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China



# Speeding Ahead

*China's Rapid Transit Railways*

Lei Fengxing

China Intercontinental Press

# **Speeding Ahead: China's Rapid Transit Railways**

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China Intercontinental Press

## 图书在版编目 (CIP) 数据

中国速度：高速铁路发展之路：英文 / 雷风行著；魏怡译。

— 北京：五洲传播出版社，2013.12

ISBN 978-7-5085-2705-5

I. ①中… II. ①雷… ②魏… III. ①高速铁路—铁路运输发展—中国—英文 IV. ①F532.3

中国版本图书馆 CIP 数据核字 (2013) 第 292269 号

### “中国创造”系列

策 划 / 荆孝敏 付 平

主 编 / 付 平

出 版 人 / 荆孝敏

## 中国速度——高速铁路发展之路

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编 著 / 雷风行

图片提供 / 人民铁道报社 中国铁道出版社 京沪高速铁路股份有限公司等

责任编辑 / 黄金敏

助理编辑 / 姜 超

翻 译 / 魏 怡

装帧设计 / 张 凭 李洪涛

制 作 / 北京新影响文化发展有限公司

出版发行 / 五洲传播出版社

(北京市海淀区北三环中路 31 号凯奇大厦)

承 印 者 / 北京全海印刷有限公司

版 次 / 2014 年 4 月第 1 版第 1 次印刷

开 本 / 710mm\*1000mm 16

印 张 / 16

字 数 / 80 千

印 数 / 1-3000 册

定 价 / 98.00 元

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## **Foreword:**

# **China Accomplishing the Dream of High-speed Rail**

No people in the world favor railways more than Chinese do. Once a university professor said that railway is a piece of collective memory to the Chinese people: train whistles beckon us home, railway sleepers are every stitch into which mothers knit all their affections under the lights, and train tickets are precious letters home of the wanderers. From the traditional green trains to the EMU rolling stock *Hexie Hao* operated for the China Railway High-speed service, trains carry on the Chinese dream and keep up with the times. There is no other means of transportation that arouses all countrymen's warm, sweet and complicated feelings.

In the vast country of China with such a large population, railway train is a popular means of public transportation for all people. However, for a long time, because of the inadequate development and gravely deficient transport capacity, the troubles and difficulties in getting train tickets and travelling by train are becoming extremely conspicuous. Especially during the Spring Festival, summer holidays and other holidays, travelers are even more packed like sardines and railway transportations are under immense pressure.

In the early 1990s, the speed per hour of train in developed countries already achieved 250 kilometers while the Chinese trains still rode at around 50 kilometers per hour. The phenomena of "an old cow pulling a rickety cart" and "the elephant walking on a tightrope" needed to be changed immediately. From then on, Chinese railway construction began to pursue the dream of high-speed and security. To achieve a big breakthrough in speed by leaps and bounds, China has picked up train speed for six times and constructed the first high-speed railway of the



country, the Qinhuangdao-Shenyang High-speed Railway. Embracing the dream of high-speed railway, Chinese railway has overcome all difficulties and setbacks, persistently steeled itself and marched forward courageously. After ten years of molding a good sword and gathering experience, it has finally laid a solid technological and personnel foundation for the development and self-improvement of high-speed railway.

It is time to ride the wind and cleave the waves! In January 2004, the first *Mid-to-Long Term Railway Network Scheme* in Chinese history was implemented by the Chinese government, working out the main structure of the High-speed Railway Network of "Four Vertical and Four Horizontal" stretching over twelve thousand kilometers. This unfolded a grand construction of China's high-speed railway. Chinese railway builders deserve the honorable title of "Iron Army". Carrying on the glory, embracing the dream of several generations and bearing the expectations and ambitions of the entire nation, the "Iron Army" embarks upon this arduous dream-building odyssey. In 2005, eleven high-speed and special passenger railways were launched successively. Within a few years, Chinese railway builders constructed Beijing-Tianjin, Wuhan-Guangzhou, Shanghai-Nanjing, Beijing-Shanghai, Harbin-Dalian, and Beijing-Guangzhou railways one after another. They overcame all difficulties and hardships and moved forward by leaps and bounds full of valor and vigor. Meanwhile with regard to the technological equipment and manufacturing of China's high-speed railway, reports of fresh successes kept pouring in. From the introduction of the high-speed train technology of 200 kilometers per hour to the independent research and development of the rolling stock *Hexie Hao* at 350 kilometers per hour and then 380 kilometers. China's railway achieved the "triple jump" within only six years.

After a decade of dream-building and another decade of dream chasing, China Railway has ushered in and strode proudly ahead into



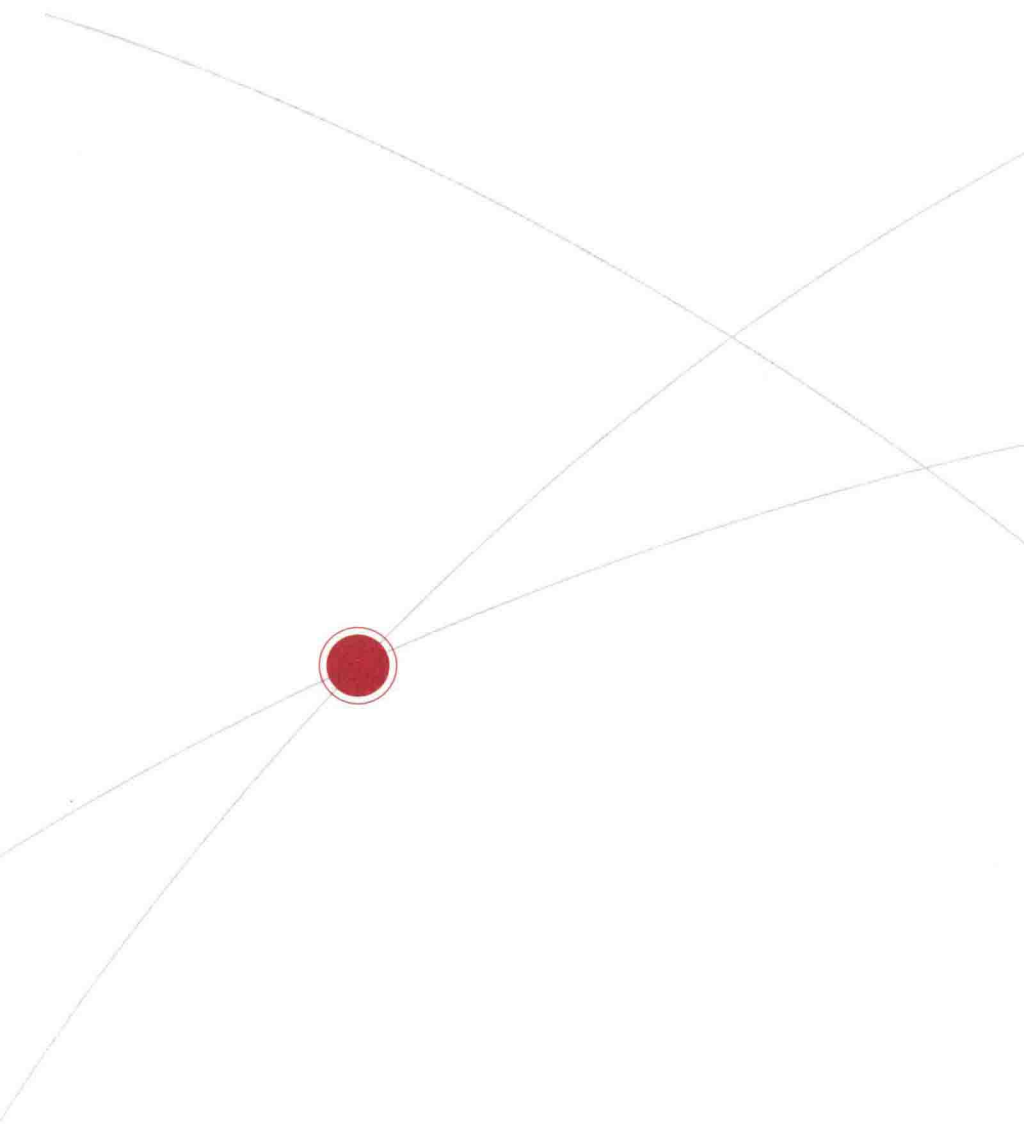
the era of high-speed trains. The Chinese nation which lagged behind in the past has caught up vigorously and finally actualized the dream of producing high-speed trains. By the end of 2013, China has constructed thirty-four high-speed railways with an operating distance of ten thousand kilometers. The distance under construction stretches over twelve thousand kilometers. Now China ranks at the top of the world in terms of comprehensive high-speed technology, strong integration capability, high operating speed, long running mileage and large scale under-construction mileage.

In the period of prosperity of a flourishing nation, railways tend to thrive. Building 10,000-kilometer rails in 10 years is a monument for China's national rejuvenation.

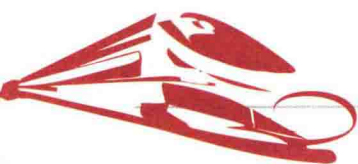
In November 2012, according to the Chairman's report at the 18th Party Congress, "notable progress has been made in making China an innovative country, and major breakthroughs have been made in manned spaceflights, the lunar exploration program, and in the development of a manned deep-sea submersible, supercomputers and high-speed railways". The achievements of high-speed railways are written into the glorious chapter of the annals of Chinese history of reform and development.

The Chinese high-speed railway, the so-called China Speed, inspired all countrymen and amazed the whole world.

How did the Chinese high-speed railway rise and go beyond itself so rapidly? How was the Chinese Speed tempered? Please follow the author of this book, have a direct contact with Chinese high-speed railway and know the past, the present and the future of Chinese railway industry.



1



# **"National Artery" Is Calling for High Speed**



On October 1st 1964, the world's first high-speed rail line Japanese *Tokaido Shinkansen* was open to traffic at a speed of 210 kilometers per hour. Thanks to this network, the direct travel time for 515.4 kilometers from Tokyo to Osaka was shortened from over six hours to three hours. It is faster, safer and more comfortable than the highway. It is lauded as "the backbone of Japan's economic takeoff".

On October 26th 1978, Deng Xiaoping paid a visit to Japan and rode on the super express train, *Shinkansen "Light No. 81"*. Very much impressed with the technology of Japan's bullet train, he said: "*Shinkansen* is pushing us to run like a wind and we need to run very fast!"

Mr. Deng was referring to China's pressing need for speedy modernization. As a leading industry of the national economy Chinese railway did "need to run". However, it was at the bottleneck restricting economic development at that time. Due to construction fund shortage, retarded new lines construction and previous lines reconstruction, Chinese railway encountered many problems such as serious deficiency of transport capability, urgent need of technology upgrading, and so on. During that time, coaches only traveled at a speed lower than forty kilometers per hour.

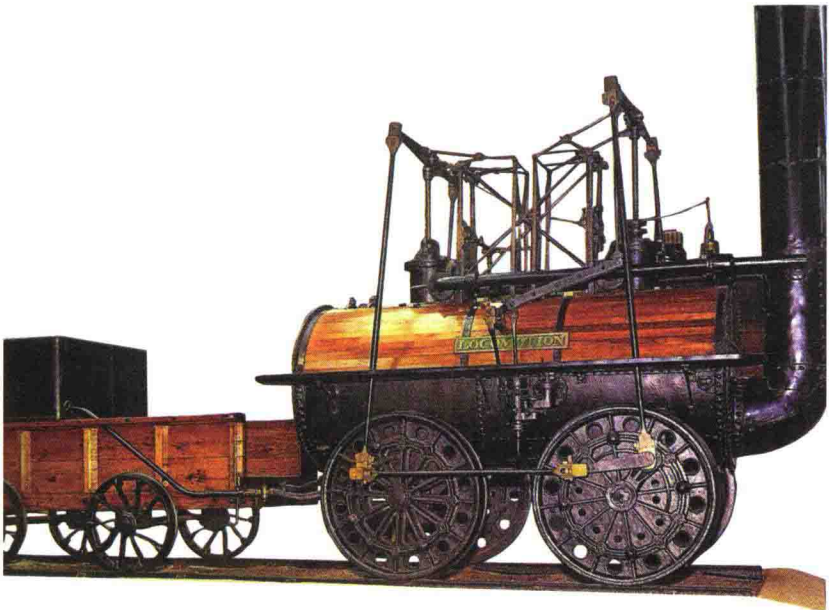
Mr. Deng's "Now we do need to run" urged Chinese railway on to do all it can to catch up and shake off backwardness.



## When Can the "Slow Cow" Run

The history of world transportation showed that, the competition of different means of transportation is basically the competition of speed. Railway rose up in the 19th century and declined in the mid 20th century. Then it soon revived in the form of high-speed railway. Since then, speed has become the critical issue concerning the rise and fall of railway industry.

With the emergence of steam engine, railways entered into the historical arena. On September 27th 1825, the world's first railway the



► the locomotive designed by George Stephenson in 1825



British Stockton-Darlington Railway was officially opened to traffic. The Father of Railways George Stephenson drove his locomotive for the railway *Locomotion* for 31.8 kilometers at an average speed of 13 kilometers and the highest speed of 24 kilometers. The opening to traffic of this locomotive caused a sensation in the world and catalyzed a major epoch-making revolution of transportation productivity. Karl Marx was keen to point out that railway is a driving force to promote the Industrial Revolution and economic and social development. He called the train the "jewel in the crown" of industrial capitalism.

Born as a cowherd boy, the British engineer Stephenson continuously improved the technology of railway traction. In 1830, the world's second railway, the British Liverpool-Manchester railway, was opened to traffic. It traveled at a maximum operating speed of up to 47 kilometers. In the celebration of the opening of this railway, Stephenson told all people present that they will definitely live to see that railway prevails over all other means of transportation.

Before long, such assertion came true. The cradle of railway, Britain, ushered in a high tide of railway construction. By 1890, the total length of the British railway network was more than thirty-two thousand kilometers. Trains hauled the British Empire to the forefront of worldwide industrialization.

According to economists, the 19th century was the railway era. Railway has become an advanced means of transport boasting of large transport capacity and fast speed. Some European and American countries took the first step to build railways which largely promoted their economic growth. Within a short period of 10 years from 1830 to 1839, the British Empire, the United States of America, France and other countries competed with each other in constructing railways. Thanks to this, these countries won an advantage over others and laid a solid foundation for industrialization. Furthermore, most of them have later evolved into developed countries.

Within 110 years of development, in 1940 before the Second World War, the length of world railway in operation reached its peak, totaling 1,356,000 kilometers. The United States constructed the largest number of railways. In only one year of 1887, the length of railways that country constructed was over 20,619 kilometers. This sets the highest record in the history of world railway industry. In 1916, the length of the U.S. railways in operation was 400,000 kilometers. The heat of railway-building not only accelerated the process of industrialization, but also gave birth to stock financing and bond financing and bred the first group of investment banks.

However, railways took the lead for only slightly over 100 years. It emerged in the 19th century for its fast speed and large transport capacity but declined after 100 years for its slow speed. In the mid 20th century, expressway and air transportation developed rapidly and far outperformed railways in western countries. One of the main reasons for such backwardness was the low running speed of rail trains. Transport capacity declined and economic benefits hit rock bottom.

Is railway industry really becoming the "sunset industry" as some people pointed out? No. Those far-sighted railway experts around the world have not given up so easily. They turned their attention to railway speed-increasing one after another. Developed countries carried out traction innovation at first and constructed high-speed railways and heavy haul railways. After several decades of lingering and stagnation, the world's railway has finally embarked upon the road to revival.

Since operating the first high-speed railway to traffic in 1964, Japan strove to develop *Shinkansen* and carried out continuous technology upgrading. The highest speeds per hour of *Sanyo Shinkansen* and *Tokaido Shinkansen* were increased to 300 kilometers and 270 kilometers respectively. The highest running speed of *Tohoku Shinkansen* was even raised to 320 kilometers. By 2010, *Shinkansen* had already covered Japan proper totaling a distance of 2,176 kilometers.





► the Japanese 500 Series *Shinkansen*

France vigorously developed the TGV high speed trains. On September 27th 1981, the first high-speed railway in Europe, the inaugural service from Paris to Lyon on the LGV Sud-Est only cost 2 hours and spread a total distance of 417 kilometers. The highest speed of the train reached 270 kilometers per hour. Afterwards, LGV Atlantique, LGV Nord, LGV Méditerranée and LGV East were constructed and opened to traffic successively. By 2010, the total distance of French high-speed railways was 1,884 kilometers. The passable distance of TGV high-speed trains was over 6,000 kilometers and the highest running speed per hour of LGV Méditerranée and LGV East achieved 320 kilometers.

In 1988, the speed of electric traction test of Germany already achieved 406.9 kilometers. The high-speed railways were not opened to traffic until June 2nd 1991. The maximum running speed of ICE trains was 280 kilometers per hour. By 2010, ICE high-speed trains can travel to most large cities in Germany radiating a total distance of 1,443 kilometers. Its passable distance spread over 6,300 kilometers at up to



► the German Type ICE3 High-speed Train

300 kilometers per hour.

By 2007 in twelve countries and regions including Japan, France, Germany, Italy, and Spanish, high-speed railways spread over 8,700 kilometers and the trains traveled at the running speed of 250 kilometers per hour or above. Therefore, high-speed railway still has outstanding competitive advantages compared to highways or civil aviation development.

While high-speed railway is rising and burgeoning, speed upgrading and improvement on existing rail lines have also made a great breakthrough. Since 1960s, some Western European countries took the lead in adopting advanced technology and carrying out electrified upgrading on the existing busy rail lines and increasing the speed to 140 to 160 kilometers. Sweden, Germany, Italy and other countries all applied the titling train technology and raised the train speed to 200 kilometers per hour. By 1994, the highest speeds of the passenger trains per hour in 25 countries around the world had already achieved 140 kilometers or above.