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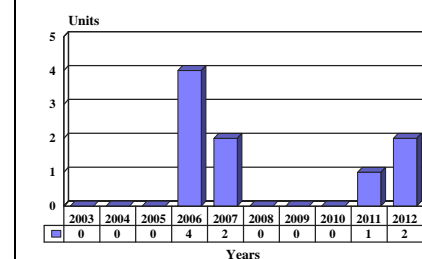
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Valkiri 127 mm Multiple Launch Rocket System - Archived 8/2004

Outlook

- Production of latest version is on an as-needed basis, but has been dormant for some time
- Two sales on the export market expected
- Other than for new rocket munitions, these systems have only a minimal modernization or retrofit potential
- Bar graph to right is for Valkiri II only; Valkiri I is no longer manufactured

10 Year Unit Production Forecast
2003 - 2012



Orientation

Description. A wheeled multiple launch rocket system.

Sponsor. The development and South African procurement of the Valkiri systems have been sponsored by the South African Department of Defence, with procurement through ARMSCOR, the purchasing agency for the Republic of South Africa.

Contractors. This system was developed by ARMSCOR as it was constituted prior to early 1992; it is currently manufactured by several firms operating under the auspices of Denel Limited, Pretoria, Republic of South Africa. Somchem is considered to be the prime contractor under Denel; the firm directly manufactures the rocket and warhead and is the system integrator. DaimlerChrysler and TruckMakers Limited are the main subcontractors.

Licensees. None

Status. The manufacture of the Valkiri Mark I system has been completed, and the system is in service in the

Republic of South Africa as the Visard. The Valkiri II system is in serial production on an as-needed basis and in service with the South African Defence Force as the Bataleur; the marketing effort as well as the development of new warheads for the rocket continues.

Total Produced. As of January 1, 2003, a total of 24 Valkiri I and 18 Valkiri II multiple launch rocket systems had been manufactured.

Application. A mobile rocket-based fire support system for the destruction of a variety of targets by means of multiple barrages.

Price Range. In equivalent 1989 United States dollars, a complete Valkiri I launcher system mounted on the UNIMOG truck had a unit price of \$577,000. In equivalent 2003 United States dollars, the complete Valkiri II launcher system mounted on the SAMIL Model 100 or similar class truck has a unit price of \$819,000.

Technical Data

Valkiri I

Crew. Normally, two men operate the vehicle/launcher, with an additional two men in an ammunition resupply truck.

Training & Elevation Mechanism. Hydraulically powered with a manual backup.

Vehicle. DaimlerChrysler UNIMOG 4x4 truck; other similar class wheeled vehicles as well as tracked vehicles can also mount the system.
Dimensions. The following data are for the last production standard:

	<u>SI units</u>	<u>US units</u>
Launcher/launch vehicle		
Tubes:	24	24
Tube length:	2.95 meters	9.68 feet
Length:	5.35 meters	17.55 feet
Width:	2.3 meters	7.55 feet
Height:	2.32 meters	7.61 feet
Weight:	6.39 tonnes	7.04 tons
Rocket		
Length:	2.68 meters	8.79 feet
Diameter:	127 millimeters	5.0 inches
Weight:	59 kilograms	129.8 pounds

Performance. The range figure is for the latest pattern rocket without any drag rings installed; with drag rings installed, the minimum range is 15 kilometers (16,404 yards).

	<u>SI units</u>	<u>US units</u>
Launcher elevation:	50°	50°
Launcher depression:	0°	0°
Launcher traverse:	110°	110°
Maximum range:	22,000 meters	24,059.2 yards
Speed:	high subsonic	high subsonic
Rate of fire:	one round/second	one round/second

Propulsion. The Valkiri I rocket uses a double-base solid rocket motor of unknown designation and performance parameters.

Warhead. The Valkiri I rocket is fitted with a high-explosive warhead containing 8,000 steel balls. Contact or proximity fuzing is available.

Launcher Mode. The Valkiri I rocket is launched from a truck-mounted, 24-round launcher configured as three rows of eight launchers.

Control & Guidance. Four wraparound fins at the rear of the rocket provide aerodynamic stabilization. In addition, various ranges can be achieved by varying the elevation of the launcher as well as by using drag rings.

Fire Control. As with most systems of this type, the onboard fire control equipment is minimal. Fire control information is usually relayed by radio to the launch vehicle by a forward observer through a fire direction center.

Valkiri II

Crew. Five men operate the vehicle/launcher; an additional two men in an ammunition resupply truck will often accompany the launcher vehicle.

Vehicle. SAMIL Model 100 6x6 truck; other, similar class wheeled vehicles as well as tracked vehicles can also mount the system.

Training & Elevation Mechanism. Hydraulically powered, manual backup.

Dimensions. The following data are for the latest production-standard Valkiri II launcher and rocket.

	<u>SI units</u>	<u>US units</u>
Launcher/launch vehicle		
Tubes:	40	40
Tube length:	2.95 meters	9.68 feet
Length:	9.31 meters	30.54 feet
Width:	2.35 meters	7.71 feet
Height:	3.41 meters	11.19 feet
Weight:	21.51 tonnes	23.71 tons

Rocket	<u>SI units</u>	<u>US units</u>
Length:	2.8 meters	9.18 feet
Diameter:	127 millimeters	5.0 inches
Weight:	59 kilograms	129.8 pounds

Performance. The range figure is for the latest pattern rocket without drag rings; with drag rings installed, the minimum range is 15,000 meters (16,404 yards). The newer rocket motor offers a maximum range of 36,000 meters (39,370 yards).

	<u>SI units</u>	<u>US units</u>
Launcher elevation:	50°	50°
Launcher depression:	0°	0°
Launcher traverse:	110°	110°
Maximum range:	33,000 meters	36,088.8 yards
Speed:	transonic	transonic
Rate of fire:	one round/second	one round/second

Propulsion. The Valkiri II rocket uses a double-base solid rocket motor of unknown designation and performance parameters.

Warhead. The Valkiri II rocket can be fitted with a high-explosive warhead containing 8,000 steel balls; other types include a submunition-dispensing (anti-armor) warhead and several different cargo warheads. Work on new warheads has been ongoing but at a slow pace. Contact or proximity fuzes are available, with a new dual-purpose fuze more recently developed.

Launcher Mode. The Valkiri II rocket is launched from a truck-mounted, 40-round launcher configured as five rows each with eight launch tubes.

Control & Guidance. Four wraparound fins at the rear of the rocket provide aerodynamic stabilization. In addition, various ranges can be achieved by varying the elevation of the launcher as well as by using drag rings. An extended-range rocket motor has been developed for the Valkiri II rocket; it is now in service.

Fire Control. Compared with that on the Valkiri I, the onboard fire control equipment on the Valkiri II is much more sophisticated. The Valkiri II has a digital computer to achieve the fire control solution; a navigation and position system is also fitted. The computer uses inputs of target distance, wind velocity and direction, and other data and presents the information so that the proper elevation and traverse of the launcher and other parameters can be set.

Variants/Upgrades

Variants. In March of 1988, it was announced by (then) ARMSCOR that a 12-round towed version of the Valkiri had been developed. This towed launcher is 3 meters (9.84 feet) in length, has a wheelbase of 1.9 meters (6.23 feet), and is 1.8 meters in height. The elevation and traverse mechanisms are operated by hand; firing is via a remotely operated unit attached by a cable. The launcher weighs 1,360 kilograms (2,992 pounds) and can be towed at speeds up to 120 kilometers per hour (74.5 miles per hour). The 127 millimeter (5 inch) rocket used in this system is 1.4 meters (4.59 feet) in length and weighs 30 kilograms (66 pounds), including the 18 kilogram (39.6 pound)

warhead. The warhead is the high-explosive type containing 8,500 steel balls. The range of the rocket is between 5,000 and 7,000 meters (5,468 and 7,655.2 yards). As of early 2003, this new towed launcher had yet to enter production.

Modernization and Retrofit Overview. Various improvements to the Mark II Valkiri/Bataleur have been incorporated as production cut-ins; these are described below. Other than for the integration of new rocket munitions and the possible retrofit of these improvements to earlier production systems, these systems essentially have no modernization or retrofit potential.

Program Review

Background. The Republic of South Africa, long ostracized by most of the world community, has developed a vibrant domestic arms industry. As a result of the military action in what was Southwest Africa, ARMSCOR, the then-government-owned umbrella arms developing and manufacturing organization, began developing an indigenous medium-range multiple launch rocket system. The new system was specially developed to counter the Russian BM-21 122 millimeter system, which South African forces were encountering in Angola. The development of the new system, called Valkiri, began in 1977; it was completed in March of 1981, with serial production commencing a month later. The Valkiri I saw extensive action in Angola, where UNITA forces called it Chindungu – the red pepper that bites. The South African Army calls the system the Visared.

Description. In order to introduce the new multiple launch rocket system into service as rapidly as possible, military and company officials decided to mount it on an existing 4x4 wheeled chassis. A version of the ubiquitous UNIMOG truck was selected for this purpose. This vehicle is noted for its ruggedness in the most difficult terrain as well as its ease of maintenance. Powered by a model OM 352 six-cylinder diesel engine rated at 82.06 kilowatts (110 horsepower) at 46.67 revolutions per second (2,800 revolutions per minute), the UNIMOG is manufactured by DaimlerChrysler of Germany (Mercedes-Benz).

The hydraulically operated launcher is mounted at the rear of the chassis, which also carries the two-man crew, communications gear, and the firing controls in the cab. A conventional artillery sight is mounted on the launcher; when not in use, it is stored in the cab of the vehicle. Two hydraulically operated stabilizing jacks mounted on the rear of the vehicle provide a stationary firing platform to reduce dispersion error.

The launcher is a 24-round unit which is reloadable while on the vehicle; reload time is 10 minutes. Once a rocket is inserted in the launcher, electrical contact with the firing circuit is automatically made. Several safety devices prevent accidental firing. Among these devices is one to prevent firing while the vehicle is in motion, another to prevent firing while the launcher is being aimed, and a third to prevent firing in the cab danger zone.

The Valkiri I rocket is available in only one version. The pre-fragmented high-explosive warhead contains 8,000 steel balls to enhance the terminal effects. The rocket uses a modern double-base propellant. Contact or proximity fuzes are available. Three differing trajectories are available by altering the launcher

elevation and using drag rings. The rocket is supplied as a complete round in an environmentally secure container. Storage life is approximately 12 years. A rocket can be handled easily by two people, aiding the task of stacking the rockets in storage facilities and reloading the launcher. Each Valkiri launcher is assigned a reload truck with two additional crew members and 48 reload rockets.

Sequence of Operation. In the South African Defence Force, a Valkiri I/Visared battery contains six launchers. Each battery has a command and control vehicle to provide meteorological and other fire control data to the launchers. It takes five minutes to bring a launcher into action and two minutes to take it out of action. A salvo of 24 rockets can be fired singly or in ripples of two to 24 rockets.

Further Development: The Valkiri II. In 1987, it was learned that a further improved version of the Valkiri was under development. This enhanced version overcame several of the deficiencies of the original Valkiri. The most important of these deficiencies were the following:

- The cab of the original Valkiri offers no protection from small-arms fire and ballistic fragments.
- The original Valkiri system is not mineproof, a major shortcoming as perceived by South African defense doctrine.
- The original Valkiri is based on a chassis and running gear that is not common with other South African Defence Force equipment.
- The 4x4 chassis of the original Valkiri has limited cross-country mobility compared to the other vehicles it is designed to accompany and support.
- Increased firepower with different types of rocket warheads was desired, as the original version has only one warhead option.

The development of the Valkiri II began in 1985, and serial production began in 1989. Initial operating capability was achieved in March of 1990. The South African Army calls the Valkiri II the Bataleur. The Valkiri II can be deployed alone or in conjunction with tube artillery systems, but the normal deployment is a battery of six launchers with a regiment having three batteries. A battery of six Valkiri II launchers can fire 240 rockets in around 46 seconds.

Description. The principal differences between the Valkiri I and Valkiri II are that the newer system has 40 launch tubes and is mounted on a larger truck chassis. The truck used is the SAMIL 100, manufactured in the

Republic of South Africa. The 6x6 SAMIL 100 has been strengthened and modified in order to fully meet the mission requirement. Among these changes are a cab with a five-man capacity as well as a large amount of internal storage; full armor protection from small arms projectiles, ballistic fragments, and land mines; increased fuel capacity to extend the range of the vehicle to 1,000 kilometers (621 statute miles);

improved suspension system components; and an uprated engine/gearbox. The Valkiri II can carry sufficient food, water, and other provisions to sustain the crew for two weeks in the field. A computerized fire control system is provided. Additional minor component improvements have subsequently been integrated with this system.

The automotive performance of the Valkiri II multiple launch rocket system, mounted on the SAMIL Model 100 truck with a fuel capacity of 400 liters (106.4 gallons), is as follows:

	<u>SI units</u>	<u>US units</u>
Maximum speed:	93 kilometers per hour	57.8 miles per hour
Maximum range:	1,000 kilometers	621 statute miles
Step:	50 centimeters	1.64 feet
Trench:	65 cm	2.13 feet
Slope:	36%	36%
Gradient:	69% meters	69%
Fording:	60 centimeters	1.97 feet

The launcher and stabilization system of the Valkiri II incorporated the latest in electronically controlled hydraulic components. The launcher consists of five rows, each with eight launch tubes. This launcher offers a 66 percent increase in firepower over the earlier Valkiri I system. The Valkiri II can fire a salvo of 40 rockets in 46 seconds.

The rocket is supplied as a complete round in an environmentally secure container. The storage life is approximately 12 years. The warhead types currently available are pre-fragmented high explosive (similar to the Valkiri I rocket described above), submunition dispensing (anti-armor), and several different cargo warheads. As of mid-2003, work on new warheads is ongoing, albeit at a slow pace. Contact or proximity fuzes are available, with a new dual-purpose fuze more recently developed.

A new family of 127 millimeter rockets was developed for the Valkiri II. At 2.8 meters (9.19 feet) in length, the new rockets are slightly longer than the rocket used in the original Valkiri multiple launch rocket system. The rockets use a new double-base solid rocket motor that burns for 1.5 seconds; the complete rocket weighs 59 kilograms (129.8 pounds). The range has been increased to 33 kilometers over the 22 kilometers of the Valkiri I rocket. Like the original Valkiri rocket, the Valkiri II rockets can be set for differing trajectories by altering the launcher elevation and using drag rings.

Operational Analysis. The Valkiri II represents a significant increase in capability and performance over the original Valkiri. Aside from the manual reloading procedure, which does reduce system complexity, maintenance, and initial cost, the Valkiri II is a thoroughly modern system that is especially suited to all but the most affluent nations that demand the latest technology.

Funding

Funding for the development and procurement of the Valkiri multiple launch rocket systems has been provided by the Republic of South Africa Department of Defence.

Recent Contracts

Contract information on these two multiple launch rocket systems is generally not available, as contractual information is not released. However, because of the new, more relaxed policies in the Republic of South Africa, some contract information has become available. In August of 1995, Somchem was awarded a ZAR3.1 million (equivalent to US\$850,000) contract for an undisclosed number of 127 millimeter rockets with fuzes.

Timetable

The following timetable relates to both Valkiri systems.

<u>Month</u>	<u>Year</u>	<u>Major Development</u>
November	1977	Development of Valkiri Mark I begun
March	1981	Development completed
April	1981	Serial production program begun
Early	1982	Initial service deliveries
	1985	Development of Valkiri Mark II begun
July	1989	First production deliveries of Valkiri Mark II
Mid	2003	Serial production of Valkiri Mark II dormant but available for new orders; further development of rocket munitions ongoing

Worldwide Distribution

Export Potential. Due to the unique geopolitical situation that long characterized the Republic of South Africa, the Valkiri has not been exported. Now that this situation has changed, South African weapons are expected to become more prevalent worldwide as they are increasingly traded on the export market.

Country. Republic of South Africa (22 Visared, 16 Bataleur).

Forecast Rationale

Our research into these two South African multiple launch rocket systems finds nothing of significance having come to pass in the last year. As of mid-2003, the serial production of the Valkiri II system remains dormant following the completion of the domestic order. However, the system continues to be marketed, especially on a regional basis. The development of the system, especially in relation to the rocket munitions, also continues, albeit at a slow pace.

Based on our research plus the continued marketing effort for the Valkiri II system, we forecast two moderate sales of the Valkiri II in five years or so. These sales will most likely be regional in nature, but due to South Africa's strong marketing efforts in the Middle East, a sale is possible in that region as well.

No additional manufacture of the original version of the Valkiri (Visared) is forecast; indeed, the Valkiri I is no longer offered.

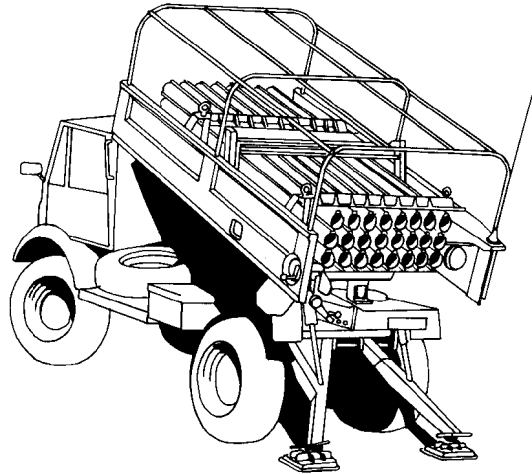
Ten-Year Outlook

ESTIMATED CALENDAR YEAR PRODUCTION

<u>Ordnance</u>	<u>(Engine)</u>	<u>through 02</u>	<u>High Confidence Level</u>			<u>Good Confidence Level</u>			<u>Speculative</u>			<u>Total 03-12</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>		<u>12</u>
DENEL LIMITED/SOMCHEM													
VALKIRI MARK I (a)	DOUBLE BASE SOLID ROCKET	24	0	0	0	0	0	0	0	0	0	0	0
VALKIRI MARK II (b)	DOUBLE BASE SOLID ROCKET	18	0	0	0	4	2	0	0	0	1	2	9
Total Production		42	0	0	0	4	2	0	0	0	1	2	9

(a) The historical production number is for the self-propelled system only and includes two prototype/developmental systems.

(b) The through 2002 production includes two developmental/prototype systems.



VALKIRI 127 mm MULTIPLE LAUNCH ROCKET SYSTEM

Source: Forecast International