

MOUNTAIN MANEUVERABILITY
FOR EFFICIENT FORESTRY OPERATIONS

TOYOTA
Moguls



It's now widely recognized that the world's forests are vital in countering global warming and cleaning up the atmosphere. In Japan, however, the declining number and advancing age of its forestry workers are hindering forestry development. The industry urgently needs mechanization to boost efficiency and improve working conditions. Toyota inaugurated the Forest of Toyota Project as a plan to help find better ways of preserving and nurturing our forests. As part of this project, we developed the Toyota Moguls, a vehicle designed specifically to traverse rugged, mountainous, obstacle-strewn forest routes that until now had to be traveled on foot. The Toyota Moguls will lighten the load on forestry workers and contribute to more efficient, successful forestry.

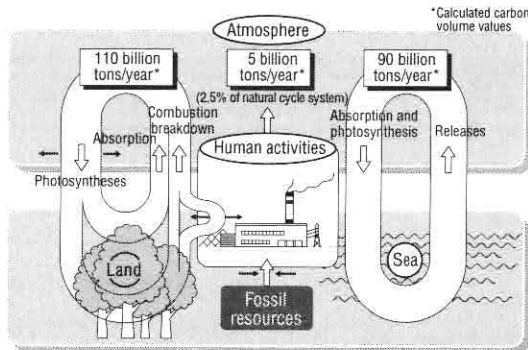
TOYOTA MOTOR CORPORATION

International Public Affairs, Tokyo Head Office
1-4-18 Koraku, Bunkyo-ku, Tokyo 112 Japan

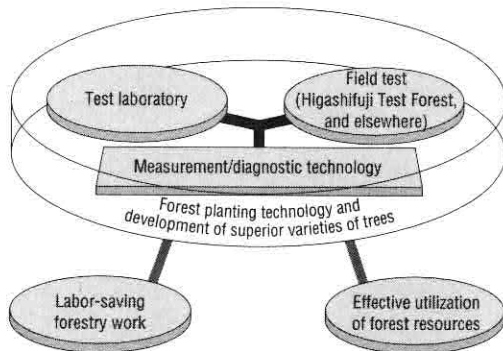
Tel: 81-3-3817-9930, 9913, 9941 Fax: 81-3-3817-9017

The Forest of Toyota Project

Protecting and restoring the global environment requires limiting pollutants, and finding ways to counteract the harmful substances already in the biosphere. The Forest of Toyota Project seeks to make optimum use of the capabilities of plants, especially trees, to improve the atmosphere.



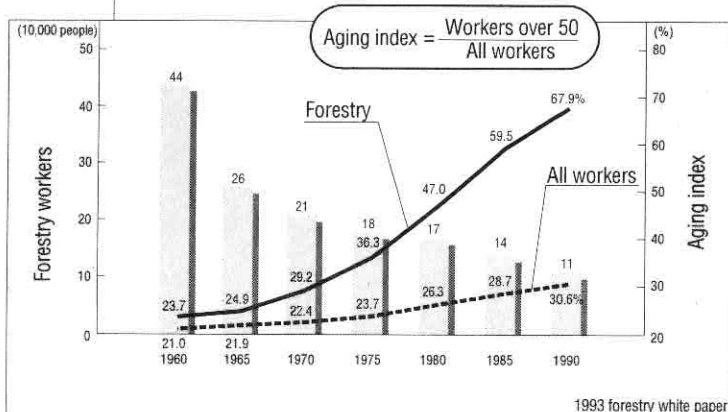
Plants can absorb CO₂ and NO₂, which are leading causes of global warming and air pollution. They also help lower temperatures in surrounding areas. It follows, then, that planting more forests, and enhancing existing forests, will go a long way toward cleaning up the atmosphere. The Forest of Toyota Project incorporates biotechnology, electronics, mechatronics, and other advanced technologies, based on our years of accumulated technology and know-how, to conduct everything from laboratory R&D to field tests. We are conducting forestry conservation and development from many viewpoints, including forest cultivation, effective utilization of forest resources, and labor savings in forestry operations. Our goal is to develop new technologies compatible with the biosphere.



Problems facing forestry workers

The number of forestry workers in Japan has declined steadily since 1960, and with few younger people coming into the labor force, the average age of workers has risen rapidly. Difficult working conditions are a major factor in the declining numbers. Forestry work is physically demanding, and must be done

in a harsh environment. Accidents and injuries tend to be more frequent than in most other industries. An urgent issue, therefore, is improving the working conditions, mainly through mechanization, to make forestry a more appealing career. Recent years have seen the introduction of feller-bunchers, harvesters, and other efficient, large-scale machinery for such forestry operations as timber culling and transport. But many basic operations like tree planting, removal of undergrowth, and pruning are still done with light equipment such as seedling beds, chain saws, and grass cutters, which must be manually carried to the work site. Mechanization of forestry operations to save labor will improve working conditions, and speed up efforts to protect and improve Japan's forest environment.



Moguls

Go-anywhere maneuverability boosts efficiency in forestry.



The Toyota Moguls has an active posture control system to boost maneuverability on bumpy roads or steep grades. Its tight turning radius function allows operations on narrow or winding roads. The Moguls can traverse logging trails impassible to conventional four-wheel drives or specialized forestry vehicles. That makes it possible to transport workers and equipment directly to remote work sites. What's more, the Moguls conveys an image unlike any conventional

forestry vehicle, with a sleek, futuristic exterior and a comfortable, spacious interior. Its appearance alone will contribute to an improved image of forestry work.



ACTIVE POSTURE CONTROL SYSTEM

The most important characteristic of the Toyota Moguls is its active posture control system. This makes it incredibly simple to operate, even on rugged mountain trails. It requires no special training, and is as easy to drive as a passenger car.

Horizontal control function

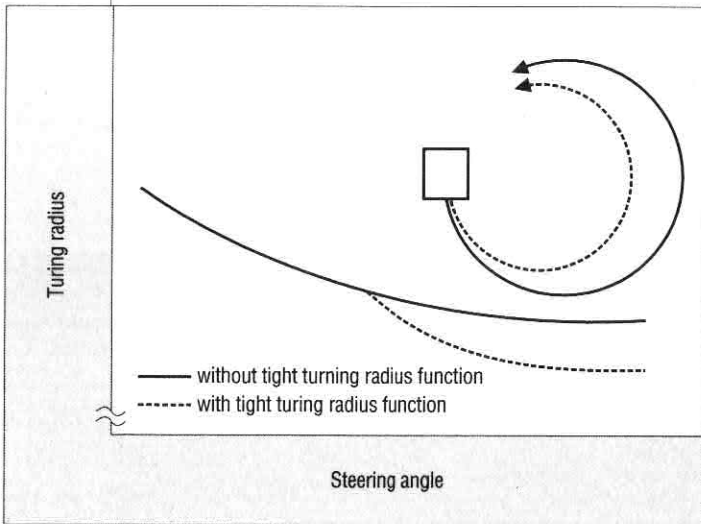
Thanks to active posture control, the Moguls stays level even when traversing steep slopes or traveling over rough ground, when just one wheel must lift up to go over a rock or stump — situations that leave ordinary vehicles tilting seriously. It improves stability and prevents rollovers, making the Moguls comfortable and stress-free to operate and ride in.

Vehicle height adjustment function

In addition, the vehicle height can be lowered for easy entry and exit, or when running on smooth roads, and raised as much as 500mm when traveling on bumpy roads, muddy roads, or on unimproved, obstacle-strewn surfaces.

Ground contact pressure control function

Contact pressure control allows independent adjustment of each wheel's ground contact pressure within a prescribed range. This keeps the wheels on the ground, eliminating wheel slippage and further improving stability.



Tight turning radius function

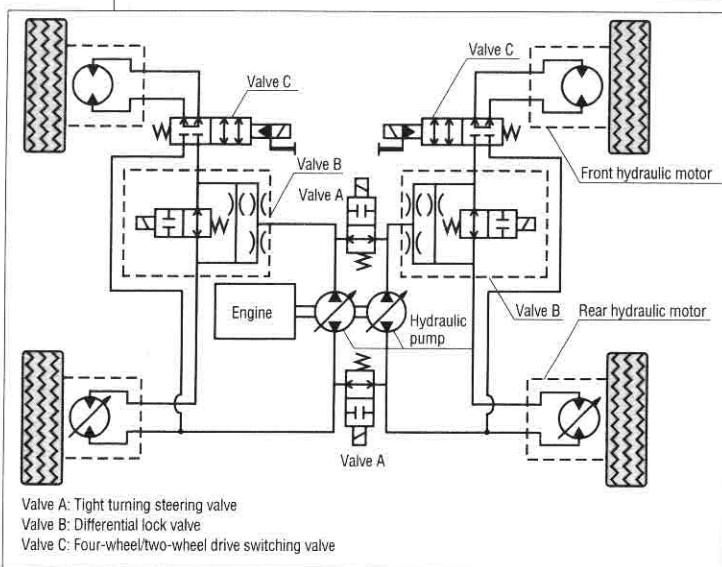
When the steering angle surpasses a certain value, the tight turning radius function automatically speeds up the rotation of the outer wheels, and slows down the inner wheels to reduce the turning radius.

Super-slow slope descent function

When descending steep slopes, the Moguls uses its super-slow slope-descent function. This slows wheel rotation, allowing descent at a safe speed, without the driver needing to worry about working the accelerator or the brake pedal.

Remarkable functions enhance performance

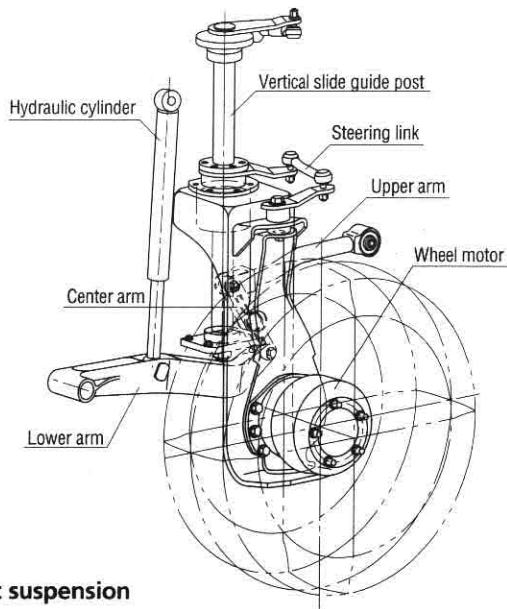
The Toyota Moguls' active posture control and tight turning radius can be done because it has a separate hydraulic wheel-motor driving each wheel and its four-wheel independent hydraulic suspension has long-stroke height adjustment. Other remarkable equipment includes triangular track units that can replace the wheels to vastly improve performance on soft ground.



Valve A: Tight turning steering valve
 Valve B: Differential lock valve
 Valve C: Four-wheel/two-wheel drive switching valve

Hydraulic wheel-motor four-wheel drive

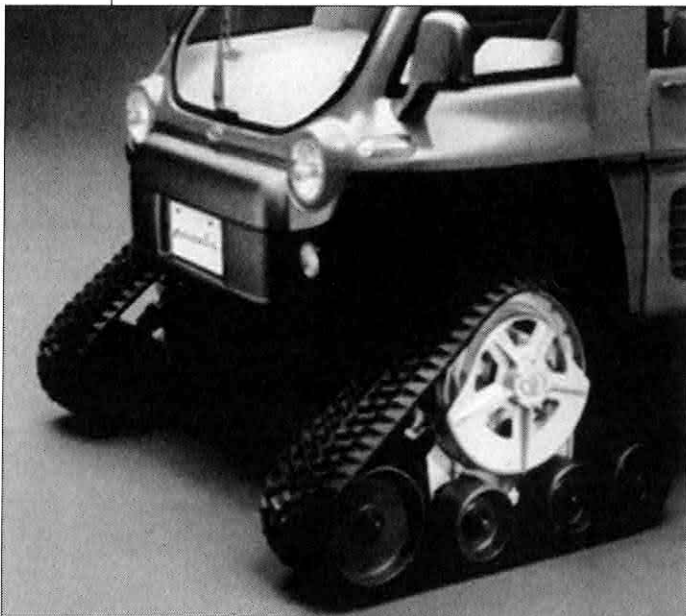
Because conventional driveshaft systems do not allow a 500mm vehicle height adjustment, the Toyota Moguls uses independent hydraulic wheel-motors to drive each wheel. This method does not require a propeller shaft or differential below the floor, so we were able to increase the ground clearance. The hydraulic drive characteristics also allow other performance-enhancing features, such as the tight turning radius and super-slow slope-descent functions mentioned earlier. Other features include easy shifting between four-wheel and two-wheel drive, a continuously variable transmission, and a limited slip differential (LSD).



Front suspension

Four-wheel independent hydraulic suspension with long-stroke height adjustment

The front and rear hydraulic suspensions have Watt link mechanisms that allow height adjustments of up to 500mm.



Four-wheel independent track units

Triangular rubber track units can be installed in place of the wheels to spread the vehicle weight across a much larger contact area. This improves performance on unimproved or soft surfaces where tires would slip or sink in. The units are independent, and can easily be installed in place of the standard wheels. Because the track units steer just like the wheels, they don't tear up the ground the way conventional two-track machines do — another environmentally friendly feature.

Moguls

A full range of safety features

The Toyota Moguls is built to travel on steep, bumpy, muddy and otherwise adverse surfaces, so naturally we put extra work into making it as safe as possible. The layout of the driver's seat and the interior design assures excellent visibility. A vehicle posture and stability monitor checks the vehicle posture when active control is engaged. The Toyota Moguls also warns the driver of unstable operating conditions, and has an automatic stop feature that halts the vehicle in dangerous situations.



Excellent visibility

Visibility is an especially important point in the safe operation on unimproved surfaces. That's why the Toyota Moguls has the driver's seat positioned front and center in the cab, a low instrument panel that doesn't hinder visibility, and a large windshield that improves the field of vision ahead and downward. Other touches to improve visibility include small windows in the lower sections of the side doors, which assure a better view of the road surface, and power-adjustable side mirrors.



better view of the road surface, and power-adjustable side mirrors.

Warning and automatic stopping function

When lateral stability is low while traversing a steep slope, the Toyota Moguls issues a warning to the driver, who can then reduce speed. If the stability continues to deteriorate, the Toyota Moguls automatically comes to a stop. In addition, even if the sensors, CPU, power source, or other parts of the

Excellent visibility

Visibility is an especially important point in the safe operation on unimproved surfaces. That's why the Toyota Moguls has the driver's seat positioned front and center in the cab, a low instrument panel that doesn't hinder visibility, and a large windshield that improves the field of vision ahead and downward. Other touches to improve visibility include small windows in the lower sections of the side doors, which assure a

Main specifications

Total length	3,165mm	
Total width	1,640mm	
Total height	1,795-2,295mm	
Passenger capacity	2	
Wheelbase	2,000mm	
Tread/front and rear	1,390mm	
Approach angle	61°	(When the vehicle height is centered and horizontal)
Departure angle	51°	(When the vehicle height is centered and horizontal)
Minimum ground clearance	190-690mm	
Minimum turning radius	3.5m	
Engine	Revised 5K engine	
Displacement	1,486cc	