

Shinkansen Practice & Performance

Peter Semmens

Last autumn, after being a privileged guest at the International Conference held in Kyoto to mark the 30th Anniversary of the Tokaido Shinkansen, I was able to make a number of journeys over the Japanese high-speed lines, and noted the differences that had occurred since my first visit to Japan 12 years earlier. These have taken place incrementally, which has to some extent masked their scale.

Like other railway writers, my interest was stimulated by the introduction of the 'Bullet Trains' in 1964, but in those days there was not the same opportunity for travel between Japan and the UK. However, 2 years later, the British Association for the Advancement of Science invited Mr Takeji Hayashi, a member of the JNR Board, to give a paper on the new line to the Association's annual conference at Nottingham. As a member of the council, I was able to meet him at that time, and dined with him later in Tokyo during my 1982 and 1994 visits. His death in January this year came as a great sadness. I have also been able to keep in personal contact with the JNR and JR developments via their representatives in Paris, as well as via the JR Central office in London after it opened.

When I made my first visit to Japan in 1982, the new Tokaido line had already been in operation for 18 years, and the high-speed route by then extended all the way to Hakata. The Tohoku Shinkansen had just come into service, and the Joetsu was to follow shortly after. However, to use either, one had to travel by ordinary train all the way to Omiya. Now the two shinkansen services terminate at adjacent platforms in Tokyo Central Station, but they are nevertheless kept apart by the Japan's two different electrical systems.

Twelve years ago, the Tokaido Shinkansen had been a busy line, but today's increased

service frequencies were immediately apparent when I reached Shin-Kyoto station at the end of the 1994 conference. Even at 9 am on a Sunday morning, the comings and goings were more like a suburban operation in other countries than part of a 1000-km main line. In 1982, all the Tokaido Shinkansen trains were identical, and one was tempted to conclude that the service frequency then achieved was made possible by the use of a single type of train, with all that meant in terms of acceleration and braking performance. Even the Series 200 'Long-Nosed Beauties' on the northern lines, although differing in detail from the Tokaido units, still looked substantially the same, apart from their green and cream livery.

However, that situation has now changed considerably. The Series 100 trains, with their double-deck coaches and higher speeds, first made their appearance on the western services, banishing the Series Os to the all-stations Kodama workings. (It was interesting to be told that the reserved seating on these trains is now of the 2+2 type, to encourage more passengers into them, so freeing capacity in the Hikari.)

The problems of operating such an increasingly intensive service became even more complex when the hourly Nozomi departures were introduced, running for much of the distance at 270 km/h. Despite this, as many as 11 trains are booked to leave Tokyo Central in 1 hour during the evening peak. From observations and the railway's booklets, I noted how the overhead electrical system had twice been upgraded to supply the extra current needed. Technological change of another sort, however, enables a Nozomi, in spite of its higher speeds, to use less power overall than a Series 0 operating a service with the same number of stops.

The gauge problem in Japan prevents through running on and off high-speed lines, a feature which is universal on similar lines in Europe. The choice of the 1067 mm gauge for Japan by British engineers in the last century has caused their pioneering high-speed network to be very different in character. However, this is now being overcome to some extent, with the conversion of the Yamagata line, and the construction of new sections of 1067-mm track which can later have standard-gauge rails laid on them. The totally different profile required for the Series 400 Mini-

Shinkansen operating the services from Tokyo to Yamagata gives these trains a very striking appearance, and the passenger accommodation is very comfortable despite their narrower width.

I was particularly interested to see this 'new' development, and arrangements were made for me to ride one of these trains after the conference. While I was waiting for its departure from Tokyo, one of the new Series E1 MAX trains arrived on an adjoining platform with its load of commuters. These very impressive units are the first high-speed trains in the world to have a double-deck layout throughout, pre-empting the French TGV Deux Niveaux units currently under construction, which do not fully utilise platform space because of their separate power cars. After I had departed in the cab of one of the Series 400 Tsubasa, I noted the extensive engineering work that had been required for the two-stage extension from Omiya into Tokyo Central.

Although I had read about the engineering changes required to enable the Tsubasa to operate over converted 1067-mm tracks, I was amazed at the scale of the other changes that had been carried out in connection with the gauge widening. Most of the stations have been rebuilt, in collaboration with the prefectures and communities they serve, to provide additional facilities for those living nearby, as well as to attract tourists to the area. Few non-Japanese readers of this Review will be aware of the scale of this work, so it is worth outlining the new facilities provided. They include: trade centres, community facilities, museums, a library, galleries and a theatre, information centres and a hot-spring resort. While some urban landscapes in Japan are not outstanding, architects of high repute were brought in to design the new buildings, which are extremely striking. To



■ A southbound Series 200 Shinkansen seen from the cab of Tsubasa above the suburbs of Tokyo
(Author)



■ A local train in Kaminoyama-Onsen station, one of those rebuilt in connection with the introduction of the Tsubasa services. (Author)

complement the Chess Museum at Tedo, for example, the station square has been paved in large black-and-white squares, the open space being broken up with trees and architectural features.

I know of no other joint-ventures on such a scale that have been carried out by railways anywhere in the world. Because the number of passengers using the line will have to increase very considerably before the company sees any return, JR East clearly has longterm confidence in the future role of railways in Japan. The small numbers travelling on the local trains I used in the middle of the day were typical of those one would find on any western European branch line. The fact that Japanese railways can afford to do this sort of thing, while other countries seek to close down uneconomic branch lines, makes an interesting comparison.

In the course of my 1982 journeys, there were frequent references to the JNR's 'Big Red Figures', and later I entertained a former JNR President at the National Railway Museum in York who considered he had been a failure because he had been unable to make JNR profitable. The Japanese privatisation has undoubtedly brought about a radical change in the larger geographical companies' fortunes, and it is particularly useful to have Professor Yukihide Okano's article in Review No. 2. With many other countries now seeking to privatise their railways, the exact nature of the Japanese changes are not widely

realised. It says a lot for the attitude of the Diet that the JR companies have been allowed to act as any private company does. (By contrast, back in 1982, permission to build the new station in Osaka had only been obtained with very great difficulty.) However, the commercial status of the JR companies is not sufficient, of itself, to explain their financial success, and one must search for other reasons to account for a situation which most other railway organisations look at with envy. The JR companies have also not slimmed down their staff numbers to the same degree as many western railways have. Most of the Japanese stations I used had manned ticket barriers, an arrangement which is now increasingly rare on European railways, and much more cleaning is carried out on the interiors of JR trains between journeys.

The large Japanese population must be a significant factor, but this is coupled with a far greater willingness for people to travel by train.

To use any form of public transport requires far more self-discipline than jumping into a car, and this strikes me as something that is far more developed in the Japanese character. The constraints of having to go to the station at the right time, buy a ticket and get on the right train do not appear to cause the same resentment as they do in other countries. For whatever reason, many of Japan's railways are used far more extensively than those in other countries, in spite of the high fares, and, for the large mainland JR companies, this ensures a high turnover and profit.

Japanese self-discipline also shows itself in another interesting fashion on the railways. In very few other countries will the drivers and conductors be found wearing white gloves, or saluting their colleagues on the platforms as the trains move in and out of the station. The high safety standards achieved reflect this too. In 30 years of operation, there has never been a serious accident, let alone a fatality, to any of the 3 billion passengers who have so far used the

shinkansen lines. While the ATC installations have undoubtedly contributed to this outstanding record, safety on other lines depends more on the driver's actions. For those coming from Europe, it is fascinating to watch the driver point at each signal as it is approached, or run his finger along the timetable to check the next stop.

Back in 1964, Japan took the world by surprise when it introduced the shinkansen, running regularly at speeds hitherto reached elsewhere only on test runs. During the intervening 30 years, other countries have been inspired to copy their example, and the French and Spanish currently have a slight (25 km/h) edge on JR East's maximum service speed. However, JR West has now announced its intention to start running commercially at 320 km/h within the next few years, so Japan is likely to regain world leadership for train speeds in revenue service. Nor does this seem to be the limit for steel-wheel-on-steel-rail in Japan, as JR East has already pushed STAR 21 up to a speed of 425 km/h, taking it to second place in the world record list. ■



■ Mixed-gauge track is needed between Yamagata and Zao to enable 1067mm freight trains to reach the factories over the lines not used by the Tsubasa Series 400 Mini-Shinkansen. (Author)



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Peter Semmens (MA) was born in 1927. He graduated in Chemistry from Oxford University, and worked in the chemical industry for 25 years before becoming the first Assistant Keeper of the new National Railway Museum at York in 1974. He left the museum in 1987, and now devotes his time to writing on railway matters. He is the author or part-author of 30 books, and for 14 years has written the monthly "Practice & Performance" article in *The Railway Magazine*, the longest-running railway column in the world having appeared every month since 1901. In 1990, he was appointed Chief Correspondent of *The Railway Magazine*.