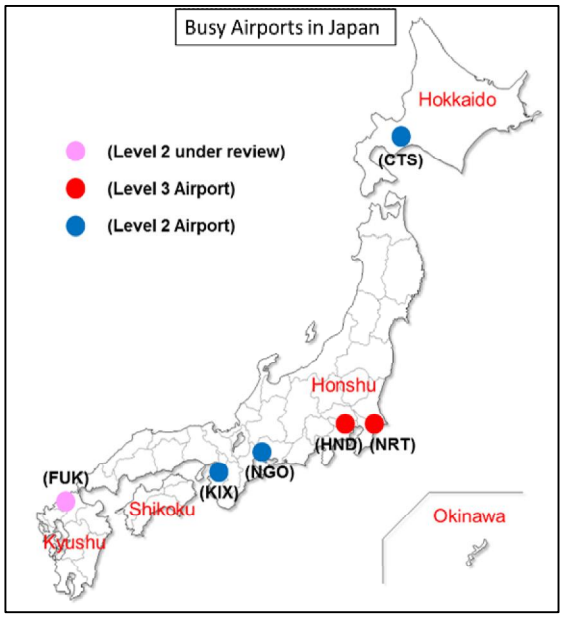
Fukuoka Airport (FUK)

Capacity Analysis 2015



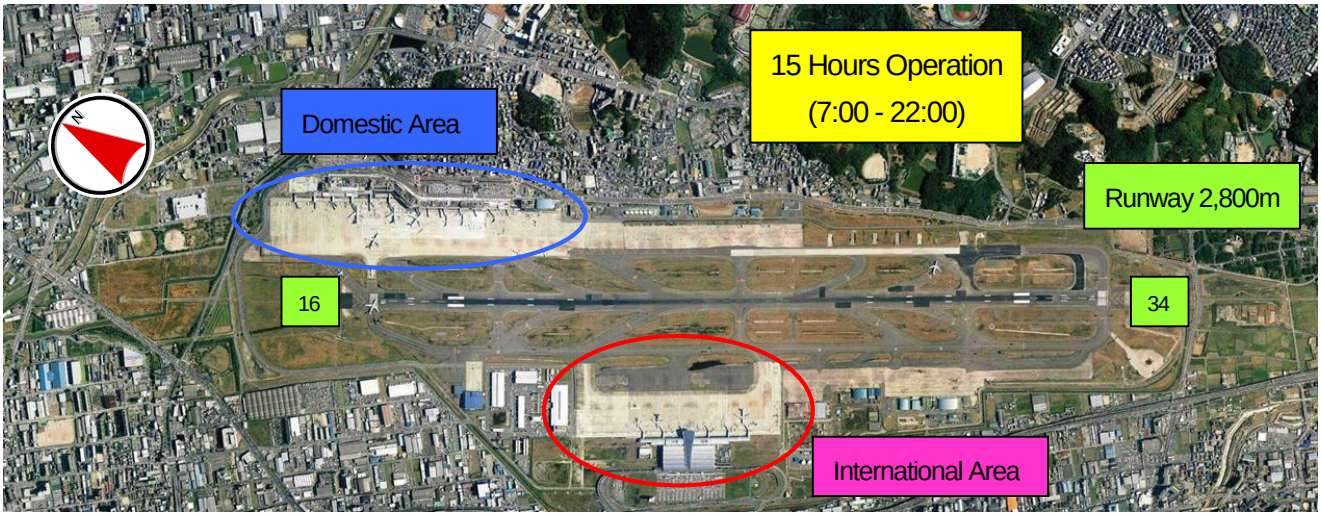
1. Introduction

1.1 Airport Characteristic

Fukuoka Airport (IATA: FUK, ICAO: RJFF) is located in Kyushu Island (the southernmost of the four main islands of Japan) and registered as Level 2 airport in 1992 by IATA. The airport accommodating the international and domestic flights is very conveniently located 3.0 km east of Hakata Station in Fukuoka (population: about 5 million). It is connected to the rest of the city by Fukuoka City Subway and road, and a subway from the airport to the business district takes less than 10 minutes. Since the airport is so close to the downtown Fukuoka and naturally surrounded by residential areas, the operational hour is limited to 15 hours in order to abate the environmental problems. The airport closes at 22:00 and opens at 7:00 because of the night curfew.

1.2 Airport Infrastructure

There is one runway (16/34) of 2,800m, and the airport is surrounded by residential areas leaving little space for expansion. As it is now approaching to the full capacity of single runway airport, the feasibility study of airport expansion was conducted several years ago. As a result, it was found to be feasible to construct a second runway (2,500m) on the west side of the current one (close parallel runways).



1.3 Air Navigation Services

In the past, 34 approach procedure (circling approach) flying over the residential areas from south was often practiced causing noise problems for local communities. However, after the installation of 34 ILS, 16 approach

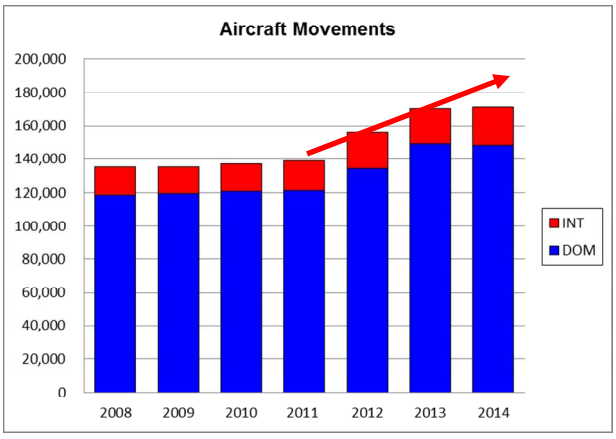
procedure flying over the sea from north became available. Now, the preferential runway use of 16 is practiced for noise abatement procedure. The ILS CAT- I for both 16/34 approach is now available.

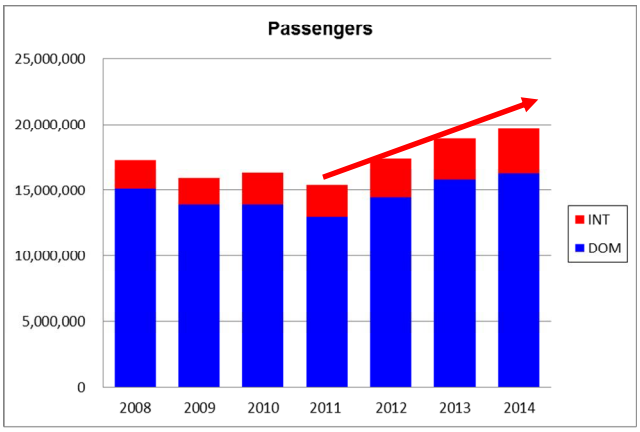
2. Air Traffic Analysis

2.1 Aircraft Movements and Passengers

The statistical data and graphs for aircraft movements and passengers for civil aviation from 2008 to 2014 are shown below. Fukuoka Airport is the fourth busiest passenger airport in Japan. In 2014, it was used by about 19.7 million people and there were 171,642 takeoffs and landings. The aircraft movement of 171,642 is the third busiest following Haneda and Narita Airports in Japan. While the past record of aircraft movements and passengers shows fairly stable trend, the record from 2012 to 2014 dramatically increased and this trend will continue due to the advent of many LCCs.

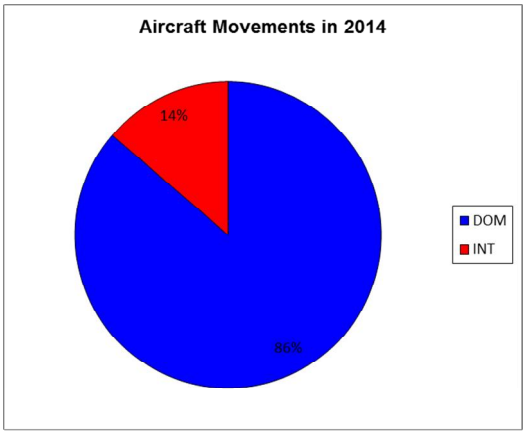
		2008	2009	2010	2011	2012	2013	2014
Aircraft Movements	DOM	118,502	119,696	120,876	121,264	134,238	148,982	148,228
	INT	16,886	15,664	16,474	17,842	21,730	21,658	23,414
	TTL	135,388	135,360	137,350	139,106	155,968	170,640	171,642
Passengers	DOM	15,149,418	13,910,342	13,937,778	12,942,742	14,438,613	15,833,928	16,236,618
	INT	2,141,801	1,991,262	2,406,774	2,451,212	2,977,954	3,117,724	3,467,151
	TTL	17,291,219	15,901,604	16,344,552	15,393,954	17,416,567	18,951,652	19,703,769

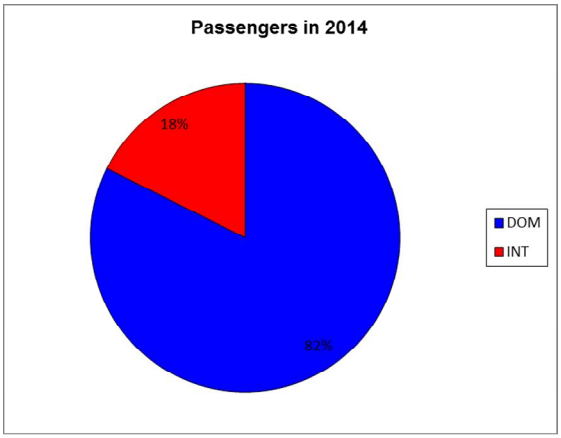




2.2 International Ratio

The percentage of international flights in aircraft movements and passengers in 2014 is shown below. As shown, the percentage share of domestic and international traffic is 86% and 14% in aircraft movements and 82% and 18% in Passengers in 2014. The share of international flights is currently rather low but it is expected to grow in the future because of open sky policy introduced by Japan Civil Aviation Bureau (JCAB).





2.3 Domestic Flight Routes

Fukuoka Airport is designated as major trunk airport following Tokyo metropolitan airports, and it has 26 domestic destinations with about 16.2 million passengers. Especially, the trunk line for Fukuoka - Haneda is the second busiest route following New Chitose - Haneda. There are four flights per hour by four airlines at peak hour. Another trunk line for Fukuoka - Osaka and Fukuoka - Nagoya also maintains many flights despite the fact that the competition with Shinkansen (bullet train) railway and highway bus is getting harder and harder.

2.4 International Flight Routes

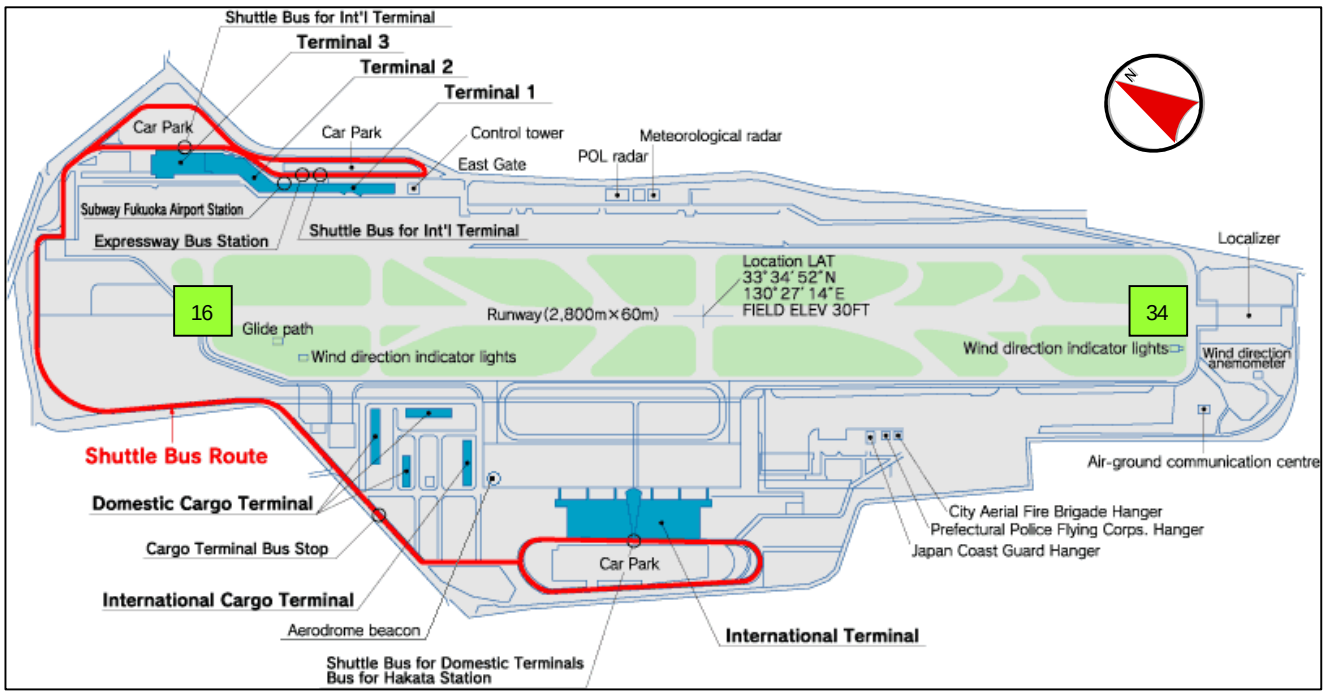
Fukuoka Airport has 20 international destinations with about 3.5 million passengers. Since Fukuoka is very close to Korea, Taiwan, Hong Kong and China, most international destinations are those countries. There is one international flight for Guam, one international flight for Honolulu and one international flight for Amsterdam as a long haul flight.

3. Passenger and Cargo Terminals

There are 4 passenger terminal buildings at the airport. Terminal 1, 2 and 3 are for domestic located on the east side of airport and one international terminal located on the opposite side of the airport. Since the domestic and international terminals are located on the opposite side, there is a free shuttle bus running between two terminals in order to provide better connection service for transit passengers.

3.1 Domestic Passenger Terminal

Domestic terminal 1, 2 and 3 are built lined up in a straight line on the east side of the airport. Terminal 1 is for small to medium class aircraft for local or island airports, terminal 2 and 3 are for medium to large class aircraft for trunk line airports. Domestic passengers have to move to the specific terminal building depending on their destinations.



(1) Domestic Terminal 1 (T1)

Domestic terminal 1 is the oldest building at Fukuoka Airport which was inaugurated in 1969. It has three stories and one underground with the total area of 19,000m^2. The terminal is being used for small to medium aircraft mainly for local airports or island airports. There are 4 boarding bridges and airline lounge.

(2) Domestic Terminal 2 (T2)

Domestic terminal 2 is the second old building which was opened in 1974. It has five stories and one underground with the total area of 60,000m^2. This terminal is mainly used for trunk line routes with 5 boarding bridges. There is a subway station under this building connecting the down town.

(3) Domestic Terminal 3 (T3)

Domestic terminal 3 is the third old building which was opened in 1981. This terminal used to be utilized as international terminal before the new international terminal building was constructed on the opposite side of the runway. It has three stories with the total area of 30,000m^2. There are 4 boarding bridges and now used for trunk line routes.


Terminal 1 (T1)


Terminal 2 (T2)


Terminal 3 (T3)

3.2 International Passenger Terminal

The international terminal is located west side of the airport, or opposite side of domestic terminals. The international terminal was inaugurated in 1999. It has four stories with the total area of 69,000 m^2 and 6 boarding bridges.


International Terminal

3.3 Cargo Terminal

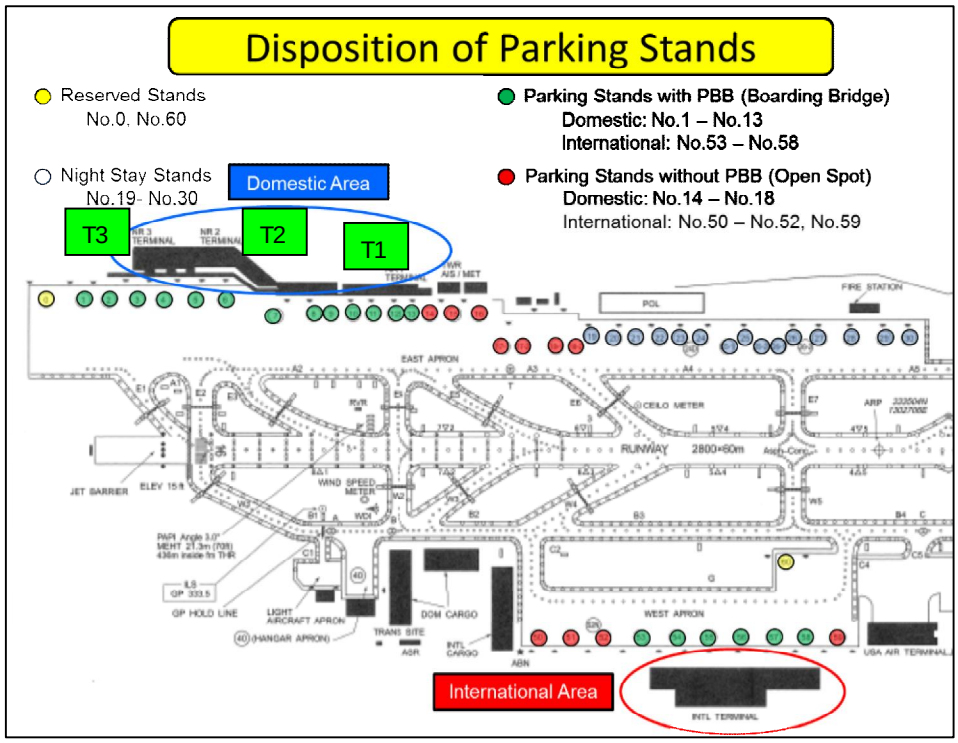
There are two domestic cargo terminals and one international cargo terminal that are located on the west side of runway.

4. Aircraft Parking Stands

There are 21 parking stands for domestic flights and 12 night stay parking stands that are located on the east side of the runway. There are 11 parking stands for international flights which are located on the west side of the runway.

Category	Domestic			Night Stay	International		
Type of Stand	PBB	Open	Reserved	Open	PBB	Open	Reserved
Number	13	7	1	12	6	4	1
Total	21			12	11		

The disposition of each parking stand is shown below. As shown, the parking apron in front of domestic terminal 1 and 2 is not deep enough to secure the passage of taxing aircraft. In addition, the number of parking stands for domestic flight is not sufficient enough to accommodate the new flights. Although there are many night stay stands next to domestic apron, they can't be used as loading stands due to the weakness of foundation.



5. Current Airport Constraints

5.1 Hourly Movements

There is neither restriction for daily movements nor hourly movements set at Fukuoka airport.

5.2 Noise Abatement Measures

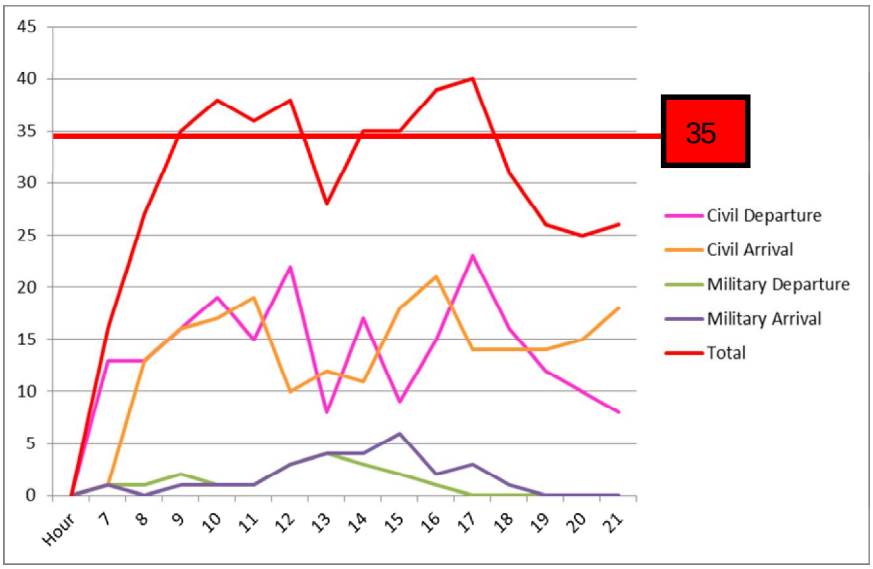
There is a night curfew at the airport since the airport is surrounded by residential areas. The operations from 22:00 to 06:59 are not allowed. There also exists the preferential runway treatment to protect the environment around the airport that the runway 16 will be assigned when tail wind velocity is 10 knots or less.

6. Capacity Analysis for summer 2012

6.1 Runway Capacity

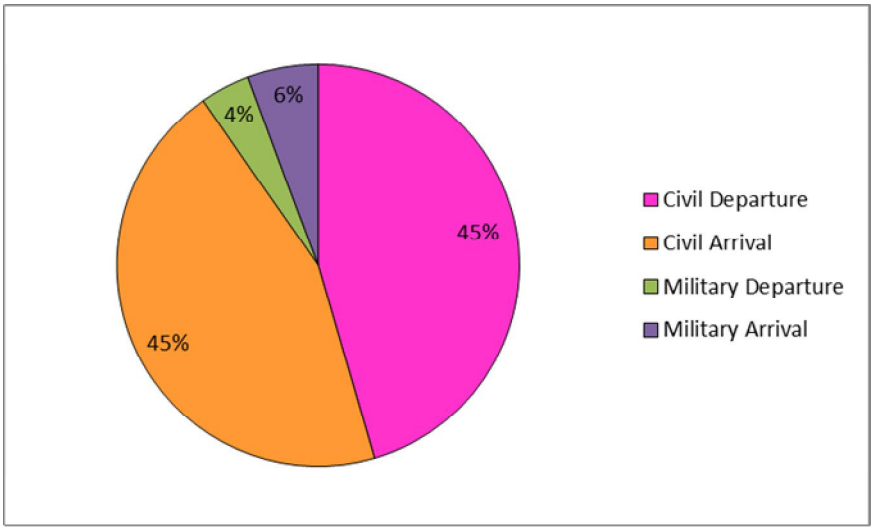
The peak week in summer 2012 was studied and found to be fifth week of August. Then, the peak day was found to accommodate 475 flights. The hourly operations for departure and arrival of civil and military operations are shown below on that day. The peak operation of 40 is recorded at 17:00. The peak hour is at 10:00 and at 12:00 in the morning and from 16:00 to 17:00 in the afternoon.

	2012/August Peak Day															
	Hour	***7***	***8***	***9***	***10***	***11***	***12***	***13***	***14***	***15***	***16***	***17***	***18***	***19***	***20***	***21***	***Total***
Civil	Departure	13	13	16	19	15	22	8	17	9	15	23	16	12	10	8	216
	Arrival	1	13	16	17	19	10	12	11	18	21	14	14	14	15	18	213
Military	Departure	1	1	2	1	1	3	4	3	2	1	0	0	0	0	0	19
	Arrival	1	0	1	1	1	3	4	4	6	2	3	1	0	0	0	27
	Total	16	27	35	38	36	38	28	35	35	39	40	31	26	25	26	475



6.2 Comparison of Civil and Military Operations

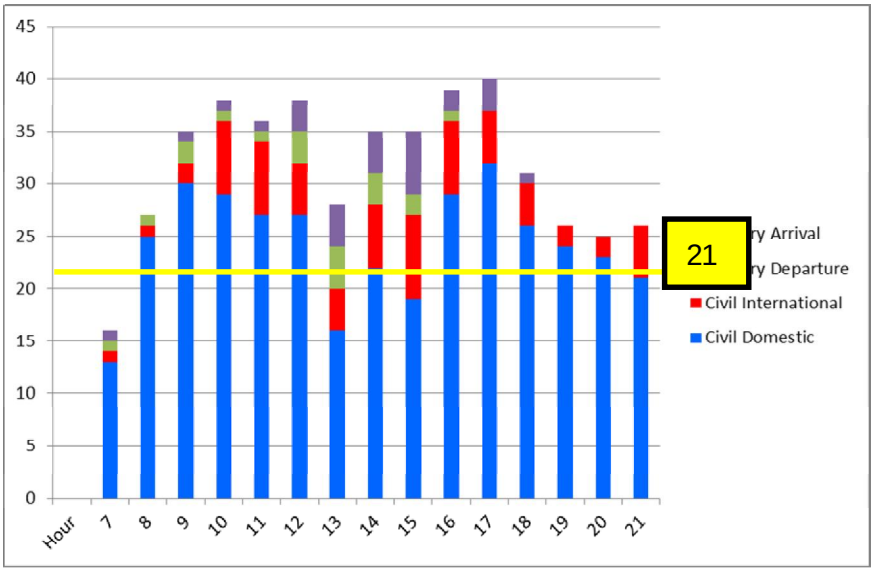
There are military bases next to international terminal areas; they are Japan Air Self-Defense Force (JASDF) and US Air Forces (USAF). Their operations are mainly to transport goods and personnel and there are no jet fighters stationed at this airport. Their operations occupy about 10% of whole operations at the airport.



6.3 Terminal and Spot Capacity

The hourly operations for civil domestic, civil international and military operations are shown below on the peak day.

	2012/August Peak Day																
	Hour	***7***	***8***	***9***	***10***	***11***	***12***	***13***	***14***	***15***	***16***	***17***	***18***	***19***	***20***	***21***	***Total***
Civil	Domestic	13	25	30	29	27	27	16	22	19	29	32	26	24	23	21	363
	International	1	1	2	7	7	5	4	6	8	7	5	4	2	2	5	66
Military	Departure	1	1	2	1	1	3	4	3	2	1	0	0	0	0	0	19
	Arrival	1	0	1	1	1	3	4	4	6	2	3	1	0	0	0	27
	Total	16	27	35	38	36	38	28	35	35	39	40	31	26	25	26	475



(1) Domestic Flights

The domestic operations from 08:00 to 12:00, at 14:00 and from 16:00 to 21:00 are over the parking stand capacity since there are only 21 domestic parking stands. There is also a shortage of boarding bridges for domestic terminal.

(2) International Flights

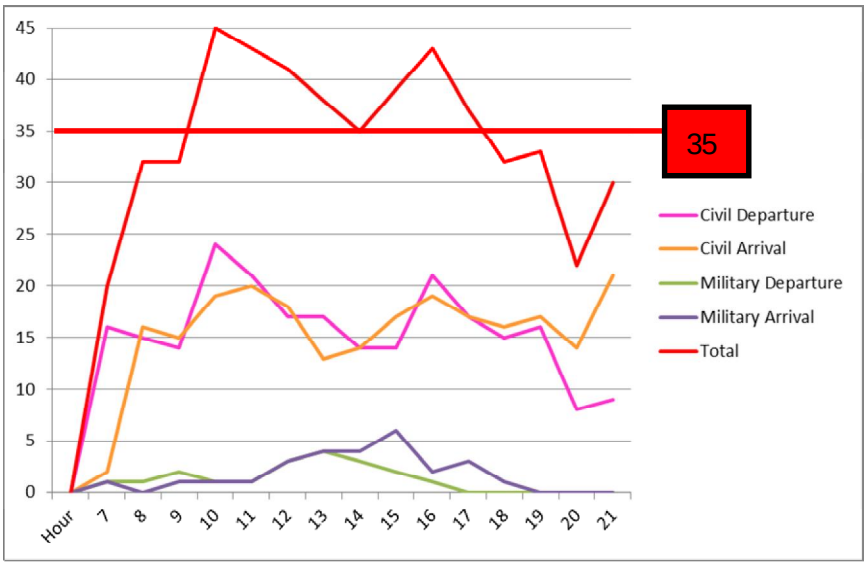
The maximum international operations are 8 at 15:00 which is far below the capacity of international parking stands of 11. There is a shortage of boarding bridges for international terminal.

7. Capacity Analysis for summer 2013

7.1 Runway Capacity

The peak week in summer 2013 was studied and found to be fifth week of August. Then, the peak day was found to accommodate 522 flights which are 10% more than the previous summer season. The hourly operations for departure and arrival of civil and military operations are shown below on that day. The peak operation of 45 is recorded at 10:00. The peak hour is from 10:00 to 13:00 in the morning and from 15:00 to 16:00 in the afternoon.

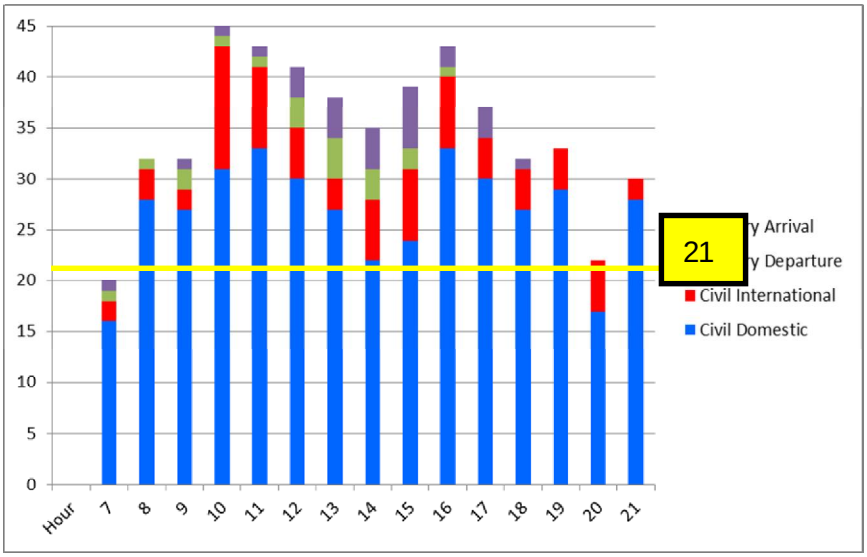
	2013/August Peak Day																
	Hour	***7***	***8***	***9***	***10***	***11***	***12***	***13***	***14***	***15***	***16***	***17***	***18***	***19***	***20***	***21***	***Total***
Civil	Departure	16	15	14	24	21	17	17	14	14	21	17	15	16	8	9	238
	Arrival	2	16	15	19	20	18	13	14	17	19	17	16	17	14	21	238
Military	Departure	1	1	2	1	1	3	4	3	2	1	0	0	0	0	0	19
	Arrival	1	0	1	1	1	3	4	4	6	2	3	1	0	0	0	27
	Total	20	32	32	45	43	41	38	35	39	43	37	32	33	22	30	522



7.2 Terminal and Spot Capacity

The hourly operations for civil domestic, civil international and military operations are shown below on the peak day.

	2013/August Peak Day																
	Hour	***7***	***8***	***9***	***10***	***11***	***12***	***13***	***14***	***15***	***16***	***17***	***18***	***19***	***20***	***21***	***Total***
Civil	Domestic	16	28	27	31	33	30	27	22	24	33	30	27	29	17	28	402
	International	2	3	2	12	8	5	3	6	7	7	4	4	4	5	2	74
Military	Departure	1	1	2	1	1	3	4	3	2	1	0	0	0	0	0	19
	Arrival	1	0	1	1	1	3	4	4	6	2	3	1	0	0	0	27
	Total	20	32	32	45	43	41	38	35	39	43	37	32	33	22	30	522



(1) Domestic Flights

The domestic operations from 08:00 to 19:00 and at 21:00 are over the parking stand capacity since there are only 21 domestic parking stands. This means that the parking demands exceed the maximum capacity of parking stands continuously in the morning and in the afternoon.

(2) International Flights

The maximum international operations are 12 at 10:00 exceeding the maximum capacity of parking stands.

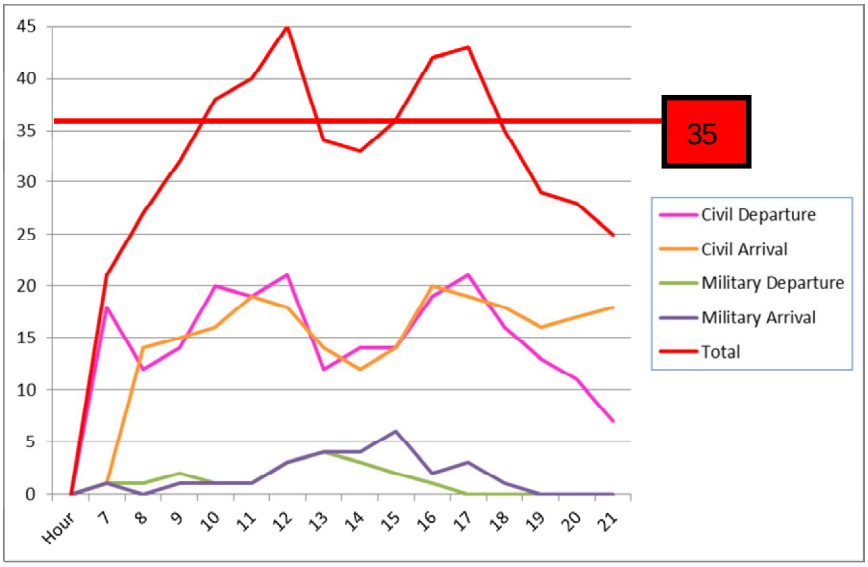
However, the rest of international operations are below the capacity of international parking stands.

8. Capacity Analysis for summer 2014

8.1 Runway Capacity

The peak week in summer 2014 was studied and found to be fifth week of August. Then, the peak day was found to accommodate 508 flights which are little less than the previous summer season. The hourly operations for departure and arrival of civil and military operations are shown below on that day. The peak operation of 45 is recorded at 12:00. The peak hour is from 10:00 to 12:00 in the morning and from 15:00 to 18:00 in the afternoon.

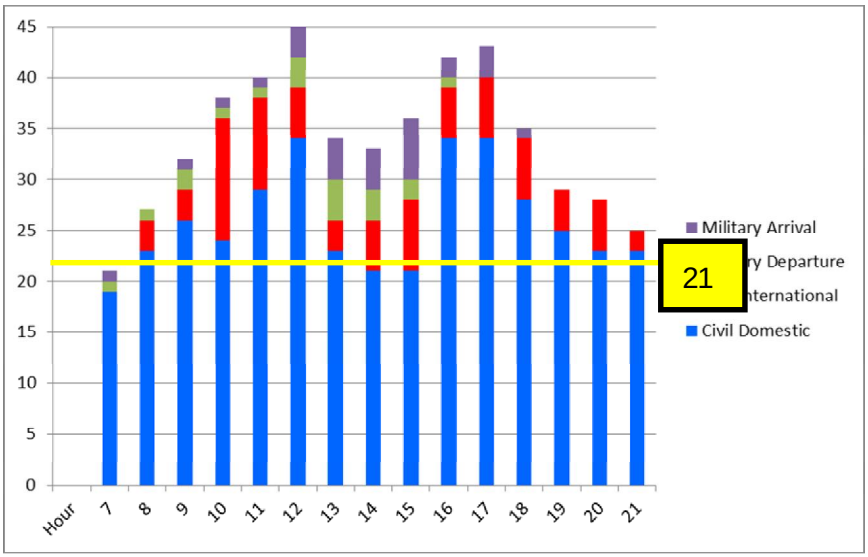
	2014/August Peak Day																
	Hour	***7***	***8***	***9***	***10***	***11***	***12***	***13***	***14***	***15***	***16***	***17***	***18***	***19***	***20***	***21***	***Total***
Civil	Departure	18	12	14	20	19	21	12	14	14	19	21	16	13	11	7	231
	Arrival	1	14	15	16	19	18	14	12	14	20	19	18	16	17	18	231
Military	Departure	1	1	2	1	1	3	4	3	2	1	0	0	0	0	0	19
	Arrival	1	0	1	1	1	3	4	4	6	2	3	1	0	0	0	27
	Total	21	27	32	38	40	45	34	33	36	42	43	35	29	28	25	508



8.2 Terminal and Spot Capacity

The hourly operations for civil domestic, civil international and military operations are shown below on the peak day.

	2014/August Peak Day																
	Hour	***7***	***8***	***9***	***10***	***11***	***12***	***13***	***14***	***15***	***16***	***17***	***18***	***19***	***20***	***21***	***Total***
Civil	Domestic	19	23	26	24	29	34	23	21	21	34	34	28	25	23	23	387
	International	0	3	3	12	9	5	3	5	7	5	6	6	4	5	2	75
Military	Departure	1	1	2	1	1	3	4	3	2	1	0	0	0	0	0	19
	Arrival	1	0	1	1	1	3	4	4	6	2	3	1	0	0	0	27
	Total	21	27	32	38	40	45	34	33	36	42	43	35	29	28	25	508



(1) Domestic Flights

The domestic operations from 08:00 to 21:00 are constantly over the parking stand capacity since there are only 21 domestic parking stands. This means that the parking demands exceed the maximum capacity of parking stands continuously in the morning and in the afternoon.

(2) International Flights

The maximum international operations are 12 at 10:00 exceeding the maximum capacity of stands. However, the rest of international operations are below the capacity of international parking stands.

9. Environmental Issues

9.1 Countermeasures for noise problem

There exist severe environmental issues, especially noise problem, at this airport since the airport is located so close to the center of Fukuoka City. The Japan Civil Aviation Bureau (JCAB) takes following countermeasures based on the noise forecast level. The Lden (Day Evening Night Sound Level) is a newly adopted average sound level where the noise is measured over a 24 hour period, with a penalty of 5 dB added for the evening hours of 19:00 to 22:00, and a penalty of 10 dB added for the nighttime hours of 22:00 to 07:00.

(1) Special Area (larger than 57dB Lden)

The public facilities like school or hospitals in this Special Area will be renovated to noise proof facilities.

(2) Class 1 Area (larger than 62 dB Lden)

The residential houses located in Class 1 Area will be renovated to noise proof houses with government subsidy.

(3) Class 2 Area (larger than 73 dB Lden)

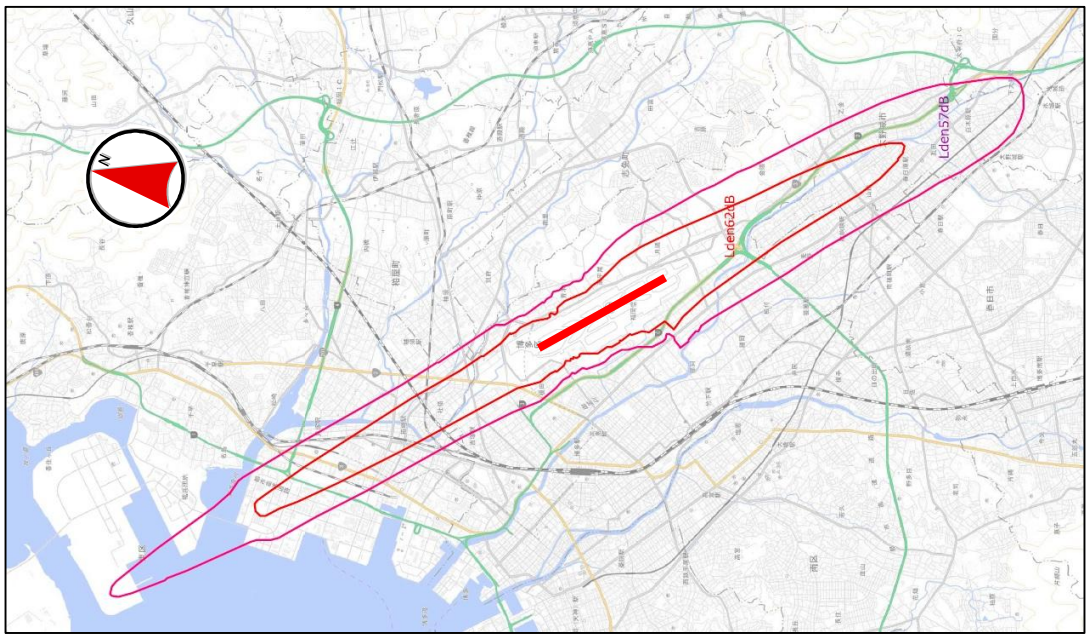
The residential houses located in Class 2 Area will be relocated to other areas with government compensation.

(4) Class 3 Area (larger than 76 dB Lden)

No residential houses will be built in Class 3 Area. This area will be reserved for green belt buffer zone.

Noise forecast contour is shown below focusing on Lden 57 dB and Lden 62 dB. As shown, both Lden 57 dB and Lden 62 dB areas spread very widely almost reaching to the sea shore. JCAB is now in the environmental assessment phase for a new second runway, and coordinating with local communities for approval of second

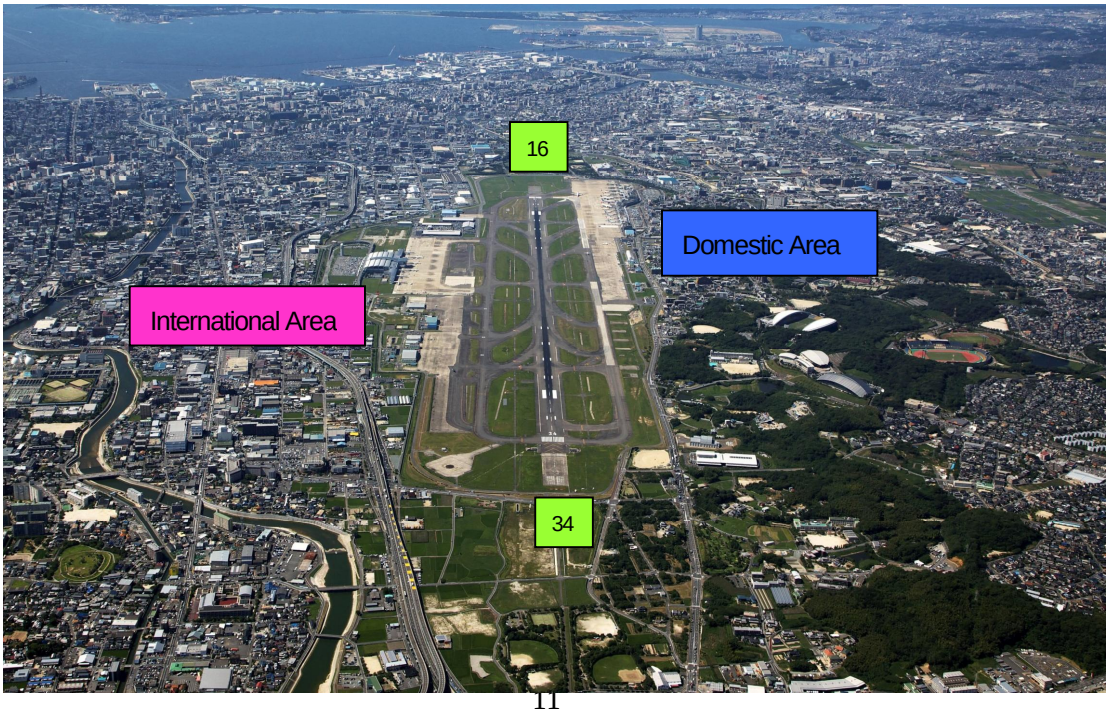
runway. In this process, there is a strong demand from local communities to limit the number of operations at night.



9.2 Violation of Night Curfew

In addition, there is a night curfew at this airport to protect the local environment where no aircraft is allowed to operate from 22:00 to 06:59. However this night curfew is not observed very well by airlines due to accumulated delay of aircraft operations. It was reported that 850 flights were conducted after 22:00 in 2013 and 816 flights were after 22:00 in 2014. There is a strong complaint from local communities over the prolonged aircraft operations.

It is desired that the reduced aircraft operations at night and the strict night curfew should be observed to protect the local communities from noise pollution.



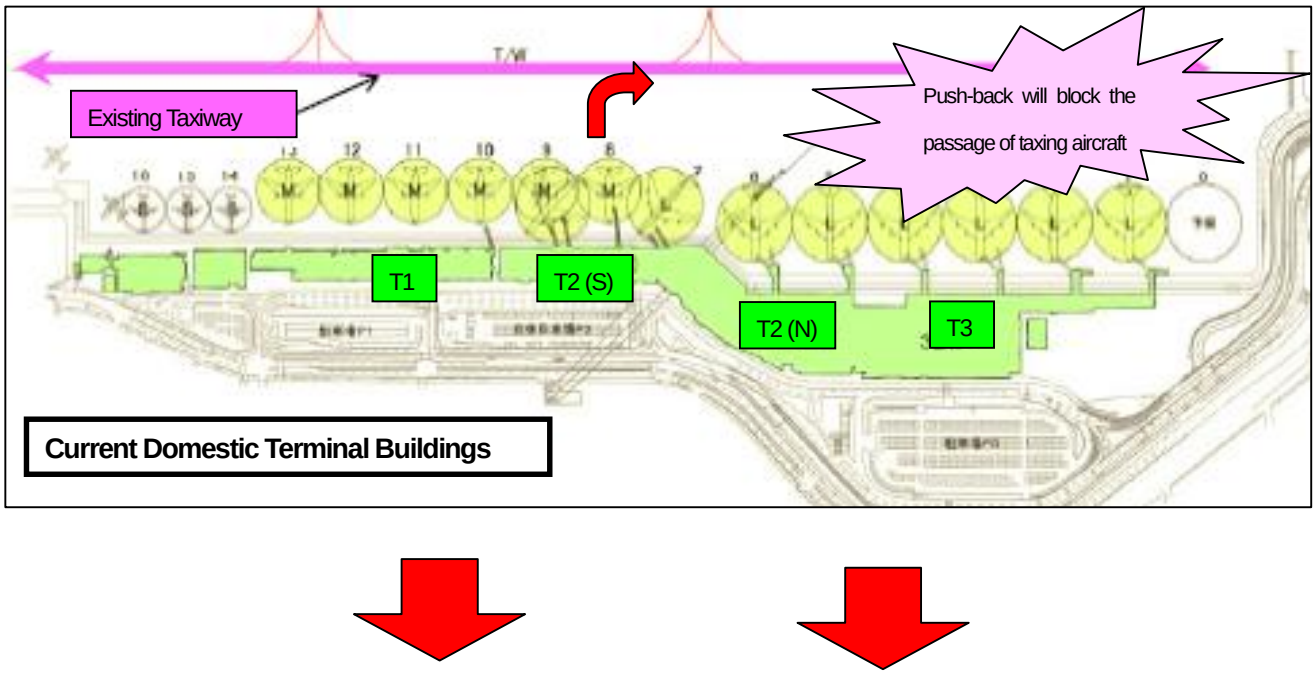
10. Future Airport Expansion Plan

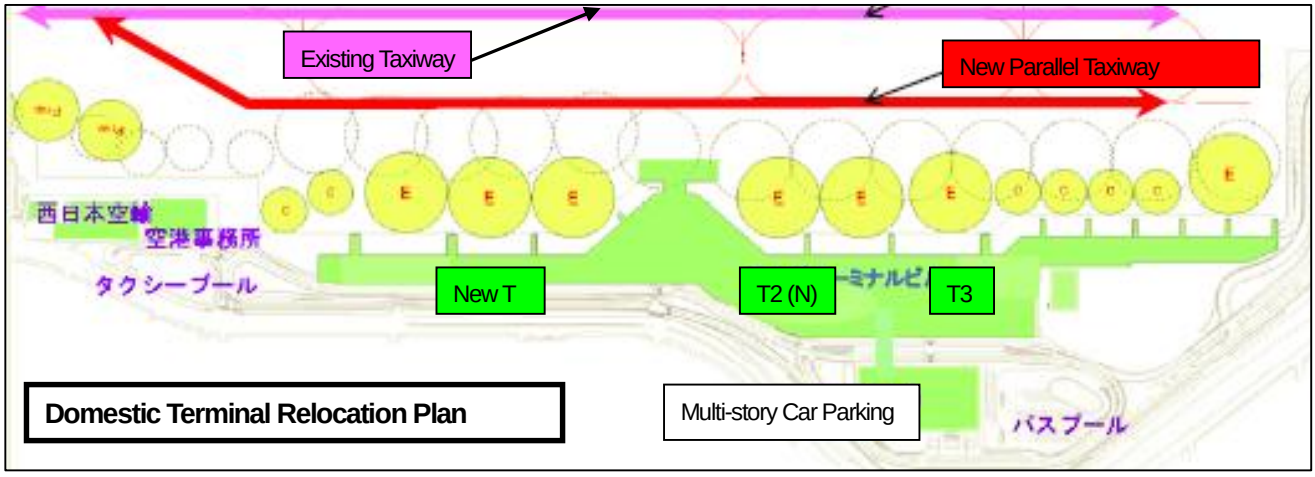
There are currently two airport expansion plans undergoing in order to increase the capacity of Fukuoka airport. One is the relocation plan of domestic terminal which is already under construction. The other is the construction of second runway which is still in the planning phase.

10.1 Relocation Plan of Domestic Terminal

There is a fact that the parking apron in front of domestic T1 and T2(S) are not deep enough to secure the passage of taxing aircraft. Whenever the aircraft parked in front of T1 and T2(S) are pushed back, they will block the passage of taxing aircraft causing congestion in the domestic apron areas. In order to solve this problem, the relocation plan of domestic terminal was formulated.

According to this plan, the multi-story car parking building is built first in front of current T2 (N) and T3 so that the capacity of level car parking in front of T1 and T2(S) will be accommodated in the new one. Then the new terminal building will be constructed behind the current T1 and T2(S) while maintaining the operation of current terminals. After the new terminal is inaugurated, T1 (oldest) and T2(S) (second oldest) will be demolished. With the set-back of terminal building, there will be a new parallel taxiway so that the congestion in domestic apron areas will be alleviated. This plan was already initiated in 2012 and will be completed in 2019.

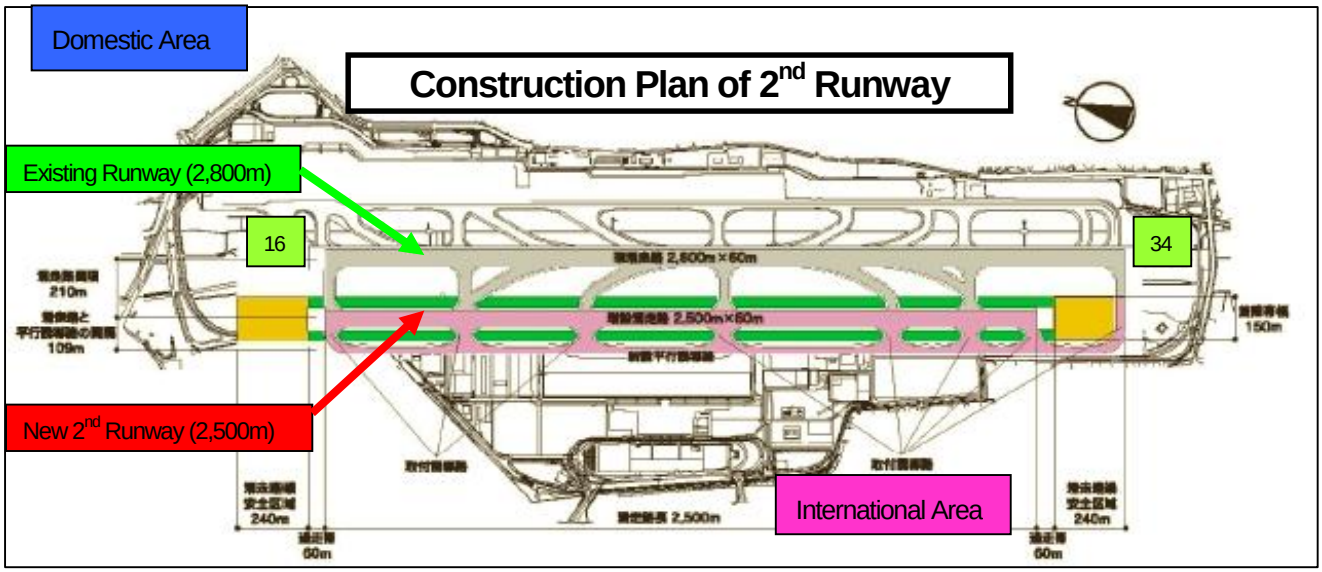




10.2 New Second Runway

It was determined in 2008 that the second new runway should be constructed to increase a capacity of airport. New close parallel runway will be constructed 210m away from the current runway on the west side of the airport. The new close parallel runway is 2,500m long and 60m wide. With this new runway, it is expected that the airport capacity will be increased by 30%.

The environmental assessment study was already initiated in 2012 and it is estimated to take about 10 years to complete the second runway.



11. Conclusion

It was found that the maximum hourly operations of civil and military aviation exceeded the reasonable level of handling capacity in 2012, 2013 and 2014 respectively, and the situation is getting worse year by year. It is obvious that the capacity of airport has already reached the saturation level with a single runway. Especially, the parking congestions at domestic terminal areas already create serious problems which may cause incidents at any moment in apron areas.

In addition, while there exist severe noise problems at the airport, the night curfew is not properly observed by airlines due to the accumulated delay of aircraft operations. There has been a strong demand from local communities to limit the number of operations at night and give penalties for delayed operations after night curfew.

This airport was registered as Level 2 airport by IATA in 1992 and schedule facilitation services have been provided by JCAB Airport Office since then. However, the current situation is far beyond the facilitated airport level where the congestion can be solved by schedule adjustments between the airlines and facilitator.

Although there are two airport expansion plans; the relocation of domestic terminal and the construction of second runway, it will take about 6 years to relocate the terminal building and it will take more than 10 years to complete the second runway. Furthermore, some of domestic parking stands have to be closed due to the renovation during terminal relocation works leading to the capacity reduction. While the airport capacity will be limited or slightly reduced during the construction period, the demands from not only domestic LCCs but also foreign LCCs are increasing with the rapid rate.

Therefore, it is essential to introduce the hourly constraints to smooth the flow of traffic and introduce the slot allocation scheme based on a neutral, non-discriminatory and transparent principle according to IATA WSG until the airport capacity will be expanded in the future. The JCAB, thus, strongly believes that Fukuoka airport should be categorized as Level 3 airport by IATA.