



## From Rockets to Racecars



NASA's operations on Earth and in space have a lot in common with the rigors of high-performance competitive driving. Both require reliability and safety under extreme conditions. Add that to the fact that NASA currently holds several Guinness Book of World Records titles for speed, and the connection becomes even clearer. Over the years, NASA has provided a great deal of technology that has not only helped the racing world, but has improved conditions for all drivers and has helped to protect the environment.

## PLANES, TRAINS AND AUTOMOBILES

NASTRAN (NASA Structural Analysis) is a software program that saves time and money by using computerized design to identify what's good and bad about a product — cars, airplanes, speakers, guitars and buildings — before it's ever made. The software had its start in NASA's human space flight program.

### BREAKING POINT

A strain gauge had its start on a mobile robot developed for NASA, detecting destructive forces on the robot's frame. The gauge now measures strain on racing car suspension systems.

### FIRE-RESISTANT MATERIAL

A chemically treated fabric that won't burn or give off fumes was developed by NASA to protect astronauts. It's now used to make suits for race car drivers and pit crews.

### KEEPING COOL

Materials from the space shuttle thermal protection system are used on race cars to protect drivers from the extreme heat generated by the engines. Without the insulation, it can reach 160 degrees inside some vehicles.

## GAS GAUGES

A gas leak detection system, developed to monitor the shuttle's hydrogen propulsion system, is now being used by automakers to build natural gas-powered cars.

### TIRE RECYCLING

Using a process developed at NASA for handling launch vehicle fuels, nearly 5,000 tires per day can be recycled into asphalt road beds, new tires and hoses.

### OIL-SAVING SEAL

NASA developed sealing gaskets to stand up under the extreme conditions of space flight. They keep car engine oil clean, increasing the life of the vehicle.

### HEAT-RESISTANT PAINT

Inorganic paint protects the hot parts of automobiles like exhaust systems, firewalls, brake drums and engine manifolds. The paint was developed from NASA technology.

### PROCEED WITH CAUTION

A system using NASA expertise in systems engineering streamlines traffic flow when an emergency vehicle enters the picture. Monitors change traffic lights automatically to keep cars out of the emergency vehicle's path.

## CLEANER CARS

Space flight research on how and why things burn has helped scientists' efforts to find other fuels, like hydrogen, for engines and furnaces. The research has already begun to show up in improved jet engines, and could soon mean cleaner-burning cars.

### ENGINE LUBRICANTS

A plasma spray coating eliminates the need for liquid lubricants in certain engines. The NASA technology may lead to lighter, cheaper and more efficient compact cars.

### BETTER BRAKES

NASA's search for heat-tolerant space materials led to composite materials for brake linings that stand up under friction temperatures up to 650 degrees, wear longer and cost less.

**Stronger, Safer Tires**  
**Magnetic Bearings**  
**Engine Design**  
**Studless Winter Tires**  
**Emissions Testing**  
**Gasoline Vapor Recovery**  
**Magnetic Liquids**  
**Tollbooth Air Purification**  
**Diesel Engine Turbochargers**  
**Safer Bridges**  
**"Smart Bolt" Fasteners**