

# Air–Rail Links in Japan: Present Situation and Future Trends

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## Eight Japanese Airports Linked by Rail to City Centre

Okinawa, Japan's southernmost prefecture, got its first rail transport system in nearly 60 years when *Yui-rail*—an Alweg (straddle-beam) monorail—started operations to link the capital of Naha with Naha Airport. Heavy ground fighting during the last days of WWII had destroyed the old prefectural railway, leaving Okinawa as the only prefecture in Japan without a railway.

The opening of this latest Japanese air–rail link (ARL) came almost 40 years after Tokyo International Airport (Haneda) was linked in 1964 to Tokyo via the Tokyo Monorail, becoming the world's fourth airport with an ARL after Brussels (1955), London Gatwick (1958), and Berlin Schönefeld (1962). Following Tokyo, eight Japanese cities now have rail links to their airports: New Tokyo International Airport (Narita) serving Tokyo and Kansai International Airport serving Osaka—the two international gateways; Haneda Airport—the super-hub for domestic

flights; Shin Chitose Airport serving Sapporo, Itami Airport serving Osaka, Fukuoka Airport, and Naha Airport—the domestic hubs; and Miyazaki Airport—a local airport (Table 1). Narita, Kansai International, and Haneda have more than one ARL to their city centres. Most links are urban or suburban commuter railways, although Haneda, Itami and Naha are noteworthy for their monorails. Through operations from these airports to the rail network operated by the six JR passenger companies are only possible at Shin Chitose, Narita, Kansai International and Miyazaki. In fact, only the Shin Chitose ARL could be described as very convenient for rail and air travellers. Moreover, even after 40 years of operations, the 2130-km shinkansen network still does not stop directly at any airport. In other words, Japan has still not taken full advantage of the high speeds of air and shinkansen by linking them.

## Recently Constructed and Planned ARLs

### Okinawa's *Yui-rail* to Naha Airport

Okinawa is the main island in the Okinawan archipelago between the East China Sea and Pacific Ocean, about 2000 km south-west of Tokyo. Construction of the *Yui-rail*, 12.9-km link between the Shuri terminus in Naha and Naha-kuko Station near the airport, began in 1996 with joint financing shared by the Okinawa Prefectural Government, the municipal government of Naha City, and private corporations. Infrastructure costs of ¥66 billion were guaranteed by the national, prefectural and municipal governments while with the public–private sector covering the non-infrastructure costs of ¥48 billion for stations, electrical facilities, rolling stock, etc. The system is operated by Okinawa Urban Monorail Co., Ltd., a public–private joint venture. The Shuri terminus in Naha is near the ruins of

Table 1 Japanese Airports with ARLs

City/Airport	Number of passengers (1000)			Distance and direction to airport	Type	Opening date	Operator	Time (minutes) from city centre to airport	Access to national railway
	Total	International	Domestic						
Tokyo/Haneda (HND)	59,510	960	58,550	14 km; south	1 Urban monorail 2 Urban railway	Sep 1964 Nov 1998	Tokyo Monorail (P) Keihin Electric Express Railway (P)	30 30	– –
Tokyo/Narita (NRT)	24,890	24,220	670	55 km; east	1 Urban railway 2 Urban railway	May 1978 Mar 1991	Keisei (P) JR East	60 60	– Good
Sapporo/ Shin Chitose (CTS)	18,500	460	18,040	38 km; south-east	Main line	Oct 1980	JR Hokkaido	35	Good
Fukuoka (FUK)	19,500	2,090	17,410	4 km; east	Urban subway	Mar 1993	Fukuoka City	10	Fare
Osaka/Kansai International (KIX)	18,750	10,980	7,770	35 km; south-west	1 Urban railway 2 Urban railway	Sep 1994 Sep 1994	JR West Nankai (P)	30 30	Good –
Miyazaki (KMI)	3,340	40	3,300	5 km; south	Main line	Jul 1996	JR Kyushu	10	Good
Osaka/Itami (OSA)	17,020	–	17,020	14 km; north	Urban monorail	Apr 1997	Osaka Monorail (S)	25	–
Okinawa/Naha (OKA)	11,130	370	10,760	3 km; west	Urban monorail	Aug 2003	Okinawa Urban Monorail (S)	10	–

1) FY2001, MLIT

2) (P) = Private railway; (S) = Public–private railway

Shuri Castle, a UNESCO World Heritage Site that was once the residence of the rulers of the Ryukyu Kingdom (1429–1879).

Although *Yui-rail* follows a winding route with many sharp curves (60 m min. radius) and some steep grades (60‰ max.), the rubber-tired cars negotiate them with ease. The driver-only two-car train sets are relatively small capacity (165 people), and run every 6.5 minutes during the day to cover the section between the airport and city centre in 10 minutes. Before the line opened, daily passenger levels of 31,000 were forecast but numbers have already reached 32,000 (February 2004). There has been a slight recent drop in numbers and although about 4400 people board and disembark at Naha-kuko Station each day, the true percentage of airline passengers using the line is still unclear. Although the line starts at Naha Airport and provides a convenient link for air travellers, it was built primarily to spur development in Naha and surrounding areas while reducing road congestion.

### **Nagoya ARL for Central Japan International Airport**

Nagoya City is located almost centrally in the middle of the densely populated industrial belt stretching 500 km along the Pacific coast of Honshu from Tokyo through Nagoya to Osaka. A new airport to be called Central Japan International Airport (CENTRAIR) is presently under construction near Nagoya because the present Nagoya Airport cannot handle anticipated passenger growth (4.12 and 6.46 million international and domestic passengers, respectively, in FY2001). It is the second airport in Japan to be constructed entirely on reclaimed land, after Kansai International Airport. The 470-ha artificial island in Ise Bay, 35 km south of central Nagoya will have a single 3500-m runway that is projected to serve 7 million international and 10 million domestic passengers annually.



Yui-rail monorail to Naha Airport opened in August 2003

(Author)



Tokyo Monorail to Haneda in service since September 1964

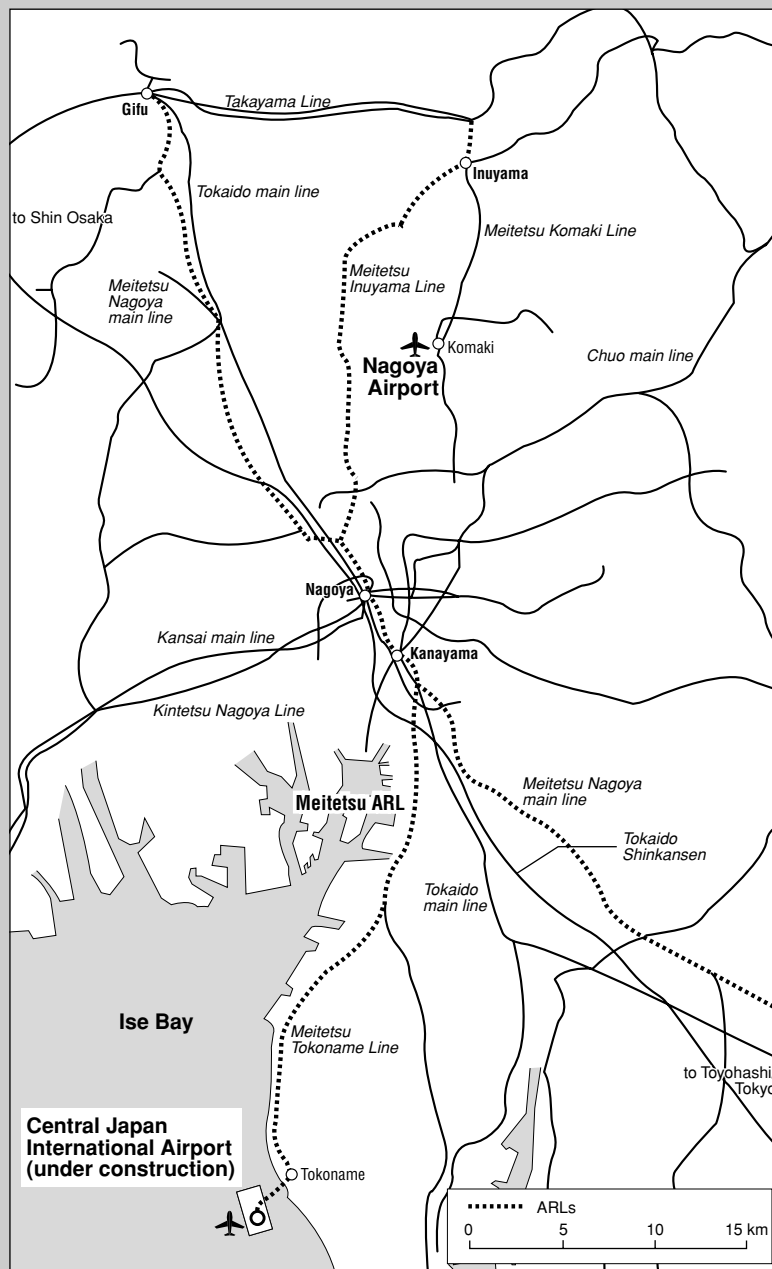
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Osaka Monorail to Itami in service since April 1997

(Author)

Figure 1 Major Railway Lines and Future Airport around Nagoya



Road and rail access are both in planning. The rail link will be constructed by extending the Tokoname Line belonging to Nagoya Railroad (Meitetsu), the main rail operator around Nagoya (Fig. 1). Meitetsu's 500-km network will offer direct links to CENTRAIR both from nearby Nagoya as well as neighbouring cities such as Gifu (70 km north) and

Toyohashi (50 km east). Development of the link with central Nagoya requires upgrading the 35.1-km Tokoname Line to Tokoname to handle operations at speeds up to 120 km/h and construction of a new 4.3-km line—including a 1.2-km causeway/bridge section—from Tokoname into the airport. Meitetsu is handling the Tokoname Line upgrades,

while the public–private Central Japan International Airport Line Company is constructing most of the new section that it will let to Meitetsu. However, most of the infrastructure inside the airport will be constructed by Central Japan International Airport Co., Ltd., that will let it to the former company. Consequently, the owner of the new section is classified as a category-3 railway business (building and selling infrastructure to category-1 companies, or renting infrastructure to category-2 companies), while Meitetsu is a category-2 railway business (providing passenger and/or freight transport on infrastructure of another company)—a similar arrangement to that proposed for the new ARL to Narita Airport described below.

The total cost of the Nagoya link will be ¥70.8 billion, including work to elevate a 1.5-km section of the Tokoname Line to connect the new line. The national and municipal governments will pay ¥27 billion with Meitetsu bearing the cost of upgrading the Tokoname Line and its terminal in central Nagoya.

Meitetsu plans to operate four limited expresses and two expresses to CENTRAIR each hour, covering the 39.3 km from its centrally located Shin Nagoya Station in a minimum of 28 minutes. It also plans direct links from the airport to the more-distant cities of Gifu, Inuyama and Toyohashi by operating one to two limited expresses run every hour from each city during the day, plus two express services every hour from Gifu and Inuyama. Fifty-four carriages including 30 carriages for limited express trains dedicated to airport access have been constructed. To ensure higher speeds on the Tokoname Line, 16 sharp curves will be realigned with larger radii, the track bed will be strengthened, and part of the line will be elevated. In addition, the new rolling stock will have an innovative air-spring tilting mechanism

to permit faster operations through curves. Nagoya is one of Japan's largest cities and is also the site of JR Central's headquarters. Greater Nagoya is served by the Tokaido Shinkansen and JR Central also operates a network of conventional lines. However, the company does not intend to develop an ARL to the new airport, meaning that its airport-bound passengers will be forced to transfer either at Kanayama Station on Meitetsu's Tokoname Line or at Shin Nagoya Station near the Nagoya main line. Passengers on the Nagoya municipal subways will also be forced to make the same changes, so Meitetsu is upgrading both transfer stations; Kanayama is Nagoya's second busiest transit hub, offering connections to various Meitetsu and JR Central lines, the municipal subway system, and buses. Since it will assume an even more important role after the new airport opens, connecting facilities to other rail lines and the bus terminal are being upgraded. Kanayama could become the main station for JR Central and subway (but not Tokaido Shinkansen) passengers transferring to the ARL. The ARL opening is scheduled for January 2005, a month before the new airport opens.

### **Sendai ARL to regional airport**

The regional city of Sendai (pop. 1 million) is 300 km north of Tokyo. It is served by Sendai Airport 15 km south of the city near the coast. This local airport ranks 12th (FY2001) in passenger numbers (420,000 international and 2.82 million domestic) and there have long been plans to improve its accessibility and relieve road congestion. Seizing on the fact that JR East's Tohoku main line passes about 6 km west of the airport, planners have proposed building a secondary line to the airport branching from the main line at Natori Station, 10.4 km south of Sendai Station.

Sendai Airport Transit Co., Ltd. (a public-private venture) is building the 6.1-km single-track, electrified line outside the

airport with two intermediate stations and other infrastructure. ¥9 billion of the ¥37.7 billion total cost is being covered by the national and local governments with the remainder financed by ¥7.5 billion in investments and ¥21.2 billion in loans. Since the company will also handle train operations, it will be classified as a category-1 railway business (providing passenger and/or freight transport using own infrastructure). The 1-km section of new line inside the airport boundary will include a tunnel and an elevated terminal station. The national government is bearing the ¥6 billion construction cost for this section from its budget for Airport Improvement Projects and will lease it to the public-private venture.

Construction began in late 2002; when the line is opened in 2006, rapid services will cover the journey from the city centre to the airport in 17 minutes. Local trains will take 23 minutes, almost halving the 40-minute road journey. There will be two or three trains every hour in each direction but the first services will only run between the city centre and airport—they might be extended to a wider area of the JR East network at a later date.

### **Extension of Kobe's Port Liner to new airport on reclaimed land**

Although Kobe already has two nearby airports (Itami and Kansai International), the government decided that the Kansai region needed a third airport to meet the anticipated increase in domestic demand for air transport. Consequently, the new Kobe Airport has been under construction since 1999 on 272-ha reclaimed land in the port zone just 8 km south of the city centre. The 2500-m runway is scheduled to begin operations in 2005, serving 3.19 million passengers annually. Access will be by both road and rail (Fig. 5). The rail link between the centrally located San'nomiya and airport will be operated by Kobe New Transit Co., Ltd., a public-private entity. This company

already operates the *Port Liner* AGT (see *JRTR* 16, pp. 4–13), and will bear an estimated ¥23 billion in non-infrastructure costs (out of a total of ¥56 billion) to extend it to the airport.

This will be Japan's first AGT ARL and the six-car train sets will carry 450 passengers from San'nomiya to the airport in 16 minutes.

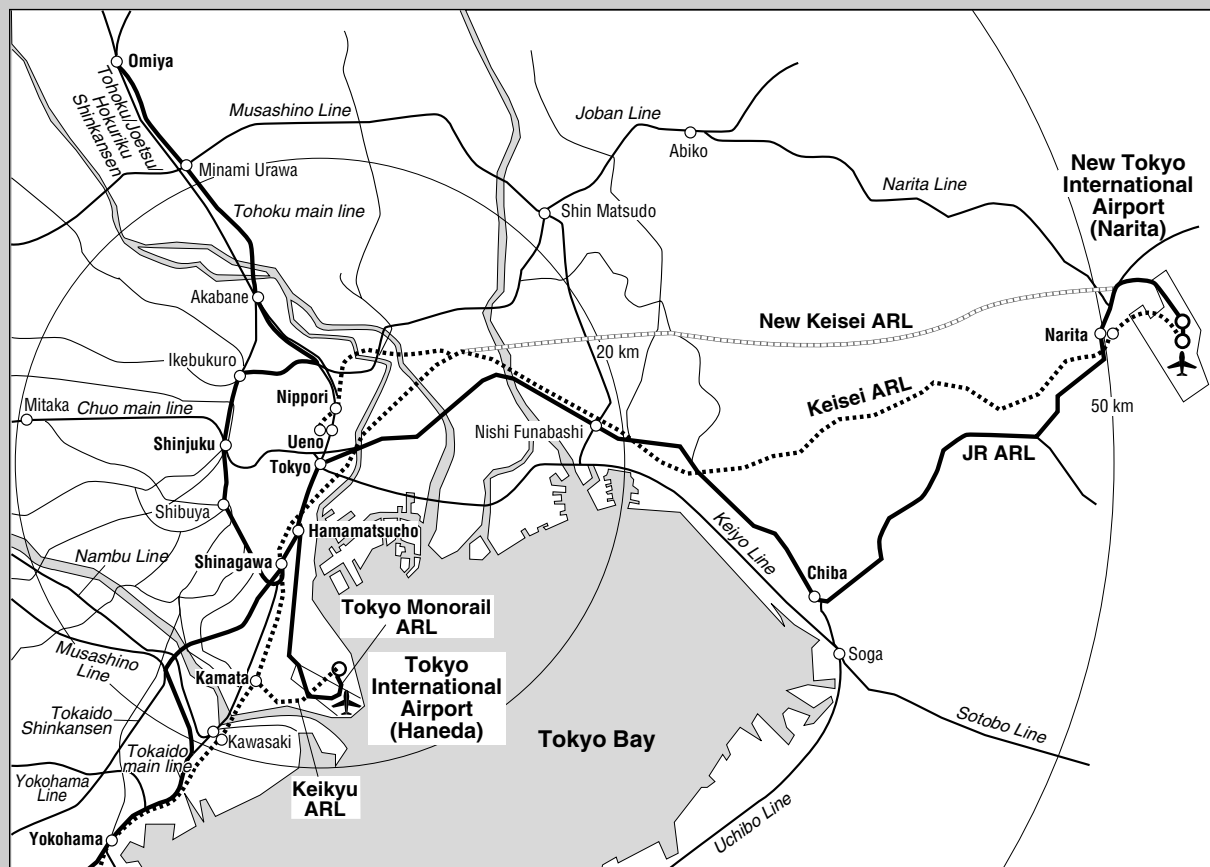
### **Tokyo plans faster route to Narita Airport**

Japan's premier international gateway is Narita located 55 km east of central Tokyo. After it opened in 1978, Narita has mainly been dedicated to international flights, while Haneda close to central Tokyo handles almost all domestic flights. In addition to being a long way from central Tokyo, the long distance between Narita and Haneda (75 minutes by bus or 2 hours by train) has long been a source of inconvenience and irritation for passengers transferring between domestic and international flights. As a consequence, more and more international passengers are bypassing Tokyo altogether. For example, some fly from Shin Chitose Airport in Hokkaido straight to Kansai International Airport near Osaka where they can easily catch an international flight.

When Narita opened, the first (and somewhat inconvenient) ARL was provided by Keisei Electric Railway. Better links began in 1991 when Keisei and JR East both offered faster services to a shared station under the terminal building. However, both routes to the airport still take 60 minutes, and travel between Narita and Haneda remains inconvenient. After a long legal battle with local opponents, Narita's second runway opened in April 2002 (albeit at a shortened temporary length of 2180 m) and anticipated increases in air traffic have led to a new plan to improve rail links with the airport.

This envisaged development will

Figure 2 Tokyo's Major Railways and Airports



almost halve the current 60-minute journey by running the new alignment straight into the city core using 10.7 km of new track to join existing sections (Fig. 2). In addition to shortening the route, the tracks will be upgraded to support operations at 130 km/h and stations and other facilities will be improved. When Keisei's *Skyliner* limited express is moved to the new route, the combination of shorter overall distance (61.0 km compared to 66.2 km) and faster speeds will cut the time between Nippori Station in central Tokyo and Airport Terminal 2 Station to 36 minutes. Nippori Station offers easy connections to JR East's extensive urban rail network. The new line will be constructed and

owned by Narita Rapid Rail Access Co., Ltd., while the trains will be operated by Keisei. Consequently, the former company will be a category-3 railway business while the latter will be category-2, and a total of five companies will be involved in the development and operations. This new ARL will also connect to the route to Haneda Airport, slightly cutting travel times between the two airports. Since additional two other companies will be involved in the Tokyo–Haneda link, the grand total of seven companies may be an extremely unwieldy business arrangement. The plan is expected to cost ¥126 billion and the national and local governments

have pledged ¥46 billion in subsidies. Plans call for trains to start running in 2010.

### Extending Tokyo Monorail and upgrading Keikyu to Haneda

About 60% of all domestic air travellers in Japan use Haneda and a second East Terminal is now under construction with opening scheduled for the latter half of 2005. The present West Terminal is accessed either by the Tokyo Monorail or by the Kuko Line operated by the Keihin Electric Express Railway (Keikyu). Construction of the new East Terminal requires a 0.7-km extension to the monorail at a cost of ¥24 billion of which Tokyo Monorail will pay ¥13 billion with

the balance coming from the national government. Adding 0.7 km to the monorail will also add to the existing travel time of 22 minutes. Feeling a sense of crisis due to the improvements to Keikyu's route (discussed later), Tokyo Monorail started rapid services departing from Haneda Airport between 22:36 and 23:50 in April 2004. These rapid trains connect Haneda Airport and Hamamatsucho in 18 minutes, 4 minutes faster than a local train.

Unlike the Tokyo Monorail, Keikyu's Kuko Station was constructed to serve both the existing and the future terminal. The Keikyu link to Yokohama was improved in October 2002 when new track was added at Keikyu Kamata Station to create a switchback configuration permitting through services and greatly improving airport access for communities in the south. Prior to this upgrade, Yokohama-bound passengers from the airport were forced to change at Keikyu Kamata Station.

Plans are also moving ahead to elevate tracks for the Keikyu main line and Kuko Line through Kamata Station, which will be 390-m long and on three levels. When this project is completed, Keikyu will be able to offer faster and more frequent through services to the airport from Tokyo and Yokohama. The total cost, including elevating another four stations, is ¥165 billion with completion scheduled for 2015.

Construction of Haneda's fourth runway will start in 2004 on reclaimed land on the south side of the airport. When it opens in 2009, there will be 410,000 annual arrivals and departures, an increase of 140% over current levels. This is expected to change the roles of Narita and Haneda, with the latter gaining some international flights. Construction of a third terminal building for international passengers is now in the planning stages and the terminal will require new facilities for existing rail links. In January 2000,

the government's Council for Transport Policy proposed development of several new routes for ARLs with completion targeted at 2015.

Expansion at major airports is a global trend, but there are limits on how far ARLs can continue to adapt. Someday soon, planners will have to develop an efficient track-based feeder system that links several terminal buildings and railway stations in different parts of a massive airport complex.

### Two airports considering ARLs

Niigata City (pop. 500,000) is a regional centre on the Sea of Japan. In FY2001, 1.04 million domestic and 220,000 international passengers used Niigata Airport. The Niigata Prefectural Government has been studying proposals to construct a railway line from the city centre to the airport since 1992. Various plans have been proposed, including extending shinkansen track from the rolling-stock yard in the suburbs, and building a conventional line from Niigata Station using a freight line for part of the distance. No decision has been reached

yet, mainly because the line would probably not be profitable.

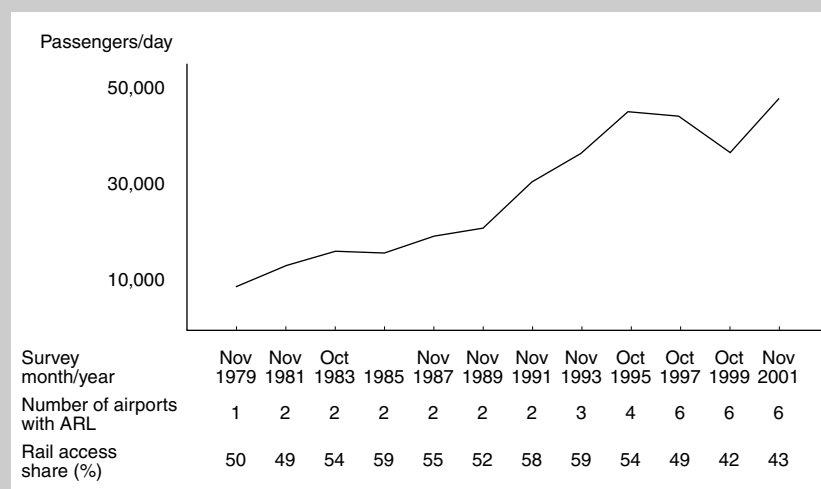
Hiroshima Airport was used by 3.05 million domestic and 300,000 international passengers in FY2001. The Hiroshima Prefectural Government has been promoting discussions on constructing a railway line to the airport. One proposal (since abandoned) involved building a MAGLEV system using ordinary electric induction motors. Discussions since 2000 have focused on constructing an 8-km branch line to the airport from nearby conventional JR West tracks.

## ARL Ridership Trends

### Domestic passenger access to airports

The Civil Aviation Bureau (under the Ministry of Land, Infrastructure and Transport) conducts a 24-hour questionnaire survey of domestic air passengers every 2 years on a weekday in October or November (Fig. 3). One question asks, 'What was your final mode of transportation to your departure

Figure 3 Domestic Air Passengers Arriving by Rail at Airports (1979–2001)



- 1) Weekday passengers on all domestic flights excluding international passengers
- 2) 70% Response rate
- 3) About 10% of all respondents did not indicate their access method.

airport?’ The answers indicate the extent of ARL usage for each airport.

On average, about 70% of passengers answer the survey with about 10% of respondents not indicating their final mode of transportation.

The annual results show that rail access has increased over the years from 8800 passengers per day in 1979 to 47,000 per day in 2001 (last available data). The increase is obviously due to the development of ARLs, starting with Haneda. For airports with a rail link, the proportion of departing domestic passengers arriving by rail has fluctuated between 59% and 42% over the years, with an average of 52%.

The 2001 survey was held on Wednesday 7 November. The total number of domestic passengers on that day was 252,000 and completed questionnaires were returned by 181,000 people (71.8% return). Of the 111,000 people arriving at one of the six airports with rail access, 47,000 (43%) used rail, 29,000 (26%) used scheduled or charter bus, and 24,000 (21%) used personal transport, such as a taxi or private car. (The remaining 11,000 (10%) did not indicate their access method.) In summary, 69% used public transport with rail access being most common, followed by bus. After apportioning the 10% who did not indicate any access, passengers arrive at 48% by rail, 29% by bus, and 23% by personal transport. Based on these ratios 53,000 domestic air passengers arrived at their departure airport by rail on the survey day. Taking into account the 71.8% response rate and assuming that this rate was the same for each airport with a rail link, we can estimate that about 74,000 domestic air passengers arrive by rail each day.

As mentioned, among the six airports with rail links in 2001, rail’s access share was almost half at 48%, with buses second at 29%. In other words, 77% of all domestic air passengers used public transportation

to get to those airports. The tendency to choose public transportation for access to airports is higher in Japan than in many other countries, probably because:

- Many Japanese airports are located relatively far from the city centre.
- Access roads cannot accommodate large traffic volumes, and airport parking spaces are limited.
- The Japanese rail network has been well developed for many years and this has encouraged people to take trains.

In FY2001, 123,000 international passengers arrived at or departed from Japanese airports each day. Adding this number to our calculations, it is obvious that far more than the above-mentioned 74,000 passengers used ARLs each day.

#### Results of access survey at Narita

In FY2002, 48.16 million international (including transit) passengers passed through Japan’s international airports. The figures of major airports are as follows:

- Narita: 28.62 million
- Kansai International: 10.44 million
- Nagoya: 4.01 million

Clearly, Narita is Japan’s most important gateway, serving almost 60% of all international air passengers. As mentioned previously, Narita is basically for international air travel while Haneda is mainly for domestic flights—61.81 million domestic passengers used Haneda in FY2002, while only 1.11 million used Narita. To avoid the inconvenience of transferring from an international flight arriving at Narita to a domestic flight leaving Haneda (and vice versa), the public is eager for Narita to handle more domestic flights.

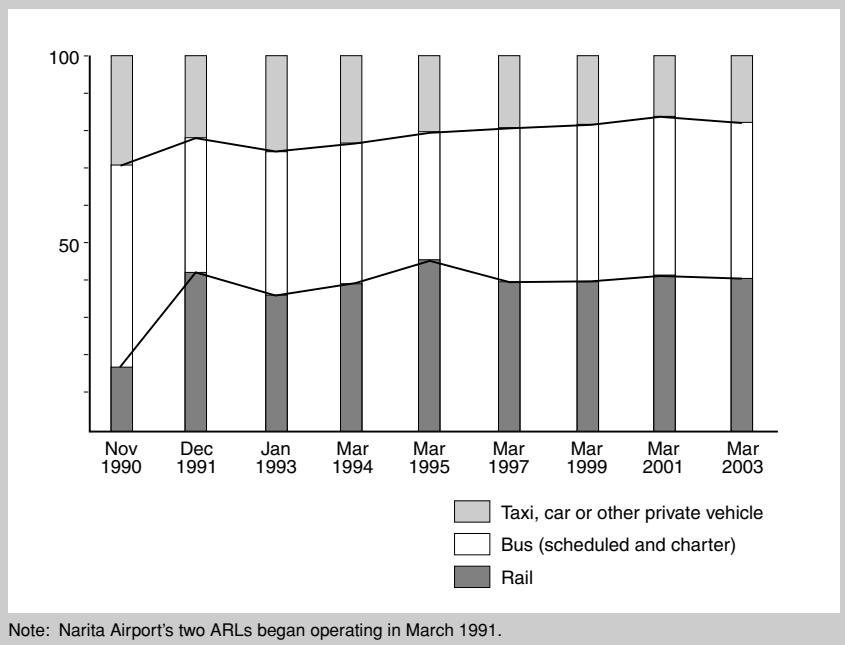
When it opened in 1978, the basic mandate of Narita Airport Authority (NAA) was to cater to international flights. NAA remained as a public body until April 2004, when it was restructured as Narita International Airport Corporation, a

government-affiliated special company. The company is entirely government funded but plans call for it to be completely privatized soon.

Since Narita opened, NAA has surveyed passenger trends about every 2 years to determine people’s access modes. The last 24-hour survey started at 00:01 on Friday 7 March 2003 and the results offer plenty of interesting information. On the survey day, 37,516 passengers flew out of Narita Airport for overseas destinations. In FY2002, 28.62 million passengers landed or departed for an average of 78,400 per day. Half this figure (39,200) would have been departures, a figure that is similar to the survey day. Of the 37,516 departing passengers on the survey day, 15,101 (40.3%) arrived by rail, 21,144 (56.4%) by road, and just 1270 (3.4%) by domestic flight. Although the majority arrived by road, many of these (40.9%) came by scheduled or chartered buses, practically the same ratio as those coming by rail. Only 14.6% used personal transport, such as a private car, taxi, etc. In other words, more than 80% of passengers departing from Narita came to the airport by public transport and about half of these came by rail with the other half coming by bus.

Of the 37,516 departing passengers, 7229 (19.3%) were non-Japanese and they favoured access by bus (54.5%) over rail (35.8%). Conversely, Japanese passengers favoured rail (41.3%) over bus (37.7%). The 54.5% ratio of non-Japanese arriving by bus can be further broken down into limousine bus (30.8%), large bus (16.1%), and other bus (7.6%). For all bus types, the percentages for non-Japanese were almost double those for Japanese nationals. We can speculate that the main factor affecting the access choice of non-Japanese passengers is lack of detailed knowledge about local conditions and available access modes. The fact that more than 90% of all non-Japanese choose public transport probably

**Figure 4 Narita Access Modes and Shares (1990–2003)**



indicates that they take the long distance (55 km) from the city centre to the airport and the high cost of a taxi ride into consideration.

As described, Narita has two ARLs operated by JR East and Keisei Electric Railway. Both routes offer through services to other parts of the metropolitan rail network. JR East through services are more convenient, but the Keisei route does provide through connections to part of the Tokyo subway system. Both carriers operate limited expresses and many rapid services to and from the airport.

The 40.3% of all departing passengers who arrived at Narita by rail can be broken down into 19.2% using the JR East line and 21.1%, used the Keisei line. A further breakdown shows that 14.9% of all departing passengers used JR East's *Narita Express (NEX)*, which offers through services with other parts of the JR East urban network, while 8.1% used Keisei's *Skyliner*. Although JR East enjoyed the advantage with regard to express services, the situation was reversed for rapid and local services (13.0% for Keisei and just 4.3% for JR East).

Looking at all 84,825 people (departing passengers, airport employees, people

meeting or seeing off travellers, and others) arriving by land-based transport at Narita that day, 37,516 (44%) were departing passengers, 30,888 (36%) were airport and airline employees, and 16,421 (20%) were classified as 'other.' In other words, somewhat less than half were departing passengers. Of the total, 30.6% came by rail and 63.2% by road with the road group broken down into 25.3% by private car (largest group among road travellers) and 24.2% by bus (smaller ratio than those arriving by rail). We can speculate that the relatively high preference for access by private car is because airport and airline employees are more likely to choose this mode. The total for rail and bus is 54.8%, showing that more than half chose public transport. Rail travellers form the largest group, the important factor surely being the great distance of the airport from the urban centre.

Thirteen years have passed since JR East and Keisei launched their rail services to the airport and Figure 4 shows how the shares of the access modes have changed. In 1990, before the links were fully established, rail had a share of only 17%. Today, the figure has more than doubled

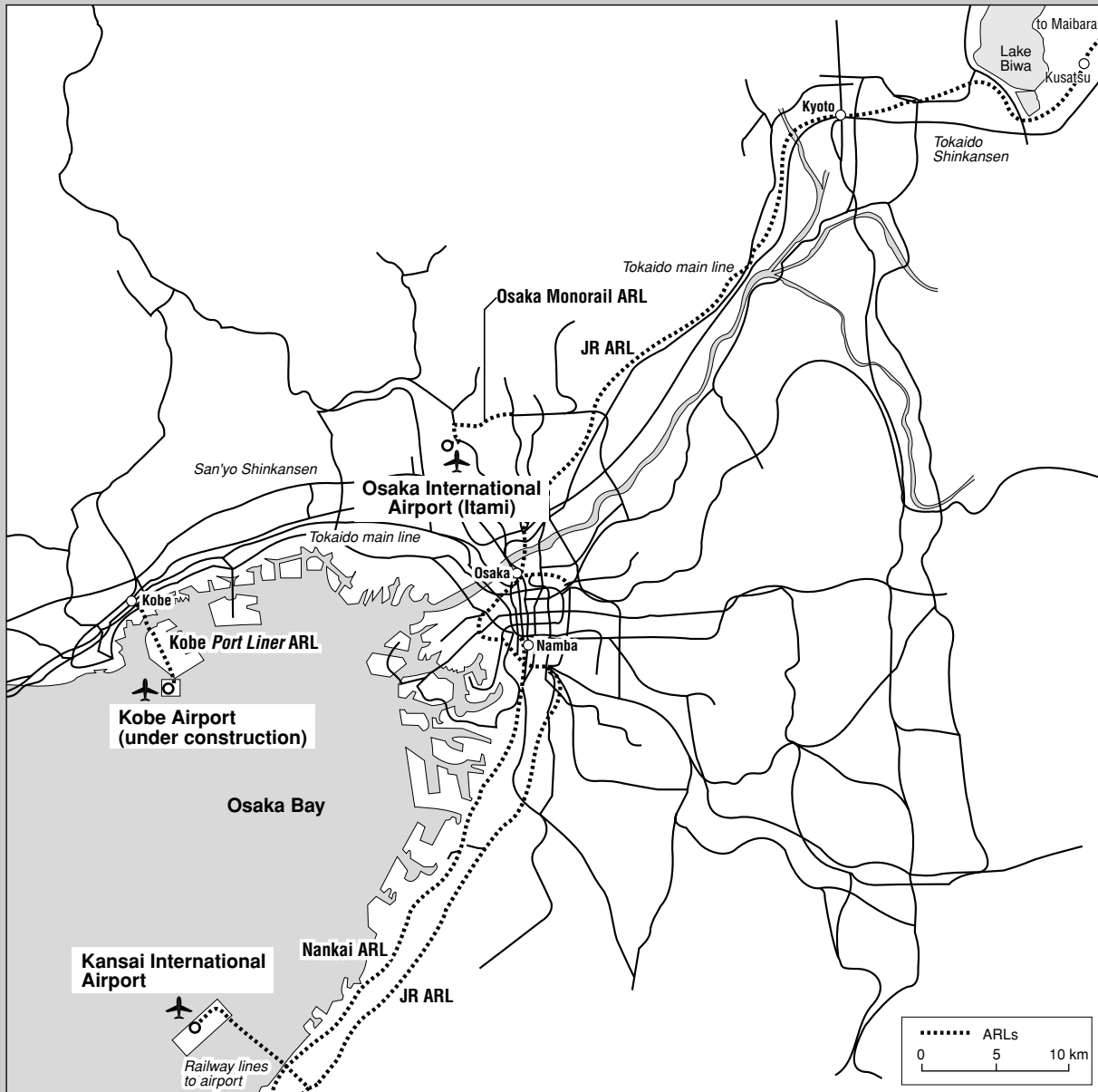
to 42%. Conversely, the bus share has plummeted in the same period from 54% to 36%. Interestingly, the preference for access by public transport (trains and buses) has risen from 70% to 80% during the same 13 years. This 10% jump is almost undoubtedly due to the better ARLs, and is important, considering the global theme among policymakers to promote use of urban public transport. Incidentally, the figures for the above-mentioned 2003 survey show that access by trains and buses still holds a steady 81% share of the total. Even so, better ARLs have not cut into the use of private cars and taxis, which remains steady with a share of about 15%. It will be interesting to see how this changes after 2010 when the faster ARL opens.

### Access share at Kansai International Airport

Kansai International Airport is 35 km south-west of central Osaka on a man-made island. It opened in September 1994, giving the Kansai region its second airport after Itami (14 km north of central Osaka). Itami only handles domestic flights, while Kansai International handles both international and domestic travellers. This is unlike Tokyo, where Haneda is almost exclusively for domestic travel and Narita is for international travel. Consequently, Kansai International users do not experience the above-described inconveniences of Tokyo's two airports. In FY2002, Kansai International was used by 16.91 million passengers including people in transit, broken down into 10.44 million international and 6.47 million domestic passengers. Itami was used by 18.06 million domestic passengers. Kansai International is Japan's second gateway after Narita. Rail and road access were both incorporated into the design from the first stages. Rail links from central Osaka are provided by JR West and Nankai Electric Railway (Fig. 5). Both run two limited expresses (take



Figure 5 Airports and Main Railways around Kansai Region



about 35 minutes) and two or three rapid services from the city centre to the airport terminal every hour.

The Nankai link starts at Namba Station, a subcentre in southern Osaka with connections to the subway network. The JR West link offers

through services on the Osaka Kanjo (loop) Line to Osaka Station and other stations in the city centre and subcentres. Twice-hourly *Haruka* (Far distance) limited expresses make the airport run in each direction on the existing network between Kyoto and the

airport via Osaka Station, taking 72 minutes to cover the full 100 km.

Unlike Narita, there have been no detailed surveys at Kansai International, but the available data for FY2001 shows that rail had a 46.9% share of the access mode with 51.6% by road, and 1.5% by boat.

Data for private cars is unclear, but 40.0% of the 51.6% share for road access used scheduled and chartered buses. Thus, a large percentage of people use public transport.

When the airport first opened, Nankai enjoyed the lion's share of rail access, but the situation is reversed today with more passengers choosing JR West's limited expresses and rapid services. This is probably because JR West's trains not only link the airport with the city centre but also offer through services to other more distant stations. (There are even a few early morning and late evening through services running as far as Maibara, 70 km north-east of Kyoto.)

### From ARL to Air-High-speed Rail Link

Ordinary rail links to major airports in Japan have already been developed or are now under construction and the next challenge is to develop new links using high-speed railways to form the spokes for airport hubs.

The biggest advantage offered by planes is speed. Flying at 1000 km/h in a plane is more than three times faster than a high-speed train operating at 300 km/h, but the time-saving offered by this speed advantage depends on the distance between origin and destination. Furthermore, rail terminals are generally located in the city centre while airports are at the distant periphery, meaning that airports require longer access and egress times. Plane boarding and security checks, etc., add at least an extra 30 minutes, while trains can be boarded in a minute or two. Examples of how a plane's speed advantage is dissipated can be seen by comparing journey times by air and train between Tokyo (central Marunouchi district) and Osaka (central Umeda district), a distance of about 500 km that is similar to the distance between Paris and London.

Travelling between Tokyo Station and



JR West's Haruka limited express to Kansai International Airport

(Author)



Nankai's ARL limited express to Kansai International Airport

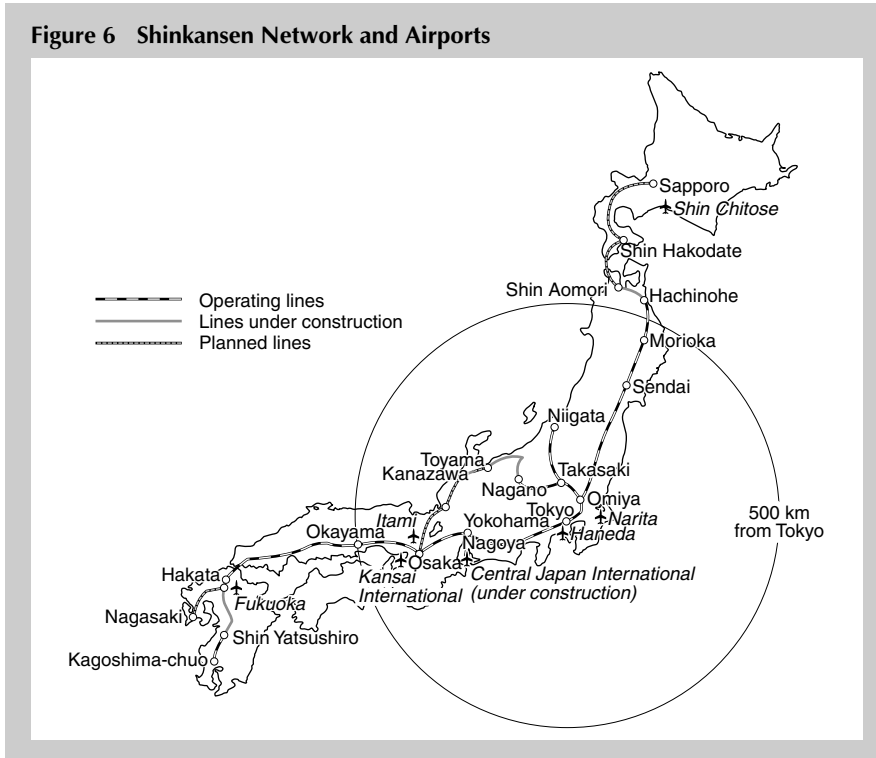
(Author)

Shin Osaka on a Nozomi shinkansen (270 km/h) takes 2 hours and 36 minutes, including three intermediate station stops. Adding 10 minutes before boarding at Tokyo Station and 10 minutes for the transfer at Shin Osaka to the Tokaido main line and onward journey to Osaka Station in the Umeda district brings the total journey time to 3 hours. By air, the time from Haneda (Tokyo) to Itami (Osaka) is just 60 minutes but the trip from Marunouchi in central Tokyo to Haneda

(including a transfer to the Tokyo Monorail) adds 40 minutes, plus 20 minutes for boarding procedures, and 30 minutes for the bus trip from Itami to Umeda, totalling 2 hours and 30 minutes at a minimum. If the roads or airport are congested, the trip more probably takes closer to 3 hours, or nearly the same as by train.

Actually, many short-haul flights up to 500 km from Tokyo have disappeared from flight timetables as more and faster shinkansen services have radiated from

Figure 6 Shinkansen Network and Airports



the capital. The Tokyo–Osaka sector is a special case because this corridor is the most heavily travelled in Japan and there are many choices of mode including plane, shinkansen, bus and car; the shinkansen has an 80% share while the plane has only 20%. Very few people drive. In FY2002, the Tokyo–Osaka route saw 7.48 million air passengers (20,000 per day). However, recent deregulation has dramatically increased competition between air and rail carriers. Since journey times are practically the same, airlines are seizing the initiative and boosting their share by increasing the number of flights and cutting fares.

Based on environmental and energy considerations as well as Japan’s greying population, the shinkansen seems the ideal mode for intercity travel up to distances of about 500 km. However, air-centric transportation policies in Japan today do not appear to share this opinion. We need to develop a consensus that the

shinkansen is superior to air for journeys of up to 500 km, not only because of similar journey time but also because of socioeconomic factors. If this consensus can be developed, policies encouraging air–high-speed rail links (AHSRLs) using shinkansen might be feasible (Fig. 6).

In FY2002, Haneda handled 59.46 million (61.5%) of the national total of 96.66 million domestic air passengers. Of these, 7.48 million (12.6%) passengers flew to Itami or Kansai International. If some of this traffic could be diverted to the shinkansen, the busy airports could open up more urgently needed slots to other

destinations. Such a change would require improved access and egress for people travelling between Haneda or Narita and regional centres within 500 km of Tokyo.

In addition, a better route is needed for travel between Haneda and Narita. The best approach would be to develop the ARL model into an AHSRL. In Europe, the French TGV stops at Charles de Gaulle Airport (see *JRTR* 19, pp. 28–29, and p. 30) and the German ICE serves Frankfurt Airport (see *JRTR* 19, pp 31–35). Japan should base its new approach on these models to develop a hub and spoke configuration that determines air routes. Medium-distance ‘spoke routes’ of around 500 km should be served by shinkansen, not planes. For example, based on the French model where a TGV serves Charles de Gaulle Airport and connects with other TGV lines in the Paris area, a new shinkansen line would link Narita and Haneda, and connect to the Tokaido and Tohoku shinkansen via a route that bypasses central Tokyo. Such a line would greatly reduce the present problems of transferring between the airports, while making travel between the airports and stations on the national shinkansen network much easier for domestic and international air travellers.

This solution would present many difficult problems to solve but I am convinced that it deserves serious consideration. ■

**Further Reading**

Mr Hirota also wrote an article in *JRTR* 19 (pp. 8–19) on the status of ARLs in Japan in 1999.



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