



Leclerc

New French Tank, Like the M1A2, Uses Digital Architecture

by Lieutenant Colonel John Moncure

They call it the first tank of the 3rd generation.¹ The new French main battle tank, the AMX-Leclerc, designed around its central computer system, incorporates many of the latest technologies in armored vehicle design.² For the French, the adoption of this new tank is an extraordinary leap from its predecessor, the 1960s vintage AMX-30, the equivalent of transitioning directly from an M60 to the M1A2.³ Its characteristics set it apart in the community of modern armor as it reflects uniquely French cultural and psychological preferences. From its conceptual phase, the designers of this tank saw it from a new perspective, likening it to a fighter aircraft more than to a traditional tank.⁴ As the “master work” of the French armaments industry and the latest symbol of French national pride, it is a “protected species” in an army that has just announced 40 percent cuts in strength. Evolving French conventional doctrine is revolving around this new weapon system as their army prepares for the 21st century.

The most striking difference of the Leclerc from other modern Western tanks is its size. In the perennial debate over mobility vs. protection, the French have always opted for the former. The AMX-30 weighed 20 tons less than its NATO contemporaries. Likewise, the Leclerc weighs only 56 tons in comparison with the tendency toward 70 tons for its cousins. The French have

achieved this feat by replacing the human loader with a chain-driven loading system and by a most judicious placement of special armor. Thus, while the tank has roughly the same height as other modern systems, it is considerably shorter. Its weight gives it two advantages over its contemporaries: it is strategically more easily deployed, and it is more agile.

Agility, rather than silhouette, was the critical value for the French designers. The Leclerc power plant consists of an 8-cylinder, 1,500-horsepower “Hyperbar” engine, manufactured by the firm of Wärtsilä, married to an SESM automatic transmission.⁵ This remarkable system, with its integrated turbine, provides instant pressure into the cylinders, up to 7½ atmospheres (as compared with about 3 atmospheres in conventional engines), on demand. From a dead stop to 32 kmph requires fewer than 6 seconds. In all gears, it accelerates quickly and smoothly. From this aspect, the Leclerc matches perfectly the French armored gospel of mobility.

In designing the Leclerc, the French began from the inside. The digital architecture preceded the design of the tank, and ensures a complete harmony of fire control, navigation, mechanics, and communications. The Conduct of Fire Calculator directs the 15 other computers, receiving wind speed, temperature, atmospheric pressure, appar-

ent target motion, and range data, as well as ballistic characteristics of the round. The result is routine first-round hits on targets at ranges in excess of 2,500 meters. The tank has achieved a remarkably soft recoil, a combination of the 42cm recoil travel and the hydro-pneumatic suspension. Wrapped around this fire control system, as tightly as possible, are ergonomic crew positions and controls. The TC, gunner, and driver can reach virtually all their controls with little motion. Indeed, motion is almost impossible in this form-fitted tank. Crew members have no visual contact with each other. The TC and gunner are so well fitted in their positions, in fact, that they cannot operate the turret standing up. These characteristics are a function of the original concept of the tank.

While the Leclerc has all the attributes of a modern tank, the French perception of it differs, sometimes dramatically. Because of its design, a crew can operate it only for a relatively short period of time — 6 hours is generally seen as the optimum — after which the unit must be replaced in the line, or replacement crews called up. Currently, 15 crews are being trained for each 13-tank company going through transition. Few maintenance responsibilities belong to the crew. The tank has a number of access plates along the sides from which mechanics can interrogate the tank, replace filters, etc., without

AMX-Leclerc Main Battle Tank Data and Organization

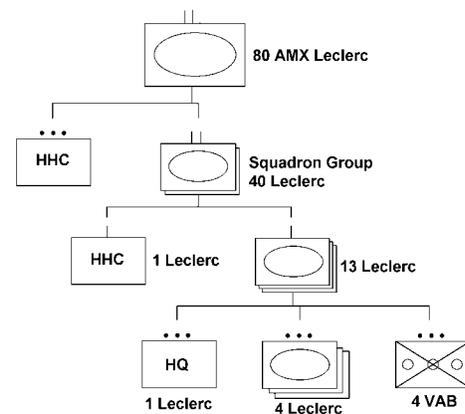
the crew dismounting. Likewise, maintenance and logistics troops in Leclerc units will be trained to conduct rearming and refueling operations. The active Leclerc unit is experimenting with an examination which, once refined, may be used to select gunner or driver candidates with desirable Leclerc-specific characteristics. Leclerc is a specialized system. In the threat-rich environment of 21st century wars, French doctrinal thinkers see it being accompanied by other vehicles to protect it. In many ways, this vehicle is viewed less like a tank and more like an aircraft.

Like its American and German counterparts, the Leclerc includes a digital communication system. The French have developed a three-tiered architecture, of which the Command Information System (or SIC, at division level) and Regimental Information System (SIR) have been developed, and the Terminal Information System (SIT) is under study. Leclerc platoon leaders communicate with their company and battalion commanders using SIR. At present, the platoon sergeant and the two wingman tanks can transmit only current location, logistics data, and the locations of three designated targets. SIT will add graphics and various message sets. Recognizing the international environment, the French participate in a panel to develop protocols to translate IVIS and the German GeFuSys. The communication system of the tank, like its other high-performance characteristics, also ensures that it must be viewed differently from its predecessor.

The French Army has created a new organization for the Leclerc. Previously, tank regiments consisted of 52 or 70 AMX-30s, depending upon the number of companies. Leclerc regiments have 80 tanks divided into two 40-tank battalions (GEs, or groupe d'escadrons). The first such unit, the 501st/503rd Tank Regiment (each GE carrying the colors of a historic tank regiment), stationed at Mourmelon in eastern France, is in the process of drawing its Leclerc tanks. It will be followed next year by the 6th/12th Cuirassier Regiment. In combat, the GEs, which in peacetime share the logistics and administrative assets of the regiment, become completely independent.

Operational concepts for this tank have not been written. French doctrine writers correctly realize that some ex-

Item	Leclerc	Item	Leclerc
Crew	3	Main gun	GIAT 120 mm smoothbore 52 caliber
Weight	55.6 t	Ammunition type	1 piece fixed combustible case stub metal
Power to wt ratio	26.97 hp/ton	Ammunition nature	APFSDS APFSDS-TPT HEAT HEAT-TPT
Ground pressure	0.9 kg/cm (12.8psi)	Loading	autoloader
Length (hull)	6.88 m	Max rate of fire	6 rds per m
Length (gun front)	9.87 m	Ammunition stowed	22 rds ready 40 rds total
Width (overall)	3.71 m	Coax	12.7 mm
Width (over track)	3.31 m	Commander MG	7.62 mm
Height (turret (overall))	2.53 m 2.92 m	Grenades	GALIX smoke AP
Ground clearance	500 mm		
Track width	0.635 m		
Track base	4.32 m		
Engine type	Uni-Diesel UD V8V, 8 cyl, diesel		
Engine power	1500 HP/1100kW		
Gearbox type	SESM ESM 500		
No. of Gears	5/2		
Max speed (road)	71 kmph (41 mph)		
Range	550 km (344 mi) 700 km w/external tanks		
Fuel consumption	1.07 mpg cruising 15.79 gal/hr idle		
Trench	3.0 m		
Step	3.0 m		
Databus	Digibus		
Fire Control Computer	Dassault Electronique CCT		
Commander Sight	SFIM HL-70 360° panoramic Day Image Intensifier		
Gunner Sight	SAGEM HL60 Day TI Nd YAG laser		

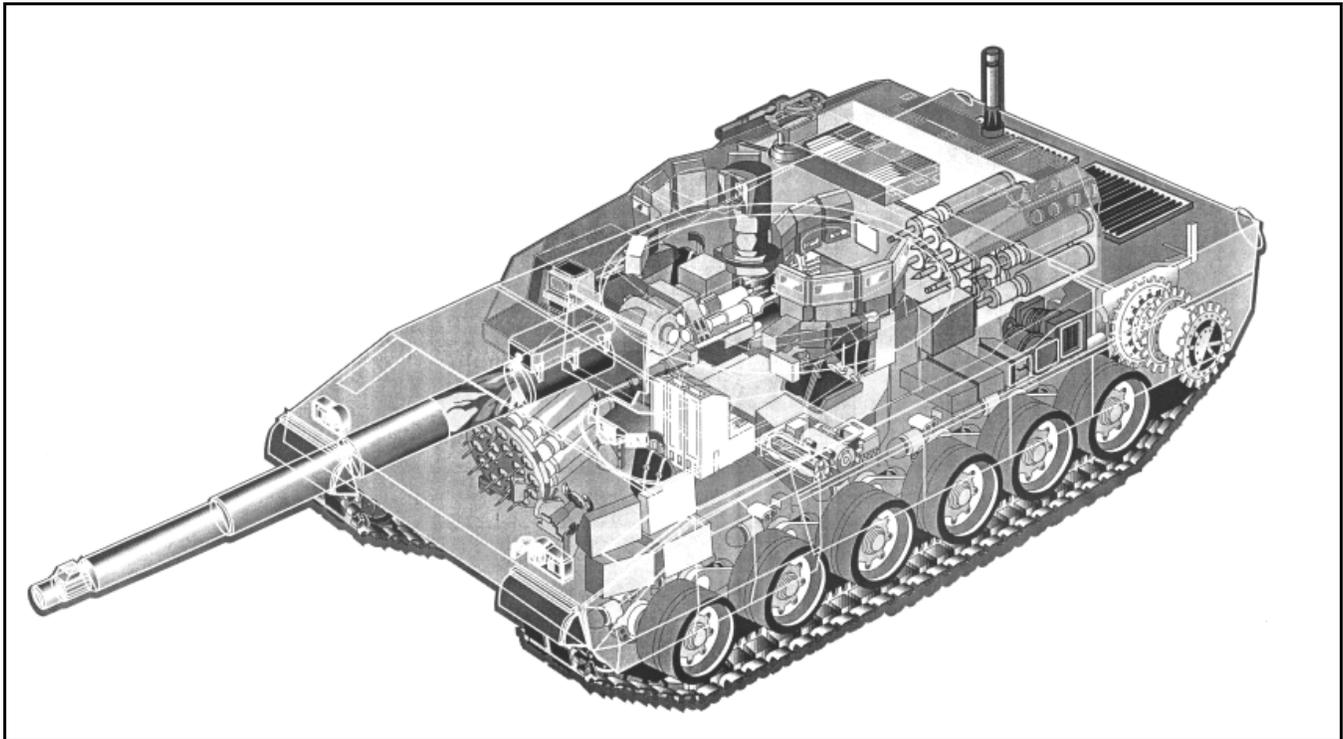


perience with a shoot-on-the-move high performance system is necessary before they commit themselves. However, some innovative ideas have surfaced.⁶ Given the performance possibilities of the Leclerc, the French believe it is best suited for highly mobile operations, rapid concentration and dispersion of force, pursuit and decisive action, in depth. They believe that the tank should operate in a mixture of patrols (2 tanks) and platoons (4 tanks) depending upon the situation.

Infantry, artillery units, logistics, and planning processes will have to adapt to the new tempo of combat that the Leclerc will afford. With the new instrument at their disposal, French cavalry commanders will again be able to operate in a manner consistent with their history of élan. Whatever doctrine emerges from the field trials and think

tanks, we can expect the new French armor force to perform aggressively.

The Leclerc is causing a revolution in French military thinking. While the machine is only appropriate to its generation — having some advantages and some disadvantages compared to other modern tanks — it has liberated the French perspective of mid- to high-intensity warfare. Anchored to older systems and sidelined for 30 years from NATO cross-pollination, the French focused their innovative energies on other subjects. The Leclerc has changed all that. Paradoxically, France's relative isolation permits it greater freedom of thought. Unfettered by the evolutionary development of doctrine in NATO, and armed with a high performance tank, we can expect the French to develop unusual solutions to the challenges that the new technologies pose.



Notes

¹I wish to thank Engineer-Principal Marie-France t'Kint de Roodenbeke, for her patience in answering my questions, Captain Richard Coleman for our frequent discussions on the Leclerc, and M. Laurent Charrault of the Etablissement Technique d'Angers for his photography.

²The Leclerc is named after Philippe de Hautecloque who, using the pseudonym Jacques Leclerc to protect his family in occupied France, commanded the French 2nd Armored Division which liberated Paris in 1944.

³To be sure, the AMX-30 has been upgraded over the years, adding a laser rangefinder and reactive armor. But the 105mm-gun tank could not fire on the move.

⁴While this seems a radical idea today, early armor doctrine borrowed much of its tactical doctrine — as well as terminology — from the navy.

⁵This in itself is a departure for the French. Previous French tanks had manual transmissions, and no self-respecting Frenchman would own an automobile with an automatic.

⁶Preliminary thought papers include: "Guide Provisoire d'Emploi des RC 40 Leclerc," December 1994, and "L'Accompagnement des Unités Leclerc," 11 July 1995.



Capabilities of the new Leclerc MBT have changed the pace of French military operations and spurred thought on how best to exploit the new tank's advantages. At page top, an X-ray view.

Lieutenant Colonel John Moncure is the American liaison officer to the French Cavalry School. Commissioned from USMA in 1972, he holds a Ph.D. from Cornell University. He has served in the 2nd, 3rd, and 11th ACRs, taught history at West Point, and was Professor of Military Science at Davidson College.