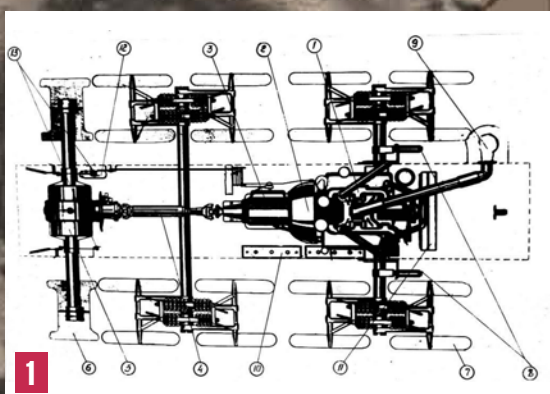
The Mk I proves that it's possible to traverse ground impassable even to tanks, as demonstrated by the bogged down Stuart. (Photo - TsAMO)



Rear three-quarter view of the Bombardier Armoured Snowmobile Mk I at Kubinka, March 1945. (Photo - TsAMO)



1. Component schematic Armoured Snowmobile Mk I showing the basic layout of the vehicle. The engine is to the rear of the vehicle. (TsAMO)
2. Suspension, transmission and running gear drive layout diagram. (from Patent US2367456A as submitted by Bombardier in 1945).
3. Technical manual illustration showing the driver-mechanics control panel, on the Bombardier Armoured Snowmobile Mk I. (TsAMO)
4. Another fascinating insight into the design of the Armoured Snowmobile Mk I spring layout taken from the Bombardier manual (January 1945).
5. Cadillac Series 42 engine installation, as used in the Armoured Snowmobile Mk I (Russian archive photograph taken from the original Bombardier manual).



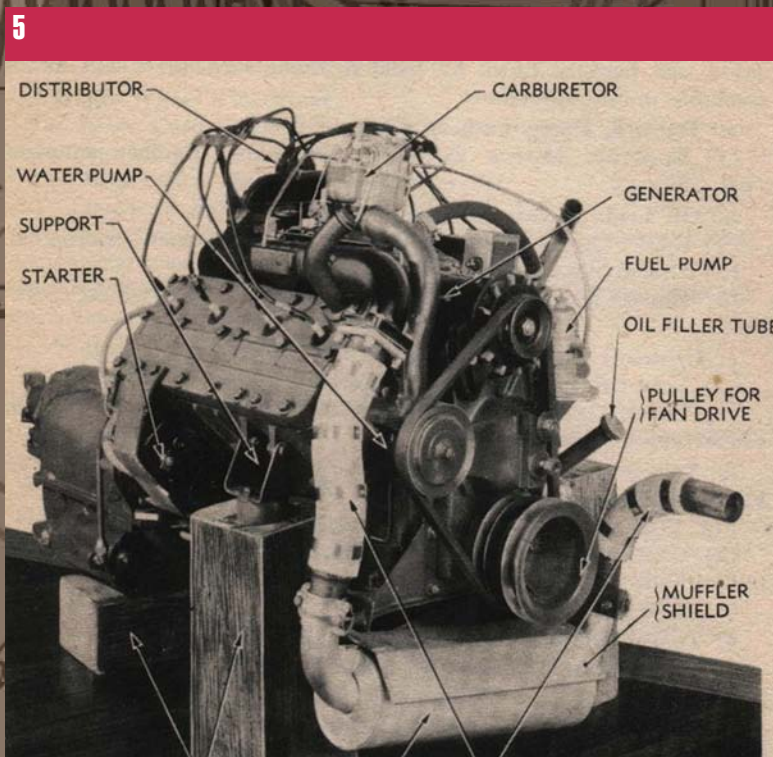
mountains of Italy. The Mk I had a short service career with the 5th Canadian Tank Brigade, from 20th January to 7th February 1945, after which the brigade was despatched to Belgium. Despite its short operational combat service, the Mk I had recommended itself and not only as a reconnaissance vehicle, having been able to tow 6-pound anti-tank guns in mountain regions where the armoured British Universal Carrier could not operate effectively.

While the Mk I had a successful but short service life in Canadian military service, a curious footnote to the history of the Mk I was its foray into the Soviet Union, where it was evaluated for service with the Red Army at the Kubinka proving grounds near Moscow. The Soviet Union took

delivery of three Armoured Snowmobile Mk.I.s, which were evaluated concurrently with the British Daimler Mk II, AEC Mk II armoured cars and the Cromwell IV and Comet tanks. In the Soviet Union the vehicle was known referred to by GABTU (the Red Army Armoured Vehicle High Command) under the index B3 (which is B3 in English and V3 in Russian depending on whether the original nomenclature was used or translated).

A CANADIAN IN RUSSIA

The first Canadian Armoured Snowmobile Mk I appears in notes of the Red Army Aerosan Command (which was within the Armoured Trains and Armoured Vehicles Command of GABTU despite the vehicle being a



snowmobile) in February 1945. The Red Army was familiar with the vehicle type as similar tracked snowmobiles had been developed in the Soviet Union pre-war, but during the early winters of the war the Red Army had employed simpler to construct ski-mounted aerosans rather than tracked vehicles for winter operations. From the winter of 1942-43 the Soviet Union turned to looking again at new vehicle types, as thereafter aerosan use was restricted to a few northern areas as the Red Army moved westwards towards Berlin across less snowbound Eastern European territory. GABTU had not entirely abandoned the idea of aerosans however, developing the NKL-38 aerosan in 1944, a modified version of which was from 1st February 1945 evaluated alongside the Canadian Mk I.

The running gear of the Bombardier Armoured Snowmobile Mk I, with its use of pneumatic tyres with rubber-metal tracks was viewed in the Soviet Union as an ideal combination for relatively light snow vehicles. The vehicle was also very short compared to indigenous Soviet half-track alternatives compared to which it was also more manoeuvrable due to its wide tracks.

In developing the Armoured Snowmobile Mk I the running gear had been seriously reworked from the earlier Kaki prototype as the new vehicle was significantly heavier and bulkier full-track vehicle compared with the earlier prototype. A second row of wheels with pneumatic tyres was added, with eight wheels in two pairs of four, and the tracks widened, all mounted on a two-section undercarriage. The tracks consisted of three rows of vulcanized rubber joined by two rows of parallel metal struts, fitted with external rubber shoes to reduce vibration and noise when moving on hard surfaces. Due to its pneumatic tyred wheels and wide tracks the Mk I had a particularly low ground pressure of 0.09-0.11kg/cm².

The Mk I was powered by a rear-mounted Cadillac Series 42 V-8 petrol engine, as used in the M5/M5A1 light tank, with power transmitted to the tracks via a four speed planetary gearbox transmission mounted at the front of the vehicle.

The Mk I had a compact hull, with the two-man crew seated in tandem, with the driver-mechanic ahead of the vehicle commander, who also acted as the gunner and radio operator. Despite its designation, the vehicle was not fully armoured. The front of the vehicle had 14mm armour, with the rest of the vehicle constructed of 7mm sheets, but the upper hull was open, while the track guards and track stowage box roof sections were constructed of plywood. Soviet test results noted the

lack of armoured protection for the fuel tank as a major design flaw.

In combat the driver-mechanic could theoretically operate closed down with viewing by means of a vision block located in the front section of the casemate, however the Russian trials showed this to be impractical in practice.

Armament as delivered consisted of a .303 Bren and 9mm Sten (the latter replaced during trials with a 0.45 Thompson M-1928). A No.19 tank radio set was located on the left side of the vehicle.

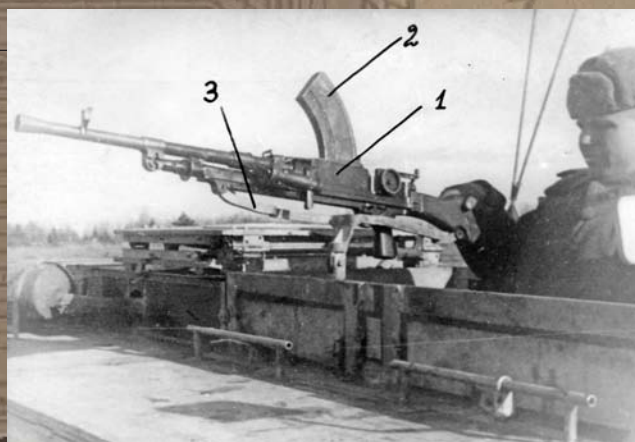
TRACKS VERSUS SKIS

The Canadian Armoured Snowmobile Mk I arrived at the NIIBT polygon at Kubinka at the beginning of March 1945. The test requirements, dated 10th March 1945, required the vehicle to be tested over a total of 1500km of which 300km was to be on roads and 1200km on snow, the test program being almost identical to that for tanks and other tracked armoured vehicles. For part of the trial period the Mk I was tested alongside a Soviet NKL-38 M-1945 aerosan, though the testing of the 4200kg tracked armoured Mk I alongside a 1260kg ski-mounted aerosan was slightly 'David & Goliath' in character, albeit they were being tested as alternative means of transport in deep snow.

The Mk I was tested at Kubinka from 12th March to 15th April 1945, late in the year for testing of such a vehicle, as the spring thaw was well underway such that there was as much mud as snow, the vehicle thereby being tested in real 'tank country'. In the first stage of testing the Mk I covered 881km, of which 737km was on snow up to 70cm deep, 73km on muddy country tracks and 7km on asphalt road.

The Soviet NKL-38 aerosan proved marginally faster (15km/h vs 12km/h) than the Mk I on even snow surfaces; however due to its wide tracks the Canadian vehicle could climb 20° slopes while anything over 15° stopped the lighter aerosan. On ice roads the NKL-38 aerosan had a medium speed of 16 km/h, while the significantly heavier but according to its Soviet testers easy to manoeuvre Mk I could traverse the broken up surface of tank trails at 20 km/h. The Canadian Mk I could, however, push over 15cm diameter trees, which were the propeller driven aerosan's arch-enemy. The Red Army conclusion was that the Canadian Mk I 'import' was perhaps one of the most manoeuvrable vehicles in service.

Although designated as a reconnaissance vehicle, the vehicle was fitted with a tow hook which was used during Soviet conducted trials for towing light artillery and aerosans.



ABOVE...

A rare Russian archive photograph showing the use of the .303 Bren gun from within the fighting compartment of the Bombardier Armoured Snowmobile Mk I.

The Mk I was used during trials to tow a 76.2mm M-1943 (OB-25) regimental gun, which the Mk I towed successfully across all terrain types at an average 18-20km/h. Due to the lack of space for the gun crew the Mk I was nevertheless considered unsuitable as an all-terrain light artillery tractor.

The Russians did not much appreciate the Mk I's open configuration but conceded that the windshields were useful and the heating system efficient. The (.303 Bren) weapons installation, mounted between the crew that could be operated by either crewman from alternative mounting points, and this was approved of. The main concern was with regard to the vision block mounted in the front of the vehicle, which the Soviets described as being purely for "decorative purposes" and useless as a vision device by which the driver-mechanic could be expected to manoeuvre the vehicle.

The NKL-38 in parallel to which the Armoured Snowmobile Mk I was tested did not enter series production. It was also to be the last Soviet aerosan specifically designed for the

TECHNICAL CHARACTERISTICS: ARMOURED SNOWMOBILE MK 1.

| | |
|-----------------------|---|
| Length: | 3.92m |
| Width: | 2.56m |
| Height: | 1.65m |
| Ground clearance: | 0.31m |
| Track length: | 2.22m |
| Track width: | 0.885m |
| Combat weight: | 4200kg |
| Crew: | 2 |
| Armour (mm) | 7-14 |
| Armament: | 1 x .303 Bren (360 rds) 1 x 9mm Sten (320 rds) |
| Engine: | Cadillac V-8 Series 42, 110hp |
| Speed (road/terrain): | 44/22km/h |
| Range (road/terrain): | 190/100km/h |
| Radio: | N°19 |

requirements of the Red Army. The Mk I meantime was considered a highly manoeuvrable all-terrain snow vehicle not only in comparison with the NKL-38 aerosan but also the Bombardier V-2 half-track snowmobile that had been tested at Kubinka in 1943 with a recommendation that an analogous vehicle should be developed in the Soviet Union for the Red Army.

SNOW TO MARSH

In accordance with an order signed on 20th April 1945 by I.A. Lebedev, Deputy Chief of GABTU, testing was prolonged until 15th May, during which extension the Armoured

Snowmobile Mk I was to be tested on soft ground and dirt roads during the spring 'rasputitsa' (i.e. mud!) season together with an American M2 half-track and an M5A1 light tank.

During the second trials stage the temperatures hovered around +15°C (balmy weather by British standards!) during which the Mk I traversed a total of 228km, of which 40km was on the Moscow-Minsk highway, 108km on village roads, 59km on made roads and 21km across marshland. The vehicle was first tested together with the M2 and the M5A1 on marshland 20-40cm deep. The M2 got stuck within 24 metres of starting off, while the Mk I easily traversed the marsh and even pulled out the 9-tonne M2 half-track. The M5A1 light tank made it through the first stage but later became stuck in marsh after driving only 45m. The Mk I meantime passed both tests and safely traversed marshland 1.5m deep. The Mk I was then tested for its amphibious characteristics and operation on dirt tracks, which was again successful bar for some overheating due to the vehicle's cooling system intakes still being set to winter mode. The final stage was road travel at 30-32km/h where some problems were encountered with the metal track shoes. The tests concluded that the vehicle was "not suitable for further testing in the spring-summer period" - in other words the Red Army testers had run out of winter! Despite the end of season testing conditions the Mk I was noted as being a very useful and highly manoeuvrable vehicle with the unusual running gear arrangements being perfect for operation in a variety of off-road conditions. The vehicle's performance on marshes was noted as exemplary. The overall test conclusions stated that, with some modifications, the running gear and track arrangements used on the Mk I would be an ideal basis for the development for snowmobiles of local Soviet manufacture.

Post-war, Bombardier developed other, fully enclosed vehicles on the Mk I chassis; the company continuing to build such vehicles for civilian use until the 1950s, thereafter concentrating on the smaller Ski-Doo range of snowmobiles. The Bombardier Armoured Snowmobile Mk I chassis and running gear with its pneumatic low pressure tyres and rubber-metal tracks went on to be used by the US in the 1950s in the development of the M56 Scorpion airborne armoured vehicle, which later saw service during the Vietnam war.

The testing of the Mk I at Kubinka was not the end of the story in the Soviet Union either. The low pressure

rubber tyre and wide rubber-metal track running gear arrangement used on the Mk I was as useful to the Soviets as the Canadians, in that both countries shared the same need for specialised all-terrain vehicles to provide military transport during the long winters of their respective snowbound northern regions. The running gear and track system used on the Mk I continued to be developed in the Soviet Union, today being found in service on the Russian DT 'Vityaz' series of two-section military transporters.

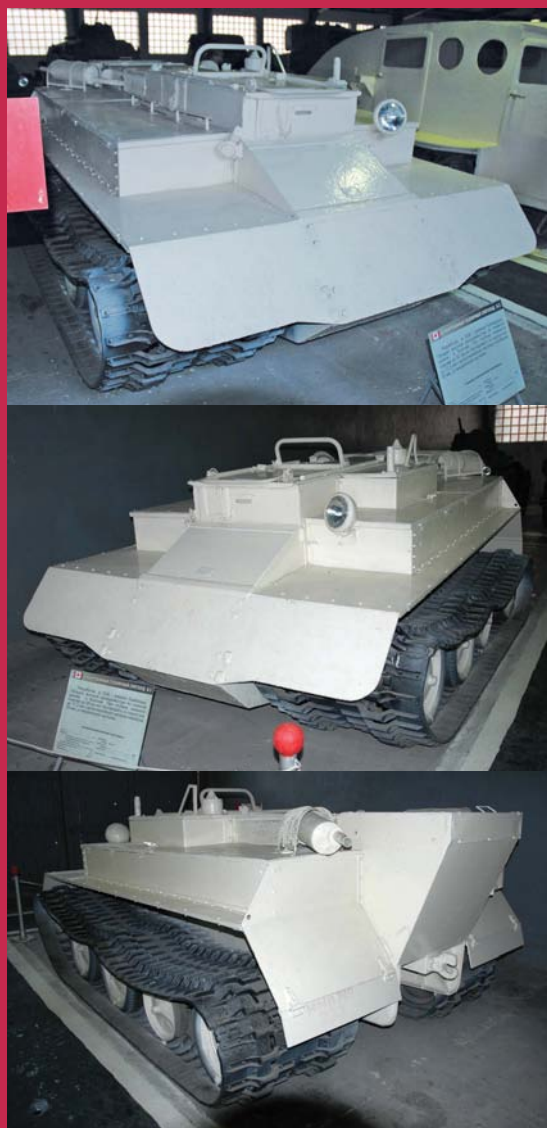
Two examples of the Armoured Snowmobile Mk.Is have survived to the present day. One is located at the Kubinka Tank Museum near Moscow - the very vehicle that underwent the two stages of testing detailed above and shown in the photographs accompanying this article. The second is located in the Italian city of Trieste, one of ten vehicles used by the Canadian Army in the region in the winter of 1945.

Authors Note

Although this article relates to a Canadian military vehicle, it has been written based on the original Russian test reports on a Canadian vehicle being evaluated by the Red Army, with rather positive conclusions for a Soviet report on a foreign vehicle. Thanks go to the Central Archives of the Russian MoD for the provision of some very rare photographs used in this article.

MUSEUM EXHIBIT

BELOW: Various views of the preserved Armoured Snowmobile Mk I as it stands today at the world-famous Kubinka Tank Museum near Moscow - a rare exhibit indeed.



MODERN DESCENDANTS

BELOW: The running gear and track system used on the Mk I continued to be developed in the Soviet Union, today being found in service on the Russian DT 'Vityaz' series of two-section military transporters, as shown below.

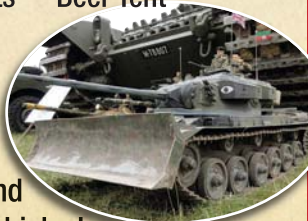


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Boxing Clever

Jim Kinnear describes the Soviet GAZ-66 2000kg 4x4 Military Truck



The GAZ-66 has been one of my favourite Soviet military vehicles since I first saw a column of GAZ-66s in the metal during a school visit to the Soviet Union as long ago as the 1970s. The vehicle was still a common sight in military service two decades later when I was working in Russia in the 1990s, and considering that the vehicle had been in service for a decade when I first saw it, the vehicle has had rather a good innings for any military vehicle design.

The particularly rugged looking GAZ-66 4x4 2 tonne general service truck is a distinctly military looking vehicle, relatively small, with a

squared-off, boxy appearance and the minimum of design features not integral to the basic needs of a military vehicle, all mounted on large all-terrain tyres with a central tyre pressure regulation system (CTPRS). The GAZ-66 was in series production from 1964 until officially replaced in 1999, a thirty five year production cycle during which almost one million GAZ-66s of all variants were produced, the majority entering military service with the Soviet armed forces, those of the former Warsaw Pact and aligned and non-aligned client states around the world. The GAZ-66 played a not insignificant role as the standard Soviet Army and

ABOVE: The GAZ-3301 was developed as a potential replacement for the GAZ-66 in the mid 1980s, but did not enter production.





LEFT...

A standard GAZ-66 in Ukrainian Army service in 2002.

BELOW LEFT...

A GAZ-3301 prototype at the now closed Ryazan Military Vehicle Museum in 2000.

BELOW CENTRE...

This photograph of a GAZ-66 without the rear stake bodywork and tilt fitted gives a good overall impression of the vehicle's construction.

LEFT...

The GAZ-66 was replaced by the GAZ-33097 and latterly GAZ-3308 as seen here, reverting to a standard cab behind engine configuration following lessons learned in Afghanistan.



The GAZ-66 in standard troop-carrier configuration. The design remained largely unaltered in 35 years of series production.

"The GAZ-66 was in series production from 1964 until officially replaced in 1999, a thirty-five year production cycle..."

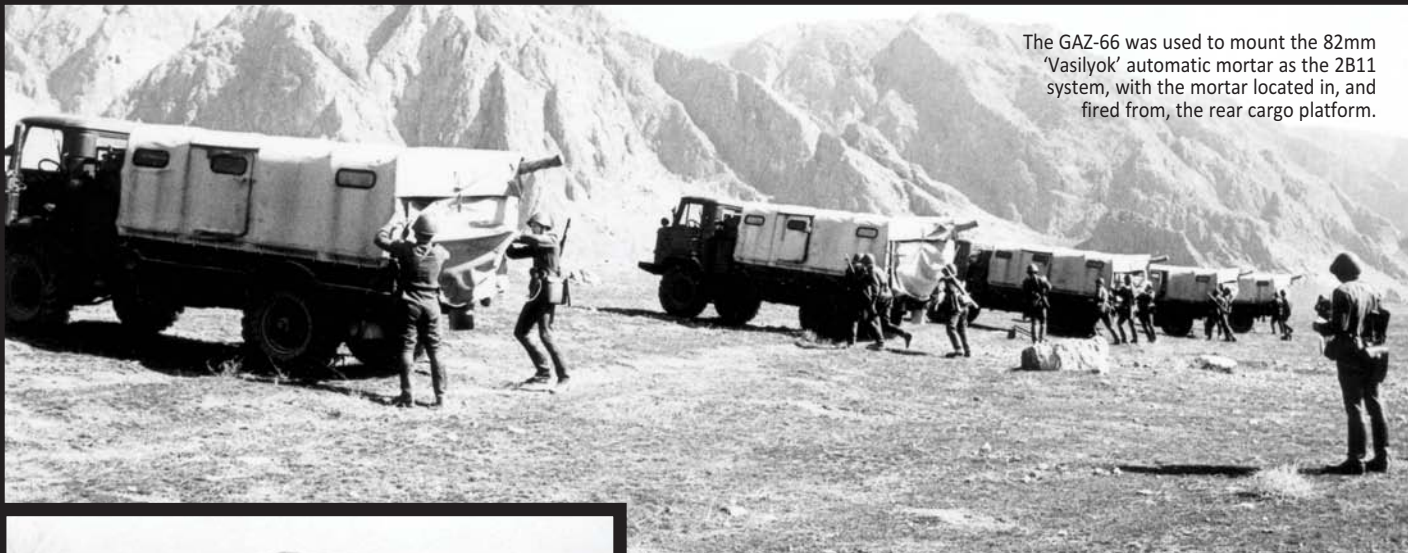
Warsaw Pact all-terrain load carrier in the 2000kg capacity class for almost four decades and it was widely exported in both civil and military versions. As such it is one of the best-known Soviet military vehicles, with a development history more interesting than most military vehicles.

The GAZ-66 was a replacement for the earlier 4x4 GAZ-63 which was the first series production Soviet 4x4 light truck, based on the 4x2 GAZ-51 and introduced into Soviet military service from 1948, with 80% component compatibility between the primarily road-bound GAZ-51 and its high

BELOW...

A Ukrainian Army vehicle, with additional makeshift armour provision during preparations for deployment with coalition forces in Iraq, 2003.





The GAZ-66 was used to mount the 82mm 'Vasilyok' automatic mortar as the 2B11 system, with the mortar located in, and fired from, the rear cargo platform.



The GAZ-66B was a specialised lightweight version of the GAZ-66, designed specifically for VDV airborne forces use.

mobility all-terrain GAZ-63 sibling. Development of the GAZ-63 had actually started before World War Two, in 1938, but was interrupted by the wartime need to concentrate on the production of existing, albeit outdated vehicles such as the GAZ-AA and ZIS-5. The first 4x4 GAZ-63 prototype, fitted with a Lend-Lease Studebaker cab, was completed in 1943, but its series production debut was again delayed by the ongoing war and for some years thereafter as the country rebuilt its truck and other 'secondary' military production capability.

maximum speed and all-terrain capability. Another critical element of the GAZ-66 was that it should be small enough to be airdropped by airborne VDV forces, mounted on specialised parachute drop pallets.

The GAZ-66 was developed from the earlier GAZ-62, the later prototypes of which were almost identical to the later GAZ-66 in appearance but dimensionally smaller. The GAZ-62 was actually a series of prototypes rather than a single vehicle, the first versions of which dated back to the mid 1950s and resembled a cross between a steroidal GAZ-69 and a US 3/4-tonne Dodge. The decision was however made to change the GAZ-62 to a cab-over engine design, such that the later prototype GAZ-62 made its appearance in such a configuration, with an emphasis on use by VDV airborne forces. The Soviet Army required a larger version of the vehicle however, such that the GAZ-62 with its 1100kg cargo capacity and 14 man rear cargo area became the basis of the GAZ-66, which was quickly developed on the basis of many years development work undertaken on the various GAZ-62 prototypes.

The main difference between the production GAZ-66 and the GAZ-62 (which also entered limited series production for trials purposes) was that

Shelter Bodies



LEFT...

A GAZ-66 with box type bodywork and configured as an ambulance.



LEFT...

Another GAZ-66, this time an AS-66 field ambulance in Russian Army service. (Photo - Andrey Aksenov)



LEFT...

Many box-bodied variants of the GAZ-66 were developed such as the AS66, used for ambulance and more unusually, command roles.

PURPOSE-BUILT

The GAZ-66 was designed from the outset as a military vehicle, although civilian use was also quite widespread. The main requirement for the new vehicle was an improved road speed (the GAZ-63 had a maximum road speed of 65km/h, the GAZ-66 initially 95km/h), better load capacity and increased towing capability. In reality the GAZ-66 retained the original load capacity of the earlier GAZ-63 but with significantly improved



Another of many specialised variants of the GAZ-66, the VFS-2.5 field water filter system.



of 0.315m and an angle of approach / departure of 35° and 32° respectively, and large 12.00-18 section all-terrain tyres with central tyre pressure regulation system for operation on very soft ground and marshland. The result of these statistics was a vehicle with significant off-road capability. The GAZ-66 could also wade through water obstacles to a depth of 0.8m unprepared.

The GAZ-66 was built in military and civilian versions. The standard military version was the closed-cab base model GAZ-66 with central tyre pressure regulation (CTPRS), which was quickly joined in production by the GAZ-66A, fitted with a 3.5-tonne

FAR LEFT...

A Ukrainian Army GAZ-66 on exercise, armed with a 23mm ZU-23 anti-aircraft gun in the rear cargo bed, a common installation.

BELOW...

Another GAZ-66 based communications vehicle, the KMZ-4P.
(Photo - Alex Koshavtsev).

BELOW CENTRE...

A GAZ-66 mounted 1V110 artillery command vehicle.
(Photo - Sergei Popsuevich).

"The GAZ-66 was relatively small at just 5.622m in length, 2.392m wide and 2.52m in height with a 3.30m wheelbase..."

the latter was dimensionally smaller, and had a wooden rear and a cab with canvas roof and folding windscreen.

The GAZ-66 prototype was tested from 1962, with the vehicle entering series production in June 1964. In typical Soviet practice, the older GAZ-63 continued to be manufactured in parallel until 1968 at which point the GAZ-66 became the sole 2000kg 4x4 vehicle in manufacture at GAZ.

MECHANICALS

The GAZ-66 was provided with new V-8 petrol engine introduced at the beginning of the 1960s and also used for the large GAZ 'Chaika' government limousines. The 4254cm³ displacement engine developed a

down rated 115hp @ 3200rpm for military truck purposes. The engine nevertheless gave the relatively small and lightweight vehicle a high power to weight ratio of 33hp/tonne with off road performance to match.

The engine was coupled to a 4-speed gearbox and two speed transfer case, with a self-blocking differential system. The GAZ-66 consequently had a maximum road speed of 95km/h (later 120km/h), more than adequate for a military load carrier. The GAZ-66 could transport 2000kg of cargo or 18 fully armed soldiers across any terrain.

The GAZ-66 was relatively small at just 5.622m in length, 2.392m wide and 2.52m in height, with a short 3.30m wheelbase, a ground clearance

The later diesel powered GAZ-66-40 provided similar performance but better fuel efficiency, giving a range of up to 1200km.



A GAZ-66 based mobile field hospital, Iraq, 2003.



Specialist Variants



A TDA-M (DDA-66) NBC decontamination vehicle.

"...a modernised variant with an uprated 120hp engine was introduced from 1985..."

winch. The standard military version was from 1968 re-designated GAZ-66-01 when the earlier GAZ-63 was removed from production. The GAZ-66A (with 3.5 tonne winch) was re-designated GAZ-66-02 the same year. The GAZ-66Eh (GAZ-66-03/04) and GAZ-66AEh (GAZ-66-05) were military variants with screened electrics for use with communications and other military electronic systems. A modernised variant with a 5hp engine up-rate to 120hp was

introduced from 1985 as the GAZ-66-11.

One of the disadvantages of the GAZ-66 was its fuel consumption, which was particularly heavy for such a small vehicle. The excessive fuel consumption of other Soviet military vehicles such as the petrol engined Ural-375D had been resolved years before with the introduction of diesel-powered variants, the Ural-4320 for instance replacing the Ural-375D in production in the late 1970s. By the

RIGHT...

The GAZ-66 was (and still is) commonly used in command and communications vehicle roles. This is a R-142MN radio communications vehicle pictured in 1999.

RIGHT...

This standard looking GAZ-66 truck is actually configured as a specialised ammunition carrier.



An unusual GAZ-66 variant used to transport and launch the Malakhit' reconnaissance drone.



"...by the end of the 1980s the GAZ-66s excessive fuel consumption was no longer acceptable and so a new diesel-engined variant was developed..."

end of the 1980s the GAZ-66s excessive fuel consumption (or rather in military terms the resultant short road range) was no longer acceptable and so a new diesel-engined variant was developed that was introduced at the beginning of the 1990s, after the break-up of the Soviet Union. The new GAZ-544 diesel engine initially developed only 85hp, though further modifications resulted in the GAZ-66-40 powered by the GAZ-5441 diesel engine developing 116hp and coupled to a 5-speed gearbox, with slightly reduced road speed but road range increased significantly to 1200km.

VARIANTS

Returning to one of the original design aspects of the GAZ-66 and its GAZ-62 predecessor, an airborne forces version of the GAZ-66 was developed and introduced into production from 1966 as the GAZ-66B. The GAZ-66B was similar to the pre-production GAZ-62, with a folding cab windshield and canvas roof, collapsible steering column and low profile tent and bows on the vehicle rear. The Soviet VDV forces also deployed the standard steel cab GAZ-66 in large numbers with the standard vehicle also being air dropped by parachute mounted on special drop pallets.

In retrospect, the GAZ-66 was a very simple and rugged vehicle, but with a cramped cab, an awkward gear level arrangement (with the gear lever behind the driver's elbow) and few home comforts, and with high fuel consumption, but eminently suited for its purpose of military all-terrain transport vehicle. The engine was powerful for such a small vehicle, and as such the GAZ-66 was considerably more manoeuvrable than its ZIL manufactured 4x2 counterparts. It is a credit to the original design of the vehicle that the GAZ-66 remained in service for four decades without any major changes to the original design.

A myriad of special variants of the GAZ-66 were used in military service. Common variants included GAZ-66S and GAZ-66AS ambulances, all-terrain bus variants such as the 38AS, field hospitals and field repair vehicles, NBC and fuel, oil and water carrier vehicles, the BM-21V Grad-V 12 barrel, 122mm multiple rocket launcher, and transport vehicles for the 2B9 'Vasilyok' mortar, etc.

A redesigned potential replacement

for the GAZ-66 was developed to prototype stage in 1979 as the GAZ-3301, powered by a 125hp diesel engine. Though tested over the period 1983-87 the GAZ-3301 did not however, enter service with the Soviet Army. In the 1990s the Russian Army took delivery of the GAZ-66 in ever diminishing numbers. The GAZ-66-41 variant with a diesel engine was introduced in the early 1990s; however, by the time of its introduction the GAZ-66 itself was on its way out as a design.

In service, the GAZ-66 soldiered on with increasing reliability and spares issues throughout the 1990s, with production ceasing officially on 1st July 1999, though few GAZ-66s had been produced in the intervening years. In a production run spanning 35 years, some 965,941 GAZ-66s of all modifications had left the production lines at GAZ.

The GAZ-66 series was widely exported to Soviet Bloc and non-aligned countries, and is still a relatively common sight in some armies around the world today. The vehicle was widely used during the Soviet war in Afghanistan and in subsequent operations in the southern republics of Russia after the break-up of the Soviet Union. It was also used by Russian and Ukrainian UN contingent forces.

The GAZ-66 was officially replaced by the 4x4 diesel engined GAZ-33097 'Sadko' from 2001. The GAZ-33097 reintroduced the cab behind engine design of the GAZ-63 which had preceded the GAZ-66, in part because of Soviet Army experience in Afghanistan and post-Soviet Russian Army experience in local wars thereafter, where the driver of cab over engine designs such as the GAZ-66 had proven vulnerable to attack, whereas they were better protected behind the engine of a conventional layout vehicle. With the introduction of the GAZ-33097 and subsequent versions of the new design the GAZ-66 began to disappear from regular sight, though communications and command vehicle versions remain in service with MVD internal security services in significant numbers. Considering the overall number built and the vehicle's extensive use at home and abroad the GAZ-66 will continue to be seen on the streets - and at military vehicle shows - for many years to come.

Air Drop

BELOW: An Emergency Situations Ministry GAZ-66 command & communications vehicle mounted on a parachute drop pallet.

BELOW CENTRE: Another standard GAZ-66 belonging to the Russian VDV airborne forces, in drop configuration with the drop parachutes mounted on the vehicle rear.

BOTTOM: In addition to the GAZ-66B VDV airborne forces variant, the standard GAZ-66 was capable of being parachute dropped with VDV airborne forces on specialised drop pallets as seen here.





Russian Rev



olution



JIM KINNEAR AND ANDREY AKSENOV LOOK AT THE NEXT GENERATION MILITARY MACHINES ON SHOW AT RUSSIA'S TECHNOLOGIES OF MACHINE BUILDING EXHIBITION

The second bi-annual military exhibition to be held at the Zhukovsky military airfield near Moscow was held in June 2012 under the curious title "Technologies of Machine Building 2012". The somewhat unusual title can be traced back to the days of the Soviet Union, with, for instance the T-34 medium tank being developed and manufactured under the control of the Ministry of Medium Machine Building, which was in fact amongst other things responsible for medium tank production, just as the 'Uralvagonzavod' - Ural (rail) wagon plant made tanks in addition to rail wagons, and similarly disingenuously named plants produced armoured vehicles, rockets and other military equipment. The system of mis-naming production plants to disguise their actual output may seem quaint when considered in today's World of multinational arms markets with the Russian Federation ably competing on the World stage, but at the time the

MAIN PHOTO...

A T-80U MBT, once the Soviet Union's most powerful tank, but with a thirsty and high maintenance gas turbine engine not suited to export sales.

TOP RIGHT...

A light, un/armoured general service utility type vehicle series, developed by the 'Zaschita' company.

BELOW...

This anti-tank vehicle version of the GAZ-2330 'Tigr' was displayed at the show with with two retractable quadruple launchers for the Kornet-EhM ATGM.



Military Trucks



ABOVE...

The 4x4 Ural-43206 is based on the longer and 6x6 Ural-4320 which has been in service with the Soviet and now Russian armies since the late 70s.

RIGHT..

The Ural-6370 is a new heavy class all-terrain 6x6 vehicle with a quoted 13000kg all-terrain load carrying capacity.



"The exhibition wa

secrecy within which these plants operated was serious stuff.

The exhibition itself was well attended by manufacturers, with a wide variety of military equipment from infantry weapons to main battle tanks on display, the majority courtesy of the "machine building" plants of the Russian Federation. The site for the exhibition, which consisted of a combination of static displays and arena events, was a corner of the Aviation Research Institute at Zhukovsky where generations of military aircraft have been historically developed and tested, as witnessed by the curious backdrop to the exhibition consisting of an assemblage of Soviet era aviation relics, from MiG fighters to one of the 'Buran' multiple entry rockets, the abandoned Soviet equivalent to the U.S. Space Shuttle.

Softskin and lightly armoured vehicles displayed included a variety of specialised vehicles on the GAZ-2330 'Tigr' chassis, general service trucks and a range of specialist all-terrain and snow/marsh vehicles, including vehicles from Germany including the Unimog range of all-terrain vehicles. There was a large selection of Russian engineering equipment on display this year, including mine clearing and combat engineering vehicles, and a significant display of tanks, armoured cars and

Armoured Truck

RIGHT..

The KamAZ-63968 armoured vehicle was fleetingly demonstrated at the NIIL-21 institute exhibition in Bronnitsy back in 2011, but was more openly demonstrated this year.



s well attended by manufacturers..."

other armoured vehicles - but more of that later. One of two significant generation-step change vehicles shown in public for the first time was the new 6x6 KamAZ-63968 wheeled APC. The base APC vehicle as demonstrated is one of a whole series of planned vehicles including the 4x4 KamAZ-53888 and 8x8 KamAZ-63988 wheeled APCs. The un-armoured variants of the new KamAZ vehicle series are intended to replace the current generation of KamAZ all-terrain load carriers for use in transporting all manner of military equipment from radar systems to multiple rocket launchers. The 6x6 KamAZ-63968 wheeled APC as demonstrated has a fully armoured cab and rear compartment with drop down rear ramp for infantry egress. The two rows of desant infantry are seated facing each other in the armoured rear of the vehicle, and they can fire their weapons from within the vehicle as required in MICV style. The KamAZ-63968 vehicle as demonstrated has an automatic gearbox, adjustable suspension and can achieve 100km/h on made roads.

New Russian softskin vehicles included the Ural-6370, a 13000kg all-terrain load class truck similar in configuration to the Ural-4320 but much larger, with a 412hp YaMZ-562 diesel engine, 90km/h road speed and a full size cab.

Iveco meantime demonstrated its LMV 'Rys' (Lynx) armoured car, which had its public debut during the 9th May 2012 Victory Parade held on Moscow's Red Square, the first appearance of a foreign AFV on the scared cobblestones of the square. The Germans joined the Italians in the arena this year, with Mercedes Benz Unimog & Zetros vehicles on display. Germany has followed the lead set by Italy some time ago of actively pursuing the notoriously closed Russian defence vehicle market, with the possible acceptance of foreign manufacturers in the local defence industry being at a higher level today than at any time in history. This is in part pragmatism on the part of the Russian Federation, which needs to work with foreign companies in overseas markets where many clients have a preference for Russian equipment fitted with Western armament and control systems, or

Light Armour



TOP RIGHT...

The Iveco LMV, known as 'Rys' (Lynx) in Russia, has now been accepted into Russian Army service, albeit with the numbers contracted for being considerably less than originally announced.

ABOVE...

One of several light armoured vehicles to be developed by 'Zaschita'.

LEFT...

The GAZ-2330 based VPK SPM-2M demonstrating its all-terrain capability.

Engineer Vehicles

RIGHT..

This T-90 based BMR-3M mine-clearing vehicle has been developed as a replacement for existing BMR vehicles based on obsolescent chassis.

BELOW...

The specialized GMZ-3 tracked mine-laying vehicle has been in service since the Soviet era.

BOTTOM...

The IMR-3 Combat Engineer Vehicle is based on the T-90 MBT chassis.



"The BMR-3M is the latest in a line of specialized mine-clearing AFVs for clearing roads of mines"

vice-versa in the case of the Russian 'Pantyr-S1' being available mounted on German wheeled chassis - and the mutual cooperation inevitable ends up being a two-way expectation.

Several tanks and tracked armoured vehicles were demonstrated at the show, including a range of armoured vehicles based on the current T-90 MBT chassis. The IMR-3 combat engineer vehicle as demonstrated was one of the first modifications of the T-90 chassis, replacing the obsolescent IMR-2 and IMR-2M. The standard IMR-3 is used for engineering work and debris removal in combat zones, the IMR-3M has additional shielding for use in areas contaminated by radiation.

The BMR-3M is the latest in a line of specialized mine-clearing AFVs for clearing roads of mines by means of rollers and electrical detonation. The vehicle was developed at the UVZ plant with the mine trawl manufactured by Stankomash in Chelyabinsk, which has been the mine-trawl capital of the USSR since before WW2. The T-90 based vehicle can clear a 3.2m wide path using the mine rollers (each clearing 1.62m) and can detonate electro-magnetic mines to a width of 6-7m. The vehicle is armed with a 12.7m Kord heavy machine gun.

The latest modification of the BMPT tank support vehicle was on display at the show. In October 1998, GABTU (the Russian State armoured vehicle command) issued instructions for a new type of combat vehicle based on an MBT chassis, the Boevaya



Main Battle Tanks

LEFT...

The highlight of the show was the debut of the new T-90AM 'Armata' MBT, the planned replacement for the T-90A, albeit it was heavily covered in thermal and radar absorbing material.

BELOW RIGHT..

A T-80U MBT, once the Soviet Union's most powerful tank.

BELOW CENTRE...

A T-90A MBT under full power firing its remote Anti-Aircraft MG.



A T-90A at full throttle in the demonstration arena.



A T-80U and a pair of T-90A MBTs pictured before their 'tank-ballet' routine!

Artillery

BELOW...

A tracked version of the 'Pantyr-S1' air defence system more commonly seen on the 8x8 wheeled KamAZ-6560 chassis. The tracked version uses the same chassis as the 'Tunguska' air defence system.

BELOW CENTRE..

The Msta-S 152mm self-propelled howitzer is a large piece of kit by any standards.

BOTTOM...

An impressive photograph of the Msta-S 152mm self-propelled howitzer opening fire.



Mashina Poderzhki Tankov, the Fighting Vehicle for Supporting Tanks, better known by its Russian acronym BMPT. A moving mock-up was demonstrated at Nizhny Tagil in 2000 and by 2002 a prototype had been built, with a new armament configuration. The prototype was subsequently built over the period 2004-2005, based on the T-72 (T-90) chassis. After nearly a decade of development pending finance for series production, the BMPT was finally accepted into service with the Russian Army in 2009; however no orders for the vehicle were placed by the Russian Ministry of Defence and at the beginning of 2010 the BMPT project was shelved. Meantime, the vehicle continues to be further refined for domestic or export use, with the latest version demonstrated this year, armed with twin 30mm 2A42/72 automatic cannon (as originally fitted on the BMP-2 MICV), a 7.62mm PKTM co-axial machine gun, 9K120 Ataka-T ATGM system and a 30mm AG-30 grenade launcher. The 47-tonne BMPT has the same level of armour protection as the MBTs it is intended to support, with its

1000hp V-92VS diesel engine giving the vehicle an impressive 65km/h road speed and 550km range.

The T-90A, T-90 and older T-80U were displayed together in a somewhat curious 'tank ballet', pending the highlight of the show which was the other large Russian armoured vehicle besides the KamAZ-63968 to receive its first public outing at the show, the new T-90AM 'Armata' MBT, the planned replacement for the current production T-90A.

The production version of the T-90AM 'Armata' when it enters service with the Russian Army on or before 2015, is expected according to the technical requirements placed on the manufacturer by GABTU, to have a new fire control system, a new autoloader with the ammunition stowed horizontally in a rear turret bustle and separated from the crew, and other significant modifications including an up-rated engine developing 1250-1300hp. The T-90AM is a capital modernization of the T-90A, which can trace its lineage back to the T-72 MBT introduced in the early 1970s.

"The production variant of the new Armata MBT is expected on or before 2015..."



The BMP-3 MICV is now a mainstay of public demonstrations, and one of the Russian Federation's most successful arms exports.



The T-90 based BMPT combines turret mounted cannon and anti-tank rocket firepower while transporting infantry into battle.

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ZSU-23-4 'Shilka'

JIM KINNEAR LOOKS AT THE ZSU-23-4 'SHILKA'
SELF-PROPELLED ANTI-AIRCRAFT GUN



The ZSU-23-4 'Shilka' self-propelled anti-aircraft gun system was in typical military fashion appropriately and directly named. The designation ZSU translates as Zenitnaya Samochodnaya Ustanovka (self-propelled anti-aircraft system), 23mm, four barrels thereof. Anyone who has served in the military of any country will recognise the to-the-point descriptive structure!

The ZSU-23-4 was in its time a highly effective anti-aircraft weapon. It was widely used by the Soviet Army and the armies of the Warsaw Pact, and was widely exported to many

other Soviet aligned countries. Its combat debut was in the Middle East Arab-Israeli wars of 1967-1973, where it proved devastating to helicopters and low flying aircraft. The system has remained in service with many countries to the present day, with its most recent use at the time of writing being by the Syrian Army during the uprisings of early 2012.

Despite its relatively common usage and wide export, the ZSU-23-4 has nevertheless remained a fairly enigmatic piece of Soviet era military hardware, relatively ubiquitous, its purpose clear, and yet rarely inspected



MAIN PHOTO...

Two ZSU-23-4s protecting a column of BMP-1 MICVs and T-62 MBTs. (ITAR-TASS).

BELOW RIGHT...

A ZSU-23-4V1 opens fire during Soviet Army exercises in the 1970s.

FAR LEFT...

The ZSU-37 was the first Soviet post-war SPADS vehicle, mounting a 37mm cannon on an SU-76 SPG chassis.

in detail. The ZSU-23-4 was not developed in isolation, but was the only member of a family of four systems that were developed concurrently for service with the Soviet Army that actually entered service. As such the ZSU-23-4, successful in service as it was, is but one part of a larger development that did not see the light of day.

The mechanical and technical aspects of the ZSU-23-4 were unremarkable. The chassis, automotive and mechanical components were similar to those employed on the PT-76 amphibious light tank, the BTR-50 tracked APC and the SU-85 airborne forces SPG, all of which were derived from the PT-76 family.

The vehicle was powered by a V-6P diesel engine of 19.1-litres displacement, giving the 20-tonne vehicle a maximum road speed of 50km/h and a range of 450km. The ZSU-23-4 had a crew of four, with the driver-mechanic located in the hull and the other crew located in the fighting compartment/turret.

SHILKA IN ACTION...



"...the gun barrels on the Shilka need to be changed after a total of 3000 rounds is fired..."

RIGHT...

A ZSU-23-4M seen on parade in Kharkov in the early 1990s.
(Sergei Popsuevich)

BELOW...

A ZSU-23-4V1 photographed during a Soviet Army exercise in the 1970s.



The ZSU-23-4 had a very specific firing sequence. After firing a short burst of 50 rounds/barrel, firing was halted for 2-3 seconds, and after 150 rounds/barrel fire was arrested for 10-15 seconds in order to reduce the effects of the significant heat generated during continuous fire. Barrel wear was nevertheless rapid, such that barrels needed to be changed after a total of 3000 rounds fired, for which purpose four spare barrels were carried as part of the spare parts supply for each vehicle.

The ZSU-23-4 was developed in accordance with a Soviet Council of

Ministers Resolution dated 17th April 1957, which authorized the development of a family of low to medium altitude self propelled weapons systems, the ZSU-23-4 'Shilka' being in the company of other systems designated "Volga", "Dnepr" and 'Enisei' - all of which were incidentally the names of Soviet rivers.

The rapid-fire 'Shilka' and 'Enisei' were entirely new self propelled air defence systems (SPADS), designed with low-altitude engagement operating envelopes of 1500m and 3000m respectively, while the 'Dnepr' and 'Volga' were modifications of the

existing ZSU-57-2 mounted on a modified T-54 chassis and armed with twin 57mm S-68 guns, but with an up-rated fire control system, radar direction and other planned modernisations. The prototypes of these latter systems were tested during the years 1957-59, further to which all development was stopped, leaving only the entirely new 'Shilka' and 'Enisei' rapid-fire systems to be developed further.

The project drawings for the ZSU-37-2 'Enisei' were drawn up in 1957 at the OKB-3 design bureau at Uralmashzavod, based on a chassis derived from that used for the Obiekt-105 (SU-100P) self propelled gun. The ZSU-37-2 was armed with twin 37mm 500P "Angara" belt-fed automatic cannon. The ZSU-37-2 project was developed to prototype stage and was evaluated for service; however the project was ultimately cancelled with only the ZSU-23-4 going on to enter series production.

The ZSU-23-4 'Shilka' was developed at the OKB-40 design bureau at the Mytishi Machine-building Plant (MMZ), in the northern suburbs of Moscow, under the direction of N.A. Astrov, the designer responsible for the wartime T-60 and T-70 light tanks amongst others. The quadruple 23mm 'Amur' heavy machine gun armament system for the ZSU-23-4 was developed at the KB of the Tula Plant No.668 in collaboration with the OKB-575 design bureau on the basis of the 2A7 23mm gun, modified from the 2A14 armament of the towed





LEFT & BELOW..

ZU-23 which had been developed in 1960 and been in service with the Soviet VDV forces since that time. The towed ZU-23 system though an effective weapon could not protect mechanized columns on the march, as its traverse and elevation mechanisms were hand operated, it had simple mechanical sights, and not least because it was a towed weapon that could not be effectively fired on the move or quickly deployed. A self-propelled variant was required which would be capable of being integral to armoured units and able to protect such units on the move.

The 2A7 heavy machine gun system as mounted in the self-propelled ZSU-23-4 (and also known by its army designation AZP-23 (the system being designated AZP-23-4) and by its GRAU artillery design index 2A10) introduced liquid cooling, and electro-pneumatic control systems. The turret mounted system allowed a 360° arc of fire, with the radar controlled 23mm guns able to engage targets across a range of 200-2500m and to a maximum altitude of 2000m. Fire control for the new self-propelled anti-aircraft vehicle was provided by the 'Tobol' fire control system, developed by the OKB-357 design bureau. The radar could detect and track incoming targets to a range of 10km at 2km altitude, or 6km at altitudes as low as 50m terrain permitting.

The ZSU-23-4 was based on the GM-575 medium tracked chassis; the GM-500 series chassis being common

to other Soviet air defence vehicles such as the 'Kub' (SA-6 Gainful) SAM system and its associated radar vehicles.

The first two prototype ZSU-23-4s were completed at the MMZ plant in August 1958 with the prototype vehicles less their armament undergoing plant trials in March of the following year. Further proving trials with the armament installed were conducted in December 1959, with 5300 rounds fired and 2600km travelled during testing. After successfully completing state trials the

ZSU-23-4 'Shilka' was accepted for service with the Soviet Army by the Central Committee of the Communist Party of the USSR and the Soviet Ministry of Defence on 5th September 1962.

MILITARY SERVICE

In Soviet Army service, the ZSU-23-4 was originally issued in two anti-aircraft system batteries of 4-6 vehicles each per tank regiment. In practice it was common for one battery to be equipped with radar controlled

A ZSU-23-4V, located at the Artillery, Engineer & Communications Troops Museum in St. Petersburg. The GM-500 series chassis was also shared by the 'Kub' (NATO:SA-6 Gainful) SAM system.



"The ZSU-23-4 was used in significant numbers by the Soviet Army and by most Warsaw Pact forces...."



DETAIL PHOTOS...

1: The radar controlled quad mounted 14.5mm machine guns provided devastating short-range firepower against low flying targets.

2: The turret of the ZSU-23-M is significantly modified from the earlier ZSU-23-4V and V1 models.

3: A ZSU-23-4M in a three-colour camouflage scheme, located at the technical Museum at Ivanovskoye near Moscow.

4: The ZSU-23-4 radar was hydraulically folded behind the turret in transit to prevent damage.

5: Close-up of the radar array on the ZSU-23-4, seen here in the folded down position behind the gun turret, the normal position for transit

6: A good view of the quad 14.5mm AZP-23 gun system fitted to the ZSU-23-4 'Shilka'. The radar is traversed to the rear.

IN SERVICE...



LEFT..

The ZSU-23-4M introduced many changes, the reconfigured turret and the guard over the gun barrels being the most obvious changes.

BELOW..

A rare colour photograph of a ZSU-23-4V1 in service with a tracked MT-LB based 'Strela-10' SAM system.



ZSU-23-4s and the other with the ZSU-57-2 armed with 57mm S-68 guns without radar control, the combination of vehicle mounted SPADS providing a better overall height envelope against targets flying at low and medium height. In Soviet Army service such a mix of operating altitude envelope was later provided by the combination of one battery of ZSU-23-4s and one battery of ZRK "Strela-1" or 'Strela-10' missile armed SAM systems. The MT-LB based "Strela-10" (NATO: SA-13 Gopher) latterly took over the short defence role from the ZSU-23-4.

The ZSU-23-4 was used in significant numbers by the Soviet Army and by most Warsaw Pact and Soviet bloc forces. It was latterly deployed by the Soviet Army in Afghanistan where it was particularly useful in providing suppressing ground fire, as it was in Chechnya during the subsequent first war in Chechnya in the mid 1990s.

The ZSU-23-4 was widely exported and was, and is, widely used in the Middle East in particular. The system was used during the Middle East Wars of 1967-1973, primarily by Egypt and Syria, in Lebanon in 1982 and by Iraq during the Gulf War of 1991. The Israelis suffered heavy losses to the ZSU-23-4 when it was initially deployed in combat in the Middle East, and incorporated a number of captured vehicles into Israeli service.

At the end of the first decade of the 21st Century the ZSU-23-4 remains in relatively common service around the world. Representative countries that today still use the ZSU-23-4 include (in alphabetical

order) Algeria (25), Angola, Egypt (350), India (75), Iran, Yemen (50), N. Korea, Peru (35), Poland (36), Somalia and Yemen, to name but a few.

MODIFICATIONS

The ZSU-23-4 was subject to continuous upgrades throughout its service life and combat career, with, particularly to the armament and the fire control system reflecting the rapid changes in radar and electronics system technology, which affected both detection and countermeasure developments during the ZSU-23-4's lengthy service career. The ZSU-23-4s early operational career showed up a

number of deficiencies, not least among which was the limited engagement altitude envelope (although the system was entirely lethal to helicopters and slow moving aircraft within that envelope), the limited types of ammunition available and a need for greater fire-automation, which was addressed in a series of major upgrades during the ZSU-23-4s service life.

The first production modification to the original ZSU-23-4 was the ZSU-23-4V, developed in 1967 and produced from 1968-69, which featured improved fire control and radar systems, a more ergonomically acceptable layout for the turret crew,

BELOW...

A ZSU-23-4MZ at the Kiev Tank School Museum. Note the modified radar system.





and an increase in the service life of the gas turbine auxiliary power unit (APU) - used to power the weapons systems during standby - to 450 hours. The ZSU-23-4V was followed in 1970-71 by the slightly improved ZSU-23-4V1, with radar improvements, the installation of a ballistic fire control computer and a further increase in gas turbine APU service life to 600 hours. A more major modification was carried out in 1971-72, with the ZSU-23-4M, introduced into service in 1973, which provided better stabilization for the now 2A7M (2A10M) guns, upgrades to the pneumatics, and an improvement in gun barrel life to 4500 rounds. The last major series production modification was carried out in 1977-78, with the introduction of the 'Luk' radar system with an integrated IFF (Identification Friend-Foe) detection system. ZSU-23-4s so modified were designated ZSU-23-4MZ (Zaproschik). A later modification was the ZSU-23-4M2, introduced in 1980, with the 1RL133 'Kredo' radar system on the turret roof. Production of the ZSU-23-4 was discontinued in 1982, after a production run of two decades.

Most early ZSU-23-4s were upgraded during capital repairs, latterly to ZSU-23-4MZ standard, such

that it is quite difficult to define individual production models without close inspection. The most significant visual change was with the ZSU-23-4M developed in 1971-72, whereby the turret was redesigned with the new panniers and steel weather covers giving the turret a more rounded and less sharply angular appearance.

In recent years there have been various attempts to extend the service life of the ZSU-23-4 in service with former export client states, with various upgrade packages being offered by Russian companies and also companies located in Belarus and Ukraine. An example is the ZSU-23-4M4 'Shilka-M4' developed by the Muromteplovoy plant and demonstrated at the MAKS-99 air show in Moscow in 1999, which provides the ZSU-23-4 with two 'Igla' SAM launchers mounted on the turret in addition to the 23mm machine gun armament. A more radical "variant" of the ZSU-23-4 is the Ukrainian 'Donets' SPADS vehicle, which mounts the ZSU-23-4 turret on the T-80 MBT chassis.

The limited engagement altitude envelope of the ZSU-23-4 was latterly addressed by the development of a replacement system, armed with a combination of cannon and ground to air rocket systems, resulting in the ZRPK 2S6 'Tunguska'.

"The last major series production modification was carried out in 1977-78..."

SHILKA REPLACEMENT...

TOP LEFT...

A ZSU-23-4M5 being demonstrated at IDEX-99 in Abu Dhabi in 1999, one of several attempts to modernise the system during the 1990s. (Alex Koshavtsev)

ABOVE LEFT...

A post-Soviet Ukrainian modification of the ZSU-23-4, with a quadruple 'Igla' SAM system mounted on the turret roof and new radar system. (Sergei Popsuevich)

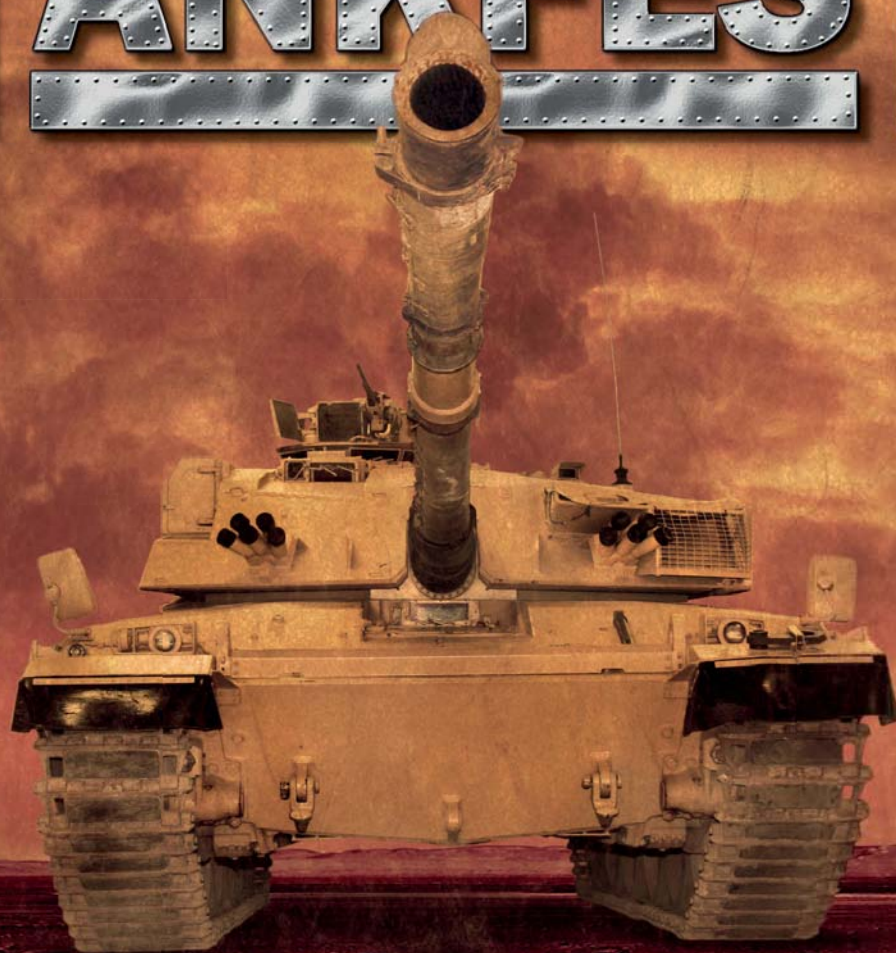
RIGHT...

The ZSU-23-4 was replaced in service by the 2S6/2S6M 'Tunguska' SPADS, with gun and SAM missile systems on a single chassis.



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Following its identification in 1975, the 2S7 'Pion' is the most powerful self-propelled artillery piece in the world. The privately owned 2S7 is seen here parked on the off-road course behind IWM Duxford's Land Warfare Hall.

2S7 'PION'

FRASER GRAY CAPTURED A RARE OUTING FOR THE 2S7 'PION' 203MM SELF-PROPELLED ARTILLERY GUN IN THE UK



The 2S7 was one of the largest tracked vehicles in the post-war Russian inventory, and indeed the Pion is regarded as the largest self-propelled artillery gun in the world. The 2S7 has the longest range of fire, compared with any current field artillery unit at 37,500m and can be extended to 55,500m by using rocket-assisted projectiles.

The Pion's 2A44 203mm artillery gun is mounted on the rear firing platform and is supplied from an onboard magazine of four 203mm projectiles for immediate use, with additional projectiles supplied by an attendant convoy of vehicles. The gun has a screw type breach block and with a large power assisted loader, enabling a rate of fire at eight rounds per minute. When engaging targets at 47 kilometre range the 2S7 is able to fire one to two rounds and leave its firing position, before the first round has reached the target, thus avoiding triangulation by counter battery fire! The gun is capable of firing a wide range of munitions including tactical-nuclear, concrete piercing and chemical rounds with the standard ZOF 43 high-explosive round weighing 43kg.



The 2S7 has a crew of seven, which includes the commander, driver and two other crewmembers located and protected in an armoured cabin at the front of the vehicle. The armoured cab, which protrudes forward, is designed to act as a counter weight for the massive gun. Other crewmembers are located within the centre section of the vehicle's hull. The 2S7 is also equipped with night vision devices, internal and external radio communication equipment, and can be sealed to protect the crew against nuclear, chemical and biological contamination.

The 2S7 is actually a development of the T-80 Main Battle Tank and is powered by a V-46-1 V-12-turbocharged diesel engine with a

"The armoured cab is designed to act as a counter weight for the massive gun..."



FAR LEFT...

The 2S7's massive 203mm gun has 0 to plus 60 degrees of elevation.

LEFT...

Here we can see the front glacis plate of the 2S7. Maximum armour protection of the self-propelled gun is just 10mm and the cabin protrudes forward to act as a counter weight for the massive 203mm gun.

power output of 750hp, giving the self-propelled gun speed and high mobility for a vehicle weighing 46-tonnes with a maximum speed of 50km/h and an operational range of 650km.

The 2S7 is also equipped with an auxiliary 24hp diesel engine to generate electrical power for the vehicle systems.

The 2S7 is currently in service with Russian forces and also serves with former Warsaw Pact countries such as Poland, Czech Republic and Slovakia. The Pion pictured here was acquired by Robert Fleming Associates and was briefly on display at the Imperial War Museum Duxford, Land Warfare Hall, before its delivery to a private collector.

BELOW...



The drive train and rear sprocket. The 2S7 design is based on a T-80 main battle tank chassis.



BELOW...



The vehicle is in its travelling configuration, with the gun secured into a travelling lock above the crew cabin.



MUSEUM PIESTANY

PAUL CARTWRIGHT AKA "CARTS" VISITS ONE OF THE MOST SPECTACULAR COLLECTIONS OF **WARSAW PACT MILITARY** EQUIPMENT TO BE FOUND IN EUROPE

Whilst in Slovakia for the Slovenske Piesky show (see last month's issue for a full report), one of my Slovakian mates, Boris, started telling me about his job working at the VHU Museum nearby. With no plans in place once the show had finished I decided to make the most of my time in Slovakia and planned a visit, if only to see where Boris worked. As it was a bit of a spur of the moment thing, I sent Boris a text to say I was on my way only to find out he was working elsewhere and the museum wasn't open

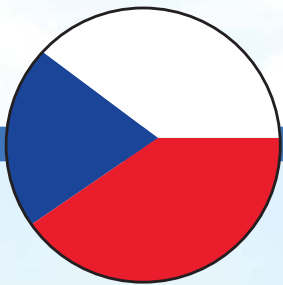
on Mondays – whoops! Luckily for me Boris came up trumps and managed to arrange for me to have a private tour of the museum to save me a wasted journey, but it just goes to show that you do need to plan visits to museums such as this that aren't open all week round.

On arrival the place looked like it was a closed down workshop, it's entrance was nothing like any museum I've ever found in the UK, unless you consider the hanger at Borden, but I was greeted by Vera who was to be

my guide and translator for the tour and without whom the visit would not have been possible.

JAW DROPPING

Moving first into the yard I came across some very large Cold War era vehicles, with all manner of weird and wonderful contraptions, from huge tracked amphibious ferries to massive earth moving engineer vehicles that wouldn't have looked out of place in a Mad Max film! While many of these





vehicles may have been standard issue to the Warsaw Pact members, for someone from the UK it was a rare treat to see these unusual military vehicles up close and personal.

From the outside the first hanger looked to be unused, but on entering I was greeted by yet another amazing sight, with line upon line of tracked vehicles running the entire length of the large hangar. Amongst the many tanks and tracked vehicles in the hangar was an incredible cutaway training aid of a T-72 tank, I've seen some cutaway vehicles in the past, but this was a true work of art and one I wouldn't mind in my living room –

assuming of course I could get away with it! After spending an hour or so in the hangar we moved on to the second hanger, which was surprisingly well lit by daylight, and was full of different versions of the Slovakian BVP, their version of the better-known Russian BMP amphibious, tracked armoured personnel carrier, in fact most of the vehicles within the second hangar were from the APC family in one form or another, together with a few other nice bits of kit, again stuff I had only ever seen in magazines.

The walk to the third and final hanger meant we had to cross the airfield, which had a huge collection of



ABOVE RIGHT...

My favourite exhibit at the museum, the cutaway T-72 training aid.

ABOVE...

Inside the museum you'll find a fantastic collection of Warsaw Pact tanks and armoured vehicles.

ABOVE LEFT...

Another Slovakian version of the Russian-designed T-72 Main Battle Tank, this time in its entirety.

LEFT...

The collection is very extensive and you'll find all manner of weird and wonderful armoured vehicles both wheeled and tracked.



RIGHT...

The Soviets liked to build things big and this 9P24 launcher for the 2K11 anti-aircraft rocket fitted the bill.

BELOW LEFT...

A second example of the P-40 'Long Track' high-mobility surveillance station.

BELOW CENTRE...

Not from Mad Max, but a Russian-built trench cutter.

BELOW RIGHT...

The amphibious GSP-55 self-propelled bridging ferry.



LEFT...

This museum certainly had the wow factor and the glorious sunshine made for a memorable visit.

BELOW...

The SAM missile and launch trailer complete with Zil 131 truck was one of the few vehicles I had seen before.

BOTTOM RIGHT...

The mighty (and very big) P-40 'Long Track' high-mobility radar vehicle dating from the Cold War era.

"There were all manner of weird and wonderful contraptions, from huge tracked amphibious ferries to massive earth moving engineer vehicles that wouldn't have looked out of place in a Mad Max film!"



FAR RIGHT...

BTR-60 8x8 armoured personnel carrier in communications role and complete with scaffold type tubular aerial mount!



RIGHT...

The Dana 152mm self-propelled howitzer is an impressive big of kit when you see it in the flesh and surprisingly big too.



RIGHT...

The Warsaw Pact used many Soviet designed and built military vehicles and here we see a most unusual variant of the GAZ-69 Light 4x4 that mounts a huge speaker!



BOTTOM RIGHT...

In the main display hall the exhibits have been laid out in diorama type settings and gives the space more of a museum feel.

Warsaw Pact military aircraft, including a large number of Migs and various attack helicopters.

Alongside the aircraft was a selection of surface to air missiles launchers and various radar vehicles. What was becoming very apparent was that this Eastern European kit was all very large and produced in huge numbers, and while some of it may not have been as a technologically advanced as the equipment the West had at their disposal, if there had ever been a Cold War I would not like to say how it would have gone having now seen just a small selection of what they had on the other side!

The third and last hanger was more like a museum in the conventional sense, with dioramas and a mixture of equipment on display, including vehicles and aircraft and untold accessories laid out within the hall.

It was a fantastic place to visit and although I've been to quite a few museums all around the world, mere words will never fully express just how impressive the collection contained in the museum was, so I will let the photos featured here provide you with just a flavour of what I was able to see and if you're ever in the area I would fully recommend a visit to VHU, but just remember to make it on a day when it's open!

THANKS

I would like to extend my thanks to Boris for organising my tour for me, and Vera for her time and patience as we toured the museum, probably dribbling on occasions!

THE MUSEUM BRANCH OF MMH PIESTANY

The Museum Branch Piestany was established in 2002 on the site of the former 32nd air base and by the 25th September 2004 the first of the exhibitions was opened to the public, exhibiting a wide variety of vehicles, equipment and aircraft used by the Czechoslovak Army between 1945 and 1992. The museum now covers more than 41,000 m2 and is divided into the interior display hangars and the exterior exhibition areas with more than 400 items on display covering artillery and engineer equipment, tanks and armoured vehicles, military aircraft and anti-aircraft weapons.

CONTACT DETAILS:

The Museum Of Military History
Orvská cesta, P.O. BOX A-9,
921 01 Piestany.

WINGED THINGS...

In addition to the many military vehicles at the museum visitors will find a huge collection of Warsaw Pact military aircraft displayed outdoors, which includes MiGs of various types and even attack helicopters!



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Into the Archives



BELOW LEFT: Credited to former Jane's Military Vehicles and Logistics Editor, Terry Gander, this Russian-built GAZ-66 was captured by the SANDF in Angola. It appeared in the 1987 edition of what was then titled Jane's Military Vehicles and Ground Support Equipment.

MAIN PHOTO BELOW: This MAZ-537 tank transporter image is one of just three images used that came with a photographer credit, in this case to C R Zwart.

In keeping with the 'Russian' theme of this issue the Ed asked me if I could supply him with something relevant for an Into the Archives special. He suggested trucks... As I'd just moved house and knew exactly where a large box of photographs I'd inherited from Terry Gander when I took over editorship of Jane's Military Vehicles and Logistics in 2001 were living..., I promptly agreed...

The following images were pretty much selected by the Ed, as following a quick down-select by myself to an envelope full, I gave him the headache of what to feature, and what to omit...

Virtually all of the selection was lacking any form of descriptive text, identification or even photographer credit, and while I managed to locate three of those used in my back issues of Military Vehicles and Logistics, the others (while not award winning shots in any sense...) have probably never been published before... As usual if you can add anything to the information we have on this selection of photos you can contact the editor via the usual contact address and he will pass on the information.

Shaun Connors, rifling his drawers, came up with a distinct 'Red in Black & White' theme for this month's archives photos...





MAZ-535



TOP LEFT: A Zil-131 3,500kg 6x6 truck photographed somewhere by somebody... Anyone got any ideas?

ABOVE LEFT: This MAZ-535 image appeared in the 1992-93 edition of Jane's Military Vehicles and Logistics, and marked 'unclassified' it appears to have been a military image of some sort, possibly for recognition, training or similar uses.

TOP RIGHT...

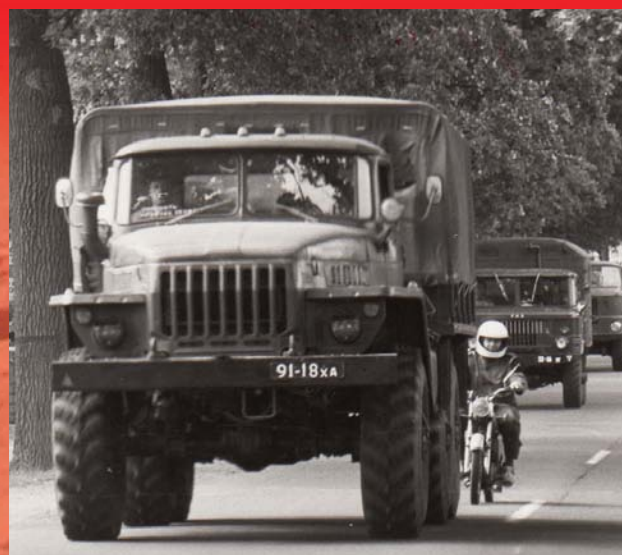
Possibly a MAZ-7313, the cargo variant of the massive MAZ-543.

ABOVE RIGHT...

A MAZ-543A-based AA-60 airfield fire crash rescue vehicle boarding what is probably a Russian military transport aircraft, and while I'm no aircraft expert I'd say most likely an Antonov An-124. I await correcting emails...

BELOW...

The Ural-4320 in its current variants remains the standard truck in its weight class for Russia's armed forces.



RIGHT...

This Ural-375D and companion trailer are thought to be East German Army...

BELOW LEFT...

This Kraz-260 appears coupled to a companion trailer that shares common wheels/tyres.

BELOW RIGHT...

A Ural-4320 mounting a mobile crane and prepared for rail transport on a rail flatcar.



LEFT...

We think of unmanned aerial reconnaissance vehicles as modern and cutting edge..., but this (UAE armed forces we think...) Russian BAZ-135MB (8x8) is in fact a launcher for the rocket-powered Tupolev-143 (VR-3 Reis) unmanned aerial reconnaissance system, vehicle, a system developed in the late 1960s and consisting of more than 30 vehicles... Faster than current generation UAVs (capable of 950 km/h), at just 13 minutes, endurance is somewhat limited... Sources suggest that 'hundreds' of Tu-143 remain in stock and are to be upgraded to Tu-243 standard.

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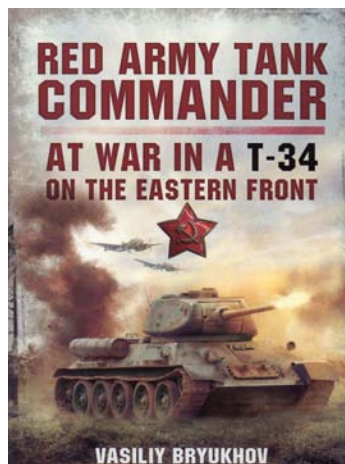
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At War in a T-34 on the Eastern Front

If you've ever wondered what it was like to command a T-34 tank on the Eastern Front at the height of the Second World War then this new book from Pen & Sword may well answer your questions. This new 218-page book is the result of personal experiences during the war by former T-34 tank commander Vasily Bryukhov. He took command of his first tank in April 1943 before taking part in the battle of Kursk, and serving continuously until the end of the war, fighting

through Ukraine, Moldavia, Romania and Hungary to Austria. In one action his crew destroyed nine panzers and in another he led the vanguard of his tank brigade through German lines to capture bridges and cut off the German retreat.

This is a graphic, first-hand account of tank warfare on the Eastern Front in World War Two, providing an insight into the experiences of the T-34 tank crews and the conditions in which they fought.

Title: Red Army Tank Commander

By: Vasily Bryukhov

ISBN: 9781781590232

Price: £19.99

Format: Hardback

Available From:
Pen & Sword Books Ltd.
www.pen-and-sword.co.uk

Anti-Tank Warfare on the Eastern Front in World War Two

Title: Panzer Killers

By: Artem Drabkin

ISBN: 9781781590508

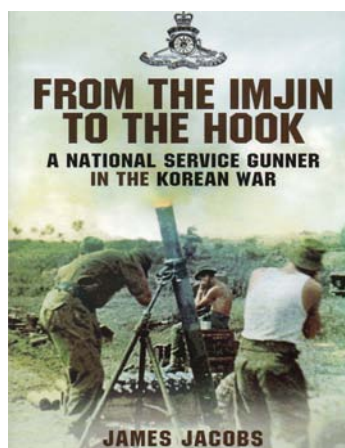
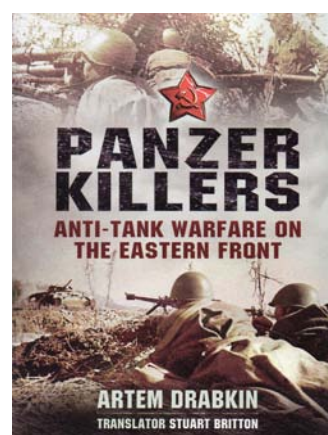
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Continuing the theme for this issue and in particular tank warfare on the Eastern Front, the book 'Panzer Killers' looks at Soviet anti-tank warfare. The Soviet anti-tank crews were regarded as amongst the finest in the world and were the bane of the German tank commanders on the Eastern Front, knocking out huge numbers of German tanks thanks to their skill, accuracy and special tactics. Despite the success rates of the gun crews,

the life of the anti-tank crew, describing the hazards, confusion and speed of combat through the recollections of those who fought on the Eastern Front. This is primarily a written account based on graphic eyewitness accounts constructed from face-to-face interviews with Red Army veterans with a small selection of black and white archive images thrown in for good measure. A fascinating and harrowing account.



A National Service Gunner in the Korean War

Most will be aware of the Korean War and most will know that soldiers from many nations fought and died there, but how many people are aware that of the British Army's considerable contribution to the Korean War between 1950 and 1953 was largely composed of National Servicemen? This new book from Pen & Sword describes the time spent in Korea by one particular National Serviceman, James Jacobs, a member of 170 Independent Mortar Battery

Royal Artillery. Jim, as he liked to be known, joined the Royal Artillery in 1951 and volunteered for overseas duty and found himself in the thick of a war as intensive and dangerous as anything the Second World War had to offer. This unique account provides details of what it was like to fight in two of the major engagements of the conflict, namely the battle of Imjin River and the Hook. A fascinating and extraordinary book.

Title: From The Imjin To The Hook

By: James Jacobs

ISBN: 9781781593431

Price: £19.99

Format: Hardback

Available From:
Pen & Sword Books Ltd.
www.pen-and-sword.co.uk

A Comprehensive Overview of German Anti-Tank Weapons of WW2

Title: German Tank Hunters The Panzerjäger

By: Bob Carruthers

ISBN: 9781781591321

Price: £9.99

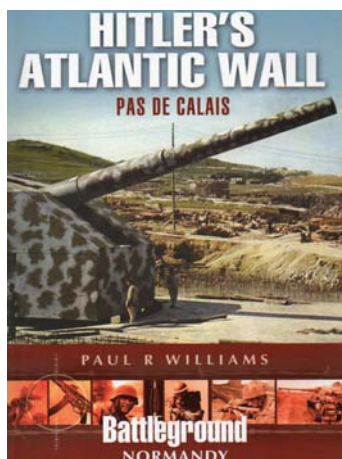
Format: Paperback

Available From:
Pen & Sword Books Ltd.
www.pen-and-sword.co.uk

Part of the new 'Hitler's War Machine' series, a new military history range from Pen & Sword, this new book by Emmy Award winning author Bob Carruthers provides a comprehensive overview of anti-tank weapons in use by the Wehrmacht during World War Two. Drawing heavily on contemporary Allied intelligence reports, the book builds into a unique account of operations on the battlefield during World War Two. The

176-page paperback is primarily a written account of the subject, but is well illustrated with a number of photos and diagrams showing the weapons and tactics involved in anti-tank warfare. At just £9.99 it is an inexpensive, but comprehensive reference source on this fascinating area of the war. The book is available from all good bookshops and specialist military book sellers.





German Construction of the Atlantic Wall Pas De Calais

This well illustrated 176-page book describes the massive effort that the occupying Nazi forces put into the construction of the Eastern section of the Atlantic Wall. While the D-Day invasion was unaffected by the fortifications in this area, they still posed a significant threat and the mighty gun batteries threatened Channel shipping not to mention the south coast of England. The author takes the reader on a fascinating journey along the coast that Hitler wrongly assumed would

be the site of the Allied invasion. The book reveals the political, military and engineering history behind the construction and use of the Atlantic Wall in the Pas De Calais region in France. In addition it describes the implications of the fortifications for the coastal towns of Kent and for the shipping in the English Channel. The book is profusely illustrated with wartime photos and comparative, modern day photos of the area.

Title: Hitler's Atlantic Wall

By: Paul Williams

ISBN: 9781848848177

Price: £12.99

Format: Paperback

Available From:
Pen & Sword Books Ltd.
www.pen-and-sword.co.uk

Sixty Years of Toys, Games and Crafts created by Airfix

Title: The Other side of Airfix

By: Arthur Ward

ISBN: 9781848848511

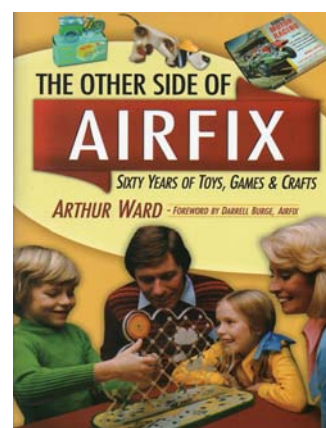
Price: £19.99

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Available From:
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www.pen-and-sword.co.uk

If you happen to be of a certain age (like me!), this new book that looks at the toys, games and crafts produced by Airfix, will certainly bring back some memories. Written by Arthur Ward, an acclaimed historian of Airfix and author of numerous books on the subject, the book concentrates on the aspect of the Airfix empire that many 'younger' readers may not even realise existed. The model kits are undoubtedly what Airfix is best

known for, but from the earliest days of the company, Airfix also branched out to produce a huge range of toys and games aimed at kids, which included the Airfix Motor Racing sets, competing against Scalextric, and model figures and a whole lot more. If you fancy a trip back in time to your childhood this well-illustrated 192-page, hardback book would be an excellent place to start. Available from all good book shops.



An In-Depth look behind the scenes at the workings of the German Leopard 2 MBT

undergoing maintenance in the workshop. The often secret world of the modern main battle tank is normally shrouded in secrecy and anyone who's ever tried to take a photograph inside an in-service tank at a show will know that the practice is often frowned upon, but somehow author and publisher Jochen Vollert has managed to pull off the seemingly impossible by gaining unprecedented access to a number of Leopard 2 tanks while undergoing routine maintenance at a Bundeswehr maintenance facility. The 96-page, full colour, landscape format book quite literally covers almost every inch of the Leopard 2 tank, from the interior of the hull, and engine bay to the engine itself, which has been photographed from every angle whilst out of the vehicle. As if that wasn't enough the running gear, tracks and armament are also treated to

an equally in-depth photo essay, with numerous photos provided from every angle and the hull is also covered in some depth with images of the various details on and around the hull as well as inside the tank with turret and engine removed. Towards the end of the book there's even a section showing the computerised turret crew trainer, which allows the commander and gunners to practice from the comfort of a training room before the graduate to the real thing. Even the maintenance hall and workshops get their own chapter, showing the many different specialised tools required to keep these monsters on the road. This is a fabulous book, packed with information and presented in German/English text and captions and offers a unique insight into the world of the Leopard 2 and particularly the routine maintenance they undergo.

Title: Leopard 2 Maintenance

By: Jochen Vollert

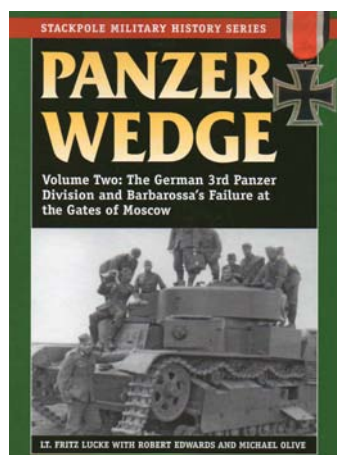
ISBN: N/A

Price: £19.99

Format: Softback

Available From:
Bookworld Wholesale Ltd.
www.bookworldws.co.uk

Many books have already been published on the subject of the modern German Leopard tank, but few have looked behind the scenes in the same way as this stunning new book from Tankograd Publishing have. After a brief overview of the Leopard tank and the stages of development it has undergone to reach the 2 A6 model, the book launches into a photofest that examines the Leopard tank in minute detail whilst



The German 3rd Panzer Division at the Gates of Moscow

This new book from Stackpole via Casemate UK, is part of their 'Secret Military History' series and looks at the role of the 3rd Panzer Division's attempts to bolster troop morale following setbacks in the offensive to take Moscow, where they endured setbacks and great hardships. The book was written by war correspondents who watched the battles unfold in front of them and therefore 'Panzer Wedge' has a unique 'you are

there' perspective that captures the heady spirit of the offensive's beginnings as well as the dogged fighting that brought it to a halt. The book will no doubt appeal to those with an interest in this particular period of history and offers a significant insight into the conflict that has so long captured the imagination of history enthusiasts everywhere. The book is essentially a written account but does include numerous images.

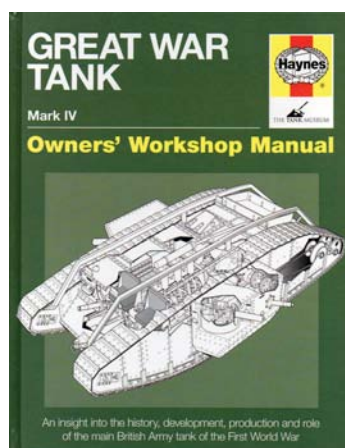
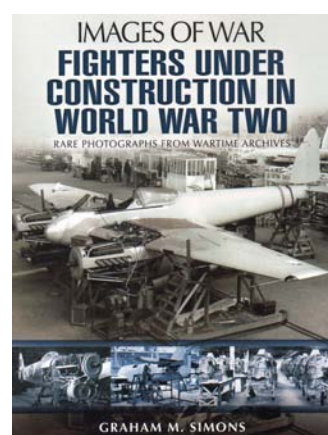
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|---|
| Title: Panzer Wedge |
| By: Lt. Fritz Lucke, Robert Edwards & Michael Olive |
| ISBN: 9780811710824 |
| Price: £11.99 |
| Format: Paperback |
| Available From: Casemate UK Ltd. www.casematepublishing.co.uk |

Fighters Under Construction - Rare Photos from Wartime Archives

| |
|---|
| Title: Images of War |
| By: Graham Simons |
| ISBN: 9781781590348 |
| Price: £14.99 |
| Format: Softback |
| Available From: Pen & Sword Books Ltd. www.pen-and-sword.co.uk |

This is an unusual and fascinating book from Pen & Sword in their 'Images of War' series that looks at a number of wartime British aircraft, however, it differs from most books in that it looks at their construction in the many factories around the UK and as such offers a unique insight into the wartime production of aircraft. Included amongst the many chapters are details on the Spitfire, Hurricane, Typhoon, Tempest, Beaufighter

and Mosquito, each of which involved the use of many different construction processes. Other chapters look at the engines, propellers and armament and the number and quality of photographs included within the 128-page book makes this a fantastic book for the aircraft enthusiast. At £14.99 it's hardly expensive and I can see a great many aircraft modeller buying this book for ideas on potential dioramas.



An Insight into the history and development of the WW1 Tank

Haynes continue with the move away from the car repair manuals they're better known for with this excellent new title on the World War One Mark IV Heavy Tank written by David Fletcher. Needless to say it's a well written, superbly researched and highly informative book that follows in the footsteps of the Tiger 1 and Sherman books also released by Haynes and as such follows a similar format. Inside you'll find numerous wartime

images as well as more modern colour images of the preserved example currently held at the Tank Museum. Following an introduction to the birth of the tank you'll find chapters on the anatomy of a Mk IV, armament, camouflage and markings, operating the Mk IV, the tank at war and the surviving examples. There's no doubt that this will be a popular book with enthusiasts and it's a fine addition to the steadily expanding series from Haynes.

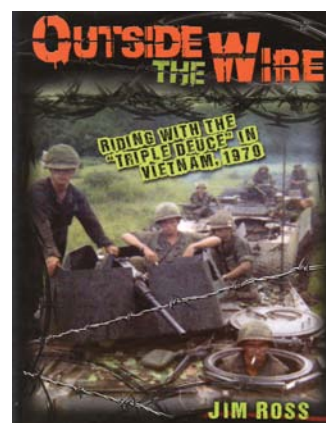
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| Title: Great War Tank |
| By: David Fletcher |
| ISBN: 9780857332424 |
| Price: £21.99 |
| Format: Hardback |
| Available From: Haynes Publishing. www.haynes.co.uk |

Riding with the 'Triple Deuce' in Vietnam, 1970

| |
|---|
| Title: Outside the Wire |
| By: Jim Ross |
| ISBN: 9780811712224 |
| Price: £15.99 |
| Format: Hardback |
| Available From: Casemate UK Ltd. www.casematepublishing.co.uk |

If you're looking for a thoughtful, action-packed memoir of an American soldier's combat experience in Vietnam in 1970, then look no further. The author, Jim Ross, served as a rifleman, machine gunner, 'tunnel rat' and demolitions man with the US Army's 25th 'Tropic Lightning' Infantry Division as well as the 1st Cavalry Division. The author's memoir focuses on the experiences of the men on

the ground in Vietnam and the sometimes harsh realities of combat, as well as the moving and unforgettable experiences encountered during his time in Vietnam. The book is both moving and unforgettable and arguably one of the best in an already crowded field of Vietnam War memoirs currently available. The book is available from all good book shops and from specialist military book sellers.



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DATES FOR YOUR DIARY

JUNE 2013

Saturday 8 Sunday 9

June 2013: Wicksteed at War: held at Wicksteed Park, Kettering, Northants, NN15 6NJ. Incorporating the MVT National Show featuring military vehicles, exhibitors stands and trade stalls, military dioramas and much more. Contact: John Denny (Re-encators) Tel: 07713 636760 Tim Hawkes (Vehicles & Trade) Tel: 01536 799395 www.wicksteedpark.co.uk

Saturday 15 Sunday 16

June 2013: Dunsfold Collection Open Weekend: held at the Springbok Estate, GU6 8EX. See one of the finest collections of Land Rovers in the world. For details contact: Tel: 01483 200567 openweekend@dunsfold.com www.dunsfoldcollection.co.uk

Sunday 16 June 2013:

Duxford Military Vehicle Show: held at IWM Duxford, Cambridgeshire, CB22 4QR. One of the best one-day shows on the calendar, lots to see and do for all the family with static vehicle displays, vehicle cavalcade and off-road display. So why not celebrate Father's Day in style and visit the show. For further details see: www.iwm.org/events/iwm-duxford

Saturday 22 Sunday 23

June 2013: Wartime in the Vale: held at Ashdown WW2 Camp, Ashdown Farm, Badsey, nr Evesham, Worcs, WR11 7EL. Military vehicles, arena events, militaria stalls, re-enactors and classics. Contact Paul on: Tel: 0779 1591528 www.ashdowncamp.webs.com

Saturday 29 Sunday 30

June 2013: Tankfest 2013: held at the Tank Museum, Bovington, Dorset, BH20 6JG. Experience the world's best display of historic moving armour. Lots to see and do for the family with trade stands and living history displays plus the world famous Tank Museum, home to the finest collection of tanks. For further details see: www.tankmuseum.org

JULY 2013

Friday 5 to Sunday 7

July 2013: The Yorkshire Wartime Experience show: now one of the largest battle re-enactment/ military shows in the North of England. Held in 30 acres of land to the south west of Leeds with easy access to the M62 motorway (Junction 26) just off the A58 Hunsworth Lane, Hunsworth, Bradford, BD4 9RN. For further details contact Stuart or check out the website to see the list of vehicles currently booked in: Tel: 07748604461 www.ywe-event.info

Saturday 6 Sunday 7

July 2013: Capel Surrey Vintage Military Vehicle Show: held at Aldhurst Farm, Temple Lane, Capel, Surrey, RH5 5HJ. The East Surrey and West Kent Area MVT Capel show. In aid of Help for Heroes, including Military Vehicles, Re-enactor Groups, stall Holders and Traders. For information and entry forms contact Area Sec John Hotston: Tel: 07445 962945 adenjohn@virginmedia.com or Phil Harris on: Tel: 01293 871727

Saturday 6 Sunday 7

July 2013: Lympne Aero Classic: celebrating the history of Lympne Airfield from 1916-1980s. Held at Lympne Village Hall and playing fields. For details or to book in for the event please call John Simpson: Tel: 01303 265078 johnsimpson43@btinternet.com

New Venue...New Venue...

Wednesday 17 to Sunday 21 July 2013: The War & Peace Revival: held at the new venue of RAF Westenhanger, Folkestone Racecourse, near Hythe in Kent, CT21 4HX. The world's largest military vehicle show that attracts thousands of military vehicles, re-enactors and living history displays and now at a brand new venue. For further details or to book in call: Tel: 01304 813337 or Tel: 01304 813945 www.thewarandpeacerevival.co.uk

JULY 2013

Friday 26 to Sunday 28

July 2013: Festival of the Forties: held at the Plough Event Site, Milk & Water Drover, Peterborough, PE7 3DR. Military vehicles and civilian vehicles, battle re-enactments, living history groups, 1940's performers, 40's vintage village and stalls. For details contact: Tel: 01733 204353 www.1940fest.org

AUGUST 2013

Friday 2 to Sunday 4

August 2013: Military & Flying Machines Show: held at Damyns Hall, Aerodrome, Aveley Road, Upminster, Essex, RM14 2TN. Featuring military vehicles, tank rides, living history displays, tank parade, classic cars, military and collectors stalls, Battle of Britain Memorial Flight, flying displays and more. For details call Tracey Brew on: Tel: 07903 104102 Tracey.brew@mvt-essex.org.uk www.militaryandflyingmachines.org.uk

Saturday 3 Sunday 4

August 2013: Woodhall Spa 40's Festival: held at Jubilee Park, Stixwold Road and Woodhall Spa village hall. Lincolnshire, LN10 6QH. For details contact Stuart on: Tel: 01526 353215 www.woodhall-spa-40s-festival.com

AUGUST 2013

Sunday 11 August 2013:

Panshanger 1930 & 1940s Day: held at Panshanger Airfield, Herts. This popular one-day show features classic military vehicles, classic cars, motorcycles and a classic aircraft fly in, plus live music from the 30s/40s and more. For further details or to book in for the event call: Tel: 01707 3971791 www.northlondonflyingschool.com

Saturday 17 Sunday 18

August 2013: Cobbaton Combat VJ Weekend: military vehicle show, stalls, living history, and all held at held at famous Cobbaton Combat Collection, home to a fantastic collection of military vehicles and military artefacts. The museum is located in Chittlehampton, N. Devon, EX37 9RZ. For further details or to book in for the event contact: Tel: 01769 540740 info@cobbatoncombat.co.uk www.cobbatoncombat.co.uk

Saturday 17 Sunday 18

August 2013: Wings & Wheels: the South West Airfield Heritage Trust Wings & Wheels show held at Dunkeswell Airfield, nr Honiton, Devon. Meet cast members from H.B.O's Band of Brothers, plus military vehicles, re-enactors, planes, and much more. For further details contact Dave Bunney on: Tel: 01404 890174



AUGUST 2013

Saturday 17 Sunday 18 August 2013:

Lacock at War, Codename Bolero: Military Vehicle & Re-Enactment Show, held in Lacock Village near Chippenham, Wiltshire, Sat Nav SN15 2LQ. For details contact, John Wardle on:
Tel: 01373 300384
westwiltsmvt@yahoo.co.uk
www.westwiltsmvt.co.uk

Saturday 17 Sunday 18 August 2013: Ramsey

1940s Weekend: held at The Camp, Ramsey, Cambs, PE26 2XB. Attractions include living history displays, period re-enactors, vintage motor vehicles, Battle of Britain Memorial Flight, trade stands and tank rides. For further details contact:
Tel: 07881 730047
Ramsey1940s@gmail.com
www.ramsey1940sweekend.org

Saturday 24 to Monday 26 August 2013: Tanks,

Trucks & Firepower: organised by the Alvis Fighting Vehicle Society and the Birmingham & West Midlands Area Military Vehicle Trust. The showground is situated just 1 mile from Dunchurch in Warwickshire on the A426 Southam Rd and 5 miles from Rugby. Easy access from the A45 and M45. Show features static military vehicle and living history displays, arena driving. For details see:
www.tankstrucksandfirepower.com

AUGUST 2013

Saturday 24 to Monday 26 August 2013: Military

Odyssey 2013: held at the Kent County Showground, Detling, Kent, ME14 3JF. Now the world's largest multi-period history event, the closest you'll get to history short of a time machine! For details contact:
Tel: 01268 772448
info@military-odyssey.com
www.military-odyssey.com

Saturday 24 to Monday 26 August 2013: Cornwall

Area MVT Show: held at Mount Edgcumbe Country Park, Cremyll, Cornwall. Exhibitors are invited to bring along military vehicles (of any era), plus military or living history displays welcome. Free entry and camping for all exhibitors. For further information regarding vehicle and living history entries please call Gwen Jenkins:
Tel: 01872 561653
gwenjen@talktalk.net

Saturday 24 to Monday 26 August 2013: Rauceby

War Years Weekend 2013: The Mid Lincs Military Vehicle Trust is holding their 5th War Years Weekend. We are a non-profit making event so any monies raised after expenses will go to the Air Ambulance, Royal British Legion and Marie Curie Cancer Care. For further details call:
Tel: 01529 488354
www.raucebywarweekend.co.uk



AUGUST 2013

Saturday 31 August Sunday 1 September

2013: 70th Anniversary of the Assault Training Center, held in Woolacombe, North Devon, living history displays, beach invasion re-enactment, vehicle run on beach, wreath laying. For further details see the website:
www.assaulttrainingcenter.com

SEPTEMBER 2013

Sunday 1 September

2013: Jeep & Cheerful day: this popular one-day vehicle show returns, offering a Free day out for anyone with a Military Jeep, or Military Vehicle, held at the regular venue of South Yorkshire Aircraft Museum 'AeroVenture' at the former site of RAF Doncaster. For more information contact Mark Askew on:
Tel: 01302 739000
info@jeepworld.co.uk
www.jeepworld.co.uk

Friday 6 to Sunday 8 September 2013: The

Victory Show: the largest WWII experience extravaganza in the UK, held at Foxlands Farm, Cosby, Leicestershire, LE9 1SG. Featuring military vehicles, tanks and artillery, living history displays, airshow, vintage tractors and farm machinery, trade stands and more. For further details (General) contact Steve Pepper on:
Tel: 07711430472
Sjpepper229@btinternet.com
For Vehicles/Re-enactors contact Dave Pratt on:
Tel: 07954 620728
thevictoryshowreenactors@yahoo.co.uk
www.thevictoryshow.co.uk

SEPTEMBER 2013

Saturday 7 September

2013: Peopleton Autumn Show: held at Peopleton Village Playing Fields, Peopleton, Worcs. The event features a variety of Classic Cars, Military Vehicles, stalls, food and entertainment throughout the day. The event is open from 12.00 noon till 6.00pm. For further details about the show please call the organiser John Sargeant:
Tel: 01905 840155
sarg-37@outlook.com

Sunday 29 September

2013: Stoneleigh Mini Militaria 2013: Blackdown Buildings, The Exhibition Centre, Stoneleigh Park, Coventry, Warks. CV8 2LZ. Round off the show season with this new event and grab those bargains ready for the winter rebuilds. For details or to book in for the event please contact Amanda on:
Tel: 01743 762266
amanda@jeeparts.co.uk
www.militaryconvention.com

Saturday 28 Sunday 29 September 2013: Railway

At War: Recreating the 1940s experience of life on the Home Front during WW2. Held by the Northampton & Lamport Railway, Pitsford and Brampton Station, Pitsford Road, Chapel Brampton, Northampton, NN6 8BA. Featuring civilian and military vehicles, 1940s music and entertainment, trade stalls, re-enactors and living history displays. For details please contact the appropriate person: Colin Haddon
Tel: 01604458521 (Vehicles)
Tel: 07756 200213 (General)
info@railwayatwar.org.uk



MISSION BRIEFING

DATES FOR YOUR DIARY

OCTOBER 2013

Friday 4 to Sunday 6

October 2013: Military Revival: a new show in alliance with Bunker Bash, and in collaboration between Old Buckenham Airfield and Battlefront; The East England Military Museum. In addition to military vehicles we will have large areas of military campsites, provided by re-enactors, which will present a variety of living history displays. The event will also include a demonstration arena, mock battles from conflicts throughout the 20th century, tank rides, militaria and other trade stalls and air displays from military aircraft. There will also be a 1940's hangar dance on the Saturday evening of the weekend. For further information contact Touchdown Aero Centre: Tel: 01953 860 806 airfield@oldbuck.com

OCTOBER 2013

Saturday 5 Sunday 6

October 2013: Holme 1940's Weekend: held in association with Holmewood Hall and Holme Village. Located near Peterborough, PE7 3PA. Featuring tank rides, vintage vehicles, vintage ploughing, stalls and displays, and much more. Re-enactors welcome. For details call: Tel: 07887 817031 chriscardell@googlemail.com www.holmewoodhall.co.uk

Sunday 6 October 2013:

Hack Green Secret Nuclear Bunker Rally: French Lane, Nantwich, Cheshire, CW5 8BL. Buy and sell your items of militaria and take in the fascinating Hack Green Secret Nuclear Bunker museum while you're there. For details call Rod: Tel: 01270 623353 coldwar@hackgreen.co.uk



OCTOBER 2013

Friday 11 to Sunday 13

October 2013: Wartime Weekend: held in Pickering, N.Yorks with steam trains, trade stands and re-enactors. For further details about the show visit the website at: www.nrmr.co.uk details about the trading area at: www.jeepworld.co.uk/pickering/wartimeweekend.htm

NOVEMBER 2013

Sunday 3 November

2013: Northern Military Expo: popular indoor show held at the Newark Country Show Ground, Notts, 2 minutes off the A1M (NG24 2NY). For details contact Mark Askew on: Tel: 01302 739000 or check out the website at: www.northernmilitaryexpo.co.uk

Sunday 17 November

2013: Malvern Militaria Fair: large, indoor militaria event held at the Three Counties Showground, Wye Hall, Malvern, Worcs, WR13 6NW. For details contact Amanda at: Tel: 01743 762266 amanda@jeeparts.co.uk www.militaryconvention.com

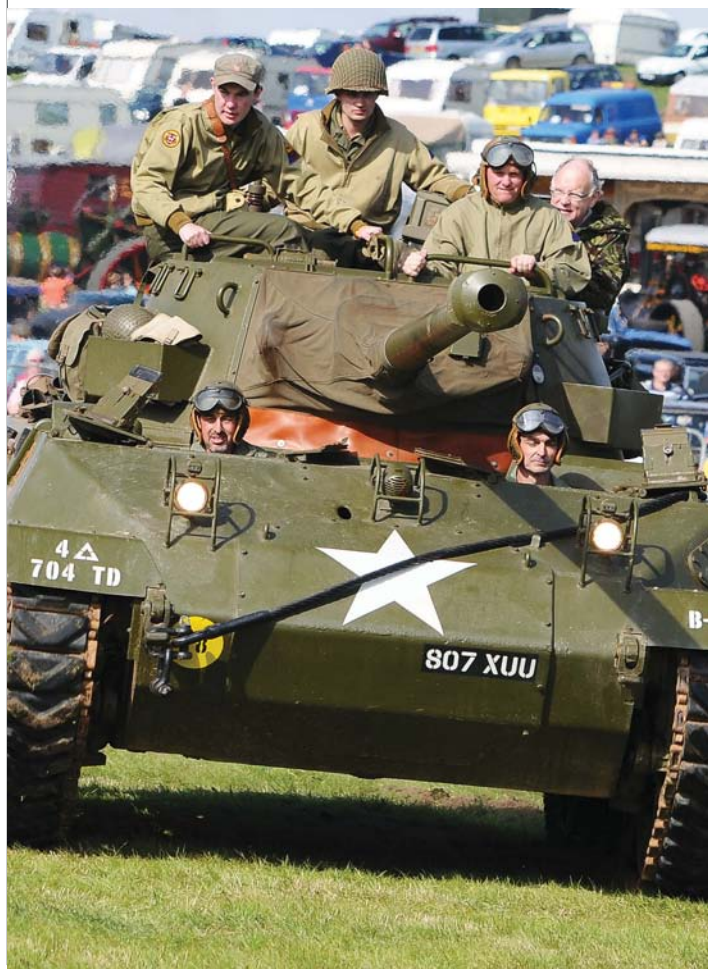
DECEMBER 2013

Sunday 15 December

2013: Bromsgrove, Militaria, Medal & Arms Collectors Fair: held at the Spadesbourne Suite, The Council House, Burcot Lane, Bromsgrove, Worcs, B60 1AA. Free parking, admission to the event is £2.50 from 9.00am to 2.00pm, accompanied children (under 13) free. For further information and dealers booking forms contact James Brown at: Tel: 07980 608211 fairs@RZMilitaria.com www.RZMilitaria.com

Are you a show organiser? Don't delay, and email your show & event details direct to the Editor at:

ian.young@keypublishing.com or if you prefer you can post them to the Editorial Office - details can be found on page 3



If travelling long distances to events we would advise people to check for cancellations before leaving home, MMI cannot be held responsible for any errors, omissions or cancellations. Submissions for Mission Briefing should be sent at least two months prior to the event and we would also ask that event organisers notify us of any changes as soon as possible.

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