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**THE COMPETITION OF PASSENGER TRANSPORT
AND THE INCREASE OF PASSENGER TRAIN SPEED
IN CHINA: A REVIEW AND PROSPECTS**

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ABSTRACT

The purpose of this paper is to consider the current situation of passenger transport competition among modes, the progress of increasing the competitive capacity of Chinese Railways (CR) , mainly by raising the speed of passenger trains, and possible future developments. The first part describes the past and current situation of passenger transport in China, from the market in which the supply, dominated by rail, did not satisfied the demand to the market in which the supply which is becoming a little bit over the demand, due to the economic reform and open door policy adopted by Chinese Government. The situation of the passenger transport competition between different modes in different market segment in terms of tariff and service level (speed, frequency and comfortable) and change of market share, are then described. In the following section the key efforts that CR adopted to increase its competitive capacity in the passenger transport – upgrading the existing line and improving the rolling stocks to raise the running speed of passenger trains, running diversified passenger trains, increasing the frequency of passenger train, opening some passenger service market to private or non railway firm and so on – and its effects are then described. Finally, the possible future development of passenger transport in CR, in the fields of competition, ownership and organization reform, and price deregulation, are considered.

Introduction

Transport System, especially railway, used to be the bottleneck of the economic and social development in China. This condition was not changed until 1996 due to the economic reform and open door policy adopted by Chinese Government, the intensive investment from all levels of the governments and the relatively economic slowdown recently. The competitions among different modes become stronger and stronger as the transport supply is a little bit over the demand, with ever-increasing market share of the road and the decreasing share of the rail. To cope with the situation, Chinese Railway (CR) try to enhance its competitive capacity in passenger transport mainly by increasing the train speed and improving the service levels. This action is resulting in a considerable passenger traffic rise and is likely the future development of CR's passenger transport.

1. The Development of Transport System in 1990's

1.1 The Development of Transport Routes

From 1990 to 1997, the total length of road network raised from 1.03 million km to 1.23 million km with a total increase of 19.5%. Of which, expressway expanded from zero to more than 4.77 thousand Km. The total route length of civil aviation raised from 507 thousand Km to 1.425 million Km with a total increase of 181.1% from 1990 to 1997.

The total route length of railway raised from 60.0 thousand Km to 66 thousand Km with a total increase of 10.0%. Of which, double lines raised from 13.02 thousand Km to 19.05 thousand Km, with a 46.2% increase and electrified lines raised from 6.90 thousand Km to 12.03 thousand Km, with an increase of 74.3%.

1.2. The Improvement of the Transport Equipment

From 1990 to 1997, the number of civil motor vehicles raised from 5.51 million to 12.19 million with an increase of 121%. Of which, the number of buses and cars raised from 1.62 million to 5.81 million with an increase of 259%, the total seat number increased from 23.76 million to 72.70 million with a 206.4% increase. The number of the civil planes raised from 681 to 770 with an increase of 11.3%. The number of railway locomotive increased from 13970 to 15747 with a 12.7% increase, of which, electricity locomotive increased from 1633 to 2821; the total capacity of railway freight car raised from 20.55 million tons to 25.6 million tons with a 24.6% increase; the total number of passenger coaches raised from 27261 to 34346, with an increase of 26.0%.

2. The Change of Passenger Transport Market in China

2.1 The Change of Market Share in Passenger Trip

The total volume of passenger_trips raised from 7.73 billion to 13.25 billion, with an increase of 71.4%. Of which, the railway's volume dropped from 960 million to 930 million with a decrease of 2.1%

and the market share decreased from 12.40% to 6.98%. While that of the highway raised from 6.48 billion to 12.05 billion with an increase of 85.96% and its market share increased from 83.90% to 84.64%, and that of civil aviation raised from 17 million to 56 million with an increase of 294.12%, although its market share increased only from 0.2% to 0.45%.

2.2 The Change of Market Share in Passenger Kilometer

The total volume of passenger_km increased from 562.8 billion passenger-km to 1001.9 billion with an increase of 78.0%. Of which, railway passenger-km raised from 261.3 billion to 354.8 billion with an increase of 35.8% and its market share decreased from 46.4% to 35.4%. While that of the highway raised from 262 billion to 554.1 billion with an increase of 111.5% and its market share raised from 46.23% to 55.3%, and that of the civil aviation raised from 23.1 billion to 77.4 billion with an increase of 235.6% and its market share increased from 4.1% to 7.7%.

So the passenger transport of railway is relatively declining in terms of the supply ability and market share, while those of the road and air is up rising.

2.3. The Analysis of the Railway Passenger Market Share in Different Distance Market

Table 2.3.1 and 2.3.2 show that the decline of the rail passenger trip was mainly come from the short distance (1-50km) and the short to medium distance (51-500km) markets where road has comparative competitive advantage in terms of frequency and convenience. Moreover, for the market whose distance is over 2000km, air has significant advantage in the field of time saving. While there is still considerable traffic increase in the medium (500-1000) and medium to long distance passenger market except the period of 1995 and 1996 when there was significant tariff increase.

**Table 2.3.1 The Change of Passenger Trip under
Different Distance from 1990 to 1997 (%)**

| Distance | 91/90 | 92/91 | 93/92 | 94/93 | 95/94 | 96/95 |
|-------------|-------|-------|-------|-------|-------|-------|
| 1-50 km | -7.9 | -0.6 | -0.7 | 3.3 | -8.95 | -16.9 |
| 51-500 km | -3.8 | -2.0 | 2.6 | 3.1 | -6.5 | -14.1 |
| 501-1000 km | 13.3 | 13.1 | 11.3 | 4.4 | -5.1 | -9.7 |

| | | | | | | |
|--------------|------|------|------|-----|------|-------|
| 1001-2000 km | 10.9 | 14.3 | 10.9 | 5.3 | -0.8 | -8.0 |
| > 2000 km | 17.1 | 14.6 | 11.2 | 4.3 | -3.3 | -13.0 |

**Table 2.3.2 The Change of Passenger Km under
Different Distance from 1990 to 1997 (%)**

| Distance | 91/90 | 92/91 | 93/92 | 94/93 | 95/94 | 96/95 |
|--------------|-------|-------|-------|-------|-------|-------|
| 1-50 km | -7.3 | 0.2 | 0.10 | 3.30 | -8.90 | -18.3 |
| 51-500 km | 1.9 | 5.7 | 7.7 | 2.7 | -4.2 | -12.1 |
| 501-1000 km | 15.6 | 15.7 | 13.1 | 4.8 | -5.5 | -8.6 |
| 1001-2000 km | 10.8 | 13.9 | 10.5 | 5.1 | -1.3 | -8.4 |
| > 2000 km | 16.4 | 13.5 | 10.7 | 4.3 | -3.7 | -12.4 |

2.4 Why the decline?

There are mainly two sets of reasons to explain decline of the market share of the rail passenger. At one hand, the rapid development of the highway and civil aviation were mainly due to the adaptation of market-oriented reform policies and measures as follows(Jianhong WU and Haipei Zhao, 1998):

- Separating the Responsibility of the Government from the Daily Management of the Enterprise
- Deregulation of the Road and Air Market
- Building the Transport Infrastructure by Using Market Mechanism and Bring every Positive Factor into Play
- Enlarging the Reform and Open Door Policy, Taking the Advantage of Foreign Capital

At another hand, CR can not satisfied the passenger's demand due to:

- Slow train speed. Comparing 1995 with 1970, the travelling speed of passenger trains increased from 42.1km/h to 49.0km/h, only 6.9km/h increased or 0.28km/h increased annually.
- Low frequency. The average passenger train frequency per day of CR was 17.8 in 1995 and there was only 1-2 direct train per day from Beijing (national capital) to the provincial capitals. Unsatisfied demand and overcrowding are common.
- A significant increase in rail passenger fares. In 1989, there was a 112% increase in the basic

passenger rate, In 1995, there was another 51.8% increase in the basic passenger rate.

- Inconvenience to buy the ticket(s). Passenger should go to railway station to buy the ticket(s) and long waits (e.g. 24 hours) for rail hard bed tickets on congested railway lines were common.

3. Fighting for Change: Measures for Enhancing Railway Competitive Capacity in the Passenger Transport Since 1997

CR set forth its new target in 1997, that was, the CR should enhance its competitive capacity in passenger transport by rescheduling the passenger train diagram to meet the requirements of transport market. CR has adopted a package of measures in the fields of raising passenger train speed, increasing the carrying capacity, running diversifying passenger trains and improving other service levels.

3.1. Raising the Running Speed of Passenger Trains Dramatically

Since April 1st, 1997, the max. travelling speed of raising-speed passenger trains on the main trunk lines raised from 80 km to 120km. A before and after comparison in passenger train speed is given in table 3.1.

**Table 3.1. A Before and After Comparison in Passenger Train Speed
on the Main Trunk Lines**

Unit: km/h

| | | 1996 | 1997 | 1997 Vs 1996 | % Increased |
|-------------|--------------------------|------|-------|--------------|-------------|
| Beijing – | Average Travelling Speed | 65.6 | 81.1 | +15.5 | 23.6 |
| Guangzhou | Average Technical Speed | 73.1 | 86.0 | +12.9 | 17.6 |
| Line | Max. Travelling Speed | 87.1 | 94.5 | +7.4 | 8.50 |
| | Max. Technical Speed | 87.1 | 94.5 | +7.4 | 8.50 |
| Shanghai – | Average Travelling Speed | 56.1 | 70.0 | +13.9 | 24.8 |
| Nanjing | Average Technical Speed | 66.0 | 80.9 | +14.9 | 22.6 |
| Line | Max. Travelling Speed | 86.0 | 112.2 | +26.2 | 30.5 |
| | Max. Technical Speed | 86.0 | 133.7 | +47.7 | 55.5 |
| Beijing – | Average Travelling Speed | 56.4 | 78.1 | +21.7 | 38.5 |
| Qinhuangdao | Average Technical Speed | 62.6 | 82.9 | +20.3 | 32.4 |
| Line | Max. Travelling Speed | 77.4 | 98.0 | +20.6 | 26.6 |
| | Max. Technical Speed | 77.4 | 98.7 | +21.3 | 27.5 |

Table 3.1.1 indicates: the average train travelling speed in Beijing-Guangzhou Line increased 15.5 km/h with a 23.6% increase; the average train travelling speed in Shanghai-Nanjing Line increased 13.9 km/h with a 24.8% increase and the average train travelling speed in Beijing-Qinhuangdao Line increased 21.7 km/h with a 38.5% increase. Furthermore, the max. technical speed in Shanghai-Nanjing Line reached to 133.7 km/h with more than half increase.

From the date of 1st of October 1998, the raising-speed passenger trains on the main trunk lines is further increased to 140-160km, while a title train is running in the Guangzhou-Shenzhen Line with max. speed of 200km/h.

The average travelling speed of passenger trains reached to 53.3 km/h in the whole CR System in 1997, a 3.8km/h higher than that of 1996, while the average speed increased from 1970 to 1995 was only

0.28km/h annually.

3.2 Increasing the Carrying Capacity for Medium and Long Distance Passenger Traffic Greatly to Extend the Comparative Competitive Advantages of the Rail

In 1997, the number of the through express train was increased to 246.5, a 25% increase compared with that of 1996. The total seat number per day for express train increased from 499220 to 545103 with a 9.2% increase.

In 1998, the number of the through express train was increased to 307, a further 24.5% increase compared with that of 1997 and a total 55.8% increase compared with that of 1996. The total seat number per day increased from 499220 to 545103 with a 9.2% increase. The total seat number per day for express train increased from 545103 to 726836 with a further 33.3% increase.

3.3 Running Diversified Passenger Trains

Various service levels of passenger trains are run in order to meet the requirements of increasing level of people's life and consumption. Firstly, 80 pairs of raising-speed trains are running between two big cities, which are also connected by the expressway. Secondly, 116 pairs of “hotel trains”, which start in the evening (or afternoon) and arrive in the morning, are running between big cities with 250% increase, such as Beijing, Shanghai, Guangzhou, Chengdu, Wuhan, Xian, Shenyang and Suzhou . Thirdly, running the shuttle trains between two big cities whose distance is less or around 300km, such as from Beijing to Tianjin, from Beijing to Sijiazhuang, from Shanghai to Nanjing and from Guangzhou to Shenzhen. Fourthly, slow trains and suburban trains are reduced. Finally, tourism trains and temporary trains are run to satisfy the demands of tourism season and the peak time.

3.4 Improving the Other Services Level in Terms of Comfortable (such as running more and more air conditioner trains, increasing the number of soft bed and hard bed coaches in a train and even supplying a luxurious private room with TV, toilet and shower in a Beijing to Guangzhou Train)

3.5 Initiating Large Scale of Marketing Promotions by:

- Making advertisement in every kinds of public media
- Increasing the ticket selling office dramatically and establishing ticket booking and agent. E.g., there were only three booking offices in Beijing in 1996, while the number of the offices increased to 125 in 1998
- Sending gift or free dinner to customer and giving some price discount for group travelling
- Increasing the train speed without increasing the tariff

4. The Effect of the Raising Passenger Train Speed and Improving the Service Level

The measures mentioned above greatly change the image of CR. It indicates that CR is trying his best to transforming from production oriented to market oriented and even customer obsession! New idea, new strategy and new action resulted in new traffic.

4.1 The Passenger Traffic Decline Trend Has Been Not Only Stopped, But Also Reversed

Table 4.1 tells us that the annual decline rate for rail passenger traffic was reduced to 1.8% in 1997 while the rate was 9.2% in 1996, and there was even 1.2% increase in 1998. A survey shows that the average daily passenger trip reached to 2.62 million with a 7.8% increase accordingly in the first 50 days after implementing the new train diagram in 1998.

**Table 4.1 A Before and After Comparison for Implementing
the New Train Diagram (unit: 10,000 passenger trip)**

| | 1996 | | 1997 | | 1998 | |
|------|----------------|------------------------|----------------|------------------------|----------------|------------------------|
| | Passenger Trip | Compare with Last Year | Passenger Trip | Compare with Last Year | Passenger Trip | Compare with Last Year |
| Jan. | 7208 | -999 | 7269 | 61 | 7942 | 673 |
| Feb. | 8037 | -396 | 7784 | -253 | 8424 | 640 |
| Mar. | 8842 | 8 | 8433 | -409 | 7867 | -566 |

| | | | | | | |
|-------|-------|-------|-------|-------|-------|------|
| April | 7995 | -1166 | 7646 | -349 | 7650 | 4 |
| May | 8029 | -1181 | 7442 | -587 | 7653 | 211 |
| June | 7160 | -1205 | 7106 | -54 | 7194 | 88 |
| July | 8119 | -1177 | 8163 | 44 | 8134 | -29 |
| Aug. | 8479 | -1018 | 8527 | 48 | 8370 | -157 |
| Sep. | 7754 | -1137 | 7705 | -49 | 7388 | -317 |
| Oct. | 7593 | -54 | 7683 | 90 | 7854 | 171 |
| Nov. | 7250 | -90 | 7075 | -175 | 7337 | 262 |
| Dec. | 7085 | -113 | 7059 | -26 | 7178 | 119 |
| Total | 93551 | -8528 | 91892 | -1659 | 92991 | 1099 |

4.2 The Raising Traffic for Medium and Long Distance Passenger Traffic

A detail analysis on segment market shows that there are traffic increases in every distance markets except for the less 50km market (Table 5.2). It can also be find that there are significant traffic increase (11.75% and 18.34% in 1998) in the medium (500-1000 km) and medium to long distance (1000-2000 km). A good example is the seat utilization rate for the airline between Beijing and Jinan, whose distance is around 500km, is reduced from 69.3% to 61.7% under the condition that two airlines were cancelled when the total train journey time was cut to 5 hours in 1997. Further, the rail can even play an important role in the long distance (>2000km) markets at present stage, where the value of time for common Chinese people is lower, if the train speed is raised reasonably.

**Table 4.2 The Change of Passenger Trip and Turnover under
Different Distance from 1995 to 1997 (%)**

| Distance (km) | Passenger Trip | | | Passenger Km | | |
|------------------|----------------|--------|-------|--------------|--------|-------|
| | 1995 | 1996 | 1997 | 1995 | 1996 | 1997 |
| 1-50 | -8.96 | -16.89 | -8.06 | -8.94 | -18.26 | -8.90 |
| 51-100 | -6.05 | -14.06 | 5.42 | -5.96 | -14.60 | 4.96 |
| 101-200 | -4.98 | -15.11 | 3.98 | -5.16 | -15.19 | 3.85 |
| 201-500 | -2.39 | -9.83 | 7.35 | -2.75 | -9.42 | 7.82 |
| 501-1000 | -4.85 | -8.88 | 10.59 | -5.52 | -8.60 | 11.75 |

| | | | | | | |
|-----------|-------|--------|-------|-------|--------|-------|
| 1001-2000 | -0.79 | -8.01 | 17.54 | -1.34 | -8.41 | 18.34 |
| >2000 | -3.33 | -12.97 | 15.04 | -3.71 | -12.42 | 14.18 |

4.4 The Increasing Traffic for Some Specific Short Distance Inter-city Transport:

A Case Study for the Competition Between Rail and Road in Short Distance Market

Facing to the fact that the road has comparative competitive advantage in short (1-50km) and short to medium (51-500km) distance markets in terms of frequency, CR increased the train frequency in some short distance inter-city markets. For example, the pairs of the trains from Beijing to Tianjin were increased from 4 in 1996 to 10 in 1998 and the pairs of the trains from Beijing to Shijiazhuang were increased from 2 in 1996 to 4 in 1998.

In Beijing – Tianjin case, there had been several wars between rail and road since 1980s, ended with the failure of the rail due to lower frequency, longer journey time and poor service level. The rail passenger trip had been dropped with 3% per year from 1993 to 1997. CR adopted a package of marketing strategies to turn around this situation. Table 5.4 lists the before and after comparison for the key parameters.

**Table 4.4 The Before and After Comparison for
Some Key Parameters Between Rail and Road**

| | | Frequency | Journey Time | Price | Ticketing |
|------|--------|--------------------|--------------|-----------|----------------------------|
| Rail | Before | 4 Pairs of Trains | 120 Min. | 25 RMB | In station only |
| | After | 10 Pairs of Trains | 74 Min. | 15-30 RMB | In station or on the train |
| Road | | Per half hour | 90-120 Min. | 25-35 RMB | In station or on the bus |

After the new marketing strategies were implemented, the rail traffic increased more than 40% and there were almost on ne half of the road traffic (1,000 passenger trip per day) shifted from the road to rail and most of the bus companies who run the Beijing to Tianjin business are going to bankrupt due to lack of traffic.

5. Opening Some Luggage and Parcel Service Market to Private or Non Railway Firm to Attract More Traffic and Increase More Revenue

The railway luggage and parcel traffic is also facing the fierce competition from the road. There was 19.5 % decrease in parcel number in 1996 although there was marginal revenue increase. CR decided to rent some luggage cars and open access for private or non-rail firm to change this situation.

A private truck firm, FU Kui Group, who leases rail cars and rail lines from MOR, with \$110,000 a day, started the first privately run parcel express from Guangdong province in southern China to Liaoning province in the northern Chins on March 18(SAYWELL T. 1998). Later, there are 7 pairs of luggage trains who are run by the truck firms from Guangzhou to Harebin via Beijing, from Guangdong to Shanxi, Gansu and Xinjiang. This action resulted in 33.5% luggage revenue increase in 1998 because of the swiftness, relieable and cheap of the parcel expresss, while the average revenue growth rate was 12.0% from 1990 to 1997. “Opening MOR’s network to private operators is expected to bring in as much as 1 billion renminbi (\$120 million) a year”(SAYWELL T. 1998).

6. The Way Ahead

6.1 Giving Higher Priority to Rail Passenger Transport: A Big Policy

China is a country ideally made for rail passenger transport (WU, J.H. and NASH, C.A., 1998). It has a vast expanse of land of 9.6 million square-kilometers and a large population of 1.23 billion people. In 1997, there were 34 cities with more than one million people, 12 of them were more than 2 millions. The population is concentrated, with over 70% of the population living east of a Beijing-Guangzhou line. Most of the distances between cities are in the range 200-500 km. This would imply generally moderate transport distances within its densely populated areas and an ideal area for rail to offer journey times and low prices which compete with road and air. In a country of a low GNP per capita (US\$ 730 in 1997), a low car ownership (1.56 per thousand population in 1997) and rather high population density, the intercity and inter-regional public transport flows are strong enough to support a good quality rail service.

The mobility of people in China is still very low, with 0.75 rail passenger trip per capita in 1997; even India had a figure over 4, whilst Great Britain at 10 and Japan at 70 were orders of magnitude bigger. International experience in Europe and Japan also told us there is greater potential to be exploited for passenger transport than that of freight, especially when the country's industry structure transferring from the Heavy to the Light, from the Light to the Services.

6.2 Increasing passenger train speed is a vital strategy to enhance the comparative competitive capacity of rail passenger transport. Developing tilting train in the existing line and building high-speed passenger line from Beijing to Shanghai, building dedicated passenger line from Qinhuangdao to Shenyang to increase the carrying capacity greatly

6.3 Establishing and Organizing a variety of passenger transport companies, such as suburban passenger transport companies, regional passenger transport companies, intercity passenger transport companies, according to the passenger flow on a trial basis

6.4 Promoting intra-competition to supply more and more diversified passenger products, services with reasonable price and improve external and internal efficiency

6.5 Running short distance inter-city passenger trains with high frequency, fast speed and relatively smaller composition(5-10 coaches each train) to attract more traffic

6.6 Developing light rail and underground railway in big municipalities, such as Beijing, Shanghai, Tianjin, Guangzhou and Chongqing

6.7 Deregulation the rail transport market by opening up ownership to private sector, opening access to non rail firms and developing public and private partnership in the field of financing, construction, ownership and operation, esp. for the new markets, such as building high speed railway line, running tilting or high class trains on the existing line

6.8 There are still several questions to be answered

What's the cost and benefit for raising train speed?

What are the principles to price the raising speed train? Is it a good policy to raise the train speed without increasing the tariff?

Whether or not is it a below cost competition?

The sustainability issue?

Main Reference:

- 1. Statistical Yearbook of China, 1998**
- 2. Chinese Railways' Timetable, 1997-1998, 1998-1999**
- 3. SAYWELL, T. (1998) "High Roller", "FAR EASTERN ECONOMIC REVIEW", SEPTEMBER 3, 1998**
- 4. Wang, H.J. (1999) "The Effect on the Rail Transport Market after Implementing the New Train Diagram in 1997 and 1998", Working Paper, Economic and Planning Institute of**

Chinese Ministry of Railways

5. **WU, J.H. and ZHAO, H.P. (1998) “The Transport Development Policies and Railways Reform when Chinese Economy Transferring from Planned to Market”, Presented to Management and Policy Studies (MAPS) of UIC, New Delhi, India**
6. **WU, J.H. and NASH C.A. (1998) “Railway Reform in China”, Working Paper 524, Institute for Transport Studies of University of Leeds**
7. **ZHAO, H.P., WU, J.H., ZHU, J.H. and WU, W.P. (1997) “ The Present Status and Future Prospects of Rail Passenger Transport in China”, Presented to the Fifth International Conference on Competition and Ownership in Land Passenger Transport, Leeds, UK.**