

ing favourably; but in the months from June to October 1942, the situation shifted rapidly with the Allies turning the tide of war against Japan. The logical inconstancies between transportation policy and the actual transportation situation quickly grew ever more apparent. On 6 October 1942 the cabinet adopted the **Matters Relating to Establishing a Wartime Emergency Land Transport System**, a land-transport policy based on the previously mentioned **Basic Policy for Transportation in Greater East Asia**. By means of this new policy, the government strengthened the planned transport system for railroads, motor vehicles, and all domestic transport modes, and at the same time it effected a shift from sea to land for freight transport.

However, none of these policies was realized as planned, and the cabinet, in March 1944, adopted the **General Plan for Emergency Measures in Decisive Battle** and, based on that, decided on 16 August 1944 to implement a **General Plan for Emergency Transport Measures**. Following these measures, passenger transport was severely restricted, allowing its use only for evacuation out of the cities, although shortages in both labour and materials had placed planned transport itself into a state of ruin. All active construction plans, such as those for the Shinkansen and the Kampo undersea tunnel, were cancelled. In the early months of 1945, the continuing bombardment and damage to Japan created a situation in which the only planned transport was that of men and materials for the defence of the main Japanese islands.

War damage in shipping and air transport far exceeded the initial estimates. An enormous amount of ship tonnage had been destroyed, the number of registered ships dropping from 6,380,000 tons in 1941 to 1,560,000 tons in August 1945. This low figure alone was enough to make planned transport impossible.

In the days leading up to Japan's defeat in the war, transportation control was impossible to effect. The responsible agency was changed to the Ministry of Transport and Communications in 1943, and then, in 1945, to the Ministry of Transport. These ministries built a system unifying land and sea transport, but in the bankrupt state prevailing at the time, there was no way that such a system could be operated as intended.

## Railroads

*Katsumasa Harada*

### Strengthening the Wartime Transportation System

The National Railways revised its timetables on 1 July 1937 immediately before the start of the war with China. This timetable revision provided five round-trip limited express trains (including one unscheduled train) per day on the Tokaido Main Line and brought express and local train service to their prewar peak levels. Economic recovery from the depression of the

early 1930s had come far enough that a train schedule of this kind could be drawn up. There was a change to a more enterprising economic policy and away from the tendency to deal with the poor economic situation by making locomotives and freight cars smaller and reducing the number of units transported.

But the recovery was brought about through a system of preparations for war based on military expansion such as the armed aggression in north-east China and the plans for total war that were decided in 1936. Within these favourable economic conditions, however, resided many dangerous elements that were directly connected to the strengthening of the war-preparedness system.

At the start of the war with China the situation changed. The series of large-scale mobilizations that began in August 1937 were so large that National Railway lines had to be used to transport the troops. The government had not formally declared war, and the leaders euphemistically called it an "incident." But it was certainly a war in every respect, for the 17 divisions and 500,000 men mobilized during the first six months were more than were mobilized during the 1904 Russo-Japanese War. And the responsibility for getting the troops to the port of embarkation was assigned to the National Railways.

Rapid and large-scale troop mobilization always places a heavy burden on general transport facilities, and to avoid excess strain, the National Railways, immediately after the 1907 nationalization, had devised a basic plan for just such contingencies in which schedules would be rewritten to give priority to troop trains. To ensure that nothing went amiss if troop transport became necessary, railroad officials always kept in close communication with the General Staff Headquarters. With plans always ready, there was no need to devise totally new schedules when war did occur. But if there was a need for mobilization of large numbers of troops in a very short time, then new modifications in the train schedule would have to be made. And if trains, stations, and other facilities were taken over by the military, that would of course mean that the normal train schedules could not be maintained.

One of the first things that happened when transport facilities started to be used for military purposes was a decline in overall transport power. Another thing was that, in order to use the railroad in the occupied regions of China, the railroads in Japan had to supply their rolling-stock. When all these wartime measures were enforced, the consequences, which could never have been foreseen during peacetime, made it impossible to operate transport facilities smoothly and on time.

In addition, the number of locomotives and cars operating on liquid fuel, particularly gasoline, had dramatically increased since the 1920s. However, these fuels became controlled items for military purposes, since more and more military vehicles and ships were also using these fuels. Consequently, in order to keep the railroads running, it was necessary to make a change-over to alternate fuels. Another problem was that, as metal shortages

worsened, locomotive and rolling-stock materials that did not absolutely have to be made from metal were made from substitute materials. Cars started to be built with parts made from alternative materials in 1938. The shortage of materials eventually affected rails, preventing not only the laying of new tracks but also the repair of worn-out sections.

In comparing the amount of traffic on the National Railways for 1936 and 1940, we see an 88 per cent increase in passenger-kilometres and a 74 per cent increase in freight ton-kilometres. But despite the increases, there were no concomitant increases in the number of trains in operation or the number of kilometres travelled, the result of which was actually an overall decline in transport power.

In such a situation, the National Railways was forced by 1939 to cut back on the number of ordinary passengers carried during peak passenger-carrying periods and to adopt an approach that would inhibit transportation demand. These steps were followed by ever stricter measures, and by 1941, third-class sleeping cars and dining cars were being eliminated and replaced with carriages with seats only. In addition, the use of express trains for trips of less than 100 km was prohibited. We can see from this that a fairly strict set of measures had been taken well before the Pacific War.

The depletion of transport power required countermeasures that would increase power. More than anything, a transport system that cut vertically along the Japanese islands was required, and this system was represented by a plan, as previously mentioned, to construct a new trunk route (the Shinkansen) on international standard-gauge tracks. (This plan will be touched upon later.) A part of this system was the plan for the Kammon Tunnel connecting Shimonoseki in Honshu to Moji in Kyushu. This plan had been under examination since 1910 and consisted of two proposals, one for a bridge and the other for a tunnel. Considering the damage that would be caused by possible air raids and the obstacles a bridge would present to the passage of large warships through the straits, Japan's military leaders pushed for the tunnel plan, which was adopted. Construction based on this plan began in 1936, with the first line opened in July 1942 and the second line in September 1944. Despite increasing shortages, the armed forces were able to obtain the needed labour and materials, and the project was completed in the short time requested. The completion of the tunnel provided a direct transport link between Honshu and Kyushu and contributed greatly to the increase in transportation strength.

The final decision to adopt the Shinkansen plan was made in 1939. The plan called for the construction of a line separate from those already in existence to cover the 971.6 km between Tokyo and Shimonoseki. According to the plan, trains would cover the distance between Tokyo and Osaka in 4 hours and 50 minutes and the entire route in 9 hours and 50 minutes. The line was to be built for ¥550 million (in the yen value at that time) and to be completed within a minimum of 15 years. Construction actually started in 1940, and all routes except for those in the vicinity of the Shimonoseki and Tokyo terminals and in the zone traversing the Suzuka Mountains had

been selected by 1942. Construction had also begun on the Shin Tanna, the Shin Higashiyama, the Nihonzaka, and other long tunnels along the way.

The Shinkansen plan called for special express trains running along the route at maximum speeds of 200 km/h. The segments between Tokyo and Shizuoka and between Nagoya and Himeji would be electrified and carry trains pulled by electric locomotives, while trains in all other zones would be pulled by steam engines.

To allow for compatibility in rolling-stock transfer, the same regulations on rolling-stock would be applied generally to all areas under Japanese control. Thus, 3,400-mm car-body width and 4,800-mm height would be mandatory for rolling-stock in Korea (under the Railway Bureau, Government-General of Korea) and in China (under the South Manchurian Railway). These regulations were anticipatory of the planned Kampu Tunnel connecting Shimonoseki and Pusan, mentioned earlier.

### The Plan to Form Transportation Links with the Asian Continent

Through its victory in the Russo-Japanese War, Japan took over the railways between Dairen (Dalian) and Changchun, between Andong (Taetong) and Shenyang (Fengtien) and other southern branch lines of the Chinese Eastern Railway. A railroad company was needed to operate these lines, and for that purpose the government provided half the capital to set up the South Manchurian Railway. The company adopted the international standard gauge of 1,435 mm as its regulation track gauge so that its rails and bed would match those in the rest of Korea and China. Goto Shimpei was the first director-general of the South Manchurian Railway, and, as referred to previously, as director-general of the Railway Department in 1909, he advocated the adoption of the 1,435 mm standard gauge for the Japanese National Railways, in the so-called standard-gauge reconstruction plan. The standard-gauge reconstruction plan had first been promoted in the 1890s by the army, but the army later gave up on it. Goto conceived the adoption of standard gauge not just for Japan but for all of Japan's possessions on the Asian continent, so that in the future, ferry links would connect the entirety into one network. Preparations continued on the plan until 1918, when it was abandoned because certain members of the Diet, in an effort to build party strength, advocated the building of railroads in their electoral districts.

Thus we can see that Japan's plan to convert to standard gauge gained impetus as part of its policy to rule Asia. The launching of war in China again breathed life into the policies to adapt to international standards. But the plan was again cancelled in 1943 after the Pacific War had turned to Japan's disadvantage. The government and armed forces were well aware of the danger to their sea lanes from attack by air and submarine and hurried to complete a railroad through China, French Indo-China, Thailand, and Burma that would strengthen the trans-continental Asian transport sys-

tem. Of course, the probability of completing this plan in 1943 and after was next to nil, but the 1,000 mm Taimen Railroad connecting Thailand and Burma was constructed and opened under the direction of the army's Railroad Regiment.

### Policies for Wartime Transportation

Domestically, railroad construction was actively pursued based on the provisions of the Railroad Construction Law. After the outbreak of the war with China, however, policy priority shifted to the construction of lines that would contribute to the development of raw material sources within Japan, that would be useful as shore-line routes to ports and harbours, and that would provide alternates to trunk lines or detours. As the war turned against Japan, completion of these lines became urgent, and as the bombings grew in ferocity, and damage worsened, they became crucial as alternates to the trunk lines.

Construction was also carried out to increase track capacity and, in consequence, to increase transport strength. Most construction of this type consisted originally of simply the addition of another track to make a single-tracked railway into a double-tracked one, or a double-tracked one into a quadruple-tracked one. But with the tremendous wartime shortage of materials, there were only a few areas where the number of tracks could be increased, and when an addition was made, it was accomplished by taking rails from tracks that were no longer in use. Most increases in track capacity consisted of building signal stations between existing stations on single tracks.

Another measure adopted to flesh out the transport system was the purchase by the National Railways of private railroads and tramways. Previous nationalizations of track had been based on the need to complete the traffic network. But by 1943, nationalization was directly related to the war effort, its purpose being to provide transport for the procurement of raw materials within the country, for commuting, and for use by defence plants, army posts, and navy bases. In the final two years of the war, the National Railways bought 22 private railroad companies, thus adding 1,051 km of track to the national transportation network.

As previously mentioned, rolling-stock began to be built with substitute materials in 1938. Although there was a strong demand for increased production and thus a fortified transport system, it was impossible to increase the amount of stock adequately, and it was becoming more difficult to build equipment that would function flawlessly. A large number of steam locomotives were built after the first model D51 rolled out of the shop in 1936, but the D52 developed in 1943, with its 1D1 (2-8-2 Mikado) wheel arrangement, was designed to pull a 1,200-ton load, the largest tractive force of any National Railway locomotive to date. But substitute materials had to be used everywhere to construct the locomotive, and the number of rivets used for the boiler had to be cut to less than half of what they would ordinarily have been. Not only did this prevent the locomotive from demonstrating its

full potential, it also presented the constant danger of the boiler blowing up.

Production started in 1944 on the EF13 electric locomotive, which paralleled the D52 in performance ability, but the shortage of metals meant that the structural weight could not be held to its targeted level, and the builders were forced into the desperate measure of mounting a 25-ton concrete block for use as a dead-weight. Shortages of materials meant that electric multiple units produced after 1944 had to be built without ceiling boards, the introduction of three-step windows, and no insulation between ceiling and roof. Other short cuts in work and materials caused major accidents later. Another area of shortage was in the number of freight cars, and attempts were thus made to increase the tonnage carried per car over the regulated limit. This was the exact opposite of what had been done during the recession, when the intent was to cut the number of tons carried per car. The result of this overloading was a great deal of stress on the cars and a shortening of freight-car life.

The lack of materials for replacement and the much harsher conditions to which rolling-stock and equipment were subjected meant incomparably faster deterioration from aging during the war than during peacetime.

The situation in the transportation system during the Pacific War was poor beyond imagining. Direction of the war effort was in total confusion. With the lines of communication to South-East Asia destroyed and naval supremacy over the coastal waters around Japan's main islands lost, it was very dangerous for ships to go to Asia by the direct sea route. To get to China, it was necessary to go through Korea, and even then, ships had a very difficult time avoiding attack on the route between Shimonoseki and Pusan. Most sea-going transport was forced to rely on the route across the Sea of Japan. The situation prompted shifting as much of the cargo moved on the Asian continent as possible over to land transport. However, much of the motivation behind this shift is attributable to the shortage of ships, and for much the same reasons, the bulk of goods transported within Japan also had to be carried on land.

One of the most important freight items to be moved over to land transport was coal, so that the output from Kyushu and Hokkaido, previously transported via coastal water routes, was shifted over to rail conveyance. This shift increased the amount of coal carried by train 15-fold from 1940 to 1944. Many other materials in addition to coal had to be shifted over to land transport, including ore, steel materials, cement, coke, and lumber. The shift also called for greater use of the shipping routes and ports along the Japan Sea coast, which was considered fairly safe from attack by sea, and the route vertically traversing Japan through the Hokuriku, Shin'etsu, and Uetsu regions along the Japan Sea grew rapidly in importance.

The volume of cargo to be switched over from sea to land transport was set at 21 million tons per year. That required maximum use of freight trains and a consequent proportional decrease in the use of passenger trains. A total of 172,000 km of passenger routes were cut between November 1942 and June 1945.

The cut-backs in passenger service caused uncontrollable confusion in passenger-train operations. Beginning in April 1944, passengers were required to have papers issued by the police permitting them to go on ordinary trips, but the regulation had almost no beneficial effect whatsoever, and in fact the red tape involved in getting the papers made things that much worse. Further restrictions were set down on commuting and group travel that made the relatively simpler times of peace something of the far-distant past.

Moreover, the bombing of the main Japanese islands by the Allied forces began in June 1944. When the air raids began to be mounted from bases in Mariana in November 1944, the damage to the railroads became increasingly severe. Then in February 1945, carrier-borne planes directly attacked both defence and railroad facilities.

The breakdown of air attacks on the National Railways alone was 403 conventional bombings, 252 incendiary bombings, and 494 strafings. A total of 15 naval bombardments damaged facilities at Kamaishi, Hitachi, Muro-ran, Hamamatsu, and elsewhere. The attacks also damaged some 1,600 km of rail tracks. One hundred-and-ninety-eight stations were damaged, 90,000 km of telegraph lines, 14 factories, 891 locomotives, 563 electric multiple units, 2,228 passenger coaches, and 9,557 freight cars. There were also 79,774 gross tons of loss in railroad ferries, 65 per cent of the total. This describes the situation regarding the railways as Japan neared its defeat in the war.

## Roads

*Hirofumi Yamamoto*

### The Wartime Motor-Vehicle Industry

The overwhelming dominance of Japan Ford and Japan GM on the motor-car industry had continued since the 1920s, but a turning point was reached with the May 1936 enactment of the Motor Vehicle Manufacturing and Enterprise Law. The motivation behind this law was military. As international tensions were heightening in the final years of the depression, the armed forces wanted to rapidly set up a domestic system for the production of motor vehicles that could be used for military needs. In order to build such a system, the government gave permission to certain companies to produce at least 3,000 vehicles a year. The government would provide these companies with favourable tax treatment and would loosen the restrictions on procurement of funds. The law also set a restriction on the scale of foreign producers, limiting the number of vehicles. Japan Ford could produce to only 12,360 vehicles a year and Japan GM to no more than 9,470 vehicles. Another step to reduce the power of foreign competition in the Japanese market was to raise the duties on imported parts.

The companies authorized for vehicle production in September 1936 were Toyoda Automatic Loom Works (which became the new Toyota Motor Manufacturing in August 1937) and Nissan Motor Company, both of which