



LYNX INFANTRY FIGHTING VEHICLE





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Lynx Infantry Fighting Vehicle

AT ITS CORE, the Rheinmetall Lynx concept comprises a highly-protected tracked armoured vehicle that fills a gap identified in the market for an affordable, highly capable family of vehicles in the 30 to 45 tonne weight class.

The Lynx family is broken down into two vehicle classes: the Lynx Kettenfahrzeug (KF) 31 in the 30-40 tonne class and the Lynx KF 41 in the 40+ tonne class. A unique feature of the family is that the Lynx KF 41 can be configured to carry eight dismounts and a two-man medium calibre turret for use in the infantry fighting vehicle role (IFV).

This requirement for an eight dismount IFV – which is common to a number of armies – cannot be met by current, high-cost IFV designs.

In addition to the eight dismount capacity, the Lynx family of vehicles is at the vanguard of a new trend in IFV design toward armoured vehicles with lower unit and through-life costs and reduced complexity.

To this end, one of the key principles of the Lynx concept is the integration of proven sub-systems with high Technology Readiness Levels that reduce development time, cost and technical risk.

The Lynx KF 41 IFV is designed for a crew of three and eight infantry dismounts. The Direct Fire High Survivability Lift (DFHSL) variants include a two-man Lance turret fitted with the Rheinmetall MK30-2/ABM (air burst munition) 30mm cannon main armament which can fire conventional and programmable 30x173mm rounds, a 7.62mm co-axial machine gun and obscurant launchers. The Lance turret's hunter-killer

ABOVE: Lynx takes a new approach to design engineering that reduces acquisition and through-life costs. All Images: Rheinmetall

functionality allows for the rapid engagement of multiple targets within a very short time. The turret crew can also perform killer-killer functions with the addition of a roof-mounted remotely-controlled weapon.

The killer-killer functionality is unique to Lance when fitted with the optional Main Sensor Slaved Armament (MSSA) which works in conjunction with the commander's panoramic sight. This killer-killer functionality is vital in urban terrain and allows the commander to protect the vehicle from attack using the independent MSSA, while the gunner provides continuous fire support to the dismounts. An unmanned Lance turret and/or 35mm cannon main armament can also be offered as options.

The ballistic armour of the Lynx IFV is designed to provide protection against a full spectrum of threats including medium calibre weapons, artillery fragments, mine blast, improvised explosive devices (IED) and bomblets. The mine protection is highly effective against heavy blast mines, explosively formed projectile mines and IEDs. Protection against hand-held anti-armour weapons and anti-tank guided missiles (ATGM) is offered as an option when fitted with Rheinmetall's Active Defence System (ADS).

A variety of the latest generation optical and opto-electronic vision devices provides the crew with automatic 360° surveillance, detection, recognition and identification of targets at long ranges.

The commander, gunner and driver have hatches immediately above their stations for optimal situational awareness, ingress and egress. Normally however, the crew enters and exits the vehicle via the hydraulically-operated rear ramp. In addition to the rear ramp, there is a roof hatch at the rear of the crew compartment large enough to enable two soldiers to maintain watch or to act as an emergency egress point.

DESIGN CONCEPT

The feature at the heart of the Lynx design concept is the separation and modularity of the vehicle into two primary parts: the Base Vehicle and specialist Mission Kits. This design approach provides significant tactical and logistics advantages as well as cost efficiencies in production.

The Base Vehicle comprises the hull and mobility assemblies and protection components that are common for all variants. The Base Vehicle is then fitted with the required Mission Kit to produce a specific variant. The Mission Kit consists of a specific roof, all specialised installations and equipment. Integration of both parts is undertaken during manufacture.

This design approach combines the functional and through-life advantages of a modular structure like that of the Boxer 8x8 and the weight, space and cost advantages of a monocoque hull design.

BASE VEHICLE DESCRIPTION

The Lynx Base Vehicle has a powerpack in the front of the hull delivering 560kW (750hp) for the Lynx KF 31 and around 800kW (1,050hp) of power for the Lynx KF 41. The final drives are mounted in the front and the idler sprockets with track tensioners are mounted at the rear. The running gear has six road wheel stations per side, which guide a lightweight end connector track. The road wheels are mounted on a well proven suspension system comprising swing arms with conventional torsion bars and damper systems which are both reliable and cost-efficient. The hull of the Base Vehicle has no roof.

The driver is placed on the left front side of the chassis, offering excellent front and side vision above the hatch and as well by periscopes.

The crew compartment is designed as a mission neutral space with the incorporation of C-rails and a pattern of universal fixing points on the walls and floor. This provides a flexible configuration for all mission specific equipment.

The engine cooling system consists of two coolers on the left and right rear sponsons. This provides the lowest possible infra-red (IR) signature, optimal ballistic protection and a well-balanced centre-of-gravity. The rear ramp for rapid ingress/egress of dismounts is positioned between the cooling systems.

The heating, cooling and nuclear, biological and chemical



ABOVE: All Lynx variants share a common Base Vehicle.

filtration system is combined in an environmental control system stowed in the left sponson in front of the cooling system. Air ducts lead to the floor and to an air duct interface on the top end of the Base Vehicle hull.

Appliqué armour is also included in the Base Vehicle and Mission Kit parts. The appliqué armour is designed to ensure the Mission Kit armour overlaps the Base Vehicle armour so that there are no ballistic gaps. The chassis is equipped with mine protection and IED protection.

MISSION KIT DESCRIPTION

The Lynx includes a Mission Kit that is designed specifically for the intended roles and fitted to the Base Vehicle to form a Mission System variant. For Phase 3 of the Land 400 program, Rheinmetall has designed eight discrete Mission Kits to comply as far as practicable to requirements of each of the variants identified in the Function and Performance Specification. The Mission Kit designs incorporate many of the sub-systems and components in common with the Boxer Combat Reconnaissance Vehicle (CRV) offered into Land 400 Phase 2, thereby providing logistics advantages through commonality.

The Mission Kit comes in two basic configurations:

- a. Turreted – to match the IFV roles of the DFHSL variants; and
- b. Non-turreted – to match the roles of the Specialist Support (SS) variants.

The DFHSL variants include IFV, command and control, joint fires and engineering reconnaissance, with SS variants being ambulance, combat engineer, repair and recovery.

RIGHT: The Lynx IFV is designed for the full spectrum of operational missions, including conventional warfare against peer adversaries.

LANCE TURRET

Rheinmetall's Lance turret is a military-off-the-shelf and modular medium-calibre turret selected for integration into the Mission Kits of the Lynx DFHSL variants for Phase 3 of Land 400. The Lance turret installed on the Lynx IFV is in the same configuration as that offered for the Boxer CRV. The Lance turret is also available in an unmanned version operated from work stations within the hull rear.

The Lance turret is designed with an internal ballistic protection cell for the crew. There are no weapons or ammunition stowed in this cell (co-axial weapon ammunition is stored separately), and the main and co-axial weapons are fitted in cradles at the front of and external to the cell. This means that a range of qualified 30mm and 35mm cannons can be fitted to Lance without changing its fundamental design. The main armament ammunition is stowed in a separate compartment that wraps around the sides and rear of the turret. This physical modularity and separation achieves higher levels of protection, crew safety and accuracy whilst providing a growth path for future upgrades.

In the configuration offered into Phase 3 of Land 400, the Lance turret is fitted with the 30mm MK30-2/ABM cannon as the main armament and a 7.62mm machine gun as the co-axial weapon. The MK30-2/ABM has a double belt ammunition feed system, meaning that the next round fired is the next round selected rather than the next round fired being the last round selected.



The Lance turret enables highly accurate and rapid engagement of static and moving targets whilst the vehicle is stationary or on the move. The commander's and gunner's stations have common human machine interfaces, with each using a duplex controller and central multi-function display. They share a common main operational panel and a common battle management system (BMS) display.

The main components of the optronics and fire control system (FCS) incorporated into the Lance turret include:

- a. Stabilised electro-optical sensor system (SEOSS) panoramic with integrated laser rangefinder and FCS; retractable;
- b. SEOSS sector sight aligned with the main armament with integrated laser rangefinder and FCS;
- c. Laser warning system (LWS);
- d. Acoustic shot locator system (ASLS)
- e. Situational awareness system (SAS) featuring day/night vision and automatic target recognition;
- f. Control handle; and
- g. Video processing and distribution unit

The optronics enable the turret crew to have unrestricted and class leading capabilities for automatically detecting, recognising and identifying targets and maintaining observation day and night while staying protected inside the turret. The optronics and laying system enable precise engagement of targets.

In addition, as the Lance turret is fully digital it has already been integrated with Rheinmetall's BMS that allows targets identified by one vehicle to be shared over the network for engagement by an alternate call sign. While integration with Rheinmetall's BMS is complete this functionality can also be provided with a customer's in-service BMS.

The benefit of the two SEOSS units is that it provides a true hunter-killer capability. Additional lethality is provided from the MSSA remotely-controlled weapon to provide the aforementioned killer-killer capability. Other optional remotely-controlled



LEFT: Advanced sighting systems for the commander and gunner, the option of a 30mm or 35mm main armament and a fully-integrated turret-mounted ATGW render the Lynx IFV a highly lethal platform.

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ABOVE: The KF 31 IFV variant.

ABOVE RIGHT: The Lynx KF 41 IFV is designed from the outset to accommodate eight dismounts in the rear compartment, plus a manned or unmanned medium calibre turret.



weapons such as the Electro Optic Systems R-400 can also be fitted to the SS variants of Lynx. Both the MSSA and R-400 can be fitted with the M2QCB 12.7mm heavy machine gun, MAG-58 7.62mm machine gun or a 40mm automatic grenade launcher.

The Lance turret can also be fitted with an optional twin-round launcher for the Rafael Spike-LR ATGM. This is the same launcher-ATGM combination soon to enter service with the German Army on the Puma IFV. The Spike-LR missile can remain mounted in the ballistically-protected, vibration isolated launcher indefinitely, dramatically increasing the readiness of the weapon system. It also means the vehicle can carry two more missiles than a vehicle without a dampened launcher.

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LYNX SPECIFICATIONS

SYSTEM	LYNX KF 31	LYNX KF 41
Crew:	3 + 6 dismounts	3 + 8 dismounts
Length/Width/Height:	7.2 x 3.6 x 3.3m	7.7 x 3.6 x 3.3m
MLC/GVM:	42 at 38 tonne	49 at 44 tonnes
Engine Power:	563kW (750hp)	800kW (1,050hp)
Max Speed:	65km/h	70km/h
Powerpack Design:	Front engine, rear cooling, rear exhaust system	
Running Gear:	Segmented rubber band or lightweight steel tracks; torsion bar based suspension system with swing arms and dampers	
Protection:	Ballistic, mine, IED and bomblet protection, ADS, combined NBC and air-conditioning system, blast attenuating seats, optional Rheinmetall ADS	
Main Armament (IFV variants):	Lance manned/unmanned turret fitted with 30 or 35mm cannon, 200rds/minute rate-of-fire; 45°/-10° elevation/depression	
Secondary Armament:	7.62mm co-axial; remotely-controlled weapon system, ATGM	
Sighting Systems:	360° independent digital commander's sight (SEOSS-P) and digital gunner's sight (SEOSS-S)	
Situational Awareness:	360° TV/IR cameras networked with SEOSS-P and SEOSS-S, Automatic Target Recognition and Tracking, Laser Warning and Acoustic Shooter Locating System, Battle Management System and Tactical Communications	

SPECIFICATIONS

PROTECTION SYSTEM OPTIONS

The Lynx provides inherently high ballistic protection through its design. Additional active protection can be provided for shaped charge warhead attack using Rheinmetall's ADS.

The Lynx also includes a range of passive protection and defensive aids, these being integrated into the Lance turret, such as the Rapid Obscuration System – Land, a LWS and an

ASLS fitted to the SAS. Rheinmetall's Solar Sigma Shield Mobile Camouflage System can also be fitted to the entire vehicle to reduce heat loading as well as thermal and IR signatures.

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LYNX IFV Q&A

With Ben Hudson, Head of Vehicle Systems, CEO of Rheinmetall Land Systems and Rheinmetall MAN Military Vehicles

DTR: What was the driver for Rheinmetall to develop the Lynx IFV?

BH: We saw a gap in the market for a modern, highly capable tracked family of vehicles with a balanced design and a focus on low acquisition and through-life costs. The result is the Lynx family, which is broken down into two main vehicle classes, Lynx KF 31 provides maximum capability below 40 tonnes and Lynx KF 41 provides the highest levels of survivability and the ability to uniquely fit a manned turret and eight dismounts.

DTR: What differentiates Lynx from other tracked IFVs currently available?

BH: There are many subtle differences between Lynx and other vehicles but the headline features include: adaptability provided by a common base vehicle and a modular design, capacity and growth built in, the highest levels of survivability, low signature design and affordability both during acquisition and through life.

We also wanted to ensure that Lynx was thought of from the start as a true family of vehicles so it was easy to create a range of variants.

DTR: What capability requirements have shaped the design of Lynx?

BH: We have been very careful to create a balanced design through the rigorous application of systems engineering principles. Before we started any design work we spent some time analysing market requirements based on the recent IFV and APC competitions in Central Europe, Canada, UK, USA and Australia. We then analysed the changing nature of conflict to ensure we weren't designing Lynx to the requirements of recent, mostly asymmetric, conflicts. This forecasting saw the inclusion of requirements that ensured that Lynx was not only relevant in the now ubiquitous asymmetric battle but could also fight, survive and win in conventional close combat with a near

peer adversary. This analysis has seen an emphasis on increasing roof protection, improved lethality through the inclusion of a 35mm gun option and a focus on reducing vehicle acoustic, visual and IR signatures in the base platform.

DTR: What has been the approach to conceptual and engineering design for Lynx?

BH: Once we had fixed the requirements we carefully analysed both the system and sub-systems concepts with a focus on balancing requirement compliance, technical risk, weight and cost. There have been several technical developments that we



ABOVE: Boxer CRV and Lynx IFV: both potent contenders for Land 400 Phase 2 and 3 respectively.

have been able to benefit from that helped us realise Lynx. For instance, we have used the latest generation COTS diesel engine that delivers a high output powerpack that was substantially smaller and lighter than what has been possible in the past without the use of exotic specialist military engines.

DTR: Lynx is clearly targeted at the Australian customer initially. What are your ambitions when it comes to the Land 400 program?

BH: Australia is a key strategic market for us and we are uniquely placed to deliver a fully integrated land mobility and combined arms fighting system for the Australian Defence Force that includes the most

modern military trucks under Land 121, the best protected 8x8 in the world (Boxer CRV), a class leading IFV, (Lynx) the latest technology digital turret (Lance), a proven armored engineering vehicle (Kodiak), the highest performance medium caliber ammunition and an integrated training and simulation capability.

DTR: What opportunities does Lynx present regarding your Australian industry plans under Land 400?

BH: In addition to delivering a great capability for Army, we also believe there is a real opportunity to look at the combination of Land 400 Phase 2 and 3 together and deliver an Australian industrial capability solution without peer. We intend to significantly exceed the levels of AIC we have achieved in Land 121 through the transfer and manufacture of the highest technology military systems and integration of Australian suppliers into Land 400 and our global supply chain.

With Boxer CRV and Lynx IFV in the mix we will offer the local manufacture of high end sub-systems, manufacture and assembly of turrets and, ultimately, the design of vehicle variants and production of complete vehicles, at what will be a world class Armoured Vehicle Centre of Excellence located in Australia. This is all in addition to expanding our existing Australian training and simulation capability in Adelaide. We hope to fundamentally enrich the Australian economy through transfer of knowledge and technology that will allow us to be a true partner to Army and create sustainable, long-term high technology jobs, with strong potential to export the systems we produce back into the global market.



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