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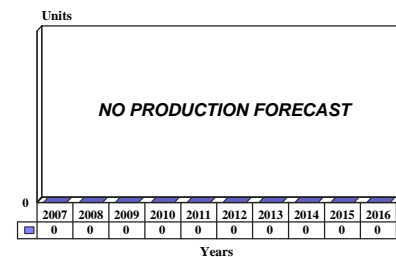
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## Type 90 - Archived 4/2008

### Outlook

- The Mitsubishi Type 90 ranks among the world's best fourth-generation main battle tanks
- Japanese law precludes export sales of the Type 90, negating any export potential or direct impact on the international market
- Forecast reflects dormant Type 90 production line, following 2005 completion of 300-unit production run exclusively for JGSDF procurement

10 Year Unit Production Forecast  
2007 - 2016



### Orientation

**Description.** A main battle tank.

**Sponsor.** The Japan Defense Agency (JDA), through the Japan Ground Self-Defense Force (JGSDF), sponsored the development and procurement of the Type 90 tank. The Technical Research and Development Institute (Setagaya-Ku, Tokyo) managed the Type 90 development program.

**Licensees.** None

**Status.** Development through serial production. The production line reportedly fell dormant in 2005.

**Total Produced.** Through 2005, the contractor produced a total of six prototype and 300 production Type 90 tanks.

**Application.** Armored mobile weapons systems, optimized for high-speed offensive and breakthrough operations, as well as for defensive fire support. The Type 90 is the primary offensive weapon for the Japan Ground Self-Defense Force (JGSDF).

**Price Range.** Its very-low and uneconomical production rate makes the Type 90 the most expensive tank in the world. In 2005 U.S. dollars, the Type 90 carried a unit price of at least \$9.728 million.

### Contractors

#### Prime

<b>Mitsubishi Heavy Industries Ltd</b>	<a href="http://www.mhi.co.jp">http://www.mhi.co.jp</a> , 16-5 Konan 2-chome, Minato-ku, Tokyo, 108-8215 Japan, Tel: + 81 3 6716 3111, Fax: + 81 3 6716 5800, Prime
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#### Subcontractor

<b>Fuji Electric Systems Co Ltd</b>	<a href="http://www.fesys.co.jp">http://www.fesys.co.jp</a> , Gate City Ohsaki, East Tower 11-2, Osaki 1-chome, Shinagawa-ku, Tokyo, 141-0032 Japan, Tel: + 81 3 5435 7114, Fax: + 81 (Commander's Dual-Axis Stabilized Sight)
<b>Fujitsu Ltd</b>	<a href="http://www.fujitsu.com">http://www.fujitsu.com</a> , Shiodome City Center, 1-5-2 Higashi-Shimbashi, Tokyo, 105-7123 Japan, Tel: + 81 3 6252 2220, Fax: + 81 3 6252 2783 (Thermal Sensor)

## Type 90

<b>Japan Steel Works</b>	<a href="http://www.jsw.co.jp">http://www.jsw.co.jp</a> , Hibaya Mitsui Bldg, 1-2, Yuraku-cho, 1-chome, Chiyoda-ku, Tokyo, 100-8456 Japan, Tel: + 81 3501 6136, Fax: + 81 3595 4624 (120mm Rh 120/44 Main Armament)
<b>Kyocera Corp</b>	<a href="http://global.kyocera.com">http://global.kyocera.com</a> , 6 Takeda Tobadono-cho, Fushimi-ku, Kyoto, 612-8501 Japan, Tel: + 81 75 604 3500, Fax: + 81 75 604 3501, Email: <a href="mailto:press1@kyocera.jp">press1@kyocera.jp</a> (Type 90 Armor Suite)
<b>Mitsubishi Electric Corp</b>	<a href="http://global.mitsubishielectric.com">http://global.mitsubishielectric.com</a> , Tokyo Bldg, 2-7-3, Marunouchi, Chiyoda-ku, Tokyo, 100-8310 Japan, Tel: + 81 3 3218 2111, Fax: + 81 3 3218 2185 (Type 90 Vehicle Electrical System)
<b>Nikon Instruments Inc</b>	<a href="http://www.nikonusa.com">http://www.nikonusa.com</a> , 1300 Walt Whitman Rd, Melville, NY 11747-3064 United States, Tel: + 1 (631) 547-8500, Fax: + 1 (631) 547-0306, Email: <a href="mailto:biosales@nikonincmail.com">biosales@nikonincmail.com</a> (Gunner's Primary Sight)
<b>Nippon Electric Glass Co Ltd</b>	<a href="http://www.neg.co.jp">http://www.neg.co.jp</a> , 7-1 Seiran, 2-chome, Otsu, 520-8639 Japan, Tel: + 81 77 537 1700, Fax: + 81 77 534 4967 (Type 90 Optical Components)
<b>Nohmi Bosai Ltd</b>	<a href="http://www.nohmi.co.jp">http://www.nohmi.co.jp</a> , 7-3 Kudan-Manami, 4-chome, Chiyoda-ku, Tokyo, 102-8277 Japan, Tel: + 81 3 3265 0231, Fax: + 81 3 3265 5348, Email: <a href="mailto:kouhou@nohmi.co.jp">kouhou@nohmi.co.jp</a> (Kidde-Graviner Fire Detection/Suppression System)

Comprehensive information on Contractors can be found in Forecast International's "International Contractors" series. For a detailed description, go to [www.forecastinternational.com](http://www.forecastinternational.com) (see Products & Samples/Governments & Industries) or call + 1 (203) 426-0800.

Contractors are invited to submit updated information to Editor, International Contractors, Forecast International, 22 Commerce Road, Newtown, CT 06470, USA; [rich.pettibone@forecast1.com](mailto:rich.pettibone@forecast1.com)

## Technical Data

**Design Features.** The Type 90 represents state-of-the-art main battle tank design, comparable to the best tanks available worldwide.

**Crew.** Three: commander, gunner, and driver.

**Armor.** The armor suite of the Type 90 remains classified. Research indicates that the armor consists of mixed composite/ceramic materials in multiple, possibly spaced, layers. The Type 90 armor suite may also feature depleted uranium (DU) armor mesh integrated with the hull and turret castings.

**Dimensions.** The following data reflect the production-standard Type 90 tank.

	<u>SI units</u>	<u>U.S. units</u>
Length	9.76 m	32.02 ft
Width	3.43 m	11.25 ft
Height	3.05 m	10.01 ft
Combat weight	49.97 tonnes	55.08 tons
Fuel capacity	1,100 liters	292.55 gal

**Performance.** The maximum speed and range data reflect use on a paved road.

	<u>SI units</u>	<u>U.S. units</u>
Maximum speed	70 kmph	43.47 mph
Maximum range	405 km	251.5 statute mi
Step	1.02 m	3.35 ft
Trench	2.71 m	8.89 ft
Slope	40%	40%
Gradient	60%	60%
Fording	2.1 m	6.89 ft

**Engine.** Mitsubishi 10ZG 10-cylinder, liquid-cooled, two-cycle supercharged diesel engine. This 21.5-liter (1,312-cubic in) powerplant generates 1,118.6 kilowatts (1,500 hp), with a power-to-weight ratio of 22.39 kilowatts per tonne (27.23 hp/ton).

The Type 90 boasts a power-to-weight ratio superior to that of other fourth-generation main battle tanks – such as the Challenger 2, the Leopard 2, and the M1 Abrams.

## Type 90

The supercharged engine employs a Roots blower and two exhaust-driven superchargers with an intercooler. The fuel system is electronically controlled. The three engine-cooling radiators feature three cooling fans, driven by variable-speed hydraulic drives.

**Gearbox.** An unidentified hydro-mechanical automatic unit with four forward and two reverse gear ratios. The mechanism features an automatic lock-up clutch and oil-cooled disc brakes. The tank also features a hydrostatically controlled, regenerative differential steering system.

**Suspension and Running Gear.** An advanced, integrated hybrid suspension system with six dual-tired alloy roadwheels and three track return rollers on each side. The drive sprocket mounts to the rear. The first, second, fourth, and sixth roadwheel stations mount hydro-pneumatic shock damper units; the center two roadwheel stations mount torsion bars. The suspension system allows the tank to pitch six degrees forward or backward, assisting elevation and depression of the main armament. The track is a cast-steel, single-pad, double-pin pattern.

### Armament

**Main Armament.** The Rheinmetall 120mm Rh 120/44 smoothbore tank gun. Japan Steel Works produces this ordnance under license from Rheinmetall Defence (formerly Rheinmetall DeTec). This ordnance features a muzzle reference system, fume extractor, and thermal sleeve. Elevation (15°), depression (-12°), and turret traverse are electrically powered with a manual backup.

Mitsubishi designed and produces a bustle-mounted, electrically operated automatic loading system for the Type 90. This device reportedly holds 16 rounds of 120mm ammunition. After firing, the main armament automatically returns to the index (0°) position for reloading. A manually operated backup system supports the automatic loading system.

**Secondary Armament.** One 12.7x99mm (.50 caliber) M2HB heavy machine gun mounted on the turret roof; one coaxially mounted 7.62x51mm NATO

(.308 Winchester) Model 74 machine gun. Three electrically operated smoke grenade launchers mount on each side of the turret.

**Fire Control.** The Type 90 employs an advanced fire control suite, featuring a neodymium yttrium-aluminum garnet laser rangefinder, thermal imaging equipment, laser warning devices, and extensive night vision devices. The gunner's Nikon primary sight features an integral neodymium yttrium-aluminum garnet laser rangefinder and a Fujitsu thermal sensor. The sight is stabilized in azimuth. The Type 90 has fire-on-the-move capability.

After acquisition, the gunner and commander can track targets manually, or by using the automatic target tracking system. This advanced feature receives data from the thermal imaging module, stores target data, and displays the thermal image at the gunner's and commander's stations. The gunner's station also features a backup, coaxially mounted telescope. The commander's station features a Fuji dual-axis stabilized sight, which allows a 180° traverse capability, and enables target acquisition and handoff to the gunner – giving the Type 90 a hunter-killer capability.

### *State-of-the-Art Fire Control*

The heart of the Type 90 fire control system is the digital computer, which incorporates at least seven sensor inputs and the automatic tracking data from the thermal imaging module. The Type 90 fire control system is among the most advanced operational systems in the world. Unconfirmed reports suggest the system may incorporate an automatic target recognition and/or target queuing capability. The tank also features a laser-warning system, integrated with the smoke- and infrared-grenade launcher. In addition to an audio signal, the laser warning system includes a directional display at the commander's station.

## Variants/Upgrades

**Variants.** Mitsubishi has thus far developed two variants of the basic Type 90:

### Designation

Type 90 ARV

### Description

Armored Recovery Vehicle. Features a new superstructure, as well as a hydraulically operated crane, dozer blade, winch, and related equipment. Entered low-rate production in 1991; between five and 26 are currently in service.

Type 91 AVLB

Armored Vehicle-Launched Bridge. Mounts a military load class 60 scissors-type bridge. The Type 91 AVLB is still in development; one prototype may exist.

## Type 90

**Modernization and Retrofit Overview.** Only two significant upgrade programs are currently available for the Type 90 tank.

Auxiliary Power Unit. Evidence indicates that the Japan Defense Agency is planning to retrofit an under-armor APU to existing Type 90 tanks. This integration work involves the Sundstrand Power Systems Titan engine, for which Mitsubishi Heavy Industries already has licensed-production rights (for the UH-60 Blackhawk application).

Type 90 Mineclearing Tank. This retrofit involves a standard Type 90 tank, mounting the Type 92 mineclearing roller system. This system features a

magnetic vehicle signature duplicator, mounted forward of the tank's roller equipment.

The Type 90 tank can also integrate a hydraulically operated dozer blade and a deep-water fording kit.

Potential Main Armament Retrofit. By the end of the forecast period, the Forecast International Weapons Group expects the JGSDF may retrofit the Type 90 tank with the Rheinmetall 120mm Rh 120/55 smoothbore tank gun, thereby keeping the Type 90 on the cutting edge of main battle tank technology.

## Program Review

**Background.** Research began in 1976 for a new tank to replace the Type 74; the Japan Defense Agency first authorized developmental funding in 1977. Following development and testing of components, delivery of the first-stage prototypes (designated TK-X, then ST-C) occurred in 1983. Problems with the indigenously designed 120mm tank gun prompted the JDA to adopt the Rheinmetall 120mm Rh 120/44 for all subsequent models.

Between 1987 and 1989, the JDA accepted six second-stage prototypes for operational testing. Prior to completion of the operational testing phase (in early 1991), the JDA initiated procurement of the first 30 tanks (standardized and designated Type 90) in 1990.

### *One of Today's Best*

In terms of survivability, battlefield mobility, and fire control, the Type 90 represents a significant enhancement over the Type 74 main battle tank. Indeed, the Type 90 is competitive with the best main battle tanks in the world.

**Description.** In general appearance, the Type 90 resembles a more compact version of the Krauss-Maffei Wegmann Leopard 2 main battle tank. To what extent this similarity indicates German-Japanese cooperation remains open to debate.

### *Conventional Layout*

The Type 90 exhibits a conventional internal layout. The driver's station – located in the left-forward hull – features a single-piece hatch cover and three periscopes; the center periscope is interchangeable with a passive night-driving instrument.

The turret is somewhat similar to that of the Leopard 2, except for the Mitsubishi automatic loading system in the turret bustle. The commander sits to the right of the main gun; the gunner sits to the left. Both stations have roof hatches. The commander's station features a roof-mounted sight and vision blocks for 180° observation. The gunner's station features a roof-mounted combined day and thermal sight with an integral laser rangefinder. Either the gunner or the commander can aim the main armament; the commander has an overriding control.

The Type 90 features a Kidde-Graviner engine and crew-compartment fire detection/suppression system (supplied through licensee Nohmi Bossai). The tank also features a nuclear, biological, and chemical (NBC) protective suite and the roof-mounted SIMRAD laser warning device.

### *Member of the Rh 120 Fraternity*

The first two Type 90 prototypes mounted an indigenous 120mm smoothbore main armament, developed in 1979 from the Rh 120 concept. Concurrent with the development of this ordnance, Japan developed a new Armor Piercing Fin Stabilized Discarding Sabot (APFSDS) round with a titanium-alloy penetrator, a High Explosive Anti-Tank-Fin Stabilized (HEAT-FS) round, and a Target Practice-Tracer (TP-T) round. Even after rejecting the indigenous ordnance design in mid-1985, the JGSDF continues to employ these indigenous munitions with the license-produced Rh 120/44 ordnance.

Mitsubishi integrated the Rh 120/44 ordnance with its indigenous automatic loader, recoil system, and gun mount in the Type 90 tank application.

## Significant News

**Japan Could Revise Constitution** – Faced with threats from North Korea, Japan may want to launch pre-emptive military action. Such a move, however, would require a change in Japan's Constitution.

The ruling Liberal Democratic Party wants to pass legislation this year calling for a national referendum to revise its pacifistic constitution. Japan's Constitution was written by the U.S. after World War II and renounces war, stating that military forces "will never be maintained." Prime Minister Shinzo Abe favors changing the document during this year's regular parliamentary session, which starts next week. The document was last amended in 1947. That amendment allowed Japan to create the Self-Defense Forces.

The LDP also called for solving such North Korean issues as its nuclear weapon and missile programs, and the abductions of Japanese citizens. (Bloomberg, 1/07)

**Japan's Constitution Does Not Bar Nuclear Weapons, Says Government** – The Japanese believe that the country's constitution allows it to possess nuclear weapons, so long as the number of weapons is kept to a minimum level necessary for self-defense. The government also announced that it has no intention of beginning a nuclear weapons program. "From a purely legal standpoint, even Article Nine of the constitution does not bar our country from possessing minimum capabilities necessary for self-defence," said a statement written in response to a question posed by an independent lawmaker. "Even with nuclear weapons, we've understood that possessing them would not necessarily violate the constitution as long as it is kept within such limits," it said.

The statement essentially repeated a position that the government has made clear in past parliamentary debate, but it comes at a time when the Japanese people are increasingly concerned over North Korea's program to build nuclear weapons and the missiles to carry them. The government is currently bound under the nuclear Non-Proliferation Treaty not to receive or manufacture nuclear weapons, but controversy over debate on nuclear arms erupted last month when Shoichi Nakagawa, the policy chief of the ruling Liberal Democratic Party, said Japan needs to discuss if it should acquire nuclear weapons following North Korea's nuclear test.

Prime Minister Shinzo Abe has said repeatedly that Japan would not move toward building nuclear weapons, noting that his government would not even discuss the topic. (Indian Government News, 11/06)

**Major Change in Japanese Defense Organization** – The Japanese Defense Agency will be upgraded to the Japanese Ministry of Defense under the terms of a bill passed in the Japanese Lower House. The bill means that the armed forces will be represented by a Cabinet-level minister, who will have the power to call for a Cabinet meeting and present budget requests directly to the Finance Ministry. At the moment, the Japanese Defense Agency is an affiliate of the Cabinet Office and lacks such representation.

The bill was passed by the ruling coalition of the Liberal Democratic Party, the New Komeito party, and the main opposition Democratic Party of Japan, and was opposed by the Social Democratic Party and the Japanese Communist Party. The proposed legislation will pass the Upper House during the current Diet session. (Xinhuanet, 11/06)

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## Funding

The Japan Defense Agency, through the Japan Ground Self-Defense Force (JGSDF), funded the development and procurement of the Type 90 main battle tank.

## Contracts/Orders & Options

Other than the initial JPY36.3 billion production contract for 30 Type 90 tanks, the Japan Defense Agency has not released any contractual information.

## Type 90

## Timetable

<u>Month</u>	<u>Year</u>	<u>Major Development</u>
	1976	Development begun
	1982-1984	Production of first-stage prototypes (with indigenous ordnance)
	1985	JDA adopts Rh 120/44 ordnance
	1986-1988	Production of second-generation prototypes
Sep	1987	JDA unveils Type 90 main battle tank
	1989-1990	Operational testing
Jul	1991	Serial production begun
	2005	Contractor completes final year of JGSDF serial production run
	2007	Production dormant; available for modernization and retrofit work

## Worldwide Distribution/Inventories

**Export Potential.** None. Japanese law precludes export sales of military hardware.

**Country.** Japan (6 prototypes and 300 production tanks).

## Forecast Rationale

In 2005, Mitsubishi Heavy Industries reportedly completed the serial production run of 300 Type 90 main battle tanks, exclusively for Japan Ground Self-Defense Force (JGSDF) procurement. The production line is now dormant.

Modernization and retrofit programs are ongoing. By the end of the forecast period, the Forecast International Weapons Group expects that the JGSDF may retrofit the Type 90 tank with the Rheinmetall 120mm Rh 120/55 smoothbore tank gun, thereby keeping the Type 90 on the cutting edge of main battle tank technology. The Type 90 will remain the primary offensive weapon of the JGSDF throughout the forecast period.

### *State-of-the-Art, and Unavailable*

As Japanese law precludes any export sales of military hardware, there is no export potential for this tank. However, this legal limitation might actually be a blessing in disguise for the contractor; the astronomically high unit price of the Type 90 would easily price the Type 90 out of the international market.

### *Dodging the Budget Bullet*

In December 2004, the Japanese government issued a new National Defense Program Outline (NDPO) in an attempt to adapt the missions of the Japan Self-Defense Forces (JSDF) to the post-Cold War threat environment.

While the NDPO stressed new force projection requirements and the need for Japan to more closely cooperate with its allies, the document also called for reducing the active JGSDF main battle tank inventory by one-third, to about 600 tanks.

By the time the Koizumi administration issued the NDPO, however, the final 19 Type 90 tanks were already in the pipeline for delivery in 2005. Consequently, the Type 90 probably survived the cuts unscathed, as the existing JGSDF inventory of 710 Type 74 tanks will absorb the brunt of the reductions.

### *Maintaining the Current Fleet*

Our ten-year production outlook reflects the fact that the Type 90 main battle tank production line is now dormant. Given the ongoing JGSDF force reductions mandated by the recent NDPO, the likelihood of new JGSDF procurement is virtually nil at this point. As Japanese law prohibits the export of war materiel, such as main battle tanks, the absence of new JGSDF procurement effectively ends the Type 90 program, in terms of new production.

Nevertheless, ongoing modernization and retrofit work, as well as the production of spare and repair parts, will maintain some level of program activity throughout the forecast period.

## Ten-Year Outlook

### ESTIMATED CALENDAR YEAR PRODUCTION

## Type 90

		<u>High Confidence Level</u>				<u>Good Confidence Level</u>				<u>Speculative</u>				
Vehicle	(Engine)	thru 06	07	08	09	10	11	12	13	14	15	16	Total 07-16	
MITSUBISHI HEAVY INDUSTRIES														
TYPE 90/TYPE 90A (a)	M-12ZG	306	0	0	0	0	0	0	0	0	0	0	0	
Total Production		306	0	0	0	0	0	0	0	0	0	0	0	

(a) Production for JGSDF procurement only. The through-2005 production total includes six prototypes; production for service deliveries began in 1991.



JGSDF Type 90 Main Battle Tank

Source: EnemyForces.com