

# ARCHIVED REPORT

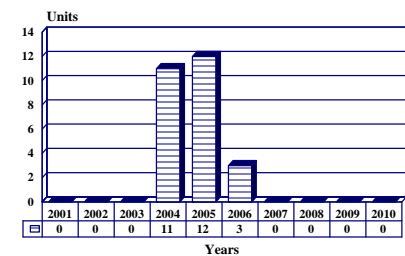
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## Ratel - Archived 3/2003

### Outlook

- The production of the Ratel is dormant but vehicle is still being marketed and is available for new orders
- Minimal production is forecast, probably of one of the variants

10 Year Unit Production Forecast  
2001 - 2010



### Orientation

**Description.** A wheeled vehicle.

**Sponsor.** The development and procurement of the Ratel vehicle is sponsored by the South African Department of Defense through ARMSCOR (the government procurement agency), the South African Army, and various internal security units.

**Contractors.** This vehicle was developed and is manufactured by Vickers OMC (formerly Reumech OMC), Boksburg, Transvaal, Republic of South Africa. Major subcontractors include Bussing and Renk.

**Licensees.** None

**Status.** The serial production of the Ratel is dormant but can be resumed as required; the marketing effort

continues. This vehicle is in service with South African Forces and at least one export customer.

**Total Produced.** As of January 2002, a total of 1,391 Ratel vehicles of all types and models had been manufactured.

**Application.** A multipurpose mechanized infantry combat vehicle for riot control, internal security, border patrol, counterinsurgency operations, mechanized infantry supply, and reconnaissance.

**Price Range.** In equivalent 2002 United States dollars, the unit price of the Ratel vehicle armed with a 90 millimeter cannon is \$292,800. The base vehicle armed with a 20 millimeter cannon has a unit price of \$261,300.

### Technical Data

#### Ratel 20

**Crew.** Eleven: commander, anti-aircraft gunner, gunner and driver, and seven infantrymen.

**Configuration.** 6x6

**Armor.** The Ratel 20 is fabricated of steel alloy armor, which gives all-around protection from 7.62 millimeter Armor Piercing projectiles and 12.7 millimeter Armor

Piercing projectiles over the frontal arc. The vehicle's armor suite also protects against ballistic fragments and land mines.

**Design Features.** The design of the Ratel is optimized for operations in harsh environments, a high degree of survivability, and ease of repair.

**Dimensions.** The following data are for the Ratel 20 mechanized infantry combat vehicle equipped with the two-man turret and F2 (M693) 20 millimeter cannon.

	<u>SI units</u>	<u>US units</u>
Length:	7.21 meters	23.65 feet
Width:	2.52 meters	8.23 feet
Height:	2.92 meters	9.58 feet
Combat weight:	18.5 tonnes	20.39 tons
Fuel capacity:	430 liters	114.36 gallons

**Performance.** The maximum speed and range figures are on hard earth surfaces.

	<u>SI units</u>	<u>US units</u>
Maximum speed:	105 kilometers per hour	65 miles per hour
Maximum range:	1,000 kilometers	621 statute miles
Step:	60 centimeters	1.89 feet
Trench:	1.15 meters	3.77 feet
Slope:	30%	30%
Gradient:	60%	60%
Fording:	1.2 meters	3.94 feet

**Engine.** All the Ratel vehicles use the Bussing six-cylinder, liquid-cooled, supercharged diesel engine designated D 3256 BTXF; this engine is rated at 210.37 kilowatts (282 horsepower) at 36.67 revolutions per second (2,200 revolutions per minute). The power-to-weight ratio is 11.37 kilowatts per tonne (13.83 horsepower per ton). A 24-volt generator and two 12-volt 100-ampere-hour batteries comprise the electrical fit of the Ratel 20. As an option, the standard engine can be replaced with the ADE 407 TI diesel engine rated at 234.99 kilowatts (315 horsepower). The power-to-weight ratio with this engine is 12.7 kilowatts per tonne (15.45 horsepower per ton).

**Gearbox.** The Renk HSU 106 automatic gearbox with six forward and two reverse gear ratios. A hydro-

dynamic torque converter is fitted to the Ratel vehicles. Steering is mechanical with hydraulic assistance.

**Suspension and Running Gear.** Each axle of the 6x6 Ratel vehicles is supported by wishbone assemblies and longitudinal arms with coil springs and double acting hydropneumatic shock dampers at each wheel station; 14.00x20 run-flat tires are standard.

**Armament.** The main armament of the Ratel 20 is a 20 millimeter F2 cannon originally developed and manufactured by Giat Industries of France but now manufactured in the Republic of South Africa. In addition, a coaxial 7.62 millimeter machine gun is mounted in the turret along with an additional 7.62 millimeter machine gun for anti-aircraft defense. Other Ratel variants use different armament configurations.

### **Ratel 90**

**Crew.** Ten: commander, main gunner, driver, anti-aircraft gunner, section commander and five infantrymen.

**Configuration.** 6x6

**Armor.** The Ratel 90 is fabricated of steel alloy armor, which gives all-around protection from 7.62 millimeter Armor Piercing projectiles and 12.7 millimeter Armor

Piercing projectiles over the frontal arc. The vehicle's armor suite also protects against ballistic fragments and land mines.

**Design Features.** The design of the Ratel 90 is optimized for operations in harsh environments, a high degree of survivability, and ease of repair.

**Dimensions.** The following data are for the Ratel 90 Fire Support Vehicle armed with a two-man turret and the GT2 90 millimeter gun.

	<u>SI units</u>	<u>US units</u>
Length:	8.11 meters	26.61 feet
Width:	2.52 meters	8.23 feet
Height:	2.76 meters	9.06 feet
Combat weight:	17.98 tonnes	19.82 tons
Fuel capacity:	430 liters	114.36 gallons

Performance. The maximum speed and range figures are on hard earth surfaces.

	<u>SI units</u>	<u>US units</u>
Maximum speed:	105 kilometers per hour	65 miles per hour
Maximum range:	1,000 kilometers	621 statute miles
Step:	60 centimeters	1.89 feet
Trench:	1.15 meters	3.77 feet
Slope:	30%	30%
Gradient:	60%	60%
Fording:	1.2 meters	3.94 feet

**Engine.** The Ratel 90 is equipped with a Bussing six-cylinder, liquid-cooled, supercharged diesel engine designated D 3256 BTXF; this engine is rated at 210.37 kilowatts (282 horsepower) at 36.67 revolutions per second (2,200 revolutions per minute). The power-to-weight ratio is 11.7 kilowatts per tonne (14.23 horsepower per ton). A 24-volt generator and two 12-volt, 100-ampere-hour batteries comprise the electrical fit of the Ratel 90. As with other versions of the Ratel, the standard engine can be replaced with the ADE 407 TI diesel engine rated at 234.99 kilowatts (315 horsepower). The power-to-weight ratio with this engine is 13.07 kilowatts per tonne (15.89 horsepower per ton).

**Gearbox.** A Renk HSU 106 automatic gearbox with six forward and two reverse gear ratios is used on the Ratel 90. This unit incorporates a hydrodynamic torque converter. Steering is mechanical with hydraulic assistance.

**Suspension and Running Gear.** Each axle of the 6x6 Ratel vehicles is supported by wishbone assemblies and longitudinal arms with coil springs and double acting

hydropneumatic shock dampers at each wheel station; 14.00x20 tires with run-flat inserts are standard.

**Armament.** The main armament of the Ratel 90 is a 90 millimeter D921 F1 gun that was originally developed and manufactured by Giat Industries of France and subsequently manufactured in the Republic of South Africa for the Eland reconnaissance vehicle. This semi-automatic gun has been improved for the Ratel and is designated GT2. The elevation is +15° and the depression is -8°; turret traverse is 360°, with all operations being manual. A total of 22 rounds are stored in the turret, with an additional 40 rounds stored in the hull. A coaxial 7.62 millimeter machine gun is mounted in the turret along with two additional 7.62 millimeter machine guns for anti-aircraft defense. Two electrically operated smoke grenade launchers are mounted on each side of the turret.

**Fire Control.** The fire control of the Ratel 90 Fire Support Vehicle is rather austere: the gunner has four periscopes affording 360° vision plus an M494 optical sight for firing the 90 millimeter GT2 gun.

## Variants/Upgrades

**Variants.** The Ratel is a versatile vehicle that can be developed into a number of variants for differing missions. The production run to date has involved the Mark 1 (1976-1979) followed by the Mark 2 (1979-1987).

**Ratel 60.** The Ratel 60 has a crew of 11 and mounts a M2 60 millimeter breech loading mortar and two 7.62 millimeter machine guns in a two-man turret. Depending on the loadout, around 50 rounds of mortar ammunition are carried. A third 7.62 millimeter machine gun can be mounted on the right rear of the vehicle.

**Ratel 90.** The Ratel 90 is similar to the Ratel 20 but has a locally produced version of the French D921 F1 90 millimeter gun designated GT2 in a somewhat more robust turret. Twenty-two rounds of High Explosive Anti-Tank, High Explosive or Armor Piercing ammunition can be carried in the turret, with an

additional 40 rounds in the hull. One less infantryman is carried. The elevation of the GT2 gun is +15° and depression is -8°; the turret can traverse 360°. Two 7.62 millimeter machine guns and four smoke grenade launchers are fitted. The secondary armament is fired electrically, and both the main and secondary armament are aimed using an M494 optical sight.

**Ratel/LCT-35.** For trials purposes, a Ratel vehicle has been fitted with the Denel LCT-35 turret. This turret is armed with a 35 millimeter EMAC cannon, with a 7.62 millimeter machine gun coaxially mounted. A variety of sight options are available for this vehicle, which has yet to be ordered.

**Ratel/Swift.** The Ratel/Swift, which is crewed by four, integrates the three-round launcher for the Kentron ZT-3 Swift anti-tank guided missile system with the 6x6 version of the Ratel vehicle. Prior to integration, the vehicle is refurbished and brought up to the latest Mark

3 standard. The three-round launcher is then mounted on top of the vehicle turret. Twelve additional missiles are stored in the vehicle. The two-man turret is armed with a 7.62 millimeter machine gun and a bank of smoke grenade launchers, located on each side. The vehicle is designated the Ratel Mark 3 ZT-3A1; 53 are in service in the Republic of South Africa.

Integrated with the Kentron ZT-3 long-range anti-tank guided missile system, the South African Ratel wheeled fighting vehicle becomes a very potent tank killer. The ZT-3 missile uses semi-automatic command-to-line-of-sight guidance technology. The missile's 127 millimeter High Explosive Anti-Tank warhead can perforate 65 centimeters of armor.

Ratel/81 Millimeter Mortar. This is a Ratel variant that was developed at the request of the South African Army. It is a mortar vehicle that mounts an 81 millimeter mortar on a turntable having a 360° traverse. This variant has a crew of five and carries 180 rounds of mortar ammunition.

Ratel/120 millimeter Mortar. This variant of the Ratel was first displayed in 1994. This vehicle mounts a 120 millimeter muzzle-loading mortar on a turntable mounted on the rear of the vehicle. A total of 46 mortar rounds are carried. This vehicle and its mortar are designed for use with a computerized weapon aiming system developed by the Teklogic firm; laying is automatic. This weapon system has been evaluated by the South African defense forces but has not been ordered.

Ratel Command. The Ratel command vehicle has a crew of nine with the two-man turret. A M2HB 12.7 millimeter machine gun and two 7.62 millimeter machine guns are fitted. Extra communications equipment, recording instruments and a public address system are provided. A pneumatically deployed radio mast is also fitted.

Ratel Armored Repair Vehicle. This version of the Ratel is the basic Ratel 20 fitted with a lifting jib and associated repair equipment and spare parts.

Ratel Logistics. The 8x8 logistics vehicle is somewhat larger and heavier than the rest of the Ratel family. The ADE 423 supercharged V-10 diesel rated at 320.78 kilowatts (430 horsepower) is fitted, as is a more robust version of the standard gearbox. This vehicle can carry nine ISO standard containers, each 1x1.2x1.2 meters in dimension. A 4.6-tonne-capacity hydraulic crane assists in loading and unloading. This vehicle has yet to enter serial production.

Enhanced Artillery Observation System. This version of the Ratel is a rebuild of an existing Ratel vehicle. It can also be ordered as an all new vehicle. It was developed by the Teklogic firm for the South African Army. It is a component of a much larger computerized target acquisition system called AS-2000. The turret is removed from the vehicle and a raised superstructure is added to the rear. A hydraulically operated mast with the associated sensors is mounted on each side of the vehicle. The sensors include an electro-optic viewer, a forward-looking infrared system and a laser rangefinder. The system allows for 20 kilometer (12.43 statute mile) observations during the day and 3.5 kilometer (2.17 statute mile) observations at night. An extensive communications suite, navigation and position system and related equipment are also featured in this vehicle, which has yet to enter production.

Modernization and Retrofit Overview. In 1985, an upgrade program for the South African Ratel vehicles was initiated. This effort, resulting in the Ratel Mark 3, involves the retrofit of an improved cooling system, the integration of an automatic cocking system for the 20 millimeter cannon, improved brush protection, and a number of other small improvements. The work has been undertaken at the contractor's Benoni facility. Future modernization and retrofit work may involve the replacement of the original engine with the newer and more powerful ADE 407 TI diesel engine.

## Program Review

**Background.** In response to the United Nations-imposed arms embargo, for over two decades the Republic of South Africa had to systematically replace and expand its fleet of wheeled vehicles to overcome or neutralize the export policies of former arms suppliers. The Ratel series of vehicles is the result of South African expertise and experience with wheeled vehicles that are ideally suited to the country's climate and terrain.

Development of the Ratel vehicles began in 1968 and production commenced in 1977. Through 2001, over 1,390 vehicles had been delivered to various South African police and armed forces units. The Ratel was designed primarily for reconnaissance and personnel transport duties. Depending on the variant, it has a combat weight of 18 to 19 tonnes (19.84 to 20.94 tons) and uses the 6x6 layout (except in the 8x8 logistics version) to provide high mobility, with all-around independent suspension and tubeless run-flat tires. The

latest production standard is the Mark 3, available in several variants as noted elsewhere in this report.

The Ratel was originally developed and manufactured by Sandock-Austral Beperk Limited of Boksburg, Transvaal. Then, in a reorganization, the contractor became Reumech Sandock Limited, and then Reumech OMC. In 1999, Reumech OMC was purchased by Vickers Defence Systems and became known as Vickers OMC.

**Description.** The hull of the Ratel is of all-welded steel construction, providing complete protection from armor piercing projectiles up to 7.62 millimeters in caliber as well as ballistic fragments. The frontal arc is protected against 12.7 millimeter Armor Piercing and Armor Piercing Incendiary projectiles, while the vehicle's underside is heavily protected against land mines.

The driver is seated in the front of the vehicle at the center and is provided with three bulletproof windows for an excellent field of vision. The windows can be quickly covered with armored shutters; the driver then operates with the aid of three periscopes. While the driver is provided with a hatch, he can also enter the driving compartment from the rear. This means that the crew does not need to leave the vehicle in order for there to be a change in drivers.

Immediately behind the driver is the all-welded two-man turret, which can be fitted with a variety of armament options. Within the turret, the commander is seated to the left and the gunner to the right. Both the commander and gunner are provided with hatches; the commander has vision blocks and the gunner has four periscopes.

The powerpack is at the rear of the vehicle to the left. Access panels to the powerpack are provided in the roof. The gearbox has a manual shift for emergency use. The powerpack, provided with quick-disconnect couplings and connectors, can be removed by two men in less than 30 minutes.

The combat team of seven men is carried in the aft compartment and is provided with eight firing ports in the vehicle sides and two to the rear, while four hatches are mounted atop the vehicle. Doors are provided on each side of the vehicle, and are operated pneumatically by the driver. These doors provide an additional measure of protection when personnel exit the vehicle. The Ratel 20 is a somewhat austere vehicle, as no nuclear, biological and chemical protection equipment or night vision equipment is fitted and the vehicle is not amphibious. Standard equipment includes maintenance tools, earth-moving/trenching tools, fire extinguishers, drinking water supplies, radios, an intercom, and a remote telephone with 1,000 meters of cable. Optional equipment includes passive night vision equipment, air conditioning, and an ADE 407 TI diesel engine rated at 234.99 kilowatts (315 horsepower) to replace the standard engine.

**Operational Analysis.** The Ratel is an exceptionally rugged design, optimized for the harsh conditions of the southern African region. The vehicle's only real shortcoming is the lack a rear door, forcing the embarked infantry to dismount to either side of the vehicle.

## Funding

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The development and procurement of the Ratel has been funded by the South African Department of Defense through the South African Army and various internal security units.

## Recent Contracts

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Not available, as contractual information is not released.

## Timetable

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<u>Month</u>	<u>Year</u>	<u>Major Development</u>
	1968	Design conceived
	1970	Engineering development initiated
July	1974	First prototype completed
	1976	Initial production of prototypes begun
February	1977	Production begun
Late	1977	First deliveries

<u>Month</u>	<u>Year</u>	<u>Major Development</u>
	1985	Mark 3 upgrade program begun
March	1987	Production halted
	1993	Ratel vehicle integrated with the Enhanced Artillery Observation System
	1994	120 millimeter version first revealed
Mid	2002	Available for further orders; upgrading and development continues

## Worldwide Distribution

**Export Potential.** The Republic of South Africa's efforts to sell its armored vehicles on the international market were long hampered by the sanctions imposed by the United Nations. Now that these sanctions have been lifted, the country should find it much easier to sell its armored vehicles on the world market. However, the nation is now having to contend with the unprecedented glut of light wheeled vehicles in the world. So far, only two countries, Morocco and Zimbabwe, have been identified as customers of the Ratel.

**Countries.** **Morocco** (80), **Republic of South Africa** (1,356) and **Zimbabwe** (4).

## Forecast Rationale

The serial production of this hardy family of vehicles remains dormant. But the marketing effort continues under the new ownership, especially in the sub-Saharan region. Since the line has been active with the Mark 3 upgrades and the further development of variants, filling any future order will prove to be no problem. No additional procurement by South Africa is forecast, as it is in the process of developing its next-generation vehicle of this type.

We still forecast an export order for the Ratel, most likely for one of the variants. However, because tensions have lowered in southern Africa and as a result of the major political changes in the Republic of South Africa, fewer Ratel vehicles are needed. So any order could be met by refurbished vehicles turned back to the contractor by the government.

## Ten Year Outlook

### ESTIMATED CALENDAR YEAR PRODUCTION

<u>Vehicle</u>	<u>(Engine)</u>	<u>High Confidence Level</u>				<u>Good Confidence Level</u>				<u>Speculative</u>			<u>Total 02-11</u>
		<u>through 01</u>	<u>02</u>	<u>03</u>	<u>04</u>	<u>05</u>	<u>06</u>	<u>07</u>	<u>08</u>	<u>09</u>	<u>10</u>	<u>11</u>	
VICKERS (REUMECH) OMC													
RATEL 20 (a)	D 3256 BTXF	1391	0	0	11	11	2	0	0	0	0	0	24
Total Production		1391	0	0	11	11	2	0	0	0	0	0	24

(a) The through 2001 production includes nine prototype and developmental vehicles.