

Restoration of M5A1 Stuart Light Tank



BAIV BV | British American Infantry Vehicles

Titaniumstraat 11 | NL 6031 TV Nederweert | The Netherlands

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M5A1 Stuart light tank



Technical Specifications

Model:	M5A1 Stuart light tank (2nd model)	Speed:	36 mph (58 km/h) on-road
Manufacturer:	Massey Harris Company, Racine, Wisconsin, USA	Range:	18 mph (29 km/h) off-road
Production period:	From December 1942 until June 1944	Fuel capacity:	160 km (99 mi) at medium speed
Production numbers:	Model M5: 1,720; Model M5A1: 6,810; Combined: 8,530	Right:	155 litres
Hull ID:	A10221	Left:	160 litres
UK registration:	T23234 (original USA 3059525)	Dimensions	Length: 4.62 m (15'2")
Date of Delivery:	12-1943; US purchase order T-3886		Width: 2.39 m (7'10")
Weight:	16.5 tons (33,070 lbs.)		Height: 2.33 m (7'8")
Crew:	4 (commander, driver, gunner, loader)	Electrical installation:	12 Volt
Engine:	Twin Cadillac V8, 296 hp (220 kW), air cooled gasoline	Armament Main:	37 mm (1.46 in) M6 AT gun
	Displacement: 346 cubic inch (5.7 litres) per engine	Secondary:	3 x cal.30 (7.62 mm) M1919 machine-guns
	Power output: 110 HP at 4000 RPM (per engine)	Armor:	From 13 to 51 mm (0.51-2 in)
	Torque: 244 ft-lbs = 331 Nm at 2000 RPM (per engine)		
Transmission:	Twin Hydra-Matic + 1 Transfer case		
Suspension:	Vertical Volute Spring		

Introduction to the Restoration Album of the

This Stuart tank, an M5A1 model, was built in December 1943 by Massey-Harris in the United States, bearing serial number A10221. The tank was delivered to the British Army under the Lend-Lease agreement and used during the liberation of Europe.



As such, the tank holds substantial historical value, having taken part in the campaign at the Western Front during the Second World War.

Known for its speed, agility, and mechanical reliability, the M5A1 Stuart featured a relatively light weight of approximately 16.5 tons, twin Cadillac V8 engines, and a revolutionary dual Automatic Hydra-Matic transmission system. It could reach speeds up to 36 mph (58 km/h) and had an operational range of about 100 miles (160 km). Armed with a 37 mm M6A anti-tank gun, the Stuart was ideally suited for reconnaissance and light support roles.

After the war, the tank returned to the United Kingdom. Likely sometime in the late 1940s or 1950s, it was converted into what is commonly referred to as a "Recce Version": the turret was removed and the upper deck was cut open to facilitate troop transport.

Eventually, after being released from the UK army, the vehicle ended up in the hands of collectors. Restoration to original condition was initiated in the UK: the upper deck was reconstructed, and at a shooting range a turret was found along with other components. However, the project stalled when it was discovered that the newly welded upper deck had warped beyond practical repair.



The team ultimately chose not to restart, and the vehicle was left incomplete. It eventually ended up on the yard of Mr. Gavin Copeman, who offered it for sale in 2020.

On June 23, 2020, the Dutch Bas and Auke Dijkstra acquired the project. What followed was a multi-year journey to gather missing original components from all over the world – through fairs, fellow collectors, online platforms, and events. Their relentless effort and commitment added immense value to the project.

From Plan to Execution

In late 2023, the Dijkstra family approached BAIV to explore the feasibility of restoring the Stuart to Class A condition. The first step involved a joint assessment of the vehicle's state, completeness, and restoration potential.



BAIV proposed an initial phase where the vehicle would be temporarily assembled and examined to establish the scope of work and generate a realistic budget. This phase was commissioned on November 15, 2023.

Shortly after, the Stuart was transported to Nederweert, and inspection began. One major issue quickly emerged: the main gun. Originally acquired pre-Brexit, its export from the UK had become problematic due to new regulations. Ultimately, BAIV sourced a replacement cannon in Greece, which was successfully installed.

Following this initial assessment, a detailed restoration budget was presented in January 2024. The projected labour amounted to approximately 2,791 hours, which was approved by the client.

The full Class A restoration started soon after, led by Martijn van Kuijk and Leroy Broks, supported by BAIV's skilled team and external specialists.

Initially, the target was to complete the tank for the September 2024 commemorations of Operation Market Garden. However, the sourcing of rare components and unforeseen technical challenges delayed the timeline. For instance, the original 'overhauled' engines required a complete rebuild. Fueltanks, expected to be restorable, were replaced with custom-fabricated stainless steel units, fitted with newly produced brass caps. Numerous complex components – such as turret locks, hatch mechanisms, turret basket and fittings, elevation and traverse systems – had to be redesigned, drawn in 3D CAD, and newly manufactured. Despite these challenges, the project remained within the original labour budget, a rare and commendable achievement.

Final Delivery and First Operations



In February 2025, after successful initial test runs, steering difficulties emerged. Though it initially handled well, the tank became increasingly difficult to steer. Investigation revealed that the original brake linings were the issue. These were replaced with a new set sourced from LWD Parts, just days before final delivery in week 7 of 2025.

M5A1 Stuart for Bas and Auke Dijkstra

On February 13 and 14, 2025 Bas and Auke Dijkstra visited Nederweert for the final inspection and Factory Acceptance Tests.

The first public appearance of the M5A1 Stuart followed shortly after, at a military event in Vianden, Luxembourg. For this special event, the tank was fitted with temporary U.S. markings appropriate to the setting of the event..

Since then, the Stuart has participated in multiple events, including tours in the Achterhoek and northern Netherlands for the 80th anniversary of the end of WWII. At the time of writing this introduction, the Stuart is back in Nederweert for some final detailing and routine service. Its performance continues to meet clients' full expectations.

This book is dedicated to all those who contributed to the liberation of Europe, and in particular the British servicemen who, in vehicles like this Stuart, helped restore freedom.

We owe special thanks, next to our team, to Carry Harts for her detailed compilation and design of this unique album, and to Bas and Auke Dijkstra, whose vision and dedication made this restoration possible.



The owners: Bas and Auke Dijkstra

Bas and Auke Dijkstra, a father-and-son team from Haaksbergen, the Netherlands, started collecting military vehicles in 1989. Both share a love for technical restoration, and history, especially the liberation of the Netherlands and their home region of Twente and the Achterhoek.

Their collection has grown into one of the most notable in the country. More importantly, they share it with others. Every September, they help organizing of one of the best MV events in the Netherlands for "Keep Them Rolling," featuring a scenic 45 km route along historical paths of the Guards Armoured Division and 43rd Wessex. They are also active participants in European and UK events.

Supported by a group of dedicated volunteers, their team gathers twice a week to maintain and improve the collection.

Their cooperation with BAIV includes so far, an M48A3, an M14 Halftrack, a Stuart Recce, this M5A1 Stuart, and, most recently, a Sherman IC Hybrid Firefly.

Their passion, dedication, and partnership have made this restoration not only possible but exemplary.

The Stuart M5A1 in British Service

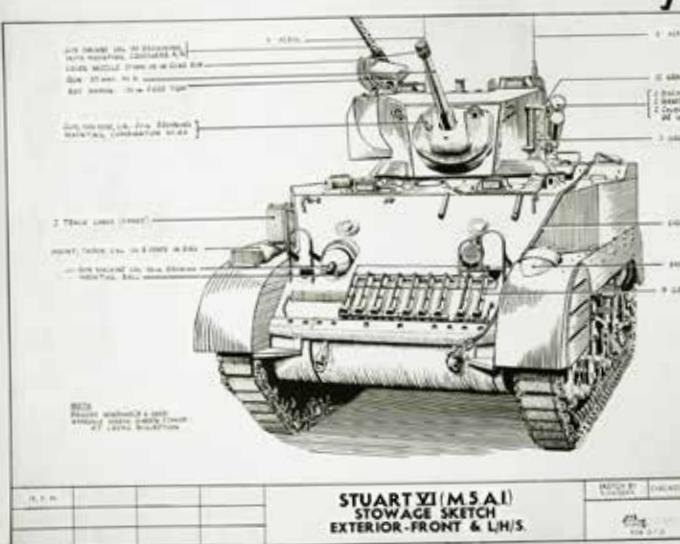
Over 1,100 M5A1 Stuarts were delivered to Britain under Lend-Lease and designated as "Stuart VI." Known affectionately as "Honeys" for their smooth handling and reliability, they saw action in North Africa (notably El Alamein and Tunisia), Sicily, and Italy.

Key British adaptations and features included:

- Redesigned turret with bustle:
Based on the M3A3 turret, the bustle allowed room for radios - initially the American SCR-508, often replaced by the British No.19 Set;
- Side-mounted .30 cal pintle mount:
Enabled safer firing from within the turret;
- Modern powertrain:
Twin Cadillac V8s with Hydra-Matic transmissions offered ease of operation and a quieter ride;
- Mobility over armour:
With 13-51 mm armour and a top speed of 58 km/h, the Stuart excelled in reconnaissance and flanking roles;
- Light weaponry:
The 37 mm M6 gun was sufficient against soft targets but not intended to engage heavy armour.

By mid-1944, as the M24 Chaffee entered service, many Stuarts were reassigned to recon duties or converted into turretless APCs ("Kangaroos").

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Sketches of the M5A1 Stuart as produced for the British Army, with right the characteristic extra stowage mounted on the back of the tank.



In the production line at the Massey-Harris plant in Rancine, a turret is hauled on a Stuart tank.

Markings & Historical Tribute

For its restoration livery, Bas and Auke Dijkstra chose to honor the legacy of an M5A1 that once served with the renowned Guards Armoured Division during the liberation of the northwest part of The Netherlands.

The distinctive marking—T232341—was replicated from a wartime picture showing a Stuart active in St. Isidorishoeve near Haaksbergen (hometown of the family Dijkstra), as part of the division's advance in early 1945.



Originally, the Guards Division is formed in WWI by merging the Foot Guards and Household Cavalry, and units of the Grenadiers, Coldstream, Irish, Welsh and Scots Guards.

Reactivated in 1939, and due to increasing need of mobility and mechanized forces, the division was transformed in June 1941 to the Guards Armoured Division, donning the black berets of British armoured squadrons.

The division landed in Normandy in June 26, 1944 and played a key role in the break-out from the beachhead, notably during Operation Goodwood around Caen, and in Operation Bluecoat creating the enclosure of German armies in the Falaise Pocket in Normandy. The division also played a role in the liberation of Brussels in Belgium.

Mid-September 1944, the Guards spearheaded XXX Corps through the Netherlands during Operation Market Garden, liberated Nijmegen bridge, and later, in the spring of 1945, pressed into the Achterhoek, Twente and Drenthe – advancing toward the German border.

By February 1945, units of the Division, including Stuart reconnaissance vehicles, moved through Haaksbergen and the nearby St. Isidorishoeve. Their presence marked a pivotal moment in the local liberation, bringing enduring gratitude to the town's residents.

The T232341 Stuart's historical paint scheme, complete with division insignia and tactical markings, now graces Bas and Auke's restored vehicle.

This is more than a decoration: it's a tribute to the



crew and the soldiers who served in this unit. It is a homage to the division's journey through western Europe into the heart of The Netherlands.

Development of the M5A1 Stuart

The M5A1 Stuart is the second variant of the Light Tank M5 Stuart family, originally developed from the Light Tank M3 Stuart family. In response to the wartime shortage of radial aero-engines used in the M3 light tanks, the new version was designed with twin Cadillac V8 engines and dual Hydra-Matic gearboxes functioning through a transfer case. This tank was quieter, cooler, and more spacious; the automatic transmission also made crew training faster.

Originally designated Light Tank M4 Stuart, but soon referred to as Light Tank M5 Stuart to avoid confusion with the Medium Tank M4 Sherman. this new light tank had a remodeled hull with a raised rear deck over the engine compartment, a sloped glacis plate, and driver's hatches moved to the top. In 1942, the M5 Stuart gradually replaced the M3 Stuart in production. As the M7 light tank project proved undesirable, finally the M5 Stuart was replaced by the Light Tank M24 Chaffee in 1944.

A total of 8,530 M5 and M5A1 tanks were produced. Based on the M5 chassis, also the 75 mm Howitzer Motor Carriage (MHC) M8 was developed, but this self-propelled gun had an open-top turret.

The M5A1 Stuart saw extensive use near the end of World War II, particularly in Normandy and on the western front. They were designed to carry out scouting, reconnaissance, and infantry support rather than engage in tank-to-tank combat with enemies!

In general, the tank was loved by its crew.

Even nowadays, it's a very popular tank for collectors. Its historical significance, characteristic silhouette, relatively compact size, low weight, and especially this model with the twin Cadillac engines in combination with the easy to operate dual Hydra-Matic gearboxes make them very popular in the worldwide MV scene!

Light Tanks Doctrine

Light tanks were issued to Tank Battalions (one of the four companies was a light tank company), Light Tank Battalions and Cavalry Reconnaissance Squadrons. The original role of the light tank in these formations was similar to medium tanks and they were expected to engage enemy armor

with AP rounds and enemy positions with HE rounds. As a result, tank gunnery training for Light and Medium tankers was common.

US Army Field Manuals written before 1944 clearly show that light tanks were to be part of an armored assault on enemy positions, and examples of fire on enemy armor were in these manuals. When pursuing an enemy, Light Tank Battalions were expected to move parallel with enemy columns and, together with accompanying infantry and engineer units, seize "critical terrain that will block hostile retreat". Despite the fact that light tank platoons were not expected to function as a reconnaissance unit, they could be used for reconnaissance purposes. In this role, they were expected to remain behind the main reconnaissance force as the support element and augment the firepower whenever enemy contact was made.

Usage in battles

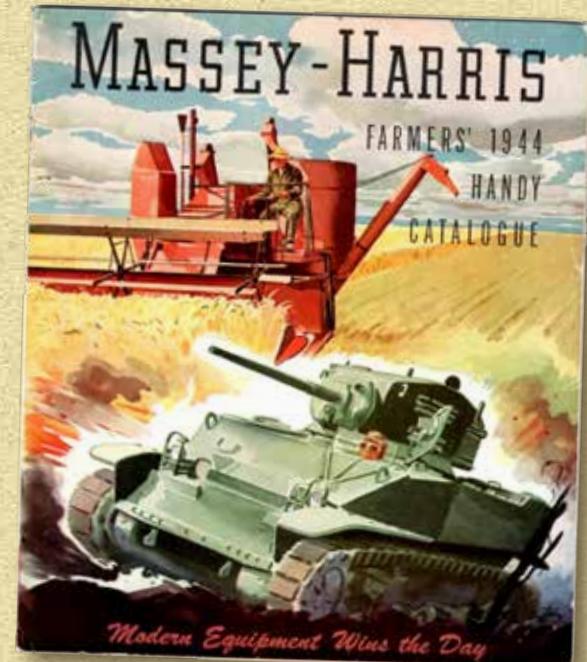
The M5A1 Stuart preserves the Rank I style of fighting. With very good mobility and fast reload, the light tank can speed to an optimal position on the enemy's side and riddle them with the 37 mm cannon. It is recommended to attack from the flanks as the weak armour on the Stuart makes it vulnerable to the newer enemy guns that can penetrate the armour with ease.

With the fast reloading 37 mm cannon, the M5A1 Stuart can deliver some good-hitting rounds if shooting at the flank at the enemies. A frontal engagement is possible but detrimental as Stuart's thin armour makes any incoming shot lethal.

If coming up to German Panther or Tiger tanks, load the M74B1 AP round for maximum penetration. In case the M5A1 comes across a heavy German tank, the recommended course of action to take it out is to get in a point-blank range and fire at the turret ring or engine rear. It is the only way for the Stuart's 37 mm grenade to penetrate the armour of heavy German tanks.

With its weak overall armour, most enemy grenades are able to penetrate the M5A1 Stuart. Enemies with heavy ammo like the Panzer IV with its short 75 mm and its HEAT rounds could destroy the Stuart with ease.

However, with its speed and relatively small size, as well as the ability to scout, the Stuart proved to be a very reputable reconnaissance vehicle. Even if you cannot penetrate heavily armoured opponents it was -combined with its decent firepower- a well-regarded and amazing reconnaissance vehicle.



BAIV BV

BAIV (British American Infantry Vehicles) BV is a family business driven by expertise and history. Founded and run by Ivo Rigter Senior and his son, Ivo Rigter Junior, the company is propelled by a shared commitment to supply, restore and service historic armoured vehicles & tanks.

It started with a group of enthusiasts in the mid-'90s. Due to expansion BAIV was founded as a company in 2012. Over the decades, the BAIV team gathered a wealth of knowledge in the field of maintenance, restoration, and reconstruction of military armoured personnel carriers, half-tracks, tanks, and howitzers.

As a result, we are able to help with identification, parts supply (N.O.S. but also a wide range of high-quality reproductions), customizations and comprehensive support services.

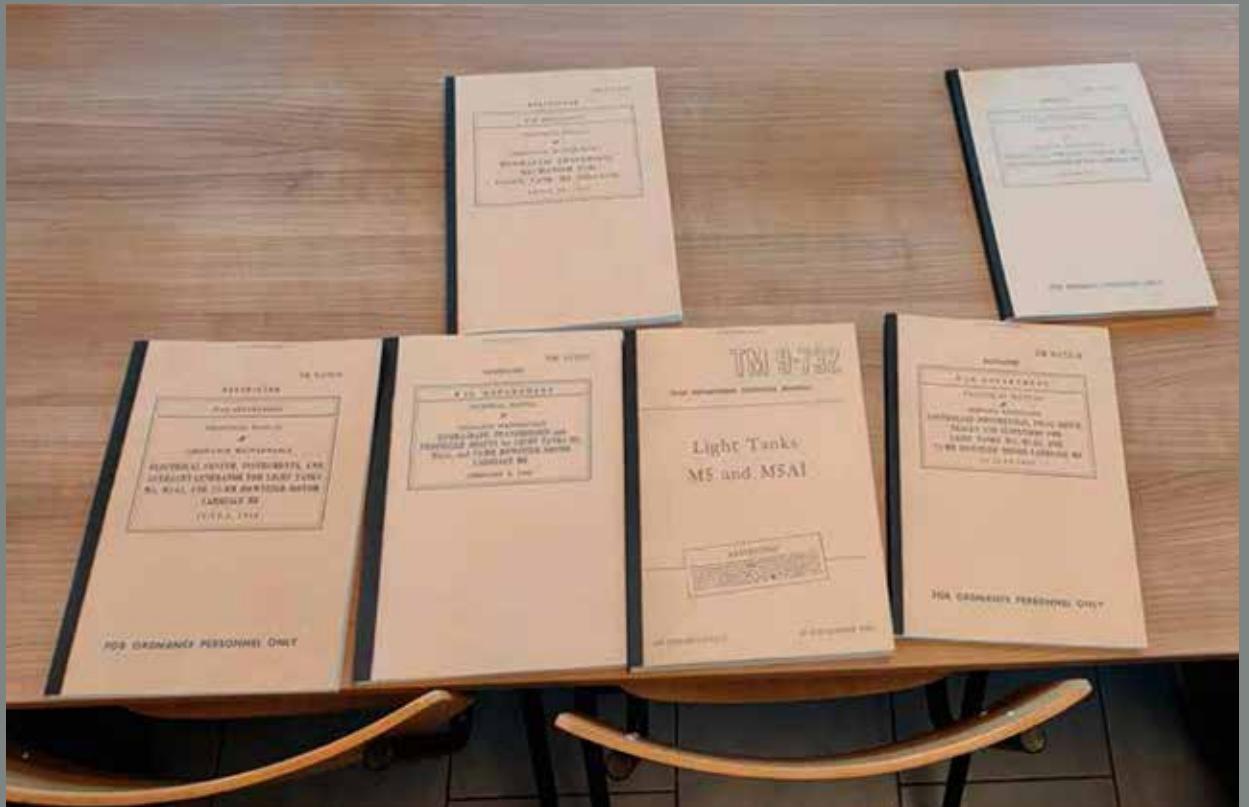
Ivo recognized the need to simplify the complexities around historic military and armored vehicle transactions, leading to the creation of Tracks & Trade.

Over the past years, our business has evolved significantly. This led us to reassess our position in the market and refine our strategy. We are proud to announce that later this year, we will launch our new strategy! This reflects exactly who we are today and where we are heading in the future.

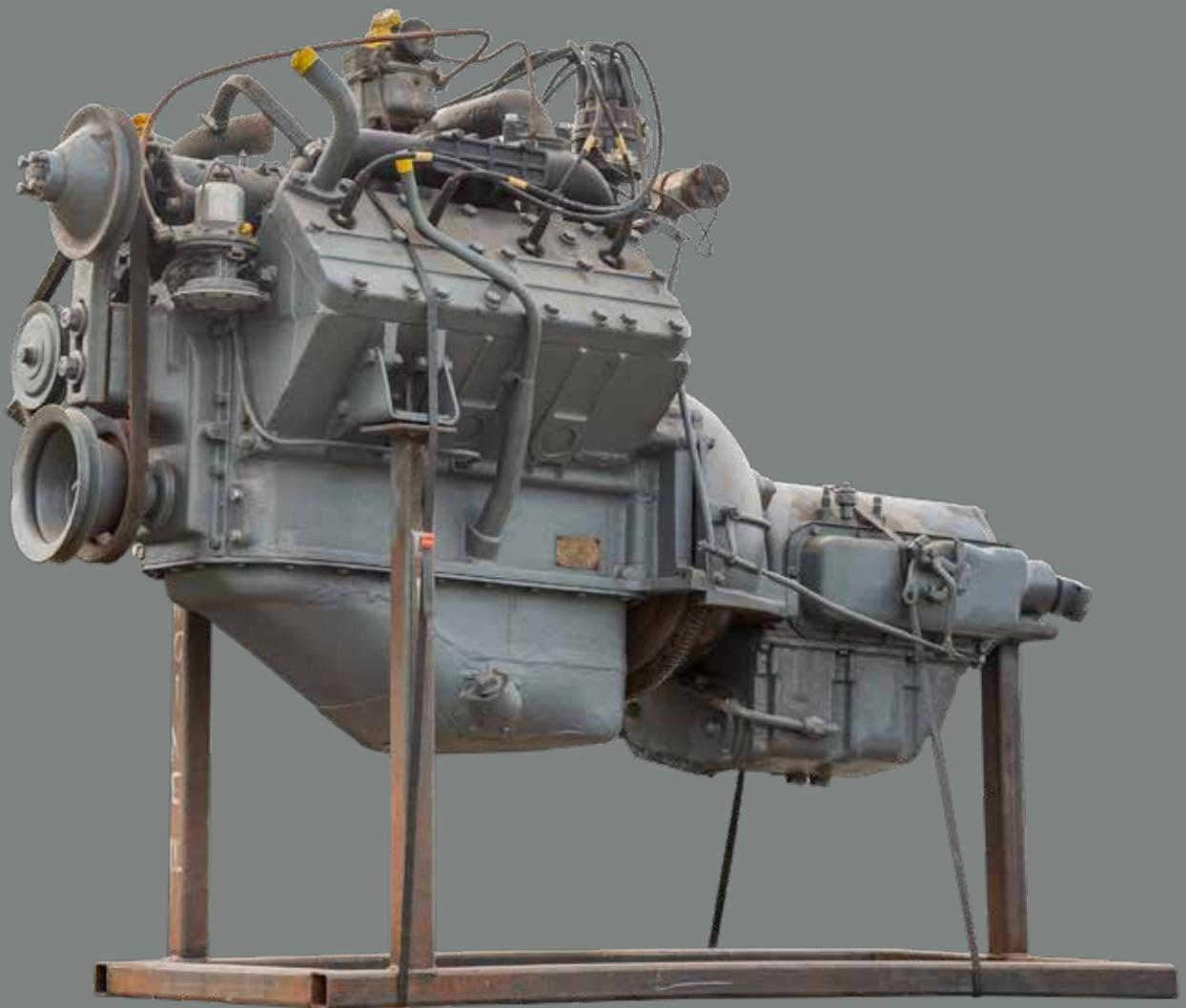




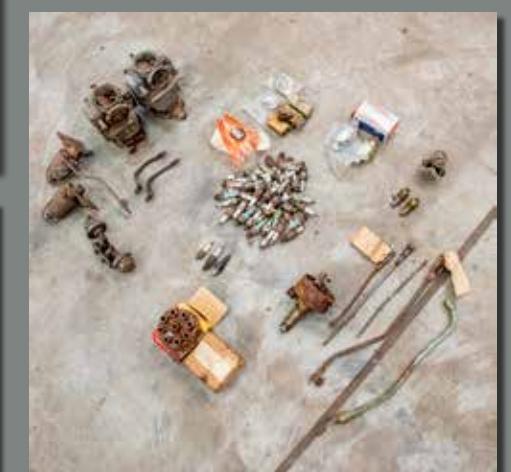


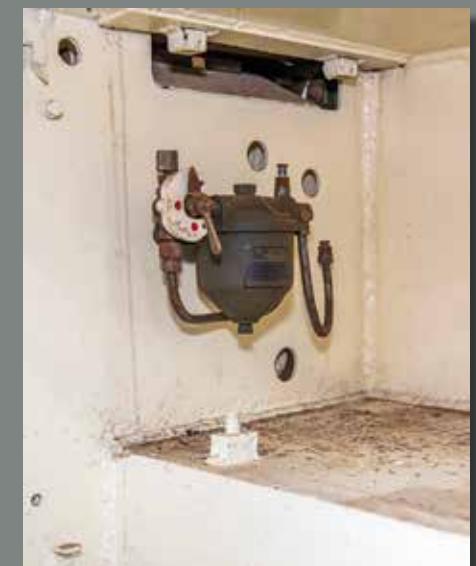


Ready to start the restoration



First inventory of all supplied loose parts

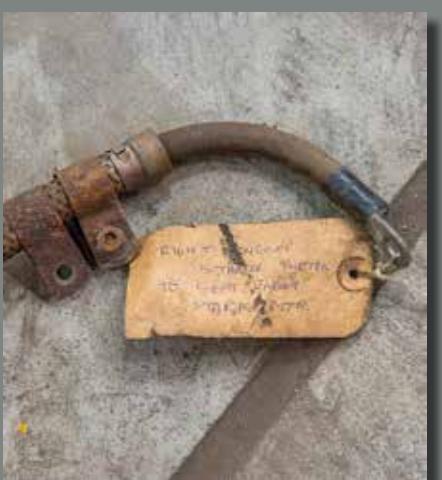
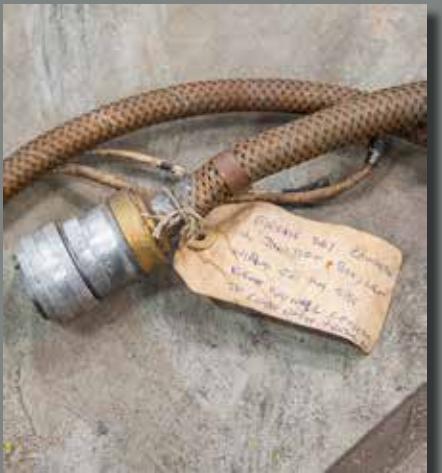






Trial fitting supplied loose parts



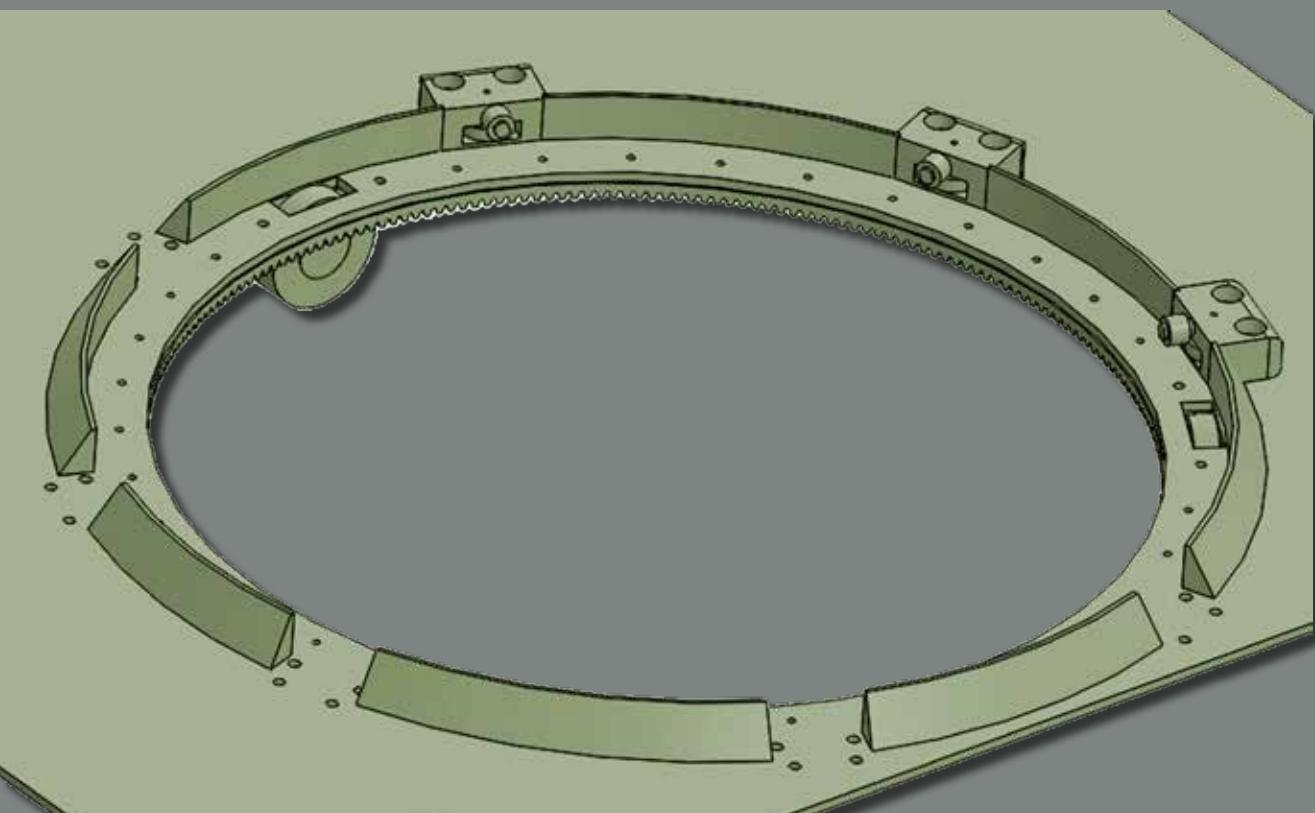
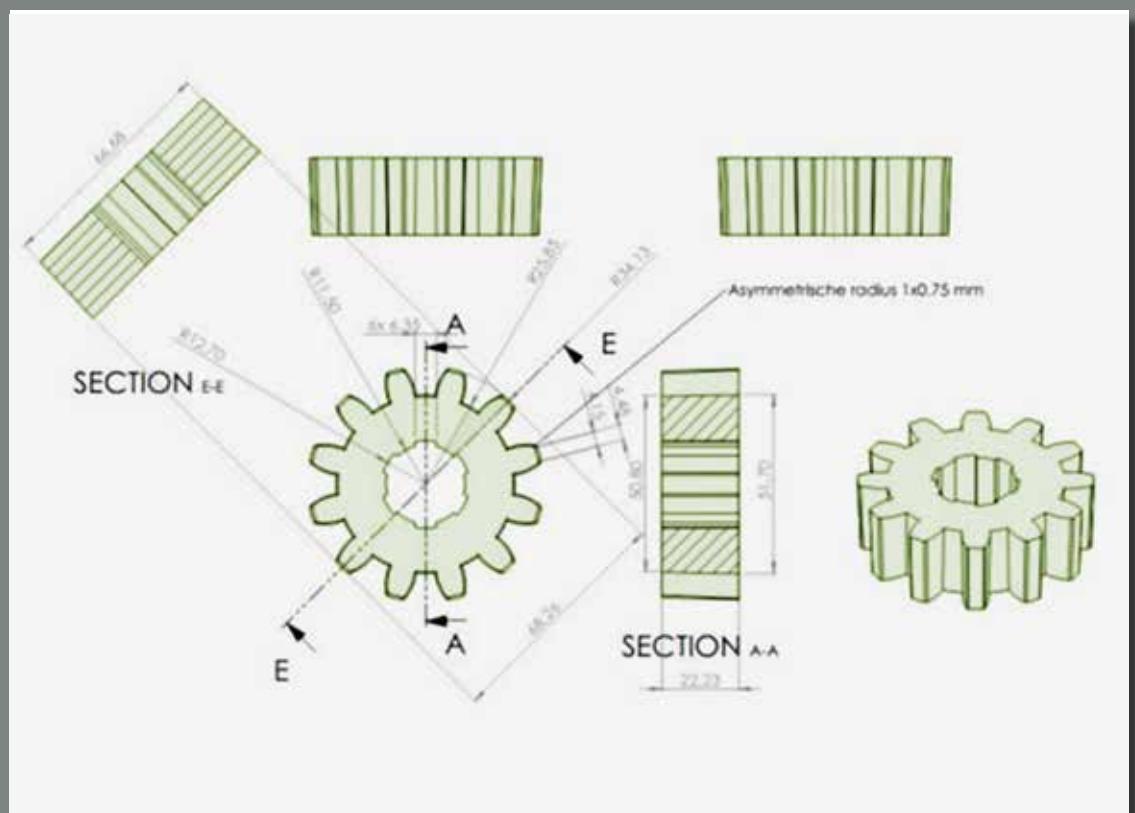








Trial fitting turret rollers and first CAD-design for reproduction



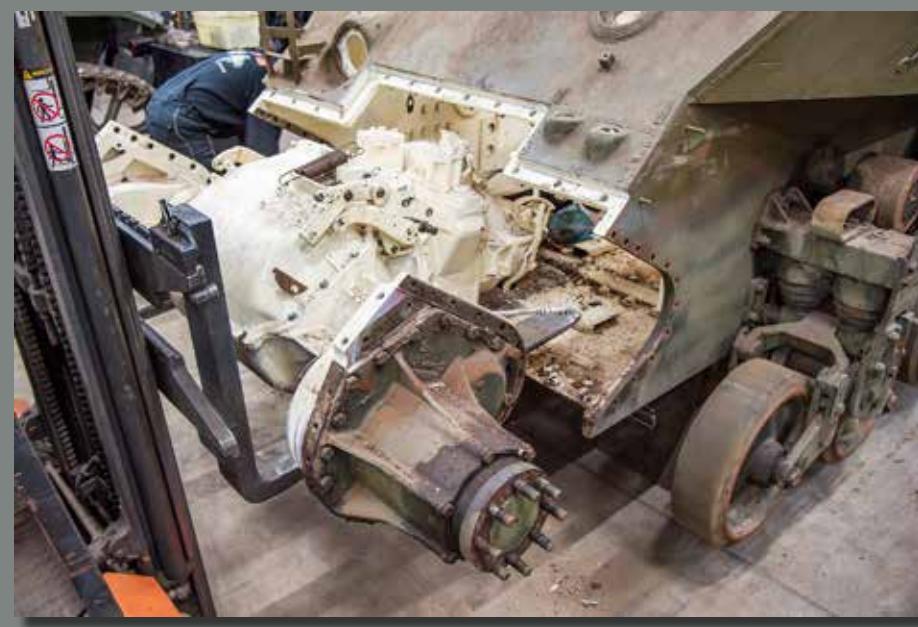




Start of dismantling the M5A1

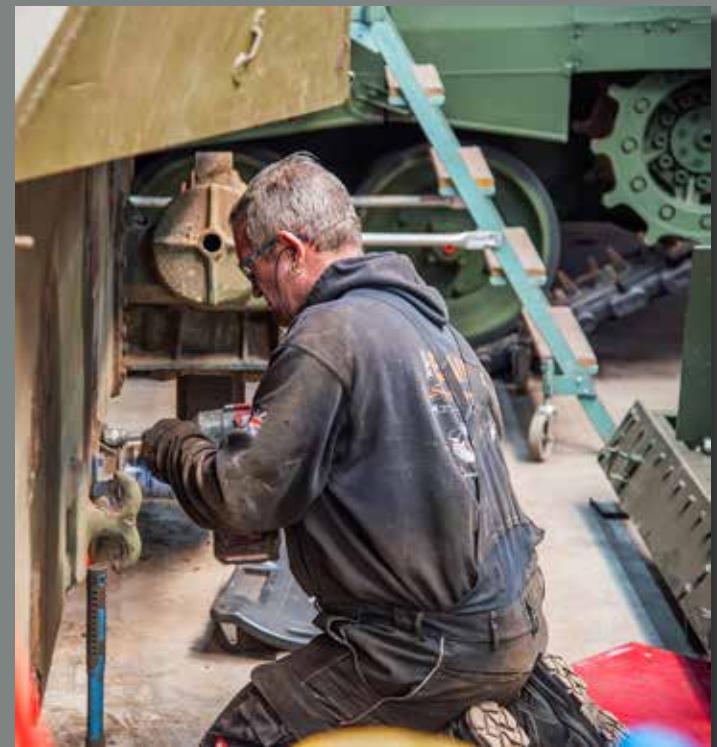




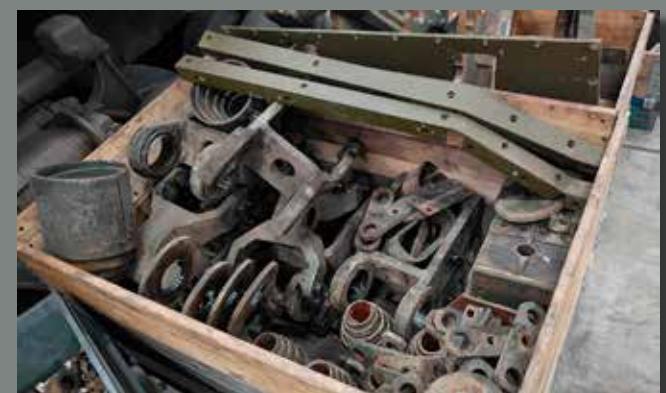








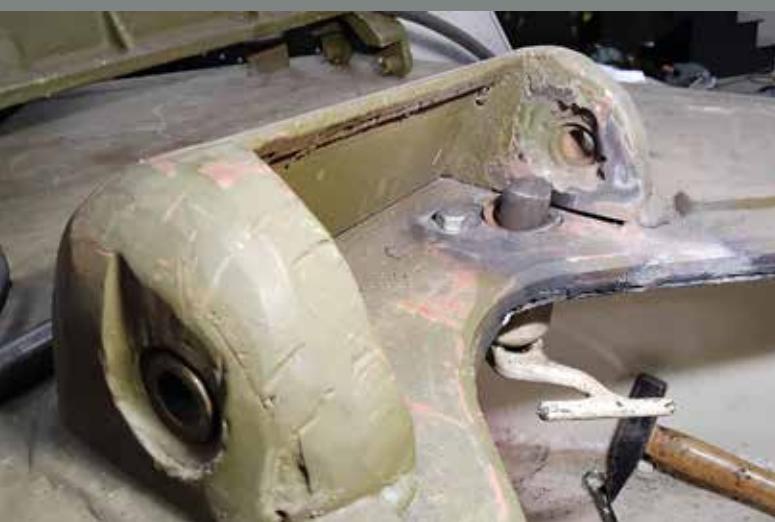
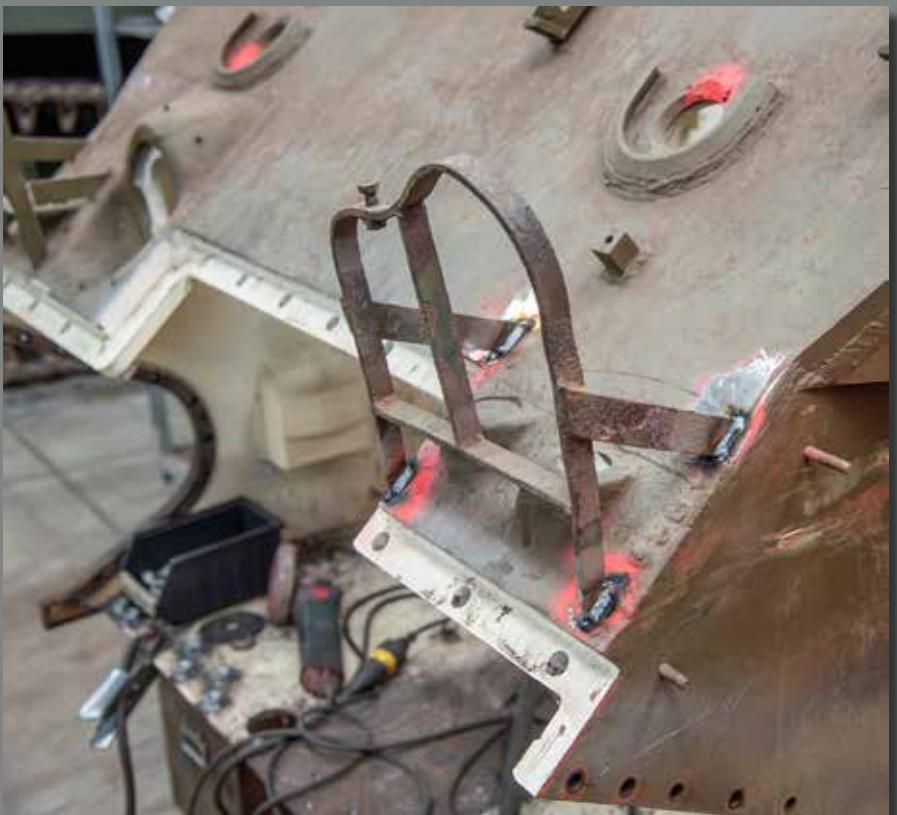


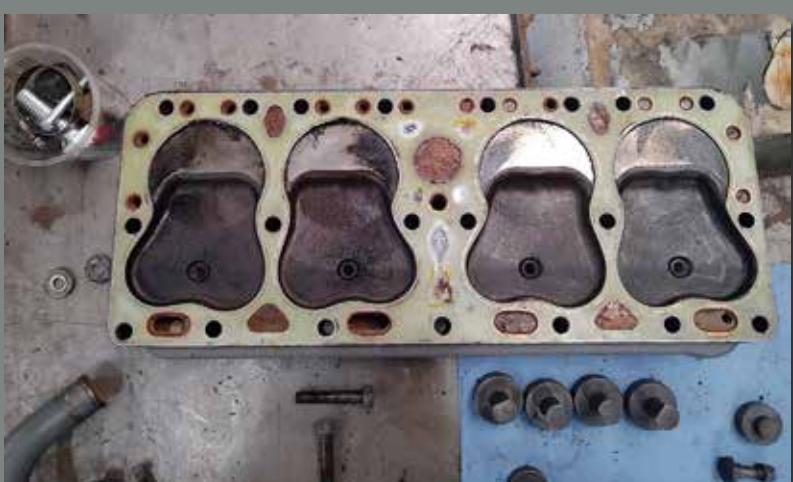


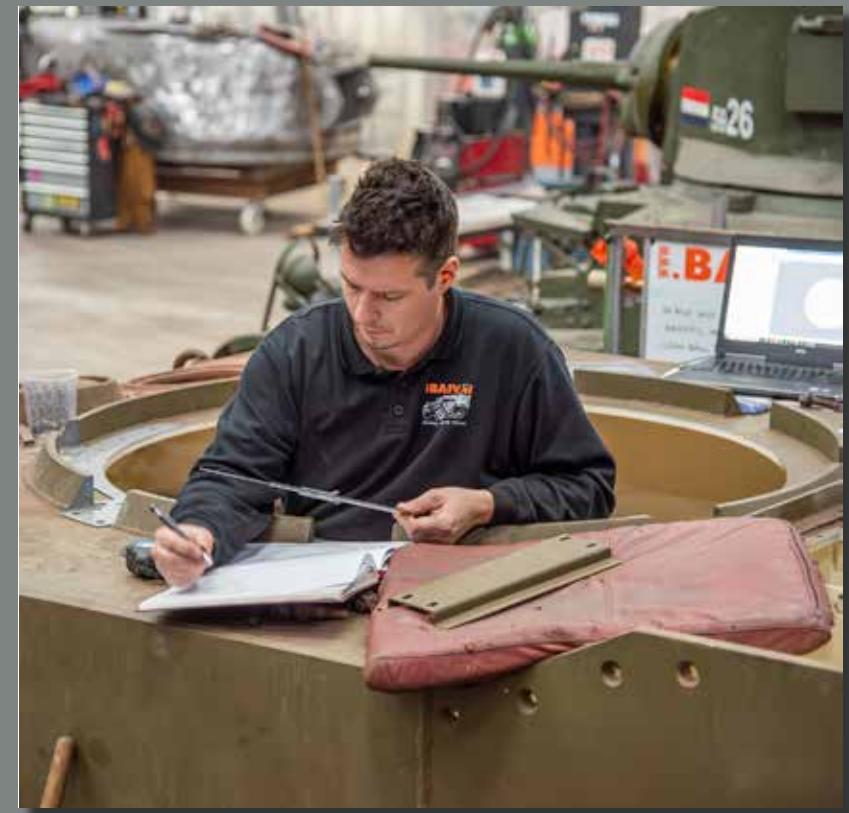


Start of the actual restoration













The upperdeck at the front needed to be realigned and rewelded, plus all blocks to guide the turret had to be grinded down to fit correctly

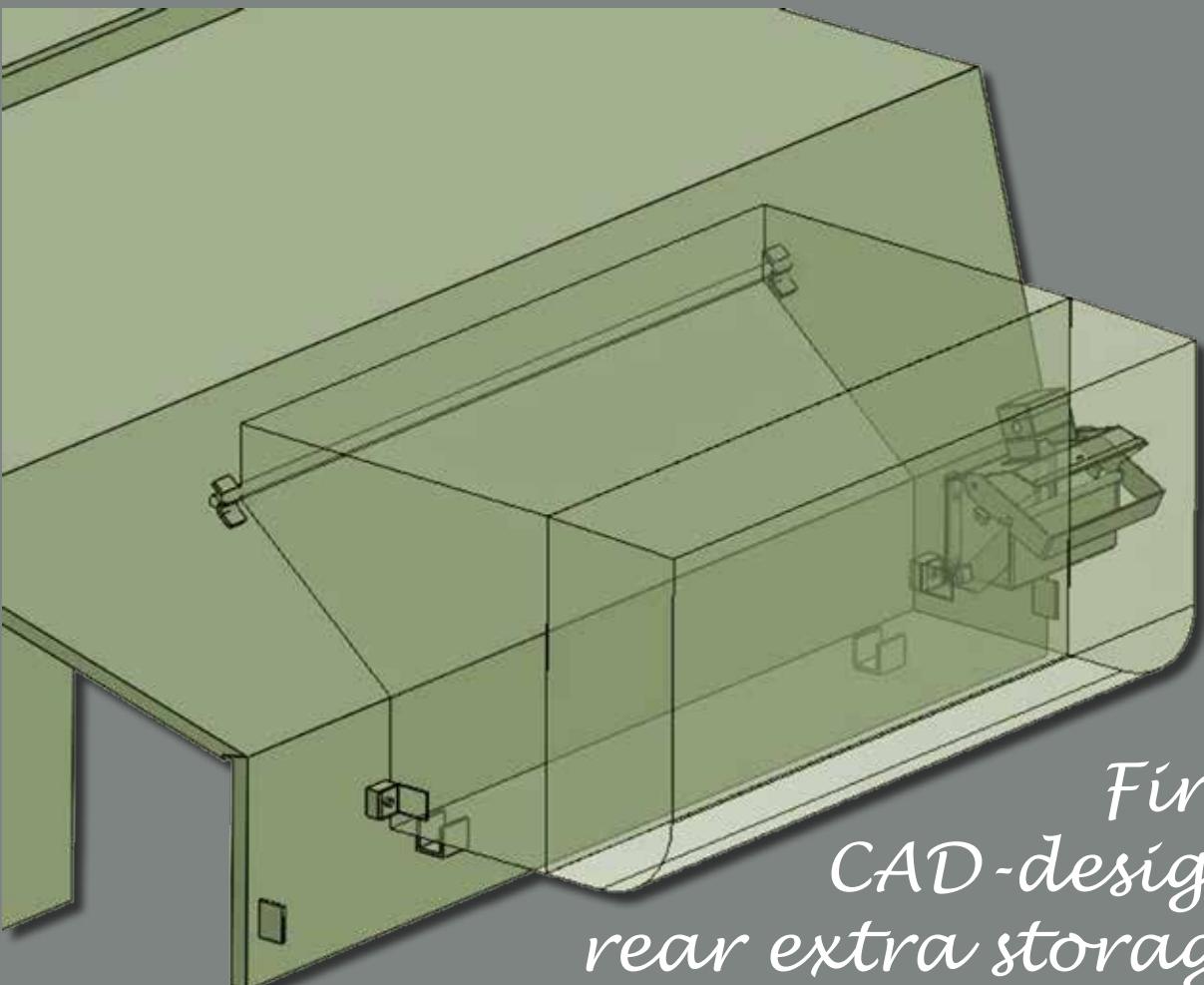




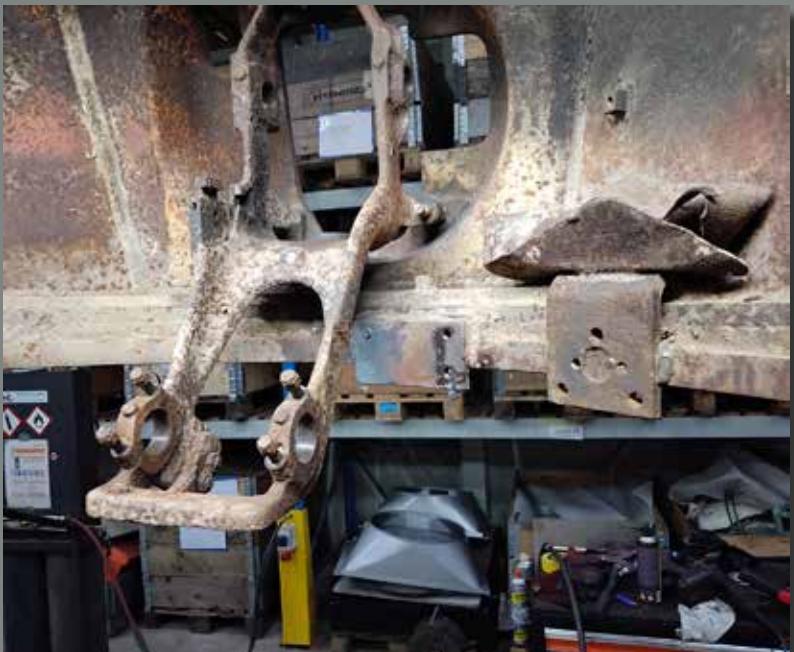
Now it runs smoothly

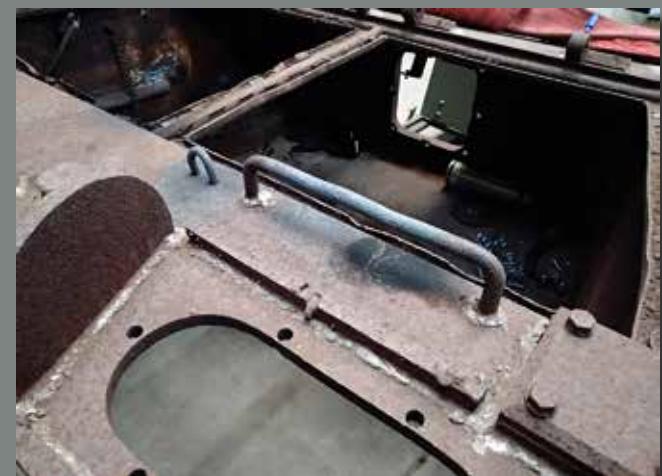




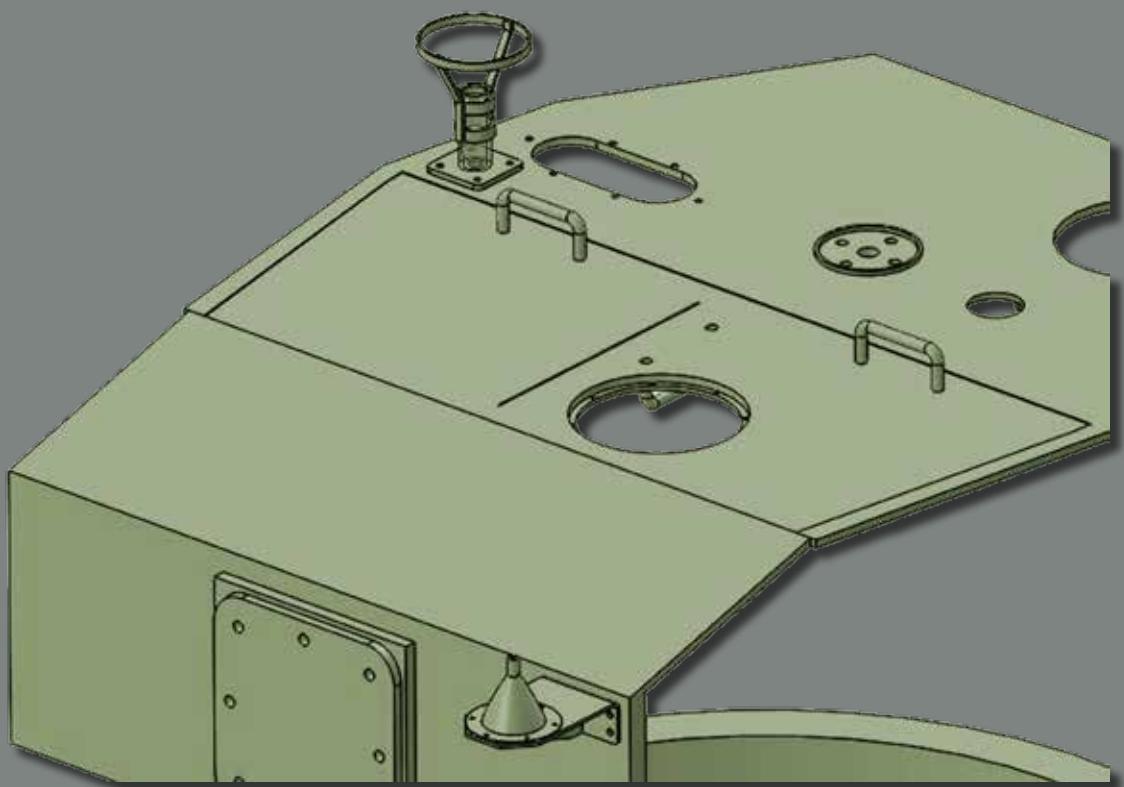


First
CAD-design
rear extra storage





*CAD-design for production
of new hatches in turret*



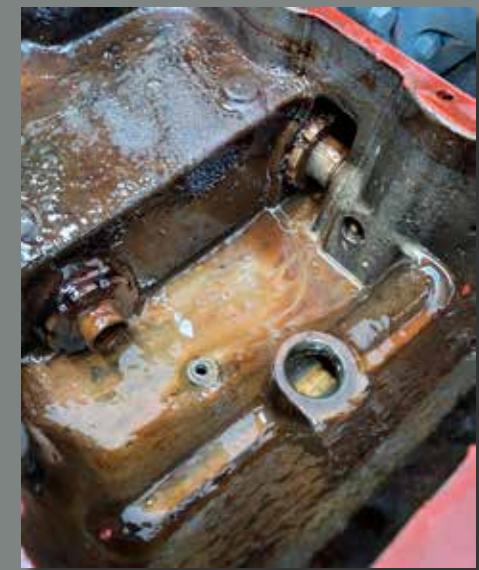


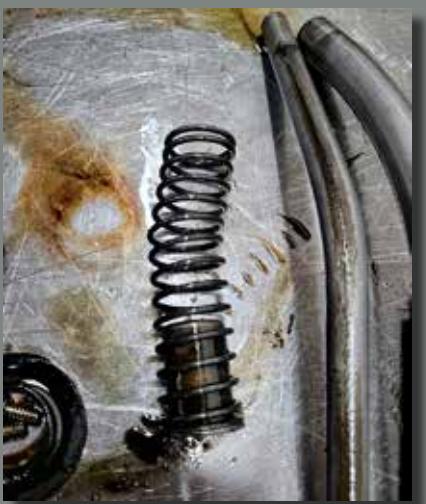


Hull and large parts go off to be blasted and set in primer

Meanwhile ...



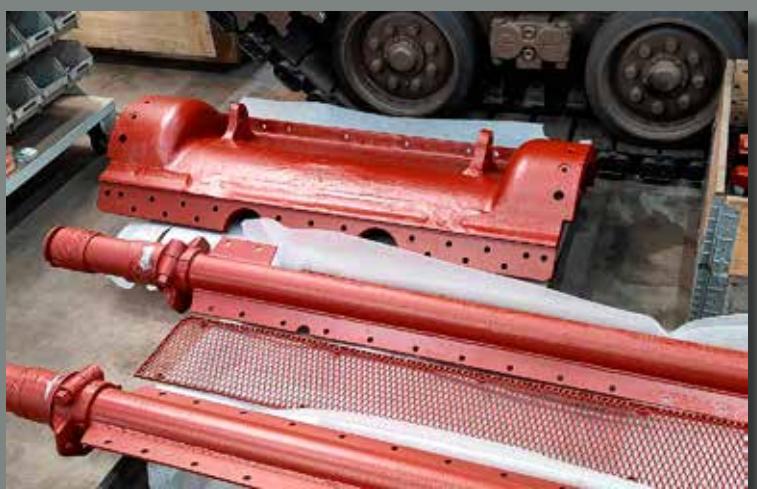


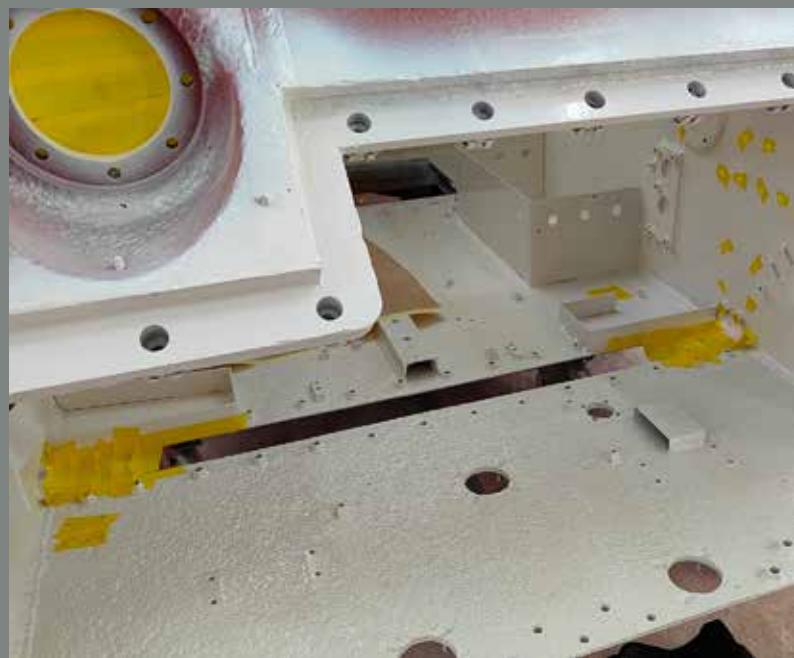


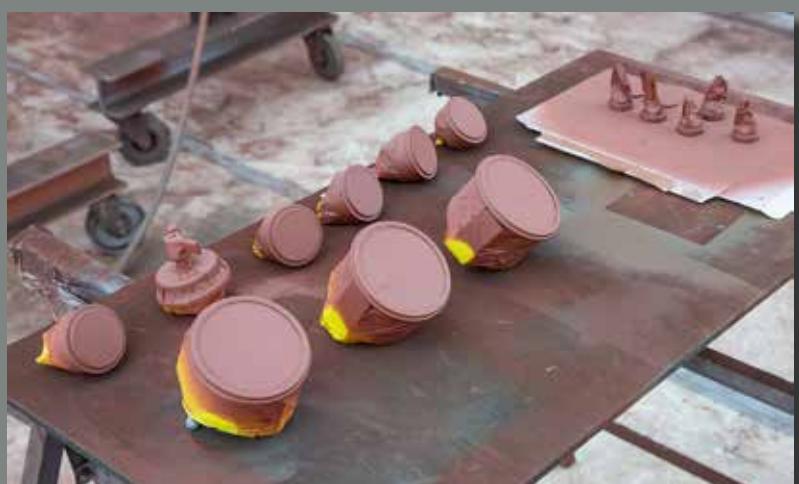
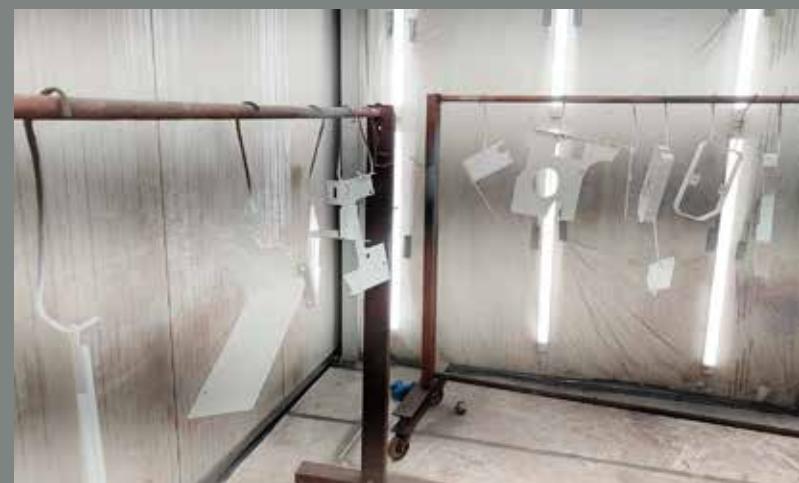


Hull and parts blasted and in the primer









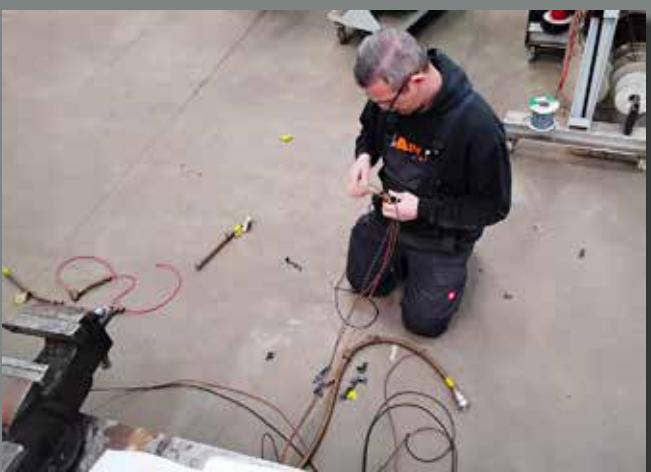
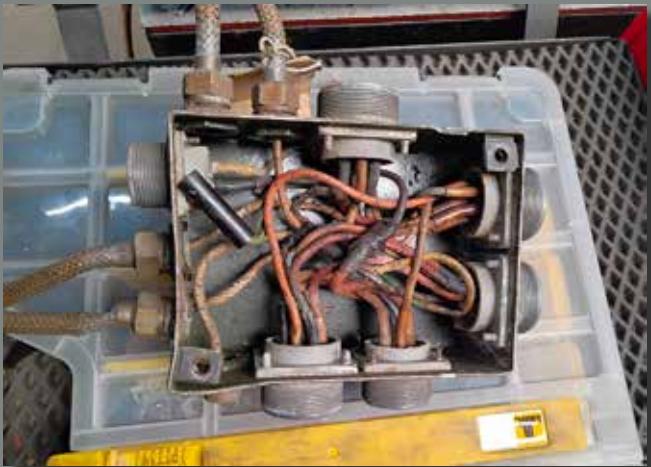


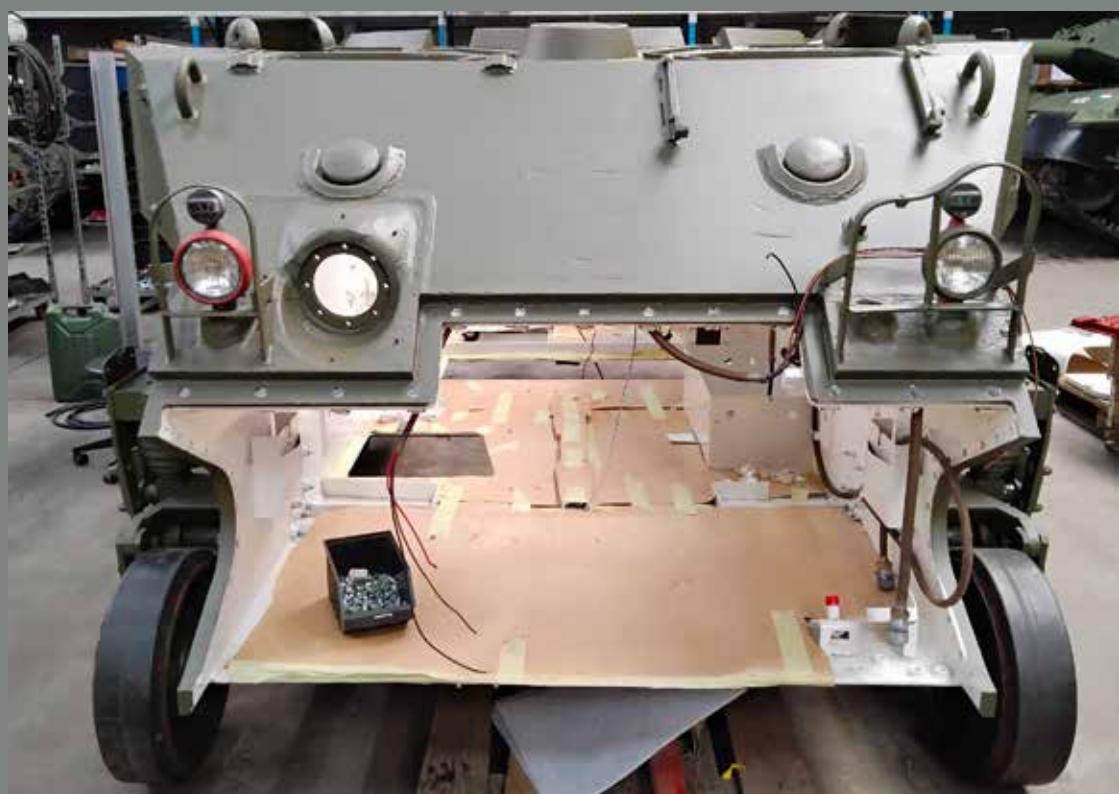
Time to build up the M5A1



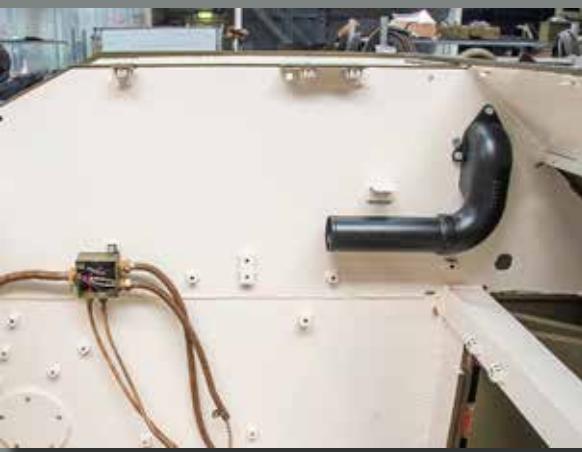
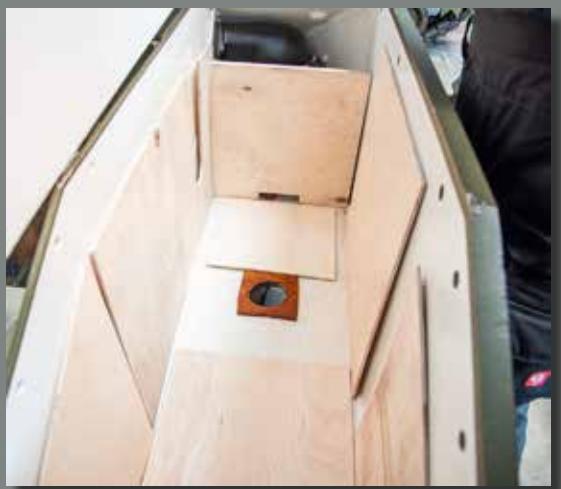


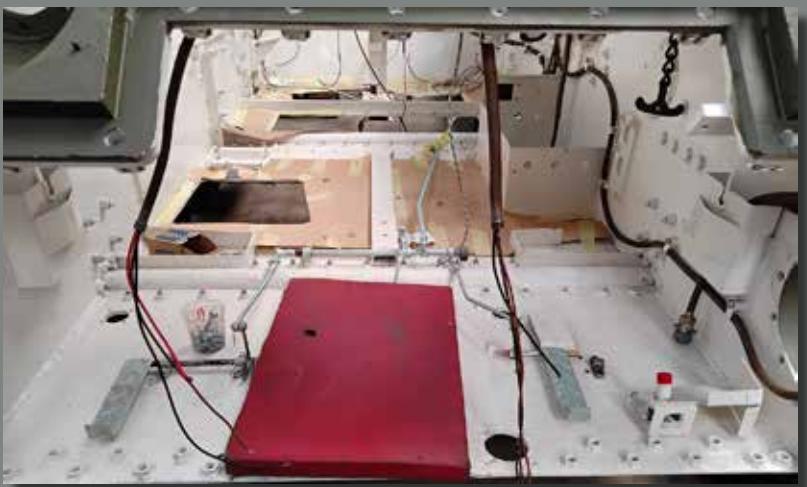
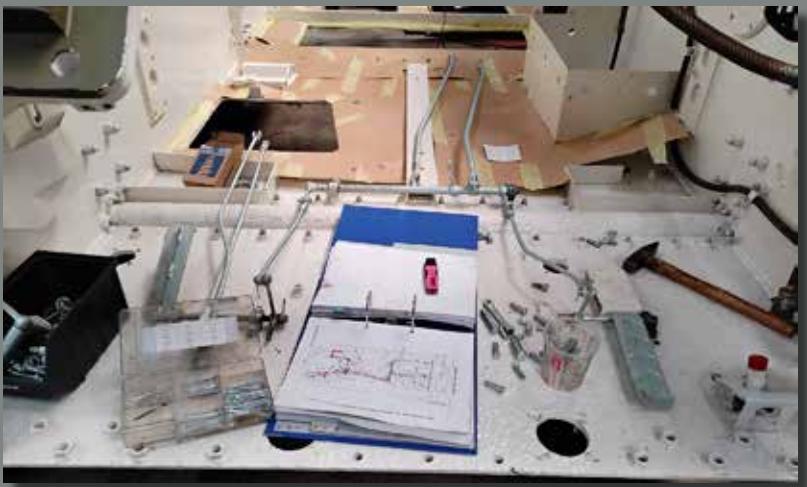


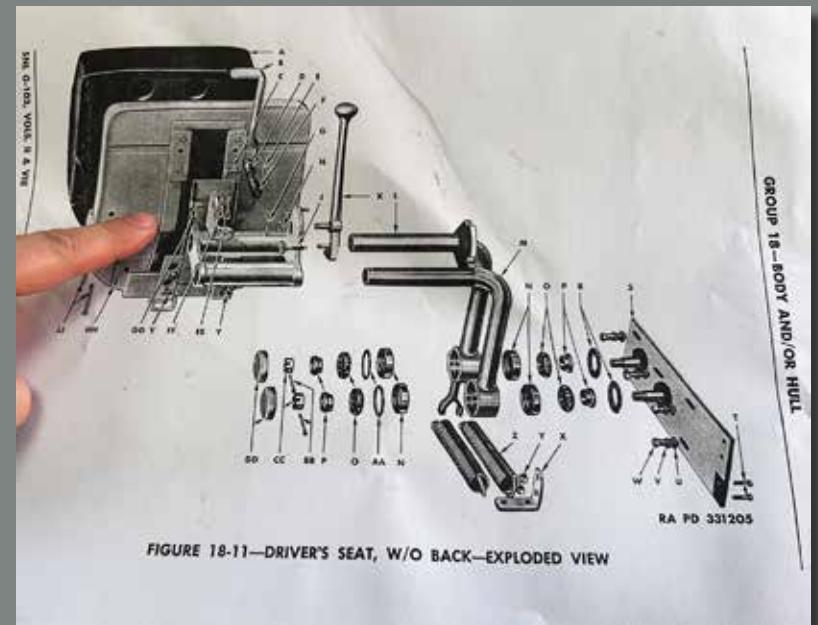


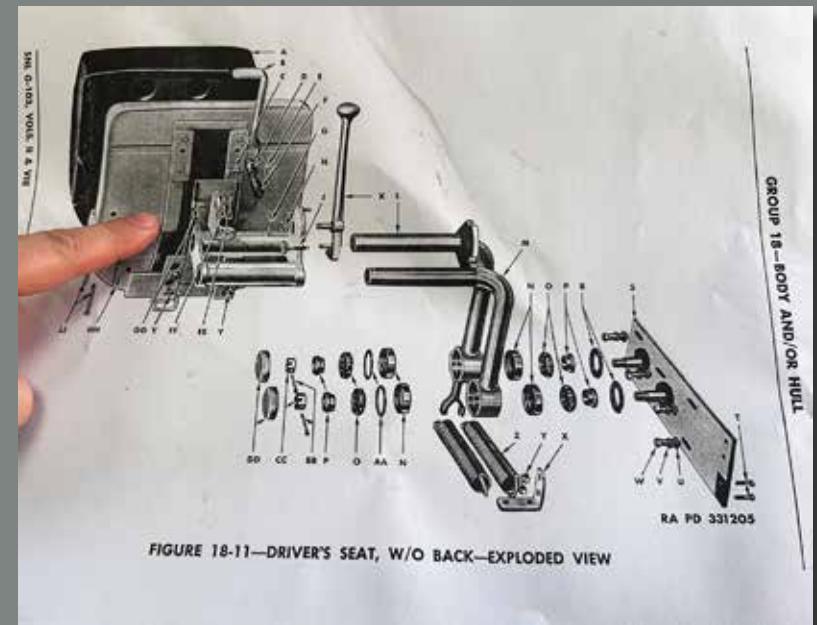


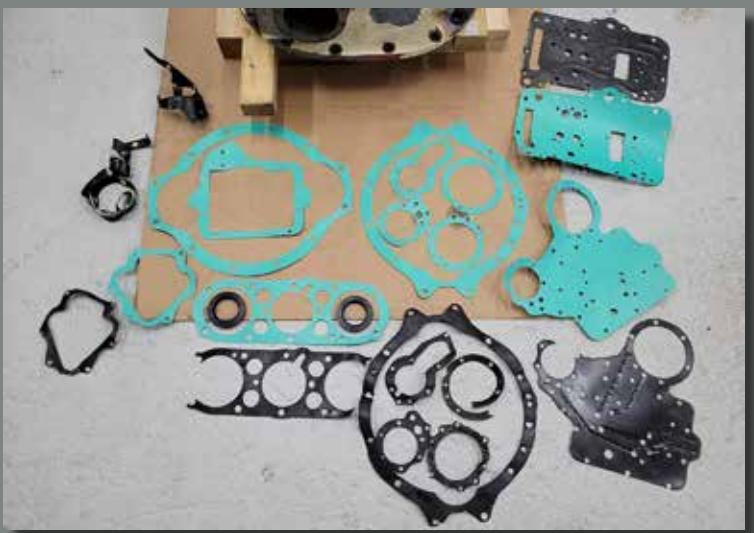
















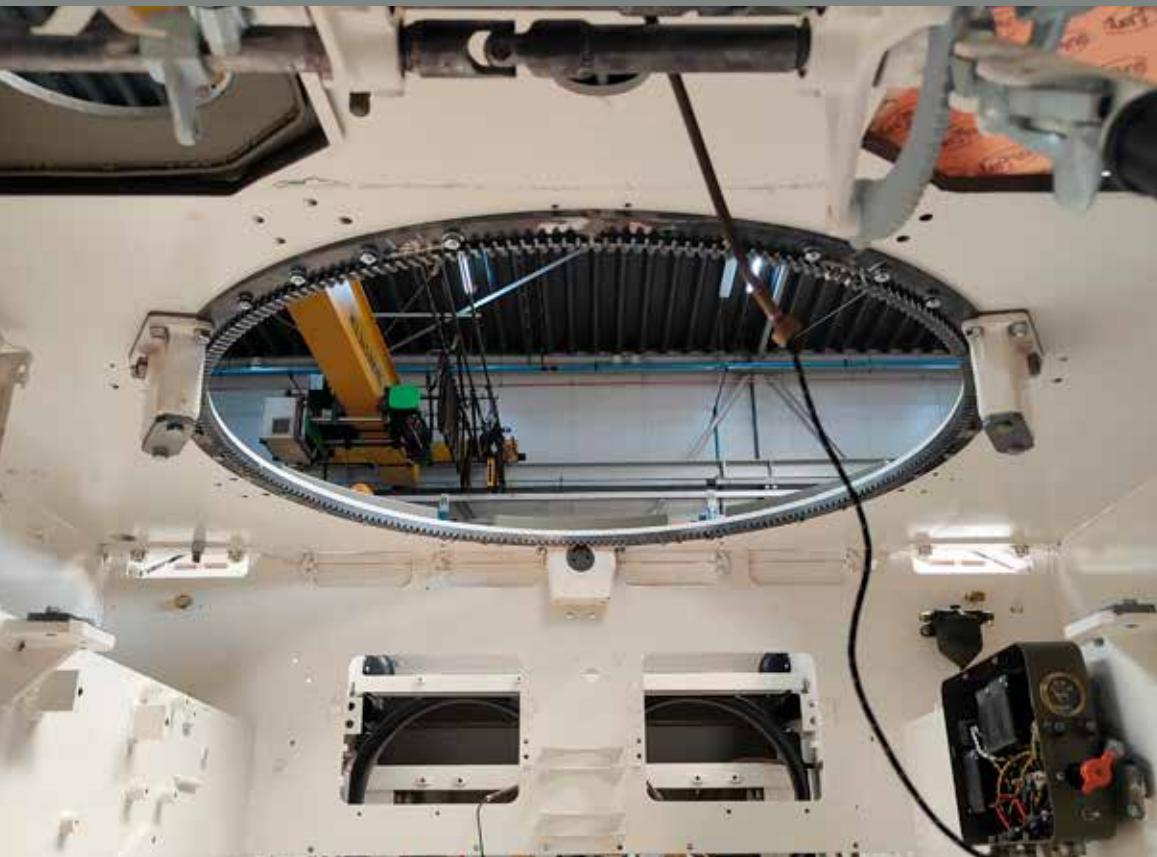






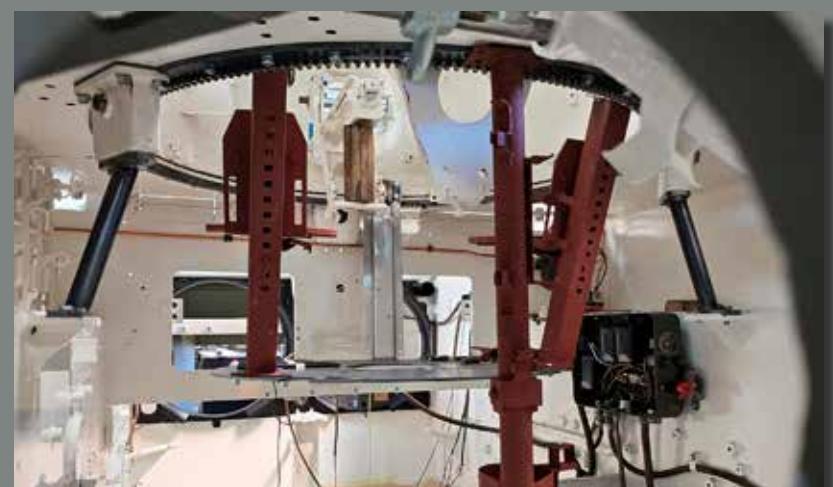


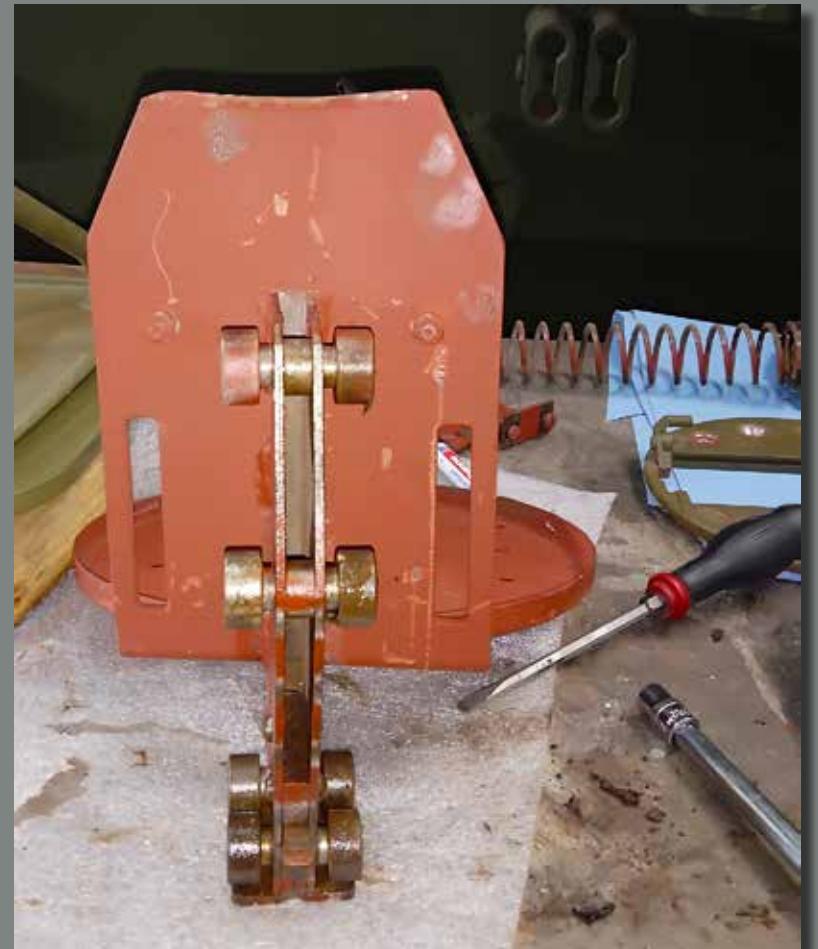
CAD-design of a new turret ring





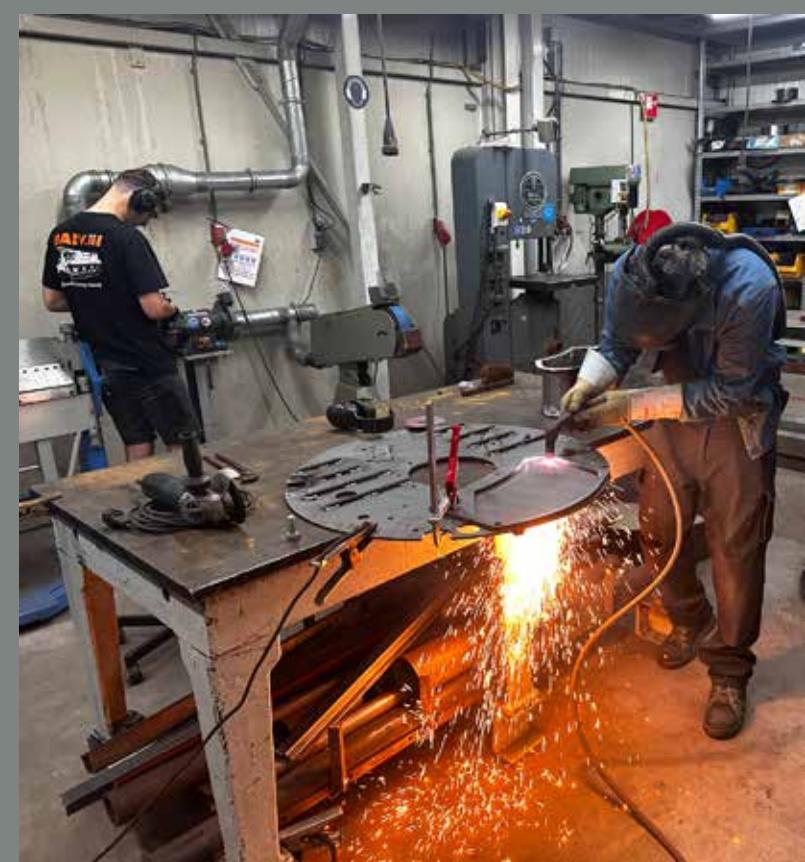
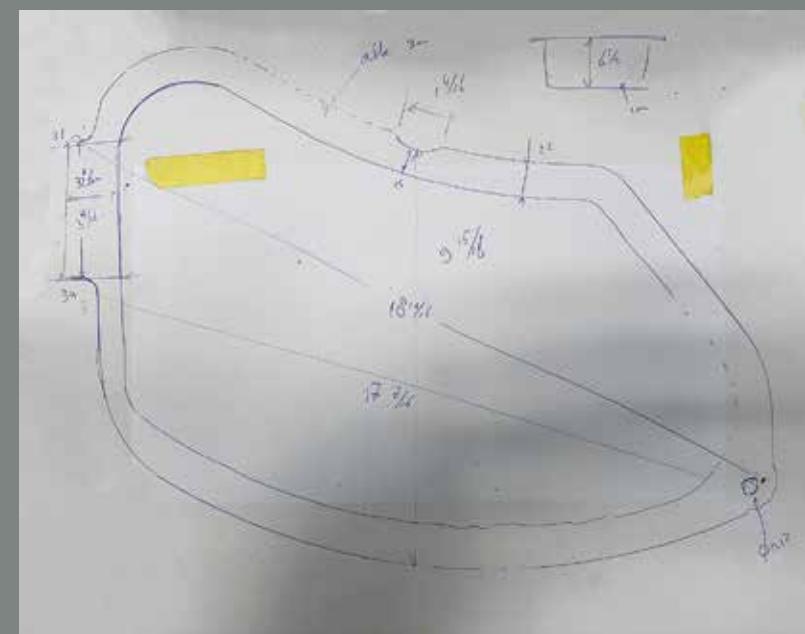
*CAD-design of
the gunner's basket
under the turret*





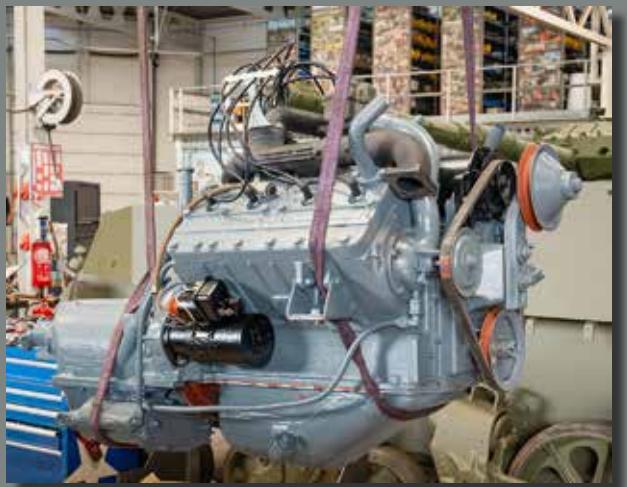


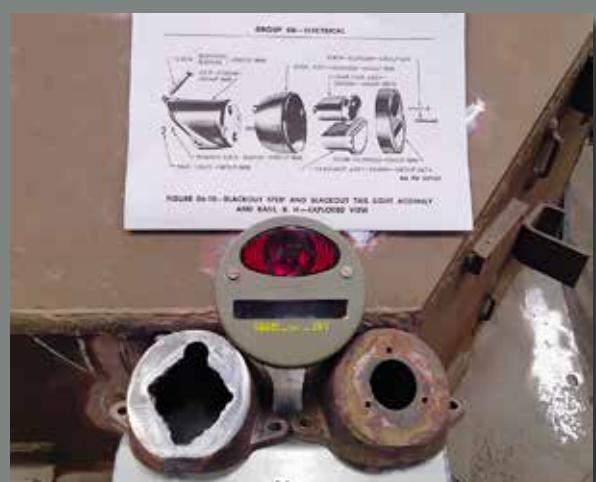
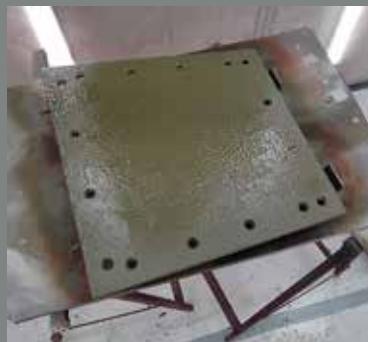
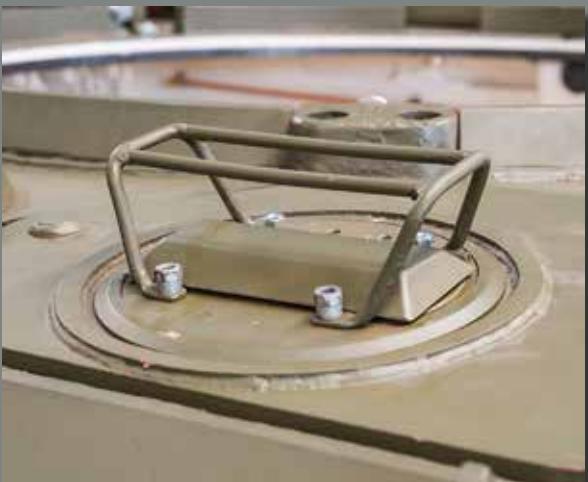
Removable steel basket under gunner's basket

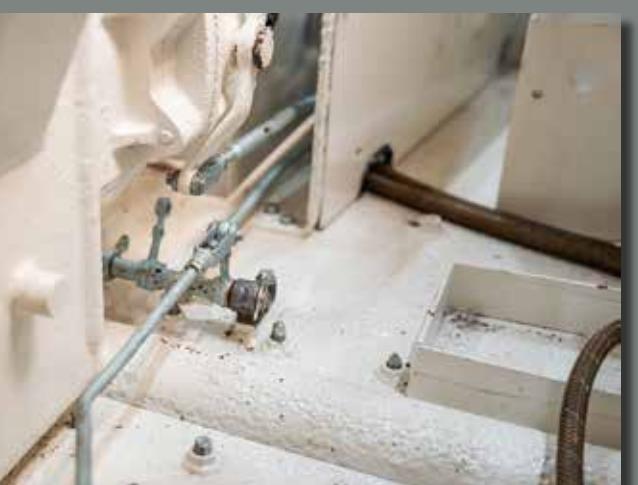


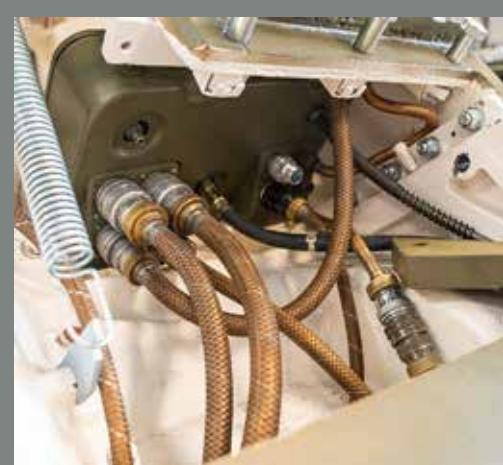
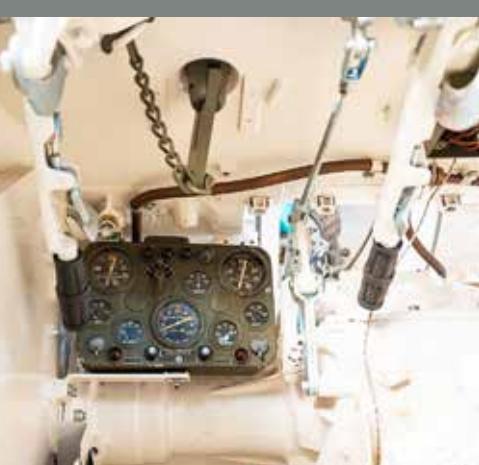
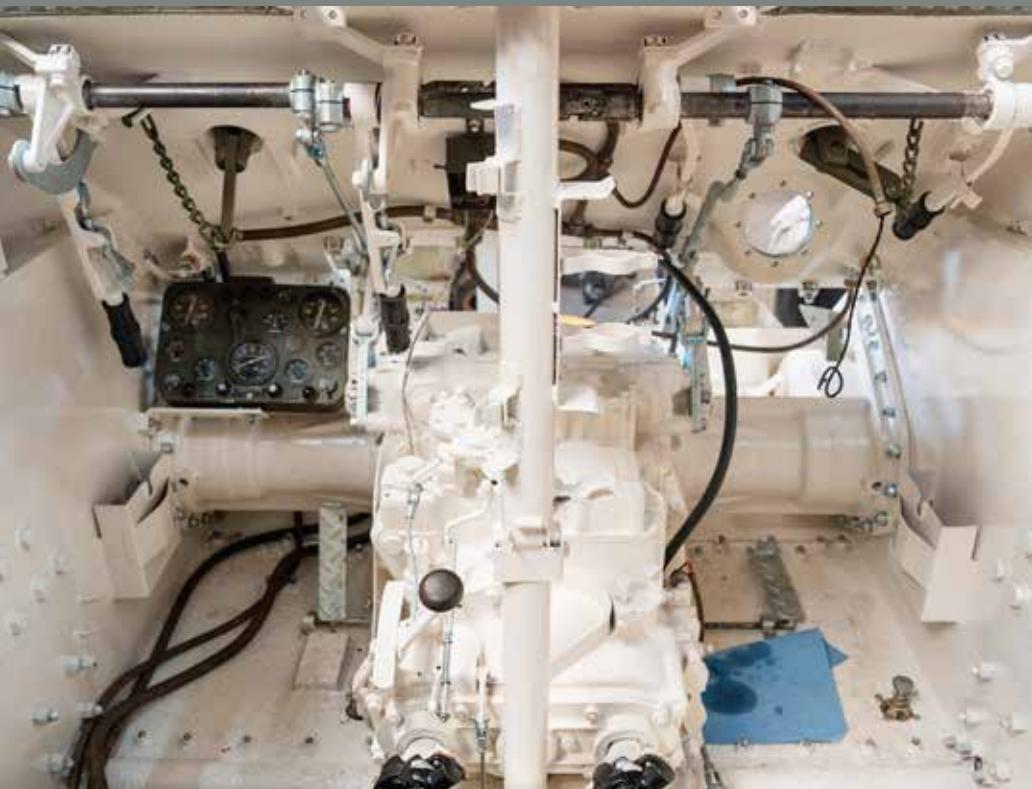


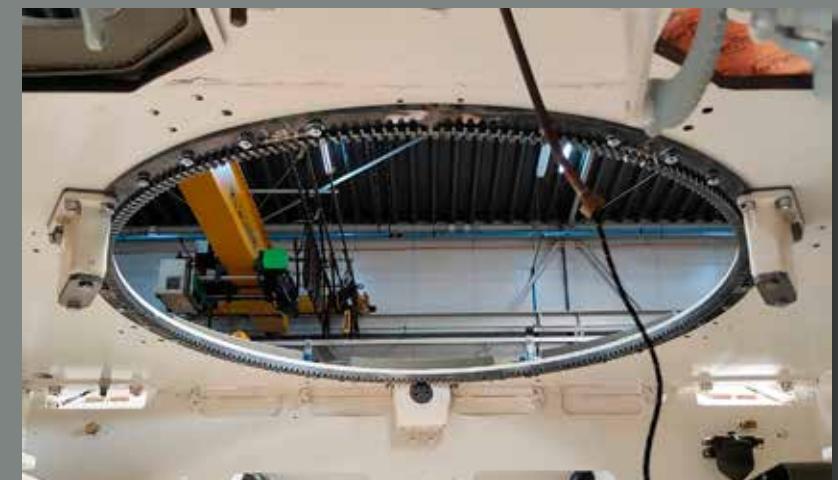


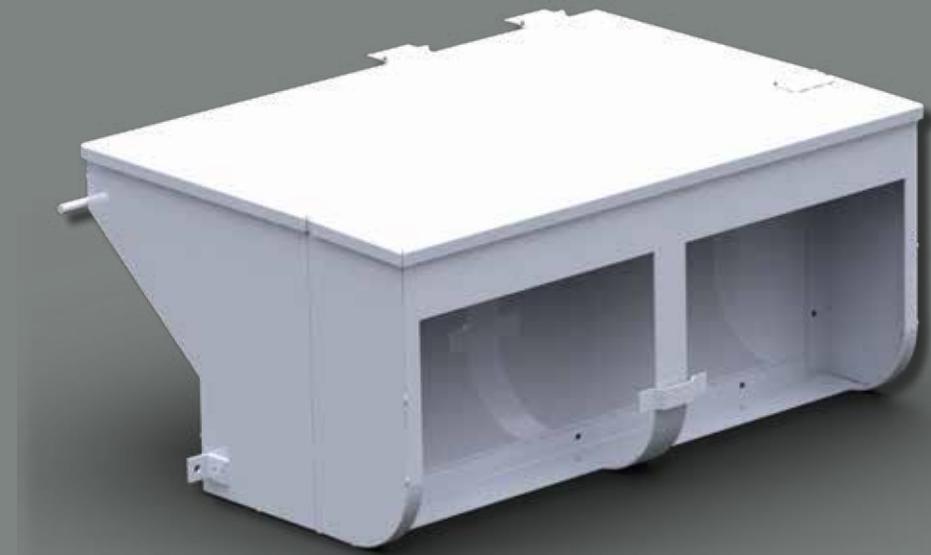
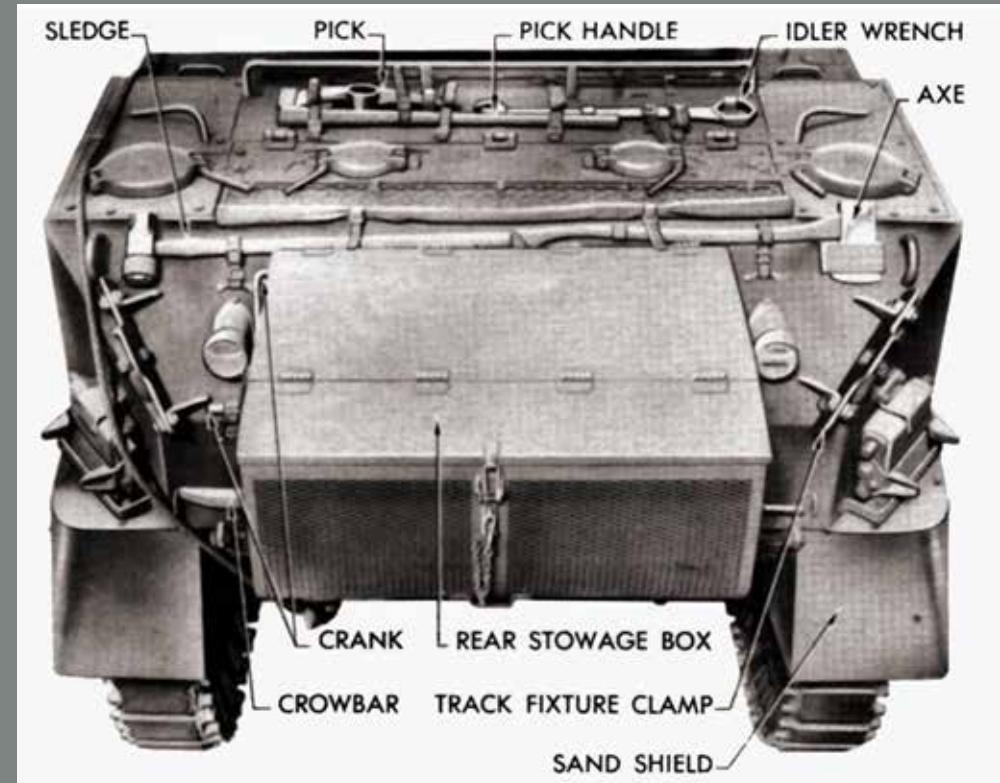












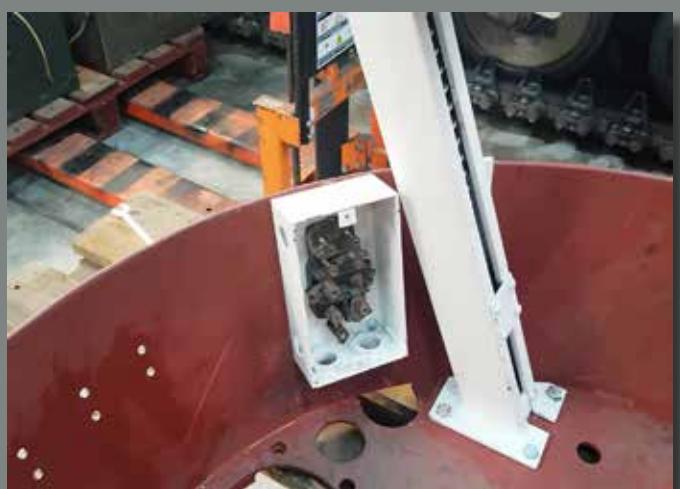
CAD-design rear storage box





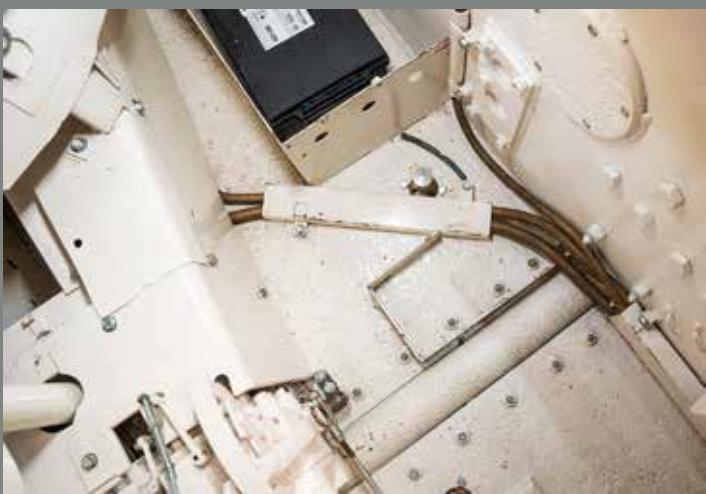




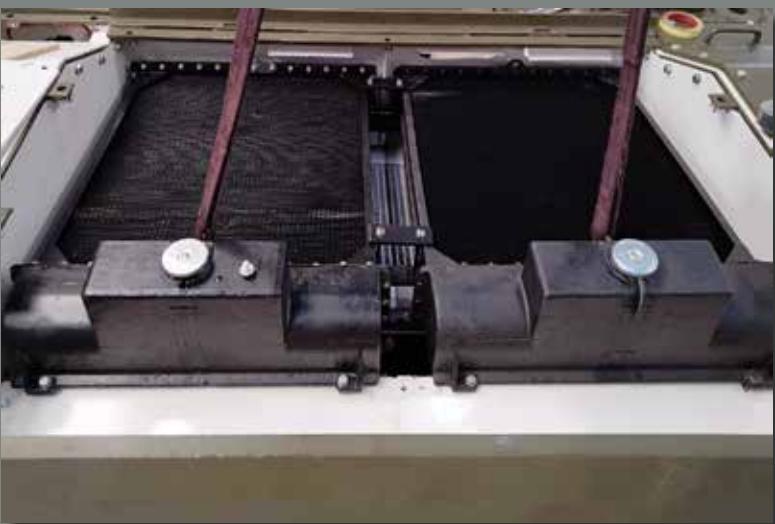
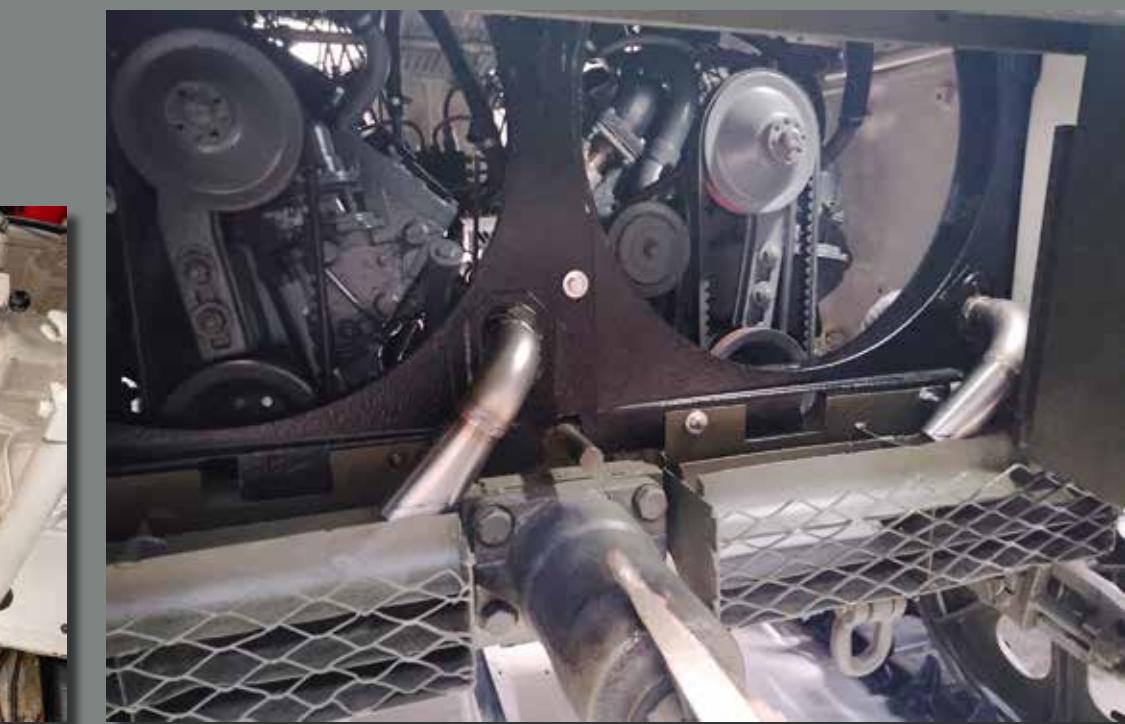


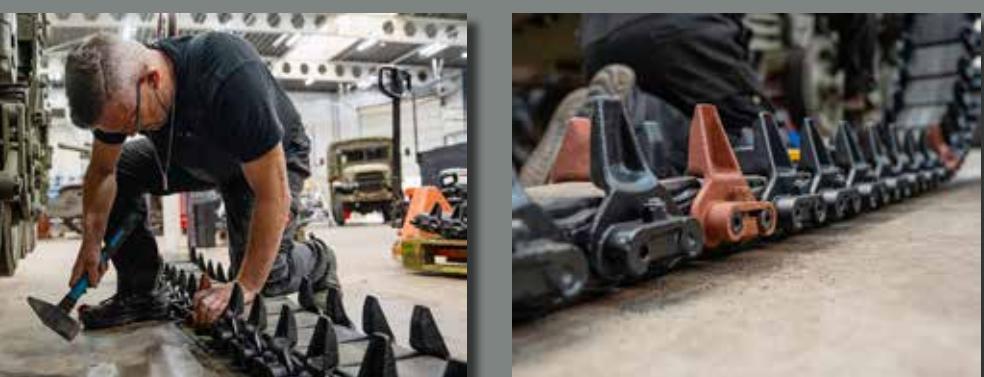












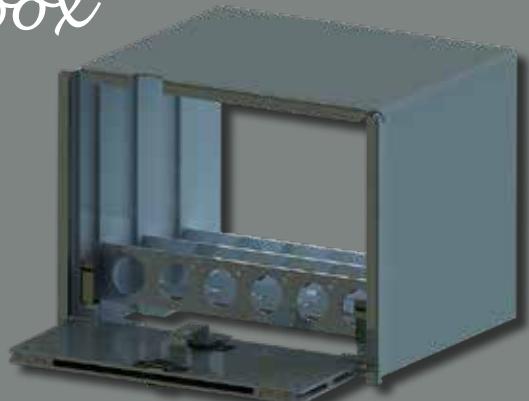




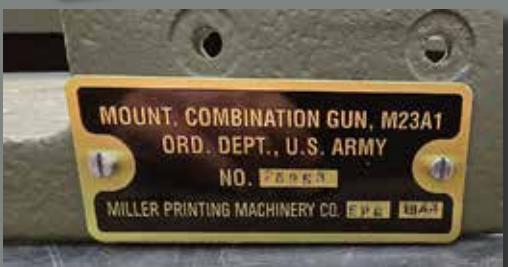


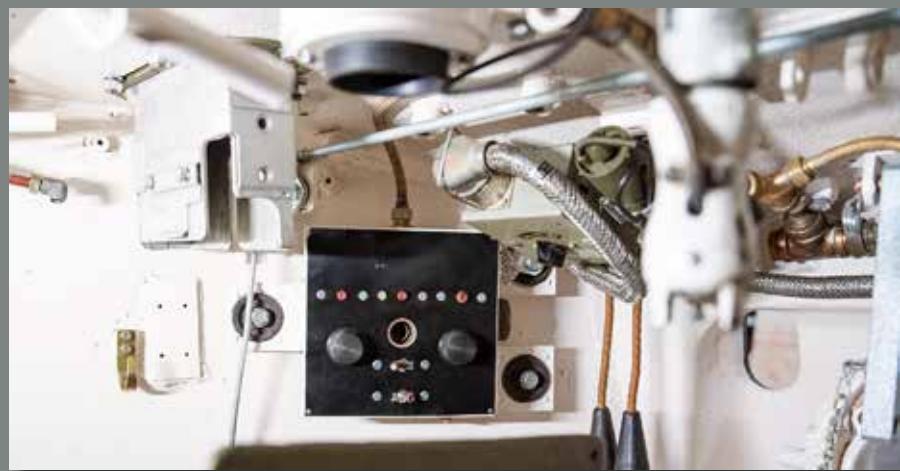
CAD-design for reproduction of grenade holders in turret basket

CAD-design for reproduction of ammunition box









*CAD-design
knob of Gyro
system of gun*





*CAD-design for reproduction
of 30. gun mechanism*



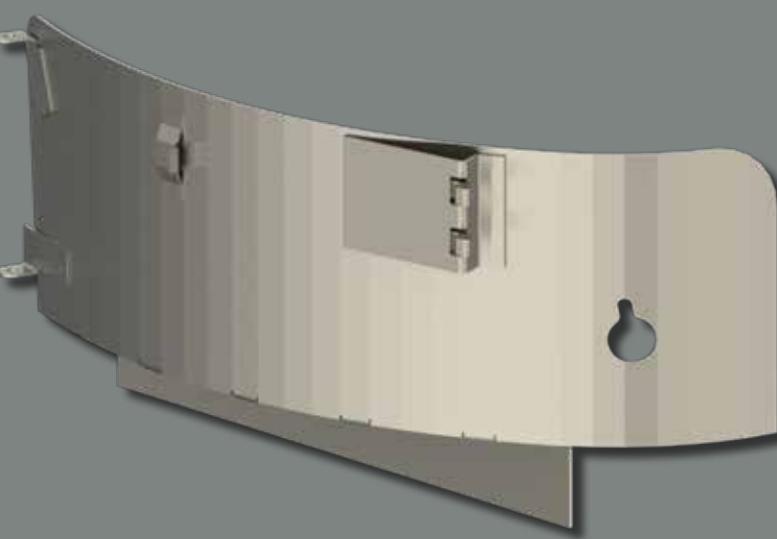
*Special
data plates*



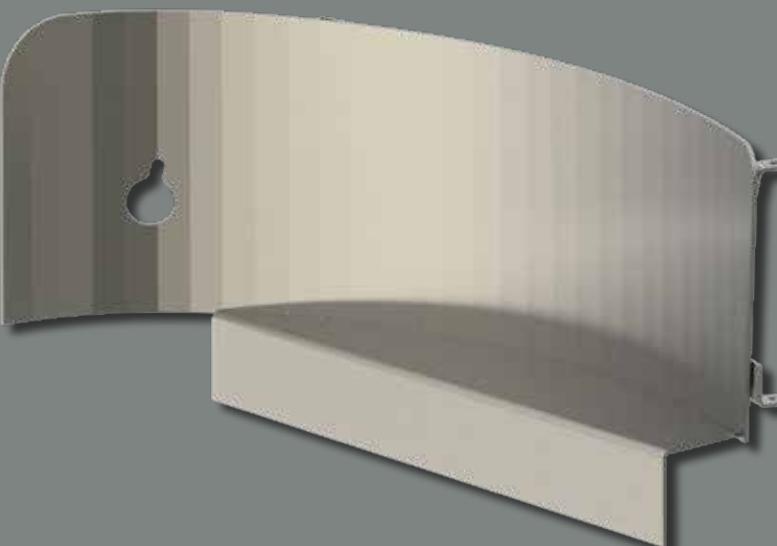


*CAD-design
of lock
hatches of
driver and
co-driver*

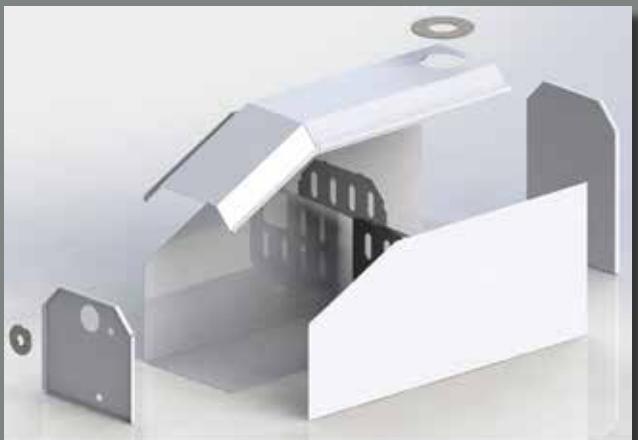




*CAD-design of
the other
turret basket shield*

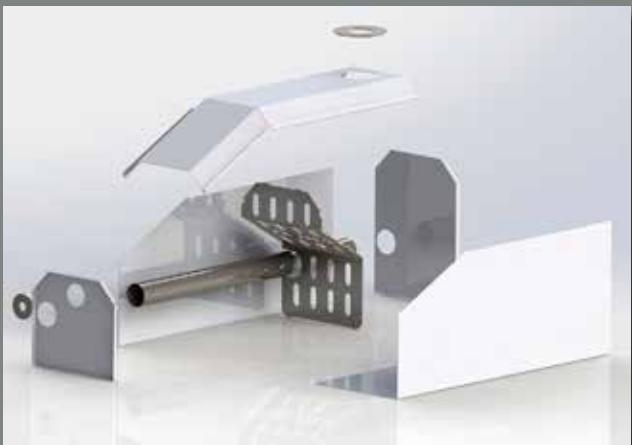






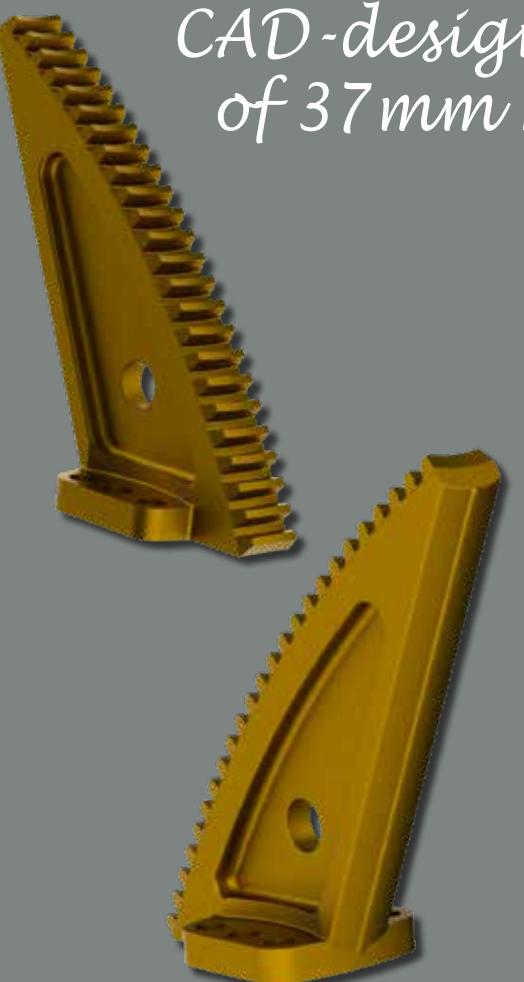
CAD-design of the right fuel tank







*CAD-design of elevation gear
of 37mm M6 A1 gun*



*CAD-design of
traverse control
box*

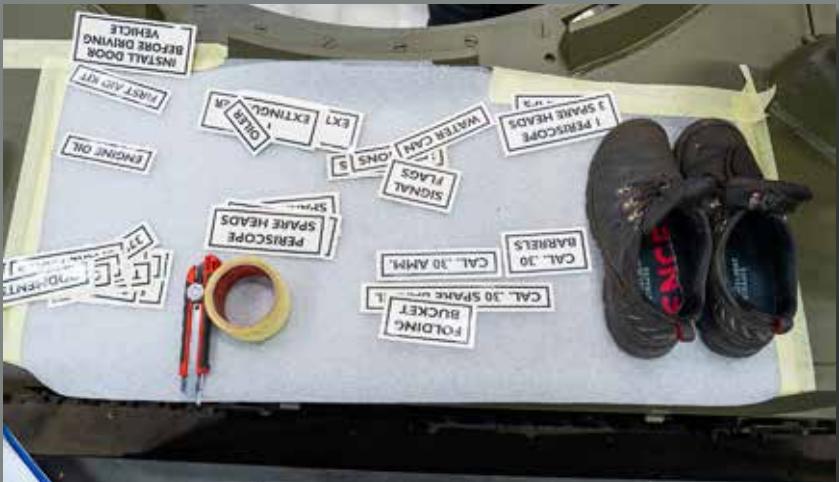


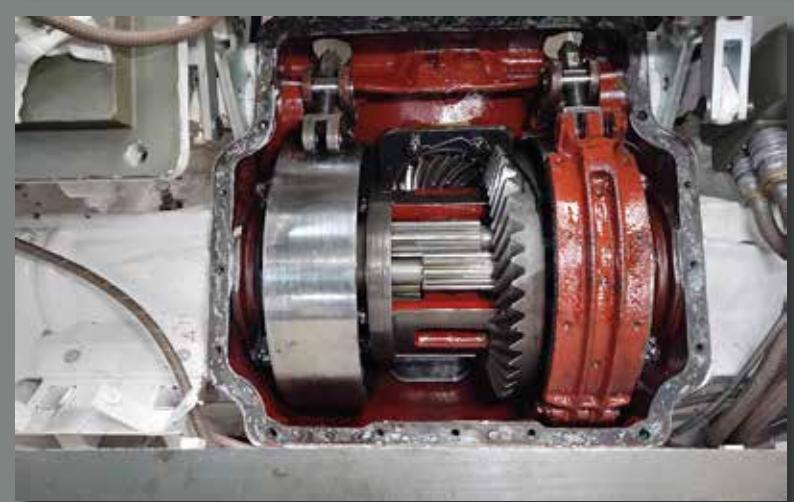
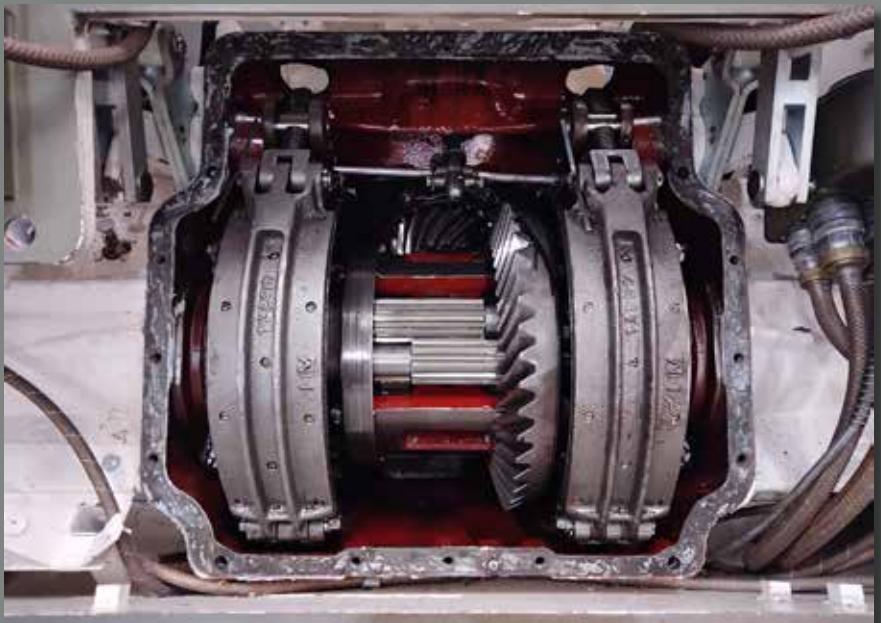


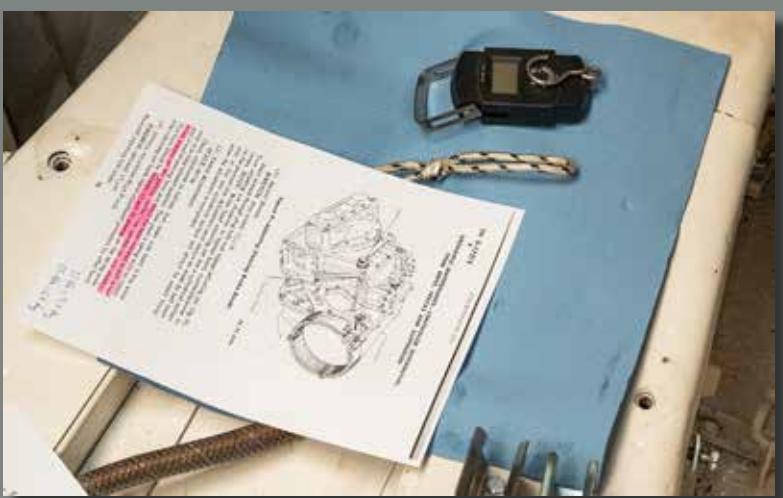
*CAD-design of cover
of siren*



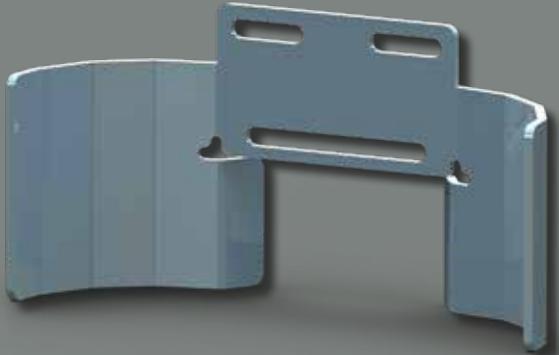








CAD-design protection pad gunners periscope











Restoration of M5A1 Stuart Light Tank



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