

Courtesy of Windshear

## Wind Tunnel Rolling Road Systems

High-performance moving ground plane systems for aerodynamic wind tunnels

### Benefits

- » Ensure high speed, accuracy and efficiency in wind tunnel testing
- » Expect outstanding durability and long life from stainless steel belts
- » Gain design insights with faster speeds, flatter belt performance and more measurement capabilities
- » Measure down-force, lift-force, drag-force and side-force with extremely high accuracy
- » Choose from single- or multi-belt configurations

Aerodynamic wind tunnels equipped with moving ground plane systems from MTS solve critical challenges in design-intensive industries. In motorsports, our rolling road systems enable precise measurement of aerodynamic drag and down-force. In automotive manufacturing, moving ground plane simulations are vital to developing passenger cars with higher fuel efficiency, lower emissions and less noise. In aerospace, MTS systems allow precise studies of an aircraft's ground interactions during takeoff and landing.

To meet these objectives, customized rolling road systems from MTS deliver the efficiency, speed and accuracy aerodynamicists need to perform tests

with high measurement fidelity. Our systems also help simulate realistic vehicle movement and control the motion of scale models. They are available in single- and multi-belt configurations.

As the pioneer in rolling road technology, MTS is uniquely positioned to excel in moving ground plane systems for wind tunnels. Belts are constructed from stainless steel to enable higher speeds, exceptional durability and long life. The belts are supported with proprietary vacuum preloaded air bearings that keep the belt flat when exposed to extreme aerodynamic loads, such as those generated by high-performance Formula 1 and LeMans race cars.

## Proven performance from rolling road experts

MTS has also developed technologies and techniques that redefine the possibilities of measurement in rolling road applications. Our systems incorporate state-of-the-art through-the-belt wheel force measurement, allowing aerodynamicists to measure down-force (or lift-force) at each wheel within newtons of accuracy. Advanced horizontal force measurement technology measures drag-force and side-force with the same degree of precision.

MTS rolling road systems can be used to test a wide variety of specimens. Track width and wheel base can be quickly adjusted through an automatic repositioning mechanism for fast changeover.

MTS is the undisputed leader in steel belt moving ground plane technology. Our teams have delivered 14 single-belt and three five-belt rolling road systems. Time and again, we have proven our ability to quickly develop custom-tailored solutions for specific wind tunnel facilities and testing applications. Capabilities of MTS rolling road systems for wind tunnels include:

- » **Stainless steel belts** provide high speeds (up to 80 m/s) and long life (up to 300,000 km). Belt exchange fixtures matched with the rolling road allow quick and convenient belt exchange. A proprietary MTS roller design and tracking system provide robust tracking within  $\pm 0.5$  mm.
- » **Proprietary vacuum preloaded air bearings** support the belt and maintain unmatched flatness of less than  $\pm 0.5$  mm. Vacuum levels do not require adjustment under varying loads. Efficient porous carbon air bearing technology reduces required air consumption, yet retains low friction to minimize belt drive motor power requirements. The high-efficiency regenerative motor drive provides steady-state speed control within  $\pm 0.1$  m/s.
- » **Tire patch support air bearings** provide a true flat rolling surface, enabling accurate simulation of tire rolling resistance and aerodynamic flow fields around the tires. Vehicle track width and wheel base can be adjusted quickly and easily for higher productivity during testing.

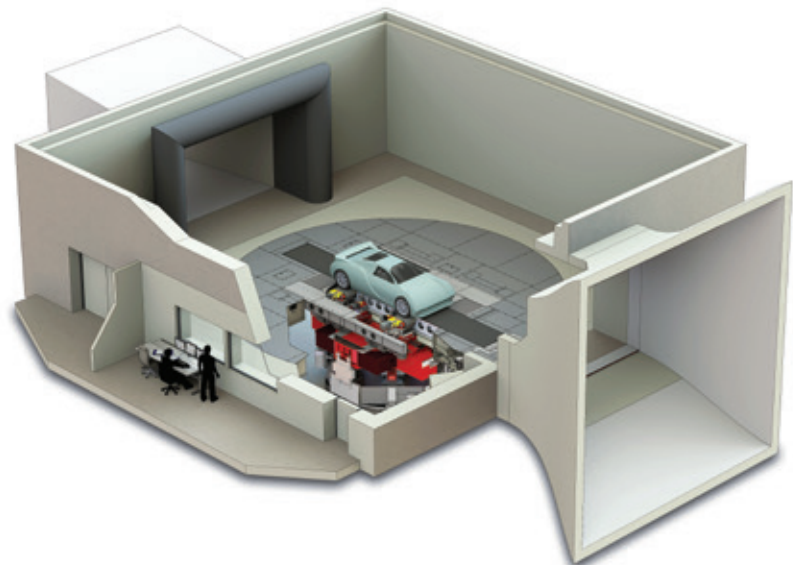
- » **Through-the-belt measurement system** provides highly accurate measurement of individual tire down-force (or lift-force). Small contact patch size minimizes measured parasitic forces.
- » **Drag-force and side-force measurement systems** for single-belt and five-belt systems deliver high accuracy. Single-belt systems offer a direct aerodynamic drag measurement system and a vehicle restraint measurement system for measuring aerodynamic drag and rolling resistance. Five-belt systems can be equipped with a compact, under-floor balance that offers high accuracy and high stiffness, and can be configured to provide dynamic measurement. In addition, tractive force transducers located under each wheel rotating unit provide individual wheel losses.
- » **Intuitive user interfaces** make it easy for operators to use MTS software and wind tunnel control systems.

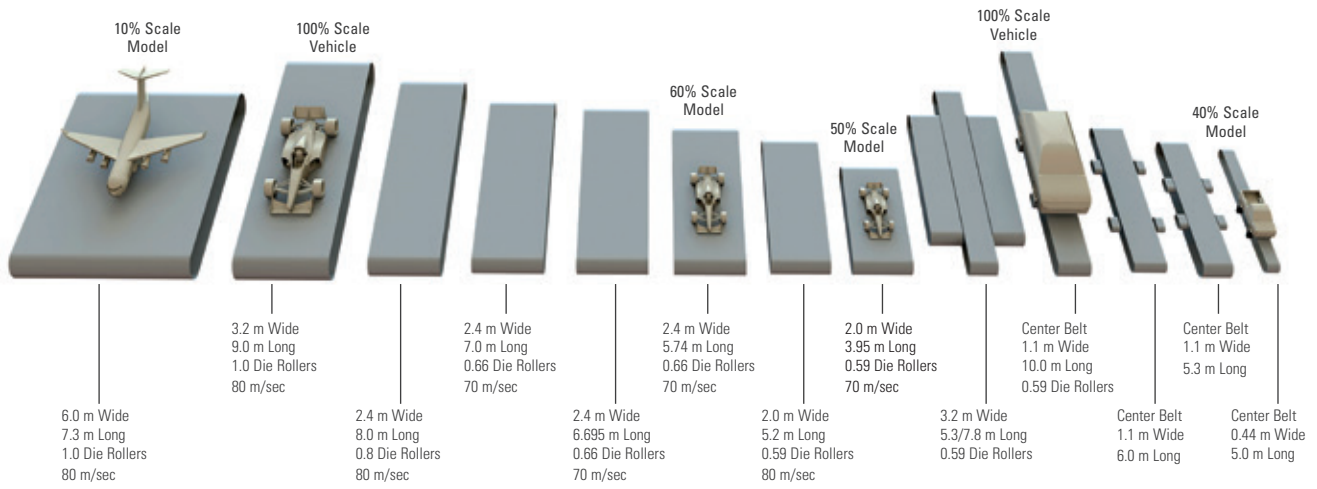
### Diverse testing applications

MTS has developed moving ground plane systems for wind tunnels used in many different applications in motorsports, automotive manufacturing and aerospace. Our systems have been deployed to test a variety of specimens as well, from 25% model scale vehicles and 10% model scale aircraft all the way up to full-scale racing vehicles and passenger cars. MTS rolling road systems can be configured for new installations or retrofit in existing wind tunnels.

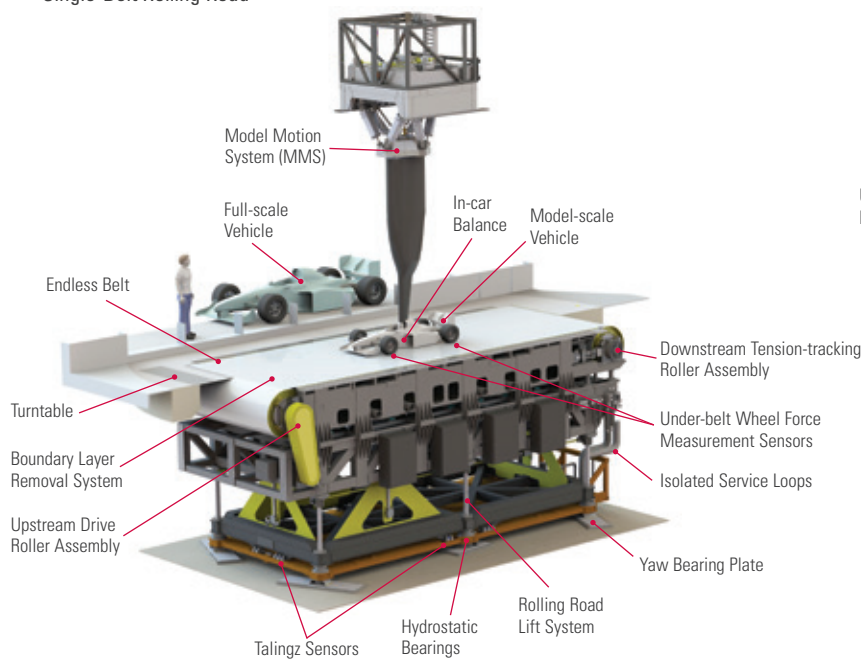
### Optional capabilities

To effectively replicate the movement of full-sized vehicles, MTS developed an optional overhead hexapod motion device and streamlined connecting strut support that position a scale model (pitch, roll, heave and internal yaw drive) in the flow stream above the rolling road, along with a 6DOF balance inside the model to measure forces and moments. Typically used with 50% and 60% scale models, this option enables continuous position adjustment with high precision and accuracy and is fully synchronized with through-the-belt force measurement and optional wheel support arm systems.

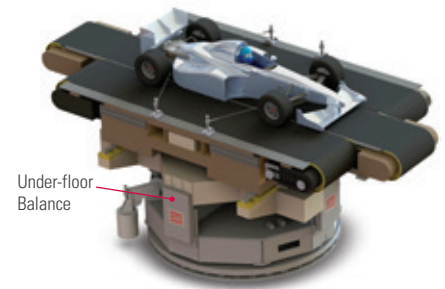




### Single-Belt Rolling Road



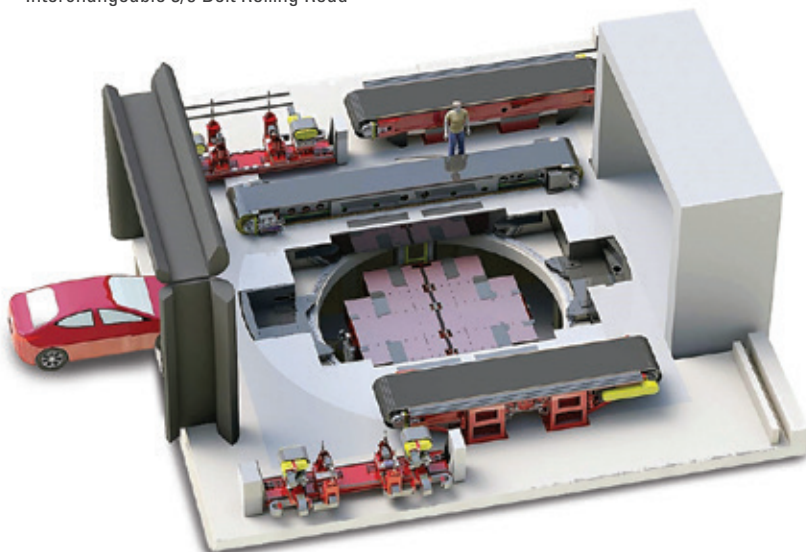
### Three-Belt Rolling Road



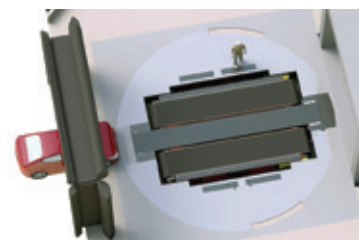
### Five-Belt Rolling Road



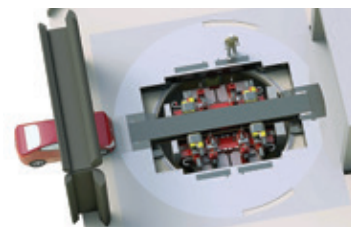
### Interchangeable 3/5 Belt Rolling Road



### Three-Belt Configuration



### Five-Belt Configuration



## Superior service, support and facilities planning

MTS fields one of the largest and most experienced worldwide service, support and consulting staff of any mechanical testing solutions provider. This global team provides facilities planning expertise to meet current and future wind tunnel testing needs, equipping you at the outset with the configuration capabilities and adaptability to support test programs for the long term. This consulting spans a wide range of disciplines, including:

- » Hydraulic power supply and distribution
- » Foundation and strong floor design
- » Floor plan efficiency
- » Hose and cabling schemes
- » Electrical power management
- » Materials and equipment handling strategies

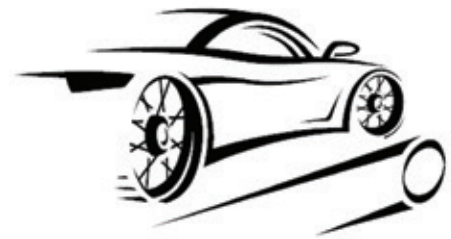
MTS also coordinates installation and integration of rolling road test systems, including training your team to operate the equipment safely. Once the rolling road system is fully operational, MTS lifecycle management programs help maximize system uptime and productivity.



Courtesy of FKFS

### Rolling Road Users Group

Customers who use MTS Wind Tunnel Rolling Road systems form a close-knit community that includes test professionals from around the world. Regular meetings take place at user facilities, providing opportunities to share best practices and discuss needs and issues with MTS experts.



### Specifications

The following specifications demonstrate the range of capabilities that are available with MTS rolling road systems for wind tunnels.

	Model Scale Vehicle	Full Scale Vehicle	Model Scale Aircraft
<b>Width</b>	2.0 m	3.2 m	6.0 m
<b>Length between rollers</b>	5.0 m	9.0 m	7.5 m
<b>Speed</b>	65 m/s (235 kph)	83 m/s (300 kph)	80 m/s (290 kph)
<b>Motor power</b>	150 kW	300 kW	500 kW
<b>Steel belt thickness</b>	0.8 mm	1.0 mm	1.0 mm



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100-250-716a WindTunnelRollingRd • Printed in U.S.A. • 11/23