

# ARCHIVED REPORT

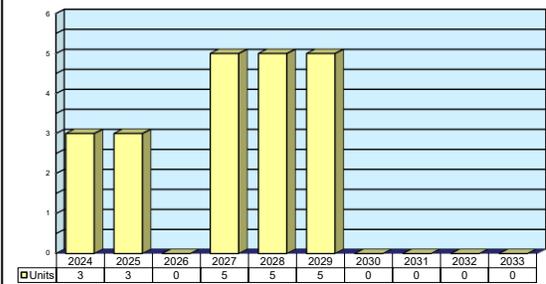
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## Terrex

### Outlook

- Production on an as-needed basis for domestic procurement by the Singapore Army and for export
- In June 2018, the USMC selected the BAE Systems SuperAV over the Terrex for the ACV 1.1 program
- Forecast reflects procurement of Terrex ICV by Singapore Army and possible export sales

**Unit Production Forecast  
2024-2033**



### Orientation

**Description.** A family of medium-weight wheeled infantry carrier vehicles.

**Sponsor.** The Ministry of Defense of Singapore sponsors the Terrex program.

**Licensees.** Turkish defense contractor Otokar produced the Terrex under license as the Yavuz APC.

**Status.** Development through serial production.

**Total Produced.** Through 2023, we estimate that the prime contractors produced 254 Terrex vehicles and 76 Yavuz vehicles, including prototypes.

**Application.** Medium-weight wheeled armored vehicles, optimized for providing multirole support to infantry during both offensive and defensive operations.

**Price Range.** In 2024 U.S. dollars, the base-model Terrex ICV carries an estimated unit prices of \$3.031 million:

### Contractors

#### Prime

<b>Singapore Technologies Engineering Ltd, (ST Engineering)</b>	<a href="http://www.stengg.com">http://www.stengg.com</a> , 1 Ang Mo Kio Electronics Park Rd, 07-01, Singapore, Singapore, Tel: + 65 6722 1818, Fax: + 65 6720 2293, Email: <a href="mailto:limbs@stengg.com">limbs@stengg.com</a> , Prime
<b>Timoney Technology</b>	<a href="http://www.timoneygroup.com">http://www.timoneygroup.com</a> , Gibbstown, Navan, Co. Meath, Ireland, Tel: + 353 0 46 905 5100, Fax: + 353 0 46 905 4424, Email: <a href="mailto:info@timoneygroup.com">info@timoneygroup.com</a> , Prime
<b>Defense Science &amp; Technology Agency</b>	<a href="http://www.dsta.gov.sg/">http://www.dsta.gov.sg/</a> , 71 Science Park Dr, Singapore, Singapore, Tel: + 65 6879 5333, Fax: + 65 6872 3406, Email: <a href="mailto:feedback@dsta.gov.sg">feedback@dsta.gov.sg</a> , Co-producer

## Terrex

<b>Otokar Otobus Karoseri Sanayi AS</b>	<a href="http://www.otokar.com">http://www.otokar.com</a> , Aydinevler Mah. Dumlupinar Cad., No. 58 A Blok Kucukyali, Istanbul, Turkey, Tel: + 90 216 489 29 50, Fax: + 90 216 489 29 67, Email: <a href="mailto:kyl@otokar.com.tr">kyl@otokar.com.tr</a> , Licensee
<b>Singapore Technologies Land Systems Ltd, (ST Land Systems)</b>	<a href="http://www.stengg.com">http://www.stengg.com</a> , 249 Jalan Boon Lay, Singapore, Singapore, Tel: + 65 6265 1066, Fax: + 65 6261 6932, Email: <a href="mailto:comms.kinetics@stengg.com">comms.kinetics@stengg.com</a> , Second Prime

Contractors are invited to submit updated information to Editor, International Contractors, Forecast International, 75 Glen Road, Suite 302, Sandy Hook, CT 06482, USA; [rich.pettibone@forecast1.com](mailto:rich.pettibone@forecast1.com)

## Technical Data



Terrex ICV

Source: U.S. Army (SPC Kimberly Hackbarth)

### Terrex

**Crew.** Two: driver and commander. The vehicle carries 11 fully equipped infantrymen.

**Armor.** All-welded steel armor, which provides protection against 30mm armor piercing (AP)

**Dimensions.** The following data reflect the latest production-standard Terrex vehicle; the Terrex RSTA vehicle is essentially the same in terms of performance capabilities.

projectiles over the frontal arc and 7.62mm projectiles over the sides and rear. The vehicle can also accept additional appliqué armor.

	<u>SI Units</u>	<u>U.S. Units</u>
Length	7.78 m	25.58 ft
Width	2.97 m	9.74 ft
Height	2.46 m	8.07 ft
Combat weight	24.0 tonnes	26.45 tons
Fuel capacity	650 liters	171.71 gal

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**Performance.** The automotive performance data reflect use on a paved road. The Terrex is fully amphibious.

	<u>SI Units</u>	<u>U.S. Units</u>
Maximum speed	105 kmph	65.24 mph
Maximum water speed	10 kmph	6.21 mph
Maximum range	600 km	372.8 stat mi
Step	60 cm	1.96 ft
Trench	2.0 m	6.56 ft
Slope	40%	40%
Gradient	60%	74%
Fording	1.8 m	5.90 ft

**Engine.** Caterpillar C9 six-cylinder turbocharged diesel powerplant generating 336 kW/450 hp.

**Gearbox.** Allison 4500SP wide-ratio hydromechanical automatic transmission unit, with one reverse and six forward gears. The gearbox integrates the vehicle braking system and hydrostatic steering.

**Suspension and Running Gear.** Independent hydrogas suspension system, with a double wishbone configuration for the front axles of the vehicle and a MacPherson strut for the rear.

The Terrex also features smart axle and cross-wheel differential locking capabilities.

All Terrex models mount 395/85 R20XZL radial tires with full run-flat capability.

**Armament.** There are two primary weapons configurations available for the Terrex vehicle.

- 7.62mm machine gun and 40mm grenade launcher mounted on a remote weapons system (RWS).
- .50-caliber heavy machine gun mounted on an RWS.

For secondary armament, the vehicle provides one or two firing positions for machine guns at the rear of the vehicle hull.

The vehicle's weapons systems feature full optical and thermal imaging capabilities and a laser rangefinder.

RWS options include the ST Kinetics Adder and EOS Technologies R-600.

## Variants/Upgrades

**Variants.** The Terrex product line currently offers the following variants. The contractors are planning a number of additional variants.

<u>Designation</u>	<u>Description</u>
Terrex RSTA	Terrex variant intended to perform specialized reconnaissance, surveillance and target acquisition functions. The variant features a stabilized remote weapons system, a stabilized reconnaissance system outfitted with a MINI-T telescopic mast, and a full C4I suite for the rapid dissemination of intelligence up and down the chain of command. The RSTA variant is known to mount an "Adder" RWS developed by ST Kinetics.
Terrex Engineer	Terrex variant intended to perform engineering functions in frontline environments. The variant features an array of specialized equipment and a push-barrier for obstacle clearance, and can be adapted to perform as a mobile bridgelayer through the integration of a Heavy Short Trackway Bridge system on top of the vehicle hull. The HSTB system is produced by German defense contractor KMW.
Terrex Command Vehicle	Terrex variant designed to perform as a mobile command post. The variant is outfitted with an array of specialized command-and-control and communications systems and features a heavily modified rear cabin.
Terrex ATGM	Terrex variant mounting a SPIKE anti-tank guided missile system produced by Israeli defense contractor Rafael Advanced Defense Systems. The ATGM variant retains the core model's RWS options.
Terrex Ambulance	Terrex variant intended to retrieve casualties from hazardous environments and provide protected treatment. The variant is outfitted with a specialized stretcher loading system for the rapid access/egress of up to three stretchers and integrates lift-support equipment in order to facilitate the loading of casualties in combat environments.

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### Designation

Terrex Trooper

### Description

Terrex variant intended to provide enhanced combat and troop deployment capabilities. The variant features a modified rear cabin to allow for the transport of combat equipment and ordnance and can carry up to 11 fully equipped troops, not including the driver and commander.

Terrex Recovery

Terrex variant intended to perform heavy vehicle recovery operations in hazardous environments.

Terrex Mortar Carrier

Terrex variant mounting a 120mm mortar system in a modified rear cabin space.

Terrex RCWS

Terrex variant integrating a 30mm cannon and ATGM systems mounted on a remotely controlled turret system.

Yavuz

Designation of the Terrex variant produced under license by Turkish defense and automotive contractor Otokar, working in collaboration with ST Kinetics. The variant features minor build and performance alterations from the base Terrex model and is optimized for the operational requirements of the Turkish Army. The variant is sometimes referred to as the AV-82.

Yavuz 2

Improved variant of the Yavuz featuring improved armored protection and performance capabilities. The Yavuz 2 is often referred to interchangeably with its predecessor.

**Modernization and Retrofit Overview.** Not applicable at this time.

## Program Review

**Background.** The Terrex infantry carrier vehicle (ICV) program was born of the operational requirements of Singapore's Army in the late 1990s. As the new millennium approached, Singapore's Ministry of Defense recognized the need to overhaul the service's troop transport capabilities in order to face the challenges of the modern warfare environment.

In particular, Singapore's Army possessed few means of rapidly transporting and deploying troops onto the field while also providing them with adequate protection from both conventional arms and the increasingly prominent danger posed by improvised explosive devices (IEDs). As a response to these operational shortcomings, defense contractors in Singapore began independently developing APCs/ICVs in anticipation of a future APC requirement.

ST Technologies and ST Kinetics, working in collaboration with Irish contractor Timoney Technology, initiated development of the Terrex in 1999.

The Terrex is also sometimes referred to as the AV-81.

The first operational prototype of the vehicle was rolled out in late 2000, and a lengthy period of trials, evaluations, and developmental enhancement began shortly thereafter.

In 2003, ST Kinetics launched a collaborative development and licensing program with Turkish automotive and defense contractor Otokar utilizing the Terrex design. The Yavuz was first publicly unveiled at

the IDEF international defense exhibition in Ankara that same year.

The program would yield a new Terrex variant, designated the Yavuz 1, optimized for the Turkish Army's requirements.

This collaborative effort would also yield an enhanced variant of the initial model, dubbed the Yavuz 2, several years later. Otokar's licensed production of the Yavuz 2 is ongoing.

The first production-model Terrex ICV was unveiled in September 2009, with low-rate serial production launched the same year. The first Terrex vehicles entered into active service with the Singapore Armed Forces in February 2010.

**Description.** The Terrex design exhibits a conventional interior layout. The driver sits to the left-front, with the commander seated in an elevated position behind the driver; the engine mounts to the right-front of the hull.

Both the driver and the commander have three forward-facing day periscopes, along with a range of imaging equipment for nighttime navigation.

The RWS mounts at the vehicle center.

The troop compartment encompasses most of the center and rear of the vehicle hull. The troop compartment features individual seats configured into a parallel arrangement along the sides of the hull. The

## Terrex

compartment's seating is suspended from the ceiling for enhanced protection from IED and mine threats.

The Terrex features a large, powered ramp on the rear of the vehicle hull for rapid access/egress. The ramp also features a conventional, forward-opening door.

The vehicle's acoustic weapons detection system is mounted on the top of the vehicle hull, roughly above the exit ramp. This system relays threat information to the Terrex commander's digital interface, allowing

occupants to rapidly assess and locate the source of small arms fire in the field.

The vehicle's situational awareness and thermal imaging systems are also mounted on the roof of the hull, near the RWS.

The vehicle's amphibious propeller systems are mounted on the lower rear of the vehicle hull, with one propeller on each side.

## Funding

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ST Technologies Engineering, Timoney Technology, and ST Technologies Kinetics launched development of the Terrex ICV as a private venture. The program now receives support from Singapore's Ministry of Defense.

## Contracts/Orders & Options

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In Sep 2009, the Singapore Ministry of Defense placed an order for 135 Terrex ICVs. Deliveries began in early 2010, shortly after the launch of low-rate serial production. Contract work was completed in 2011.

## Worldwide Distribution/Inventories

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**Export Potential.** The Terrex ICV is well regarded on the international market for its high build quality, strong performance capabilities, and advanced technical systems.

Licensed-production deals such as the one pursued by Turkish defense contractor Otokar offer an attractive option for nations seeking to modernize their armored inventories while also building up their own defense industries. The price of the Terrex varies considerably based on the configuration ordered; however, the basic model carries a mid-range unit cost that is in line with its competitors such as the LAV/Piranha series.

In 2009, the Indonesian Ministry of Defense expressed interest in pursuing a deal with ST Technologies Engineering and ST Kinetics for the licensed production of Terrex vehicles. However, no further progress on such a deal has been reported.

Nevertheless, the saturation of wheeled armored vehicles on the international market is likely to limit the vehicle's overall export potential.

**Countries.** Singapore, Turkey.

## Forecast Rationale

The ST Kinetics Terrex ICV is available for production on an as-needed basis for domestic follow-on orders by the Singapore Armed Forces and for possible export.

Reports indicate that production of the Turkish Yavuz ICV variant is dormant.

### *USMC ACV 1.1 Competition*

In November 2015, the U.S. Marine Corps selected the BAE Systems SuperAV and the ST Kinetics Terrex ICV for the engineering and manufacturing development phase of the Amphibious Combat Vehicle Increment 1.1 program. The Marines intend ACV 1.1 to provide a new

amphibious armored personnel carrier to help replace some of the service's long-serving AAV7 inventory.

In June 2018, the USMC selected the BAE Systems SuperAV over the Terrex for the ACV 1.1 program.

### *Domestic Procurement*

The SAF has not announced any major new procurement contracts for the Terrex ICV since completion of the initial 135-vehicle order in 2011.

Despite the country's small landmass and the relatively modest security demands placed upon its ground forces, Singapore fields one of the region's most thoroughly

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modern armored vehicle inventories, operating over 500 Bionix armored fighting vehicles and around 100 active Leopard 2 main battle tanks. Therefore, significant follow-on orders for Terrex vehicles are unlikely to be necessary for Singapore's defense requirements.

Nevertheless, the Forecast International Weapons Group believes the Army will pursue intermittent Terrex follow-on orders in low quantities.

## Ten-Year Outlook

ESTIMATED CALENDAR YEAR UNIT PRODUCTION												
Designation or Program	Thru 2023	High Confidence				Good Confidence			Speculative			Total
		2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	
<b>Singapore Technologies Engineering Ltd</b>												
<b>Terrex</b>												
	254	3	3	0	5	5	5	0	0	0	0	21
<b>Total</b>	254	3	3	0	5	5	5	0	0	0	0	21