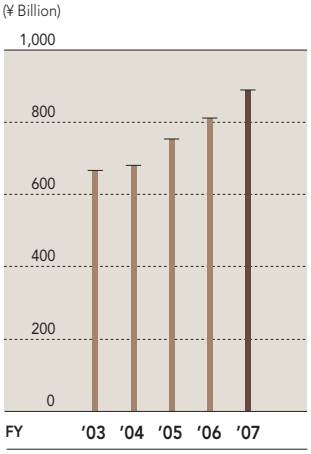
R&D and Intellectual Property

Toyota pursues R&D to provide customers worldwide with high-quality, low-cost, appealing products. Further, viewing intellectual property created by R&D as an important management resource, we utilize and protect it to help maximize corporate value.

R&D Expenses



Note: Fiscal years ended March 31

R&D Policy

In R&D, Toyota follows guiding principles that call on the Company to first dedicate itself to providing clean and safe products and to enhancing the quality of life everywhere through all its activities and second create and develop advanced technologies and provide outstanding products and services that fulfill the needs of customers worldwide. Aiming to put those principles into practice and create high-quality, appealing products by improving its technological capabilities, Toyota conducts continuous R&D activities.

In fiscal 2007, Toyota's R&D expenses increased 9.6% year on year, to ¥890.7 billion, which represented 3.7% of consolidated net revenues. Toyota's recent high R&D expenses have resulted from stepped-up advance and leading-edge development of technology for new-model vehicles, environmental technology, and safety technology. Against the backdrop of technology competition that is intensifying on a global scale, Toyota intends to continue high levels of R&D investment in order to maintain the competitive superiority of its products and technologies.

Meanwhile, as a policy to ensure efficient R&D, we promote integration and coordination among respective R&D phases, which include basic research, leading-edge research, advance development, and product development. Toyota controls research expenses appropriately by undertaking regular evaluations and reviews, in light of consultations with external parties, particularly with regard to such long-term basic research themes as energy, the environment, information technology and telecommunications, and materials. The Company also pursues efficient investment for development by setting out clear investment benchmarks for each project tasked with product development, advance development, or leading-edge technology development.

Basic Research Phase:	**Development theme discovery** Research on basic vehicle-related technology
Forward-Looking Technology Development Phase:	**Technological breakthroughs related to components and systems** Development of leading-edge components and systems ahead of competitors
Product Development Phase:	**Primary responsibility for development of new-model vehicles** Development of new-model vehicles and upgrading of existing vehicles

R&D Facilities

Head Office Technical Center
(Toyota City, Aichi Prefecture, Japan)

Toyota Motor Engineering & Manufacturing North America, Inc.
(Ann Arbor, Michigan, U.S.A.)

Toyota Motor Europe R&D/ Manufacturing (Brussels, Belgium)

R&D Organization

In Japan, Toyota Central Research & Development Laboratories, Inc., mainly conducts Toyota's R&D activities. Also, Toyota Group companies, including Daihatsu Motor Co., Ltd., Hino Motors, Ltd., Toyota Auto Body Co., Ltd., and Kanto Auto Works, Ltd., develop products in close collaboration with Toyota's R&D. Further, Toyota is constructing a global development organization. We have established technical centers in North America, Europe, Asia, and Oceania in order to build cars that cater accurately to customer needs in respective regions. In addition to those centers, we have also created design and motorsports R&D bases in respective regions.

Further, Toyota concluded an agreement on an operational tie-up with Isuzu Motors Limited in November 2006. Focusing on diesel engines as an important environmental technology, Toyota and Isuzu Motors will take full advantage of complementary management and technological resources to jointly undertake advance development of next-generation small diesel engines.

Note: Please see the R&D Organization section on page 61 for further details.

R&D Activities

The overriding goal of Toyota's technology and product development is to minimize the negative aspects of cars, such as environmental burden and traffic accidents, while maximizing the positive aspects, such as driving pleasure, comfort, and convenience. At all times, we aim to open the way to a new automotive society through advanced solutions that simultaneously meet the requirements of "incompatible" goals.

In the development of safety technology, Toyota continues to take initiatives to develop technologies in the areas of active safety and passive safety as well as pre-crash technologies linking these two areas. In recent years, the Company has concentrated technology development efforts on an integrated safety management concept. Those efforts seek to ensure safety in all driving phases by integrating safety systems that previously controlled different driving phases separately. For example, we have further evolved our Vehicle Dynamics Integrated Management (VDIM) system by adding functions that control steering and vehicle stability. At the same time, we have achieved even better collision avoidance by integrating the management of VDIM with Pre-crash Safety Systems, which use cameras and radars to achieve recognition and assessment functions. Through such initiatives, we want to continue radically evolving cars' safety functions.

In the development of environmental technology, Toyota is stepping up measures that realize sustainable mobility* by heightening the convenience of automobiles while contributing to the preservation of the environment. One area of focus is the development of power-train technologies, which lie at the heart of efforts to improve vehicles' environmental performance. In developing those measures, we emphasize three broad themes: improving fuel efficiency to reduce CO_2, preventing atmospheric pollution through cleaner exhaust emissions, and adapting to energy diversification. In putting into practice our strategy of providing *the right vehicle for the right place at the right time*, we keep abreast of energy diversification trends and provide countries and regions with the type of vehicles they need when they need them. One of Toyota's major initiatives, hybrid technology is a core environmental

technology that we can adapt to a wide variety of power trains, and we are currently moving forward with the development of next-generation systems.

* Sustainable mobility is defined by the World Business Council for Sustainable Development as "the ability to meet the needs of society to move freely, gain access, communicate, trade, and establish relationships without sacrificing other essential human or ecological values today or in the future."

Approach to Intellectual Property

By continuing to take on R&D challenges ahead of the competition, Toyota has heightened both the appeal of its products and its technological capabilities and made such the source of its competitiveness. Because expertise and inventions always underpin products created through such R&D initiatives, intellectual property is one of Toyota's key management resources. Toyota's basic philosophy with respect to such intellectual property is to appropriately protect and effectively use it to secure degrees of freedom in operational activities and maximize corporate value.

Systems for Intellectual Property Activities

Toyota organizationally links R&D and intellectual property activities. Through that system, we select promising development themes, upon which we encourage the building of a strong patent portfolio. Encompassing the three areas of management, R&D, and intellectual property, our Intellectual Property Committee deliberates the acquisition and use of intellectual property that is important to our business as well as strategies for dealing with management risk involving intellectual property.

Intellectual Property Strategies

Toyota analyzes patents in respective research fields and uses its findings for formulating R&D strategies. Further, we are building a global patent portfolio by filing and obtaining patents after identifying the areas of each technology development theme in which Toyota should acquire patents.

Regarding the use of intellectual property as a management resource, Toyota always bears in mind the need to contribute to sustainable mobility by promoting the spread of beneficial technologies related to the environment and safety. Reflecting that approach, Toyota basically has an open licensing policy and grants patent license under appropriate conditions. A good example of this policy is our licensing to other companies of patents related to hybrid systems, a core technology enabling adaptation to environmental energy.

R&D Organization

As of March 31, 2007

Japan		
❶ Head Office Technical Center	Establishment	1954
	Location	Toyota City, Aichi Prefecture
	Activities	Planning and design of products, prototypes manufacture, and vehicle evalution
❷ Toyota Central Research & Development Laboratories, Inc.	Establishment	1960
	Location	Aichi County, Aichi Prefecture
	Activities	Fundamental technical research for the Toyota Group
❸ Higashi-Fuji Technical Center	Establishment	1966
	Location	Mishuku, Susono City, Shizuoka Prefecture
	Activities	Research and development of new vehicle technology and new engine technology
❹ Shibetsu Proving Ground	Establishment	1984
	Location	Onnebetsu, Shibetsu City, Hokkaido
	Activities	Testing and evaluation of automobiles under high speed and cold conditions
U.S.A.		
❺ Toyota Motor Engineering & Manufacturing North America, Inc.*	Establishment	1977
	Location	Ann Arbor, Plymouth (Michigan), Torrance, Gardena (California), Wittmann (Arizona), Washington, D.C.
	Activities	Vehicle development & evaluation, certification, collection of technical information
❻ Calty Design Research, Inc.	Establishment	1973
	Location	Newport Beach (California)
	Activities	Exterior / Interior / Color design

Europe		
❼ Toyota Motor Europe R&D/ Manufacturing	Establishment	1987
	Location	Brussels (Belgium), Derby (U.K.)
	Activities	Vehicle development & evaluation, certification, collection of technical information
❽ Toyota Europe Design Development	Establishment	2000
	Location	Nice (France)
	Activities	Exterior / Interior / Color design
❾ Toyota Motorsport GmbH	Establishment	1993
	Location	Cologne (Germany)
	Activities	Development of Formula One race cars, participation in F1 races
Asia Pacific		
❿ Toyota Motor Asia Pacific Engineering and Manufacturing Co., Ltd.	Establishment	2003**
	Location	Samutprakan Province (Thailand)
	Activities	Development and evaluation of locally produced vehicles in Asia, operational support to Toyota production affiliates in Asia
⓫ Toyota Technical Center Asia Pacific Australia Pty., Ltd.	Establishment	2003
	Location	Melbourne (Australia)
	Activities	Vehicle development, software development, evaluation, collection of technical information

* Toyota Motor Engineering & Manufacturing North America, Inc., is a consolidated R&D and manufacturing company in North America.

** The year shown is as at the establishment of Toyota Technical Center Asia Pacific Thailand Co., Ltd., which integrated with Toyota Motor Asia Pacific Co., Ltd., to establish Toyota Motor Asia Pacific Engineering and Manufacturing Co., Ltd., in April 2007.