Topics

(April-December 1993)

1 April • Keihtn Electric Express Railway Airport Line extended (0.7 km from Anamori Inari to Haneda)

10 April • Great Seto Bridge celebrated 5th anniversary

15 April • Tokyo Disneyland celebrated 10th anniversary with total number of visitors topping 130 million

18 April • JAS aircraft crashed and burned at Hanamaki Airport, Iwate Prefecture

11 May • JR East held training course for steam locomotive engineers

14 May • Five-span, brick arch bridges in Abt track section of former Shin-Etsu line recommended by Council for Protection of Cultural Properties to Minister of Education, Science and Culture, as important cultural asset of historical significance under newly-established "Inheritance of Modernisation" programme

18 May • TGV Northern Europe Line (Paris-Lille) completed

20 May • New Tokyo International Airport (Narita) celebrated 15th anniversary becoming one of world's largest airports serving average of 60,000 people per day and totalling over 200 million

23 May • TGV Northern Europe Line opened to Lille; second section between Arras and Lille put into commercial operation connecting Lille and Paris in 1 hour

27 May • Fully-automated VAL service began between international and domestic terminals and parking lots at Chicago O'Hare International Airport at maximum speed of 80 km/h

28 May • First subway service began in Shanghai over 6.6-km span of 165-km system

• Railway Friends Club (only nationwide organisation of railway fans), awarded Blue Ribbon Prize to JR Kyushu's Tsubame express, and Laurel Prizes to JR Central's Nozomi (300 series) *Shinkansen* and to JR Freight's EF200 high-tech electric locomotive as best new rolling stock in 1992

2 June • Passengers killed and injured when guard's van of backing freight train derailed and express train crashed into it in southern India

9 June • Japanese Crown Prince married Princess Masako in traditional ceremony at Imperial Palace

10 June • Joint symposium on railway maintenance held in Tokyo by JR East and German National Railways on "Maintenance in the 21st century"

26 June • Unmanned VAL-type mini-Metro started service on 10-km section between Jolimont and Basso-Cambo in Toulouse in southern France

1 July • JR East's Yamagata *Shinkansen* celebrated first anniversary of operation on double-gauge tracks (conventional + 1,435 mm).

Total of 3.23 million passengers travelled on Tsubasa connecting Tokyo and Yamagata in 2 hours and 27 minutes

2 July • JR East Boso View Express super express (255 series) debuted

7 July • Czech Republic nationalised railways

12 July • Large earthquake hit south-western Hokkaido

18 July • Non-LDP parties won majority in Japan in 40th general election

30 July • Work began in Russia to build new high-speed railway between Moscow and St. Petersburg (approx. 650 km) connecting two cities in 2 hours and 25 minutes at maximum speed of 350 km/h when completed in 2000

6 August • Maintenance cars collided and derailed in Hamamatsu Station on *Tokaido Shinkansen* interrupting regular service all day

9 August • Coalition cabinet formed by Japanese Prime Minister Hosokawa

12 August • Nagoya City's Bureau of Transportation opened 1.4-km section between Shonai Ryokuchi Koen and Kami-Otai on Tsurumai line to start direct connection with Nagoya Railroad's Inuyama line forming main artery (approx. 60 km) from Inuyama and Toyota via Nagoya

20 August • Korean Government chose TGV by French-British joint company, GEC/Alsthom, for high-speed railway between Seoul and Pusan (approx. 400 km)—competition included Japanese and German technologies

26 August • Rainbow Bridge (approx. 800m) completed across Tokyo Bay as part of Shuto Expressway No.11 (between Shibaura and Ariake) of Metropolitan Expressway Public Corporation—differs structurally from Bay Bridge (cable-stayed bridge) in Yokohama

6 September • 10-day joint meeting (world's largest railway conference) of IRCA (International Railway Congress Association) and UIC (Union Internationale des Chemins de fer) held in Lisbon attended by about 600 persons representing railways in member countries

13 September • Super Express system selected for Itoigawa-Uozu section (approx. 40 km) of Hokuriku Shinkansen allowing direct connection between new Shinkansen and conventional tracks at maximum speed of 200 km/h. Work requires 10 years and ¥18.8 billion to complete

21 September • Bank of Japan lowered official rate by 0.75% to 1.75% per annum effectively immediately

22 September • Miami-bound Amtrak train from Los Angeles (Sunset Limited with 206 passengers) derailed into swamp north of Mobile, Alabama, when bridge col-

lapsed, killing 47 passengers

24 September • New passenger terminal opened at Haneda Airport along with new control tower and cargo terminal as part of expansion plan toward sea. Five-floor building (total area 289 million m2) nicknamed *Big Bird* from shape—Tokyo monorail extended to basement of new station

1 October • German National Railway opened Tokyo office providing base for planned joint technological development activities with JR East according to November 1992 memorandum

5 October • Passengers injured when runaway train (four cars) of Osaka City's New Tram transportation system crashed into buffers in Suminoe Koen Station

13 October • Forty-nine commuters killed and 70 injured by another train in India after jumping off commuter train in Bombay when stopped and filled with smoke after power failure probably due to lightning

26 October • JR East became first JR company listed on stock exchange when 2.5 million of 4 million stocks owned by Japanese National Railway Settlement Corporation sold to private investors

1 November • Ridership of *Tohoku-Joetsu Shinkansen* topped 600 million 11 years after Tohoku section opened on 23 June 1982 (Joetsu section opened on 11 November 1982) with total distance 251 million train-km

2 November • Two passenger trains collided on single-track section in suburbs of Jakarta, Indonesia killing at least 18 and injuring over 200 passengers

5 November • British House of Lords passed bill to divide and privatise BR. Bill favours dividing railways into facilities management and passenger/freight operations. Allows freight division to be sold immediately to private sector and passenger operations to be changed to private operation by 25 franchises

9 November • Asian railway safety seminar held in Tokyo by JR East and labour union with management and labour representatives from 17 countries in Asia and other parts of world

10 November • Fifteen people killed and 49 injured in collisions on French A10 expressway

7 December • Man fired gun in crowded rush-hour train in Long Island, New York, killing 5 passengers and injuring 17

9 December • *Tokaido Shinkansen* stopped due to power failure and many trains delayed or cancelled as result—unfortunately, Chinese delegation led by Mr. Han Zhulin, Minister of Railways, delayed by 2.5 hours on-board a Nozomi

21 December • JR East's STAR21 marked new national speed record of 425 km/h breaking earlier record (420 km/h on 13 December).

STAR21 (experimental train designed for quiet operation) ranked second fastest train in world after French TGV (515.3km/h)

• Seven-car TGV, bound for Valenciennes from Paris, derailed near Amiens at speed of 300 km/h. Special linked bogie system prevented train from falling and none of 170 passengers injured—accident caused by loose ballast built over World War I trench, which collapsed due to continuous rain for some days

24 December • Opening of New Kansai International Airport (Japan's first 24-hour airport built on artificial island off Osaka Bay) set for 4 September 1994

■ STAR21 passing Omiya Station on *Tohoku Shinkansen*

Milestones

(April-December 1993)

Yasuo Nishimura, 59, President of Tokyo Metropolitan Subway Construction Corporation Ltd., and former Director General of Civil Aviation Bureau, Ministry of Transport, appointed president of Japanese National Railway Settlement Corp. on 1 April. Born in Tokyo, Nishimura graduated from Tokyo University, Faculty of Law in 1953. Assumed Ministry-of-Transport posts such as Director General of Tourism Dept., Director-General for policy cordination, and Director General of Civil Aviation Bureau before retiring in January 1986

Renjiro Toyohara, 77, former Managing Director of Japanese National Railways and Chairman of former Ex-Railway Employees Relief Assoc. (*Tetsudo-Kosai-Kai*). died 18 April. Toyohara graduated from Faculty of Law of Tokyo Imperial University in 1939 and entered pre-war Ministry of Railways. Assumed post as Director General of JNR Nagoya Railway Operating Division of JR headquarters and Managing Director of JNR headquarters.

Moritoshi Serizawa, 77, Chairman of Keihin Electric Express Railway, appointed chairman of Japan Non-Government Railways Assoc. on 31 May, succeeding former chairman, Shunjiro Kuma (Chairman of Hanshin Electric Railway Co., Ltd.). Born

in Nagano, Serizawa graduated from Faculty of Law of Tohoku Imperial University in 1941 and joined Shonan Electric Railway (predecessor of Keihin Electric Express Railway)

Sumio Shioda, 58, Vice President of Teito Rapid Transit Authority, appointed president of Japan Railway Construction Public Corp. on 28 June. Born in Tokyo, Shioda graduated from Tokyo University, Faculty of Law in 1957. Assumed such Ministry-of-Transport posts as Director General of Transportation Policy Bureau and Director General of Maritime Safety Agency before retiring in June 1990

Takahide Yamada, 60, Corporate Adviser of ANA, appointed president of Air Nippon on 28 June. Born in Tokyo, Yamada graduated from Tokyo University, Faculty of Law in 1956. Assumed Ministry-of-Transport posts such as Director General of Civil Aviation Bureau and Director General of Maritime Safety Agency before retiring in June 1986. Also President of Maritime Credit Corp.

Masatake Matsuda, 57, Vice President of JR East, promoted to President on 29 June. Born in Hokkaido, Matsuda graduated from Graduate School of Hokkaido University in 1961. Assumed JNR posts including Planning Manager of Management Planning Office, Planning Manager of Hokkaido Headquarters, and Director General of Reconstruction Promotion Headquarters before becoming Managing Director and General Manager of Corporate Planning Headquarters of JR East in April 1987 when former JNR privatised. Former president, Shoji Sumita, promoted to Chairman, former chairman, Isamu Yamashita, promoted to Principal Executive Adviser, and former vice president, Shuichi Yamanouchi, promoted to Vice Chairman simultaneously, leaving post of vice president open

Yabushi Tanahashi, 60, President of Japan Railway Construction Public Corp., appointed president of Japan Freight Railway Corp. on 29 June. Born in Tokyo, Tanahashi graduated from Tokyo University, College of General Education in 1956. Assumed Ministry-of-Transport posts such as Director-General of National Railways Dept., Deputy Vice-Minister for National Railways Reconstruction Promotion, Director General of Transport Policy Bureau and Director General of Secretariat before retiring in June 1989. Also assumed posts such as Vice President and President of Japan Railway Construction Public Corp. Former president, Masashi Hashimoto, appointed Chairman, and former senior executive manager, Hisashi Ueda, promoted to Vice President of Japan Freight Railway Corp. Former chairman, Naoshi Machida, and vice presidents, Katahisa Okada and Hiromi Matsuki, retired

Hiroichi Nishiyama, 63, Vice President of Keihin Electric Express Railway, promoted to President on 29 June. Born in Tokyo, Nishiyama graduated from Faculty of Economics of Keio University in 1951 and joined Sumitomo Trust & Banking Co., Ltd. in 1953. Retired as bank vice president in 1988

Motohiro Sugai, 63, Vice President of Hankyu Corp., promoted to President on 29 June. Born in Hyogo, Sugai graduated from School of Economics of Kansei Gakuin University in 1953 and joined Keihanshin Express Railway Co. (predecessor of Hankyu Corp.). Former president, Kohei Kobayashi, became Chairman

Seiji Fukatsu, 60, Senior Executive Manager of ANA (All Nippon Airways), promoted to President on 29 June. Born in Tokyo, Fukatsu graduated from Tokyo University, Faculty of Law in 1956, and joined Japan Helicopter Transport Co., Ltd. (predecessor of ANA). Former president, Akio Kondo, became Vice Chairman

Michihiko Matsuo, 56, Director General of Civil Aviation Bureau, appointed Administrative Vice-Minister for Transport on 30 July. Born in Okayama, Matsuo graduated from Tokyo University, Faculty of Law in 1960. Assumed Ministry-of-Transport posts such as Director General of Chubu District Transport Bureau and Director General of Secretariat. Appointed as result of resignation of former Administrative Vice-Minister for Transport, Toru Nakamura, and Director General of Transport Policy, Bureau Hideo Otsuka. Former Director General of Secretariat, Minoru Toyoda, became Director General of Transport Policy Bureau, former Director General of Road Transport Bureau, Yasutoshi Tsuchisaka, became Director General of Civil Aviation Bureau, former Director General of Fourth Dept. of Cabinet Legislation Bureau, Masahide Ochi, became Director General of Road Transport Bureau, and former Deputy Directcr General of Railway Bureau, Masahiko Kurono, became Director General of Secretariat

Saburo Nagakura, 83, Corporate Adviser of JR Kyushu, died on 11 October. Nagakura graduated from Tokyo Imperial University in 1934 and joined Toho Electric Power Co., Ltd. Assumed posts such as President of Kyushu Electric Power Co., Ltd., and director of former JNR, before becoming Chairman of JR Kyushu when company established in April 1987 after privatisation of JNR

Rekiji Kobari, 79, Chairman of Fukushima Kotsu Co., Ltd., died on 7 November. Known as king of Fukushima Transport group, Kobari was President of Fukushima Mimpo Co., Ltd. and Radio Fukushima. Also engaged in real estate, leisure-oriented projects and other businesses. Often called "wirepuller" of Tohoku district because of close political connections. ■

E351 Series Pendulum EMU and a short history of tilting trains in Japan

The East Japan Railway Company (JR East) took first delivery of the E351 Series of pendulum EMUs in September 1993. This is the first time JR East has introduced pendulum trains. JR Central and JR West inherited the 381 Series of EMU Natural Pendulum Trainsets from JNR. JR Shikoku and JR Hokkaido have already developed and are operating pendulum trains; JR Kyushu has recently ordered new EMU pendulum trains.

Japan is a mountainous country and there are many steep curves on all lines. The technology of actively-controlled pendulum systems has been perfected recently and the effectiveness of such systems is now acknowledged. Introduction of pendulum trains increases speeds on curves cutting travel times.

The E351 Series will be put into service on the Chuo Line running west from Shinjuku in Tokyo serving Matsumoto in Nagano, and also on the Oito Line serving Hakuba, the site of the 1998 Winter Olympics. In recent years, JR East has introduced several limited expresses using new concepts on main lines radiating from Tokyo, such as the *Super Hitachi* business express on the Joban Line, the *Super View Odoriko* for passengers to the Izu Peninsula resorts on the Tokaido Line, the *Boso View Express* to the Boso Peninsula, and the *Narita Express*, serving New Tokyo International Airport. The new E351 rolling stock will complete JR East's network of new trains around Tokyo.

1. Development of Pendulum Trains In Japan

1.1 381 series EMU (JNR)

The first generation of Japanese pendulum trains were introduced in 1973 between Nagoya and Nagano making JNR one of the first railways in the world to use pendulum trains. This 381 Series of limited expresses uses a natural pendulum system with cylindrical surfaces under the car body supported by rollers on bogies. The centre of curvature of the cylindrical surface is 2.3 m above the rail. The maximum tilt is 5 degrees compensating for lateral acceleration of 0.1G. The centre of gravity of the car body was lowered using an aluminium-alloy lightweight body to provide sufficient tilting moment as a result of centrifugal force. This tilt mechanism is very simple and reliable, but some-

■ E351 Series Pendulum E.M.U.

■ 381 Series Pendulum EMU

times the inertia of the car body delays the tilting motion when negotiating transient curves which degrades comfort. JR Central and JR West are now using 277 cars of these 381 Series EMUs.

1.2 2000 Series DMU (JR Shikoku) and KIHA 281 Series DMU (JR Hokkaido)

After the 1987 restructuring of JNR, JR Shikoku and the JR Technical Research Institute developed the 2000 Series DMUs with actively-controlled body tilting in 1988. The tilt mechanism is similar to the 381 Series but pneumatic cylinders between the car body and bogies control the tilt angle. When the train negotiates a curve, these cylinders are actuated by commands determined by the train speed and track geometry memorized in an onboard controller to compensate for the lateral acceleration. The memory is collated with the actual

■ 2000 Series Pendulum DMU (JR Shikoku)

position of the train on the track using the ATS (Automatic Train Stop System) induction coils on the track. The control system issues the tilt command slightly before the curve to compensate for the tilt delay and improve the ride comfort. Curves with a radius of 400 m can be negotiated at 100 km/h or 25 km/h faster than ordinary trains.

JR Hokkaido is introducing this system on its limited expresses as the KIHA 281 Series DMU which comes into commercial operation between Hakodate and Sapporo in March 1994. The winter weather in Hokkaido is very severe and countermeasures against snow and low temperatures are most important.

■ KIHA 281 Series Pendulum DMU (JR Hokkaido)

1.3 8000 Series EMU (JR Shikoku)

JR Shikoku developed the 8000 Series pendulum EMU in 1992; it is similar to the 2000 Series DMU but the pantographs are mounted on sliding circular arches across the roof and connected to bogie frames by wires so the relative position on the overhead wire does not change despite the tilt. The running performance is similar to the 2000 Series.

1.4 E351 Series EMU (JR East)

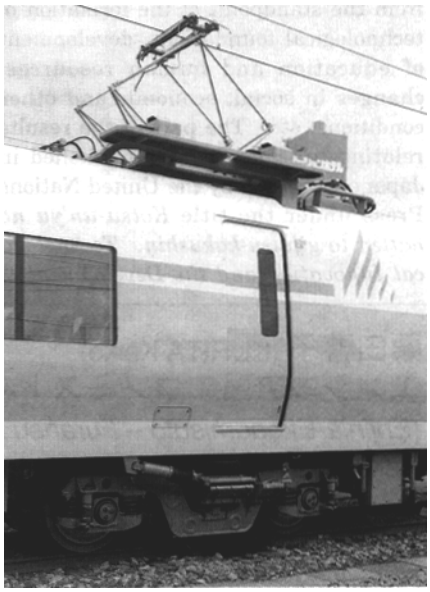
This pendulum EMU series is the successor to the 8000 Series but, for higher reliability, the pantographs are fixed on top of the tall suspension frames attached directly on the bogie frames without tilting. The running performance is expected to be better than the 2000 Series and the tilting system and bogies are now under adjustment.

2. Outline of E351 Series

This series has been developed to replace the old 183 Series. It is being used as the *Azusa* limited express on the Chuo line with 18 trains in each direction per day. One trainset is composed of up to 12 cars but can be split into 4- and 8-car sets depending on the number of passengers; the gangways between carsets are coupled automatically. A maximum of 713 passengers can be carried including 50 in the Green Car, an increase of 26% over the earlier 9-car *Azusa*. The maximum speed is 130 km/h or 10 km/h faster and the curve speed is also higher. Larger windows give passengers a better view of the passing countryside, and the muted interior colour scheme suits businessmen better.

The electric propulsion system uses asynchronous motors with VVVF control and regenerative braking to decrease maintenance and save energy. The regenerative brake force decelerates the trailer cars in the same set using the service brakes.

The Command Controller in the Control Trailer issues the tilt command to the Tilt Controller in each car according to the train location and the curve geometry to control the tilt actuators. ■



■ Pantograph on suspension frame

Makoto Yamada

Mr. Yamada graduated in 1969 from Waseda University's Post-Graduate School with a Master's degree in Mechanical Engineering. He worked for JNR from 1969 to 1987 and as Deputy Director of JR East Paris Office from 1987 to 1990. He is presently General Manager of the Rolling Stock Division of JR East.