An Improved Tabu Search for Airport Gate Assignment

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Abstract

Airport gate assignment is concerned with assigning aircrafts to gates. A good assignment can benefit both airport operations and passengers. In this research, we focus on the static gate assignment which is usually prepared by the airport staff a few days before use. Although the static gate assignment problem (GAP) does not deal with dynamic issues, it is still a very difficult problem. Typically, researchers adopt heuristic methods for realistic problem.

In this research, we examine the use of meta-heuristic. Specifically, we attempt to improve tabu search (TS) methods for the GAP. The first TS used for GAP is proposed by Xu and Bailey [2001]. We extend their work by making use of a systematic approach to tune the parameters and introducing a path relinking (PR) feature into the TS algorithm. Our path relinking approach uses a new neighborhood structure and reference set updating strategy to improve its performance. The improved TS is compared to a TS without PR and a hybrid of TS and simulated annealing (SA).

The traditional formulation of GAP minimizes the total passenger walking distance. As an extension, we also take the airline preference into consideration in gate assignment. Seven days' flight data are collected from Incheon International Airport for testing. Computational experience is analyzed and presented.

摘要

機場閘口分配是關於把飛機分配於不同閘口的作業。有效的閘口分配能使機場的運作變得更有效率，同時亦能爲乘客帶來方便。在這研究中，我們著眼於預先制訂的靜態閘口分配。雖然靜態的閘口分配無需考慮突發情況，這仍然是一個難以解決的問題。一般來說，研究人員會使用啓發式演算法 (Heuristic Method) 來解決現實的閘口分配問題。

在這研究中，我們對萬用啓發式演算法(Meta-heuristics)進行研究。具體來說，我們嘗試改善 Xu 和 Bailey (2001) 爲機場的閘口分配問題而設計的禁忌搜尋(Tabu Search)演算法。我們將透過調校參數，及使用搜尋路徑連結(Path Relinking)方法，來改善禁忌搜尋法的成效。爲了使搜尋路徑連結的效果更佳，我們設計了新的領域結構 (Neighborhood Structure) 方法和參考集更新方法。我們會將這個最新的演算法，跟原來沒有搜尋路徑連結的禁忌搜尋演算法，以及混合了禁忌搜尋法和模擬退火 (Simulated Annealing) 的演算法作出比較。

傳統的機場閘口分配模型以最小化乘客的總步行距離爲目標，在這之上，我們將航空公司使用閘口的優先權加入到閘口分配問題的考慮之中。我們從韓國仁川機場收集了總共七天的測試數據，運算結果會加以分析然後匯報。

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I would like to express my deepest appreciation to my supervisor, Professor C.H. Cheng, who has given me valuable advice and guidance. I would also like to thank Dr. Sin Ho who has given me a lot of technical support and suggestions. Without their assistance, this thesis would not possibly have been completed.

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Contents

List of Figures

List of Tables

List of Symbols

G : the set of gates in the airport

G_i : is the set of gates available to flight i

$|G|$: the cardinality of set G

F : the set of flights in the airport

$|F|$: the cardinality of set F

Z : objective value of the gate assignment problem

S: solution of gate assignment problem

x_{ik} : a decision variable which is equal to 1 when flight i is assigned to gate k, and equal to 0 otherwise

a_i : the arrival time of flight i

d_i : the departure time of flight i

p_{ij} : the total number of transfers passengers from flight i to flight j

p_{i0} : the total number of arriving passengers of flight i

p_{0i} : the total number of departure passengers of flight i

π : the percentage of total number of transfer passengers

w_{kl} : the walking distance between gate k and gate l

w_{k0} : the walking distance between gate k and the arrival hall of airport

w_{0k} : the walking distance between the departure hall and gate k

b_{ijkl} : the fixed cost to assign flight i to gate j and flight k to gate l

E_k : the earliest available time of gate k

$N(S)$: neighborhood of solution S

$N_T(S)$: neighborhood of solution S reduced by tabu list

$N_I(S)$: neighborhood of S by performing Insert Move

$N_{E1}(S)$: neighborhood of S by performing Exchange I Move

$N_{E2}(S)$: neighborhood of S by performing Exchange II Move

$N_1(S)$: neighborhood of S containing solutions that can be reached from solution S by an Insert Move while taking into account the characteristics of the guiding solution

$N_2(S)$: neighborhood of an infeasible solution S containing feasible solutions by moving the conflicted flights to a gate which can eliminate the conflict

$Iter$: the current number of iterations

$Iter_{max}$: maximum number of iterations of the search process

$tenue$: the duration of tabu tenure

E_j : the earliest available time of gate j

m_1: period of iterations to invoke Exchange I Move

m_2: period of iterations to invoke Exchange II Move

m_{PR}: period of iterations to invoke path relinking

n_1: number of consecutive iteration to perform Exchange I Move

n_2: number of consecutive iteration to perform Exchange II Move

NoImp : the number of iterations that the search has not improved the overall best known solution

θ: threshold of number of iterations to tolerate no improvement for overall best solution

R : reference set

$|R|$: the cardinality of reference set

R_{min} : the minimum number of solutions stored in reference set R

R_N : non-volatile reference set

R_V : volatile reference set

θ : the threshold of number of iterations for the best solution has not been improved

q: the number of solutions will be copied from R_V to R_N just before Random Exchange Gate Move is executed

$U(a, b)$: an uniform distribution function that randomly generate an integer in the interval $[a, b]$

$U_d[a, b]$: an uniform distribution function that randomly generates a decimal number in the interval $[a, b]$

D_a^b : level of dissimilarity between solution a and solution b

R_i : rank sum of test i

Chapter 1 Introduction

1.1 The Gate Assignment Problem

In this work, we are concerned with selecting and assigning aircrafts to gates to create an assignment schedule. Generally, the airport pre-assigns the scheduled arriving or departure flights to gates taking the following factors into considerations: (1) flight information such as type of aircraft, scheduled arrival time and departure time; (2) number of passengers; (3) terminal status and gate availability; and (4) airline preference. This assignment problem is referred to as the gate assignment problem (GAP) in this thesis.

In reality, GAP is a difficult problem. In one hard constraint of GAP, we require that every aircraft must be assigned to one and only one gate. Further we allow at most one flight occupying a gate at one time. In other words, there must be no time conflict for flights in using the same gate. Another hard constraint has to do with the physical size of an aircraft and the capability of a gate. These constraints increase the computation effort significantly as the number of flights or gates increases. Besides, there are also soft constraints specifying airport business decisions. For example, local airlines may prefer to the gates which are closer to the customs inspection hall. In Incheon Airport in Korea, the flights of Korean Airline and Asiana Airlines are often assigned to gates in terminal 1, while the flights of other airlines are assigned to those in terminal 2. In this airport, terminal 1 is closer to the customs inspection hall.

GAP is very important to airport operations. A bad gate assignment may create inconvenience to passengers, reduce the efficiency of ground services (such as transportation of baggage), and even cause flight delays. For example, if the gates assigned to a transfer flight pair is too far away, the time required for transferring the passengers and baggage from the arrival flight to departure flight will be very long. The airport has to schedule enough buffer time for the flight pair. Otherwise, a delayed arrival flight may subsequently cause delays to the departure flight.

GAP has drawn substantial research attention. There are different models and methodologies to deal with GAP. Minimizing total passenger walking distance is one of the most classic and popular objectives. Mangoubi and Mathaisel [1985] present a model and a heuristic to solve the problem. This is the first work to consider transfer passengers in their model. However, since it is a NP-hard quadratic assignment problem [Obata, 1979], it is very unlikely to find an optimal solution in polynomial time.

Xu and Bailey [2001] propose tabu search to solve the problem. This meta-heuristic approach is able to find an optimal or near optimal solution in a reasonable time. However, they do not address the following issues:

1. The parameters used in their tabu search algorithm are not tuned but determined arbitrarily.
2. Although Xu and Bailey show that their algorithm can solve small problems optimally, the performance on large problems is unknown.
3. They do not consider the airline preference in the model. Airline preference is a very important concern in the airport business.

1.2 Contributions

In this research, we try to answer the questions mentioned in the previous section. We will use a systematic approach to tune the values of the parameters for our tabu search (TS) algorithm. We subsequently improve the performance of TS using path relinking (PR).

In the literature, the work of Xu and Bailey's work has been extended by Lim, Rodrigues and Zhu [2005], and Ding, Lim, Rodrigues and Zhu [2005] and Wang and Lim [2005]. Their improvements focus on using TS to deal with the GAP with different objectives. The structures and parameter settings of the TS are similar to Xu and Bailey. Our approach is different from them as we mainly focus on improving the performance of TS by adding PR. Since PR is a highly portable concept, it can be combined with other meta-heuristics. Therefore, we believe that this research benefits not only TS, but also other algorithms used in GAP.

To show that our algorithm is practical, we collect seven days' data from Incheon International Airport for testing. In this case study, airline preference is addressed. To our best knowledge, there is no prior research to consider the constraints posed by airline preference.

1.3 Formulation of Gate Assignment Problem

Our objective is to minimize total passengers' walking distance. We consider three different kinds of passengers: (1) arriving passenger, (2) departure passenger, and (3) transfer passenger. There are three types of walking distance: (1) the distance between gate and arrival hall, (2) the distance between gate and departure hall, and (3) the distance between two gates.

Generally, we follow Ding, Lim, Rodrigues and Zhu [2005] to build the model of GAP. We modify the objective function since we consider only the total passengers' walking distance while Ding et al. consider both passengers' walking distance and number of unassigned aircrafts. The notation and model are described as follows:

G : the set of gates in the airport

F : the set of flights in the airport

Z : objective value of the gate assignment problem

x_{ik} : a decision variable which is equal to 1 when flight i is assigned to gate k, and equal to 0 otherwise

a_i : the arrival time of flight i

d_i : the departure time of flight i

p_{ij} : the total number of transfers passengers from flight i to flight j

p_{i0} : the total number of arrival passengers of flight i

p_{0i} : the total number of departure passengers of flight i

w_{kl} : the walking distance between gate k and gate l

w_{k0} : the walking distance between gate k and the arrival hall of airport

w_{0k} : the walking distance between the departure hall and gate k

$$\text{Minimize } Z = \sum_{i \in F} \sum_{j \in F} \sum_{k \in G} \sum_{l \in G} p_{ij} w_{kl} x_{ik} x_{jl} + \sum_{i \in F} \sum_{k \in G} (p_{i0} w_{k0} + p_{0i} w_{0k}) x_{ik} \quad (1.1)$$

$$\text{Subject to : } \quad \sum_{k \in G} x_{ik} = 1, \forall i \in F \quad (1.2)$$

$$x_{ik} x_{jk} (d_j - a_i)(d_i - a_j) \le 0, \ \ \forall i, j \in F, \ \ \forall k \in G \quad (1.3)$$

$$x_{ik} \in \{0,1\}, \ \ \forall i \in F, \ \ \forall k \in G \quad (1.4)$$

It should be noted that the flight here does not represent the flight code but the ID of the aircraft. Each flight is one sojourn of an aircraft. Therefore, the arrival time and departure time of a flight can be interpreted as the starting time and ending time for an aircraft to use a gate.

The objective function (1.1) is to minimize total passenger walking distance. This objective function has been widely used in the literature (e.g., Sherali and Brown [1993], Haghani and Chen [1997], Xu and Bailey [2001] and Ding et al. [2005]). The quadratic part of the function deals with the transfer passengers while the linear part indicates the total walking distance for arriving and departure passengers.

Constraint (1.2) requires every flight to be assigned to one and only one gate. Constraint (1.3) is a non-linear constraint. It specifies that no two flights are assigned to the same gate at the same time. This constraint has been proposed by Ding et al. [2005]. Both constraints (1.2) and (1.3) are the basic hard constraints for all GAPs. Finally, constraint (1.4) enforces to the binary and nonnegative requirements for decision variables.

Ding et al. [2005] suggest a dummy gate 0 to represent the entrance or exit of an airport. Thus, w_{k0} refers to the walking distance between gate k and the exit hall of the airport and w_{0k} refers to the walking distance between the departure hall to gate k. Similarly, there is also flight 0 which is a dummy flight to represent the airport. Therefore, p_{i0} denotes the total number of passengers transfers from flight i to the airport and p_{0i} denotes the total number of passengers transfer from the airport to flight i. Flight 0 is pre-assigned to gate 0 from the beginning to the end of the whole assignment. In our case, the arrival time and departure time of flight 0 is 00:00 and 24:00, respectively.

1.4 Organization of Thesis

This report is organized as follows: we provide a literature review on the GAP in the next chapter. We then discuss a tabu search algorithm for the problem in Chapter 3. Chapter 4 introduces path relinking which is used to improve the performance of tabu search. Then, we will present a real case study of Incheon International Airport in Chapter 5. In this case study, we address airline preference in the model. Finally, we summarize our findings and discuss future directions in the last chapter.

Chapter 2 Literature Review

2.1 Introduction

In this work, we focus on the gate assignment problem (GAP). The GAP is concerned with the assignment of aircrafts to gates.

Typically, researchers formulate GAP as a quadratic 0-1 assignment problem and minimize total passengers' walking distance. The quadratic GAP is characterized to be NP-hard by Obata [1979]. This states that solving a big GAP problem optimally is time-consuming. Unfortunately, the facilities of an international airport and the number of flights to be handled are usually huge. It is not uncommon for an international hub to have more than 50 gates and schedule more than 300 flights daily. As realistic problems are usually very large, heuristic algorithms are used by many researchers to find solutions.

Other issues such as the passenger waiting time, the influence of flight delays, the utilization and the buffer time are also concerned in GAP. The aim of this review is to present various formulations (Section 2.2) and solution methodologies (Section 2.3) that are available in the literature.

2.2 Formulations of Gate Assignment Problems

We classify the models of GAP into two types: **static models** and **stochastic and robust models**. Each type of models commonly has its conventional objectives or measures. For example, a static model has objectives like minimizing the passenger's walking distance, waiting time, the number of unassigned flights. A stochastic model tries to address and measure the effects of uncertainty. It also helps find robust solutions which may deal with minor changes. Figure 2.1 shows an overview of GAP formulations.

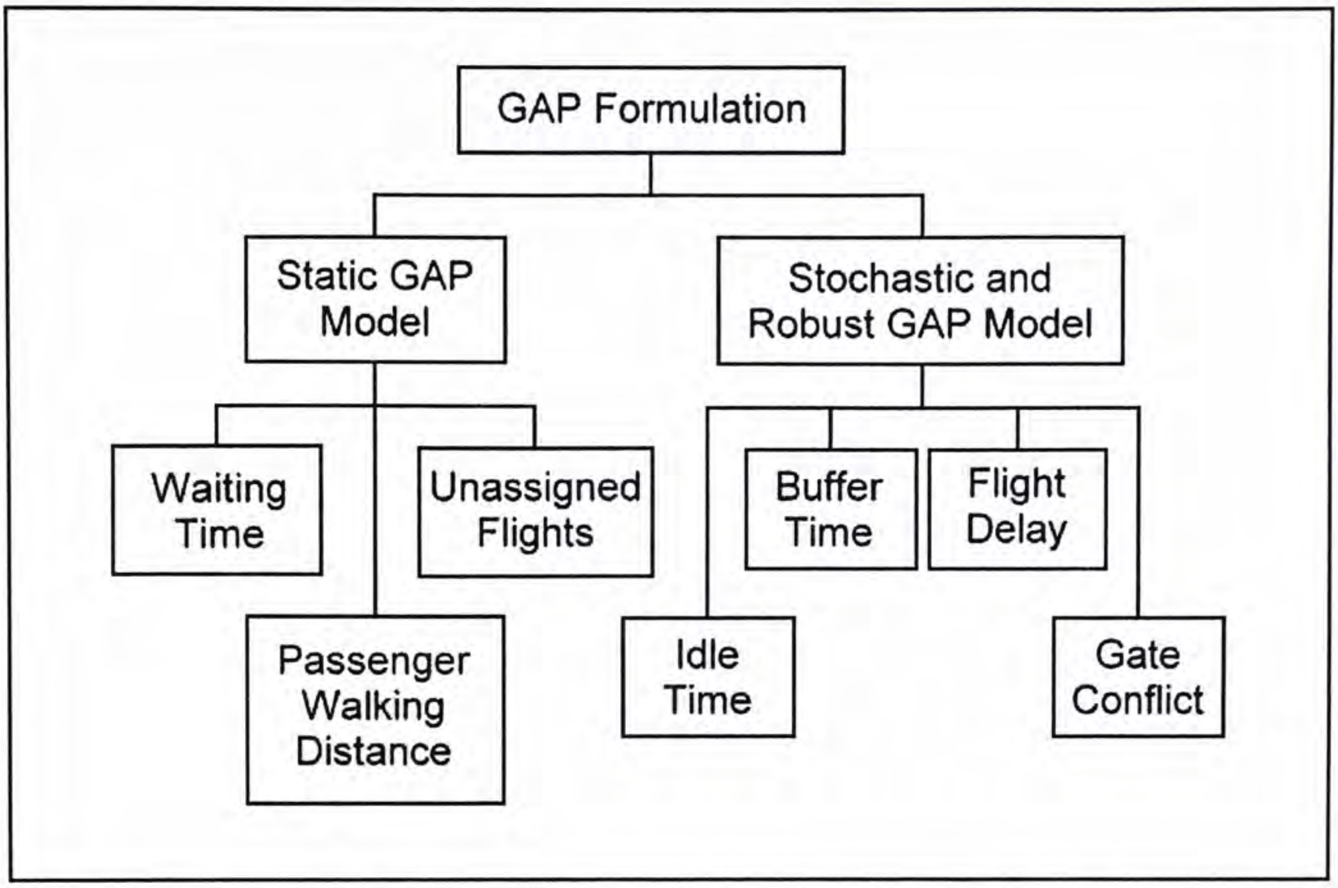


Figure 2.1 Overview of Gate Assignment Problem Formulation

2.2.1 Static Gate Assignment Model

Typically, the static gate assignment is prepared a week or even a month ahead of time. The assignment considers only the deterministic factors (such as airport layout, number of flights and number of passengers) but not stochastic factors (such as flight cancellations and delays). In most cases, airports needs to assign all flights to the gates in the terminal and tries to accommodate the traveling needs of all passengers while keeping a smooth ground operation.

2.2.1.1 Total Passenger Walking Distance

Minimization of the total passenger walking distance is a typical objective in solving the GAP. There are three types of passengers to consider: (1) arriving passengers, (2) departure passengers, and (3) transfer passengers. The walking distance is defined as the distance between a gate and the baggage claiming area for (1), the distance between check-in counter to the gate for (2), or the distance between two gates for (3). Braaksma [1977] demonstrates that the total passenger walking distance can be reduced by an effective assignment of flights to gate positions without changing the layout of the terminal area. The total passenger walking distance is based on the product of passenger walking distance and the passenger volume. Similar to Braaksma [1977], Mangoubi and Mathaisel [1985] consider the walking distances of arriving and departing passengers, but they also include transfer passengers. As the objective used in Mangoubi and Mathaisel [1985] become a classic objective in GAP, we examine its objective function in greater detail.

We let x_{ij} be a binary decision variable and define it as

$$x_{ij} = \begin{cases} 1, & \text{if flight } i \text{ is assigned to gate } j; \\ 0, & \text{otherwise.} \end{cases}$$

Passengers are classified as arrival, departure or transfer passengers. The number of arriving, departure and transfer passengers of flight i are denoted as p_i^a, p_i^d and p_i^t, respectively. In addition, w_j^a and w_j^d denote the walking distance for an arrival, and departure passenger, respectively, and w_j^t denotes the average walking distance of transfer passenger from gate j to any other gate. The objective suggested by Mangoubi and Mathaisel is to minimize the total passenger walking distance:

$$Z = \sum_{i \in F} \sum_{j \in G} (p_i^a w_j^a + p_i^d w_j^d + p_i^t w_j^t) x_{ij} \qquad (1)$$

where F and G are the set of flights and gates, and $|F|$ and $|G|$ are the cardinality of sets F and G, respectively. In this model, the objective function is linear. It does not consider the exact transfer passenger's walking distance for every flight pair, but determined using a uniform probability distribution of all inter-gate walking distances. If w_{jk} is the distance between gate j and gate k, then w_j^t is the expected walking distance for a transfer passenger arriving at gate j with the value:

$$w_j^t = \frac{1}{|G|}\sum_{k=1}^{|G|} w_{jk} \qquad \forall j = 1,\ldots,|G| \tag{2}$$

Since the objective is linear, this model can be solved by using a simple heuristic method. Although it is not very accurate, this model gives the first insight on formulating the transfer passenger's walking distance in GAP.

Sherali and Brown [1993], based on the model of Mangoubi and Mathaisel [1985], develop a quadratic objective function for transfer pairs. They introduce a direct cost of assigning flight i to gate j (represented by a_{ij}) and a cost of the simultaneous assignment of flight i to gate j and flight k to gate l. Also, they reduce the number of constraints by checking the feasibility of all gates to different flights. Finally, they have an indicator δ_{ik}. This indicator returns 1 if flights i and k overlap in airport occupancy time, and it returns 0, otherwise. The objective function for total passengers' walking distance proposed by Sherali and Brown [1993] is as follows:

$$Z = \sum_{i=1}^{|F|}\sum_{j\in G_i}\left[a_{ij} + (p_i^a w_j^a + p_i^d w_j^d)x_{ij}\right] +$$

$$\sum_{i=1}^{|F|-1}\sum_{j=1}^{|G|}\sum_{k=i+1}^{|F|}\sum_{\substack{l\in G_k \\ l\neq j, if\,\delta_{ik}=1}}\left[b_{ijkl} + (p_{ik} + p_{ki})w_{jl}\right]x_{ij}x_{kl} \tag{5}$$

where G_i is the set of gates available to flight i, p_{ik} is the total number of transfers passengers from flight i to flight k, w_{jl} is the walking distance between gate j and gate l and b_{ijkl} is the fixed cost to assign flight i to gate j and flight k to gate l.

This function is divided into two parts. The first part is linear and the second part is quadratic. The linear part indicates the total walking distance for arriving and departure passengers while the quadratic part deals with the transfer passengers. This function is much more accurate than Mangoubi and Mathaisel [1985] since the walking distances between gates are actual values. Although this quadratic function requires more time to solve, their method to handle transfer passengers is widely used in subsequent research.

Haghani and Chen [1997] reformulate the objective function into a linear function and make it easier to understand. They introduce a dummy gate 0 and dummy flight 0 to represent the airport entrance. To illustrate, p_{i0} and p_{0i} denote the number of arriving passengers from flight i to the airport, and the number of departure passengers of flight i respectively. Moreover, w_{j0} and w_{0j} denote the walking distance from gate j to the arrival hall and from departure hall to gate j, respectively. The new objective function by Haghani and Chen is expressed as:

$$\text{Minimize } Z = \sum_{i \in F} \sum_{j \in G} (p_{i0} w_{j0} + p_{0i} w_{0j}) x_{ij} + \sum_{i \in F} \sum_{j \in G} \sum_{k \in F} \sum_{l \in G} p_{ik} w_{jl} x_{ij} x_{kl} \quad (6)$$

We treat the ariport as an available gate to be used. For example, the arrival passengers of flight i to the arrival hall of the airport is considered as walking from flight i to flight 0. Therefore, we eliminate the linear part and keep the quadratic part by including flight 0 in set F and gate 0 in set G:

$$\text{Minimize } Z = \sum_{i \in F} \sum_{j \in G} \sum_{k \in F} \sum_{l \in G} p_{ik} w_{jl} x_{ij} x_{kl} \quad (7)$$

This quadratic 0-1 function can be transformed to a linear one by replacing the decision variable $x_{ij}x_{kl}$ by new binary variable y_{ijkl}:

$$y_{ijkl} = x_{ij}x_{kl} \tag{8}$$

where

$$y_{ijkl} = \begin{cases} 1, & \text{if flight } i \text{ is assigned to gate } j \text{ and flight } k \text{ to gate } l; \\ 0 & \text{otherwise.} \end{cases}$$

The quadratic gate assignment problem is then equivalent to an integer problem:

$$\text{Minimize } Z = \sum_{i\in F}\sum_{j\in G}\sum_{k\in F}\sum_{l\in G} p_{ik} w_{jl} y_{ijkl} \tag{9}$$

The following two constraints will be used if the quadratic function is transformed to a linear program. With the use of these constraints, $x_{ij}x_{kl}$ can be written as y_{ijkl}.

$$x_{ij} + x_{kl} \le 2y_{ijkl} \qquad \forall i,k \in F, \forall j,l \in G \tag{10}$$

$$\sum_{j\in G}\sum_{l\in G} y_{ijkl} = 1 \qquad \forall i \ne k \tag{11}$$

The formulation of Haghani and Chen is easy to implement and understand. Similar formulations of this approach have been used by recent researchers such as Xu and Bailey [2001], Ding, Lim, Rodrigues and Zhu [2005]. In this work, we adopt this formulation

2.2.1.2 Waiting Time

Besides the walking distance, waiting time is also another important issue when evaluating the service level of an airport. During the peak hours, especially at some international hub airports, the gate assignment schedule may be very tight. An early arrival or late departure may lengthen passengers' waiting time. Therefore, Yan and Huo [2001] formulate a multi-objectives model that minimizes not only the passenger walking distance, but also the passenger waiting time shown as follows:

$$\text{Minimize } Z = \sum_{i \in F} \left(p_i \left(\sum_{j \in G} \sum_{k \in L_i} k x_{ijk} - B_i \right) \right) \tag{12}$$

Equation (12) demonstrates the objective function of passenger waiting time minimization. The decision variable x_{ijk} is equal to 1 if flight i is assigned to gate j at the kth time; otherwise equal to 0. In the objective function, p_i is the total number of passengers on flight i, B_i is the earliest time that flight i can be assigned to a gate, and L_i is the latest time that flight i should be assigned to a gate. The objective function is actually a summation of time differences between the starting time and the earliest starting time of each flight.

Lim, Rodrigues and Zhu [2005] use a model similar to Yan and Huo [2001] but they minimize the flight's deviation from their scheduled time slots. They also state that this model can be adapted for optimizing problems in other areas such as cross-docking or freight terminal where material arrival times may fluctuate.

2.2.1.3 Unassigned Flights

In practice, it is not possible for an aircraft to wait too long on the apron. If there is no available gate in the terminal for an arriving flight, the aircraft is unassigned and its passengers will be transported from the apron to an airport terminal by shuttle buses. This operation causes inconvenience to passengers as well as increases the workload of ground staff. Ding, Lim, Rodrigues and Zhu [2005] consider this over-constrained GAP in which the utilization of gates is very high. During the peak hours, some of the flights have to remain on the apron. Their first objective is to minimize the number of unassigned flights and the second objective is to minimize total passengers' walking distance.

2.2.2 Stochastic and Robust Gate Assignment Model

In reality, the input data: arrival time, departure time, and passenger numbers may change over time. A static assignment may become infeasible if there are flight delays, change in weather conditions or machine breakdowns. Obviously, we cannot avoid the occurrences of those events. However, if the assignment is robust enough, this will help the airport manage to react to these events quickly. This is the main reason for developing stochastic and robust gate assignment models in GAP.

These models aim at absorbing the uncertainty and increasing their robustness. A solution with good robustness is able to withstand changes in different scenarios and circumstances. The stochastic and robust models are aiming to find a solution that is capable of coping with uncertainties and reducing the loss of service level.

2.2.2.1 Idle Time

Bolat [1999] suggests that the gate assignment with uniformly distributed slack times[1] will increase the robustness of a solution. Small variations such as flight delays can be absorbed. Bolat proposes a surrogate objective which minimizes the difference between the maximum and minimum slack times. Later, Bolat [2000] proposes a mixed-binary quadratic programming model to minimize the variance of idle times. The idea is to create an initial assignment insensitive to variations in flight schedules. Furthermore, Bolat [2001] reformulates the model and provides some

[1] Slack time is the idle period between two consecutive flights in the same gate.

linear representations for minimizing the variation in idle times. He also identifies the situations in which the optimal solutions can be obtained in polynomial time.

2.2.2.2 Buffer Time

Yan, Shieh and Chen [2002] analyze the interrelationship between the static gate assignment and the real-time gate assignment caused by stochastic flight delays. They suggest a flexible buffer time[2] as a cushion between two consecutive flights in the same gate to absorb the stochastic delays. Yan et al. propose a simulation framework to analyze the effects of stochastic delays on a static gate assignment. They also evaluate flexible buffer times and real-time gate assignment rules.

They divide the simulation framework into two stages. The first phase is a planning stage. The model of Mangoubi and Mathaisel [1985] is adopted and solved by a solution algorithm and a heuristic. In the second phase (i.e., the real-time stage), they evaluate the assignment using simulation process under different buffer time strategies, reassignment rules, and stochastic flight delay patterns. Real data from CKS International Airport is used for running the simulation. The framework is found to be useful in helping the airport to improve their operation.

2.2.2.3 Flight Delays

Yan and Tang [2007] develop a heuristic approach embedded in a framework to study the impact of flights delays on the relationship between planning and real-time stages. The framework integrates the planning and real-time stages to solve GAP and carries out the reassignment under the influence of stochastic flight delays.

[2] Buffer time is a time period added before the gate is locked or after the gate is released to a flight.

It includes three components: a stochastic flight delay gate assignment model, a real-time reassignment rule, and two penalty adjustment methods.

The stochastic flight delay gate assignment model is established in the planning stage. It includes a gate-flow network and a mathematical formulation. The objective of this model is to minimize total passenger waiting time, and the expected penalty due to stochastic delays. They solve the problem by a heuristic and follow by a reassignment procedure using different flight delay scenarios. During the reassignment procedure, the penalty adjustment method is applied repeatedly to adjust the penalty value.

Similar to Yan, Shieh and Chen [2002], they perform the sensitivity analysis on buffer time. In addition, they evaluate different disturbance and flight delay patterns to demonstrate the flexibility of this framework.

2.2.2.4 Gate Conflicts

Concerning the gate reassignment, Fan and Lim [2005] formulate a robust airport GAP by a stochastic programming model that is transformed to a binary programming model through the use of an estimation function. Without knowing the real arrival and departure time, the model is able to minimize the number of conflict gates. In order to solve the NP-hard binary program, they propose a hybrid tabu search and a local search.

This is the first research to formulate the GAP as a stochastic programming model. They use real data from Hong Kong International Airport to test the performance. Computational results show that the model is able to reduce gate conflicts and improve robustness. In addition, this method aids the airlines in determining the number of gates to rent in an airport.

2.3 Solution Methodologies

The solution methodologies of GAP can be mainly divided into two categories: the optimization and expert system approach. Within optimization, it can be further classified into exact methods and heuristics. The exact methods include branch-and-bound methods and relaxations. The optimization methods aim at finding optimal or near optimal solutions. However, more and more researchers try to focus on heuristics because practical GAPs are usually large in size. Figure 2.2 shows an overview of the solution methodologies.

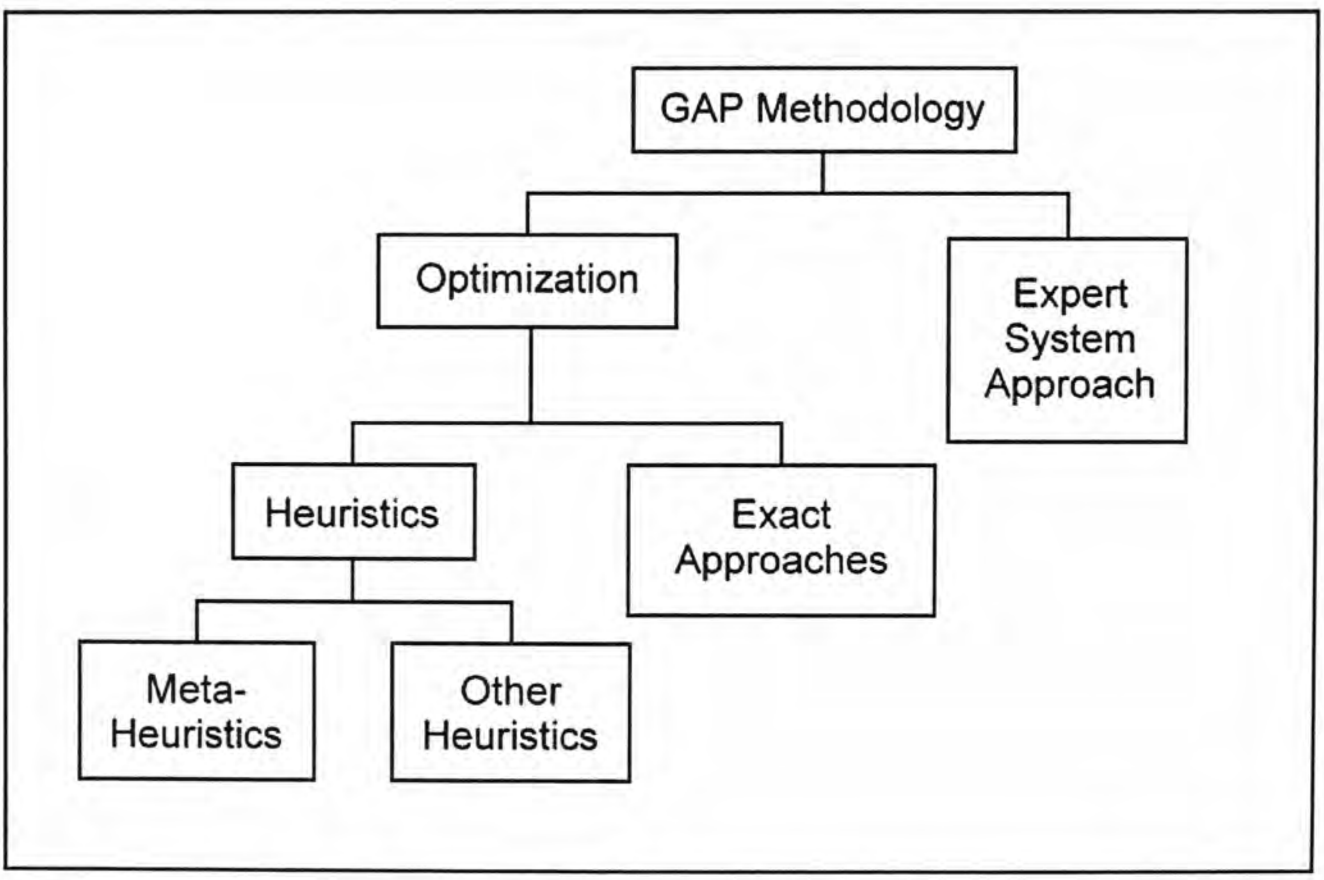


Figure 2.2 Overview of Solution Methodologies of Gate Assignment Problems

2.3.1 Expert System Approaches

Expert system is a software that stimulates the performance of human experts. A database, which contains rules generated by human knowledge in a specific problem domain, is used to provide suggested solutions. A system operator can adjust existing rules or input new rules so as to upgrade the system to handle different problem environments. Since producing a useful mathematical formulation may be a difficult task for some problem domains, the usage of expert systems is another viable approach.

Brazile and Swigger [1988] develop a constraint satisfaction expert system called GATES using Prolog. GATES consists of two logic levels. The first level produces an initial schedule before use, and the second level adjusts the schedule in reaction to incoming real time information such as flight delays, changes in weather condition and facility failures. To make a decision, GATES uses permissive rules and conflict rules. The permissive rules determine when it is appropriate to consider a particular gate for a flight while the conflict rules decide when a particular flight cannot be assigned to particular gates. Brazile and Swigger captured knowledge and procedures used by the experienced ground controllers and implemented GATES for New York John F. Kennedy International Airport located in New York. It is reported that GATES creates gate assignments in about 30 seconds which is much faster than human schedules.

Later, Gosling [1990] designs an expert system which also adapts to delays and equipment changes. Moreover, it considers the constraints imposed by the available facilities and personnel to handle the aircraft, and the consequences on downstream operations of particular assignment decisions. Gosling suggests that it is better to integrate the expert system with operational databases. This work is further examined by Su and Srihari [1993]. They develop a knowledge based aircraft gate assignment advisor using a similar approach to Gosling's. They integrate the inference process with an operational database that allows end users to modify the knowledge base and hence improve the flexibility of the system.

Although an expert system approach can handle more complicated constraints in real operations, it cannot solve the optimization problem efficiently. Cheng [1997] proposes a knowledge-based gate assignment system which integrates with optimization techniques. Cheng first divides the problem into several smaller problems and uses a linear programming method called Mack Bradford's method (introduced in the book written by Bunday and Garside [1987]) to optimize multi-objective functions of the smaller problems. The knowledge-based system can control the coefficients of the objective functions.

2.3.2 Optimization

Optimization techniques can be further divided into exact methods and heuristics. Exact methods (e.g., branch-and-bound, branch-and-cut, simplex) are guaranteed to find the optimal solutions. However, due to the size and the complicated structure of the problem, many researchers use heuristic methods to handle practical problems.

2.3.2.1 Exact Methods

Babic, Teodorvic, and Tosic [1984] propose a backtracking version of a brand-and-bound method to find the optimal solution. However, it is difficult to solve problems of large sizes. Later, Bolat [1999, 2000] also applies a brand-and-bound framework to solve a mixed integer program. Although he uses a more advanced computer, the computational time is still very long for small problems. Yan and Huo [2001] formulate a multiple objective 0-1 integer model that minimizes total passenger walking distance and waiting time. They use a weighting method, column generation approach, simplex method and brand-and-bound techniques to develop a solution algorithm that is able to solve larger scale problems in practice.

Mangoubi et al. [1985] and Sherali et al. [1993] both use linear programming relaxation to find the lower bound. However, the linear models of Sherali et al. are more complicated than Mangoubi et al. because the models are obtained by transforming a quadratic model. Sherali et al. formulate four different mixed-integer programming models and compare their lower bounds and computation efforts. By using different properties of the models, Sherali et al. develop a heuristic procedure. The heuristic is able to find near optimal solutions within one minute[3].

2.3.2.2 Heuristics Approaches

Although the exact methods may provide exact solutions, their computational times increase dramatically as the number of flights and gates increase. Hence, some researchers rely on heuristics to find good solutions within a reasonable amount of computing time.

Mangoubi and Mathaisel [1985], using a linear model, propose a simple heuristic to minimize the total passenger walking distance. Flights are assigned in the order of decreasing passenger volume. For a flight with a larger passenger volume, it gets a higher priority to be assigned to a gate with a smaller average walking distance. They conduct a series of experiments on an IBM 370/168 computer. The heuristic requires only a few CPU seconds to complete a daily assignment for Toronto International Airport. However, this heuristic has its limitation. First, it mainly considers passenger volumes and walking distances, and thus it requires further modification to handle other objectives and considerations. Also, there is no

[3] The test is ran on a SunSparc IIpx workstation using CPLEX 2.0 with problem size of 4 gates and 36 flights

distinction between arriving, departure and transfer passengers in the calculation of total passenger numbers. The relationship between transfer flight pairs is not considered.

Haghani and Chen [1997] improve the heuristic with the consideration of transfer flight pairs. Unlike Mangoubi and Mathaisel, they consider both passenger and distance simultaneously when deciding which flight pairs should be assigned first.

2.3.2.3 Meta-Heuristic Approaches

The heuristics mentioned in Section 2.3.2.2 are fast enough to get good solutions, but they are problem specific and may not be suitable in solving models with different objectives. Meta-heuristic approaches are relatively more flexible as they do not require particular knowledge on the problem. Therefore, researchers use them to solve many different types of problems.

Gu and Chung [1999] develop a genetic algorithm to handle the gate reassignment problem. The genetic algorithm provides effective and efficient solutions in which the extra delayed time is minimized. They claim that the reassignment is better than the results generated by experienced airport managers.

Bolat [2001] also apply a genetic algorithm to minimize the dispersion of idle time periods. The genetic algorithm implementation utilizes problem-specific knowledge. Computational studies show that the algorithm performs well in realistic data instances, and is able to provide several good alternative solutions. Recently, Hu and Paolo [2009] develop a genetic algorithm for the multi-objective GAP. In their work, the relative position between aircrafts is used to construct chromosomes, instead of the absolute position of aircrafts. They implement a new uniform crossover operator which avoids producing infeasible chromosomes.

Xu and Bailey [2001] use another meta-heuristic, tabu search (TS), to minimize the overall connection time. They employ the short term memory architecture and employ the special properties of different types of neighborhood structures to create highly effective candidate list. They compare the algorithm with a branch-and-bound procedure implemented in CPLEX. Both of the approaches produce optimal solutions to small size problems. For the larger size problem, the computing time required by CPLEX increases dramatically while the computing time of tabu search remains satisfactory.

Lim, Rodrigues and Zhu [2005] compare TS, genetic algorithm and memetic algorithm on a model by Xu and Bailey [2001]. Results shows that TS performs better than the memetic algorithm and the genetic algorithm.

Ding, Lim, Rodrigues and Zhu [2005] extend the work of Xu and Bailey [2001]. They combine tabu search with simulated annealing. The model they proposed is similar to Xu and Bailey, except that with an over-constrained airport, aircrafts are allowed to park on the apron. To deal with the problem, they introduce two new neighborhood structures – Apron Exchange Move and Interval Exchange Move. Results show that the hybrid approach is the best in solving an over-constrained GAP.

The idea of hybridization is also used by Wang and Lim [2005]. However, instead of using simulated annealing, they combine TS with a local search technique. They divide the meta-heuristic algorithm into two stages. In the first stage, they use TS to find out an initial solution. Then a local search is applied to improve the initial solution.

2.3.2.4 Path Relinking

In our research, we try to integrate path relinking (PR) in TS. PR is originally proposed by Glover and Laguna [1993]. It works like a plug-in feature for TS algorithm to improve its performance. To best of our knowledge, this is the first attempt of PR in GAP. However, the application of PR to some meta-heuristics is the usual practice.

Bastos and Ribeiro [1999] implement PR in TS to solve the Steiner problem in graphs. Ho and Gendreau [2006] use PR in their TS to solve the vehicle routing problem. Both of them conclude that PR improves the solutions found by TS.

In addition to tabu search, PR is also adaptive to other meta-heuristics. Yamada [1999] consider the integration of PR and genetic algorithm to improve the performance of the genetic algorithm for a flow-shop sequencing problem. Zhang and Lai [2006] use a similar approach. They combine PR with genetic algorithm to solve a multiple-level warehouse layout problem.

In the algorithm of Alfandari, Plateau and Tolla [2001], LP-solving cuts, local search and PR are used in different phases to solve the generalized assignment problem. Later, Yagiura, Ibaraki and Glover [2006] combine ejection chain and PR to solve the same problem.

Oliveira, Pardalos and Resende [2004] integrate greedy randomized adaptive search procedure (GRASP) with PR to solve a quadratic assignment problem. They also illustrate the effectiveness of GRASP with PR over pure GRASP in terms of the rate of the search convergence. Moreover, GRASP with PR is also used in job shop scheduling [Aiex, Binato and Resende, 2003], 2-layer straight line crossing minimization and other optimization problem [Laguna and Marti., 1999].

From the literatures, it can be seen that PR can further improve the performance of the meta-heuristics. Thus, we believe that PR can also help TS to get better solutions in GAP.

2.4 Current Practice of Gate Assignment Problems

Many companies provide business solution packages for airport operations, such as Avient, Quintiq, and Sabre. The packages usually contain gate management system and passenger management system. For the gate management system, it provides decision making, database management, and graphical user interface which enable airport staff to assign flights to different gates efficiently.

These companies do not provide details of the algorithms and optimization methods used in their software packages. They claim that the modules of the packages take into account all applicable rules and constraints. These include arrival patterns, airline rules, airline preferences, and ground operation rules. They also claim that their systems are able to handle last minute changes and disturbances.

2.5 Summary

Gate assignment is an important activity in airports as it influences the operation and service quality of the airport. Various researches have been conducted on formulations dealing with both static and stochastic issues. The researchers also develop different solution methodologies to solve this problem.

As the problem faced by airport nowadays is becoming more complicated, it is necessary to find a method which can give good quality solution within reasonable time. Some researchers propose using heuristic methods. However, these methods are problem-dependent. In the past decade, the application of meta-heuristics to GAP has been studied. The meta-heuristics are found to be effective in providing good solutions and capable of adapting to different formulation.

In this research, we concentrate on improving the performance of a TS meta-heuristic. This is achieved by integrating PR feature in to the tabu search. Since PR is also useful for many meta-heuristics, we believe that this study will benefit other meta-heuristics for GAP.

Chapter 3 Tabu Search

3.1 Introduction

The Gate Assignment Problem (GAP) is NP-hard [Obata, 1979] and therefore, may not be solved to optimality in polynomial time. The computational effort increases significantly even for a small increase in the number of flights and gates. Thus, many researchers have focused on the design of good heuristic algorithms for practical problems. Tabu Search (TS) is one of the popular meta-heuristics used to solve GAP. The original TS-based algorithm for GAP is proposed by Xu and Bailey [2001]. This algorithm is not only easy to implement but also able to give a good solution in a reasonable computational time. After Xu and Bailey, there have been other researchers applying TS to solve different versions of the GAP problem, such as Ding, Lim, Rodrigues and Zhu [2005], Lim, Rodrigues and Zhu [2005], and Wang and Lim [2005].

In this section, we introduce the details of our TS algorithm and a fine-tuning method [Xu, Chiu and Glover, 1998] to optimize the parameters of TS. We also compare the performance of our fine-tuned TS algorithm and the original TS algorithm.

3.2 Mathematical Model

For the convenience of the reader, we reproduce the mathematical model for GAP in this section. To formulate the GAP, we let:

G be the set of gates in the airport
F be the set of flights in the airport
Z be objective value of the gate assignment problem
Let the decision variables $x_{ik} = 1$ when flight i is assigned to gate k, and equal to 0 otherwise

Other parameters are:

a_i : the arrival time of flight i

d_i : the departure time of flight i

p_{ij} : the total number of passengers transfers from flight i to flight j

p_{i0} : the total number of arriving passengers of flight i

p_{0i} : the total number of departure passengers of flight i

w_{kl} : the walking distance between gate k and gate l

w_{k0} : the walking distance between gate k and the arrival hall of airport

w_{0k} : the walking distance between the departure hall and gate k

The formulation is given as follows:

Minimize $$Z = \sum_{i\in F}\sum_{j\in F}\sum_{k\in G}\sum_{l\in G} p_{ij} w_{kl} x_{ik} x_{jl} + \sum_{i\in F}\sum_{k\in G}(p_{i0} w_{k0} + p_{0i} w_{0k}) x_{ik} \quad (3.1)$$

Subject to : $$\sum_{k\in G} x_{ik} = 1, \forall i \in F \quad (3.2)$$

$$x_{ik} x_{jk} (d_j - a_i)(d_i - a_j) \le 0, \quad \forall i, j \in F, \quad \forall k \in G \quad (3.3)$$

$$x_{ik} \in \{0,1\}, \quad \forall i \in F, \quad \forall k \in G \quad (3.4)$$

This is a 0-1 quadratic programming formulation. Objective function (3.1) tries to minimize total passenger walking distance. Constraint (3.2) requires every flight to be assigned to one and only one gate. Constraint (3.3) specifies that no two flights are assigned to the same gate at the same time. Finally, constraint (3.4) enforces to the binary and nonnegative requirements for decision variables.

Gate 0 represents the entrance or exit of an airport. Thus, w_{k0} refers to the walking distance between gate k and the exiting hall of the airport and w_{0k} refers to the walking distance between the departure hall to gate k. Flight 0 is also used to represent the airport. Therefore, p_{i0} denotes the total number of passengers transferring from flight i to the airport and p_{0i} denotes the total number of passengers transferring from the airport to flight i. Flight 0 is pre-assigned to gate 0 from the beginning to the end of the whole assignment. In our case, the arrival time and departure time of flight 0 is 00:00 and 24:00, respectively.

According to the general GAP formulation, a solution is a set of flight assignments. We denote

$$S = \begin{pmatrix} x_{11} & x_{12} & \cdots & x_{1n} \\ x_{21} & x_{22} & & x_{2n} \\ \vdots & & \ddots & \vdots \\ x_{m1} & x_{m2} & \cdots & x_{mn} \end{pmatrix}$$

as the solution of GAP where m is the total number of flights, and n is the total number of gate. In each row, there is only one x_{ij} whose value is equal to one which indicates that each flight is assigned to one and only one gate. For simplicity, we may present the solution S in form of $\{(1, \beta_1), (2, \beta_2), \ldots, (i, \beta_i)\}$ where i denotes for flight i, and β_i is the assignment of flight i. Thus, (i, β_i) represent the assignment of flight i. We call (i, β_i) as the attribute of S. For instance, $S = \{(1, 3), (2, 5), (3, 4)\}$ means that flight 1 is assigned to gate 3, flight 2 is assigned to gate 5 and flight 3 is assigned to gate 4. *(1, 3)*, *(2, 5)*, and *(3, 4)* are the three attributes of this solution.

By strategically changing the attributes of S according to some pre-defined rules, we may find a solution that the objective value Z is minimized. Tabu search is a method to guide the changes of the attributes.

3.3 Principles of Tabu Search

Glover, McMillan, and Novick [1985] apply TS to subset clustering problems represented by a 0-1 mixed integer programming model with over 25,000 variables and 50,000 constraints. This approach obtains solutions in less than one minute on a

V77 minicomputer [Glover, 1993]. Since then, TS has been widely used to solve combinatorial optimization problems such as the vehicle routing problems and various scheduling problems.

In general, TS is a kind of local search technique. The basic local search algorithm moves at each iteration from a solution to its best-neighbor solution until no improved solution can be found. The neighborhood of a solution is a set containing the solutions that only differing by one move (in GAP, one move can be a change of flight assignment). The solutions are also called candidate solutions because the search needs to choose which one to move to. The search is "local" because it uses only information about the solutions in the neighborhood of the current solution. Typically, the search will choose the solution in the neighborhood which yields the best objective function value to move to.

However, local search has a limitation as it may get trapped by local optimal solutions and cannot escape a region of the solution space. This leads to the invention of TS.

TS employs an adaptive memory and a responsive exploration to effectively search the solution space. With the use of the memory technique, the search can prevent cycling back to previously visited solutions. This design guides the search to escape from being trapped in a local optimum. The first success of TS applied to a quadratic assignment problem was shown by Skorin-Kapov [1990].

TS starts with an initial solution, and progressively improves it by applying a series of neighborhood search move. A move is a transition from one solution to another. At each move, TS moves from a current solution S to a new solution S' that is the best candidate in the neighborhood of the current solution S. At the same time, the move is recorded in the tabu list. In order to avoid trapped in local optima, the search is prohibited from performing the reversal of the moves which have been recorded in the currently effective tabu list.

The prohibited move may be allowed if it satisfies an aspiration criterion. A common aspiration criterion is that the prohibited move leads to a best-seen-solution. TS terminates the search if certain conditions (e.g. after a fixed number of iterations or a maximum computing time is reached) are satisfied.

3.4 Neighborhood Structures

The neighborhood of a current solution S is denoted by $N(S)$. In our case, $N(S)$ is a set of all feasible solutions that can be reached from solution S by performing a move. A move can be a re-assignment of a flight, for example, re-assigning flight 2 from gate 1 to gate 2. Neighborhood search requires evaluation of the objective function values of all solutions in $N(S)$ to find the best candidate. The solution S' in $N(S)$ with the lowest cost will be considered. TS proceeds by moving from solution S to solution S' in $N(S)$ at each iteration.

Different neighborhood structures will generate different neighborhoods. In GAP, we consider two kinds of moves, Insert Move and Exchange Move.

3.4.1 Insert Move

Xu and Bailey [2001] first propose the Insert Move for GAP. It moves a single flight from its current gate to another gate. $(i, k) \rightarrow (i, l)$ denotes moving flight i from gate k to gate l. Figure 3.1 illustrates the Insert Move. The figure shows tbe current solution $S = \{(1, 1), (2, 2), \mathbf{(3, 1)}, (4, 2), (5, 1), (6, 2)\}$ and a new solution $S' = \{(1, 1), (2, 2), \mathbf{(3, 2)}, (4, 2), (5, 1), (6, 2)\}$ after the Insert Move has been applied.

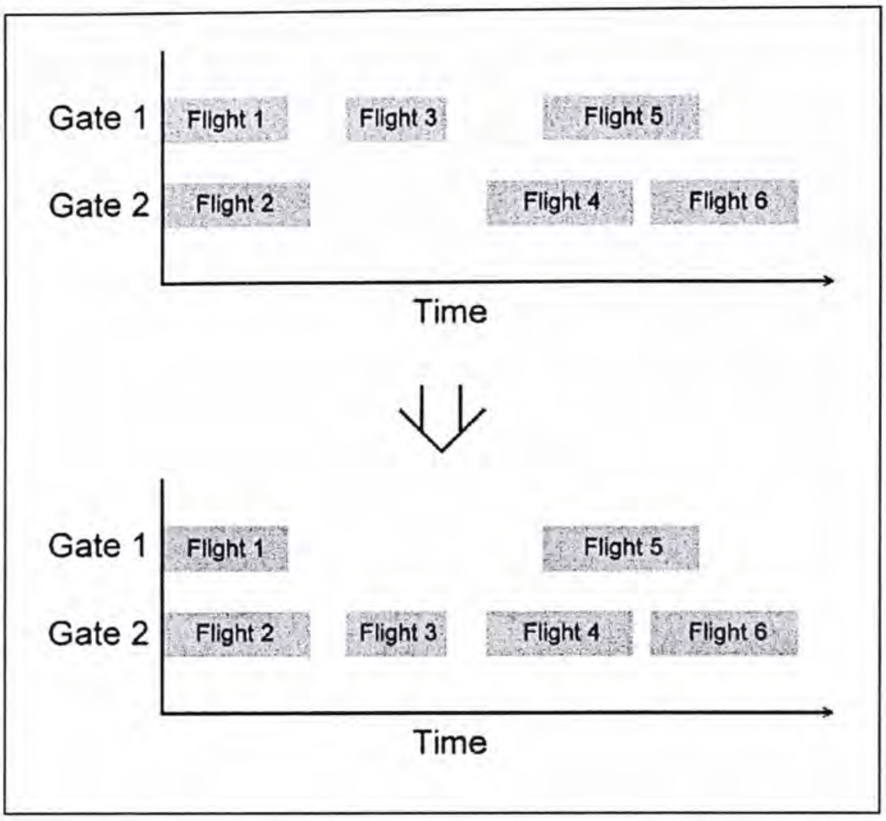


Figure 3.1 Example of Insert Move *(3, 1)→(3, 2)*

3.4.2 Exchange Move

Exchange moves define another type of neighborhood structure, which has also been suggested by Xu and Bailey [2001]. Unlike an Insert Move, an Exchange Move involves two or more gate reassignment for flights. They use two kinds of exchange move: (1) Exchange I Move, and (2) Exchange II Move.

Exchange I Move exchanges two flights and their gate assignments. $(i, k)\leftrightarrow(j, l)$ denotes moving flight i from gate k to gate l, while moving flight j from gate l to gate k. Exchange II Move exchanges two flight pairs in the current assignment. $(i_1, i_2, k)\leftrightarrow(j_1, j_2, l)$ denotes moving flights i_1 and i_2 are from gate k to gate l, while moving flights j_1 and j_2 from gate l to occupy gate k. i_1 and i_2 are two consecutive flights assigned to gate k before the move. j_1 and j_2 are two consecutive flights assigned to gate l before the move. Examples are shown in Figure 3.2 and 3.3.

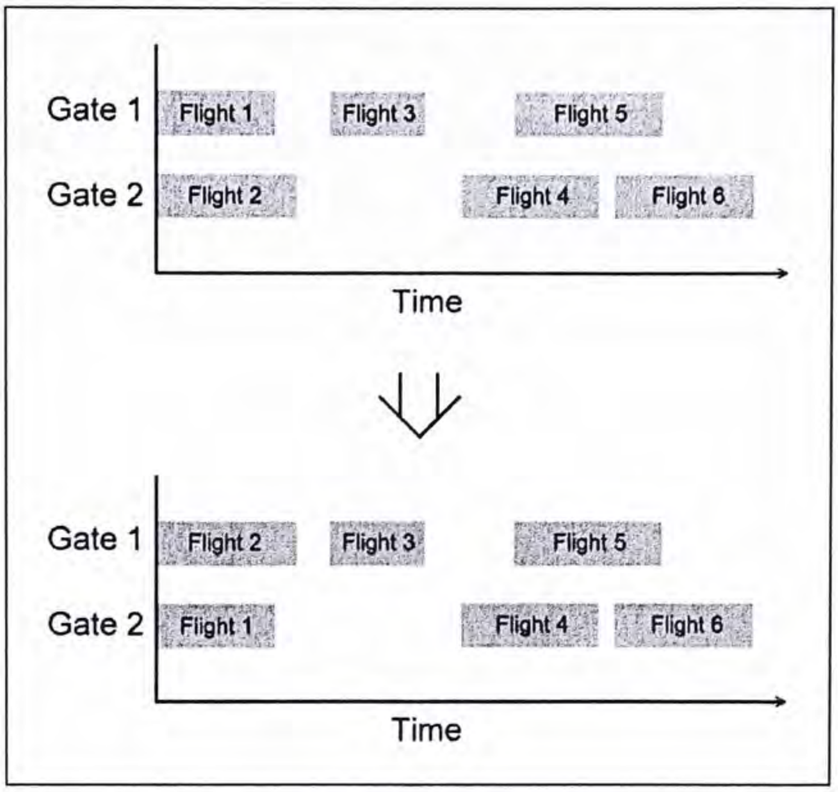


Figure 3.2 Exchange I Move *(1, 1)↔(2, 2)*

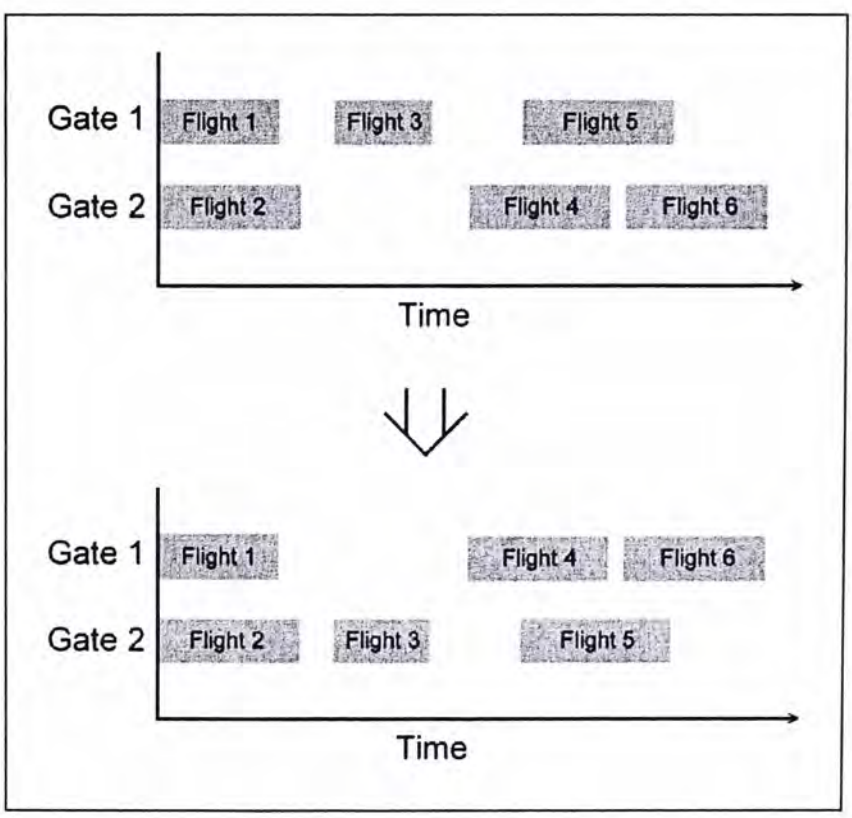


Figure 3.3 Exchange II Move *(3, 5, 1)↔(4, 6, 2)*

3.5 Short Term Memory Structure

TS enhances the performance of a local search method by using a short term memory structure. The short term memory operates by imposing restrictions on the moves that are permitted to be incorporated in neighborhood search. Once a move is made, we mark the move as "**tabu**" effective for a time period so that the algorithm does not visit the previously visited-solutions. For example, after the search has performed a move from solution *S* to *S'*, the move performed is recorded. Within a certain period, it will forbid the reversal of that move. This mechanism prevents the search from being trapped in a local optimum.

In general, the tabu short term memory stores the moves that have been previously used and the moves are declared forbidden for a given number of iterations (called the **tabu tenure**). The tabu tenure is generated from a random uniform distribution function (denoted by *U(a, b)* where *a* and *b* are two parameters denoting the lower and upper bound of the interval). The interval of the function can be different for different types of neighborhood structures. More about the tabu tenure will be discussed later in Section 3.9.1.1.

The effect of the short term memory may be viewed as a way to restrict the size of the neighborhood *N(S)* of solution *S* since some solutions are forbidden by the tabu list. We denote $N_T(S)$ to be the reduced neighborhood and by definition, $N_T(S) \subseteq N(S)$. Since the tabu list stores the searching history, the search will avoid previously visited-solutions and it will be guided to new regions in the solution space.

Xu and Bailey [2001] use three tabu lists: (1) Tabu(), (2) TabuI(), and (3) TabuII() for the three corresponding neighborhood structures: (1) Insert Move, (2) Exchange I Move, and (3) Exchange II Move.

- Tabu([*(i, k)*→*(i, l), Expire*]) prevents Insert Move of *(i, l)*→*(i, k)*
- TabuI([*(i, k)*↔*(j, l), Expire*]) prevents Exchange I Move of *(j, l)*↔*(i, k)*
- TabuII([(i_1, i_2, k)↔(j_1, j_2, l), *Expire*]) prevents Exchange II Move of (j_1, j_2, k)↔(i_1, i_2, l)

Note that *Expire* = *Tenure*+*Iter* where *Iter* is the current iteration and *Tenure* is the tabu tenure that is a randomly generated integer representing the duration of this restriction being valid. Thus, when current iteration is more than *Expire*, then the tabu restriction is released. The following example illustrates the implementation of the tabu lists.

Again, we use Figure 3.1 to illustrate an example. Suppose, at iteration 5, we have a current solution *S* = *{(1, 1), (2, 2),* **(3, 1)**, *(4, 2), (5, 1), (6, 2)}* and the search is performing an Insert Move *(3, 1)*→*(3, 2)* (flight 3 moves from gate 1 to gate 2). Thus, *S* moves to a new solution *S'* = *{(1, 1), (2, 2),* **(3, 2)**, *(4, 2), (5, 1), (6, 2)}*.

After that, the Insert Move is stored in the Insert Move tabu list, Tabu(). Moreover, it generates the tabu tenure and calculate the expire iteration. For example, if the generated tabu tenure is 7 iterations, the expiration iteration is 7 + 5 = 12, i.e. Tabu([*(3, 1)*→*(3, 2), 12*]). Then, before iteration 12, the Insert Move *(3, 2)*→*(3, 1)* is prohibited. However, the tabu list does not have effect on the neighborhood search after iteration 12.

3.6 Aspiration Criterion

Although the three tabu lists help the search from being trapped in a local optimum, they create a new problem. When a move is marked as a tabu, this typically results in disallowing more than one solution. Some of these solutions might be of excellent quality. To overcome this problem, an aspiration criterion is introduced. An aspiration criterion can override a solution's tabu state, thereby including the otherwise-excluded solution in the candidate list. A commonly used aspiration criterion is to allow solutions which are better than the currently-known best solution.

We also apply this aspiration criterion in our TS framework. A move is marked as a tabu, let say an Insert Move *(1, 2)→ (1, 3)*. Normally, it is not possible to perform the above Insert Move. However, if the Insert Move leads a solution better than the current best solution, the search will accept this solution.

3.7 Intensification and Diversification Strategies

Intensification and **diversification strategies** are two important components of TS. The use of these strategies is to help the search to explore a wider solution space and at the same time, more deeply in a potentially good region. A good design of the strategies can increase the effectiveness of the TS.

Generally, the objective of intensification strategies is to guide the search to attractive regions and search them more thoroughly. For example, when a good solution is found, the solutions close to the good solutions are also evaluated. On the contrary, diversification strategies are the rules designed to drive the search into new regions. Usually, the diversification strategies accomplish its objective by modifying choice rules to bring the current solution to **infrequently visited and dissimilar** solutions[4] [Glover and Laguna, 1997].

The effect of Intensification and diversification is attained by an **oscillation mechanism** between different neighborhood search moves [Glover and Laguna, 1997].

[4] Two solutions are considered dissimilar if many of their attributes, or flight assignments are different.

In the other words, we can introduce intensified effect and diversified effect to the search by choosing Insert Move and Exchange Move in a proper manner.

Solutions with more different attributes (different gate assignments) are regarded as dissimilar and diverse. Under this aspect, since the change in attributes of the Exchange Move is more than the Insert Move, the diversity of the solutions in the Exchange Move neighborhood is greater than that of the solutions in the Insert Move neighborhood. For instance, let *S* be the current solution,

- $N_I(S)$ be the neighborhood of *S* by performing the Insert Move
- $N_{E1}(S)$ be the neighborhood of *S* by performing the Exchange I Move
- and $N_{E2}(S)$ be the neighborhood of *S* by performing the Exchange I Move.

We may say the diversity of the solutions in $N_{E1}(S)$ is greater than $N_I(S)$, and the diversity of the solutions in $N_{E2}(S)$ is greater than $N_{E1}(S)$. Thus, choosing Exchange Move generally gives a more diversified effect than choosing Insert Move.

The oscillation mechanism is achieved by controlling the usage of different neighborhood search moves. During the search, Insert Move is a default selection. This is because we want to exploit its intensification power and to explore one specific solution space region more thoroughly.

Unlike Insert Move, Exchange I Moves and Exchange II Moves are used less frequently. In our TS algorithm, there are three situations where the Exchange Moves will be invoked. First, under a normal situation, they are invoked every m_1 and m_2 iterations periodically. For example, when the number of iteration hits the factor of m_1, the search will select Exchange I Move once. Secondly, if the search cannot improve the overall best result for a given period, either one of the Exchange Move will be invoked for consecutively n_1 or n_2 times. The idea here is to induce a more significant change in the current solution and hence they are executed to enforce great diversification. Thirdly, if the search does not find a feasible solution from the Insert Move, it will switch to Exchange I or Exchange II move arbitrarily.

3.8 Tabu Search Framework

3.8.1 Initial Solution

The TS process starts with an initial solution which may be easily found by a greedy algorithm proposed by Ding et al. [2004]. Let E_j represents the earliest available time of gate j, G and F are the set of gates and flights at the airport, and $|F|$ denote the cardinality of set F. The greedy algorithm is presented in Algorithm 3.1.

Algorithm 3.1 Greedy Algorithm for Finding Initial Solution in GAP

Sort all the flights according to their departure times d_i in an ascending order. Set $E_j = 0$ for all j in G

for $i = 1$ to $|F|$ **do**

  Find gate j such that $E_j < a_i$ and E_j is maximized

  Set $x_{ij} = 1$, update $E_j = d_i$

end

We explain the algorithm by an example. Suppose we have two gates and n flights with departure times sorted in an ascending order (shown in Table 3.1). At first, E_j for the two gates are both zero. Therefore Flight 1 may be arbitrarily assigned to either one of the gates. Suppose it is assigned to gate 1. After gate 1 is occupied, the earliest available time of gate 1, E_1, is updated to the departure time of flight 1, 180. In the next iteration, flight 2 is assigned to gate 2 since it is the only gate with an earlier available time less than the arrival time of flight 2. As a result, E_2 is set to be 250. For flight 3, the earliest available time of gate 1 and 2 are all earlier than the arrival time, so we choose the gate with maximum earliest available time. Thus, flight 3 is assigned to gate 2. In iteration 4, although E_2 is greater than E_1, only E_1 is earlier than the arrival time of flight 4. Finally, flight 4 is assigned to gate 1. Table 3.2 summarizes the procedures of the greedy algorithm example.

The reason for choosing the gate with a maximal earliest available time is to minimize the idle time[5]. In iteration 3 of the example, if flight 3 is assigned to gate 1, the idle time is equal to 300 – 180 = 120. However, if flight 3 is using gate 2, the idle time is only 300 – 250 = 50.

Flight	Arrival Time	Departure Time
1	60	180
2	100	250
3	300	390
4	350	480

Table 3.1 Flight Data of Greedy Algorithm Example

Iteration	Flight	Before Iteration		Assignment	After Iteration		Idle time $a_i - E_j$
		E_1	E_2		E_1	E_2	
1	1	0	0	1	180	0	60–0 = 60
2	2	180	0	2	180	250	100-0 = 100
3	3	180	250	2	180	390	300-250 = 50
4	4	180	390	1	480	390	350-180 = 170

Table 3.2 Example of Greedy Algorithm

3.8.2 Tabu Search Algorithm

We will now describe the TS algorithm. The TS algorithm is similar to the algorithm by Xu and Bailey [2001]. We first set the initial feasible solution as the currently best solution and then start the neighborhood search move iteratively.

[5] Suppose flight *i* and flight *j* assigned to the same gate. The idle time is defined as the difference between the arrival time of flight *j* and departure time of flight *i*, given that the departure time of flight *i* is earlier than the arrival time of flight *j*.

In each iteration, one of the moves is selected based on the intensification and diversification strategies. That is, the default neighborhood search move is the Insert Move. The Exchange I Move and Exchange II Move are selected when the number of iterations hits the multiple of two parameter m_1 and m_2, respectively or no feasible Insert Move can be performed. If the best solution has not been improved for *NoImp* consecutive iterations, either Exchange I Move or Exchange II Move will be executed in the next n_1 or n_2 consecutive iterations.

If the selected move is an Insert Move, Exchange I Move or an Exchange II Move, the corresponding neighborhood $N_T(S)$ is produced. The pseudo codes of building neighborhoods are presented in Pseudo Code 3.1, 3.2 and 3.3. For the Insert Move, the procedure scans through every flight to check the feasibility to move from its currently assigned gate g_i to another gate j (provided that there is no conflict with other flights). All the moves that are not restricted by the tabu list or satisfy the aspiration criterion are selected to build the legitimate solution set $N_T(S)$

For the Exchange I Move, we select two flights in each iteration and try to exchange their gate assignment. If the exchange is feasible and not restricted by the tabu list or it satisfies the aspiration criterion, the solution after the move will be included in $N_T(S)$. The procedure of Exchange II Move is nearly the same as Exchange I Move, except that each time we exchange two flights with another two flights. We provide the pseudo code for the three neighborhood search moves as follow:

Pseudo Code 3.1 Building Insert Move Neighborhood

Let S be the current solution, $N_T(S)$ be the neighborhood of S, and g_i be the gate assignment of flight i

for $i = 1$ to $|F|$ **do**

  for $j = 1$ to $|G|$ and $j \neq g_i$ **do**

    if Insert Move $(i, g_i) \rightarrow (i, j)$ is feasible

      if Insert Move $(i, g_i) \rightarrow (i, j)$ is non-tabu or satisfies aspiration criterion

        Generate a new solution S_t by applying the move,

        Set $N_T(S) = N_T(S) \cup S_T$

return $N_T(S)$

end

Pseudo Code 3.2 Building Exchange I Move Neighborhood

Let S be the current solution, $N_T(S)$ be the neighborhood of S, and g_i be the gate assignment of flight i

for $i = 1$ to $|F|$ **do**

  for $j = i$ to $|F|$ **do**

    if Exchange I Move $(i, g_i) \rightarrow (j, g_j)$ is feasible

      if Exchange I Move $(i, g_i) \rightarrow (j, g_j)$ is non-tabu or the satisfies aspiration criterion

        Generate a new solution S_t by applying the move,

        Set $N_T(S) = N_T(S) \cup S_T$

return $N_T(S)$

end

Pseudo Code 3.3 Building Exchange II Move Neighborhood

Let S be the current solution, $N_T(S)$ be the neighborhood of S, g_i be the gate assignment of flight i, and CF_i be the consecutive flight after flight i.

for $i = 1$ to $|F|$ **do**
  for $j = i$ to $|F|$ **do**
    if Exchange II Move $(i, CF_i, g_i) \rightarrow (j, CF_j, g_j)$ is feasible
      if Exchange II Move $(i, CF_i, g_i) \rightarrow (j, CF_j, g_j)$ is non-tabu or satisfies the aspiration criterion
        Generate a new solution S_t by applying the move,
        Set $N_T(S) = N_T(S) \cup S_T$
return $N_T(S)$
end

The TS algorithm is presented in Algorithm 3.2. First, an initial feasible solution is generated by the greedy algorithm and it is set as the current best solution. The type of neighborhood search moves is decided by the parameter *MoveSelection*. The default is Insert Move. However, *MoveSelection* is controlled by another parameter *NextMove*. For example, if Insert Move cannot provide a feasible solution in this iteration, then *NextMove* is set to be Exchange I Move and force the next iteration to run Exchange I Move. Similarly, if no feasible solution can be generated by using Exchange I Move in this iteration, then *NextMove* is set to be Exchange II Move.

When $N_T(S)$ is non-empty, the search will evaluate all solutions $\overline{S} \in N_T(S)$ to find the best one. The best solution in $N_T(S)$ (but not necessarily the best solution in overall search history) is used to update the current solution S. If this solution is better than the current best solution, it will be regarded as the new current best solution. The move for transforming S to $\overline{S}$ is recorded in the corresponding tabu list for *Tenure* iterations where *Tenure* is the parameter of tabu tenure. Within the next

Tenure iterations, the reversal of the move is prohibited unless it provides an overall best solution.

There is a counter *NoImp*. If the search cannot improve the overall best solution in this iteration, *NoImp* is incremented by 1. When *NoImp* exceed a threshold θ, the search will randomly choose Exchange I Move or Exchange II Move and run it for next n_1 or n_2 iterations, respectively. The purpose of doing this is to guide the search to other region in the search space by performing consecutive diversified moves.

Algorithm 3.2 Tabu Search Algorithm

```
Generate an initial feasible solution S by Greedy Algorithm
set S* = S
NextMove = NULL
for Iter = 1 to Iter_max do
   if (NextMove==NULL) MoveSelection = Insert Move
   if (mod (Iter, m_1) == 0) or (NextMove== Exchange I Move)
      MoveSelection =Exchange I Move
   if (mod (Iter, m_2) == 0) or (NextMove== Exchange II Move)
      MoveSelection =Exchange II Move

   Perform the move of MoveSelection, and create N_T(S)
   if ((N_T(S) == ∅) and (MoveSelection==Insert Move))
      NextMove = Exchange I Move
      break
   if ((N_T(S) == ∅) and (MoveSelection== Exchange I Move))
      NextMove = Exchange II Move
      break

   Select a solution S̄ ∈ N_T(S) that minimizes Z(S̄)
   Set the move tabu for Tenure iterations
   if Z(S̄) < Z(S*), set S* = S̄ and NoImp = 0
   else NoImp = NoImp+1
   if (NoImp > θ),
      Set NextMove= Exchange I Move for n_1 Iterations or
      NextMove= Exchange II Move for n_2 Iterations
      Set NoImp = 0
   Set S = S̄
return S*
```

3.9 Computational Studies

In this section, we assess the performance of the TS algorithm. First, we perform a fine-tuning method to obtain the desirable parameter values. Then we compare the performance of the fine-tuned TS algorithm with the original TS algorithm by Xu and Bailey [2001].

3.9.1 Parameters Tuning

The TS algorithm involves a set of parameters or options that need to be tuned appropriately in order to achieve the best results. In the TS algorithm for GAP, the parameters needed to be tested include the tabu tenure, move selection options, and the total number of iterations. However, Xu and Bailey [2001] do not test these parameters but set them arbitrarily or by common sense in their TS approach for GAP. Ding et al. [2005], Lim et al. [2005], and Wang and Lim [2005] follow the works of Xu and Bailey and use the same parameter setting as them.

In fact, Xu, Chiu and Glover [1998] suggest to fine-tune a TS algorithm using statistical tests. The fine-tuning method is called the Tree Growing and Pruning Method. They propose this method to fine-tune a TS algorithm for a telecommunications network design problem. The fine-tuned TS algorithm yields solutions better than those from the TS without fine-tuning. Since the method is quite general, it is believed that it can also be applied to the TS algorithm in GAP.

3.9.1.1 Fine-tuning a Tabu Search Algorithm with Statistical Tests

. The steps of the method are shown as follows:

Step 1 Suppose that there are k factors for tests and they are ranked in order of decreasing importance, $F = (F_1, F_2, ..., F_k)$. Chose a set of treatments, $T_i=(T_{i1}, T_{i2}, ..., T_{it_i})$, for each factor F_i.

Step 2 Initiate the search tree by considering factor F_1 at the root node, which is also considered the unique initial leaf node. Define level $i = 1$.

Step 3 For every currently existing leaf node at level i, grow t_i branches where each branch represents one of the treatments in T_i. Run the test problems for each branch and collect the test results, thereby creating a leaf node at level $i + 1$. The nodes at level i lose their status as leaf nodes.

Step 4 For each set of leaf nodes (at level $i+1$) that share the same parent node, use Friedman's test to determine the best treatments. Prune (eliminate) any leaf nodes that are inferior to the best treatments.

Step 5 For each pair of currently remaining leaf nodes that do not share a parent node, and which has not yet been examined at this step, apply the Wilcoxon's test. If the members of the pair under investigation are significantly different, prune the one which is inferior.

Step 6 $i = i + 1$. If $i > k$, go to Step 7; else go to Step 3.

Step 7 Every currently remaining leaf node represents one of the best configurations for the algorithm. Terminate.

In step 1, we identify the factors needed to be tested and rank them in the order of decreasing importance (the most important factor will be tested first). In our TS algorithm, we arrange the importance of the factors in the same order as Xu et al. [1998] (some factors used by Xu et al. do not apply in our TS algorithm and those will be excluded): (1) tabu tenure, (2) move selection strategies, (3) frequency of Exchange Move selection. Therefore we have $k = 3$ factors for testing, i.e. $F = (F_1, F_2, F_3)$.

At level 1, we consider F_1 as the initial leaf node. For F_1, we initiate a set of treatments[6] $T_1 = (T_{11}, T_{12}, ..., T_{1t_1})$ to be its branches. Then, we run the test problems for each branch. The procedure requires Friedman's test (details are given in Appendix 1) to determine the best treatment and eliminate other treatments that are inferior to the best treatment. Since the distribution of the test results is unknown, Friedman's test is used to analyze the test results as this non-parametric statistical test makes no assumptions about the distribution of the data.

The unpruned branches will become the leaf nodes at next level. Each node will grow new branches for the treatments of F_2. Again, the Friedman's test is applied to prune the inferior branches. Branches which do not share the same parent node are examined and may be pruned by Wilcoxon's signed rank test (details are given in Appendix 2). It is stated in Xu et al. [1998] that since the treatments are tested on the same problem set, it is assumed that the test results series have continuous distributions that differ only with respect to their means. This assumption allows the use of Wilcoxon's signed rank test.

The fine-tuning procedure proceeds by branching and pruning with the use of two tests. It terminates when all factors are examined. The remaining leaf node represents one of the best configurations for the TS algorithm.

3.9.1.2 Tabu Tenure

One important parameter in TS is the tabu tenure. If the tabu tenure is too small, the time of the tabu list being active is short and may not be able to guide the search from being trapped by local optima.

[6] Treatments of a factor refer to different parameter settings of that factor

For many TS algorithms, the tabu tenures are generated randomly within certain intervals [*a*, *b*] and they may be different for different types of neighborhood search moves. We use *U(a, b)* to represent the function that return an integer between *a* and *b* randomly, and we have $U(a_1, b_1)$, $U(a_2, b_2)$, $U(a_3, b_3)$ for Insert Move, Exchange I Move, Exchange II Move respectively. The tabu tenure test is to determine the best values for *a* and *b*. Glover [1993] suggest a proper way to identify a good tabu list size is to watch for the deterioration in solution quality when the size is too large and the occurrence of cycling[7] when the size is too small (cycling will also cause deterioration in solution quality as the search only focus on a region of the solution space). The best sizes lie in an intermediate range between these extremes. Therefore, we choose the tabu tenure from Xu and Bailey [2001] as starting value. Then we gradually increase it until the result gets worse. The test sets are shown in Table 3.3 (The value used by Xu and Bailey [2001] is Set 1).

We randomly generate 30 test problems and test the parameter set for each treatment. The size of test problems is moderate – 40 gates and 200 flights. On average, there are 5 flights to be assigned to a gate which is similar to realistic utilization. The number of iterations is 40*|*G*|-500 = 1100 (where |*G*| is the total number of gates) which is suggested by Xu and Bailey [2001]. If the number of iterations is too large, all runs may get near optimal solution and we cannot identify the differences between the treatments.

In level 1, we prepare 8 treatments to test the tabu tenure. The parameter settings of 8 treatments and their rank sums are shown in Table 3.3.

We set the confidence level 1-α, where α = 0.10 and calculate the Friedman's test statistics F_r = 56.7, which is greater than $\chi^2_{0.1,11}$ = 12.02. Therefore, we conclude

[7] The search endlessly revisits a set of solutions is also called cycling).

that changing the values of tabu tenures will have an effect on the outcome at confidence level 0.90. From Table 3.3, Set 6 has the minimum rank sum, so we compare other data sets with Set 6 and prune them at the confidence level 0.90 if

$$R_i \geq R_6 + z_{0.1} \times \sqrt{30 * 8 * (8+1)/6} = 111.3$$

Therefore, Set 6 and 7 are taken into future consideration.

Set	1	2	3	4	5	6	7	8
a_1	2	5	8	11	14	17	20	23
b_1	5	8	11	14	17	20	23	26
a_2	3	6	9	12	15	18	21	24
b_2	7	10	13	16	19	22	25	28
a_3	4	7	10	13	16	19	22	25
b_3	8	11	14	17	20	23	26	29
R_i	190	183	149.5	144.5	116	87	97.5	112.5

Table 3.3 Tests on Tabu Tenure

3.9.1.3 Move Selection Strategies

One of the intensification and diversification strategies is based on the oscillation between Insert Move and Exchange Moves. In our TS algorithm, the default move is Insert Move and the Exchange Moves are occasionally used. The Exchange I Move and Exchange II Move are executed once in every m_1 and m_2 iterations, respectively. In this subsection, we attempt to find the best parameter set for m_1 and m_2.

For each of the unpruned parameter set (Set 6 and 7), we create eight branches and further test the move selection parameter sets shown in Tables 3.4 and

3.5. Sets 11 and 19 are used by Xu and Bailey [2001] and Ding et al. [2004]. We gradually increase the value of the parameters from Set 11 to Set 16. In Set 16, the value of m_1 and m_2 are very large in order to make the Exchange Move occurs infrequently.

The ratio of m_1 and m_2 is kept at 5:7 except for Sets 9, 10, 17 and 18. The value of parameter m_1 in Set 10 and 18 and the value of parameter of m_2 in Set 9 and Set 17 are set to zero. This means that Exchange I or Exchange II Move is not used in these treatments.

Set	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**
m_1	5	0	5	8	11	14	17	20
m_2	0	7	7	11	15	20	24	28
R_i	230	216	90	89	93	117	117	128

Table 3.4 Tests on Move Selection Strategies for Set 6

Set	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**
m_1	5	0	5	8	11	14	17	20
m_2	0	7	7	10	13	16	19	23
R_i	226	217	91	81	110	110	108	137

Table 3.5 Tests on Move Selection Strategies for Set 7

The Friedman's test statistics F_r are 123.3 and 121.3 from Table 3.4, and 3.5, respectively. As the test statistics are greater than $\chi^2_{0.1,7}$ = 12.02. This suggests that the move selection strategies will affect the outcome at the confidence level 0.90.

From Table 3.4, since Set 12 has the minimum rank sum, we prune other sets at the confidence level 0.90 if

$$R_i \geq R_{12} + z_{0.1} \times \sqrt{30*8*(8+1)/6} = 113.3$$

Thus, Set 11 and 13 are kept for further analysis. For Table 3.5, Set 20 has the minimum rank sum, and then we can prune other sets at the confidence level 0.90 if

$$R_i \geq R_{20} + z_{0.1} \times \sqrt{30*8*(8+1)/6} = 105.3$$

Thus, Set 19 is reserved.

After the Friedman's test, we have five remaining sets at this level. These are Sets 11, 12, 13, 19 and 20. Since they are derived from two different parent nodes (Sets 6 and 7), according to Step 5 of the fine-tuning method, we may apply the Wilcoxon's signed rank test to prune the sets which are significantly dominated by others.

We set the confidence level 0.90, i.e. z_α is 1.28. By following the procedure in Appendix 2, different values of the test statistic z_0 are obtained and they are reported in Table 3.6. The hypothesis (two sets are identical) will be rejected if z_0 are smaller than $-z_{0.1}$ = -1.28 or greater than $z_{0.1}$ = 1.28. Therefore, Set 12, 13 and 19 are pruned.

Set Pair	**(11, 19)**	**(12, 19)**	**(13, 19)**
z_0	-1.29	-0.01	0.54
Set Pair	**(11, 20)**	**(12, 20)**	**(13, 20)**
z_0	0.55	1.32	1.63

Table 3.6 Wilcoxon's Test on Move Selection Strategies

3.9.1.4 Frequency of Exchange Moves

If the overall best solution has not been improved for the past 50 consecutive iterations, either one of the Exchange Moves will be called. The probabilities of choosing Exchange I Move and Exchange II Move are identical and the chosen Exchange Move will be performed for consecutively n_1 or n_2 iterations (n_1 is for Exchange I Move and n_2 is for Exchange II Move). We attempt to find the best settings for n_1 and n_2. To best of our knowledge, there is no published work on the use of n_1 and n_2 in a TS algorithm for the GAP. However, Xu et al. [1998] use the similar parameters for another problem. Therefore, we take them into our reference.

We initiate six branches to the unpruned sets, 11 and 20. The setting is based on Xu et al. [1998]. In their paper, they propose a Swap Move (this move is similar to the Exchange Move) on the TS algorithm for solving a telecommunications network design problem. They test the parameter of frequency of Swap Move with values 3, 5 and 10. In our experiment, we will test the values 0, 1, 3, 5, 7 and 10.

The Friedman's test statistics are calculated from Table 3.7 and 3.8. We have F_r = 5.76 and 2.32, respectively. As the test statistics are smaller than $\chi^2_{0.1,5}$ = 9.24, we conclude that the frequency of Exchange Moves has no effect on the performance of the algorithm. Therefore, we arbitrarily choose the set with minimum rank sum in each table. They are Set 27 and 36.

After that, we apply Wilcoxon's signed rank test. From Table 3.9, it can be seen that Set 36 dominate Set 27. Therefore, we prune Set 27.

The entire tuning procedure is shown in Figure 3.4. The number at each node in the tree indicates the parameter set number. An "X" on a branch indicates that its leaf node is pruned by Friedman's test and "XX" indicates that the leaf node is pruned by the Wilcoxon' signed-rank test. To the end, Set 36 remains and we set it to be the best parameter configuration in the TS algorithm.

Set	**25**	**26**	**27**	**28**	**29**	**30**
n_1	0	1	3	5	7	10
n_2	0	1	3	5	7	10
R_i	101.5	103	93.5	95.5	115.5	121.5

Table 3.7 Tests on Frequency of Exchange Moves for Set 11

Set	**31**	**32**	**33**	**34**	**35**	**36**
n_1	0	1	3	5	7	10
n_2	0	1	3	5	7	10
R_i	113	102.5	102	114.5	100	98

Table 3.8 Tests on Frequency of Exchange Moves for Set 20

Set Pair	***(27, 36)***
z_0	1.78

Table 3.9 Wilcoxon's Test on Frequency of Exchange Moves

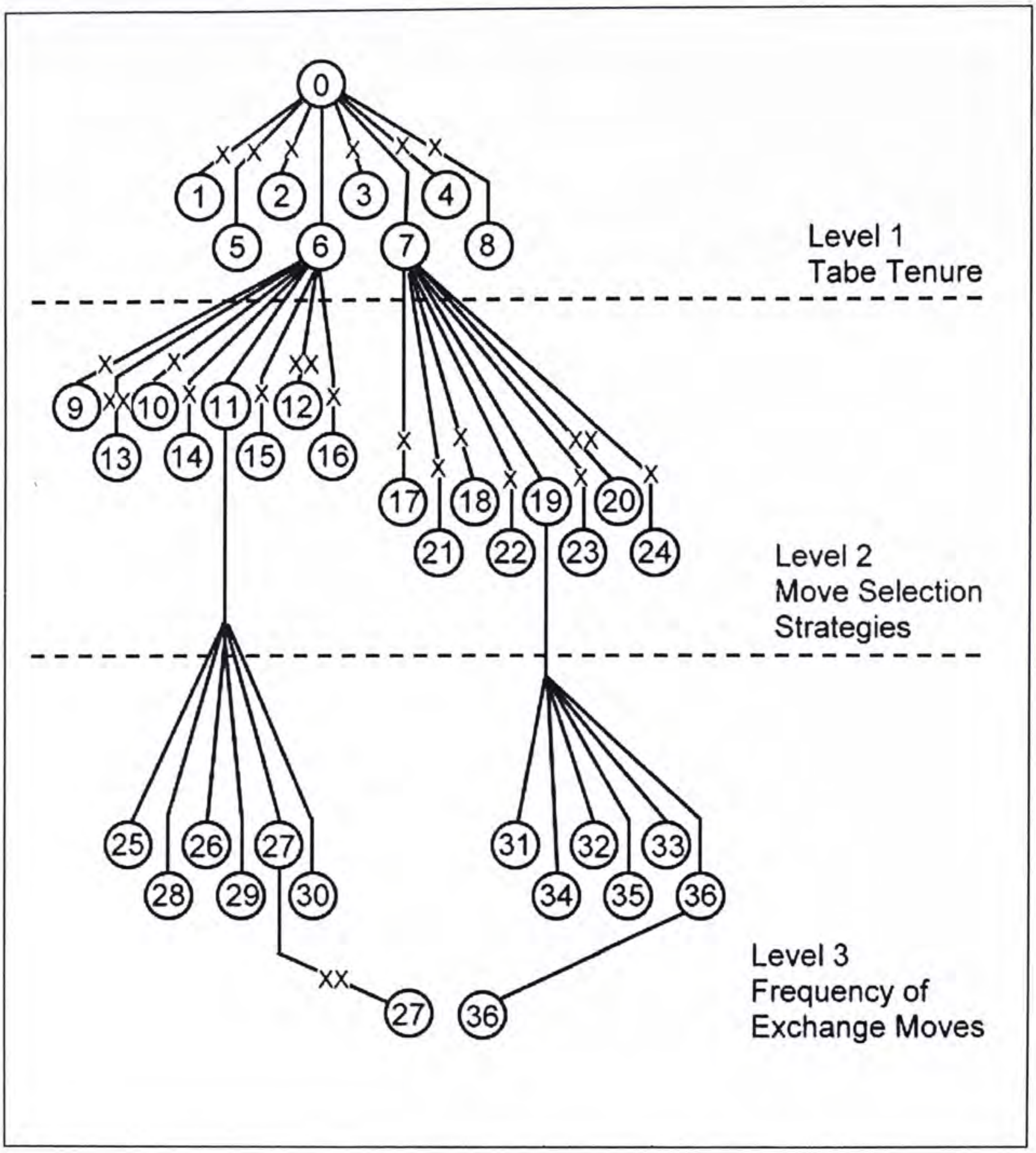


Figure 3.4 Tree of the Fine-tuning Procedure for TS (refer to Xu et al. [1998])

3.9.2 Comparison the Fine-tuned TS with original TS

We summarize the parameter setting in Table 3.10. The main difference between fine-tuned TS and the TS without fine-tuned parameter values are the parameter setting of tabu tenure and frequency of Exchange Moves.

Parameter		Fine-tuned TS	Original TS
Tabu Tenure	Insert Move	[20, 23]	[2, 5]
	Exchange I Move	[21, 25]	[3, 7]
	Exchange II Move	[22, 26]	[4, 8]
Move Selection Strategies	Insert Move	Basic selection	Basic selection
	Exchange I Move	Every 8 iterations	Every 5 iterations
	Exchange II Move	Every 11 iterations	Every 7 iterations
Frequency of Exchange Moves	Exchange I Move	10 consecutive runs if no improvement	1 run if no improvement
	Exchange II Move	10 consecutive runs if no improvement	1 run if no improvement

Table 3.10 Parameter Setting of Fine-tuned TS and Original TS

To test the performance of the fine-tuned TS, we setup nine cases [Xu and Bailey, 2001] of different problem sizes. For each case, we generate ten problem instances and test them by the fine-tuned TS and the original TS. The average objective values of nine cases are shown in Table 3.11.

Overall, the performance of fine-tuned TS is slightly better than the original TS. The average percentage improvement over the nine cases is only 0.5%. This indicates that the original TS parameter setting already produces very good solutions. As we find in Section 3.9.1.3, the frequency of Exchange Moves does not have significant effect on the performance of TS. Therefore, the only factor that contributes to a better performance should be tabu tenure.

However, a larger value of tabu tenure also has tradeoff. From Table 3.11, we can also see that the computational time of fine-tuned TS is slightly longer. This may due to the larger tabu tenure size and more time is spent on checking larger tabu lists.

Problem Size	Fine-tuned TS		Original TS		Percentage of Fine-tuned TS to Original TS
	Average Objective Value	Time (sec.)	Average Objective Value	Time (sec.)	
80 X 10	227676	2.3	227925	2.2	0.11%
120 X 15	423339	5.9	428356	5.8	1.18%
160 X 20	680390	12.5	687357	12.4	1.02%
200 X 25	983174	22.8	989369	21.8	0.63%
240 X 30	1419223	38.6	1425149	37.6	0.42%
280 X 35	1882503	58.0	1886217	57.4	0.20%
320 X 40	2451872	83.6	2458384	82.6	0.27%
360 X 45	3263543	118.6	3276896	116.2	0.41%
400 X 50	3615694	160.6	3620509	158	0.13%

Table 3.11 Performance of Fine-tuned TS and Original TS

Note: Percentage improvement = $\frac{Original\ \ TS - Fine\ \ Tuned\ \ TS}{Fine\ \ Tuned\ \ TS} \times 100\%$

3.10 Conclusions

In this chapter, we introduce the TS algorithm for solving GAP. Our algorithm is based on the algorithm proposed by Xu and Bailey [2001]. However, all the parameters of the original TS algorithm are set arbitrarily or by common sense. In our TS, the parameters are tuned by using Friedman's test and Wilcoxon's test.

We employ the best parameter setting to solve nine problems with different sizes. We also compared the performance of fine-tuned TS with the original TS in the testing. Computational experiments showed that better results are obtained by the fine-tuned TS than the original TS for in all the test problems.

Chapter 4 Path Relinking

4.1 Introduction

In this section, we describe a path relinking (PR) procedure to improve the performance of TS algorithms. PR is originally proposed by Glover and Laguna [1993]. This additional feature works like a plug-in for TS algorithms to improve their performance. The objective of PR is to combine elements of different good solutions found during the iterations of TS, to yield better solutions.

Literatures (examples are given in Section 2.3.2.4) show that PR can easily adapt to different meta-heuristics and improve the performance. In the gate assignment problem (GAP), although the performance of TS is already very good, we believe that PR can improve it further. To the best of our knowledge, this is the first application of path relinking to the GAP.

4.2 Principles of Path Relinking

PR is an approach to integrate intensification[8] and diversification strategies[9] in the context of TS [Glover and Laguna, 1997]. This approach generates new solutions by exploring trajectories that connect elite solutions[10]. It starts from one of the elite solutions, called an **initial solution**, and generates a sequence of intermediate solutions that leads toward the other solution (also one of the elite solutions), called the **guiding solution**. The sequence of solutions is similar to a path in the neighborhood space. The principle behind this method is that elite solutions to a problem should share some common characteristics. By generating paths between

[8] The objective of Intensification strategies is to guide the search to attractive regions and search them more thoroughly.
[9] The objective of diversification strategies is to guide the search to infrequently visited regions.
[10] An elite solution has an relatively good objective function value than other solutions. It may be a local minimum solution.

the elite solutions, one would reasonably hope to find better solutions [Ho and Gendreau, 2006].

Basically, PR starts with a collection of elite solutions called a **reference set *R***. The solutions in R can either be expanded or updated during both the TS procedure and the PR procedure. When PR is invoked, some of the solutions are extracted from the reference set R as initial and guiding solutions.

PR proceeds by incrementally moving the initial solution towards the guiding solution. This is accomplished by selecting moves (such as Insert Move and Exchange Moves) that introduces attributes contained in the guiding solution. We may call this processive mechanism as path-building process. During the path-building process, a sequence of solutions are produced and linked up to become a path-liked set. PR achieves intensification by generating paths from similar solutions, while achieves diversification by building paths from dissimilar solutions.

4.2.1 Example of Path Relinking

Let F be the set of flights. Let S_i and S_g be the initial and guiding solutions, respectively. Let D_a^b be the **level of dissimilarity** of solutions S_a and S_b. The level of dissimilarity can be calculated by:

$$D_a^b = \sum_{i \in F} d_i$$

where

$$d_i = \begin{cases} 1, & \text{if the assignment of flight } i \text{ in solution } a \text{ is different from that in solution } b; \\ 0, & \text{otherwise.} \end{cases}$$

Therefore, we can consider the level of dissimilarity as the distance between two solutions.

Let S_i = *{(1, 3), (2, 2), (3, 1), (4, 2), (5, 1)}* be an initial solution and S_g = *{(1, 2), (2, 1), (3, 3), (4, 1), (5, 3)}* be a guiding solution. Figure 4.1 shows an example of a PR process. The boldfaced number at each node represents the objective function value of the associated solution. At first, the dissimilarity of the initial solution and the guiding solution is 5. We perform an Insert Move on flight 4 and assign it to gate 1 (i.e., the same assignment as in the guiding solution). Hence, the dissimilarity becomes 4. In the next two moves, the dissimilarity is continuously reduced. At the solution with the objective function value of 130, flight 2 is moved from gate 2 to gate 1 yielding a solution better than the initial and guiding solution.

In this example, we see that the PR explores the solution space by creating a path from the initial solution to the guiding solution. By applying a series of moves (in this example is Insert Moves), a path is built, a sequence of intermediate solutions are created and a better solution may be found.

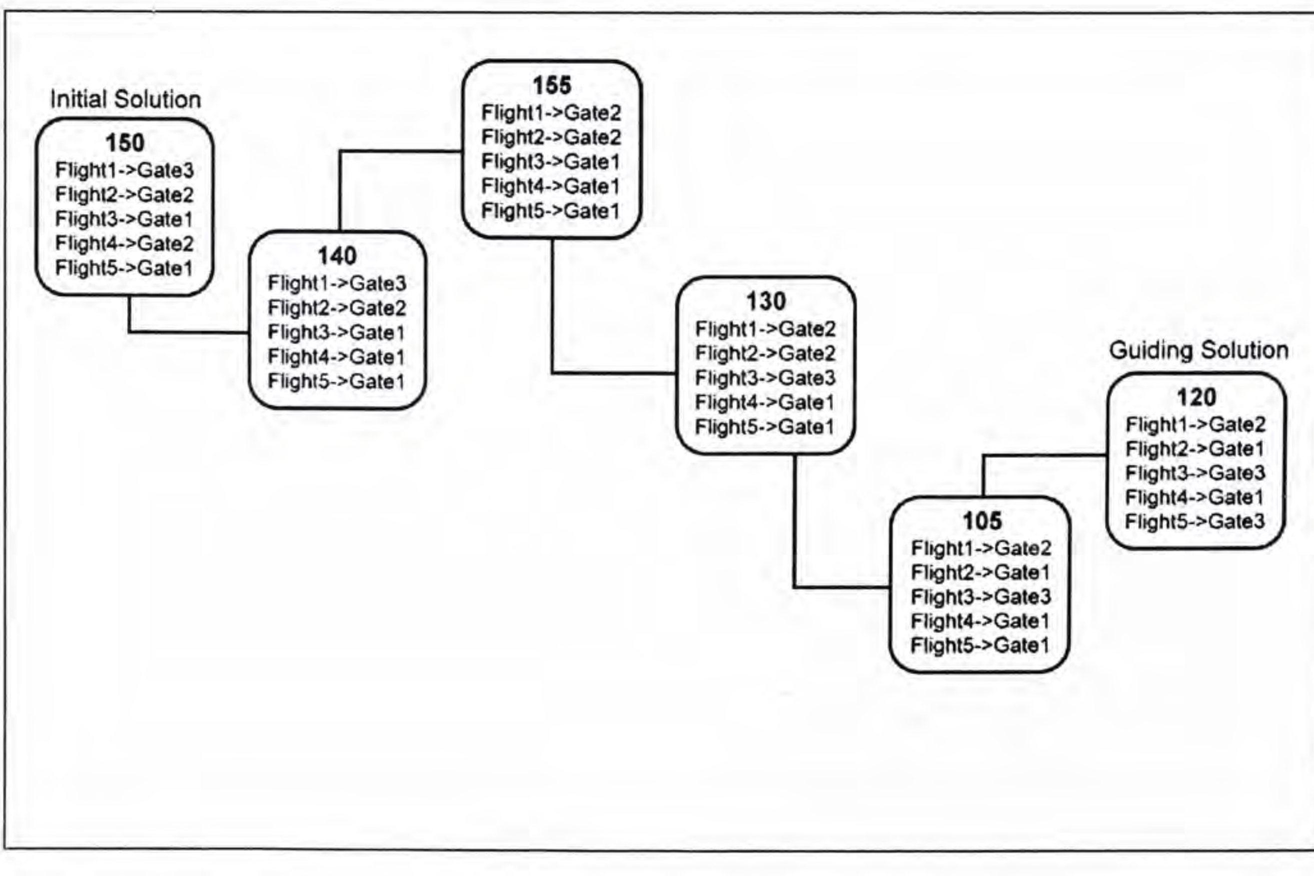


Figure 4.1 Example of a PR Process

4.3 Reference Set

Initial and guiding solutions are chosen from a solution set called **reference set** (denoted as ***R***). The purpose of *R* is to store up elite solutions that are found using TS or PR. From Figure 4.2, we can see the relationship between *R*, path-building process and TS. During TS and the path-building process, if a suitable solution is found (e.g., the best solution that becomes the best overall solution), it will be used to update *R*.

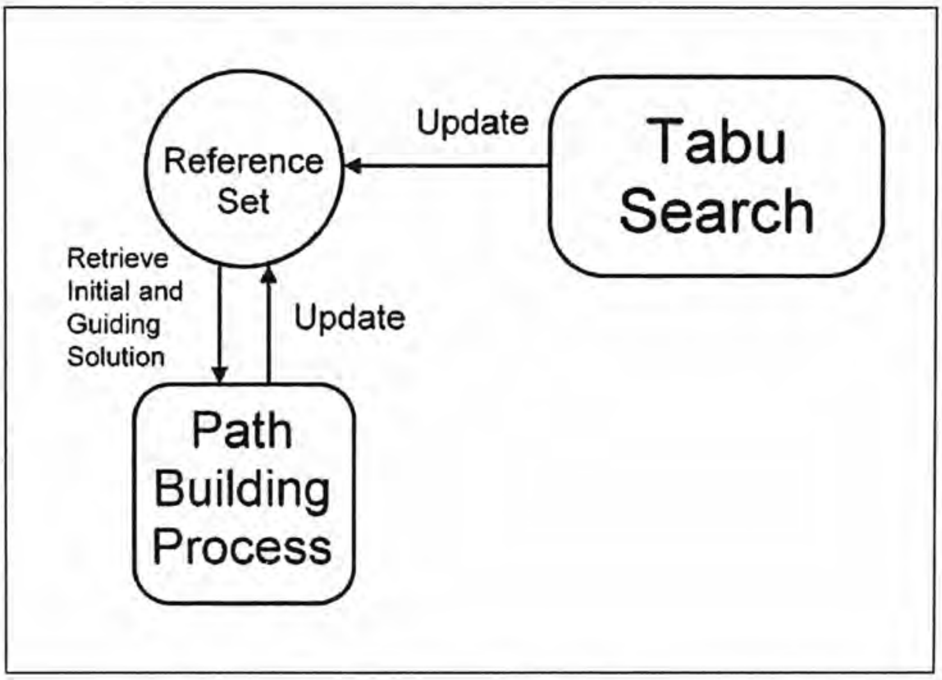


Figure 4.2 Relationship of Reference Set

The solutions in the reference set affect the quality[11] of the generated solutions and therefore must be carefully chosen. Usually, the solutions with a relatively high level of dissimilarity and quality are superior. Otherwise, a path built from similar solutions will be too short to find a better solution. Therefore, longer paths are preferred. A longer path gives a higher chance to produce good solutions. To build a longer path, we typically choose an initial and guiding solution with a higher level of dissimilarity.

[11] A high quality solution has an relatively good objective function value than other solutions. The meaning is same as elite solution.

Glover, Laguna and Marti [2004] propose six strategies to build the reference set *R*:

- **Strategy *S1***: *R* is built using the solutions that at some points of TS have became the best overall solution and become the best one.
- **Strategy *S2***: The reference set contains the best local minima encountered during the TS phase. This strategy is motivated by the fact that locally minimal solutions many share some common characteristics with optimal solutions. Linking these solutions may help find better solutions.
- **Strategy *S3***: This strategy selects R-improving local minima, i.e., local minimum solutions that have a better objective function value than those already in *R*. The idea behind is that better solutions are usually found when the search has proceeded for some time. This strategy can retain potentially good solutions found early during the search by paying less attention to the local minima obtained at a later stage (i.e. the solution will not be saved if it is only better than the worst solution in the reference set).
- **Strategy *S4***: This strategy considers both the objective values, and the level of dissimilarity. We define the **median position** of all solutions S_a in *R* relative to the best solution S_b as:

$$Median = \frac{\sum_{\substack{S_a \in R \\ S_a \neq S_b}} D_a^b}{|R| - 1}$$

where $|R|$ is the cardinality of the reference set. A solution S_a is included in *R* if (1) the objective function value of S_a is better than the best solution in *R*, or if (2) its objective function value is better than the worst solution in *R* and its level of dissimilarity relative to the best solution in *R* exceeds the median, i.e.

$D_a^b > Median$.

- **Strategy *S5***: This strategy aims to ensure both the quality and the diversity[12] of solutions in *R*. It starts with a large set of elite solutions (denoted as *Q*), and then partially fills *R* (Ho and Gendreau [2006] fill half of *R*) with the best solutions found to ensure the quality. It is then extended with solutions that differ significantly from those already in the reference set to ensure diversity. The level of diversity of *R* is computed before the extension. A solution will be collected if it can increase the level of diversity of *R*. The steps to calculate the diversity level and to build *R* are described as follows:

  1. Initialize *R* with solutions satisfying strategy *S1*.

  2. For each solution $S \in Q \setminus R$, compute the level of diversity Δ_S^R between solutions *S* and all solutions in $R : \Delta_S^R = \sum_{S_j \in R} \frac{D_{S_j}^S}{|R|}$.

  3. Extend *R* with solution $S \in Q \setminus R$ that maximize Δ_S^R.

- **Strategy *S6***: This strategy is similar to strategy *S5*. It differs from strategy *S5* in how to extend the reference set in step 3. In the implementation of this strategy, it uses the first two steps of strategy *S5*. In step 3, it extends *R* with solution $S \in Q \setminus R$ that minimizes Δ_S^R, instead of maximizing Δ_S^R. This strategy aims to intensify the search by grouping good solutions with similar characteristics to build *R*.

[12] Diversity of a solution set refers to the average dissimilarity of the solutions

4.3.1 Two-Reference-Set Implementation

To take advantage of the above strategies, we design a two-reference-set strategy. For simplicity, we call it Strategy ***S7*** although it is quite different from the strategies discussed previously. We maintain two-reference-set in PR procedure: a **volatile reference set R_V** to store high-quality solutions, and a **non-volatile reference set R_N** to store diverse solutions.

R_V is "volatile" because it temporarily collects the solutions with a better objective function value during tabu search. If other solutions have a better objective function value than the worst solution in R_V, they will be stored in R_V. If the addition of a solution makes R_V full, then the worst solution in R_V will be replaced by the new solution.

The **non-volatile reference set R_N** contains the solutions of different local minima and they will not be removed. The idea of R_N is to allow the PR procedure to build a path from a new elite solution with past elite solutions. The solutions in R_N are from R_V.

When the search cannot find a new overall best solution for a given number of iterations, it is necessary to diversify the search. Before go to a new region of the solution space, the best q solutions in R_V (they should be local minima) are collected by R_N. After that, the solutions in R_V are removed so that R_V can store other elite solutions in the new region. Thus, R_N functions as a warehouse to store the local minima from R_V which are come from different time.

In the path-building process, all solutions in R_V and R_N will be used. Therefore, the initial and the guiding solutions can be local minima solutions and newly found solutions. The high level of dissimilarity in the combined reference set allows building a longer path, and increases the chance to encounter new and good solutions.

4.3.1.1 Random Exchange Gate Move

To ensure the high level of dissimilarity in R_N, we introduce another move – Random Exchange Gate Move. Unlike the Insertion Move, and Exchange Move, Random Exchange Gate Move does not evaluate the candidates before taking the move. It selects the move randomly in order to guide the search to an unknown region.

The Random Exchange Gate Move is invoked when TS has not been able to improve the overall best known solution for a given number of iterations. In Random Exchange Gate Move, two gates are randomly selected, say gate k and gate l. All the flights originally assigned to gate k will be assigned to gate l while all the flights to gate l will be assigned to gate k. We denote it by $(k)\leftrightarrow(l)$. Since all the flights are exchanged, one Random Exchange Gate Move may involve a lot of changes in the gate assignment. Therefore it can provide a great diversification effect. An illustration of Random Exchange Gate Move is shown in Figure 4.3.

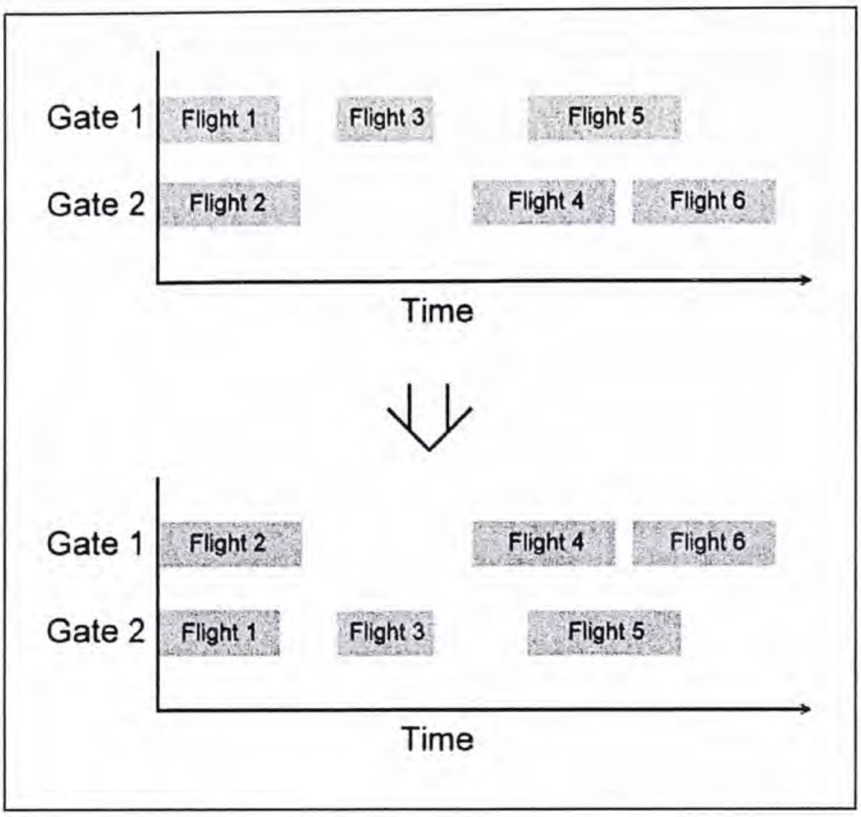


Figure 4.3 Random Exchange Gate Move *(1)↔(2)*

4.4 Initial and Guiding Solution

Each time we start the path relinking process, we choose two different solutions from the reference set. The two solutions are called initial and guiding solutions.

The choice of initial and guiding solutions is also an important issue in path relinking, since the quality of the newly generated solutions is highly dependent upon these solutions. Glover, Laguna and Marti [2004] suggest six selection criteria:

- ***C1***: The guiding and initial solutions are the best and worst solutions in *R*, respectively.
- ***C2***: The guiding solution is the best solution in *R*, while the initial solution is the second best.
- ***C3***: The guiding solution is the best solution in *R*, while the initial solution is one with the highest level of dissimilarity from the guiding solution.
- ***C4***: The guiding and initial solutions are chosen randomly in *R*.

- *C5*: The guiding and initial solutions have the highest level of dissimilarity in *R*.
- *C6*: The guiding and initial solutions are the worst and the best solutions in *R*. This criterion is contrary to criterion *C1*.

4.5 Path-Building Process

Path-building process is the core component of PR. During this process, paths are built by introducing progressively attributes of the guiding solution into solutions obtained by moving away from the initial solution. At the same time, the identical parts of the two solutions are kept unchanged. In GAP, identical parts of the initial and guiding solutions are easy to identify. For instance, if the assignment of flight *i* in the initial solution is the same as that in the guiding solution, this assignment for flight *i* is considered to be identical.

The path-building process proceeds with taking neighborhood search moves that gradually modify the initial solution until the guiding solution is reached. It is accomplished by using two neighborhoods $N_1(S)$ and $N_2(S)$. $N_1(S)$ contains all the solutions that can be reached from solution *S* by an Insert Move while taking into account the characteristics of the guiding solution. To make sure that it is moving towards the guiding solution, we temporary relax the constraint that the occupancy of two flights must not be present at the same time at a gate. Hence $N_1(S)$ may contain infeasible solutions. To force a solution back to the feasible region of the solution space, we introduce the second neighborhood. $N_2(S)$ makes up of solutions by moving a conflicted flight of an infeasible solution *S* to a gate to eliminate the conflict. While choosing the gate, the objective function value is also considered.

We further explain the two neighborhoods (see Figure 4.4). Let $S_i = \{(1, 1), (2, 2), (3, 1), (4, 2), (5, 1), (6, 2)\}$ be the initial solution and $S_g = \{(1, 1), (2, 2), (3, 2),$

(4, 1), (5, 2), (6, 1)} be the guiding solution. The identical attributes of S_i and S_g are *(1, 1)* and *(2, 2)*. Therefore, when constructing neighborhood $N_1(S_i)$, flight 1 and flight 2 will not be considered. Since the moves are guided by S_g, only four possible Insert Moves: *(3, 1)*→*(3, 2)*, *(4, 2)*→*(4, 1)*, *(5, 1)*→*(5, 2)*, and *(6, 2)*→*(6, 1)* are allowed even if there are more than two gates. The solutions made by applying these four Insert Moves are the members of the neighborhood $N_1(S_i)$. We evaluate the members and accept the move that gives the smallest objective function value. At the first iteration of the path-building process, we assume *(3, 1)*→*(3, 2)* gives the best objective function value. This move reduces the level of dissimilarity between the current solution and guiding solution by 1.

Assume *(5, 1)*→*(5, 2)* is the best move in the next iteration. Although this move results in a conflict with flights 4 and 6 at gate 2, we temporarily accept the move. In order to recover feasibility, the process uses another neighborhood $N_2(S)$. Since the conflict is created by flights 4 and flight 6, $N_2(S)$ contains all feasible solutions by moving the two flights to other gates at the same time. In this example, the best choice for moving flights 4 and 6 is gate 1 as it is the same as the assignment in guiding solution. However, if the moving of flight 4 or 6 to gate 1 cause a time conflict, then they will be moved to the gate that results in the best feasible solution.

In the path-building phase, if a solution is better than the current best solution, it will replace the current best solution and it will also be stored in *R*.

After one pass of path relinking is finished, the initial solution is removed from *R*. Then the algorithm continues to proceed the selection with another initial solution and guiding solution in *R* to perform path relinking again until the number of solutions in *R* is less than R_{min}. R_{min} is a pre-defined threshold of *R*. Algorithm 4.1 shows the procedure of path relinking.

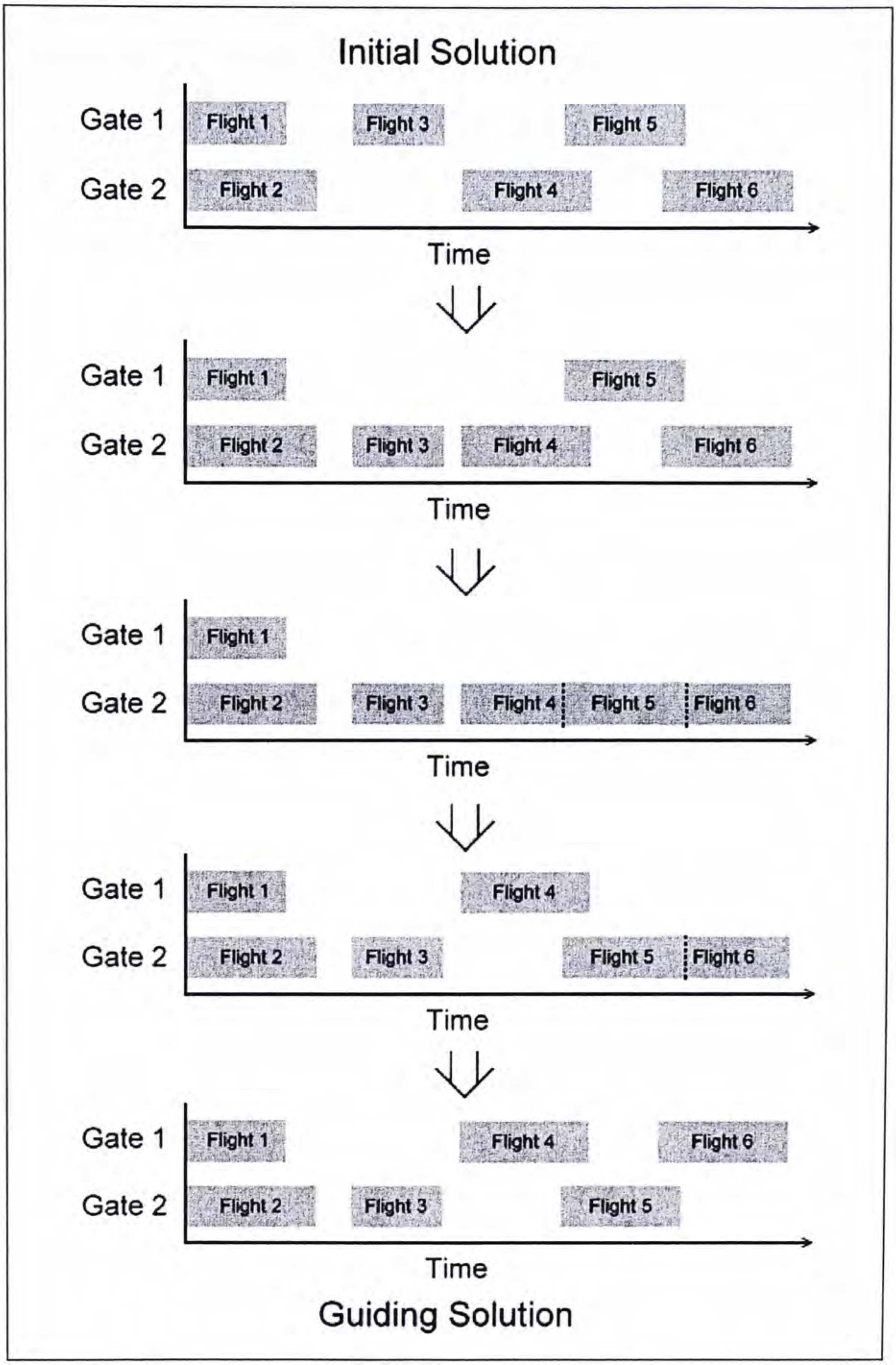


Figure 4.4 Example of the Path-Building Process

Algorithm 4.1 Path Relinking

Let S^* be the current best known solution

repeat

Select S_i and S_g in R according to selection criterion C*

Set $S = S_i$

repeat

Select $\overline{S} \in N_1(S)$ that minimize $Z(\overline{S})$

if $\overline{S}$ is feasible

set $S = \overline{S}$

else select $\hat{S} \in N_2(S)$ that minimizes $Z(\hat{S})$ and set $S = \hat{S}$

if $Z(S) < Z(S^*)$

set $S^* = S$,

$R = R \cup S^*$

until $S = S_g$

$R = R \setminus \{S_i\}$

until $|R| \leq R_{\min}$

return S^*

4.6 Tabu Search Framework with Path Relinking

In this section, we describe how PR is integrated with TS. Algorithm 4.2 shows the procedure. In general, this TS is similar to the one presented in the last chapter but it consists of PR and the reference set update procedure. Initially, the reference set *R* is empty. When the search gets a solution from any of the neighborhood search moves, the solution is added to *R* upon satisfying the chosen reference set update strategy *U** (choosing from strategy *S1* to *S6*). The Path-building process *PathRelinking(R, S*)* is called when the number of iterations equals to the factor of parameter m_{PR} which controls the frequency of PR. This process requires the input of reference set *R* and returns a solution S_p. If the PR process finds a new best solution, it will update the overall best result and return the solution to continue the TS algorithm.

Algorithm 4.2 Tabu Search with Path Relinking

```
Generate an initial feasible solution S by Greedy Algorithm
set S* = S, and R = ∅
NextMove = NULL
for Iter = 1 to Iter_max do
   if (NextMove==NULL) MoveSelection = Insert Move
   if (mod (Iter, m_1) == 0) or (NextMove== Exchange I Move)
      MoveSelection =Exchange I Move
   if (mod (Iter, m_2) == 0) or (NextMove== Exchange II Move)
      MoveSelection =Exchange II Move

   Perform the move of MoveSelection, and create N_T(S)
   if ((N_T(S) == ∅) and (MoveSelection==Insert Move))
      NextMove = Exchange I Move
      break
   if ((N_T(S) == ∅) and (MoveSelection== Exchange I Move))
      NextMove = Exchange II Move
      break

   Select a solution S̄ ∈ N_T(S) that minimizes Z(S̄)
   Set the reversal of the move tabu for Tenure iterations
   if S̄ satisfy the reference set update strategy U*, R = R ∪ S̄
   if Z(S̄) < Z(S*), set S* = S̄ and NoImp = 0
   else NoImp = NoImp+1
   Set S = S̄

   if (NoImp > θ),
      Set NextMove= Exchange I Move for n_1 Iterations or
      NextMove= Exchange II Move for n_2 Iterations
      Set NoImp = 0
   if (mod (Iter, m_PR) == 0)
      S_p = PathRelinking(R, S*)
      if Z(S_p) < Z(S*), set S = S_p and NoImp = 0
return S*
```

The implementation of the TS framework with strategy *S7* and Random Exchange Gate Move is different. This algorithm is more complicated than the previous one. First of all, we have two reference sets R_V and R_N. The update of R_V is the same as the update of R in Algorithm 4.2. When a solution obtained in TS satisfying the reference set update strategy *S7*, the solution is stored in R_V. For R_N, it is updated just before the Random Exchange Gate Move is executed. The reason is that R_N needs to collect the solution from R_V before the search is guided to a new region.

The Random Exchange Gate Move replaces the use of Exchange I and Exchange II Move when the best solution has not been improved for θ iterations. Random Exchange Gate Move gives more change on attributes and hence provides greater diversified effect. Therefore, it may guide the search to a new region in the search space. Before Random Exchange Gate Move is executed, we have to transfer the solutions in R_V to R_N. This allows R_V to collect solutions in the new region while keeping the elite solutions from previous visited regions.

Path relinking is applied on reference solutions stored in R_V and R_N. The reason for doing so is to add a time dimension into the path generating procedure so that both previously and newly encountered elite solutions are considered. The TS with PR for S7 and Random Exchange Gate Move is provided in Algorithm 4.3.

Algorithm 4.3 Tabu Search with Path Relinking for Two-Reference-Set Strategy

---

Generate an initial feasible solution S by Greedy Algorithm

set $S^* = S$ and $R, R_N, R_V = \varnothing$

NextMove = NULL

for $Iter = 1$ to $Iter_{max}$ **do**

  if (*NextMove*==NULL) *MoveSelection* = Insert Move

  if ($mod(Iter, m_1) == 0$) **or** (*NextMove*== Exchange I Move)

    MoveSelection =Exchange I Move

  if ($mod(Iter, m_2) == 0$) **or** (*NextMove*== Exchange II Move)

    MoveSelection =Exchange II Move

  Perform the move of *MoveSelection*, and create $N_T(S)$

  if (($N_T(S) == \varnothing$) **and** (*MoveSelection*==Insert Move))

    NextMove = Exchange I Move

    break

  if (($N_T(S) == \varnothing$) **and** (*MoveSelection*== Exchange I Move))

    NextMove = Exchange II Move

    break

  Select a solution $\overline{S} \in N_T(S)$ that minimizes $Z(\overline{S})$

  Set the reversal of the move tabu for *Tenure* iterations

  if $\overline{S}$ satisfy the reference set update strategy *S7*, $R_V = R_V \cup \overline{S}$

  if $Z(\overline{S}) < Z(S^*)$, set $S^* = \overline{S}$ and $NoImp = 0$

  else $NoImp = NoImp + 1$

  Set $S = \overline{S}$

  if ($NoImp > \theta$),

    Perform Random Exchange Gate Move

    Copy the q best solutions from R_V to R_N

    Set $NoImp = 0$

  if ($mod(Iter, m_{PR}) == 0$)

    $R = R_v \cup R_N$

    $S_p = PathRelinking(R, S^*)$

    $R_v = \varnothing$

    if $Z(S_p) < Z(S^*)$, set $S = S_p$ and $NoImp = 0$

return S^*

4.6.1 Computational Complexities

In each iteration of TS, either Insert Move, Exchange I Move and Exchange II Move will be selected. The computational complexities of the moves are $O(F^2)$, $O(F*G)$ and $O(F*G)$, respectively (where F is the total number of flight and G is the total number of gate). In most of the case, F is greater than G. Therefore, if we have $Iter_{max}$ total iterations, the computational complexity of the pure TS algorithm is $O(Iter_{max} *F^2)$

During the path building process, almost F Insert Moves are performed. However, these Insert Moves may create infeasible solutions which require moving the conflicted flights to another gate. Therefore, the computational complexity for building one path is $O(F*(F-1)*G) = O(F^2G-FG)$. The PR phase terminates when the number of solution in the reference set is smaller than two. Thus, there are |R|-1 paths. As the procedure invokes the PR phase when the iteration number hits the factor of m_{pr}, the number of PR being invoked will be $Iter_{max} / m_{pr}$.

Finally, we can calculate the computational complexity of TS with PR which is equal to $O(Iter_{max} *F^2)+ O((Iter_{max} / m_{pr})*(|R|-1)*(F^2G-FG))$

4.7 Computational Studies

In this section, we will study the usage of PR in GAP. First, we present a set of experiments to find the best parameter settings for PR. Then, we compare our algorithm with other algorithms to understand the benefit of integrating PR into TS.

4.7.1 Best Configuration for Path Relinking

The reference set updating strategy, the initial and guiding solution selection criterion, the frequency of PR and the size of the reference set are the factors that affect the performance of PR in the whole framework. In this section, we examine the factors and try to find the best configuration by using the fine-tuning method [Xu, Chiu and Glover, 1998] (see Section 3.9.1.1).

In the fine-tuning procedure, all the tests are sized to 40 gates and 200 flights. For each test on a parameter value, we generate 30 instances for calibration. Other parameters such as tabu tenure, intensification and diversification strategy have been determined for a fine-tuned TS algorithm in Chapter 3. All tests will be run for 1100 iterations which are the same as the fine-tuned TS discussed in previous chapter.

4.7.1.1 Reference Set Strategies and Initial and Guiding Criteria

Glover, Laguna and Marti [2004] propose six reference set update strategies and six criteria to choose initial and guiding solutions. Different combinations of the strategies and criteria are examined by Ghamlouche, Crainic, Gendreau [2004] and Ho and Gendreau [2006]. Although they identify the combination ***S3*** and ***C5*** as the best combination, other combinations will be examined in our experiments.

We would like to investigate the two-reference-set updating strategy combined with different initial and guiding solution selection criteria.

Table 4.1 presents the average improvement of TS with PR over pure TS. We see that TS with PR features produces better results than pure TS in all combinations (except S5C2 and S6C2). Moreover, it should be noted that the two-reference-set strategy S7 outperforms other strategies with respect to all selection criteria.

Friedman's test (procedure of the test is given in Appendix 1) is applied on S7 for different initial and guiding solution selection criteria. Friedman's test is used as we cannot make any assumption about the distribution of the data. Table 4.2 shows the rank sum of each selection criterion. The Friedman's test statistics, F_r = 20.8, is greater than $\chi^2_{0.1,5}$ = 9.24 (confidence level is set to be 0.9). Therefore, any change of the selection criterion will affect the final solutions. Since the rank sum of criterion C1 is the minimum, we compare other criteria with C1 using the following formula:

$$R_i \geq R_{C1} + z_{0.1} \times \sqrt{30 * 8 * (8+1)/6} = 102$$

If the rank sum of a criterion is greater than 102, then it is dominated by C1. From Table 4.2, the rank sums of C2, C3 and C6 are greater than 102, so we conclude that criterion C1 dominates C2, C3 and C6 at confidence level 0.90. Although there is no significant difference between C1, C4 and C5, we only C1 is retained for further analysis.

From the experiment, strategy S7 obtains the best performance jointly with criterion C1 which is better than the combination with C5. Since C1 concerns with the quality of solutions while C5 concerns with the level of dissimilarity, we would expect that the combination of S7 and C5 may build a longer path during the path-building process. However, we find that the path lengths for both combinations are nearly the same. It might be explained that the use of Random Exchange Gate Move in S7 guides the search to different regions of the solution space. This helps the reference set to gather solutions from different regions. This characteristic brings a high level of dissimilarity into the reference solutions. Even if C1 does not consider the level of dissimilarity, it is not worse than C5. In addition, unlike C5, C1 concerns the quality of solutions. This provides a good base for finding better solutions during the path-building process.

C2 is the worst criterion not only for S7, but also for other strategies. This may due to the fact that the best solution and the second best solutions are too similar and share many characteristics. Hence PR is unable to build a path that is long enough.

	C1	C2	C3	C4	C5	C6
S1	0.037%	0.011%	0.058%	0.031%	0.045%	0.061%
S2	0.053%	0.105%	0.065%	0.139%	0.087%	0.114%
S3	0.037%	0.011%	0.058%	0.031%	0.045%	0.061%
S4	0.130%	0.011%	0.143%	0.065%	0.064%	0.054%
S5	0.147%	-0.002%	0.130%	0.160%	0.099%	0.091%
S6	0.071%	-0.002%	0.102%	0.150%	0.117%	0.077%
S7	0.776%	0.130%	0.499%	0.672%	0.680%	0.527%

Table 4.1 Test on Path Relinking with Different Strategies Combinations

Note: Percentage improvement = $\frac{TS - TS \ \ with \ \ PR}{TS \ \ with \ \ PR} \times 100\%$

Criterion	**C1**	**C2**	**C3**	**C4**	**C5**	**C6**
R_i	83	144.5	107	90.5	94.5	110.5

Table 4.2 Friedman's Test on Two-Reference-Set Strategy S7

For the parameters of PR, we perform the fine-tuned method to tune the parameters again (details are given in Section 3.9.1.1). First, we arrange the importance of the parameters as follow: (1) frequency of path relinking, (2) size of volatile reference set R_V and (3) non-volatile reference R_N. The frequency of PR is the most important parameter as it controls the number of times PR is executed. Then, the size of R_V needs to be determined before R_N. This is because R_N gets its solutions from R_V, thus the size of R_N depends on the size of R_V.

4.7.1.2 Frequency of Path Relinking

The frequency of PR is the most important parameter because it greatly affects the overall performance and computational time. If PR is applied too frequently, the resource required is large and the search is forced to focus on a small region of the solution space. However, if PR is rarely applied, its impact becomes negligible [Ho and Gendreau, 2006].

PR is called when the number of iterations hits the factor of m_{PR}, so the parameter m_{PR} controls the frequency of PR. Ho and Gendreau [2006] test m_{PR} = 5000, 10000, 20000, 30000 and 40000, and identify m_{PR} = 10000 yielding the best results (the total number of iterations performed is 100000, so the best identified m_{PR} is 10% of total number of iterations). For this reason, we examine m_{PR} = 50, 100, 200, 300 and 400 and use Friedman's test (Appendix 1) to find the best setting.

Table 4.3 shows the average improvement for the TS with PR over pure TS, computational time (in seconds) and rank sum for different m_{PR}. The Friedman's test statistics F_r is 20.3 which is greater than $\chi^2_{0.1,4}$ = 7.78. This tells us that the value of m_{PR} will affect the performance of the heuristic. Since m_{PR} =50 is the minimum rank sum, we compare the rank sum of other m_{PR} by using the formula:

$$R_i \geq R_1 + z_{0.1} \times \sqrt{30 * 5 * (5+1)/6} = 82.7$$

Thus, we prune m_{PR} =200, 300, 400 as they are dominated by m_{PR} =50. Set 1 and 2 are retained for later experiment.

Set	1	2	3	4	5
m_{PR}	50	100	200	300	400
Improvement	0.82%	0.67%	0.31%	0.52%	0.26%
Time (s)	46.1	39.8	32.8	29	27.8
R_i	67	72.5	100.5	97	113

Table 4.3 Test on the Path Relinking Frequency

4.7.1.3 Size of Volatile Reference Set

Unlike standard PR, our purposed strategy uses two different reference sets. Therefore, the sizes of both reference sets need to be decided. The function of volatile reference set R_V is similar to a classic reference set – being built during the search process. Yagiura, Ibaraki and Glover [2002], Ghamlouche, Crainic and Gendreau [2004] and Ho and Gendreau [2006] set the size of reference set equal to 20, 6 and 10, respectively. In this experiment, we perform the test on 6, 10, 15, 20, 25 and 30.

We calculate the Friedman's test statistics F_r after testing. The F_r for m_{PR} = 50 and m_{PR} = 100 in the test of R_V size are 2.22 and 4.26, respectively. As both test statistics are less than $\chi^2_{0.1,5}$ = 9.24, this indicates that the size of R_V does not have a significant impact on the result. From Table 4.4 and 4.5, it seems that a larger size of R_V gives a slight better improvement. It is because larger size of R_V may store more elite solutions and thus increase the chance for the path-building process to find better solutions. We finally choose the size of R_V to be 30 for later experiments since it performs the best in these experiments. Compared to Yagiura et al. [2002], Ghamlouche et al. [2004] and Ho and Gendreau [2006], we use the largest R_V.

We also apply the Wilcoxon's test on Set 11 and 17. By following the procedure in Appendix 2, we get the test statistics $z_0 = 1.14$ (shown in Table 4.6). Thus, there is no domination of Set 11 and 17. We retain them for further testing.

Set	**6**	**7**	**8**	**9**	**10**	**11**
$\mid R_V \mid$	6	10	15	20	25	30
Improvement	0.64%	0.65%	0.60%	0.71%	0.73%	0.81%
Time (s)	33.4	36.2	37.5	38.8	41	41.3
R_i	114.5	95	106.5	107	107.5	99.5

Table 4.4 Test on Size of Volatile Reference Set for Set 1

Set	**12**	**13**	**14**	**15**	**16**	**17**
$\mid R_V \mid$	6	10	15	20	25	30
Improvement	0.53%	0.54%	0.61%	0.54%	0.62%	0.67%
Time (s)	29.2	30.7	32.1	33	34.1	34.8
R_i	120	114.5	105.5	105	93.5	91.5

Table 4.5 Test on Size of Volatile Reference Set for Set 2

Set Pair	***(11, 17)***
z_0	1.14

Table 4.6 Wilcoxon's Test on Volatile Reference Set

4.7.1.4 Size of Non-volatile Reference Set

R_N gets the first q elite solutions from volatile reference set R_V just before the Random Exchange Gate Move is invoked, so its size depends on q and the frequency of Random Exchange Gate Move. It should be reminded that Random Exchange Gate Move is only executed when the best solution has not been improved for θ consecutive iterations. Therefore, the value of θ controls the frequency of Random Exchange Gate Move and hence controls the size of R_N indirectly.

Xu and Bailey [2001] set $\theta = 50$ in their TS procedure. If after 50 consecutive iterations, the best solution has not been improved, an Exchange Move will be applied to diversify the search. Wu, Yeh and Syau [2004] set $\theta = 100$ for a similar purpose. In our experiment, we test $\theta = 25, 50, 75, 100, 125, 150, 175$ and 200 for Set 11 and 17.

The results are shown in Tables 4.7 and 4.8. The Friedman's test statistics for the results in Table 4.7 and 4.8 are 16.8 and 13.5, respectively. Since both test statistics are greater than $\chi^2_{0.1,7} = 12.02$, the value of θ is proven to affect the performance of PR at a 90% confidence level.

In Table 4.7, Set 20, 21 to 25 are pruned as their rank sums are greater than the right-hand side of the below formula:

$$R_i \geq R_{19} + z_{0.1} \times \sqrt{30 * 8 * (8+1)/6} = 123.8$$

In Table 4.8, Set 28, 31 to 33 are pruned as their rank sums are greater than the right-hand side of the below formula:

$$R_i \geq R_{27} + z_{0.1} \times \sqrt{30 * 8 * (8+1)/6} = 135.8$$

We apply Wilcoxon's test to test the resulting eight pairs. The test results are listed in Table 4.9. Since z_0 for Set pairs (19, 29) and (19, 30) are less than $-z_{0.1} = -$

1.28, this implies that Set 19 dominates Set 29 and 30. Furthermore, Set 26 and 27 are dominated by Set 18 from the testing result of Set pairs (18, 26) and (18, 27). Hence, all sets except Set 18 and 19 are eliminated.

Set	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**
θ	25	50	75	100	125	150	175	200
Improvement	0.89%	0.82	0.55%	0.67%	0.49%	0.54%	0.55%	0.31%
Time (s)	53.4	41.2	36.5	34.9	31.3	31.9	30.6	30.2
R_i	112	99.5	138	129.5	137.5	145	148.5	170

Table 4.7 Test on Frequency of Random Exchange Gate Move for Set 11

Set	**26**	**27**	**28**	**29**	**30**	**31**	**32**	**33**
θ	25	50	75	100	125	150	175	200
Improvement	0.37%	0.47%	0.29%	0.38%	0.40%	0.19%	0.04%	0.30%
Time (s)	47.7	34.6	33.3	31.1	29.5	29.5	29.2	28.1
R_i	131.5	111.5	149.5	120	119.5	143.5	168.5	136

Table 4.8 Test on Frequency of Random Exchange Gate Move for Set 17

Set Pair	**(18, 26)**	**(18, 27)**	**(18, 29)**	**(18, 30)**
z_0	-2.10	-1.55	-1.38	-1.76
Set Pair	**(19, 26)**	**(19, 27)**	**(19, 29)**	**(19, 30)**
z_0	-1.18	-1.14	-1.39	-1.37

Table 4.9 Wilcoxon's Test on Move Selection Strategies

Since the idea of using R_N in PR is new, so no related work can be cited to determine the value of q. However, since R_N gets q solutions from R_V, the value of q therefore cannot exceed the size of R_V. From Section 4.6.1.2, the size of R_V is set to be 30, thus the calibrating process of q is conducted in the interval [5, 30].

Tests with different values of q are conducted and the results are presented in Tables 4.10 and 4.11. The Friedman' test statistics for the results in Tables 4.10 and 4.11 are 1.61 and 1.51, respectively. They are both less than $\chi^2_{0.1,5}$ = 9.24. Therefore, there is no dominating set. It should be noted that when q increases, the computational time increases. However, no significant improvement on the final solutions is obtained.

This time, Sets 34 and 40 are selected for Wilcoxon's test because they consume the least computing time in their tests. From the result shown in Table 4.12, Set 34 dominates Set 40. Therefore, Set 34 will be the final setting for PR. The whole procedure of the fine-tuned method of PR is illustrated in Figure 4.5. An "X" on a branch indicates that its leaf node is pruned by Friedman's test and "XX" indicates that the leaf node is pruned by the Wilcoxon' signed-rank test.

Set	34	35	36	37	38	39
q	5	10	15	20	25	30
Improvement	1.17%	1.12%	1.14%	1.10%	1.13%	1.13%
Time (s)	57.2	91.3	121.2	146.8	162.8	166.8
R_i	111.5	105	97	111.5	104.5	100.5

Table 4.10 Test on the parameter q for Set 18

Set	40	41	42	43	44	45
q	5	10	15	20	25	30
Improvement	0.82%	0.83%	0.84%	0.86%	0.86%	0.87%
Time (s)	41.7	49.8	55.9	61.5	65.7	68.0
R_i	114	109.5	102.5	99.5	104	100.5

Table 4.11 Test on the parameter q for Set 19

Set Pair	***(34, 40)***
z_0	-1.86

Table 4.12 Wilcoxon's Test on the parameter p

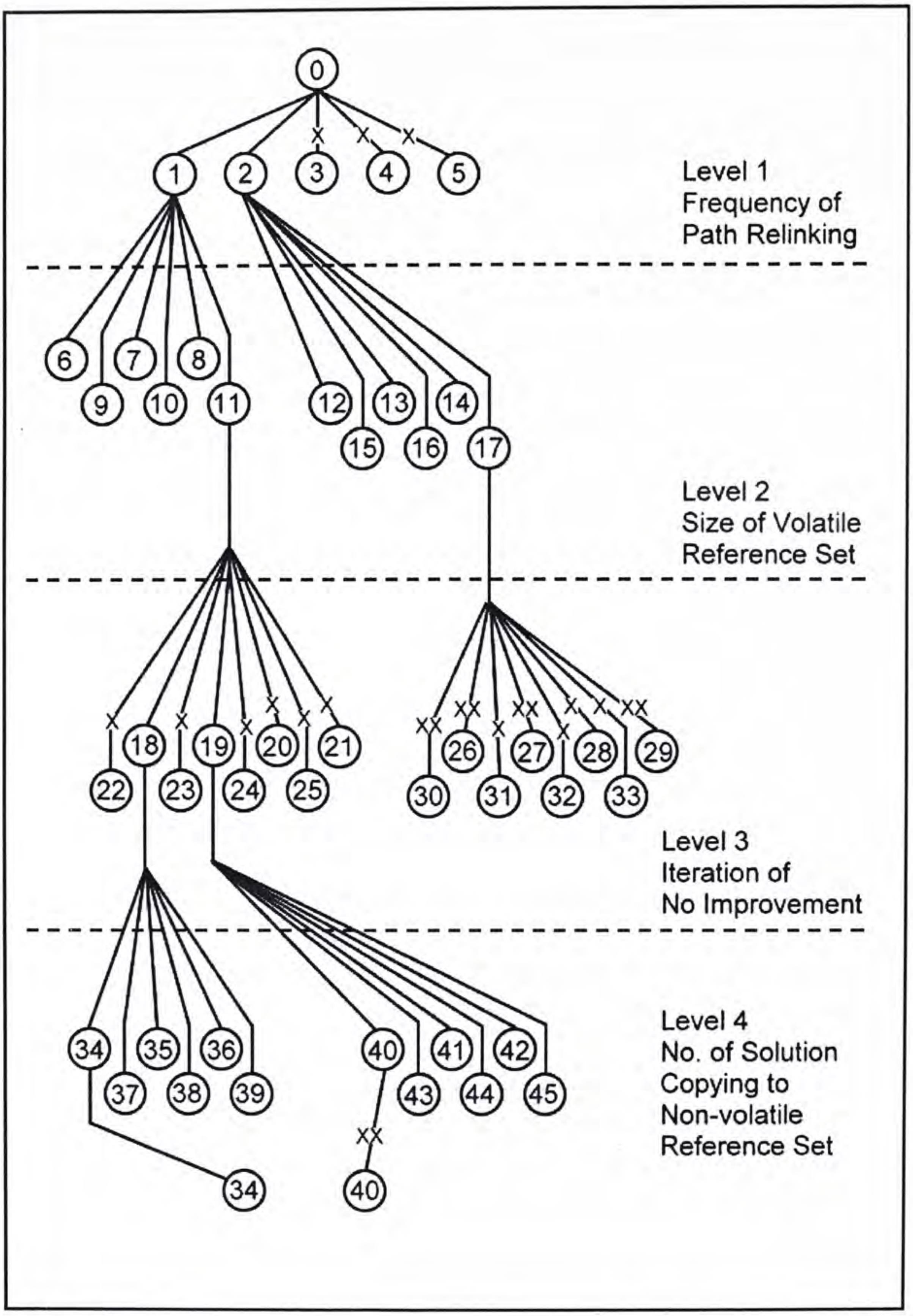


Figure 4.5 Tree of the Fine-tuning Procedure for PR (refer to Xu et al. [1998])

4.7.2 Comparisons with Other Algorithms

To understand the benefit of integrating PR into TS, we perform several runs on pure TS and TS with PR. We also implement a hybrid of simulated annealing and TS algorithm (SATS) by Ding, Lim, Rodrigues and Zhu [2005] (see Appendix 3). This algorithm is the latest developed TS algorithm to deal with static GAP and the objective is to minimize the walking distance.

The results are obtained with the following parameter settings for PR: $Iter_{max}$ = 1100, m_{PR} = 50, size of R_V = 30, q = 5, R_{min} = 1, θ = 25 and the parameters of TS have been determined for a fine-tuned TS algorithm in Chapter 3.

The test sizes range from 80 gates and 10 flights to 400 gates and 50 flights which are same as Xu and Bailey [2001]. The number of passengers on each aircraft is randomly generated from [100, 500] and the percentage of transfer passenger is set to be 10% of flight capacity. For each problem size, we randomly generate 10 instances and take the average of the objective value and computational time. All experiments are being done on a Pentium 4 2.8 GHz computer by using C++ and reported in Table 4.13.

From the table we can see that TSPR performs better than both FTS1 and FTS2 in all problems. Although the computational time of TSPR is longer than FTS1 and FTS2, the computing time is still reasonable. In fact, for large problem size (280X35 or above), TSPR has a faster computing time than FTS2. Hence, TSPR is more effective than FTS especially in large problem.

We also investigate the performance of SATS. It can be seen from the table that SATS also provides better results than FTS1 and FTS2 in all problems except for the largest problem size. However, the computing time for SATS is much longer. Especially for large problems, the computing time is three or even four times of the computing time of FTS2. Compared to SATS, the performance of TSPR is better (except for problem sizes 200X25 and 280X35). Although TSPR requires more time than SATS for smaller problems, the reverse is true when the problem size increases.

Overall, a better performance is obtained by TSPR. Especially for larger problems, TSPR can find the best solution with minimum computing time among all algorithms. Since the problem size of an international hub is very large, we believe that TSPR is a practical algorithm for it.

	FTS1		FTS2		SATS		TSPR				
Problem Size	Average Objective Value	CPU (s)	Average Objective Value	CPU (s)	Average Objective Value	CPU (s)	Average Objective Value	CPU (s)	Over FTS1 (%)	Over FTS2 (%)	Over SATS (%)
80 X 10	169591	2.4	169247	4.9	168964	4.6	167119	9.9	1.43%	1.23%	1.09%
120X15	294020	6.4	293101	12.6	288763	13.2	288165	22.4	1.96%	1.66%	0.20%
160X20	571006	12.2	570934	25.1	570279	26.9	567995	41.6	0.52%	0.51%	0.39%
200X25	983174	21.0	980915	42.1	979169	47.2	980021	59.5	0.32%	0.09%	-0.11%
240X30	1181400	34.1	1180800	71.5	1176158	86.7	1174502	76.6	0.58%	0.53%	0.12%
280X35	1395329	54.6	1391377	114.8	1383213	154	1389787	96.6	0.39%	0.11%	-0.48%
320X40	1598714	84.2	1595200	168.9	1594972	349	1593531	134	0.33%	0.11%	0.08%
360X45	1820441	114.1	1815773	233.9	1811896	838	1810572	168	0.54%	0.28%	0.08%
400X50	2014514	158.8	2011231	322.9	2013842	1626	2010250	229	0.21%	0.05%	0.18%

Table 4.13 Comparison on Different Algorithms

FTS1: Fine-tuned tabu search for 1100 iterations

FTS2: Fine-tuned tabu search for 2200 iterations

SATS: Hybrid simulated annealing with tabu search

TSPR: Fine-tuned tabu search with path relinking feature for 1100 iterations

$$\text{Improvement of TSPR} = \frac{TSPR - Other\quad A\lg orithm}{TSPR} \times 100\%$$

We also compute the optimal solutions by using total elimination and compare with the solutions computed by TSPR. Since the computing time of total elimination for large problem is extremely long, we only conduct the experiment by using a small problem size (15 flights and 5 gates).

Table 4.14 clearly shows that the computing time of TSPR dominates total elimination. Therefore, TSPR is much more practical in solving the real problem. In eight out of the ten test problems, TSPR can find the optimal solutions. The average gap between the solutions obtained from TSPR to the optimal solutions is 0.27%

	Total Elimination		TSPR		
Problem Size	Objective Value	CPU (s)	Objective Value	CPU (s)	Gap between TSPR and Total Elimination (%)
15 X 5	23133	3067	23133	1	0.00%
15 X 5	20896	3273	20896	1	0.00%
15 X 5	24483	3309	24483	1	0.00%
15 X 5	23319	2274	23895	1	2.47%
15 X 5	23292	2755	23292	1	0.00%
15 X 5	21343	2854	21343	1	0.00%
15 X 5	19917	3351	19966	1	0.25%
15 X 5	22547	3864	22547	1	0.00%
15 X 5	23348	2229	23348	1	0.00%

Table 4.14 Comparison on Tabu Search with Path Relinking and Total Elimination

4.8 Conclusion

In this chapter, we enhance TS with PR to solve GAP. This is the first attempt to apply PR in GAP. We introduce a two-reference-set strategy to complement other strategies in the literature. We develop a Random Exchange Gate Move to diversify the search in order to makes the update of the reference set more efficient. We provide the details of the path-building process for GAP. We design two special neighborhood search moves $N_1(S)$ and $N_2(S)$ to transform an initial solution to the guiding solution.

In the computational study, we illustrate that the two two-reference-set strategy outperforms the strategies used in literature. We also find the best configuration of the parameters of PR. Finally, we compare pure TS, TS with PR and a hybrid TS and simulated annealing algorithm. Result indicates that TS with PR outperforms the other algorithms especially for larger size problems.

Chapter 5 Case Study

5.1 Introduction

To illustrate the application of our algorithm, we perform a case study using a major airline hub – Incheon International Airport (ICN). This case is based on the actual flight data collected from ICN. We try to investigate our algorithm under the influence of airline preference. In this work, airline preference refers to the tendency to assign flights to specific gates based on some business requirements. Although it is an important consideration in airport operation, researchers generally do not consider this in the reported formulation or testing.

5.2 Airport Background

ICN is the airport in the capital city of South Korea. It is one of the largest and busiest hubs in Asia. ICN serves over 500 flights daily. A majority of these flights are international flights.

5.2.1 Layout of ICN

ICN has two terminals: main passenger terminal and passenger concourse (illustrated in Figure 5.1). The facility provides 74 fixed gates and 3 remote gates (gate 5, 25 and 29). All gates are capable of handling the biggest aircraft (Airbus A380).

The airline preference strategy of ICN is very clear in this case. The main passenger terminal serves mainly the flights of Korean Air and Asiana Airlines while the passenger concourse serves the flights of other airlines. In fact, the flights of Korean Air will be assigned to the right wing of main passenger terminal (gate 1 to gate 28) and the flights of Asiana Airlines will be assigned to the left wing of the terminal (gate 29 to 50). The two terminals are connected by a 870 meters long underground passageway (illustrated by the dotted line in Figure 5.1).

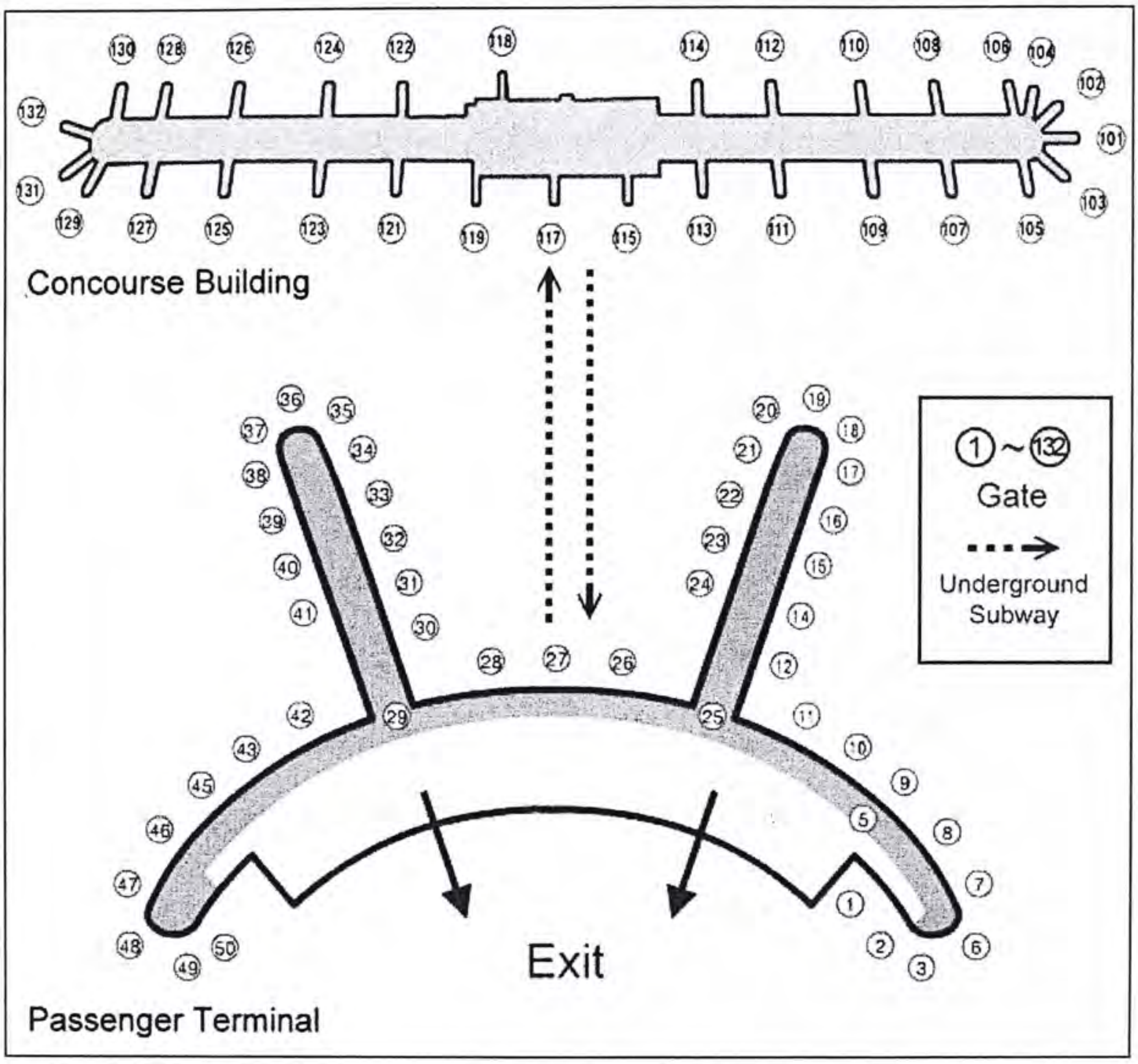


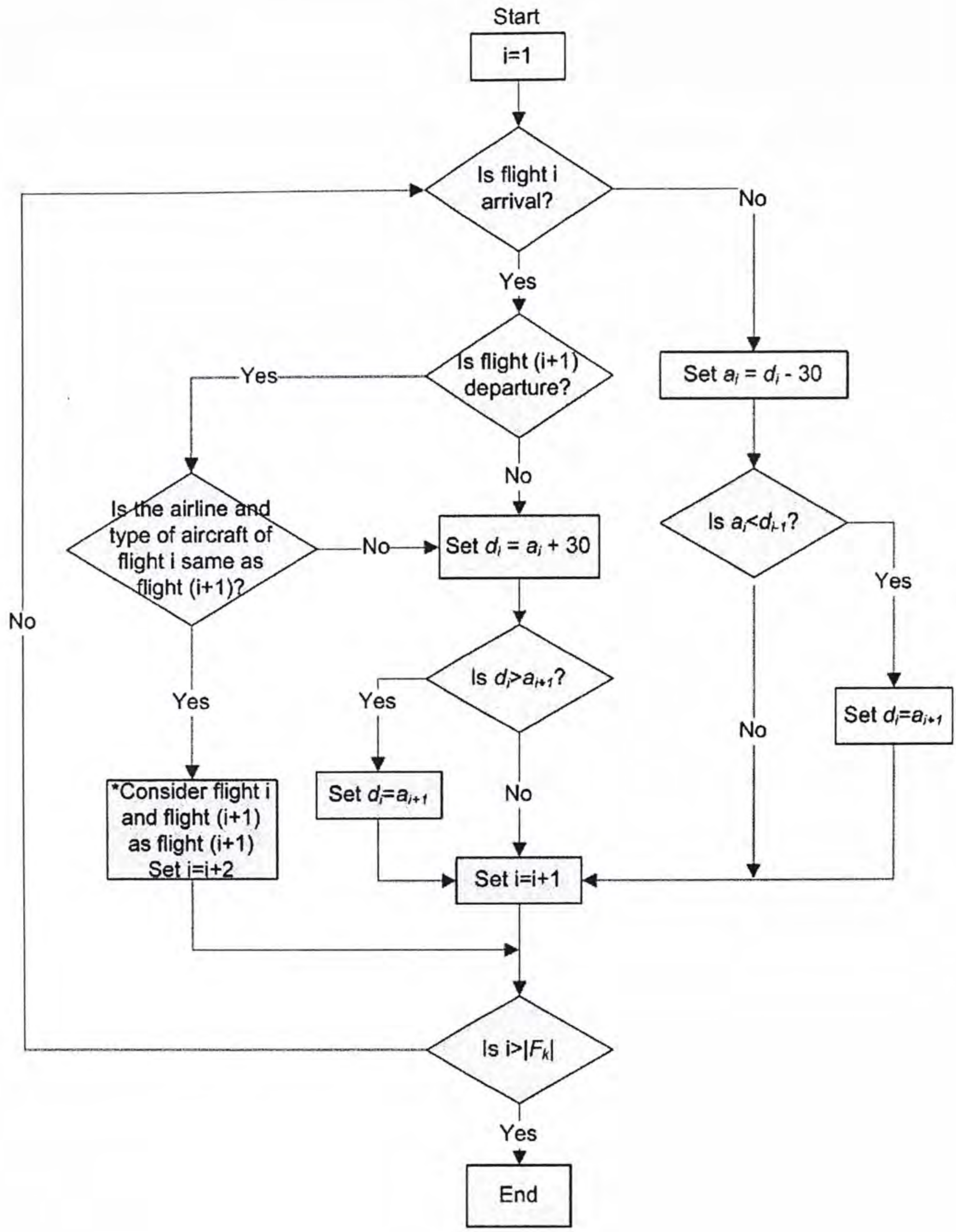
Figure 5.1 Layout of Incheon International Airport

5.3 Data Preparation

We collected the flight data for a week (from 27th February 2009 to 5th March 2009) from the web page of ICN (http://www.airport.kr/) and FlightStats (http://www.flightstats.com/). The arrival data contains flight code, airline, origin country, gates for arrival, scheduled arrival time, and actual arrival time of a flight. The departure data contains flight code, airline, destination country, gates for departure, scheduled departure time, and actual departure time of a flight. These data can be found in Appendices 4 and 5. However, we cannot produce a complete flight assignment schedule directly from these raw data. We need to combine the arrival and departure data to obtain the sojourn time of each flight (i.e. when an arrival flight leaves its assigned gate and when a departure flight enters its assigning gate). Thus, we use the following rules to help us develop the schedule.

1. If a departure flight i immediately follows an arrival flight j in the same gate, and their airlines and aircraft types are identical, then flights i and j are considered as "flight j". The sojourn time for "flight j" at the gate is the difference between the departure time of flight i and arrival time of flight j.
2. If we cannot determine the time when a previously arrived flight leaving the gate using rule 1, we assume that it occupies the gate for 30 minutes. Thus, the time when the flight leaves the gate is 30 minutes plus the arrival time.
3. If we cannot determine the time when a departing flight enters the gate using rule 1, we assume that it occupies 30 minutes before it departs. Thus, the time when the flight enters the gate is the departure time minus 30 minutes.

Based on these rules, we design an estimation procedure to produce a flight assignment schedule. First, for each gate, we sort the assigned flights according to their arrival times a_i or departure times d_i (depending on whether it is an arrival flight or a departure flight) in ascending order. Then, we apply a gate usage estimation routine (shown in Figure 5.2) to complete the flight assignment schedule of a gate.



* We combine flight *i* and flight (*i*+1) by setting the arrival time of flight (*i*+1) equal to the arrival time of flight *i*. Then we remove flight *i* from that gate.

Figure 5.2 Gate Usage Estimation Routine

We illustrate the process of the routine using an example. Suppose we have a sorted flight data for a gate (shown in Table 5.1). For i = 1, the flight KE696 is a departure flight, so we simply set its arrival time as 30 minutes before its departure. The second flight OZ121 is an arrival flight and we find the next flight, OZ124 that is a departure flight with the same aircraft type from the same airline. Hence, we combine OZ121 and OZ124 together as OZ124 with an arrival time being the arrival time of OZ121.

For i = 4, although KE789 is an arrival flight, the next flight KE869 is not a departure flight. Therefore, we set the departure time of KE789 as 30 minutes after it arrives. Note that if this setting produces a time conflict with KE869, then the departure time of KE789 is set to the arrival time of KE869 to resolve the conflict. In fact, this situation rarely happens.

In next iteration, even though KE869 is an arrival flight and KE897 is a departure flight, their aircraft types are different. We treat them as two different flights and determine their departure time and arrival time, accordingly. Eventually, following this procedure, we complete flight assignment schedule in a gate (shown in Table 5.2).

i	Flight	Arrival Time	Departure Time	Airline	Aircraft Type
1	KE696	-	06:30	Korean Air	A330-300
2	OZ121	08:20	-	Asiana Airlines	A330-300
3	OZ124	-	10:00	Asiana Airlines	A330-300
4	KE789	15:10	-	Korean Air	B777-300
5	KE869	17:50	-	Korean Air	B747-400
6	KE897	-	19:00	Korean Air	A330-300

Table 5.1 Raw Data from ICN Website

i	Flight	Arrival Time	Departure Time	Airline	Aircraft Type
1	KE696	06:00	06:30	Korean Air	A330-300
2	OZ121	08:20	10:00	Asiana Airlines	A330-300
3	KE789	15:10	15:40	Korean Air	B777-300
4	KE869	17:50	18:20	Korean Air	B747-400
5	KE897	18:30	19:00	Korean Air	A330-300

Table 5.2 Complete Flight Assignment Schedule

5.3.1 Passenger Data

The total number of passengers of a flight is given by:

$$p = maximum\ capacity\ of\ aircraft * U_d[0.7, 1]$$

where $U_d[a, b]$ is an uniform distribution function that randomly generates a decimal number in the interval $[a, b]$. If the flight is an arrival flight, we need to generate the number of transfer passengers. The number of total transfer passenger of a flight is determined by:

$$p * \pi$$

where π is the percentage of total number of transfer passengers. Hence, for an arrival flight i, the total number of arriving passenger is $p_{i0} = p*(1-\pi)$. Assume flight j is a departure flight with departure time 2 hours later than the arrival time of flight i, the transfer passenger volume from flight i to flight j p_{ij} is given by $U[0, 10]$ (this function returns an integer in the interval $[a, b]$). In the case study, we will examine $\pi = 0.1$, 0.3 and 0.5.

5.4 Computational Studies

Besides the total passenger walking distance, ICN indeed considers other factors in the flight assignment, such as airline preference. Therefore, it is meaningless to compare the actual flight assignment schedule with the assignment from our methodology. However, the data from ICN is useful in testing the performance of different algorithms: (1) pure TS [Xu and Bailey, 2001], hybrid of TS and simulated annealing [Ding, Lim, Rodrigues and Zhu, 2005], and TS with PR features. All algorithms are implemented by C++. All the tests in this section are conducted in a Pentium 4 2.8 GHz computer with 1 GB memory.

5.4.1 Experiments without Airline Preference

In this computational study, we mainly focus on the total passenger walking distance without considering any airline preference. We apply the mathematical model introduced in Section 1.3. In order to examines the effect of transfer passengers, we set $\pi = 0.1$, 0.3 and 0.5 to generate the passenger data.

Tables 5.3, 5.4 and 5.5 provide the average objective value and computational time for three algorithms. According to the result, TSPR (average objective value: 26998540) outperforms FTS (average objective value: 27189506) and SATS (average objective value: 27126011) although its average computational time is slightly longer than FTS in all three cases. SATS also performs better than FTS, but its computational time is much longer.

We observe that when the percentage of transfer passengers increases, the computational times of all algorithms also increase. For the case with smaller percentage of transfer passengers, there are more flight pairs with no transfer passengers. When the algorithm is calculating the objective function value, these flight pairs can be skipped. This is the reason why the computational effort is slightly reduced for small value of π.

		FTS		SATS		TSPR			
Test Date	Problem Size	Objective Value	CPU (s)	Objective Value	CPU (s)	Objective Value	CPU (s)	Over FTS (%)	Over SATS (%)
27/2/2009	294 X74	27091415	170	27014880	576	26945560	185	0.541%	0.257%
28/2/2009	290 X74	27001350	174	26824715	640	26800315	185	0.750%	0.091%
1/3/2009	304 X74	30016505	193	30105775	562	29764555	201	0.846%	1.146%
2/3/2009	297 X74	27554290	185	27762240	697	27668210	207	-0.412%	0.340%
3/3/2009	290 X74	26055045	180	25871305	777	25780535	196	1.065%	0.352%
4/3/2009	279 X74	25092430	151	25003005	580	24875240	173	0.873%	0.514%
5/3/2009	289 X74	27515505	168	27300160	642	27155365	190	1.326%	0.533%

Table 5.3 Comparison of different algorithm on ICN for $\pi = 0.1$ and without airline preference

		FTS		SATS		TSPR			
Test Date	Problem Size	Objective Value	CPU (s)	Objective Value	CPU (s)	Objective Value	CPU (s)	Over FTS (%)	Over SATS (%)
27/2/2009	294 X74	29325270	184	29327425	632	29274210	196	0.174%	0.182%
28/2/2009	290 X74	29378545	194	28904000	599	29272310	224	0.363%	-1.258%
1/3/2009	304 X74	31690910	199	31678075	607	31642165	226	0.154%	0.113%
2/3/2009	297 X74	29798700	219	30020395	708	30025230	228	-0.754%	-0.016%
3/3/2009	290 X74	28050095	189	27588135	813	27898320	211	0.544%	-1.112%
4/3/2009	279 X74	27816840	156	27637820	611	27588215	174	0.829%	0.180%
5/3/2009	289 X74	29472105	186	29675425	678	29402315	205	0.237%	0.929%

Table 5.4 Comparison of different algorithm on ICN for $\pi = 0.3$ and without airline preference

		FTS		SATS		TSPR			
Test Date	Problem Size	Objective Value	CPU (s)	Objective Value	CPU (s)	Objective Value	CPU (s)	Over FTS (%)	Over SATS (%)
27/2/2009	294 X74	31679360	199	31462855	678	31304880	213	1.196%	0.502%
28/2/2009	290 X74	31436665	195	31412030	648	31337070	213	0.318%	0.239%
1/3/2009	304 X74	35011240	217	35039805	609	35050585	261	-0.112%	-0.031%
2/3/2009	297 X74	31989310	213	32227595	707	31900725	234	0.278%	1.014%
3/3/2009	290 X74	30112340	198	29858750	823	30069210	223	0.143%	-0.705%
4/3/2009	279 X74	29751435	175	29959470	625	29667010	201	0.285%	0.976%
5/3/2009	289 X74	31896375	194	31725500	681	31755335	228	0.444%	-0.094%

Table 5.5 Comparison of different algorithm on ICN for $\pi = 0.5$ and without airline preference

FTS: Fine-tuned tabu search for 1100 iterations

SATS: Hybrid simulated annealing with tabu search

TSPR: Fine-tuned tabu search with path relinking feature for 1100 iterations

5.4.2 Experiments with Airline Preference

Airline preference refers to the airport's tendency to satisfy airlines' preference in gate assignment. In ICN, the flights of Korean Air and Asiana Airlines are often assigned to the main passenger terminal while the flights of other airlines go to passenger concourse. We assume that ICN does consider airline preference in gate assignment.

In this case study, we reserve a wing of a terminal to an airline. This means that flights of an airline are allowed to use any gates of its assigned wing. Hence, Korean Air uses the right wing and Asiana Airlines uses the left wing of the main terminal. In this computational study, we would like to examine the performance of the three algorithms under the operational constraint of airline preference.

5.4.2.1 Formulation

In Section 1.3 and 3.2, we have introduced the mathematical model of GAP. The model minimizes total passenger walking distance while satisfying the basic constraints[13]. Sherali and Brown [1993] introduce an additional feature to this model. With this feature, the model can restrict the flights to a set of gates. To consider airline preference, we modify our model by applying this feature. We let:

G : the set of gates in the airport

G_i: the set of gates available to flight i

F : the set of flights in the airport

Z : objective value of the gate assignment problem

x_{ik} : a decision variable which is equal to 1 when flight i is assigned to gate k, and equal to 0 otherwise

a_i : the arrival time of flight i

[13] The basic constraints of GAP require every flight to be assigned to one and only one gate. It also specifies that no two flights are assigned to the same gate.

d_i : the departure time of flight i

p_{ij} : the total number of passengers transfers from flight i to flight j

p_{i0} : the total number of arriving passengers of flight i

p_{0i} : the total number of departure passengers of flight i

w_{kl} : the walking distance between gate k and gate l

w_{k0} : the walking distance between gate k and the arrival hall of airport

w_{0k} : the walking distance between the departure hall and gate k

The formulation is given as follows:

$$\text{Minimize } Z = \sum_{i\in F}\sum_{j\in F}\sum_{k\in G_i}\sum_{l\in G_j} p_{ij} w_{kl} x_{ik} x_{jl} + \sum_{i\in F}\sum_{k\in G_i}(p_{i0}w_{k0} + p_{0i}w_{0k})x_{ik} \quad (5.1)$$

$$\text{Subject to : } \sum_{k\in G_i} x_{ik} = 1, \forall i \in F \quad (5.2)$$

$$x_{ik}x_{jk}(d_j - a_i)(d_i - a_j) \le 0, \quad \forall i,j \in F, \quad \forall k \in G \quad (5.3)$$

$$x_{ik} \in \{0,1\}, \quad \forall i \in F, \quad \forall k \in G \quad (5.4)$$

$$\sum_{k\in G, k\notin G_i} x_{ik} = 0, \forall i \in F \quad (5.5)$$

Constraints (5.2) – (5.4) have been discussed in Section 1.3 and 3.2. In this model, G_i is first introduced into the objective function. G_i is the set of gates available to flight i. It requires that a flight must be assigned to the gates of the preferred wing. We can easily change airline preference by modifying G_i. For example, if an airport disallows flight i to use gate j, it simply remove gate j from Set G_i. We also introduce constraint (5.5) which ensures no flight will be assigned to unpreferred gate

5.4.2.2 Results

Tables 5.6, 5.7 and 5.8 show the results of the tests. First of all, the average computational times of three algorithms are greatly reduced. This is due to the additional restriction imposed by airline preference.

The average objective values of TSPR and SATS are both better than FTS. However, unlike the results in Section 5.4.1, SATS is the best among the three algorithms in term of objective value while TSPR is the second best. We therefore inspect the procedure of TSPR and discover that the path relinking process becomes less able to build a complete path. To be exact, there may be no feasible intermediate solution between the initial solution and the guiding solution under the restriction of airline preference. Hence, the performance of path relinking is affected.

We can also see that the average computational time of SATS is greatly reduced compare to the result in Section 5.4.1. The reason may due to the problem size. In this experiment, all the gates are divided according to airline preference. This breaks the large problem into some smaller problems. This phenomenon is same as Table 4.13 in Section 4.7.2. That table also shows that the computational times of SATS in smaller problems are much shorter than those in larger problems.

		FTS		SATS		TSPR			
Test Date	Problem Size	Objective Value	CPU (s)	Objective Value	CPU (s)	Objective Value	CPU (s)	Over FTS (%)	Over SATS (%)
27/2/2009	294 X74	37620285	69	37398655	73	37460455	85	0.427%	-0.165%
28/2/2009	290 X74	37782920	81	37793885	81	37652620	89	0.346%	0.375%
1/3/2009	304 X74	41742630	83	41625870	83	41672805	109	0.168%	-0.113%
2/3/2009	297 X74	38801725	77	38493605	85	38655035	99	0.379%	-0.418%
3/3/2009	290 X74	38011065	76	37803310	88	37938240	93	0.192%	-0.356%
4/3/2009	279 X74	36178785	64	36059290	71	36225145	76	-0.128%	-0.458%
5/3/2009	289 X74	38819580	74	39099320	78	38856230	88	-0.094%	0.626%

Table 5.6 Comparison of different algorithm on ICN with airline preference and $\pi = 0.1$

		FTS		SATS		TSPR			
Test Date	Problem Size	Objective Value	CPU (s)	Objective Value	CPU (s)	Objective Value	CPU (s)	Over FTS (%)	Over SATS (%)
27/2/2009	294 X74	40188060	74	39989525	86	39926455	94	0.651%	0.158%
28/2/2009	290 X74	40403415	88	40061075	99	40353075	107	0.125%	-0.729%
1/3/2009	304 X74	43327920	89	43261275	98	43232115	100	0.221%	0.067%
2/3/2009	297 X74	41159960	89	41237800	99	41005235	109	0.376%	0.564%
3/3/2009	290 X74	39498895	79	39426535	105	39415485	101	0.211%	0.028%
4/3/2009	279 X74	39264315	70	39064765	83	39178085	91	0.220%	-0.511%
5/3/2009	289 X74	41123175	81	40872560	95	41144495	95	-0.052%	-0.530%

Table 5.7 Comparison of different algorithm on ICN with airline preference and π = 0.3

		FTS		SATS		TSPR			
Test Date	Problem Size	Objective Value	CPU (s)	Objective Value	CPU (s)	Objective Value	CPU (s)	Over FTS (%)	Over SATS (%)
27/2/2009	294 X74	42095445	168	41780590	88	41897295	97	0.471%	-0.279%
28/2/2009	290 X74	42405875	237	42091395	97	42173720	103	0.547%	-0.196%
1/3/2009	304 X74	46226475	221	45969250	99	46244275	115	-0.039%	-0.598%
2/3/2009	297 X74	43186725	225	43192485	99	43073895	105	0.261%	0.275%
3/3/2009	290 X74	41843905	196	41703255	108	41494150	113	0.836%	0.501%
4/3/2009	279 X74	41058805	172	40969620	89	40817445	96	0.588%	0.371%
5/3/2009	289 X74	43708615	215	43306240	103	43422210	105	0.655%	-0.268%

Table 5.8 Comparison of different algorithm on ICN with airline preference and π = 0.5

FTS: Fine-tuned tabu search for 1100 iterations

SATS: Hybrid simulated annealing with tabu search

TSPR: Fine-tuned tabu search with path relinking feature for 1100 iterations

We also investigate the objective function value under the influence of airline preference. We solve the seven days' problem by using TSPR and record the average walking distance for different kinds of passenger in Table 5.9.

From the table, we can see that the average walking distances of the arrival and departure passengers of Korea Air and Asiana Airlines are reduced if airline preference is considered. This is because all aircrafts of Korean Air and Asiana Airlines are restricted to park in the passenger terminal that is close to the entrance of ICN. At the same time, the average walking distances for the passengers of other airlines are greatly increased (especially the arrival and departure passengers) as they are forced to use the concourse building.

		Average Walking Distance per passenger (w/o Airline Preference)	Average Walking Distance per passenger (with Airline Preference)
Korea Air	Arrival Passenger	225 meters	199 meters
	Departure Passenger	228 meters	198 meters
	Transfer Passenger	605 meters	681 meters
Asiana Airlines	Arrival Passenger	243 meters	238 meters
	Departure Passenger	250 meters	240 meters
	Transfer Passenger	625 meters	740 meters
Other Airlines	Arrival Passenger	233 meters	584 meters
	Departure Passenger	237 meters	583 meters
	Transfer Passenger	618 meters	736 meters

Table 5.9 Average Walking Distance of Different Passenger with $\pi = 0.5$

5.5 Conclusion

In this chapter, we use three TS algorithms (the pure TS, hybrid of TS and simulated annealing, and TS with PR feature) to solve the GAP of Incheon International Airport. First, we consider the case without airline preference. The computational results indicate that the performance of our algorithm is better than others.

After that, we carry out the test on the same problem set with the consideration of airline preference. The original model of GAP has been modified to model airline preference. Under this restriction, the hybrid of TS and simulated annealing performs the best.

Chapter 6 Conclusion

6.1 Summary of Achievement

In this research, we present a meta-heuristic, tabu search (TS) with path relinking (PR) to address gate assignment problem (GAP). The usage of TS is very common in GAP, its variants and related problems. The first TS algorithm of GAP is proposed by Xu and Bailey [2001]. We follow their work and integrate PR in TS (TSPR).

To improve the performance of TS, we first apply a fine-tuning method [Xu, Chiu and Glover, 1998] to obtain the most suitable parameters for TS. Computational results show that the performance of the fine tuned TS is slightly better than the original one. Then, we integrate PR into the fined-tuned TS. We design a two-reference-set strategy and a special move, Random Exchange Gate Move which can help storing solutions with high quality and level of dissimilarity. We compare the performance of our two-reference-set strategy with various reference set strategies used in the literature. Computational results show that our new strategy produces better results.

We also conduct two experiments to test the performance of TSPR. First, we implement the original TS and a hybrid of TS and simulated annealing [Ding, Lim, Rodrigues and Zhu, 2005] and compare it with the TSPR. On average, TSPR outperforms the other algorithms and requires less computing time for larger size problems. Then we compare TSPR with an exact optimization approach – total elimination. In eight, TSPR yields optimal solutions for eight out of the ten test problems, while requiring only a fraction of the solution time.

A case study is conducted by using the real data from Incheon International airport. Test problems with up to 304 flights and 74 gates over seven consecutive working days are collected. Among the original TS, the hybrid of TS and simulated annealing and TSPR, our algorithm give better average objective function value with different percentage of transfer passengers. We also modify the original GAP model to incorporate airline preference. TSPR can obtain a better result than pure TS, but its result is not as good as the hybrid of TS and simulated annealing.

6.2 Future Developments

Since this is the first research using PR in GAP, it only provides some initial insights. There is still room for future improvement.

First, PR is a highly portable concept. Other than TS, it can also be applied to other meta-heuristics such as genetic algorithm, greedy randomized adaptive search procedure. A further investigation can combine PR with different meta-heuristics. The success in GAP can be further extended to other problems such the design of layout in a cross dock.

Second, although our two-reference-set strategy helps to collect solutions with high quality and level of dissimilarity, it has a trade-off. The size of non-volatile reference set will become very large if the number of iterations increases. However, many solutions in the set have no contribution to the PR. It is better to look for a strategy to reduce the size while keeping enough quality and level of dissimilarity.

Currently, we consider the airline preference as a hard constraint. However, many airports may violate this constraint in some special cases such as flight delays. In fact, unlike Incheon International Airport, many airports do not have such a clear boundary for different airlines. Since airline preference is a vital factor in airport business, the fulfillment of the preference is also important consideration. To make our model suitable for realistic application, one suggestion is to use a multi-objectives function which minimize both passengers' walking distance and maximize the number of flights assigned to their preferred gates. This is a good attempt to solve this multi-objectives function by TSPR. This is because the number of constraints is smaller when airline preferences are formulated into the objective function. This environment is much suitable for TSPR.

Since budget airlines are common in nowadays airline business, we suggest using the airports which serve budget airlines for further case study and testing. As they have some special airline preferences (e.g. their aircrafts usually park in the remote gate or the gates which are cheap) which require extending the model and algorithm to handle. However, we believe this development will be a successful implementation in real world.

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Appendix

1. Friedman's Test

(The details about Friedman's test are referred to Devore [1991] and Hetimansperger [1984])

Let x_{ij} be the test result yielded by treatment i for test problem j for $i = 1, ..., I$ and $j = 1, ..., J$. For each problem j, rank the results x_{ij} ($i = 1, ..., I$) from 1 to I according to their goodness. Let R_{ij} denote the rank of x_{ij}. (If ties occur, each tied entry receives the same rank, equal to the average of the ranks received by the tied entries as if the ties were broken arbitrarily. For example, the rank vector for the test results [(100, 99, 100, 101) is (2.5, 1, 2.5, 4)]. We define:

$$\overline{R_i} = \frac{1}{J}\sum_{j=1}^{J} R_{ij}$$

$$\overline{R} = \frac{1}{IJ}\sum_{j=1}^{J}\sum_{i=1}^{I} R_{ij}$$

$$SS_{bg(R)} = J\sum_{i=1}^{I}(\overline{R_i} - \overline{R})^2$$

Then the test statistic is computed by:

$$F_r = \frac{SS_{bg(R)}}{I(I+1)/12}$$

F_r has approximately a chi-squared distribution with I - 1 degrees of freedom when the null hypothesis is true. Therefore, the null hypothesis is rejected if F_r exceeds the critical value $\chi^2_{\alpha,I-1}$ at the confidence level 1-α. It means that the parameter setting will have an effect on the performance of the algorithm.

A comparison between any two treatments i_1 and i_2 is conducted to see if one dominates the other. The treatment i_1 is considered to be better than treatment i_2 at the confidence level 1-α if

$$R_{i_2} \geq R_{i_1} + z_\alpha \times \sqrt{JI(I+1)/6}$$

where z_α is the 100(1-α)th percentile of the standard normal distribution.

2. Wilcoxon's Signed Rank Test for Paired Observation

(The details about Friedman's test are referred to Devore [1991])

Let Set A and B yield the result series X_A and X_B, respectively, then the null hypothesis is H_0: $\mu_D = 0$, where $D = X_A - X_B$ and μ_D represents the mean of D. Let W_+ be the sum of the positive ranks. W_+ can be calculated as follows: first disregard the signs of the components of D corresponding to the test problems, and rank the components in order of increasing magnitude of their absolute values. Then calculate W_+ as the sum of the ranks associated with the positive D components (where $W_+ = 0$ if all components are non-positive).

If the sample size is moderately large, say n > 20, it can be shown that W_+ (or W_-) has approximately a normal distribution with mean

$$\mu_{W_+} = \frac{n(n+1)}{4}$$

and variance [Montgomery and Runger, 2002]

$$\sigma^2_{W_+} = \frac{n(n+1)(2n+1)}{24}$$

Therefore, a test of H_0: $\mu_D = 0$ can be based on the statistic

$$z_0 = \frac{W_+ - n(n+1)/4}{\sqrt{n(n+1)(2n+1)/24}}$$

We reject H_0 at the confidence level 1-α when $z_0 \geq z_\alpha$ or $z_0 \leq -z_\alpha$. If H_0 is rejected by the test and $z_0 \geq z_\alpha$, we conclude that the mean of X_A is greater than that of X_B, which implies that Set B outperforms Set A. Likewise, if $z_0 \leq -z_\alpha$, then we conclude that Set A dominates Set B.

3. Hybrid Simulated Annealing with Tabu Search Approach

Step 1 Get an initial solution S_{now} by the greedy method. Set the best solution S^* $= S_{now}$.

Step 2 Set the annealing temperature T as a linear function to the input size: $T = T_{const} * n$, where T_{const}, determines the starting temperature, and n is the number of aircraft. Variables *unimproved* and *unaccept* record the number of iterations for which the cost has not improved and number of iterations that no neighborhood move is performed, respectively.

Step 3 Determine the type of neighborhood move. Randomly generate a neighborhood of the type and calculate the delta cost Δ, if the generated neighborhood move is performed.

Step 4 Decide whether to perform the neighborhood move generated, with the probability $P_0 = a * exp(-\Delta = (k * T))$, where constants a and k determine the accept rate. If the move is performed and the cost is smaller than S^*, update S^*. Update the variable *unimproved* and *unaccepted.*

Step 5 if (*unimproved* > *max_improve*) or (*unaccept* > *max_accept*) perform tabu search for a number of iterations. Reheat the temperature by a factor, *reheat* : $T = T * reheat$, else decrease the temperature by a cool rate factor, $d : T = T * d$.

Step 6 If the termination requirement is not met, return to step 3.

In the above framework, we have changed some of the original parameter settings to new settings to adapt our gate assignment problem:

$T_{const} = 2$. $a = 2.25$. $k = 50$. $reheat = 1.25$. $d = 0.996$. Termination criteria: $T < 0.1$.

4. Arrival Flight Data of Incheon International Airport

The arrival data is collected from the website of Incheon International and FlightStats (http://www.flightstats.com/). EAT and RAT mean the expected arrival time and real arrival time, respectively.

Date: 27th February 2009

Airline	Flight	EAT	RAT	Origin	Gate	Aircraft
Korean Air	KE696	0:30	0:08	Tribhuvan	12	B777-200ER
Korean Air	KE086	5:00	4:16	NEWYORK	24	B747-400
Asiana Airlines	OZ358	4:50	4:23	CHONGQING	48	A320-200
Korean Air	KE882	4:40	4:25	WUHAN	20	B737-800
Cathay Pacific Airways	CX412	4:45	4:31	HONG KONG	121	A330-300
Asiana Airlines	OZ704	4:40	4:34	MANILA	41	B767-300
Asiana Airlines	OZ724	4:50	4:37	HONG KONG	32	B747-400
Korean Air	KE9698	5:05	4:43	SIEMREAP	18	#N/A
Korean Air	KE608	5:05	4:51	HONG KONG	22	B777-300
Korean Air	KE624	5:05	4:56	MANILA	7	A330-200
Asiana Airlines	OZ3205	5:10	4:59	NANCHANG	35	A320-200
Vietnam Airlines	VN936	5:30	5:02	HANOI	106	A321-231
Philippine Airlines	PR466	6:00	5:08	MANILA	117	A320-200
Asiana Airlines	OZ734	5:35	5:16	HANOI	37	B767-300
Korean Air	KE688	5:40	5:21	SIEMREAP	15	B737-800
Korean Air	KE680	5:50	5:28	HANOI	28	A330-300
Asiana Airlines	OZ752	6:00	5:35	SINGAPORE	30	A330-300
Korean Air	KE642	5:50	5:43	SINGAPORE	10	B777-200ER
Asiana Airlines	OZ758	6:10	5:45	KOTA KINABALU	31	A321-100
Asiana Airlines	OZ708	5:40	5:50	CLARK FIELD	46	A321-100
Korean Air	KE652	5:50	5:52	BANGKOK	12	B777-300
Thai Airways International	TG658	6:25	6:06	BANGKOK	124	B777-300
Asiana Airlines	OZ235	6:00	6:09	CHICAGO	40	B777-200ER
Vietnam Airlines	VN938	6:20	6:11	HO CHI MINH	108	A330-300
Asiana Airlines	OZ604	6:30	6:14	SAIPAN	39	B767-300
Asiana Airlines	OZ738	7:10	6:20	SIEMREAP	47	A321-100
Air Macau	NX826	6:40	6:25	MACAU	119	A321-100
Korean Air	KE628	6:50	6:28	JAKARTA	26	A330-300
Korean Air	KE690	6:40	6:30	PHNOM PENH	8	B737-800
Thai Airways International	TG656	7:10	6:33	BANGKOK	125	A330-300
Asiana Airlines	OZ354	6:40	6:35	HAIKOU	42	A321-100
Korean Air	KE012	6:05	6:38	LOS ANGELES	24	B747-400
Asiana Airlines	OZ710	6:25	6:40	CEBU	43	A320-200
Singapore Airlines	SQ602	7:05	6:45	SINGAPORE	122	B777-312
China Eastern Airlines	MU2039	7:40	6:48	SANYA	126	A320-200
Asiana Airlines	OZ740	7:10	6:55	PHNOM PENH	35	A320-200
Korean Air	KE682	6:50	6:59	HO CHI MINH	21	A330-300
Asiana Airlines	OZ3245	6:50	7:04	SANYA	36	A321-100
Korean Air	KE672	7:20	7:06	KUALA LUMPUR	23	A330-300
Korean Air	KE632	7:15	7:09	CEBU	12	B737-900
Asiana Airlines	OZ203	7:00	7:11	LOS ANGELES	49	B777-200ER
China Eastern Airlines	MU2003	7:00	7:16	KUNMING	127	A320-200
Asiana Airlines	OZ742	6:35	7:21	BANGKOK	32	A330-300
Asiana Airlines	OZ8532	7:50	7:36	BUSAN	3	A320-200
Asiana Airlines	OZ732	8:00	7:39	HO CHI MINH	43	B747-400
Korean Air	KE112	8:05	7:47	GUAM	21	B777-200ER
Korean Air	KE1402	8:05	7:50	BUSAN	5	B737-900
Korean Air	KE1412	8:15	8:01	DAEGU	1	B737-900
Malaysia Airlines	MH066	8:35	8:03	KUALA LUMPUR	111	A330-200
Korean Air	KE630	8:40	8:07	DENPASAR	27	A330-300
Garuda Indonesia	GA870	8:30	8:28	DENPASAR	113	A330-300
Asiana Airlines	OZ744	8:20	8:30	BANGKOK	49	B767-300
Air France	AF264	8:00	8:35	PARIS	110	B777-200ER
Korean Air	KE654	8:40	8:37	BANGKOK	15	B777-300
Korean Air	KE638	9:40	9:11	PHUKET	26	A330-300
Uzbekistan Airways	HY511	9:45	9:13	TASHKENT	117	B767-300ER
Asiana Airlines	OZ748	10:15	9:40	PHUKET	31	B767-300
Korean Air	KE952	10:10	9:53	DUBAI	12	B777-200ER
Asiana Airlines	OZ6085	10:10	9:58	KOROR	46	A321-100
China Southern Airlines	CZ685	10:40	10:32	DALIAN	104	A321-200
China Southern Airlines	CZ313	10:45	10:38	SHANGHAI/PUDONG	103	B737-800
Aeroflot-Russian Int. Airlines	SU599	10:50	10:46	MOSCOW	109	Tupolev Tu-154M
China Eastern Airlines	MU549	11:00	10:56	YANTAI	127	A320-200
China Southern Airlines	CZ317	11:10	10:58	BEIJING	110	A321-200
Air China	CA171	10:45	11:01	TIANJIN	102	B737-300
Japan Airlines	JL983	11:25	11:09	NAGOYA	114	B767-300ER
China Airlines	CI160	11:35	11:15	TAIPEI	121	A340-300
Asiana Airlines	OZ115	11:25	11:17	OSAKA/KANSAI	42	A321-100
Korean Air	KE748	11:35	11:19	OKAYAMA	11	B737-900
Air China	CA123	11:50	11:22	BEIJING	107	A330-200
Korean Air	KE722	11:40	11:25	OSAKA/KANSAI	19	B777-300
Japan Airlines	JL961	11:30	11:30	OSAKA/KANSAI	115	B767-300ER
China Southern Airlines	CZ681	11:35	11:31	SHENYANG	105	A321-200
Korean Air	KE752	11:45	11:34	NAGOYA	23	B747-400
Air China	CA139	12:05	11:37	HANGZHOU	106	A319-100
Korean Air	KE788	12:00	11:43	FUKUOKA	17	A330-300

Asiana Airlines	OZ107	11:40	11:49	TOKYO/NARITA	41	A330-300
Korean Air	KE706	12:00	11:50	TOKYO/NARITA	14	B747-400
Korean Air	KE764	11:55	11:53	NIIGATA	15	B737-900
China Eastern Airlines	MU5041	11:55	11:55	SHANGHAI/PUDONG	129	A321-200
Asiana Airlines	OZ310	12:20	11:59	WEIHAI	45	A321-100
China Eastern Airlines	MU2033	12:20	12:00	QINGDAO	130	A320-200
China Southern Airlines	CZ337	12:10	12:02	GUANGZHOU	112	A321-200
Lufthansa Airlines	LH712	12:30	12:05	FRANKFURT	122	A340-600
China Eastern Airlines	MU579	11:50	12:07	NANJING	128	A320-200
China Southern Airlines	CZ687	12:20	12:10	CHANGCHUN	111	A321-200
Korean Air	KE792	12:45	12:26	OITA	9	B737-900
Mongolian Airlines	OM301	12:45	12:28	ULAANBAATAR	103	B737-800
All Nippon Airways	NH941	12:40	12:29	NAGOYA	117	A320-200
Air China	CA127	12:50	12:32	QINGDAO	108	B737-800
Asiana Airlines	OZ542	12:40	12:35	FRANKFURT	47	B777-200ER
Asiana Airlines	OZ768	12:20	12:36	DELHI	39	A330-300
KLM Royal Dutch Airlines	KL865	13:05	12:38	AMSTERDAM	110	B747-400M
Shanghai Airlines	FM827	12:40	12:46	SHANGHAI/PUDONG	118	B737-700
Asiana Airlines	OZ302	13:10	12:58	DALIAN	42	A320-200
China Southern Airlines	CZ6073	13:25	13:01	YANJI	104	A321-200
Asiana Airlines	OZ131	13:10	13:04	FUKUOKA	46	B767-300
Japan Airlines	JL951	12:45	13:06	TOKYO/NARITA	113	B767-300ER
Korean Air	KE906	13:25	13:10	FRANKFURT	7	B747-400
Korean Air	KE832	13:10	13:19	SHENYANG	26	A330-300
Korean Air	KE936	13:50	13:22	PRAGUE	15	A330-300
Asiana Airlines	OZ161	13:45	13:24	HIROSHIMA	43	A321-100
Korean Air	KE838	13:40	13:27	YANTAI	18	B737-900
All Nippon Airways	NH907	13:40	13:29	TOKYO/NARITA	119	A320-200
Asiana Airlines	OZ163	13:40	13:31	YONAGO	38	A321-100
Korean Air	KE846	13:50	13:33	QINGDAO	11	B737-800
Korean Air	KE894	13:55	13:36	SHANGHAI/PUDONG	21	B777-200ER
Asiana Airlines	OZ8590	13:55	13:39	JEJU	5	A320-200
Korean Air	KE776	14:05	13:48	KOMATSU	20	B737-900
Cathay Pacific Airways	CX410	14:05	13:50	HONG KONG	121	A330-300
Asiana Airlines	OZ165	14:10	13:53	TAKAMATSU	36	A321-100
Vladivostok Airlines	XF743	14:20	13:55	VLADIVOSTOK	114	A320-200
Korean Air	KE786	14:10	13:58	KAGOSHIMA	24	A330-200
Asiana Airlines	OZ127	14:00	14:00	TOYAMA	30	A321-100
Asiana Airlines	OZ121	14:00	14:03	NAGOYA	34	B767-300
Asiana Airlines	OZ157	14:30	14:16	MIYAZAKI	31	A321-100
Shandong Airlines	SC4089	14:20	14:18	YANTAI	127	B737-300
Korean Air	KE852	14:40	14:22	BEIJING	9	A330-200
China Southern Airlines	CZ3065	14:15	14:28	CHANGSHA/Datuopu	109	A320-200
Asiana Airlines	OZ111	14:50	14:40	OSAKA/KANSAI	48	A330-300
Asiana Airlines	OZ318	14:40	14:41	QINGDAO	42	A320-200
Asiana Airlines	OZ334	15:00	14:46	BEIJING	45	B767-300
Asiana Airlines	OZ304	15:05	14:48	CHANGCHUN	32	A320-200
Asiana Airlines	OZ362	15:00	14:50	SHANGHAI/PUDONG	41	B747-400
Korean Air	KE902	15:20	14:56	PARIS	27	B747-400
Korean Air	KE032	15:05	15:01	DALLAS	23	B777-200ER
Asiana Airlines	OZ328	15:30	15:03	TIANJIN	33	A320-200
China Eastern Airlines	MU5033	15:20	15:07	SHANGHAI/PUDONG	118	A321-200
China Eastern Airlines	MU559	15:20	15:14	QINGDAO	117	A320-200
Korean Air	KE692	15:35	15:19	TAIPEI	10	A330-300
Korean Air	KE724	15:40	15:22	OSAKA/KANSAI	26	A330-300
Korean Air	KE806	16:00	15:27	TIANJIN	12	B777-200ER
Shandong Airlines	SC4081	15:30	15:32	QINGDAO	128	B737-300
Korean Air	KE702	15:35	15:35	TOKYO/NARITA	7	B777-200ER
Korean Air	KE934	15:40	15:39	ZURICH	19	A330-300
Asiana Airlines	OZ364	15:55	15:42	SHANGHAI/PUDONG	43	B767-300
Korean Air	KE768	15:55	15:44	AOMORI	18	B737-800
Emirates	EK322	16:45	15:45	DUBAI	111	B777-300ER
Korean Air	KE038	16:20	15:50	CHICAGO	17	B777-200ER
Korean Air	KE094	16:25	15:54	WASHINGTON	24	B777-200ER
Korean Air	KE908	16:00	15:56	LONDON	22	B747-400
Asiana Airlines	OZ151	16:00	16:04	SENDAI	49	B767-300
Singapore Airlines	SQ016	16:35	16:06	SINGAPORE	121	B777-312
Asiana Airlines	OZ101	16:10	16:08	TOKYO/NARITA	46	B747-400
Air China	CA135	16:25	16:10	DALIAN	103	B737-800
Thai Airways International	TG634	16:15	16:11	BANGKOK	122	B777-300
Korean Air	KE052	16:40	16:15	HONOLULU	6	B777-200ER
Asiana Airlines	OZ712	16:30	16:17	TAIPEI	50	B767-300
Korean Air	KE036	17:05	16:25	ATLANTA	30	B747-400
Air China	CA125	16:50	16:27	BEIJING	102	A321-200
Korean Air	KE704	16:35	16:29	TOKYO/NARITA	9	B777-300
Korean Air	KE870	16:50	16:32	DALIAN	16	B737-900
Korean Air	KE082	17:20	16:34	NEWYORK	8	B747-400
Korean Air	KE604	17:00	16:39	HONG KONG	7	B777-200ER
Asiana Airlines	OZ522	16:55	16:41	LONDON	40	B777-200ER
Turkish Airlines	TK090	16:50	16:43	ISTANBUL	107	A330-200
Korean Air	KE820	17:15	16:48	CHANGSHA/Datuopu	32	B737-800
Japan Airlines	JL963	17:05	16:50	OSAKA/KANSAI	112	B767-300ER
Korean Air	KE790	17:10	16:53	FUKUOKA	14	B777-200ER
Korean Air	KE898	17:00	16:54	SHANGHAI/PUDONG	31	A330-300
Japan Airlines	JL953	17:00	16:55	TOKYO/NARITA	113	B767-300ER
Korean Air	KE958	17:15	16:59	TEL AVIV	28	B747-400
Asiana Airlines	OZ370	17:00	17:03	GUANGZHOU	37	A330-300
Korean Air	KE766	17:15	17:04	SAPPORO	15	A330-300
Singapore Airlines	SQ017	16:55	17:07	VANCOUVER	124	B777-212ER
Korean Air	KE842	17:30	17:08	QINGDAO	23	A330-300
Korean Air	KE124	17:35	17:13	BRISBANE	30	A330-300
Korean Air	KE622	17:25	17:14	MANILA	17	B777-300
Asiana Airlines	OZ271	17:35	17:24	SEATTLE	47	B777-200ER
Korean Air	KE018	17:05	17:28	LOS ANGELES	10	B747-400
Korean Air	KE122	17:40	17:31	SYDNEY	33	B747-400
Asiana Airlines	OZ722	17:45	17:32	HONG KONG	41	B777-200ER
Korean Air	KE138	17:40	17:34	NADI	26	A330-200
Asiana Airlines	OZ350	17:15	17:37	NANJING	35	A321-100
Air Canada	AC063	17:15	17:38	VANCOUVER	119	B767-300ER
All Nippon Airways	NH177	18:00	17:39	OSAKA/KANSAI	117	A320-200

Korean Air	KE1406	17:50	17:41	BUSAN	3	B737-900
Asiana Airlines	OZ308	17:50	17:42	YANTAI	46	A320-200
Korean Air	KE828	17:35	17:44	SHENZEN	21	A330-300
Korean Air	KE758	18:00	17:46	NAGOYA	25	B737-900
Asiana Airlines	OZ213	17:45	17:47	SAN FRANCISCO	39	B777-200ER
Asiana Airlines	OZ340	18:10	17:48	HARBIN	34	A321-100
China Southern Airlines	CZ369	17:45	17:52	SHANGHAI/PUDONG	110	B737-800
Asiana Airlines	OZ575	17:50	17:54	SAKHALINSK	38	A321-100
Eva Air	BR160	18:20	17:55	TAIPEI	125	A330-200
Korean Air	KE840	18:25	18:00	WEIHAI	11	B737-900
Korean Air	KE020	17:45	18:03	SEATTLE	12	B777-200ER
China Southern Airlines	CZ683	17:50	18:04	HARBIN	106	A320-200
Asiana Airlines	OZ602	18:10	18:06	SYDNEY	31	B777-200ER
Asiana Airlines	OZ372	18:20	18:09	SHENZEN	42	A320-200
Asiana Airlines	OZ103	18:10	18:11	TOKYO/NARITA	40	B767-300
Cathay Pacific Airways	CX418	18:35	18:13	HONG KONG	121	B777-300
Korean Air	KE848	18:30	18:15	JINAN	25	B737-900
Asiana Airlines	OZ336	18:20	18:19	BEIJING	36	A321-100
Korean Air	KE024	17:55	18:22	SAN FRANCISCO	17	B777-200ER
Air China	CA147	18:30	18:23	WEIHAI	103	B737-300
Asiana Airlines	OZ702	18:00	18:27	MANILA	48	A330-300
China Southern Airlines	CZ671	18:30	18:29	SHENYANG	108	A319-100
Korean Air	KE982	18:40	18:33	VLADIVOSTOK	20	B737-800
Singapore Airlines	SQ015	18:25	18:36	SAN FRANCISCO	123	B777-312
Philippine Airlines	PR468	19:20	18:46	MANILA	122	A330-300
Asiana Airlines	OZ113	19:00	18:48	OSAKA/KANSAI	35	A330-300
Asiana Airlines	OZ201	18:30	18:49	LOS ANGELES	43	B747-400
Asiana Airlines	OZ133	19:10	18:51	FUKUOKA	41	A321-100
Asiana Airlines	OZ175	19:10	18:53	MATSUYAMA	45	A321-100
Asiana Airlines	OZ8534	19:10	19:00	BUSAN	3	A320-200
Qatar Airways	QR820	19:05	19:04	DOHA	113	A330-200
Asiana Airlines	OZ360	19:35	19:08	HANGZHOU	34	B767-300
Korean Air	KE726	19:25	19:14	OSAKA/KANSAI	23	A330-300
China Xiamen Airlines	MF871	19:30	19:17	XIAMEN	128	B737-700
Asiana Airlines	OZ366	19:40	19:22	SHANGHAI/PUDONG	32	A321-100
Korean Air	KE002	19:40	19:26	LOS ANGELES	27	B777-200ER
Shandong Airlines	SC4095	19:20	19:29	JINAN	127	B737-300
United Airlines	UA893	19:35	19:31	SAN FRANCISCO	126	B777-200
Thai Airways International	TG628	19:55	19:33	BANGKOK	124	A330-300
China Eastern Airlines	MU2023	19:35	19:36	CHANGSHA/Datuopu	130	A320-200
Korean Air	KE614	19:45	19:39	HONG KONG	16	B737-800
Asiana Airlines	OZ123	19:55	19:47	NAGOYA	31	B767-300
Asiana Airlines	OZ368	20:20	19:58	SHANGHAI/PUDONG	36	A320-200
Asiana Airlines	OZ338	20:20	20:04	BEIJING	33	A321-100
Korean Air	KE130	20:10	20:13	AUCKLAND	9	B747-400
Cathay Pacific Airways	CX420	20:40	20:17	HONG KONG	123	A330-300
China Eastern Airlines	MU5087	21:20	20:39	BEIJING	127	A320-200
China Southern Airlines	CZ675	20:45	20:43	DALIAN	106	A319-100
China Eastern Airlines	MU5051	20:55	20:47	SHANGHAI/PUDONG	129	A321-200
Cathay Pacific Airways	CX416	21:05	20:57	HONG KONG	121	A330-300
Cebu Pacific Air	5J194	20:45	21:02	MANILA	117	A320-200
United Airlines	UA881	21:10	21:06	CHICAGO	126	B777-200
Japan Airlines	JL959	20:55	21:09	TOKYO/NARITA	112	B747-400
Northwest Airlines	NW007	21:15	21:12	SEATTLE	115	B757-700
Air China	CA133	21:10	21:15	QINGDAO	102	B737-300
Cebu Pacific Air	5J128	21:05	21:19	CEBU	119	A320-200
Asiana Airlines	OZ714	21:40	21:24	TAIPEI	42	A320-200
Air China	CA137	21:45	21:26	BEIJING	103	B737-800
Korean Air	KE782	22:20	21:56	FUKUOKA	12	B777-200ER
Asiana Airlines	OZ105	23:10	23:18	TOKYO/NARITA	27	A321-100

Date: 28th February 2009

Airline	Flight	EAT	RAT	Origin	Gate	Aircraft
Korean Air	KE896	0:15	0:02	SHANGHAI/PUDONG	10	B777-200ER
Korean Air	KE854	0:10	0:33	BEIJING	9	B777-200ER
Korean Air	KE074	3:30	3:08	TORONTO	14	B747-400
Asiana Airlines	OZ326	4:00	3:50	GUILIN	24	A321-100
Korean Air	KE086	5:00	4:19	NEWYORK	9	B747-400
Cathay Pacific Airways	CX412	4:45	4:28	HONG KONG	121	A330-300
Asiana Airlines	OZ704	4:40	4:30	MANILA	34	B767-300
Asiana Airlines	OZ724	4:50	4:42	HONG KONG	49	B747-400
Korean Air	KE608	5:05	4:46	HONG KONG	27	B747-400
Asiana Airlines	OZ7043	5:25	4:49	MANILA	45	A321-100
Korean Air	KE624	5:05	4:58	MANILA	21	A330-300
Asiana Airlines	OZ734	5:35	5:03	HANOI	30	B767-300
Vietnam Airlines	VN936	5:30	5:07	HANOI	108	A330-200
Asiana Airlines	OZ221	5:10	5:10	NEWYORK	40	B747-400
Korean Air	KE688	5:40	5:13	SIEMREAP	17	B737-800
Korean Air	KE886	5:35	5:17	KUNMING	19	A330-200
Korean Air	KE680	5:50	5:25	HANOI	26	A330-300
Philippine Airlines	PR466	6:00	5:27	MANILA	117	A320-200
Korean Air	KE652	5:50	5:28	BANGKOK	7	B777-200ER
Asiana Airlines	OZ708	5:40	5:38	CLARK FIELD	37	A321-100
Korean Air	KE642	5:50	5:40	SINGAPORE	15	B777-300
Asiana Airlines	OZ758	6:10	5:43	KOTA KINABALU	41	A321-100
Asiana Airlines	OZ752	6:00	5:50	SINGAPORE	31	A330-300
Korean Air	KE012	6:05	6:03	LOS ANGELES	22	B747-400
Asiana Airlines	OZ710	6:25	6:05	CEBU	38	A320-200
Lufthansa Airlines	LH716	6:35	6:07	MUNICH	126	A340-300
Korean Air	KE674	6:30	6:15	KOTA KINABALU	20	B737-800
Asiana Airlines	OZ604	6:30	6:22	SAIPAN	47	A321-100
Asiana Airlines	OZ738	7:10	6:24	SIEMREAP	45	A321-100
Asiana Airlines	OZ742	6:35	6:29	BANGKOK	39	B767-300
Vietnam Airlines	VN938	6:20	6:31	HO CHI MINH	106	A330-300
Singapore Airlines	SQ602	7:05	6:37	SINGAPORE	122	B777-312

Korean Air	KE690	6:40	6:39	PHNOM PENH	18	B737-800
Asiana Airlines	OZ203	7:00	6:43	LOS ANGELES	48	B777-200ER
Thai Airways International	TG658	6:25	6:45	BANGKOK	124	B777-200
Korean Air	KE628	6:50	6:48	JAKARTA	8	A330-300
Asiana Airlines	OZ740	7:10	6:52	PHNOM PENH	50	A320-200
Korean Air	KE682	6:50	6:55	HO CHI MINH	27	A330-300
Korean Air	KE632	7:15	6:59	CEBU	17	B737-900
Thai Airways International	TG656	7:10	7:09	BANGKOK	125	A330-300
Korean Air	KE672	7:20	7:11	KUALA LUMPUR	24	A330-300
Korean Air	KE062	7:20	7:15	SAO PAULO	6	B777-200ER
Asiana Airlines	OZ578	7:50	7:39	ALMATY	35	B767-300
Asiana Airlines	OZ8532	7:50	7:41	BUSAN	2	A320-200
Asiana Airlines	OZ732	8:00	7:46	HO CHI MINH	39	A330-300
Air France	AF264	8:00	7:48	PARIS	110	B777-200ER
Korean Air	KE1402	8:05	7:49	BUSAN	3	B737-900
Korean Air	KE9708	7:40	7:54	TOKYO/HANEDA	11	#N/A
Korean Air	KE112	8:05	7:57	GUAM	19	B777-200ER
Korean Air	KE1412	8:15	8:01	DAEGU	5	B737-900
Malaysia Airlines	MH066	8:35	8:03	KUALA LUMPUR	111	A330-200
Asiana Airlines	OZ744	8:20	8:13	BANGKOK	48	B767-300
Korean Air	KE654	8:40	8:18	BANGKOK	12	B777-300
Korean Air	KE630	8:40	8:23	DENPASAR	26	A330-300
Korean Air	KE942	8:35	8:26	TASHKENT	9	A330-300
Asiana Airlines	OZ574	9:00	8:32	TASHKENT	45	A330-300
FINNAIR	AY041	9:20	9:00	HELSINKI	126	A340-300
Asiana Airlines	OZ748	9:45	9:36	PHUKET	30	B767-300
Korean Air	KE1494	9:50	9:44	BUSAN	5	#N/A
China Southern Airlines	CZ685	10:40	10:24	DALIAN	104	ATR 72-500
China Southern Airlines	CZ313	10:45	10:35	SHANGHAI/PUDONG	102	B737-800
Air China	CA171	10:45	10:44	TIANJIN	103	B737-300
Korean Air	KE924	10:55	10:48	MOSCOW	12	B777-200ER
China Eastern Airlines	MU549	11:00	10:52	YANTAI	129	A320-200
China Southern Airlines	CZ317	11:10	10:56	BEIJING	105	A321-200
China Airlines	CI160	11:35	11:10	TAIPEI	121	A340-300
Japan Airlines	JL983	11:25	11:11	NAGOYA	112	B767-300ER
Asiana Airlines	OZ119	11:25	11:16	SAIPAN	46	A321-100
Air China	CA123	11:50	11:17	BEIJING	107	A330-200
Japan Airlines	JL961	11:30	11:19	OSAKA/KANSAI	114	B767-300ER
Korean Air	KE748	11:35	11:23	OKAYAMA	11	B737-900
China Southern Airlines	CZ681	11:35	11:25	SHENYANG	106	A321-200
China Eastern Airlines	MU579	11:50	11:30	NANJING	128	A320-200
Korean Air	KE730	11:40	11:34	GUAM	26	A330-300
Korean Air	KE764	11:55	11:38	NIIGATA	17	B737-900
Korean Air	KE752	11:45	11:41	NAGOYA	27	B747-400
Air China	CA139	12:05	11:44	HANGZHOU	109	A319-100
Asiana Airlines	OZ107	11:40	11:46	TOKYO/NARITA	41	A330-300
Korean Air	KE706	12:00	11:47	TOKYO/NARITA	14	B777-300
Korean Air	KE788	12:00	11:57	FUKUOKA	8	A330-300
Asiana Airlines	OZ310	12:20	12:01	WEIHAI	42	A321-100
China Eastern Airlines	MU5041	11:55	12:03	SHANGHAI/PUDONG	125	A321-200
Lufthansa Airlines	LH712	12:30	12:05	FRANKFURT	122	A340-600
SAT Airlines	HZ111	11:35	12:11	SAKHALINSK	130	B737-200
China Eastern Airlines	MU2033	12:20	12:13	QINGDAO	126	A320-200
China Southern Airlines	CZ337	12:10	12:15	GUANGZHOU	111	A321-200
China Southern Airlines	CZ687	12:20	12:16	CHANGCHUN	115	A321-200
KLM Royal Dutch Airlines	KL865	13:05	12:18	AMSTERDAM	110	B747-400M
All Nippon Airways	NH941	12:40	12:22	NAGOYA	117	A320-200
Air China	CA143	12:40	12:25	YANJI	108	B737-800
Air China	CA127	12:50	12:28	QINGDAO	102	B737-800
Korean Air	KE794	12:40	12:29	NAGASAKI	20	B737-900
Asiana Airlines	OZ542	12:40	12:31	FRANKFURT	45	B777-200ER
Japan Airlines	JL951	12:45	12:32	TOKYO/NARITA	113	B777-200
Mongolian Airlines	OM301	12:45	12:34	ULAANBAATAR	103	B737-800
Lufthansa Airlines	LH717	12:40	12:37	SHENYANG	124	A340-300
Asiana Airlines	OZ131	13:10	12:57	FUKUOKA	32	B767-300
Asiana Airlines	OZ302	13:10	13:03	DALIAN	34	A320-200
Korean Air	KE906	13:25	13:14	FRANKFURT	7	B747-400
Korean Air	KE832	13:10	13:17	SHENYANG	24	A330-300
Korean Air	KE956	13:55	13:25	ISTANBUL	21	A330-300
Korean Air	KE846	13:50	13:32	QINGDAO	16	B737-800
Asiana Airlines	OZ141	14:00	13:35	KUMAMOTO	36	A320-200
Korean Air	KE894	13:55	13:37	SHANGHAI/PUDONG	9	B777-200ER
Asiana Airlines	OZ161	13:45	13:41	HIROSHIMA	31	B767-300
Asiana Airlines	OZ121	14:00	13:43	NAGOYA	30	B767-300
Cathay Pacific Airways	CX410	14:05	13:47	HONG KONG	121	A330-300
Korean Air	KE852	14:40	14:19	BEIJING	19	A330-200
Asiana Airlines	OZ318	14:40	14:22	QINGDAO	38	A320-200
Asiana Airlines	OZ111	14:50	14:39	OSAKA/KANSAI	41	A330-300
Korean Air	KE656	15:10	14:41	MUMBAI	12	A330-300
Asiana Airlines	OZ362	15:00	14:43	SHANGHAI/PUDONG	40	B747-400
Asiana Airlines	OZ155	15:00	14:46	FUKUSHIMA	33	A320-200
Asiana Airlines	OZ304	15:05	14:48	CHANGCHUN	47	A321-100
Asiana Airlines	OZ171	15:00	14:50	OKINAWA	37	A321-100
Korean Air	KE902	15:20	14:52	PARIS	28	B747-400
Asiana Airlines	OZ334	15:00	15:02	BEIJING	32	B747-400
China Eastern Airlines	MU5033	15:20	15:08	SHANGHAI/PUDONG	117	A321-200
China Eastern Airlines	MU559	15:20	15:10	QINGDAO	118	A320-200
Korean Air	KE692	15:35	15:13	TAIPEI	22	A330-300
Asiana Airlines	OZ328	15:30	15:19	TIANJIN	42	A321-100
Korean Air	KE810	15:35	15:20	ZHENGZHOU	34	B737-900
Korean Air	KE702	15:35	15:23	TOKYO/NARITA	15	B777-300
Korean Air	KE724	15:40	15:27	OSAKA/KANSAI	8	A330-300
Korean Air	KE770	15:45	15:35	AKITA	31	B737-800
All Nippon Airways	NH907	13:40	15:38	TOKYO/NARITA	119	A320-200
Shandong Airlines	SC4081	15:30	15:40	QINGDAO	127	B737-300
Asiana Airlines	OZ502	16:00	15:42	PARIS	35	B777-200ER
Delta Air Lines	DL091	16:05	15:47	ATLANTA	112	B777-200ER
Asiana Airlines	OZ364	15:55	15:50	SHANGHAI/PUDONG	39	B767-300
Korean Air	KE926	16:10	15:52	Madrid Barajas Airport	30	B777-200ER
Asiana Airlines	OZ101	16:10	15:56	TOKYO/NARITA	43	B777-200ER

Korean Air	KE826	16:10	15:58	YANJI	11	B737-900
Asiana Airlines	OZ151	16:00	16:01	SENDAI	49	B767-300
Korean Air	KE908	16:00	16:02	LONDON	7	B747-400
Thai Airways International	TG634	16:15	16:04	BANGKOK	121	B777-300
Emirates	EK322	16:45	16:07	DUBAI	111	B777-300ER
Singapore Airlines	SQ016	16:35	16:07	SINGAPORE	122	B777-312
Korean Air	KE038	16:20	16:09	CHICAGO	10	B777-200ER
Korean Air	KE052	16:40	16:10	HONOLULU	17	B777-200ER
Air China	CA135	16:25	16:11	DALIAN	108	B737-800
Korean Air	KE982	16:40	16:13	VLADIVOSTOK	16	B737-800
Korean Air	KE806	16:00	16:15	TIANJIN	24	B747-400
Korean Air	KE094	16:25	16:17	WASHINGTON	6	B777-200ER
Korean Air	KE082	17:20	16:18	NEWYORK	8	B747-400
Asiana Airlines	OZ712	16:30	16:19	TAIPEI	46	B767-300
Asiana Airlines	OZ153	16:40	16:23	ASAHIKAWA	38	A320-200
Asiana Airlines	OZ3485	16:25	16:28	MUDANJIANG	36	A320-200
Korean Air	KE954	16:45	16:29	CAIRO	26	A330-200
Korean Air	KE870	16:50	16:31	DALIAN	32	B737-900
Air China	CA125	16:50	16:33	BEIJING	103	A321-200
Korean Air	KE704	16:35	16:41	TOKYO/NARITA	27	B777-300
Korean Air	KE604	17:00	16:43	HONG KONG	23	B747-400
Korean Air	KE898	17:00	16:46	SHANGHAI/PUDONG	18	B737-800
Singapore Airlines	SQ018	17:10	16:49	SINGAPORE	125	B777-212ER
Korean Air	KE790	17:10	16:50	FUKUOKA	19	B777-200ER
Asiana Airlines	OZ370	17:00	16:51	GUANGZHOU	41	A330-300
Korean Air	KE842	17:30	16:55	QINGDAO	22	A330-300
Korean Air	KE018	17:05	16:56	LOS ANGELES	12	B747-400
Korean Air	KE888	17:25	16:58	XIAMEN	11	B737-800
Japan Airlines	JL963	17:05	17:00	OSAKA/KANSAI	113	B767-300ER
Air Canada	AC063	17:15	17:01	VANCOUVER	119	B767-300ER
Japan Airlines	JL953	17:00	17:03	TOKYO/NARITA	115	B767-300ER
Asiana Airlines	OZ8534	17:30	17:16	BUSAN	3	A320-200
Korean Air	KE024	17:55	17:18	SAN FRANCISCO	33	B777-200ER
Korean Air	KE122	17:40	17:20	SYDNEY	30	B747-400
Korean Air	KE036	17:05	17:21	ATLANTA	21	B747-400
Asiana Airlines	OZ308	17:50	17:25	YANTAI	42	A320-200
Korean Air	KE928	17:35	17:27	Fiumicino Airport	24	B777-200ER
Korean Air	KE072	17:50	17:29	VANCOUVER	17	B777-200ER
Korean Air	KE622	17:25	17:30	MANILA	14	B777-300
Korean Air	KE1406	17:50	17:32	BUSAN	1	B737-900
Asiana Airlines	OZ7083	17:55	17:34	CLARK FIELD	36	A321-100
Korean Air	KE866	17:55	17:36	GUANGZHOU	12	A330-300
Korean Air	KE766	17:15	17:38	SAPPORO	9	A330-300
Asiana Airlines	OZ722	17:45	17:39	HONG KONG	48	A330-300
Asiana Airlines	OZ213	17:45	17:41	SAN FRANCISCO	40	B777-200ER
China Southern Airlines	CZ369	17:45	17:43	SHANGHAI/PUDONG	110	B737-800
All Nippon Airways	NH177	18:00	17:44	OSAKA/KANSAI	117	A320-200
Eva Air	BR160	18:20	17:48	TAIPEI	123	A330-200
Korean Air	KE758	18:00	17:51	NAGOYA	20	B737-900
Asiana Airlines	OZ340	18:10	17:53	HARBIN	34	B767-300
Asiana Airlines	OZ602	18:10	17:55	SYDNEY	35	B777-200ER
Asiana Airlines	OZ702	18:00	17:57	MANILA	39	A330-300
Korean Air	KE840	18:25	18:01	WEIHAI	25	B737-800
Singapore Airlines	SQ015	18:25	18:03	SAN FRANCISCO	124	B777-312
Asiana Airlines	OZ201	18:30	18:11	LOS ANGELES	50	B747-400
Cathay Pacific Airways	CX418	18:35	18:13	HONG KONG	122	A330-300
Asiana Airlines	OZ103	18:10	18:15	TOKYO/NARITA	46	B777-200ER
Asiana Airlines	OZ336	18:20	18:17	BEIJING	31	A330-300
China Southern Airlines	CZ671	18:30	18:19	SHENYANG	108	MD-90-30
Asiana Airlines	OZ133	18:50	18:29	FUKUOKA	30	B767-300
Qatar Airways	QR820	19:05	18:37	DOHA	113	A330-200
China Eastern Airlines	MU2043	18:40	18:40	QINGDAO	131	A320-200
Asiana Airlines	OZ360	19:00	18:44	HANGZHOU	32	A321-100
Asiana Airlines	OZ113	19:00	18:49	OSAKA/KANSAI	41	B767-300
Japan Airlines	JL955	19:10	18:54	TOKYO/NARITA	109	B767-300ER
Mandarin Airlines	AE960	19:05	18:56	KAOHSIUNG	105	Embraer E-190
Asiana Airlines	OZ571	19:00	18:58	KHABAROVSK	45	A321-100
Asiana Airlines	OZ366	19:20	19:03	SHANGHAI/PUDONG	33	A321-100
Asiana Airlines	OZ606	19:00	19:10	SAIPAN	42	A321-100
Philippine Airlines	PR468	19:20	19:12	MANILA	121	A330-300
United Airlines	UA893	19:35	19:15	SAN FRANCISCO	126	B777-200
Korean Air	KE726	19:25	19:18	OSAKA/KANSAI	23	A330-300
China Eastern Airlines	MU2023	19:35	19:20	CHANGSHA/Datuopu	129	A320-200
Korean Air	KE614	19:45	19:26	HONG KONG	18	B737-800
China Southern Airlines	CZ683	20:05	19:30	HARBIN	114	MD-90-30
Korean Air	KE002	19:40	19:37	LOS ANGELES	7	B777-200ER
Asiana Airlines	OZ123	19:45	19:45	NAGOYA	36	B767-300
Thai Airways International	TG628	19:55	19:49	BANGKOK	125	A330-300
Asiana Airlines	OZ368	20:20	19:54	SHANGHAI/PUDONG	38	A320-200
Asiana Airlines	OZ338	20:40	20:24	BEIJING	41	A320-200
Korean Air	KE130	20:10	20:29	AUCKLAND	27	B747-400
Philippine Airlines	PR488	20:50	20:32	CEBU	122	A320-200
Cebu Pacific Air	5J194	20:45	20:41	MANILA	117	A320-200
China Southern Airlines	CZ675	20:45	20:43	DALIAN	110	A321-200
China Eastern Airlines	MU5087	21:20	20:46	BEIJING	127	A320-200
Northwest Airlines	NW007D	21:15	20:49	SEATTLE	115	B757-700
Cathay Pacific Airways	CX416	21:05	20:54	HONG KONG	121	B777-200
Air China	CA133	21:10	20:55	QINGDAO	102	B737-300
Japan Airlines	JL959	20:55	20:57	TOKYO/NARITA	112	B777-300
United Airlines	UA881A	21:10	21:03	CHICAGO	126	#N/A
China Eastern Airlines	MU5051	20:55	21:05	SHANGHAI/PUDONG	128	A321-200
Asiana Airlines	OZ736	21:20	21:15	HO CHI MINH	34	A321-100
Cebu Pacific Air	5J128	21:05	21:22	CEBU	119	A320-200
Korean Air	KE868	21:35	21:25	ULAANBAATAR	26	A330-200
Air China	CA137	21:45	21:27	BEIJING	103	B737-800
Korean Air	KE694	22:15	21:52	TAIPEI	11	B737-900
Korean Air	KE782	22:20	22:00	FUKUOKA	10	B777-200ER
Asiana Airlines	OZ105	23:10	23:25	TOKYO/NARITA	24	A321-100
Cathay Pacific Airways	CX420	20:40	23:35	HONG KONG	123	B777-300
Korean Air	KE854T	23:55	23:46	BEIJING	12	B777-200ER

Korean Air	KE896T	23:50	23:54	SHANGHAI/PUDONG	22	B737-800

Date: 1st March 2009

Airline	Flight	EAT	RAT	Origin	Gate	Aircraft
Korean Air	KE086	5:00	4:05	NEWYORK	8	B747-400
Asiana Airlines	OZ324	4:40	4:15	CHENGDU	30	A320-200
Cathay Pacific Airways	CX412	4:45	4:27	HONG KONG	121	A330-300
Asiana Airlines	OZ724	4:50	4:34	HONG KONG	40	A330-300
Asiana Airlines	OZ7043	5:25	4:46	MANILA	47	A321-100
Asiana Airlines	OZ221	5:10	4:51	NEWYORK	48	B747-400
JEJUAIR	7C2653	5:00	4:53	SUBIC BAY	35	#N/A
Korean Air	KE624	5:05	4:59	MANILA	15	A330-300
Korean Air	KE608	5:05	5:02	HONG KONG	21	B777-300
Asiana Airlines	OZ734	5:35	5:10	HANOI	33	B767-300
Philippine Airlines	PR466	6:00	5:14	MANILA	119	A320-200
Vietnam Airlines	VN936	5:30	5:17	HANOI	106	A321-231
Asiana Airlines	OZ708	5:40	5:22	CLARK FIELD	45	A321-100
Korean Air	KE688	5:40	5:34	SIEMREAP	16	B737-800
Korean Air	KE680	5:50	5:36	HANOI	9	A330-300
Korean Air	KE652	5:50	5:41	BANGKOK	14	B777-200ER
Korean Air	KE012	6:05	5:49	LOS ANGELES	6	B747-400
Asiana Airlines	OZ758	6:10	5:52	KOTA KINABALU	46	A321-100
Asiana Airlines	OZ710	6:25	5:58	CEBU	37	A320-200
Thai Airways International	TG658	6:25	6:02	BANGKOK	122	B777-200
Korean Air	KE642	5:50	6:05	SINGAPORE	17	B777-300
Lufthansa Airlines	LH718	6:35	6:07	MUNICH	126	A340-300
Vietnam Airlines	VN938	6:20	6:11	HO CHI MINH	108	A330-300
Air Macau	NX826	6:40	6:13	MACAU	118	A321-100
Asiana Airlines	OZ604	6:30	6:17	SAIPAN	49	B767-300
Korean Air	KE674	6:30	6:19	KOTA KINABALU	20	B737-800
Asiana Airlines	OZ752	6:00	6:21	SINGAPORE	50	A330-300
Asiana Airlines	OZ203	7:00	6:27	LOS ANGELES	31	B777-200ER
Asiana Airlines	OZ742	6:35	6:30	BANGKOK	32	A330-300
Asiana Airlines	OZ738	7:10	6:32	SIEMREAP	43	A321-100
Asiana Airlines	OZ740	7:10	6:35	PHNOM PENH	35	A320-200
Korean Air	KE006	6:50	6:37	LAS VEGAS	24	B777-200ER
Malaysia Airlines	MH064	6:50	6:39	KUALA LUMPUR	107	A330-200
Korean Air	KE690	6:40	6:45	PHNOM PENH	6	B737-800
Korean Air	KE682	6:50	6:49	HO CHI MINH	21	A330-300
Singapore Airlines	SQ602	7:05	6:53	SINGAPORE	124	B777-312
Korean Air	KE628	6:50	6:55	JAKARTA	26	A330-300
Korean Air	KE632	7:15	6:58	CEBU	22	B737-900
Thai Airways International	TG656	7:10	7:02	BANGKOK	125	A330-300
Korean Air	KE672	7:20	7:11	KUALA LUMPUR	28	A330-300
Asiana Airlines	OZ8532	7:50	7:36	BUSAN	3	A320-200
Asiana Airlines	OZ732	8:00	7:47	HO CHI MINH	46	B747-400
Korean Air	KE112	8:05	7:49	GUAM	6	B777-200ER
Korean Air	KE1402	8:05	7:52	BUSAN	5	B737-800
Korean Air	KE1412	8:15	7:59	DAEGU	2	B737-900
Korean Air	KE668	8:40	8:05	CHIANG MAI	26	A330-200
Asiana Airlines	OZ744	8:20	8:13	BANGKOK	33	B767-300
Aircalin	SB700	8:10	8:16	NOUMEA	111	A330-200
Garuda Indonesia	GA870	8:30	8:20	DENPASAR	113	A330-300
Air France	AF264	8:00	8:23	PARIS	110	B777-300ER
Orient Thai Airlines	OX300	8:25	8:25	BANGKOK	110	B747-300
Korean Air	KE654	8:40	8:28	BANGKOK	12	B777-300
Asiana Airlines	OZ748	9:45	9:26	PHUKET	45	B767-300
Korean Air	KE952	10:10	9:34	DUBAI	19	B777-200ER
Asiana Airlines	OZ8536	10:00	9:50	BUSAN	3	A320-200
China Southern Airlines	CZ685	10:40	10:20	DALIAN	104	A321-200
Aeroflot-Russian Int. Airlines	SU599	10:50	10:28	MOSCOW	9	Tupolev Tu-154M
China Southern Airlines	CZ313	10:45	10:31	SHANGHAI/PUDONG	102	B737-800
China Eastern Airlines	MU549	11:00	10:47	YANTAI	118	A320-200
Air China	CA171	10:45	10:53	TIANJIN	103	B737-300
China Southern Airlines	CZ317	11:10	10:56	BEIJING	110	A321-200
Japan Airlines	JL983	11:25	11:06	NAGOYA	112	B767-300ER
Korean Air	KE630	11:30	11:11	DENPASAR	14	A330-300
Korean Air	KE748	11:35	11:13	OKAYAMA	15	B737-900
Japan Airlines	JL961	11:30	11:18	OSAKA/KANSAI	114	B767-300ER
Asiana Airlines	OZ115	11:25	11:25	OSAKA/KANSAI	30	B767-300
China Airlines	CI160	11:35	11:27	TAIPEI	121	A340-300
China Southern Airlines	CZ681	11:35	11:28	SHENYANG	105	A321-200
Lufthansa Airlines	LH719	12:00	11:31	BUSAN	126	A340-300
Korean Air	KE722	11:40	11:34	OSAKA/KANSAI	17	B777-300
Korean Air	KE752	11:45	11:38	NAGOYA	23	B747-400
SAT Airlines	HZ111	11:35	11:41	SAKHALINSK	131	B737-200
Asiana Airlines	OZ107	11:40	11:42	TOKYO/NARITA	35	A321-100
China Eastern Airlines	MU5041	11:55	11:44	SHANGHAI/PUDONG	128	A321-200
Air China	CA139	12:05	11:45	HANGZHOU	108	A319-100
Korean Air	KE706	12:00	11:47	TOKYO/NARITA	24	B747-400
Korean Air	KE788	12:00	11:49	FUKUOKA	21	A330-300
Air China	CA123	11:50	11:51	BEIJING	111	A330-200
China Southern Airlines	CZ337	12:10	11:54	GUANGZHOU	109	A321-200
China Eastern Airlines	MU579	11:50	11:57	NANJING	129	A320-200
Korean Air	KE764	11:55	11:58	NIIGATA	18	B737-900
China Eastern Airlines	MU2033	12:20	12:00	QINGDAO	123	A320-200
Asiana Airlines	OZ768	12:20	12:15	DELHI	46	A330-300
China Southern Airlines	CZ687	12:20	12:18	CHANGCHUN	107	A321-200
Shanghai Airlines	FM827	12:40	12:21	SHANGHAI/PUDONG	125	B737-700
Lufthansa Airlines	LH712	12:30	12:22	FRANKFURT	124	A340-600
All Nippon Airways	NH941	12:40	12:25	NAGOYA	117	A320-200
Mongolian Airlines	OM301	12:45	12:28	ULAANBAATAR	102	A310-300
Air China	CA127	12:50	12:31	QINGDAO	103	B737-800
KLM Royal Dutch Airlines	KL865	13:05	12:32	AMSTERDAM	110	B747-400M
Asiana Airlines	OZ542	12:40	12:36	FRANKFURT	47	B777-200ER

Korean Air	KE832	13:10	12:42	SHENYANG	28	A330-300
Japan Airlines	JL951	12:45	12:51	TOKYO/NARITA	113	B777-200
Asiana Airlines	OZ302	13:10	12:58	DALIAN	38	A320-200
Asiana Airlines	OZ131	13:10	13:03	FUKUOKA	41	B767-300
Korean Air	KE838	13:40	13:13	YANTAI	18	B737-800
Korean Air	KE906	13:25	13:18	FRANKFURT	19	B747-400
Asiana Airlines	OZ332	13:45	13:22	BEIJING	32	A321-100
All Nippon Airways	NH907	13:40	13:27	TOKYO/NARITA	119	A320-200
Korean Air	KE846	13:50	13:31	QINGDAO	25	B737-800
Korean Air	KE894	13:55	13:36	SHANGHAI/PUDONG	10	B777-300
Korean Air	KE936	13:50	13:39	PRAGUE	7	A330-300
Asiana Airlines	OZ121	14:00	13:46	NAGOYA	34	B767-300
Asiana Airlines	OZ127	14:00	13:50	TOYAMA	43	A320-200
Eva Air	BR170	14:20	13:55	TAIPEI	123	A330-200
Korean Air	KE776	14:05	13:55	KOMATSU	16	B737-900
Vladivostok Airlines	XF801	14:15	13:57	KHABAROVSK	114	Tupolev Tu-154M
Cathay Pacific Airways	CX410	14:05	14:00	HONG KONG	121	A330-300
Vladivostok Airlines	XF743	14:20	14:02	VLADIVOSTOK	115	A320-200
Shandong Airlines	SC4089	14:20	14:03	YANTAI	127	B737-300
Asiana Airlines	OZ165	14:10	14:07	TAKAMATSU	37	A320-200
China Southern Airlines	CZ3065	14:15	14:10	CHANGSHA/Datuopu	112	A320-200
Asiana Airlines	OZ362	15:00	14:39	SHANGHAI/PUDONG	31	B747-400
Asiana Airlines	OZ111	14:50	14:47	OSAKA/KANSAI	49	A330-300
Korean Air	KE902	15:20	14:49	PARIS	6	B747-400
Korean Air	KE852	14:40	14:53	BEIJING	27	B737-900
Asiana Airlines	OZ334	15:00	14:56	BEIJING	41	A330-300
Asiana Airlines	OZ328	15:30	15:00	TIANJIN	48	A321-100
Asiana Airlines	OZ304	15:05	15:04	CHANGCHUN	42	A321-100
China Eastern Airlines	MU5033	15:20	15:06	SHANGHAI/PUDONG	118	A321-200
Korean Air	KE032	15:05	15:09	DALLAS	17	B777-200ER
Korean Air	KE692	15:35	15:17	TAIPEI	24	A330-300
China Eastern Airlines	MU559	15:20	15:18	QINGDAO	117	A320-200
Asiana Airlines	OZ352	15:40	15:20	YANJI	38	A321-100
Korean Air	KE702	15:35	15:24	TOKYO/NARITA	12	B747-400
Korean Air	KE934	15:40	15:26	ZURICH	26	A330-300
Korean Air	KE806	16:00	15:28	TIANJIN	10	B777-200ER
Korean Air	KE724	15:40	15:31	OSAKA/KANSAI	14	A330-300
Shandong Airlines	SC4081	15:30	15:32	QINGDAO	124	B737-300
Korean Air	KE038	16:20	15:48	CHICAGO	21	B777-200ER
Korean Air	KE768	15:55	15:54	AOMORI	11	B737-800
Emirates	EK322	16:45	15:54	DUBAI	111	B777-300ER
Asiana Airlines	OZ364	15:55	15:58	SHANGHAI/PUDONG	45	A321-100
Korean Air	KE094	16:25	16:00	WASHINGTON	8	B777-200ER
Korean Air	KE908	16:00	16:02	LONDON	9	B747-400
Air China	CA135	16:25	16:04	DALIAN	108	B737-800
Asiana Airlines	OZ151	16:00	16:07	SENDAI	40	B767-300
Singapore Airlines	SQ016	16:35	16:09	SINGAPORE	123	B777-312ER
Asiana Airlines	OZ101	16:10	16:11	TOKYO/NARITA	43	A330-300
Asiana Airlines	OZ712	16:30	16:13	TAIPEI	50	B767-300
Asiana Airlines	OZ163	16:40	16:16	YONAGO	36	A321-100
Thai Airways International	TG634	16:15	16:17	BANGKOK	122	B777-300
Korean Air	KE9824	16:30	16:20	MUDANJIANG	20	#N/A
Korean Air	KE774	16:25	16:22	HAKODATE	32	B737-900
Korean Air	KE052	16:40	16:24	HONOLULU	23	B777-200ER
Air China	CA125	16:50	16:29	BEIJING	102	B737-800
Singapore Airlines	SQ017	16:55	16:32	VANCOUVER	121	B777-212ER
Korean Air	KE870	16:50	16:34	DALIAN	28	B737-900
Asiana Airlines	OZ522	16:55	16:37	LONDON	41	B777-200ER
Korean Air	KE704	16:35	16:40	TOKYO/NARITA	10	B777-300
Korean Air	KE018	17:05	16:43	LOS ANGELES	30	B747-400
Korean Air	KE604	17:00	16:44	HONG KONG	22	B747-400
Japan Airlines	JL963	17:05	16:46	OSAKA/KANSAI	113	B767-300ER
Korean Air	KE820	17:15	16:46	CHANGSHA/Datuopu	18	B737-800
Asiana Airlines	OZ370	17:00	16:49	GUANGZHOU	46	A330-300
Korean Air	KE036	17:05	16:51	ATLANTA	6	B747-400
Korean Air	KE898	17:00	16:53	SHANGHAI/PUDONG	24	A330-300
Korean Air	KE790	17:10	16:54	FUKUOKA	16	B777-200ER
Turkish Airlines	TK090	16:50	16:56	ISTANBUL	107	A330-200
Asiana Airlines	OZ350	17:15	16:58	NANJING	34	A320-200
Korean Air	KE082	17:20	16:59	NEWYORK	15	B747-400
Japan Airlines	JL953	17:00	17:03	TOKYO/NARITA	112	B767-300ER
Air Canada	AC063	17:15	17:04	VANCOUVER	119	B767-300ER
Korean Air	KE124	17:35	17:06	BRISBANE	26	A330-300
Korean Air	KE122	17:40	17:08	SYDNEY	17	B747-400
Korean Air	KE766	17:15	17:10	SAPPORO	35	A330-300
Korean Air	KE842	17:30	17:11	QINGDAO	19	A330-300
Asiana Airlines	OZ822T	17:00	17:12	SEOUL/ SUNGNAM	5	#N/A
Asiana Airlines	OZ271	17:35	17:16	SEATTLE	43	B777-200ER
Korean Air	KE622	17:25	17:17	MANILA	10	B777-300
Asiana Airlines	OZ308	17:50	17:23	YANTAI	42	A320-200
Korean Air	KE786	17:40	17:29	KAGOSHIMA	21	A330-200
Korean Air	KE866	17:55	17:31	GUANGZHOU	33	A330-300
Korean Air	KE020	17:45	17:32	SEATTLE	31	B777-200ER
Korean Air	KE758	18:00	17:35	NAGOYA	16	B737-900
All Nippon Airways	NH177	18:00	17:37	OSAKA/KANSAI	117	A320-200
Asiana Airlines	OZ722	17:45	17:38	HONG KONG	40	B747-400
Korean Air	KE024	17:55	17:41	SAN FRANCISCO	12	B777-200ER
China Southern Airlines	CZ369	17:45	17:42	SHANGHAI/PUDONG	110	B737-800
Korean Air	KE1406	17:50	17:43	BUSAN	1	B737-900
Singapore Airlines	SQ015	18:25	17:49	SAN FRANCISCO	124	B777-312ER
Asiana Airlines	OZ340	18:10	17:49	HARBIN	38	A321-100
Asiana Airlines	OZ702	18:00	17:51	MANILA	49	B747-400
Eva Air	BR160	18:20	17:54	TAIPEI	122	A330-200
Shenzhen Airlines	ZH9787	18:55	17:55	SHENZEN	114	B737-800
Korean Air	KE126	17:55	17:57	MELBOURNE	30	A330-200
Asiana Airlines	OZ602	18:10	17:59	SYDNEY	41	B777-200ER
Asiana Airlines	OZ201	18:30	18:01	LOS ANGELES	45	B747-400 Combi
Korean Air	KE840	18:25	18:03	WEIHAI	11	B737-800
Asiana Airlines	OZ161	18:05	18:05	HIROSHIMA	37	B767-300
China Southern Airlines	CZ671	18:30	18:06	SHENYANG	103	A319-100

Asiana Airlines	OZ103	18:10	18:10	TOKYO/NARITA	47	B777-200ER
Air China	CA147	18:30	18:18	WEIHAI	108	B737-300
Cathay Pacific Airways	CX418	18:35	18:22	HONG KONG	123	A330-300
Asiana Airlines	OZ133	18:50	18:31	FUKUOKA	34	B767-300
Qatar Airways	QR820	19:05	18:34	DOHA	113	A330-200
United Airlines	UA893	19:35	18:38	SAN FRANCISCO	126	B777-200
Philippine Airlines	PR468	19:20	18:41	MANILA	121	A330-300
Asiana Airlines	OZ113	19:00	18:44	OSAKA/KANSAI	45	B767-300
Asiana Airlines	OZ360	19:00	18:46	HANGZHOU	30	A321-100
Asiana Airlines	OZ336	18:35	18:49	BEIJING	35	A320-200
Mandarin Airlines	AE960	19:05	18:53	KAOHSIUNG	105	Embraer E-190
Asiana Airlines	OZ8534	19:10	18:55	BUSAN	3	A320-200
Asiana Airlines	OZ606	19:00	18:59	SAIPAN	41	A321-100
Asiana Airlines	OZ175	19:20	19:03	MATSUYAMA	47	A320-200
Korean Air	KE726	19:25	19:08	OSAKA/KANSAI	14	A330-300
Asiana Airlines	OZ157	19:20	19:11	MIYAZAKI	36	A321-100
Asiana Airlines	OZ366	19:20	19:13	SHANGHAI/PUDONG	46	A330-300
Korean Air	KE792	19:25	19:15	OITA	20	B737-900
Japan Airlines	JL955	19:10	19:18	TOKYO/NARITA	109	B767-300ER
China Xiamen Airlines	MF871	19:30	19:23	XIAMEN	130	B737-700
China Southern Airlines	CZ683	20:05	19:26	HARBIN	110	A320-200
Asiana Airlines	OZ123	19:45	19:35	NAGOYA	50	B767-300
Korean Air	KE002	19:40	19:38	LOS ANGELES	7	B777-200ER
Korean Air	KE614	19:45	19:41	HONG KONG	18	B737-800
Thai Airways International	TG628	19:55	19:48	BANGKOK	125	A330-300
Asiana Airlines	OZ310	20:20	19:59	WEIHAI	37	A321-100
Asiana Airlines	OZ338	20:20	20:04	BEIJING	32	A320-200
Asiana Airlines	OZ171	20:20	20:07	OKINAWA	43	B767-300
Korean Air	KE130	20:10	20:18	AUCKLAND	12	B747-400
Cathay Pacific Airways	CX420	20:40	20:22	HONG KONG	123	B777-200
Philippine Airlines	PR488	20:50	20:25	CEBU	122	A330-300
China Southern Airlines	CZ675	20:45	20:30	DALIAN	108	A321-200
Korean Air	KE1424	20:50	20:34	JEJU	1	B737-800
Asiana Airlines	OZ368	21:00	20:45	SHANGHAI/PUDONG	42	A321-100
China Eastern Airlines	MU5087	21:20	20:46	BEIJING	127	A320-200
Japan Airlines	JL959	20:55	20:48	TOKYO/NARITA	112	B777-300
United Airlines	UA881	21:10	20:50	CHICAGO	124	B777-200
China Eastern Airlines	MU5051	20:55	20:52	SHANGHAI/PUDONG	129	A321-200
Cebu Pacific Air	5J194	20:45	20:55	MANILA	117	A320-200
Asiana Airlines	OZ8552	20:55	20:58	JEJU	2	A320-200
China Eastern Airlines	MU2015	20:35	21:01	GUILIN	128	A320-200
Air China	CA133	21:10	21:03	QINGDAO	102	B737-300
Northwest Airlines	NW007	21:15	21:06	SEATTLE	115	B757-700
Cebu Pacific Air	5J128	21:05	21:09	CEBU	119	A320-200
Cathay Pacific Airways	CX416	21:05	21:13	HONG KONG	121	A330-300
Asiana Airlines	OZ736	21:20	21:16	HO CHI MINH	31	A320-200
Asiana Airlines	OZ318	21:40	21:18	QINGDAO	30	A321-100
Air China	CA137	21:45	21:30	BEIJING	106	A330-200
Korean Air	KE782	22:20	22:09	FUKUOKA	26	A330-300
China Eastern Airlines	MU2043	18:40	22:22	QINGDAO	118	A320-200
China Southern Airlines	CZ339	22:40	22:31	GUANGZHOU	101	A320-200
Asiana Airlines	OZ105	23:10	23:02	TOKYO/NARITA	27	B767-300
Korean Air	KE896	23:55	23:55	SHANGHAI/PUDONG	12	B737-800

Date: 2nd March 2009

Airline	Flight	EAT	RAT	Origin	Gate	Aircraft
Korean Air	KE854	0:10	0:03	BEIJING	11	B737-900
Korean Air	KE882	4:40	3:59	WUHAN	20	B737-800
Asiana Airlines	OZ704	4:40	4:20	MANILA	45	A321-100
Cathay Pacific Airways	CX412	4:45	4:23	HONG KONG	121	A330-300
Asiana Airlines	OZ724	4:50	4:32	HONG KONG	49	A330-300
Asiana Airlines	OZ358	4:50	4:38	CHONGQING	38	A320-200
Korean Air	KE608	5:05	4:44	HONG KONG	24	B747-400
Korean Air	KE624	5:05	4:54	MANILA	27	B777-200ER
Korean Air	KE086	5:00	4:58	NEWYORK	22	B747-400
Philippine Airlines	PR466	6:00	5:08	MANILA	119	A320-200
Vietnam Airlines	VN936	5:30	5:12	HANOI	111	A330-200
Asiana Airlines	OZ734	5:35	5:15	HANOI	36	B767-300
Korean Air	KE680	5:50	5:18	HANOI	8	A330-300
Korean Air	KE688	5:40	5:21	SIEMREAP	18	B737-800
Korean Air	KE652	5:50	5:32	BANGKOK	15	B777-300
Asiana Airlines	OZ752	6:00	5:35	SINGAPORE	41	A330-300
Asiana Airlines	OZ758	6:10	5:42	KOTA KINABALU	47	A321-100
Korean Air	KE012	6:05	5:48	LOS ANGELES	17	B747-400
Korean Air	KE642	5:50	5:55	SINGAPORE	7	B777-300
Asiana Airlines	OZ604	6:00	5:57	SAIPAN	48	A321-100
Asiana Airlines	OZ710	6:25	6:06	CEBU	34	A321-100
Thai Airways International	TG658	6:25	6:11	BANGKOK	122	B777-200
Asiana Airlines	OZ708	5:40	6:14	CLARK FIELD	35	A321-100
Lufthansa Airlines	LH716	6:35	6:16	MUNICH	126	A340-300
Asiana Airlines	OZ235	6:00	6:19	CHICAGO	31	B777-200ER
Asiana Airlines	OZ203	7:00	6:21	LOS ANGELES	45	B777-200ER
Vietnam Airlines	VN938	6:20	6:23	HO CHI MINH	107	A321-231
Korean Air	KE690	6:40	6:25	PHNOM PENH	16	B737-800
Asiana Airlines	OZ354	6:40	6:28	HAIKOU	33	A321-100
Asiana Airlines	OZ740	7:10	6:30	PHNOM PENH	32	A320-200
Singapore Airlines	SQ602	7:05	6:31	SINGAPORE	124	B777-312
Asiana Airlines	OZ738	7:10	6:34	SIEMREAP	38	A320-200
Asiana Airlines	OZ742	6:35	6:36	BANGKOK	30	A330-300
Korean Air	KE682	6:50	6:42	HO CHI MINH	9	A330-300
Korean Air	KE628	6:50	6:44	JAKARTA	23	A330-300
China Eastern Airlines	MU2003	7:00	6:46	KUNMING	127	A320-200
Korean Air	KE062	7:20	6:49	SAO PAULO	24	B777-200ER
Asiana Airlines	OZ3245	6:50	6:52	SANYA	46	A321-100
China Eastern Airlines	MU2039	7:40	6:55	SANYA	128	A320-200

Air Macau	NX826	6:40	6:57	MACAU	117	A321-100
Korean Air	KE632	7:15	7:00	CEBU	20	B737-900
Korean Air	KE672	7:20	7:04	KUALA LUMPUR	21	A330-300
Thai Airways International	TG656	7:10	7:21	BANGKOK	125	A330-300
Asiana Airlines	OZ732	8:00	7:30	HO CHI MINH	41	B777-200ER
Asiana Airlines	OZ8532	7:50	7:33	BUSAN	5	A320-200
Air France	AF264	8:00	7:47	PARIS	110	B777-200ER
Korean Air	KE9708	7:40	7:49	TOKYO/HANEDA	28	#N/A
Korean Air	KE112	8:05	7:52	GUAM	7	B777-200ER
Korean Air	KE1402	8:05	7:53	BUSAN	3	B737-900
Korean Air	KE1412	8:15	8:03	DAEGU	1	B737-900
Korean Air	KE942	8:35	8:05	TASHKENT	17	A330-300
Asiana Airlines	OZ744	8:20	8:08	BANGKOK	33	B767-300
Malaysia Airlines	MH066	8:35	8:10	KUALA LUMPUR	108	A330-200
Garuda Indonesia	GA870	8:30	8:19	DENPASAR	113	A330-300
Korean Air	KE654	8:40	8:23	BANGKOK	9	B777-300
Iran Air	IR800	9:20	8:51	IMAM KHOMEINI	130	B747-200
FINNAIR	AY041	9:20	8:58	HELSINKI	126	A340-300
Asiana Airlines	OZ748	9:45	9:24	PHUKET	40	B767-300
Asiana Airlines	OZ6085	10:10	9:50	KOROR	50	#N/A
Korean Air	KE638	10:35	9:55	PHUKET	26	A330-300
Air China	CA171	10:45	10:23	TIANJIN	103	B737-300
China Southern Airlines	CZ685	10:40	10:28	DALIAN	104	A321-200
China Southern Airlines	CZ313	10:45	10:32	SHANGHAI/PUDONG	102	B737-800
China Eastern Airlines	MU549	11:00	10:47	YANTAI	127	A320-200
Korean Air	KE924	10:55	10:51	MOSCOW	23	B777-200ER
China Southern Airlines	CZ317	11:10	10:53	BEIJING	107	A321-200
Korean Air	KE630	11:30	10:56	DENPASAR	15	A330-300
Japan Airlines	JL983	11:25	11:06	NAGOYA	114	B767-300ER
China Airlines	CI160	11:35	11:11	TAIPEI	121	A340-300
Air China	CA123	11:50	11:14	BEIJING	111	A330-200
Japan Airlines	JL961	11:30	11:20	OSAKA/KANSAI	112	B767-300ER
China Southern Airlines	CZ681	11:35	11:23	SHENYANG	105	A321-200
Asiana Airlines	OZ119	11:25	11:26	SAIPAN	43	B767-300
China Eastern Airlines	MU579	11:50	11:28	NANJING	128	A320-200
Korean Air	KE748	11:35	11:29	OKAYAMA	20	B737-900
Korean Air	KE730	11:40	11:32	GUAM	8	A330-300
Korean Air	KE764	11:55	11:35	NIIGATA	17	B737-900
Korean Air	KE752	11:45	11:36	NAGOYA	24	B747-400
Air China	CA139	12:05	11:38	HANGZHOU	108	A319-100
China Eastern Airlines	MU5041	11:55	11:40	SHANGHAI/PUDONG	123	A321-200
Korean Air	KE788	12:00	11:43	FUKUOKA	6	A330-300
Asiana Airlines	OZ107	11:40	11:45	TOKYO/NARITA	47	A330-300
China Eastern Airlines	MU2017	12:00	11:53	WEIHAI	129	A320-200
China Eastern Airlines	MU2033	12:20	11:55	QINGDAO	130	A320-200
China Southern Airlines	CZ337	12:10	11:58	GUANGZHOU	109	A321-200
Asiana Airlines	OZ310	12:20	12:01	WEIHAI	42	A321-100
China Southern Airlines	CZ687	12:20	12:03	CHANGCHUN	106	A321-200
Lufthansa Airlines	LH712	12:30	12:06	FRANKFURT	124	A340-600
Korean Air	KE706	12:00	12:10	TOKYO/NARITA	27	B747-400
Shanghai Airlines	FM827	12:40	12:14	SHANGHAI/PUDONG	125	B737-700
All Nippon Airways	NH941	12:40	12:21	NAGOYA	117	A320-200
Asiana Airlines	OZ542	12:40	12:29	FRANKFURT	45	B777-200ER
Air China	CA127	12:50	12:33	QINGDAO	103	B737-800
Lufthansa Airlines	LH717	12:40	12:37	SHENYANG	126	A340-300
KLM Royal Dutch Airlines	KL865	13:05	12:39	AMSTERDAM	110	B747-400M
Asiana Airlines	OZ302	13:10	12:52	DALIAN	41	A320-200
China Southern Airlines	CZ6073	13:25	12:53	YANJI	107	A321-200
Korean Air	KE832	13:10	12:56	SHENYANG	9	A330-300
Korean Air	KE906	13:25	12:58	FRANKFURT	12	B747-400
Japan Airlines	JL951	12:45	13:00	TOKYO/NARITA	113	B747-400
Asiana Airlines	OZ131	13:10	13:04	FUKUOKA	30	B767-300
Air Astana	KC909	12:00	13:10	ALMATY	115	B757-200
Korean Air	KE846	13:50	13:25	QINGDAO	14	B737-800
Asiana Airlines	OZ332	13:45	13:36	BEIJING	34	A320-200
Korean Air	KE956	13:55	13:39	ISTANBUL	7	A330-300
Asiana Airlines	OZ161	13:45	13:42	HIROSHIMA	31	B767-300
Korean Air	KE838	13:40	13:44	YANTAI	18	B737-800
Korean Air	KE894	13:55	13:47	SHANGHAI/PUDONG	22	B777-200ER
All Nippon Airways	NH907	13:40	13:53	TOKYO/NARITA	119	A320-200
Cathay Pacific Airways	CX410	14:05	13:58	HONG KONG	121	A330-300
Korean Air	KE776	14:05	14:01	KOMATSU	17	B737-900
Asiana Airlines	OZ121	14:00	14:03	NAGOYA	32	B767-300
Korean Air	KE916	14:05	14:08	MUNICH	21	A330-200
China Southern Airlines	CZ3065	14:15	14:12	CHANGSHA/Datuopu	112	A320-200
Asiana Airlines	OZ318	14:40	14:21	QINGDAO	42	A320-200
Shandong Airlines	SC4089	14:20	14:23	YANTAI	127	B737-300
Korean Air	KE852	14:40	14:25	BEIJING	15	B777-300
Asiana Airlines	OZ334	15:00	14:37	BEIJING	30	B767-300
Asiana Airlines	OZ362	15:00	14:40	SHANGHAI/PUDONG	43	B747-400
Asiana Airlines	OZ304	15:05	14:49	CHANGCHUN	47	A321-100
Asiana Airlines	OZ111	14:50	14:52	OSAKA/KANSAI	41	A330-300
Asiana Airlines	OZ155	15:00	14:54	FUKUSHIMA	35	A320-200
Korean Air	KE902	15:20	15:08	PARIS	9	B747-400
China Eastern Airlines	MU5033	15:20	15:11	SHANGHAI/PUDONG	117	A321-200
Asiana Airlines	OZ328	15:30	15:14	TIANJIN	38	A320-200
Korean Air	KE692	15:35	15:17	TAIPEI	26	A330-300
Korean Air	KE724	15:40	15:26	OSAKA/KANSAI	8	A330-300
China Eastern Airlines	MU559	15:20	15:31	QINGDAO	118	A320-200
Asiana Airlines	OZ364	15:55	15:34	SHANGHAI/PUDONG	48	A321-100
Korean Air	KE702	15:35	15:35	TOKYO/NARITA	10	B777-300
Korean Air	KE094	16:25	15:40	WASHINGTON	23	B777-200ER
Korean Air	KE770	15:45	15:42	AKITA	16	B737-800
Shandong Airlines	SC4081	15:30	15:44	QINGDAO	124	B737-300
Asiana Airlines	OZ151	16:00	15:49	SENDAI	32	B767-300
Emirates	EK322	16:45	15:50	DUBAI	111	B777-300ER
Korean Air	KE926	16:10	15:52	Madrid Barajas Airport	19	B777-200ER
Korean Air	KE806	16:00	15:55	TIANJIN	28	B747-400
Korean Air	KE826	16:10	15:56	YANJI	24	B737-900
Singapore Airlines	SQ016	16:35	15:58	SINGAPORE	122	B777-312ER

Korean Air	KE908	16:00	16:01	LONDON	27	B747-400
Korean Air	KE038	16:20	16:03	CHICAGO	35	B777-200ER
Air China	CA135	16:25	16:10	DALIAN	114	B737-800
Korean Air	KE982	16:40	16:15	VLADIVOSTOK	20	B737-800
Thai Airways International	TG634	16:15	16:19	BANGKOK	121	B777-300
Korean Air	KE018	17:05	16:21	LOS ANGELES	21	B747-400
Korean Air	KE052	16:40	16:23	HONOLULU	9	B747-400
Asiana Airlines	OZ522	16:55	16:27	LONDON	40	B777-200ER
Asiana Airlines	OZ101	16:10	16:29	TOKYO/NARITA	46	B777-200ER
Korean Air	KE604	17:00	16:30	HONG KONG	17	B747-400
China Eastern Airlines	MU217	16:40	16:33	YANCHENG	126	A320-200
Singapore Airlines	SQ018	17:10	16:35	SINGAPORE	124	B777-212ER
Korean Air	KE082	17:20	16:37	NEWYORK	15	B747-400
Asiana Airlines	OZ712	16:55	16:38	TAIPEI	36	B767-300
Korean Air	KE704	16:35	16:41	TOKYO/NARITA	12	B777-300
Asiana Airlines	OZ370	17:00	16:42	GUANGZHOU	50	A330-300
Korean Air	KE790	17:10	16:44	FUKUOKA	33	A330-300
Korean Air	KE898	17:00	16:45	SHANGHAI/PUDONG	26	A330-200
Korean Air	KE820	17:15	16:47	CHANGSHA/Datuopu	11	B737-900
Japan Airlines	JL963	17:05	16:50	OSAKA/KANSAI	112	B767-300ER
Korean Air	KE870	16:50	16:50	DALIAN	34	B737-900
Asiana Airlines	OZ171	15:00	16:52	OKINAWA	37	A321-100
Korean Air	KE122	17:40	16:55	SYDNEY	35	B747-400
Asiana Airlines	OZ350	17:15	16:58	NANJING	42	A321-100
Korean Air	KE138	17:40	17:04	NADI	32	A330-200
Japan Airlines	JL953	17:00	17:07	TOKYO/NARITA	113	B767-300ER
Korean Air	KE842	17:30	17:11	QINGDAO	28	A330-300
Air Canada	AC063	17:15	17:12	VANCOUVER	119	B767-300ER
Korean Air	KE856	17:10	17:15	BEIJING	11	B737-900
Korean Air	KE766	17:15	17:16	SAPPORO	31	A330-300
Asiana Airlines	OZ8534	17:30	17:20	BUSAN	2	A320-200
Asiana Airlines	OZ213	17:45	17:24	SAN FRANCISCO	41	B777-200ER
Korean Air	KE020	17:45	17:28	SEATTLE	30	B777-200ER
Singapore Airlines	SQ015	18:25	17:29	SAN FRANCISCO	123	B777-312ER
Korean Air	KE828	17:35	17:31	SHENZEN	6	A330-300
Asiana Airlines	OZ602	18:10	17:33	SYDNEY	43	B777-200ER
Asiana Airlines	OZ575	17:50	17:35	SAKHALINSK	38	A321-100
Asiana Airlines	OZ308	17:50	17:36	YANTAI	47	A320-200
Korean Air	KE622	17:25	17:38	MANILA	7	A330-300
Korean Air	KE1406	17:50	17:39	BUSAN	1	B737-900
China Southern Airlines	CZ683	17:50	17:41	HARBIN	109	A320-200
Korean Air	KE072	17:50	17:43	VANCOUVER	21	B777-200ER
Eva Air	BR160	18:20	17:44	TAIPEI	125	A330-200
Asiana Airlines	OZ722	17:45	17:46	HONG KONG	39	B777-200ER
All Nippon Airways	NH177	18:00	17:47	OSAKA/KANSAI	117	A320-200
Korean Air	KE928	17:35	17:50	Fiumicino Airport	12	B777-200ER
China Southern Airlines	CZ369	17:45	17:51	SHANGHAI/PUDONG	103	B737-800
Korean Air	KE024	17:55	17:55	SAN FRANCISCO	33	B777-200ER
Korean Air	KE840	18:25	17:56	WEIHAI	25	B737-800
Asiana Airlines	OZ201	18:30	17:57	LOS ANGELES	35	B747-400
Asiana Airlines	OZ372	18:20	17:58	SHENZEN	34	A321-100
Korean Air	KE758	18:00	17:59	NAGOYA	23	B737-900
Asiana Airlines	OZ340	18:10	18:01	HARBIN	37	A321-100
Asiana Airlines	OZ702	18:00	18:03	MANILA	48	B777-200ER
China Southern Airlines	CZ671	18:30	18:05	SHENYANG	114	A319-100
Asiana Airlines	OZ336	18:20	18:07	BEIJING	30	B767-300
Cathay Pacific Airways	CX418	18:35	18:12	HONG KONG	121	A330-300
Air China	CA147	18:30	18:14	WEIHAI	102	B737-300
Iran Air	IR801	18:00	18:20	TOKYO/NARITA	130	B747-200
Asiana Airlines	OZ103	18:10	18:23	TOKYO/NARITA	49	B777-200ER
Asiana Airlines	OZ133	18:50	18:27	FUKUOKA	50	B767-300
Philippine Airlines	PR468	19:20	18:34	MANILA	122	A330-300
China Eastern Airlines	MU2043	18:40	18:37	QINGDAO	128	A320-200
Asiana Airlines	OZ141	19:10	18:41	KUMAMOTO	33	A320-200
Mandarin Airlines	AE960	19:05	18:42	KAOHSIUNG	105	Embraer E-190
Asiana Airlines	OZ113	19:00	18:47	OSAKA/KANSAI	35	B767-300
Qatar Airways	QR820	19:05	18:51	DOHA	113	A330-200
Asiana Airlines	OZ360	19:00	18:53	HANGZHOU	40	A321-100
Asiana Airlines	OZ366	19:20	18:56	SHANGHAI/PUDONG	30	A320-200
Korean Air	KE794	19:25	18:59	NAGASAKI	11	B737-900
Asiana Airlines	OZ571	19:00	19:01	KHABAROVSK	48	A321-100
United Airlines	UA893	19:35	19:03	SAN FRANCISCO	126	B777-200
Korean Air	KE726	19:25	19:11	OSAKA/KANSAI	27	A330-300
Shandong Airlines	SC4095	19:20	19:15	JINAN	127	B737-800
Korean Air	KE614	19:45	19:28	HONG KONG	16	B737-800
Korean Air	KE002	19:40	19:30	LOS ANGELES	19	B777-200ER
Asiana Airlines	OZ123	19:45	19:33	NAGOYA	33	B767-300
Thai Airways International	TG628	19:55	19:35	BANGKOK	124	A330-300
Air China	CA125	16:50	19:54	BEIJING	108	B737-800
Cathay Pacific Airways	CX420	20:40	20:08	HONG KONG	123	A330-300
Korean Air	KE130	20:10	20:16	AUCKLAND	15	B777-200ER
Cebu Pacific Air	5J194	20:45	20:23	MANILA	117	A320-200
Asiana Airlines	OZ368	20:55	20:25	SHANGHAI/PUDONG	32	A320-200
Korean Air	KE036	17:05	20:30	ATLANTA	24	B747-400
Asiana Airlines	OZ338	20:40	20:40	BEIJING	35	A320-200
China Southern Airlines	CZ675	20:45	20:42	DALIAN	109	A321-200
Japan Airlines	JL959	20:55	20:44	TOKYO/NARITA	112	B777-300
Cathay Pacific Airways	CX416	21:05	20:52	HONG KONG	121	A330-300
United Airlines	UA881	21:10	21:06	CHICAGO	126	B777-200
Air China	CA133	21:10	21:08	QINGDAO	102	B737-300
China Eastern Airlines	MU5087	21:20	21:10	BEIJING	127	A320-200
China Eastern Airlines	MU5051	20:55	21:12	SHANGHAI/PUDONG	131	A321-200
Northwest Airlines	NW007	21:15	21:14	SEATTLE	115	B757-700
Air China	CA137	21:45	21:27	BEIJING	103	B737-800
Cebu Pacific Air	5J128	21:05	21:29	CEBU	119	A320-200
Korean Air	KE782	22:20	21:59	FUKUOKA	9	A330-300
Asiana Airlines	OZ105	23:10	22:51	TOKYO/NARITA	26	B767-300
Korean Air	KE896	23:55	23:53	SHANGHAI/PUDONG	14	B777-200ER
Korean Air	KE854T	23:55	23:59	BEIJING	11	B737-900

Date: 3rd March 2009

Airline	Flight	EAT	RAT	Origin	Gate	Aircraft
Korean Air	KE696	0:30	0:04	Tribhuvan	10	B777-200ER
Asiana Airlines	OZ322	4:00	3:09	CHANGSHA/Datuopu	23	A321-100
Asiana Airlines	OZ326	4:00	3:23	GUILIN	27	A321-100
Korean Air	KE074	3:30	3:31	TORONTO	12	B747-400
Korean Air	KE868	4:25	3:56	ULAANBAATAR	8	A330-300
Asiana Airlines	OZ704	4:40	4:15	MANILA	42	A321-100
Cathay Pacific Airways	CX412	4:45	4:18	HONG KONG	123	A330-300
Asiana Airlines	OZ574	5:00	4:24	TASHKENT	49	A330-300
Asiana Airlines	OZ724	4:50	4:27	HONG KONG	31	A330-300
Korean Air	KE624	5:05	4:37	MANILA	26	A330-300
Korean Air	KE608	5:05	4:58	HONG KONG	28	B747-400
Philippine Airlines	PR466	6:00	5:01	MANILA	119	A320-200
Vietnam Airlines	VN936	5:30	5:03	HANOI	109	A330-200
Asiana Airlines	OZ734	5:35	5:06	HANOI	34	B767-300
Korean Air	KE688	5:40	5:11	SIEMREAP	18	B737-800
Korean Air	KE886	5:35	5:15	KUNMING	21	A330-200
Korean Air	KE652	5:50	5:17	BANGKOK	7	B777-300
Asiana Airlines	OZ708	5:40	5:20	CLARK FIELD	50	A321-100
Korean Air	KE680	5:50	5:27	HANOI	15	A330-300
Asiana Airlines	OZ752	6:00	5:36	SINGAPORE	32	A330-300
Vietnam Airlines	VN938	6:20	5:47	HO CHI MINH	108	A321-231
Korean Air	KE012	6:05	5:52	LOS ANGELES	22	B747-400
Asiana Airlines	OZ604	6:30	5:59	SAIPAN	31	A321-100
Thai Airways International	TG658	6:25	6:01	BANGKOK	122	B777-200
Korean Air	KE642	5:50	6:03	SINGAPORE	19	B777-300
Korean Air	KE674	6:30	6:08	KOTA KINABALU	16	B737-800
Korean Air	KE006	6:50	6:12	LAS VEGAS	27	B777-200ER
Asiana Airlines	OZ203	7:00	6:14	LOS ANGELES	41	B747-400
Lufthansa Airlines	LH718	6:35	6:16	MUNICH	126	A340-300
Asiana Airlines	OZ740	7:10	6:20	PHNOM PENH	47	A320-200
Korean Air	KE690	6:40	6:23	PHNOM PENH	23	B737-800
Korean Air	KE682	6:50	6:29	HO CHI MINH	26	A330-300
Singapore Airlines	SQ602	7:05	6:32	SINGAPORE	124	B777-312
Korean Air	KE628	6:50	6:35	JAKARTA	28	A330-300
Asiana Airlines	OZ742	6:35	6:37	BANGKOK	45	A330-300
Korean Air	KE672	7:20	7:00	KUALA LUMPUR	6	A330-300
Korean Air	KE632	7:15	7:03	CEBU	18	B737-900
Asiana Airlines	OZ732	8:00	7:22	HO CHI MINH	40	B777-200ER
Korean Air	KE112	8:05	7:26	GUAM	7	B777-200ER
Asiana Airlines	OZ8532	7:50	7:41	BUSAN	3	A320-200
Korean Air	KE1402	8:05	7:52	BUSAN	2	B737-900
Korean Air	KE1412	8:15	8:00	DAEGU	1	B737-900
Korean Air	KE630	8:40	8:04	DENPASAR	8	A330-300
Korean Air	KE654	8:40	8:13	BANGKOK	22	B777-300
Garuda Indonesia	GA870	8:30	8:17	DENPASAR	113	A330-300
Asiana Airlines	OZ744	8:20	8:20	BANGKOK	32	B767-300
Aircalin	SB700	8:10	8:25	NOUMEA	111	A330-200
Orient Thai Airlines	OX300	8:25	8:25	BANGKOK	111	B747-300
Air France	AF264	8:00	8:28	PARIS	110	B777-300ER
FINNAIR	AY041	9:20	8:47	HELSINKI	126	A340-300
Korean Air	KE638	9:40	9:04	PHUKET	26	A330-300
Thai Airways International	TG656	9:07	9:07	BANGKOK	125	A330-300
Asiana Airlines	OZ748	9:45	9:16	PHUKET	33	B767-300
Uzbekistan Airways	HY511	9:45	9:22	TASHKENT	117	B757-200
Korean Air	KE952	10:10	9:50	DUBAI	9	B777-200ER
China Southern Airlines	CZ685	10:40	10:27	DALIAN	104	ATR 72-500
China Southern Airlines	CZ313	10:45	10:39	SHANGHAI/PUDONG	102	B737-800
Korean Air	KE086	5:00	10:42	NEWYORK	27	B747-400
Air China	CA171	10:45	10:45	TIANJIN	103	B737-300
China Southern Airlines	CZ317	11:10	10:54	BEIJING	105	A321-200
Asiana Airlines	OZ221	5:10	10:56	NEWYORK	41	B747-400
China Eastern Airlines	MU549	11:00	11:03	YANTAI	127	A320-200
China Airlines	CI160	11:35	11:08	TAIPEI	121	A340-300
Japan Airlines	JL983	11:25	11:10	NAGOYA	111	B767-300ER
Asiana Airlines	OZ115	11:25	11:20	OSAKA/KANSAI	40	A321-100
Air China	CA123	11:50	11:22	BEIJING	110	A330-200
Japan Airlines	JL961	11:30	11:24	OSAKA/KANSAI	112	B767-300ER
China Eastern Airlines	MU5041	11:55	11:28	SHANGHAI/PUDONG	125	A321-200
Korean Air	KE752	11:45	11:31	NAGOYA	19	B747-400
China Southern Airlines	CZ681	11:35	11:34	SHENYANG	106	A321-200
Korean Air	KE748	11:35	11:35	OKAYAMA	20	B737-900
Korean Air	KE722	11:40	11:37	OSAKA/KANSAI	8	B777-200ER
SAT Airlines	HZ111	11:35	11:40	SAKHALINSK	131	B737-200
Lufthansa Airlines	LH719	12:00	11:42	BUSAN	126	A340-300
Air China	CA139	12:05	11:44	HANGZHOU	107	A319-100
Korean Air	KE764	11:55	11:48	NIIGATA	18	B737-900
Asiana Airlines	OZ107	11:40	11:50	TOKYO/NARITA	43	B777-200ER
China Southern Airlines	CZ337	12:10	11:55	GUANGZHOU	114	A321-200
Korean Air	KE706	12:00	11:59	TOKYO/NARITA	15	B777-300
Korean Air	KE788	12:00	12:06	FUKUOKA	6	A330-300
China Eastern Airlines	MU2033	12:20	12:11	QINGDAO	128	A320-200
China Southern Airlines	CZ687	12:20	12:13	CHANGCHUN	109	A321-200
China Eastern Airlines	MU2017	12:00	12:16	WEIHAI	129	A320-200
Mongolian Airlines	OM301	12:45	12:20	ULAANBAATAR	102	B737-800
Asiana Airlines	OZ310	12:20	12:23	WEIHAI	32	A321-100
Asiana Airlines	OZ542	12:40	12:25	FRANKFURT	45	B777-200ER
Air China	CA127	12:50	12:33	QINGDAO	103	B737-800
All Nippon Airways	NH941	12:40	12:37	NAGOYA	117	A320-200
Asiana Airlines	OZ131	13:10	12:56	FUKUOKA	34	B767-300
Japan Airlines	JL951	12:45	13:02	TOKYO/NARITA	113	B747-400
Korean Air	KE906	13:25	13:11	FRANKFURT	17	B747-400
Asiana Airlines	OZ302	13:10	13:16	DALIAN	47	A320-200

Korean Air	KE936	13:50	13:22	PRAGUE	19	A330-300
Korean Air	KE832	13:10	13:25	SHENYANG	14	A330-300
Asiana Airlines	OZ161	13:45	13:37	HIROSHIMA	31	B767-300
Cathay Pacific Airways	CX410	14:05	13:39	HONG KONG	123	B747-400
Korean Air	KE846	13:50	13:46	QINGDAO	24	B737-800
Korean Air	KE894	13:55	13:55	SHANGHAI/PUDONG	16	B737-900
Shandong Airlines	SC4089	14:20	14:04	YANTAI	127	B737-300
Asiana Airlines	OZ127	14:00	14:17	TOYAMA	46	A321-100
Asiana Airlines	OZ121	14:00	14:23	NAGOYA	32	B767-300
Asiana Airlines	OZ165	14:10	14:28	TAKAMATSU	30	A320-200
Asiana Airlines	OZ318	14:40	14:31	QINGDAO	47	A321-100
All Nippon Airways	NH907	13:40	14:36	TOKYO/NARITA	121	A320-200
Asiana Airlines	OZ111	14:50	14:45	OSAKA/KANSAI	40	B777-200ER
Korean Air	KE032	15:05	14:48	DALLAS	10	B777-200ER
Korean Air	KE902	15:20	14:50	PARIS	15	B747-400
Korean Air	KE656	15:10	14:53	MUMBAI	12	A330-300
Asiana Airlines	OZ334	15:00	15:04	BEIJING	46	A330-300
China Eastern Airlines	MU5033	15:20	15:09	SHANGHAI/PUDONG	117	A321-200
Asiana Airlines	OZ328	15:30	15:12	TIANJIN	38	B767-300
Asiana Airlines	OZ362	15:00	15:15	SHANGHAI/PUDONG	45	B747-400
Korean Air	KE692	15:35	15:19	TAIPEI	14	A330-300
Korean Air	KE724	15:40	15:25	OSAKA/KANSAI	21	A330-300
Asiana Airlines	OZ171	15:00	15:28	OKINAWA	42	A321-100
Asiana Airlines	OZ352	15:40	15:31	YANJI	36	A321-100
Asiana Airlines	OZ502	16:00	15:34	PARIS	43	B777-200ER
Emirates	EK322	16:45	15:37	DUBAI	111	B777-300ER
Shandong Airlines	SC4081	15:30	15:40	QINGDAO	128	B737-300
Thai Airways International	TG634	16:15	15:47	BANGKOK	121	B777-300
Korean Air	KE908	16:00	15:54	LONDON	6	B747-400
Asiana Airlines	OZ364	15:55	15:56	SHANGHAI/PUDONG	47	A330-300
Korean Air	KE852	14:40	15:58	BEIJING	26	A330-200
Singapore Airlines	SQ016	16:35	15:59	SINGAPORE	124	B777-312ER
China Eastern Airlines	MU559	15:20	16:01	QINGDAO	118	A320-200
Korean Air	KE702	15:35	16:02	TOKYO/NARITA	23	B777-300
Korean Air	KE954	16:45	16:04	CAIRO	33	A330-200
Korean Air	KE094	16:25	16:08	WASHINGTON	31	B777-200ER
Asiana Airlines	OZ151	16:00	16:09	SENDAI	37	B767-300
Korean Air	KE806	16:00	16:12	TIANJIN	15	B777-200ER
Korean Air	KE810	15:35	16:13	ZHENGZHOU	20	B737-900
Air China	CA135	16:25	16:17	DALIAN	108	B737-800
Korean Air	KE774	16:25	16:21	HAKODATE	11	B737-900
Asiana Airlines	OZ101	16:10	16:26	TOKYO/NARITA	48	B777-200ER
Korean Air	KE038	16:20	16:27	CHICAGO	9	B777-200ER
Delta Air Lines	DL091	16:05	16:30	ATLANTA	112	B777-200ER
Asiana Airlines	OZ712	16:30	16:31	TAIPEI	35	B767-300
Korean Air	KE870	16:50	16:34	DALIAN	16	B737-900
Singapore Airlines	SQ017	16:55	16:36	VANCOUVER	122	B777-212ER
Asiana Airlines	OZ163	16:40	16:38	YONAGO	50	A320-200
Korean Air	KE898	17:00	16:40	SHANGHAI/PUDONG	30	B777-200ER
Air China	CA125	16:50	16:42	BEIJING	102	B737-800
Korean Air	KE704	16:35	16:46	TOKYO/NARITA	22	B777-300
Korean Air	KE052	16:40	16:49	HONOLULU	19	B747-400
Korean Air	KE790	17:10	16:53	FUKUOKA	32	A330-300
Korean Air	KE122	17:40	16:56	SYDNEY	28	B747-400
Japan Airlines	JL953	17:00	16:57	TOKYO/NARITA	113	B767-300ER
Korean Air	KE018	17:05	17:01	LOS ANGELES	7	B747-400
Korean Air	KE604	17:00	17:03	HONG KONG	17	B777-200ER
Japan Airlines	JL963	17:05	17:04	OSAKA/KANSAI	114	B767-300ER
Korean Air	KE036	17:05	17:06	ATLANTA	8	B747-400
Air Canada	AC063	17:15	17:08	VANCOUVER	119	B767-300ER
Korean Air	KE842	17:30	17:09	QINGDAO	24	B777-200ER
Asiana Airlines	OZ271	17:35	17:25	SEATTLE	45	B777-200ER
China Southern Airlines	CZ369	17:45	17:27	SHANGHAI/PUDONG	110	B737-800
Asiana Airlines	OZ8534	17:30	17:29	BUSAN	2	A320-200
Korean Air	KE082	17:20	17:31	NEWYORK	12	B747-400
Korean Air	KE766	17:15	17:33	SAPPORO	26	A330-300
Korean Air	KE072	17:50	17:35	VANCOUVER	14	B777-200ER
Korean Air	KE866	17:55	17:37	GUANGZHOU	22	A330-300
Asiana Airlines	OZ602	18:10	17:39	SYDNEY	41	B777-200ER
Korean Air	KE888	17:25	17:42	XIAMEN	11	B737-800
Korean Air	KE1406	17:50	17:43	BUSAN	1	B737-900
Eva Air	BR160	18:20	17:45	TAIPEI	125	A330-200
Korean Air	KE126	17:55	17:47	MELBOURNE	30	A330-200
Asiana Airlines	OZ340	18:10	17:49	HARBIN	50	A321-100
Korean Air	KE622	17:25	17:53	MANILA	10	B777-300
Korean Air	KE848	18:30	17:56	JINAN	16	B737-900
Korean Air	KE758	18:00	17:57	NAGOYA	25	B737-900
Asiana Airlines	OZ702	18:00	17:59	MANILA	40	B747-400
China Southern Airlines	CZ671	18:30	18:02	SHENYANG	103	A319-100
All Nippon Airways	NH177	18:00	18:04	OSAKA/KANSAI	117	A320-200
Cathay Pacific Airways	CX418	18:35	18:07	HONG KONG	121	A340-300
Asiana Airlines	OZ722	17:45	18:16	HONG KONG	49	A330-300
Korean Air	KE840	18:25	18:19	WEIHAI	18	B737-800
Asiana Airlines	OZ308	17:50	18:21	YANTAI	35	A320-200
Asiana Airlines	OZ103	18:10	18:22	TOKYO/NARITA	47	A330-300
Asiana Airlines	OZ336	18:20	18:24	BEIJING	46	B777-200ER
Singapore Airlines	SQ015	18:25	18:26	SAN FRANCISCO	123	B777-312ER
Asiana Airlines	OZ133	18:50	18:28	FUKUOKA	45	B767-300
Asiana Airlines	OZ201	18:30	18:30	LOS ANGELES	33	B747-400 Combi
China Eastern Airlines	MU2043	18:40	18:31	QINGDAO	128	A320-200
Asiana Airlines	OZ360	19:00	18:34	HANGZHOU	30	B767-300
Qatar Airways	QR820	19:05	18:36	DOHA	113	A330-200
Asiana Airlines	OZ113	19:00	18:46	OSAKA/KANSAI	39	B767-300
Asiana Airlines	OZ606	19:00	18:54	SAIPAN	38	A321-100
Asiana Airlines	OZ366	19:20	18:58	SHANGHAI/PUDONG	42	A321-100
Asiana Airlines	OZ175	19:20	19:01	MATSUYAMA	31	A320-200
Korean Air	KE726	19:25	19:05	OSAKA/KANSAI	27	B777-200ER
Japan Airlines	JL955	19:10	19:13	TOKYO/NARITA	105	B767-300ER
Philippine Airlines	PR468	19:20	19:22	MANILA	122	A330-300
China Eastern Airlines	MU2023	19:35	19:29	CHANGSHA/Datuopu	118	A320-200

United Airlines	UA893	19:35	19:31	SAN FRANCISCO	126	B777-200
Korean Air	KE002	19:40	19:34	LOS ANGELES	21	B777-200ER
Thai Airways International	TG628	19:55	19:47	BANGKOK	124	A330-300
China Southern Airlines	CZ683	20:05	19:55	HARBIN	108	MD-90-30
Asiana Airlines	OZ123	19:45	20:01	NAGOYA	45	B767-300
Asiana Airlines	OZ368	20:35	20:04	SHANGHAI/PUDONG	43	A320-200
Asiana Airlines	OZ338	20:20	20:05	BEIJING	36	A320-200
Korean Air	KE614	19:45	20:09	HONG KONG	11	B737-800
Korean Air	KE130	20:10	20:11	AUCKLAND	12	B777-200ER
Cathay Pacific Airways	CX420	20:40	20:13	HONG KONG	123	A330-300
Korean Air	KE982	16:40	20:20	VLADIVOSTOK	16	B737-800
Asiana Airlines	OZ370	17:00	20:24	GUANGZHOU	34	A330-300
Cebu Pacific Air	5J194	20:45	20:30	MANILA	117	A320-200
China Southern Airlines	CZ675	20:45	20:33	DALIAN	110	A321-200
Cathay Pacific Airways	CX416	21:05	20:41	HONG KONG	121	A330-300
China Eastern Airlines	MU5051	20:55	20:52	SHANGHAI/PUDONG	129	A321-200
Japan Airlines	JL959	20:55	20:53	TOKYO/NARITA	112	B777-300
Air China	CA133	21:10	20:57	QINGDAO	103	B737-300
China Eastern Airlines	MU5087	21:20	21:00	BEIJING	127	A320-200
Northwest Airlines	NW007	21:15	21:03	SEATTLE	115	B757-700
Cebu Pacific Air	5J128	21:05	21:07	CEBU	119	A320-200
Air China	CA137	21:45	21:10	BEIJING	114	B737-800
United Airlines	UA881	21:10	21:19	CHICAGO	126	B777-200
Asiana Airlines	OZ736	21:20	21:39	HO CHI MINH	41	A321-100
Korean Air	KE782	22:20	21:52	FUKUOKA	22	B777-200ER
Asiana Airlines	OZ714	21:10	22:34	TAIPEI	27	A321-100
Asiana Airlines	OZ105	23:10	23:17	TOKYO/NARITA	24	A321-100
Korean Air	KE896	23:55	23:52	SHANGHAI/PUDONG	18	B777-200ER

Date: 4th March 2009

Airline	Flight	EAT	RAT	Origin	Gate	Aircraft
Korean Air	KE854	0:10	0:09	BEIJING	23	B777-200ER
Air China	CA143D	2:10	2:04	YANJI	108	B737-800
Korean Air	KE882	4:40	3:50	WUHAN	11	B737-800
Cathay Pacific Airways	CX412	4:45	4:10	HONG KONG	121	A330-300
Korean Air	KE086	5:00	4:26	NEWYORK	22	B747-400
Asiana Airlines	OZ724	4:50	4:29	HONG KONG	49	B767-300
Korean Air	KE624	5:05	4:43	MANILA	7	A330-300
Asiana Airlines	OZ704	4:40	4:47	MANILA	50	A321-100
Korean Air	KE608	5:05	4:55	HONG KONG	27	B777-300
Philippine Airlines	PR466	6:00	4:58	MANILA	119	A320-200
Asiana Airlines	OZ734	5:35	5:09	HANOI	32	B767-300
Asiana Airlines	OZ708	5:40	5:11	CLARK FIELD	37	A321-100
Korean Air	KE642	5:50	5:20	SINGAPORE	24	B777-200ER
Korean Air	KE652	5:50	5:28	BANGKOK	23	B777-300
Vietnam Airlines	VN936	5:30	5:30	HANOI	111	A321-231
Asiana Airlines	OZ752	6:00	5:38	SINGAPORE	39	A330-300
Asiana Airlines	OZ758	6:10	5:47	KOTA KINABALU	33	A321-100
Asiana Airlines	OZ235	6:00	5:50	CHICAGO	46	B777-200ER
Asiana Airlines	OZ604	6:30	5:52	SAIPAN	42	A321-100
Korean Air	KE688	5:40	5:54	SIEMREAP	16	B737-800
Thai Airways International	TG658	6:25	5:57	BANGKOK	122	B777-200
Korean Air	KE012	6:05	5:59	LOS ANGELES	17	B747-400
Vietnam Airlines	VN938	6:20	6:01	HO CHI MINH	109	A330-300
Lufthansa Airlines	LH716	6:35	6:04	MUNICH	126	A340-300
Singapore Airlines	SQ602	7:05	6:23	SINGAPORE	124	B777-312
Malaysia Airlines	MH064	6:50	6:25	KUALA LUMPUR	108	A330-200
Thai Airways International	TG656	7:10	6:28	BANGKOK	125	A330-300
Korean Air	KE628	6:50	6:29	JAKARTA	19	A330-300
Asiana Airlines	OZ740	7:10	6:31	PHNOM PENH	36	A320-200
Korean Air	KE674	6:30	6:44	KOTA KINABALU	9	B737-800
Korean Air	KE690	6:40	6:47	PHNOM PENH	8	B737-800
Korean Air	KE632	7:15	6:54	CEBU	14	B737-900
Korean Air	KE672	7:20	6:58	KUALA LUMPUR	15	A330-300
Asiana Airlines	OZ203	7:00	7:01	LOS ANGELES	31	B777-200ER
Korean Air	KE682	6:50	7:04	HO CHI MINH	26	A330-300
Korean Air	KE680	5:50	7:16	HANOI	10	A330-300
Asiana Airlines	OZ578	7:50	7:25	ALMATY	30	B767-300
Korean Air	KE112	8:05	7:28	GUAM	22	B777-200ER
Asiana Airlines	OZ742	6:35	7:30	BANGKOK	48	A330-300
Asiana Airlines	OZ732	8:00	7:36	HO CHI MINH	40	B747-400
Asiana Airlines	OZ8532	7:50	7:43	BUSAN	2	A320-200
Korean Air	KE1402	8:05	7:47	BUSAN	1	B737-900
Korean Air	KE1412	8:15	8:04	DAEGU	3	B737-900
Korean Air	KE630	8:40	8:16	DENPASAR	19	A330-300
Korean Air	KE942	8:35	8:24	TASHKENT	17	A330-300
Air France	AF264	8:00	8:27	PARIS	110	B777-200ER
Asiana Airlines	OZ574	9:00	8:35	TASHKENT	31	A330-300
Korean Air	KE654	8:40	8:41	BANGKOK	15	B777-300
Korean Air	KE668	8:40	9:11	CHIANG MAI	20	B737-800
Asiana Airlines	OZ748	9:45	9:27	PHUKET	45	B767-300
Korean Air	KE1494	10:00	9:42	BUSAN	5	#N/A
China Southern Airlines	CZ685	10:40	10:24	DALIAN	104	A321-200
Air China	CA171	10:45	10:27	TIANJIN	103	B737-300
China Southern Airlines	CZ313	10:45	10:32	SHANGHAI/PUDONG	102	B737-800
China Eastern Airlines	MU549	11:00	10:41	YANTAI	131	A320-200
Japan Airlines	JL983	11:25	11:09	NAGOYA	112	B767-300ER
Japan Airlines	JL961	11:30	11:13	OSAKA/KANSAI	114	B767-300ER
Korean Air	KE748	11:35	11:15	OKAYAMA	20	B737-900
Air China	CA123	11:50	11:16	BEIJING	111	A330-200
China Airlines	CI160	11:35	11:18	TAIPEI	121	A340-300
China Southern Airlines	CZ681	11:35	11:19	SHENYANG	106	A321-200
Asiana Airlines	OZ115	11:25	11:22	OSAKA/KANSAI	30	A321-100
Korean Air	KE722	11:40	11:23	OSAKA/KANSAI	19	B747-400
Korean Air	KE752	11:45	11:26	NAGOYA	14	B747-400

China Eastern Airlines	MU579	11:50	11:28	NANJING	123	A320-200
Asiana Airlines	OZ107	11:40	11:30	TOKYO/NARITA	36	B767-300
China Eastern Airlines	MU5041	11:55	11:33	SHANGHAI/PUDONG	118	A321-200
Korean Air	KE764	11:55	11:35	NIIGATA	28	B737-900
China Eastern Airlines	MU2017	12:00	11:37	WEIHAI	128	A320-200
SAT Airlines	HZ111	11:35	11:42	SAKHALINSK	130	B737-200
Air China	CA139	12:05	11:46	HANGZHOU	109	A319-100
Korean Air	KE788	12:00	11:47	FUKUOKA	10	A330-300
Korean Air	KE706	12:00	11:50	TOKYO/NARITA	15	B747-400
Asiana Airlines	OZ310	12:20	11:54	WEIHAI	42	A321-100
Lufthansa Airlines	LH712	12:30	11:59	FRANKFURT	124	A340-600
China Southern Airlines	CZ687	12:20	12:02	CHANGCHUN	115	A321-200
China Southern Airlines	CZ337	12:10	12:07	GUANGZHOU	108	A321-200
Asiana Airlines	OZ768	12:20	12:13	DELHI	32	A330-300
All Nippon Airways	NH941	12:40	12:21	NAGOYA	117	A320-200
Shanghai Airlines	FM827	12:40	12:23	SHANGHAI/PUDONG	125	B737-700
Air China	CA127	12:50	12:25	QINGDAO	103	B737-800
Japan Airlines	JL951	12:45	12:26	TOKYO/NARITA	113	B777-200
KLM Royal Dutch Airlines	KL865	13:05	12:28	AMSTERDAM	110	B747-400M
Asiana Airlines	OZ542	12:40	12:32	FRANKFURT	31	B777-200ER
Mongolian Airlines	OM301	12:45	12:36	ULAANBAATAR	102	B737-800
Lufthansa Airlines	LH717	12:40	12:36	SHENYANG	126	A340-300
China Eastern Airlines	MU2033	12:20	12:39	QINGDAO	129	A320-200
Asiana Airlines	OZ131	13:10	12:57	FUKUOKA	34	B767-300
Korean Air	KE832	13:10	13:05	SHENYANG	26	A330-300
China Southern Airlines	CZ6073	13:25	13:08	YANJI	105	A321-200
Korean Air	KE838	13:40	13:16	YANTAI	27	B737-800
Asiana Airlines	OZ302	13:10	13:19	DALIAN	47	A320-200
Korean Air	KE906	13:25	13:20	FRANKFURT	9	B747-400
Korean Air	KE956	13:55	13:22	ISTANBUL	19	A330-300
Korean Air	KE846	13:50	13:24	QINGDAO	11	B737-800
Asiana Airlines	OZ161	13:45	13:27	HIROSHIMA	41	B767-300
All Nippon Airways	NH907	13:40	13:30	TOKYO/NARITA	119	A320-200
Cathay Pacific Airways	CX410	14:05	13:43	HONG KONG	121	A330-300
Korean Air	KE894	13:55	13:46	SHANGHAI/PUDONG	28	A330-200
Korean Air	KE776	14:05	13:52	KOMATSU	20	B737-900
Korean Air	KE786	14:10	13:57	KAGOSHIMA	14	B737-900
Shandong Airlines	SC4089	14:20	14:01	YANTAI	130	B737-300
Vladivostok Airlines	XF743	14:20	14:02	VLADIVOSTOK	114	A320-200
Korean Air	KE852	14:40	14:05	BEIJING	22	B777-300
Asiana Airlines	OZ121	14:00	14:07	NAGOYA	30	A330-300
China Southern Airlines	CZ3065	14:15	14:18	CHANGSHA/Datuopu	109	A320-200
Asiana Airlines	OZ157	14:30	14:20	MIYAZAKI	48	A320-200
Asiana Airlines	OZ111	14:50	14:30	OSAKA/KANSAI	46	A330-300
Asiana Airlines	OZ318	14:40	14:32	QINGDAO	32	A321-100
Asiana Airlines	OZ362	15:00	14:37	SHANGHAI/PUDONG	50	A321-100
Asiana Airlines	OZ304	15:05	14:41	CHANGCHUN	35	A321-100
Asiana Airlines	OZ334	15:00	14:47	BEIJING	43	B767-300
Korean Air	KE902	15:20	14:56	PARIS	8	B747-400
China Eastern Airlines	MU559	15:20	15:04	QINGDAO	117	A320-200
Asiana Airlines	OZ328	15:30	15:11	TIANJIN	33	A321-100
Korean Air	KE724	15:40	15:16	OSAKA/KANSAI	26	A330-300
Korean Air	KE692	15:35	15:19	TAIPEI	7	A330-300
China Eastern Airlines	MU5033	15:20	15:20	SHANGHAI/PUDONG	118	A321-200
Shandong Airlines	SC4081	15:30	15:21	QINGDAO	128	B737-300
Korean Air	KE702	15:35	15:25	TOKYO/NARITA	10	B777-300
Korean Air	KE934	15:40	15:27	ZURICH	12	A330-300
Korean Air	KE908	16:00	15:31	LONDON	15	B747-400
Korean Air	KE806	16:00	15:40	TIANJIN	9	A330-200
Thai Airways International	TG634	16:15	15:43	BANGKOK	121	B777-300
Korean Air	KE032	15:05	15:45	DALLAS	21	B777-200ER
Korean Air	KE768	15:55	15:47	AOMORI	11	B737-800
Korean Air	KE826	16:10	15:48	YANJI	34	B737-900
Korean Air	KE038	16:20	15:49	CHICAGO	19	B777-200ER
Emirates	EK322	16:45	15:51	DUBAI	111	B777-300ER
Asiana Airlines	OZ364	15:55	15:53	SHANGHAI/PUDONG	42	A321-100
Asiana Airlines	OZ101	16:10	15:56	TOKYO/NARITA	45	B747-400
Asiana Airlines	OZ151	16:00	15:59	SENDAI	41	B767-300
Singapore Airlines	SQ016	16:35	16:01	SINGAPORE	122	B777-312ER
Air China	CA135	16:25	16:03	DALIAN	103	B737-800
Air China	CA125	16:50	16:11	BEIJING	108	B737-800
Korean Air	KE704	16:35	16:17	TOKYO/NARITA	23	B777-300
Asiana Airlines	OZ712	16:30	16:18	TAIPEI	38	A321-100
Asiana Airlines	OZ153	16:40	16:20	ASAHIKAWA	37	A320-200
Korean Air	KE094	16:25	16:23	WASHINGTON	27	B777-200ER
Korean Air	KE870	16:50	16:25	DALIAN	18	B737-900
Korean Air	KE898	17:00	16:28	SHANGHAI/PUDONG	6	B777-200ER
Turkish Airlines	TK090	16:50	16:29	ISTANBUL	109	A340-300
Asiana Airlines	OZ522	16:55	16:37	LONDON	47	B777-200ER
Korean Air	KE052	16:40	16:43	HONOLULU	17	B747-400
Asiana Airlines	OZ370	17:00	16:45	GUANGZHOU	46	A330-300
Korean Air	KE082	17:20	16:46	NEWYORK	35	B747-400
Korean Air	KE604	17:00	16:49	HONG KONG	22	B747-400
Korean Air	KE790	17:10	16:49	FUKUOKA	24	A330-300
Korean Air	KE856	17:10	16:51	BEIJING	31	B777-200ER
Korean Air	KE820	17:15	16:54	CHANGSHA/Datuopu	34	B737-900
Korean Air	KE766	17:15	17:00	SAPPORO	26	A330-300
Korean Air	KE622	17:25	17:02	MANILA	14	B777-300
Japan Airlines	JL963	17:05	17:07	OSAKA/KANSAI	112	B767-300ER
Korean Air	KE124	17:35	17:09	BRISBANE	7	A330-300
Asiana Airlines	OZ350	17:15	17:12	NANJING	48	A320-200
Japan Airlines	JL953	17:00	17:13	TOKYO/NARITA	113	B767-300ER
Korean Air	KE842	17:30	17:13	QINGDAO	30	A330-300
Korean Air	KE958	17:15	17:17	TEL AVIV	28	B747-400
Korean Air	KE138	17:40	17:18	NADI	15	A330-300
Asiana Airlines	OZ8534	17:30	17:21	BUSAN	3	A320-200
China Southern Airlines	CZ683	17:50	17:22	HARBIN	107	A320-200
Korean Air	KE036	17:05	17:24	ATLANTA	12	B747-400
Korean Air	KE122	17:40	17:28	SYDNEY	19	B747-400
Korean Air	KE018	17:05	17:30	LOS ANGELES	21	B747-400

China Southern Airlines	CZ369	17:45	17:33	SHANGHAI/PUDONG	110	B737-800
Asiana Airlines	OZ308	17:50	17:34	YANTAI	38	A320-200
Korean Air	KE1406	17:50	17:35	BUSAN	2	B737-900
Asiana Airlines	OZ722	17:45	17:43	HONG KONG	41	A330-300
Asiana Airlines	OZ602	18:10	17:45	SYDNEY	35	B777-200ER
Korean Air	KE828	17:35	17:46	SHENZEN	33	B737-800
Eva Air	BR160	18:20	17:49	TAIPEI	125	A330-200
Korean Air	KE758	18:00	17:51	NAGOYA	25	B737-900
Korean Air	KE840	18:25	17:53	WEIHAI	20	B737-800
All Nippon Airways	NH177	18:00	17:54	OSAKA/KANSAI	117	A320-200
Asiana Airlines	OZ702	18:00	17:56	MANILA	36	B767-300
Korean Air	KE024	17:55	17:59	SAN FRANCISCO	32	B777-200ER
Asiana Airlines	OZ336	18:20	18:08	BEIJING	31	B777-200ER
Korean Air	KE020	17:45	18:11	SEATTLE	12	B777-200ER
China Southern Airlines	CZ671	18:30	18:13	SHENYANG	103	A319-100
Cathay Pacific Airways	CX418	18:35	18:15	HONG KONG	121	A330-300
Asiana Airlines	OZ103	18:10	18:16	TOKYO/NARITA	49	B777-200ER
Asiana Airlines	OZ372	18:20	18:18	SHENZEN	39	B767-300
Air China	CA147	18:30	18:20	WEIHAI	102	B737-300
Asiana Airlines	OZ213	17:45	18:26	SAN FRANCISCO	40	B777-200ER
Asiana Airlines	OZ133	18:50	18:28	FUKUOKA	37	B767-300
China Eastern Airlines	MU2043	18:40	18:30	QINGDAO	118	A320-200
Asiana Airlines	OZ360	19:00	18:38	HANGZHOU	34	B767-300
Qatar Airways	QR820	19:05	18:39	DOHA	113	A330-200
Philippine Airlines	PR468	19:20	18:41	MANILA	122	A330-300
Asiana Airlines	OZ113	19:00	18:48	OSAKA/KANSAI	32	A330-300
Japan Airlines	JL955	19:10	18:55	TOKYO/NARITA	106	B767-300ER
Asiana Airlines	OZ201	18:30	19:00	LOS ANGELES	30	B747-400
Asiana Airlines	OZ366	19:20	19:02	SHANGHAI/PUDONG	41	B767-300
Asiana Airlines	OZ571	19:15	19:04	KHABAROVSK	35	A321-100
Mandarin Airlines	AE960	19:05	19:06	KAOHSIUNG	105	Embraer E-190
Korean Air	KE726	19:25	19:08	OSAKA/KANSAI	26	A330-300
Singapore Airlines	SQ015	18:25	19:12	SAN FRANCISCO	123	B777-312ER
China Xiamen Airlines	MF871	19:30	19:14	XIAMEN	130	B737-700
China Eastern Airlines	MU2023	19:35	19:25	CHANGSHA/Datuopu	129	A320-200
Korean Air	KE982	20:00	19:28	VLADIVOSTOK	14	B737-800
Thai Airways International	TG628	19:55	19:32	BANGKOK	124	A330-300
Korean Air	KE002	19:40	19:37	LOS ANGELES	24	B777-200ER
Asiana Airlines	OZ368	20:20	19:54	SHANGHAI/PUDONG	47	A320-200
Korean Air	KE614	19:45	20:00	HONG KONG	10	B737-800
Asiana Airlines	OZ123	20:05	20:02	NAGOYA	33	A330-300
Cathay Pacific Airways	CX420	20:40	20:09	HONG KONG	121	B777-300
Philippine Airlines	PR488	20:50	20:13	CEBU	122	A320-200
Korean Air	KE130	20:10	20:15	AUCKLAND	23	B777-200ER
Cebu Pacific Air	5J194	20:45	20:22	MANILA	117	A320-200
China Eastern Airlines	MU5087	21:20	20:28	BEIJING	128	A320-200
China Eastern Airlines	MU5051	20:55	20:38	SHANGHAI/PUDONG	127	A321-200
Cathay Pacific Airways	CX416	21:05	20:45	HONG KONG	123	B777-300
United Airlines	UA893	19:35	20:48	SAN FRANCISCO	125	B777-200
United Airlines	UA881	21:10	20:52	CHICAGO	126	B777-200
Japan Airlines	JL959	20:55	20:54	TOKYO/NARITA	112	B777-300
Northwest Airlines	NW007	21:15	21:00	SEATTLE	115	B757-700
Cebu Pacific Air	5J128	21:05	21:02	CEBU	119	A320-200
Air China	CA137	21:45	21:04	BEIJING	103	B737-800
Air China	CA133	21:10	21:29	QINGDAO	102	B737-300
China Southern Airlines	CZ675	20:45	21:40	DALIAN	107	A321-200
Korean Air	KE782	22:20	21:57	FUKUOKA	19	A330-300
Korean Air	KE694	22:15	21:58	TAIPEI	18	B737-900
Asiana Airlines	OZ105	23:10	23:03	TOKYO/NARITA	27	B767-300
Korean Air	KE854T	23:50	23:57	BEIJING	11	B737-900

Date: 5th March 2009

Airline	Flight	EAT	RAT	Origin	Gate	Aircraft
Korean Air	KE896	0:05	0:05	SHANGHAI/PUDONG	16	B737-800
Korean Air	KE074	3:30	3:33	TORONTO	10	B747-400
Asiana Airlines	OZ704	4:40	4:09	MANILA	35	A321-100
Cathay Pacific Airways	CX412	4:45	4:18	HONG KONG	123	A330-300
Asiana Airlines	OZ724	4:50	4:33	HONG KONG	43	B747-400
Korean Air	KE086	5:00	4:45	NEWYORK	22	B747-400
Asiana Airlines	OZ324	4:40	4:50	CHENGDU	50	A320-200
Korean Air	KE608	5:05	4:55	HONG KONG	24	B747-400
Korean Air	KE624	5:05	4:58	MANILA	23	A330-300
Asiana Airlines	OZ221	5:10	5:00	NEWYORK	40	B747-400
Asiana Airlines	OZ734	5:35	5:09	HANOI	31	B767-300
Philippine Airlines	PR466	6:00	5:12	MANILA	119	A320-200
Korean Air	KE642	5:50	5:17	SINGAPORE	10	B777-300
Korean Air	KE652	5:50	5:23	BANGKOK	9	B777-300
Korean Air	KE680	5:50	5:30	HANOI	27	A330-300
Asiana Airlines	OZ708	5:40	5:34	CLARK FIELD	45	A321-100
Asiana Airlines	OZ758	6:10	5:44	KOTA KINABALU	36	A321-100
Korean Air	KE688	5:40	5:46	SIEMREAP	14	B737-800
Asiana Airlines	OZ752	6:00	5:48	SINGAPORE	39	A330-300
Vietnam Airlines	VN936	5:30	5:51	HANOI	111	A330-200
Asiana Airlines	OZ710	6:25	6:04	CEBU	34	A321-100
Thai Airways International	TG658	6:25	6:06	BANGKOK	122	B777-200
Vietnam Airlines	VN938	6:20	6:08	HO CHI MINH	109	A321-231
Asiana Airlines	OZ604	6:30	6:10	SAIPAN	37	A321-100
Air Macau	NX826	6:40	6:16	MACAU	126	A321-100
Asiana Airlines	OZ742	6:35	6:21	BANGKOK	30	A330-300
Korean Air	KE012	6:05	6:23	LOS ANGELES	17	B747-400
Asiana Airlines	OZ738	7:10	6:25	SIEMREAP	38	A321-100
Korean Air	KE628	6:50	6:28	JAKARTA	7	A330-300
Singapore Airlines	SQ602	7:05	6:31	SINGAPORE	124	B777-312
Thai Airways International	TG656	7:10	6:39	BANGKOK	125	A330-300
Korean Air	KE690	6:40	6:41	PHNOM PENH	20	B737-800

Korean Air	KE682	6:50	6:45	HO CHI MINH	21	A330-300
Korean Air	KE006	6:50	6:56	LAS VEGAS	24	B777-200ER
Korean Air	KE632	7:15	6:58	CEBU	16	B737-900
Korean Air	KE672	7:20	7:02	KUALA LUMPUR	8	A330-300
Asiana Airlines	OZ203	7:00	7:06	LOS ANGELES	43	B777-200ER
Korean Air	KE062	7:20	7:29	SAO PAULO	15	B777-200ER
Asiana Airlines	OZ8532	7:50	7:37	BUSAN	3	A320-200
Asiana Airlines	OZ732	8:00	7:38	HO CHI MINH	32	A330-300
Korean Air	KE112	8:05	7:40	GUAM	27	B777-200ER
Korean Air	KE1402	8:05	7:48	BUSAN	1	B737-800
Malaysia Airlines	MH066	8:35	8:02	KUALA LUMPUR	108	A330-200
Korean Air	KE1412	8:15	8:02	DAEGU	5	B737-900
Korean Air	KE630	8:40	8:09	DENPASAR	22	A330-300
Asiana Airlines	OZ744	8:20	8:26	BANGKOK	34	B767-300
Korean Air	KE654	8:40	8:28	BANGKOK	15	B777-300
Garuda Indonesia	GA870	8:30	8:31	DENPASAR	113	A330-300
FINNAIR	AY041	9:20	8:56	HELSINKI	126	A340-300
Korean Air	KE638	9:40	9:20	PHUKET	26	A330-300
Asiana Airlines	OZ748	9:45	9:26	PHUKET	46	B767-300
China Southern Airlines	CZ685	10:40	10:16	DALIAN	104	ATR 72-500
Korean Air	KE924	10:55	10:21	MOSCOW	12	B777-200ER
China Southern Airlines	CZ313	10:45	10:29	SHANGHAI/PUDONG	102	B737-800
China Eastern Airlines	MU549	11:00	10:38	YANTAI	127	A320-200
Air China	CA171	10:45	10:46	TIANJIN	103	B737-300
China Southern Airlines	CZ317	11:10	11:01	BEIJING	105	A321-200
Japan Airlines	JL983	11:25	11:08	NAGOYA	112	B767-300ER
Air China	CA123	11:50	11:12	BEIJING	111	A330-200
China Southern Airlines	CZ681	11:35	11:16	SHENYANG	106	A321-200
China Airlines	CI160	11:35	11:19	TAIPEI	121	A340-300
Asiana Airlines	OZ119	11:25	11:24	SAIPAN	47	B767-300
Korean Air	KE748	11:35	11:32	OKAYAMA	11	B737-900
Japan Airlines	JL961	11:30	11:33	OSAKA/KANSAI	114	B767-300ER
Korean Air	KE752	11:45	11:37	NAGOYA	6	B747-400
China Eastern Airlines	MU2017	12:00	11:38	WEIHAI	128	A320-200
Korean Air	KE730	11:40	11:42	GUAM	28	A330-300
Air China	CA139	12:05	11:46	HANGZHOU	110	A319-100
China Eastern Airlines	MU5041	11:55	11:49	SHANGHAI/PUDONG	118	A321-200
Asiana Airlines	OZ107	11:40	11:51	TOKYO/NARITA	45	A330-300
Korean Air	KE764	11:55	11:53	NIIGATA	16	B737-900
Korean Air	KE788	12:00	11:56	FUKUOKA	19	A330-300
Korean Air	KE706	12:00	12:00	TOKYO/NARITA	15	B777-300
Asiana Airlines	OZ310	12:20	12:05	WEIHAI	42	A320-200
China Eastern Airlines	MU579	11:50	12:08	NANJING	123	A320-200
Lufthansa Airlines	LH712	12:30	12:11	FRANKFURT	124	A340-600
China Southern Airlines	CZ337	12:10	12:13	GUANGZHOU	107	A321-200
Air Astana	KC909	12:00	12:14	ALMATY	115	B757-200
China Eastern Airlines	MU2033	12:20	12:19	QINGDAO	129	A320-200
Korean Air	KE794	12:40	12:21	NAGASAKI	18	B737-900
China Southern Airlines	CZ687	12:20	12:23	CHANGCHUN	109	A321-200
Air China	CA127	12:50	12:26	QINGDAO	108	B737-800
Air China	CA143	12:40	12:29	YANJI	102	B737-800
All Nippon Airways	NH941	12:40	12:40	NAGOYA	117	A320-200
Japan Airlines	JL951	12:45	12:47	TOKYO/NARITA	113	B767-300ER
Korean Air	KE832	13:10	13:00	SHENYANG	7	A330-300
Asiana Airlines	OZ131	13:10	13:02	FUKUOKA	32	B767-300
Asiana Airlines	OZ302	13:10	13:05	DALIAN	41	A320-200
Korean Air	KE906	13:25	13:07	FRANKFURT	9	B747-400
Korean Air	KE846	13:50	13:23	QINGDAO	11	B737-800
All Nippon Airways	NH907	13:40	13:27	TOKYO/NARITA	119	A320-200
Eva Air	BR170	14:20	13:37	TAIPEI	123	A330-200
Asiana Airlines	OZ141	14:00	13:45	KUMAMOTO	46	A320-200
Asiana Airlines	OZ161	13:45	13:47	HIROSHIMA	34	B767-300
Korean Air	KE894	13:55	13:51	SHANGHAI/PUDONG	24	B777-200ER
China Southern Airlines	CZ3065	14:15	14:00	CHANGSHA/Datuopu	105	A320-200
Asiana Airlines	OZ121	14:00	14:04	NAGOYA	39	B767-300
Cathay Pacific Airways	CX410	14:05	14:08	HONG KONG	121	A330-300
Shandong Airlines	SC4089	14:20	14:11	YANTAI	127	B737-300
Korean Air	KE916	14:05	14:18	MUNICH	14	A330-200
Asiana Airlines	OZ318	14:40	14:21	QINGDAO	42	A321-100
Korean Air	KE852	14:40	14:26	BEIJING	8	B777-300
Asiana Airlines	OZ362	15:00	14:39	SHANGHAI/PUDONG	43	B747-400
Asiana Airlines	OZ111	14:50	14:41	OSAKA/KANSAI	45	A330-300
Asiana Airlines	OZ334	15:00	14:45	BEIJING	41	B777-200ER
Korean Air	KE902	15:20	14:49	PARIS	21	B747-400
Korean Air	KE656	15:10	14:54	MUMBAI	12	A330-300
Asiana Airlines	OZ304	15:05	14:59	CHANGCHUN	36	A320-200
China Eastern Airlines	MU559	15:20	15:03	QINGDAO	117	A320-200
Asiana Airlines	OZ328	15:30	15:05	TIANJIN	48	A321-100
Vladivostok Airlines	XF801	14:15	15:07	KHABAROVSK	114	Tupolev Tu-154M
China Eastern Airlines	MU5033	15:20	15:10	SHANGHAI/PUDONG	118	A321-200
Asiana Airlines	OZ155	15:00	15:12	FUKUSHIMA	31	A320-200
Asiana Airlines	OZ171	15:00	15:14	OKINAWA	32	B767-300
Korean Air	KE692	15:35	15:19	TAIPEI	22	A330-300
Asiana Airlines	OZ352	15:40	15:23	YANJI	50	A321-100
Korean Air	KE806	16:00	15:25	TIANJIN	24	B747-400
Korean Air	KE724	15:40	15:28	OSAKA/KANSAI	30	A330-300
Shandong Airlines	SC4081	15:30	15:31	QINGDAO	128	B737-300
Korean Air	KE770	15:45	15:35	AKITA	23	B737-800
Asiana Airlines	OZ502	16:00	15:37	PARIS	40	B777-200ER
Korean Air	KE926	16:10	15:38	Madrid Barajas Airport	9	B777-200ER
Korean Air	KE702	15:35	15:43	TOKYO/NARITA	10	B777-300
Emirates	EK322	16:45	15:45	DUBAI	111	B777-300ER
Korean Air	KE908	16:00	15:48	LONDON	14	B747-400
Thai Airways International	TG634	16:15	15:51	BANGKOK	121	B777-300
Delta Air Lines	DL091	16:05	15:53	ATLANTA	113	B777-200ER
Korean Air	KE038	16:20	15:59	CHICAGO	17	B777-200ER
Asiana Airlines	OZ364	15:55	16:01	SHANGHAI/PUDONG	38	A321-100
Singapore Airlines	SQ016	16:35	16:03	SINGAPORE	123	B777-312ER
Air China	CA135	16:25	16:06	DALIAN	103	B737-800
Asiana Airlines	OZ101	16:10	16:10	TOKYO/NARITA	46	B747-400

Asiana Airlines	OZ151	16:00	16:13	SENDAI	37	B767-300
Korean Air	KE774	16:25	16:16	HAKODATE	20	B737-900
Korean Air	KE9824	16:30	16:21	MUDANJIANG	18	#N/A
Korean Air	KE870	16:50	16:23	DALIAN	16	B737-900
Korean Air	KE094	16:25	16:26	WASHINGTON	19	B777-200ER
Korean Air	KE704	16:35	16:34	TOKYO/NARITA	27	B777-300
Korean Air	KE036	17:05	16:37	ATLANTA	33	B747-400
China Eastern Airlines	MU217	16:40	16:38	YANCHENG	126	A320-200
Korean Air	KE052	16:40	16:39	HONOLULU	6	B747-400
Korean Air	KE954	16:45	16:43	CAIRO	12	A330-200
Korean Air	KE898	17:00	16:45	SHANGHAI/PUDONG	32	B737-900
Korean Air	KE604	17:00	16:46	HONG KONG	28	A330-300
Air China	CA125	16:50	16:48	BEIJING	102	B737-800
Korean Air	KE790	17:10	16:51	FUKUOKA	7	B777-200ER
Asiana Airlines	OZ712	16:55	16:53	TAIPEI	36	B767-300
Singapore Airlines	SQ018	17:10	16:55	SINGAPORE	122	B777-212ER
Japan Airlines	JL963	17:05	16:57	OSAKA/KANSAI	114	B767-300ER
Korean Air	KE820	17:15	16:58	CHANGSHA/Datuopu	34	B737-800
Korean Air	KE842	17:30	17:01	QINGDAO	26	A330-300
Korean Air	KE928	17:35	17:03	Fiumicino Airport	8	B777-200ER
Korean Air	KE766	17:15	17:04	SAPPORO	31	A330-300
Korean Air	KE888	17:25	17:06	XIAMEN	11	B737-800
Japan Airlines	JL953	17:00	17:09	TOKYO/NARITA	112	B767-300ER
Korean Air	KE082	17:20	17:10	NEWYORK	15	B747-400
Korean Air	KE122	17:40	17:16	SYDNEY	27	B747-400
Asiana Airlines	OZ308	17:50	17:18	YANTAI	37	A320-200
Korean Air	KE018	17:05	17:24	LOS ANGELES	33	B747-400
Asiana Airlines	OZ575	17:50	17:28	SAKHALINSK	35	A321-100
China Southern Airlines	CZ683	17:50	17:30	HARBIN	108	A320-200
Air Canada	AC063	17:15	17:31	VANCOUVER	119	B767-300ER
China Southern Airlines	CZ369	17:45	17:35	SHANGHAI/PUDONG	110	B737-800
Korean Air	KE622	17:25	17:39	MANILA	14	B777-300
Korean Air	KE126	17:55	17:42	MELBOURNE	22	A330-200
Korean Air	KE1406	17:50	17:46	BUSAN	1	B737-900
All Nippon Airways	NH177	18:00	17:48	OSAKA/KANSAI	117	A320-200
Asiana Airlines	OZ702	18:00	17:51	MANILA	41	B747-400
Korean Air	KE840	18:25	17:53	WEIHAI	16	B737-800
Asiana Airlines	OZ340	18:10	17:54	HARBIN	38	A321-100
China Southern Airlines	CZ671	18:30	17:56	SHENYANG	104	A319-100
Asiana Airlines	OZ722	17:45	17:59	HONG KONG	47	A330-300
Korean Air	KE758	18:00	18:00	NAGOYA	31	B737-900
Eva Air	BR160	18:20	18:01	TAIPEI	125	A330-200
Korean Air	KE072	17:50	18:03	VANCOUVER	32	B777-200ER
Asiana Airlines	OZ602	18:10	18:05	SYDNEY	39	B777-200ER
Asiana Airlines	OZ370	17:00	18:11	GUANGZHOU	48	A330-300
Asiana Airlines	OZ271	17:35	18:12	SEATTLE	45	B777-200ER
Asiana Airlines	OZ213	17:45	18:17	SAN FRANCISCO	49	B777-200ER
Cathay Pacific Airways	CX418	18:35	18:19	HONG KONG	123	A330-300
Asiana Airlines	OZ103	18:10	18:25	TOKYO/NARITA	43	A330-300
Qatar Airways	QR820	19:05	18:27	DOHA	113	A330-200
Singapore Airlines	SQ015	18:25	18:31	SAN FRANCISCO	124	B777-312ER
Philippine Airlines	PR468	19:20	18:33	MANILA	121	A330-300
Asiana Airlines	OZ360	19:00	18:35	HANGZHOU	31	B767-300
Asiana Airlines	OZ336	18:20	18:48	BEIJING	33	A330-300
Mandarin Airlines	AE960	19:05	18:50	KAOHSIUNG	105	Embraer E-190
Asiana Airlines	OZ201	18:30	18:52	LOS ANGELES	45	B747-400
United Airlines	UA893	19:35	18:53	SAN FRANCISCO	126	B777-200
Asiana Airlines	OZ113	19:00	18:56	OSAKA/KANSAI	40	B767-300
Asiana Airlines	OZ366	19:20	18:57	SHANGHAI/PUDONG	34	A320-200
Asiana Airlines	OZ606	19:00	19:00	SAIPAN	32	A321-100
China Southern Airlines	CZ6061	19:20	19:04	CHANGCHUN	107	#N/A
Japan Airlines	JL955	19:10	19:10	TOKYO/NARITA	106	B767-300ER
Korean Air	KE726	19:25	19:15	OSAKA/KANSAI	10	A330-300
Korean Air	KE866	17:55	19:18	GUANGZHOU	8	A330-300
Asiana Airlines	OZ133	19:40	19:28	FUKUOKA	34	B767-300
Korean Air	KE614	19:45	19:34	HONG KONG	18	B737-800
Korean Air	KE002	19:40	19:39	LOS ANGELES	24	B777-200ER
Asiana Airlines	OZ123	19:45	19:46	NAGOYA	33	B767-300
Thai Airways International	TG628	19:55	19:53	BANGKOK	122	A330-300
Asiana Airlines	OZ368	20:20	19:56	SHANGHAI/PUDONG	42	A320-200
Korean Air	KE130	20:10	20:06	AUCKLAND	19	B777-200ER
Cathay Pacific Airways	CX420	20:40	20:13	HONG KONG	123	A330-300
Cebu Pacific Air	5J194	20:45	20:15	MANILA	117	A320-200
Philippine Airlines	PR488	20:50	20:18	CEBU	124	A320-200
China Southern Airlines	CZ675	20:45	20:33	DALIAN	109	A321-200
China Eastern Airlines	MU2015	20:35	20:34	GUILIN	127	A320-200
Japan Airlines	JL959	20:55	20:40	TOKYO/NARITA	112	B777-300
Cebu Pacific Air	5J128	21:05	20:50	CEBU	119	A320-200
Northwest Airlines	NW007	21:15	20:52	SEATTLE	115	B757-700
Cathay Pacific Airways	CX416	21:05	20:55	HONG KONG	121	B777-200
China Eastern Airlines	MU5051	20:55	20:57	SHANGHAI/PUDONG	130	A321-200
United Airlines	UA881	21:10	21:01	CHICAGO	126	B777-200
Asiana Airlines	OZ736	21:20	21:03	HO CHI MINH	41	A321-100
China Eastern Airlines	MU5087	21:20	21:06	BEIJING	128	A320-200
Air China	CA133	21:10	21:10	QINGDAO	102	B737-300
Air China	CA137	21:45	21:50	BEIJING	103	B737-800
Korean Air	KE782	22:20	21:55	FUKUOKA	12	B777-200ER
Asiana Airlines	OZ105	23:10	23:07	TOKYO/NARITA	27	B767-300
Shenzhen Airlines	ZH9787	18:55	23:13	SHENZEN	114	B737-800
Korean Air	KE896T	23:45	23:55	SHANGHAI/PUDONG	11	B737-900
Korean Air	KE854	23:50	23:57	BEIJING	21	B737-900

5. Departure Flight Data of Incheon International Airport

The arrival data is collected from the website of Incheon International and FlightStats (http://www.flightstats.com/). EDT and RDT mean the expected arrival time and real arrival time, respectively.

Date: 27th February 2009

Airline	Flight	EDT	RDT	Destination	Gate	Aircraft
Korean Air	KE787	8:00	8:10	FUKUOKA	27	A330-300
Air Macau	NX825	8:00	8:12	MACAU	119	A321-100
Japan Airlines	JL956	8:00	8:15	TOKYO/NARITA	107	B767-300ER
Korean Air	KE831	8:20	8:31	SHENYANG	28	A330-300
Philippine Airlines	PR467	8:30	8:35	MANILA	117	A320-200
Korean Air	KE791	8:25	8:37	OITA	11	B737-900
Korean Air	KE621	8:25	8:40	MANILA	22	B777-300
Asiana Airlines	OZ8531	8:30	8:42	BUSAN	2	A320-200
Korean Air	KE603	8:30	8:44	HONG KONG	14	B777-200ER
China Southern Airlines	CZ340	8:40	8:48	GUANGZHOU	105	A320-200
Korean Air	KE925	8:40	8:50	Madrid Barajas Airport	19	B777-200ER
Korean Air	KE893	8:45	8:52	SHANGHAI/PUDONG	17	B777-200ER
Asiana Airlines	OZ331	8:40	9:00	BEIJING	50	A321-100
Air China	CA134	8:45	9:02	QINGDAO	102	B737-300
Cathay Pacific Airways	CX415	8:50	9:06	HONG KONG	123	A330-300
Asiana Airlines	OZ701	8:50	9:09	MANILA	30	A330-300
Asiana Airlines	OZ369	8:50	9:11	GUANGZHOU	41	A330-300
Korean Air	KE1401	9:00	9:14	BUSAN	1	B737-900
Asiana Airlines	OZ309	9:00	9:16	WEIHAI	46	A321-100
China Eastern Airlines	MU5052	9:05	9:19	SHANGHAI/PUDONG	129	A321-200
Singapore Airlines	SQ603	9:00	9:21	SINGAPORE	122	B777-312
Korean Air	KE827	8:55	9:23	SHENZEN	26	A330-300
China Eastern Airlines	MU5088	9:05	9:26	BEIJING	127	A320-200
Korean Air	KE775	9:10	9:28	KOMATSU	12	B737-900
Cathay Pacific Airways	CX421	9:15	9:28	HONG KONG	121	A330-300
Korean Air	KE691	9:10	9:30	TAIPEI	24	A330-300
Korean Air	KE851	9:15	9:30	BEIJING	9	A330-200
Korean Air	KE819	9:25	9:32	CHANGSHA/Datuopu	16	B737-800
Asiana Airlines	OZ122	9:15	9:32	NAGOYA	34	B767-300
Asiana Airlines	OZ721	9:20	9:35	HONG KONG	40	B777-200ER
Korean Air	KE701	9:20	9:38	TOKYO/NARITA	6	B777-200ER
Air China	CA138	9:30	9:39	BEIJING	103	B737-800
Asiana Airlines	OZ128	9:00	9:40	TOYAMA	38	A321-100
Asiana Airlines	OZ164	9:30	9:44	YONAGO	28	A321-100
Korean Air	KE767	9:25	9:46	AOMORI	20	B737-800
Asiana Airlines	OZ371	9:40	9:48	SHENZEN	48	A320-200
Asiana Airlines	OZ303	9:40	9:50	CHANGCHUN	35	A320-200
Korean Air	KE785	9:30	9:50	KAGOSHIMA	7	A330-200
Japan Airlines	JL950	9:30	9:51	TOKYO/NARITA	112	B777-300
Asiana Airlines	OZ361	9:40	9:53	SHANGHAI/PUDONG	43	B747-400
Asiana Airlines	OZ162	9:40	9:54	HIROSHIMA	31	A321-100
Korean Air	KE845	9:40	9:56	QINGDAO	18	B737-800
Asiana Airlines	OZ132	9:30	9:56	FUKUOKA	37	B767-300
Asiana Airlines	OZ301	9:40	9:59	DALIAN	45	A320-200
Asiana Airlines	OZ166	9:50	10:00	TAKAMATSU	36	A321-100
Korean Air	KE723	9:45	10:02	OSAKA/KANSAI	23	A330-300
Asiana Airlines	OZ333	9:50	10:02	BEIJING	39	B767-300
Korean Air	KE837	10:00	10:06	YANTAI	8	B737-900
Asiana Airlines	OZ158	10:00	10:10	MIYAZAKI	42	A321-100
Air France	AF267	10:05	10:14	PARIS	110	B777-200ER
Asiana Airlines	OZ112	10:00	10:15	OSAKA/KANSAI	32	A330-300
Thai Airways International	TG659	10:05	10:16	BANGKOK	124	B777-200
Asiana Airlines	OZ102	10:00	10:18	TOKYO/NARITA	30	B747-400
Korean Air	KE035	10:05	10:20	ATLANTA	14	B747-400
Asiana Airlines	OZ152	10:10	10:22	SENDAI	33	B767-300
Korean Air	KE093	10:00	10:25	WASHINGTON	10	B777-200ER
Korean Air	KE765	10:10	10:27	SAPPORO	22	A330-300
Cathay Pacific Airways	CX417	10:15	10:28	HONG KONG	123	B777-200
Garuda Indonesia	GA871	10:35	10:31	DENPASAR	113	A330-300
Korean Air	KE703	10:20	10:31	TOKYO/NARITA	15	B777-300
Vietnam Airlines	VN937	10:15	10:33	HANOI	106	A321-231
Asiana Airlines	OZ317	10:30	10:37	QINGDAO	41	A320-200
Asiana Airlines	OZ711	10:30	10:39	TAIPEI	49	B767-300
Korean Air	KE805	10:35	10:45	TIANJIN	21	B777-200ER
Vietnam Airlines	VN939	10:35	10:51	HO CHI MINH	108	A330-300
Asiana Airlines	OZ363	10:50	11:01	SHANGHAI/PUDONG	40	B767-300
Asiana Airlines	OZ576	9:10	11:04	SAKHALINSK	47	A321-100
Asiana Airlines	OZ327	10:50	11:07	TIANJIN	48	A320-200
Northwest Airlines	NW008	11:00	11:09	SEATTLE	115	B757-700
Thai Airways International	TG629	10:50	11:11	BANGKOK	125	A330-300
Korean Air	KE081	11:00	11:17	NEWYORK	9	B747-400
Malaysia Airlines	MH067	11:00	11:22	KUALA LUMPUR	111	A330-200
Korean Air	KE613	11:20	11:30	HONG KONG	20	B737-800
Asiana Airlines	OZ104	11:30	11:39	TOKYO/NARITA	31	B767-300
Korean Air	KE001	11:20	11:42	LOS ANGELES	24	B777-200ER
Korean Air	KE037	11:40	11:48	CHICAGO	12	B777-200ER
Uzbekistan Airways	HY512	11:15	11:53	TASHKENT	117	B767-300ER
China Southern Airlines	CZ314	11:45	11:56	SHANGHAI/PUDONG	103	B737-800
Korean Air	KE897	11:45	11:58	SHANGHAI/PUDONG	26	A330-300
Asiana Airlines	OZ349	11:45	12:02	NANJING	46	A321-100

Korean Air	KE981	11:50	12:04	VLADIVOSTOK	16	B737-800
China Southern Airlines	CZ686	12:00	12:06	DALIAN	104	A321-200
China Eastern Airlines	MU550	12:00	12:09	YANTAI	127	A320-200
United Airlines	UA882	12:15	12:26	CHICAGO	123	B777-200
China Southern Airlines	CZ318	12:05	12:30	BEIJING	110	A321-200
Japan Airlines	JL962	12:25	12:35	OSAKA/KANSAI	114	B767-300ER
Air China	CA172	11:45	12:37	TIANJIN	102	B737-300
Japan Airlines	JL952	12:25	12:39	TOKYO/NARITA	115	B767-300ER
Asiana Airlines	OZ339	12:30	12:41	HARBIN	42	A321-100
China Eastern Airlines	MU2024	12:50	12:55	CHANGSHA/Datuopu	126	A320-200
Korean Air	KE757	12:55	13:01	NAGOYA	11	B737-900
Asiana Airlines	OZ541	12:45	13:05	FRANKFURT	43	B777-200ER
China Southern Airlines	CZ682	12:45	13:07	SHENYANG	105	A321-200
Korean Air	KE789	13:10	13:10	FUKUOKA	8	B777-200ER
China Eastern Airlines	MU5042	13:00	13:12	SHANGHAI/PUDONG	129	A321-200
Air China	CA140	13:05	13:14	HANGZHOU	106	A319-100
China Airlines	CI161	13:00	13:16	TAIPEI	121	A340-300
China Eastern Airlines	MU580	12:50	13:18	NANJING	128	A320-200
Aeroflot-Russian Int. Airlines	SU600	12:40	13:20	MOSCOW	109	Tupolev Tu-154M
Korean Air	KE841	13:10	13:22	QINGDAO	17	A330-300
Korean Air	KE869	13:00	13:24	DALIAN	15	B737-900
Asiana Airlines	OZ501	13:15	13:26	PARIS	40	B777-200ER
Air China	CA124	13:05	13:30	BEIJING	107	A330-200
China Southern Airlines	CZ338	13:20	13:32	GUANGZHOU	112	A321-200
Asiana Airlines	OZ335	13:20	13:39	BEIJING	45	A321-100
China Eastern Airlines	MU2034	13:35	13:41	QINGDAO	130	A320-200
All Nippon Airways	NH172	13:30	13:44	OSAKA/KANSAI	117	A320-200
Korean Air	KE907	13:10	13:49	LONDON	23	B747-400
China Southern Airlines	CZ688	13:20	13:51	CHANGCHUN	111	A321-200
Shanghai Airlines	FM828	13:40	13:53	SHANGHAI/PUDONG	118	B737-700
Korean Air	KE847	13:45	13:56	JINAN	9	B737-900
Korean Air	KE905	13:25	13:59	FRANKFURT	22	B747-400
Korean Air	KE901	13:45	14:06	PARIS	28	B747-400
Mongolian Airlines	OM302	13:55	14:12	ULAANBAATAR	103	B737-800
Asiana Airlines	OZ359	14:10	14:15	HANGZHOU	46	B767-300
Air China	CA128	14:00	14:18	QINGDAO	108	B737-800
Japan Airlines	JL954	14:00	14:18	TOKYO/NARITA	113	B767-300ER
Asiana Airlines	OZ114	14:10	14:22	OSAKA/KANSAI	41	A330-300
Korean Air	KE955	14:10	14:23	ISTANBUL	27	A330-300
Asiana Airlines	OZ307	14:20	14:29	YANTAI	42	A320-200
All Nippon Airways	NH908	14:30	14:40	TOKYO/NARITA	119	A320-200
China Southern Airlines	CZ6074	14:35	14:42	YANJI	104	A321-200
Asiana Airlines	OZ8591	14:40	14:45	JEJU	5	A320-200
KLM Royal Dutch Airlines	KL866	14:35	14:49	AMSTERDAM	110	B747-400M
Korean Air	KE725	14:25	14:50	OSAKA/KANSAI	26	A330-300
Asiana Airlines	OZ365	14:45	14:52	SHANGHAI/PUDONG	43	A321-100
Korean Air	KE839	14:50	15:00	WEIHAI	18	B737-900
Asiana Airlines	OZ176	15:00	15:10	MATSUYAMA	30	A321-100
United Airlines	UA892	15:05	15:14	SAN FRANCISCO	123	B777-200
Korean Air	KE017	15:00	15:19	LOS ANGELES	12	B747-400
Asiana Airlines	OZ367	15:15	15:19	SHANGHAI/PUDONG	35	A320-200
Cathay Pacific Airways	CX411	15:15	15:23	HONG KONG	121	A330-300
China Southern Airlines	CZ3066	15:10	15:27	CHANGSHA/Datuopu	109	A320-200
Asiana Airlines	OZ124	15:10	15:27	NAGOYA	34	B767-300
Lufthansa Airlines	LH713	14:45	15:34	FRANKFURT	122	A340-600
Shandong Airlines	SC4090	15:20	15:36	YANTAI	127	B737-300
Asiana Airlines	OZ134	15:30	15:41	FUKUOKA	31	A321-100
Korean Air	KE627	15:20	15:45	JAKARTA	15	A330-300
Korean Air	KE923	14:50	15:50	MOSCOW	10	B777-200ER
Asiana Airlines	OZ713	15:40	15:52	TAIPEI	42	A320-200
Korean Air	KE641	15:55	15:59	SINGAPORE	14	B777-300
Korean Air	KE953	15:50	16:04	CAIRO	24	A330-200
Asiana Airlines	OZ751	16:00	16:06	SINGAPORE	39	A330-300
Vladivostok Airlines	XF744	15:50	16:08	VLADIVOSTOK	114	A320-200
China Eastern Airlines	MU560	16:10	16:16	QINGDAO	117	A320-200
China Eastern Airlines	MU5034	16:20	16:34	SHANGHAI/PUDONG	118	A321-200
Shandong Airlines	SC4082	16:30	16:37	QINGDAO	128	B737-300
Asiana Airlines	OZ202	16:30	16:40	LOS ANGELES	41	B747-400
Korean Air	KE927	16:40	16:44	Fiumicino Airport (Leonardo Da Vinci Internaitonal	21	B777-200ER
Korean Air	KE671	16:50	17:00	KUALA LUMPUR	10	A330-300
Asiana Airlines	OZ214	16:45	17:02	SAN FRANCISCO	47	B777-200ER
Korean Air	KE023	16:50	17:04	SAN FRANCISCO	23	B777-200ER
Asiana Airlines	OZ106	17:10	17:20	TOKYO/NARITA	36	A321-100
Korean Air	KE629	17:15	17:23	DENPASAR	26	A330-300
Korean Air	KE941	17:15	17:29	TASHKENT	19	A330-300
Air China	CA136	17:25	17:32	DALIAN	103	B737-800
Korean Air	KE651	17:20	17:34	BANGKOK	12	B777-200ER
Thai Airways International	TG635	17:30	17:37	BANGKOK	122	B777-300
Asiana Airlines	OZ573	17:20	17:43	TASHKENT	48	A330-300
Korean Air	KE687	17:55	17:58	SIEMREAP	11	B737-800
Singapore Airlines	SQ016	17:40	18:00	SAN FRANCISCO	121	B777-312
Korean Air	KE763	17:55	18:02	NIIGATA	20	B737-900
Japan Airlines	JL984	18:00	18:08	NAGOYA	112	B767-300ER
Japan Airlines	JL964	18:00	18:10	OSAKA/KANSAI	113	B767-300ER
Asiana Airlines	OZ577	18:10	18:14	ALMATY	43	B767-300
Air China	CA126	18:10	18:20	BEIJING	102	A321-200
Asiana Airlines	OZ741	18:20	18:30	BANGKOK	49	B767-300
Korean Air	KE781	18:25	18:33	FUKUOKA	14	B777-200ER
Singapore Airlines	SQ017	17:55	18:38	SINGAPORE	124	B777-212ER
Korean Air	KE747	18:25	18:41	OKAYAMA	16	B737-900
Asiana Airlines	OZ757	18:35	18:43	KOTA KINABALU	35	A321-100
Korean Air	KE673	18:40	18:49	KOTA KINABALU	18	B737-800
Korean Air	KE705	18:40	18:51	TOKYO/NARITA	9	B777-300
China Southern Airlines	CZ370	18:45	18:58	SHANGHAI/PUDONG	110	B737-800
All Nippon Airways	NH942	18:55	19:00	NAGOYA	117	A320-200
Korean Air	KE071	18:40	19:02	VANCOUVER	6	B777-200ER
Korean Air	KE751	18:50	19:05	NAGOYA	27	B747-400
Asiana Airlines	OZ108	18:50	19:09	TOKYO/NARITA	45	A330-300
China Southern Airlines	CZ684	18:50	19:10	HARBIN	106	A320-200

Korean Air	KE689	18:50	19:12	PHNOM PENH	32	B737-800
Asiana Airlines	OZ120	19:10	19:17	SAIPAN	34	A321-100
Korean Air	KE729	19:05	19:19	GUAM	15	A330-300
Asiana Airlines	OZ737	19:15	19:24	SIEMREAP	38	A321-100
Korean Air	KE129	19:05	19:27	AUCKLAND	19	B747-400
Eva Air	BR159	19:20	19:32	TAIPEI	125	A330-200
Korean Air	KE681	18:45	19:35	HO CHI MINH	23	A330-300
Asiana Airlines	OZ739	19:15	19:38	PHNOM PENH	46	A320-200
Korean Air	KE1411	19:20	19:39	DAEGU	1	B737-900
Asiana Airlines	OZ325	19:30	19:41	GUILIN	36	A321-100
Korean Air	KE121	19:10	19:42	SYDNEY	22	B747-400
Korean Air	KE679	19:25	19:43	HANOI	30	A330-300
Korean Air	KE085	19:30	19:44	NEWYORK	8	B747-400
Korean Air	KE853	18:55	19:45	BEIJING	24	B777-200ER
Asiana Airlines	OZ733	19:35	19:47	HANOI	40	B767-300
China Southern Airlines	CZ672	19:40	19:48	SHENYANG	108	A319-100
Korean Air	KE011	19:30	19:50	LOS ANGELES	10	B747-400
Cathay Pacific Airways	CX419	19:45	19:51	HONG KONG	121	B777-300
Air China	CA148	19:40	19:54	WEIHAI	103	B737-300
Asiana Airlines	OZ723	19:45	19:56	HONG KONG	49	B747-400
Korean Air	KE885	19:30	19:58	KUNMING	26	A330-200
Korean Air	KE895	19:05	20:00	SHANGHAI/PUDONG	12	B777-200ER
Air Canada	AC064	18:45	20:04	VANCOUVER	119	B767-300ER
Singapore Airlines	SQ015	19:25	20:05	SINGAPORE	123	B777-312
Asiana Airlines	OZ601	19:50	20:06	SYDNEY	39	B777-200ER
Asiana Airlines	OZ703	19:45	20:07	MANILA	37	B767-300
Korean Air	KE607	20:00	20:13	HONG KONG	28	B747-400
Asiana Airlines	OZ204	20:00	20:15	LOS ANGELES	47	B777-200ER
Korean Air	KE623	20:00	20:16	MANILA	21	A330-300
Asiana Airlines	OZ8533	19:40	20:17	BUSAN	3	A320-200
Asiana Airlines	OZ743	20:10	20:19	BANGKOK	50	B767-300
Asiana Airlines	OZ709	20:20	20:21	CEBU	42	A320-200
Korean Air	KE1405	20:05	20:22	BUSAN	2	B737-900
Asiana Airlines	OZ731	20:10	20:25	HO CHI MINH	48	A330-300
Korean Air	KE653	20:10	20:28	BANGKOK	14	B777-300
Asiana Airlines	OZ603	20:10	20:28	SAIPAN	45	A321-100
Shandong Airlines	SC4096	20:20	20:30	JINAN	127	B737-300
Philippine Airlines	PR469	20:20	20:32	MANILA	122	A330-300
Asiana Airlines	OZ7033	20:30	20:35	MANILA	41	A321-100
China Xiamen Airlines	MF872	20:30	20:39	XIAMEN	128	B737-700
Korean Air	KE051	20:00	20:40	HONOLULU	7	B777-200ER
Asiana Airlines	OZ222	20:00	20:44	NEWYORK	43	B747-400
Korean Air	KE655	20:40	20:47	MUMBAI	15	A330-300
Asiana Airlines	OZ747	20:45	20:53	PHUKET	34	B767-300
Asiana Airlines	OZ707	20:45	20:55	CLARK FIELD	32	A321-100
Qatar Airways	QR821	21:00	21:04	DOHA	113	A330-200
Korean Air	KE631	21:00	21:08	CEBU	11	B737-900
Thai Airways International	TG657	21:15	21:26	BANGKOK	124	A330-300
Korean Air	KE111	21:30	21:37	GUAM	12	B777-200ER
Korean Air	KE061	21:30	21:42	SAO PAULO	10	B777-200ER
China Southern Airlines	CZ676	21:45	21:45	DALIAN	106	A319-100
Korean Air	KE005	21:40	21:51	LAS VEGAS	27	B777-200ER
Cebu Pacific Air	5J195	21:35	22:00	MANILA	117	A320-200
Cebu Pacific Air	5J129	22:05	22:20	CEBU	119	A320-200
Turkish Airlines	TK091	23:55	23:53	ISTANBUL	107	A330-200

Date: 28th February 2009

Airline	Flight	EDT	RDT	Destination	Gate	Aircraft
Emirates	EK323Y	0:25	0:18	DUBAI	111	B777-300ER
Korean Air	KE9707	1:55	1:55	TOKYO/HANEDA	20	#N/A
Lufthansa Airlines	LH716	7:45	7:49	SHENYANG	126	A340-300
Korean Air	KE787	8:00	8:13	FUKUOKA	12	A330-300
Philippine Airlines	PR467	8:30	8:30	MANILA	117	A320-200
Korean Air	KE621	8:25	8:36	MANILA	15	B777-300
Korean Air	KE831	8:20	8:37	SHENYANG	23	A330-300
Asiana Airlines	OZ8531	8:30	8:38	BUSAN	2	A320-200
Korean Air	KE603	8:30	8:47	HONG KONG	28	B747-400
Air China	CA134	8:45	8:52	QINGDAO	102	B737-300
Cathay Pacific Airways	CX415	8:50	8:54	HONG KONG	121	A330-300
Korean Air	KE893	8:45	8:57	SHANGHAI/PUDONG	10	B777-200ER
Korean Air	KE793	8:50	9:00	NAGASAKI	17	B737-900
Asiana Airlines	OZ701	8:50	9:00	MANILA	46	A330-300
Asiana Airlines	OZ7073	9:00	9:03	CLARK FIELD	42	A321-100
Asiana Airlines	OZ154	9:00	9:06	ASAHIKAWA	32	A320-200
Asiana Airlines	OZ369	8:50	9:08	GUANGZHOU	31	A330-300
Korean Air	KE1401	9:00	9:09	BUSAN	1	B737-900
Asiana Airlines	OZ605	9:00	9:11	SAIPAN	37	A321-100
Asiana Airlines	OZ309	9:00	9:11	WEIHAI	50	A321-100
China Eastern Airlines	MU5052	9:05	9:13	SHANGHAI/PUDONG	129	A321-200
Singapore Airlines	SQ603	9:00	9:17	SINGAPORE	122	B777-312
China Eastern Airlines	MU5088	9:05	9:20	BEIJING	130	A320-200
Asiana Airlines	OZ156	9:10	9:20	FUKUSHIMA	33	A320-200
Korean Air	KE691	9:10	9:23	TAIPEI	24	A330-300
Cathay Pacific Airways	CX421	9:15	9:25	HONG KONG	123	A330-300
Asiana Airlines	OZ172	9:20	9:28	OKINAWA	41	A321-100
Asiana Airlines	OZ122	9:15	9:30	NAGOYA	30	B767-300
Korean Air	KE865	9:15	9:31	GUANGZHOU	21	A330-300
Asiana Airlines	OZ142	9:30	9:33	KUMAMOTO	36	A320-200
Korean Air	KE851	9:15	9:33	BEIJING	7	A330-200
Asiana Airlines	OZ735	9:20	9:36	HO CHI MINH	43	A321-100
Korean Air	KE701	9:20	9:38	TOKYO/NARITA	14	B777-300
Asiana Airlines	OZ721	9:20	9:38	HONG KONG	39	A330-300
Air China	CA138	9:30	9:40	BEIJING	103	B737-800
Asiana Airlines	OZ132	9:30	9:40	FUKUOKA	34	B767-300
Japan Airlines	JL950	9:30	9:43	TOKYO/NARITA	112	B747-400

Korean Air	KE845	9:40	9:50	QINGDAO	11	B737-800
Asiana Airlines	OZ162	9:40	9:51	HIROSHIMA	35	B767-300
Asiana Airlines	OZ301	9:40	9:52	DALIAN	38	A320-200
Korean Air	KE769	9:45	9:55	AKITA	16	B737-800
Asiana Airlines	OZ361	9:40	9:55	SHANGHAI/PUDONG	49	B747-400
Korean Air	KE723	9:45	9:58	OSAKA/KANSAI	27	A330-300
Asiana Airlines	OZ303	9:40	9:58	CHANGCHUN	47	A321-100
Asiana Airlines	OZ333	9:50	10:01	BEIJING	40	B747-400
Korean Air	KE981	10:00	10:03	VLADIVOSTOK	17	B737-800
Korean Air	KE031	9:50	10:05	DALLAS	23	B777-200ER
Asiana Airlines	OZ112	10:00	10:12	OSAKA/KANSAI	45	A330-300
Asiana Airlines	OZ102	10:00	10:14	TOKYO/NARITA	31	B777-200ER
Asiana Airlines	OZ3475	10:00	10:15	MUDANJIANG	46	A320-200
Korean Air	KE887	10:00	10:17	XIAMEN	20	B737-800
Korean Air	KE765	10:10	10:18	SAPPORO	26	A330-300
Korean Air	KE809	10:00	10:19	ZHENGZHOU	25	B737-900
Korean Air	KE093	10:00	10:21	WASHINGTON	15	B777-200ER
Air France	AF267	10:05	10:22	PARIS	110	B777-200ER
Thai Airways International	TG659	10:05	10:24	BANGKOK	124	B777-200
Cathay Pacific Airways	CX417	10:15	10:26	HONG KONG	121	A330-300
Asiana Airlines	OZ152	10:10	10:26	SENDAI	28	B767-300
Korean Air	KE825	10:00	10:28	YANJI	22	B737-900
Korean Air	KE703	10:20	10:30	TOKYO/NARITA	12	B777-300
Vietnam Airlines	VN937	10:15	10:32	HANOI	108	A330-200
Asiana Airlines	OZ317	10:30	10:41	QINGDAO	42	A320-200
Asiana Airlines	OZ711	10:30	10:43	TAIPEI	37	B767-300
Korean Air	KE035	10:05	10:45	ATLANTA	10	B747-400
Asiana Airlines	OZ327	10:50	10:47	TIANJIN	43	A321-100
Vietnam Airlines	VN939	10:35	10:49	HO CHI MINH	106	A330-300
Korean Air	KE933	10:30	10:53	ZURICH	8	A330-300
Korean Air	KE805	10:35	10:59	TIANJIN	24	B747-400
Thai Airways International	TG629	10:50	11:01	BANGKOK	125	A330-300
Northwest Airlines	NW008	11:00	11:05	SEATTLE	115	B757-700
Asiana Airlines	OZ363	10:50	11:08	SHANGHAI/PUDONG	48	B767-300
Malaysia Airlines	MH065	11:00	11:10	KUALA LUMPUR	111	A330-200
FINNAIR	AY042	11:10	11:18	HELSINKI	126	#N/A
Korean Air	KE081	11:00	11:23	NEWYORK	21	B747-400
Korean Air	KE001	11:20	11:29	LOS ANGELES	7	B777-200ER
Korean Air	KE613	11:20	11:36	HONG KONG	18	B737-800
Asiana Airlines	OZ104	11:30	11:44	TOKYO/NARITA	47	B777-200ER
China Southern Airlines	CZ314	11:45	11:46	SHANGHAI/PUDONG	102	B737-800
Korean Air	KE037	11:40	11:49	CHICAGO	6	B777-200ER
Korean Air	KE897	11:45	11:52	SHANGHAI/PUDONG	9	B737-800
Air China	CA172	11:45	12:04	TIANJIN	103	B737-300
China Southern Airlines	CZ686	12:00	12:09	DALIAN	104	ATR 72-500
China Eastern Airlines	MU550	12:00	12:16	YANTAI	129	A320-200
China Southern Airlines	CZ318	12:05	12:19	BEIJING	105	A321-200
United Airlines	UA882	12:15	12:21	CHICAGO	123	B777-200
Asiana Airlines	OZ572	12:10	12:25	KHABAROVSK	31	A321-100
Japan Airlines	JL962	12:25	12:38	OSAKA/KANSAI	112	B767-300ER
Japan Airlines	JL952	12:25	12:41	TOKYO/NARITA	114	B767-300ER
Asiana Airlines	OZ339	12:30	12:43	HARBIN	30	B767-300
China Eastern Airlines	MU2024	12:50	12:54	CHANGSHA/Datuopu	127	A320-200
China Southern Airlines	CZ682	12:45	12:58	SHENYANG	106	A321-200
China Eastern Airlines	MU580	12:50	12:59	NANJING	128	A320-200
Korean Air	KE757	12:55	13:06	NAGOYA	11	B737-900
Asiana Airlines	OZ541	12:45	13:09	FRANKFURT	40	B777-200ER
China Airlines	CI161	13:00	13:12	TAIPEI	121	A340-300
Air China	CA140	13:05	13:16	HANGZHOU	109	A319-100
China Eastern Airlines	MU5042	13:00	13:18	SHANGHAI/PUDONG	125	A321-200
Korean Air	KE841	13:10	13:21	QINGDAO	26	A330-300
Air China	CA124	13:05	13:23	BEIJING	107	A330-200
SAT Airlines	HZ112	12:45	13:25	SAKHALINSK	130	B737-200
Korean Air	KE869	13:00	13:26	DALIAN	17	B737-900
Korean Air	KE789	13:10	13:27	FUKUOKA	19	B777-200ER
Korean Air	KE951	13:00	13:28	DUBAI	12	B777-200ER
China Southern Airlines	CZ338	13:20	13:33	GUANGZHOU	111	A321-200
All Nippon Airways	NH172	13:30	13:36	OSAKA/KANSAI	117	A320-200
Korean Air	KE907	13:10	13:40	LONDON	15	B747-400
China Southern Airlines	CZ688	13:20	13:42	CHANGCHUN	115	A321-200
Asiana Airlines	OZ335	13:20	13:45	BEIJING	41	A330-300
Asiana Airlines	OZ359	13:35	13:48	HANGZHOU	46	A321-100
Korean Air	KE867	13:20	13:51	ULAANBAATAR	23	A330-200
Asiana Airlines	OZ521	13:35	13:57	LONDON	43	B777-200ER
Air China	CA144	13:40	13:59	YANJI	108	B737-800
China Eastern Airlines	MU2034	13:35	14:01	QINGDAO	126	A320-200
Korean Air	KE905	13:25	14:03	FRANKFURT	27	B747-400
Air China	CA128	14:00	14:06	QINGDAO	102	B737-800
Korean Air	KE901	13:45	14:09	PARIS	28	B747-400
Mongolian Airlines	OM302	13:55	14:15	ULAANBAATAR	103	B737-800
Asiana Airlines	OZ114	14:10	14:16	OSAKA/KANSAI	32	B767-300
Japan Airlines	JL954	14:00	14:18	TOKYO/NARITA	113	B777-200
Asiana Airlines	OZ365	14:10	14:20	SHANGHAI/PUDONG	42	A321-100
Lufthansa Airlines	LH717	13:55	14:22	MUNICH	124	A340-300
Asiana Airlines	OZ307	14:20	14:25	YANTAI	34	A320-200
Korean Air	KE935	14:20	14:38	PRAGUE	22	A330-300
Korean Air	KE725	14:25	14:44	OSAKA/KANSAI	24	A330-300
KLM Royal Dutch Airlines	KL866	14:35	14:48	AMSTERDAM	110	B747-400M
Korean Air	KE839	14:50	14:58	WEIHAI	16	B737-800
Lufthansa Airlines	LH713	14:45	15:00	FRANKFURT	122	A340-600
Asiana Airlines	OZ124	15:00	15:07	NAGOYA	31	B767-300
United Airlines	UA892	15:05	15:15	SAN FRANCISCO	123	B777-200
Asiana Airlines	OZ367	15:15	15:15	SHANGHAI/PUDONG	36	A320-200
Korean Air	KE017	15:00	15:18	LOS ANGELES	10	B747-400
Asiana Airlines	OZ134	15:10	15:21	FUKUOKA	30	B767-300
Cathay Pacific Airways	CX411	15:15	15:25	HONG KONG	121	A330-300
Korean Air	KE627	15:20	15:35	JAKARTA	21	A330-300
Asiana Airlines	OZ337	15:40	15:48	BEIJING	38	A320-200
Korean Air	KE693	16:00	16:08	TAIPEI	20	B737-900
Korean Air	KE641	15:55	16:10	SINGAPORE	14	B777-300

Asiana Airlines	OZ751	16:00	16:15	SINGAPORE	41	A330-300
China Eastern Airlines	MU560	16:10	16:19	QINGDAO	118	A320-200
China Eastern Airlines	MU5034	16:20	16:30	SHANGHAI/PUDONG	117	A321-200
Shandong Airlines	SC4082	16:30	16:38	QINGDAO	127	B737-300
All Nippon Airways	NH908	14:30	16:41	TOKYO/NARITA	119	A320-200
Asiana Airlines	OZ202	16:30	16:45	LOS ANGELES	40	B747-400 Combi
Korean Air	KE671	16:50	17:04	KUALA LUMPUR	22	A330-300
Korean Air	KE023	16:50	17:08	SAN FRANCISCO	9	B777-200ER
Korean Air	KE651	17:20	17:37	BANGKOK	14	B777-200ER
Air China	CA136	17:25	17:39	DALIAN	108	B737-800
Asiana Airlines	OZ106	17:10	17:41	TOKYO/NARITA	42	A321-100
Thai Airways International	TG635	17:30	17:45	BANGKOK	121	B777-300
Singapore Airlines	SQ016	17:40	17:51	SAN FRANCISCO	122	#N/A
Korean Air	KE763	17:55	18:01	NIIGATA	34	B737-900
Korean Air	KE687	17:55	18:06	SIEMREAP	31	B737-800
Delta Air Lines	DL092	18:05	18:09	ATLANTA	112	B777-200ER
Japan Airlines	JL984	18:00	18:11	NAGOYA	113	B767-300ER
Air China	CA126	18:10	18:14	BEIJING	103	A321-200
Asiana Airlines	OZ272	18:00	18:17	SEATTLE	45	B777-200ER
Japan Airlines	JL964	18:00	18:25	OSAKA/KANSAI	115	B767-300ER
Singapore Airlines	SQ018	18:15	18:29	VANCOUVER	125	B777-212ER
Korean Air	KE125	18:15	18:31	MELBOURNE	26	A330-200
Asiana Airlines	OZ741	18:20	18:35	BANGKOK	41	A330-300
Korean Air	KE747	18:25	18:40	OKAYAMA	32	B737-900
Korean Air	KE019	18:20	18:43	SEATTLE	6	B777-200ER
Korean Air	KE781	18:25	18:45	FUKUOKA	19	B777-200ER
Korean Air	KE673	18:40	18:48	KOTA KINABALU	16	B737-800
Asiana Airlines	OZ757	18:35	18:50	KOTA KINABALU	37	A321-100
Korean Air	KE705	18:40	18:54	TOKYO/NARITA	23	B747-400
Korean Air	KE689	18:50	18:57	PHNOM PENH	18	B737-800
Asiana Airlines	OZ108	18:50	18:58	TOKYO/NARITA	47	A321-100
All Nippon Airways	NH942	18:55	19:03	NAGOYA	117	A320-200
Korean Air	KE681	18:45	19:05	HO CHI MINH	28	A330-300
Korean Air	KE751	18:50	19:06	NAGOYA	7	B747-400
China Southern Airlines	CZ370	18:45	19:07	SHANGHAI/PUDONG	110	B737-800
Korean Air	KE853	18:55	19:09	BEIJING	10	B777-200ER
Air Canada	AC064	18:45	19:10	VANCOUVER	119	B767-300ER
Asiana Airlines	OZ737	19:15	19:15	SIEMREAP	36	A321-100
Korean Air	KE895	19:05	19:17	SHANGHAI/PUDONG	11	B737-800
Korean Air	KE721	19:05	19:17	OSAKA/KANSAI	27	B777-300
Asiana Airlines	OZ116	19:10	19:22	OSAKA/KANSAI	49	B767-300
Eva Air	BR159	19:20	19:23	TAIPEI	123	A330-200
Korean Air	KE129	19:05	19:26	AUCKLAND	15	B747-400
Asiana Airlines	OZ739	19:15	19:26	PHNOM PENH	38	A320-200
Korean Air	KE121	19:10	19:28	SYDNEY	22	B747-400
Korean Air	KE1411	19:20	19:31	DAEGU	1	B737-900
Asiana Airlines	OZ236	19:15	19:33	CHICAGO	43	B777-200ER
Korean Air	KE679	19:25	19:37	HANOI	12	A330-300
Korean Air	KE085	19:30	19:39	NEWYORK	8	B747-400
Asiana Airlines	OZ733	19:35	19:42	HANOI	34	B767-300
Singapore Airlines	SQ015	19:25	19:44	SINGAPORE	124	B777-312ER
Asiana Airlines	OZ8533	19:30	19:44	BUSAN	2	A320-200
China Southern Airlines	CZ672	19:40	19:45	SHENYANG	108	MD-90-30
Asiana Airlines	OZ767	19:40	19:48	DELHI	48	A330-300
Korean Air	KE123	19:35	19:51	BRISBANE	26	A330-300
Cathay Pacific Airways	CX419	19:45	19:53	HONG KONG	122	A330-300
Asiana Airlines	OZ723	19:45	19:55	HONG KONG	50	A330-300
Korean Air	KE011	19:30	19:56	LOS ANGELES	21	B747-400
Asiana Airlines	OZ601	19:50	20:06	SYDNEY	40	B777-200ER
Korean Air	KE623	20:00	20:10	MANILA	9	A330-300
Korean Air	KE1405	20:05	20:11	BUSAN	3	B737-800
Asiana Airlines	OZ323	20:00	20:12	CHENGDU	37	A320-200
Korean Air	KE051	20:00	20:16	HONOLULU	17	B777-200ER
Korean Air	KE607	20:00	20:16	HONG KONG	19	B777-300
Asiana Airlines	OZ703	19:55	20:18	MANILA	45	A321-100
Asiana Airlines	OZ204	20:00	20:18	LOS ANGELES	46	B777-200ER
Mandarin Airlines	AE961	20:05	20:20	KAOHSIUNG	105	Embraer E-190
Asiana Airlines	OZ603	20:10	20:20	SAIPAN	47	B767-300
Asiana Airlines	OZ743	20:10	20:22	BANGKOK	30	B767-300
Korean Air	KE629	20:05	20:25	DENPASAR	6	A330-300
Asiana Airlines	OZ731	20:10	20:28	HO CHI MINH	31	B747-400
JEJUAIR	7C2643	20:30	20:31	SUBIC BAY	35	#N/A
Asiana Airlines	OZ747	20:15	20:33	PHUKET	41	B767-300
Asiana Airlines	OZ709	20:20	20:37	CEBU	32	A320-200
Korean Air	KE653	20:10	20:39	BANGKOK	14	B777-300
Philippine Airlines	PR469	20:20	20:42	MANILA	121	A330-300
Korean Air	KE667	20:40	20:44	CHIANG MAI	10	A330-200
Asiana Airlines	OZ707	20:45	20:46	CLARK FIELD	42	A321-100
Qatar Airways	QR821	21:00	20:57	DOHA	113	A330-200
Korean Air	KE631	21:00	21:03	CEBU	20	B737-900
China Southern Airlines	CZ684	21:05	21:09	HARBIN	114	MD-90-30
Thai Airways International	TG657	21:15	21:25	BANGKOK	125	A330-300
Korean Air	KE111	21:30	21:36	GUAM	24	B777-200ER
China Southern Airlines	CZ676	21:45	21:41	DALIAN	110	A321-200
Cebu Pacific Air	5J195	21:35	21:48	MANILA	117	A320-200
Cebu Pacific Air	5J129	22:05	22:28	CEBU	119	A320-200
Philippine Airlines	PR489	21:50	22:31	CEBU	122	A320-200

Date: 1st March 2009

Airline	Flight	EDT	RDT	Destination	Gate	Aircraft
Emirates	EK323Y	0:05	0:01	DUBAI	111	B777-300ER
Lufthansa Airlines	LH718	7:35	7:37	BUSAN	126	A340-300
Air Macau	NX825	8:00	8:09	MACAU	118	A321-100
Japan Airlines	JL956	8:00	8:13	TOKYO/NARITA	109	B767-300ER
Korean Air	KE787	8:00	8:15	FUKUOKA	21	A330-300

Korean Air	KE831	8:20	8:31	SHENYANG	23	A330-300
Philippine Airlines	PR467	8:30	8:33	MANILA	119	A320-200
Korean Air	KE621	8:25	8:40	MANILA	14	B777-300
China Eastern Airlines	MU2044	8:30	8:41	QINGDAO	131	A320-200
Asiana Airlines	OZ8531	8:30	8:43	BUSAN	3	A320-200
Korean Air	KE603	8:30	8:45	HONG KONG	27	B747-400
Asiana Airlines	OZ331	8:40	8:47	BEIJING	41	A321-100
Korean Air	KE893	8:45	8:49	SHANGHAI/PUDONG	10	B777-300
Air China	CA134	8:45	8:51	QINGDAO	102	B737-300
Korean Air	KE925	8:40	8:54	Madrid Barajas Airport	19	B777-200ER
Asiana Airlines	OZ369	8:50	8:58	GUANGZHOU	50	A330-300
Cathay Pacific Airways	CX415	8:50	9:04	HONG KONG	121	A330-300
Asiana Airlines	OZ701	8:50	9:06	MANILA	45	B747-400
Asiana Airlines	OZ128	9:00	9:08	TOYAMA	30	A320-200
China Eastern Airlines	MU5088	9:05	9:10	BEIJING	129	A320-200
Asiana Airlines	OZ605	9:00	9:10	SAIPAN	47	A321-100
China Eastern Airlines	MU5052	9:05	9:12	SHANGHAI/PUDONG	128	A321-200
Korean Air	KE1401	9:00	9:13	BUSAN	2	B737-900
Singapore Airlines	SQ603	9:00	9:18	SINGAPORE	124	B777-312
Korean Air	KE691	9:10	9:20	TAIPEI	28	A330-300
Korean Air	KE775	9:10	9:21	KOMATSU	22	B737-900
Korean Air	KE865	9:15	9:23	GUANGZHOU	9	A330-300
Asiana Airlines	OZ122	9:15	9:24	NAGOYA	36	B767-300
Asiana Airlines	OZ721	9:20	9:30	HONG KONG	48	B747-400
Korean Air	KE767	9:25	9:32	AOMORI	16	B737-800
Asiana Airlines	OZ735	9:20	9:32	HO CHI MINH	35	A320-200
Korean Air	KE819	9:25	9:35	CHANGSHA/Datuopu	20	B737-800
Korean Air	KE851	9:15	9:37	BEIJING	7	B737-900
Air China	CA138	9:30	9:40	BEIJING	103	B737-800
Korean Air	KE701	9:20	9:41	TOKYO/NARITA	17	B747-400
Asiana Airlines	OZ132	9:30	9:44	FUKUOKA	31	B767-300
Asiana Airlines	OZ303	9:40	9:44	CHANGCHUN	42	A321-100
Japan Airlines	JL950	9:30	9:47	TOKYO/NARITA	112	B777-300
Asiana Airlines	OZ361	9:40	9:51	SHANGHAI/PUDONG	40	B747-400
Korean Air	KE773	9:45	9:53	HAKODATE	23	B737-900
Asiana Airlines	OZ351	9:40	9:53	YANJI	37	A321-100
Korean Air	KE845	9:40	9:55	QINGDAO	8	B737-800
Korean Air	KE723	9:45	9:56	OSAKA/KANSAI	21	A330-300
Asiana Airlines	OZ301	9:40	9:58	DALIAN	38	A320-200
Asiana Airlines	OZ166	9:50	10:00	TAKAMATSU	34	A320-200
Asiana Airlines	OZ333	9:50	10:01	BEIJING	46	A330-300
Korean Air	KE093	10:00	10:08	WASHINGTON	14	B777-200ER
Korean Air	KE837	10:00	10:08	YANTAI	18	B737-800
Asiana Airlines	OZ102	10:00	10:11	TOKYO/NARITA	39	A330-300
Asiana Airlines	OZ112	10:00	10:12	OSAKA/KANSAI	32	A330-300
Thai Airways International	TG659	10:05	10:17	BANGKOK	122	B777-200
Korean Air	KE9823	10:05	10:19	MUDANJIANG	11	#N/A
Asiana Airlines	OZ152	10:10	10:20	SENDAI	33	B767-300
Cathay Pacific Airways	CX417	10:15	10:21	HONG KONG	121	B777-200
Korean Air	KE765	10:10	10:25	SAPPORO	15	A330-300
Air France	AF267	10:05	10:26	PARIS	110	B777-300ER
Korean Air	KE035	10:05	10:27	ATLANTA	27	B747-400
Korean Air	KE703	10:20	10:31	TOKYO/NARITA	12	B777-300
Aircalin	SB701	10:30	10:34	NOUMEA	111	A330-200
Asiana Airlines	OZ711	10:30	10:35	TAIPEI	49	B767-300
Asiana Airlines	OZ8551	10:30	10:38	JEJU	3	A320-200
Garuda Indonesia	GA871	10:35	10:44	DENPASAR	113	A330-300
Korean Air	KE805	10:35	10:46	TIANJIN	24	B777-200ER
Vietnam Airlines	VN937	10:15	10:48	HANOI	106	A321-231
Asiana Airlines	OZ363	10:50	10:56	SHANGHAI/PUDONG	43	A321-100
Vietnam Airlines	VN939	10:35	10:58	HO CHI MINH	108	A330-300
Asiana Airlines	OZ327	10:50	11:01	TIANJIN	47	A321-100
Thai Airways International	TG629	10:50	11:11	BANGKOK	125	A330-300
Northwest Airlines	NW008	11:00	11:13	SEATTLE	115	B757-700
Malaysia Airlines	MH067	11:00	11:16	KUALA LUMPUR	107	A330-200
Korean Air	KE081	11:00	11:20	NEWYORK	28	B747-400
Orient Thai Airlines	OX301	11:25	11:25	BANGKOK		B747-300
Korean Air	KE001	11:20	11:31	LOS ANGELES	7	B777-200ER
Korean Air	KE613	11:20	11:33	HONG KONG	16	B737-800
Asiana Airlines	OZ104	11:30	11:39	TOKYO/NARITA	31	B777-200ER
China Southern Airlines	CZ314	11:45	11:46	SHANGHAI/PUDONG	102	B737-800
Korean Air	KE037	11:40	11:48	CHICAGO	19	B777-200ER
Korean Air	KE897	11:45	11:51	SHANGHAI/PUDONG	8	A330-300
Asiana Airlines	OZ349	11:45	11:54	NANJING	41	A320-200
Cathay Pacific Airways	CX421	9:15	11:57	HONG KONG	123	B777-300
Air China	CA172	11:45	12:00	TIANJIN	103	B737-300
China Eastern Airlines	MU550	12:00	12:04	YANTAI	118	A320-200
China Southern Airlines	CZ686	12:00	12:08	DALIAN	104	A321-200
China Southern Airlines	CZ318	12:05	12:18	BEIJING	110	A321-200
United Airlines	UA882	12:15	12:21	CHICAGO	122	B777-200
Asiana Airlines	OZ164	12:30	12:34	YONAGO	32	A321-100
Asiana Airlines	OZ339	12:30	12:38	HARBIN	42	A321-100
Japan Airlines	JL962	12:25	12:40	OSAKA/KANSAI	112	B767-300ER
Japan Airlines	JL952	12:25	12:46	TOKYO/NARITA	114	B767-300ER
China Eastern Airlines	MU580	12:50	12:58	NANJING	129	A320-200
SAT Airlines	HZ112	12:45	13:04	SAKHALINSK	131	B737-200
Korean Air	KE757	12:55	13:07	NAGOYA	15	B737-900
China Eastern Airlines	MU5042	13:00	13:09	SHANGHAI/PUDONG	128	A321-200
Korean Air	KE785	13:00	13:12	KAGOSHIMA	22	A330-200
Asiana Airlines	OZ541	12:45	13:12	FRANKFURT	40	B777-200ER
China Southern Airlines	CZ682	12:45	13:14	SHENYANG	105	A321-200
China Airlines	CI161	13:00	13:16	TAIPEI	121	A340-300
Air China	CA140	13:05	13:18	HANGZHOU	108	A319-100
Aeroflot-Russian Int. Airlines	SU600	12:40	13:20	MOSCOW	9	Tupolev Tu-154M
Korean Air	KE869	13:00	13:23	DALIAN	18	B737-900
China Eastern Airlines	MU2016	12:50	13:25	GUILIN	127	A320-200
Air China	CA124	13:05	13:26	BEIJING	111	A330-200
Korean Air	KE789	13:10	13:27	FUKUOKA	11	B777-200ER
Korean Air	KE841	13:10	13:29	QINGDAO	21	A330-300
China Southern Airlines	CZ688	13:20	13:32	CHANGCHUN	107	A321-200

China Southern Airlines	CZ338	13:20	13:36	GUANGZHOU	109	A321-200
Asiana Airlines	OZ359	13:35	13:40	HANGZHOU	35	A321-100
All Nippon Airways	NH172	13:30	13:41	OSAKA/KANSAI	117	A320-200
China Eastern Airlines	MU2034	13:35	13:42	QINGDAO	123	A320-200
Korean Air	KE907	13:10	13:45	LONDON	27	B747-400
Shanghai Airlines	FM828	13:40	13:47	SHANGHAI/PUDONG	125	B737-700
Lufthansa Airlines	LH719	13:15	13:50	MUNICH	126	A340-300
Asiana Airlines	OZ821T	13:40	13:51	SEOUL/ SUNGNAM	5	#N/A
Korean Air	KE905	13:25	13:55	FRANKFURT	12	B747-400
Asiana Airlines	OZ521	13:35	14:00	LONDON	39	B777-200ER
Asiana Airlines	OZ335	13:40	14:06	BEIJING	46	A320-200
Japan Airlines	JL954	14:00	14:13	TOKYO/NARITA	113	B777-200
Korean Air	KE901	13:45	14:13	PARIS	24	B747-400
Asiana Airlines	OZ365	14:10	14:15	SHANGHAI/PUDONG	42	A330-300
Air China	CA128	14:00	14:17	QINGDAO	103	B737-800
Mongolian Airlines	OM302	13:55	14:19	ULAANBAATAR	102	A310-300
Asiana Airlines	OZ162	14:00	14:22	HIROSHIMA	30	B767-300
Asiana Airlines	OZ307	14:20	14:22	YANTAI	38	A320-200
Korean Air	KE915	14:00	14:26	MUNICH	26	A330-200
Asiana Airlines	OZ114	14:10	14:32	OSAKA/KANSAI	31	B767-300
Korean Air	KE949	13:55	14:33	Fiumicino Airport (Leonardo Da Vinci Internaitonal	6	B777-200ER
All Nippon Airways	NH908	14:30	14:36	TOKYO/NARITA	119	A320-200
Korean Air	KE955	14:10	14:40	ISTANBUL	14	A330-300
Korean Air	KE725	14:25	14:42	OSAKA/KANSAI	28	A330-300
Asiana Airlines	OZ172	14:40	14:50	OKINAWA	41	B767-300
Korean Air	KE839	14:50	14:53	WEIHAI	18	B737-800
Asiana Airlines	OZ158	14:50	14:56	MIYAZAKI	32	A321-100
KLM Royal Dutch Airlines	KL866	14:35	15:09	AMSTERDAM	110	B747-400M
Asiana Airlines	OZ124	15:00	15:12	NAGOYA	45	B767-300
Lufthansa Airlines	LH713	14:45	15:14	FRANKFURT	124	A340-600
Korean Air	KE791	15:05	15:14	OITA	16	B737-900
Asiana Airlines	OZ176	15:10	15:16	MATSUYAMA	37	A320-200
China Southern Airlines	CZ3066	15:10	15:18	CHANGSHA/Datuopu	112	A320-200
United Airlines	UA892	15:05	15:18	SAN FRANCISCO	122	B777-200
Korean Air	KE017	15:00	15:20	LOS ANGELES	10	B747-400
Korean Air	KE923	14:50	15:22	MOSCOW	23	B777-200ER
Shandong Airlines	SC4090	15:20	15:25	YANTAI	127	B737-300
Asiana Airlines	OZ134	15:10	15:26	FUKUOKA	34	B767-300
Asiana Airlines	OZ337	15:15	15:27	BEIJING	43	A320-200
Cathay Pacific Airways	CX411	15:15	15:30	HONG KONG	121	A330-300
Eva Air	BR169	15:20	15:32	TAIPEI	123	A330-200
Korean Air	KE627	15:20	15:34	JAKARTA	22	A330-300
Korean Air	KE1423	15:30	15:39	JEJU	3	B737-800
Vladivostok Airlines	XF802	15:45	15:55	KHABAROVSK	114	Tupolev Tu-154M
Vladivostok Airlines	XF744	15:50	16:09	VLADIVOSTOK	115	A320-200
Asiana Airlines	OZ367	16:05	16:14	SHANGHAI/PUDONG	42	A321-100
China Eastern Airlines	MU560	16:10	16:17	QINGDAO	117	A320-200
Asiana Airlines	OZ751	16:00	16:19	SINGAPORE	49	A330-300
China Eastern Airlines	MU5034	16:20	16:22	SHANGHAI/PUDONG	118	A321-200
Shandong Airlines	SC4082	16:30	16:30	QINGDAO	124	B737-300
Asiana Airlines	OZ202	16:30	16:47	LOS ANGELES	31	B747-400
Korean Air	KE641	15:55	16:49	SINGAPORE	17	B777-300
Asiana Airlines	OZ214	16:45	17:00	SAN FRANCISCO	47	B777-200ER
Korean Air	KE671	16:50	17:05	KUALA LUMPUR	26	A330-300
Asiana Airlines	OZ309	17:00	17:09	WEIHAI	38	A321-100
Korean Air	KE941	17:15	17:25	TASHKENT	7	A330-300
Asiana Airlines	OZ106	17:10	17:27	TOKYO/NARITA	40	B767-300
Air China	CA136	17:25	17:30	DALIAN	108	B737-800
Korean Air	KE651	17:20	17:37	BANGKOK	12	B777-300
Korean Air	KE023	16:50	17:40	SAN FRANCISCO	21	B777-200ER
Thai Airways International	TG635	17:30	17:42	BANGKOK	122	B777-300
Singapore Airlines	SQ016	17:40	17:47	SAN FRANCISCO	123	B777-312ER
Asiana Airlines	OZ317	17:40	17:49	QINGDAO	45	A321-100
Korean Air	KE763	17:55	17:59	NIIGATA	32	B737-900
Korean Air	KE687	17:55	18:01	SIEMREAP	11	B737-800
Japan Airlines	JL984	18:00	18:13	NAGOYA	113	B767-300ER
Singapore Airlines	SQ017	17:55	18:15	SINGAPORE	121	B777-212ER
Asiana Airlines	OZ8591	18:15	18:18	JEJU	5	A320-200
Japan Airlines	JL964	18:00	18:19	OSAKA/KANSAI	112	B767-300ER
Air China	CA126	18:10	18:21	BEIJING	102	B737-800
Korean Air	KE019	18:20	18:25	SEATTLE	8	B777-200ER
Asiana Airlines	OZ741	18:20	18:31	BANGKOK	39	A330-300
Korean Air	KE747	18:25	18:34	OKAYAMA	28	B737-900
Korean Air	KE781	18:25	18:38	FUKUOKA	24	A330-300
Korean Air	KE681	18:45	18:46	HO CHI MINH	14	A330-300
Asiana Airlines	OZ757	18:35	18:49	KOTA KINABALU	36	A321-100
Korean Air	KE071	18:40	18:51	VANCOUVER	27	B777-200ER
China Southern Airlines	CZ370	18:45	18:54	SHANGHAI/PUDONG	110	B737-800
Korean Air	KE705	18:40	18:55	TOKYO/NARITA	6	B747-400
All Nippon Airways	NH942	18:55	18:59	NAGOYA	117	A320-200
Korean Air	KE751	18:50	19:05	NAGOYA	7	B747-400
Air Canada	AC064	18:45	19:07	VANCOUVER	119	B767-300ER
Korean Air	KE689	18:50	19:09	PHNOM PENH	18	B737-800
Asiana Airlines	OZ108	18:50	19:10	TOKYO/NARITA	46	A330-300
Korean Air	KE853	18:55	19:11	BEIJING	20	B737-900
Korean Air	KE895	19:05	19:14	SHANGHAI/PUDONG	12	B777-200ER
Korean Air	KE729	19:05	19:15	GUAM	17	A330-300
Korean Air	KE129	19:05	19:22	AUCKLAND	23	B777-200ER
Asiana Airlines	OZ737	19:15	19:23	SIEMREAP	42	A320-200
Korean Air	KE121	19:10	19:24	SYDNEY	9	B747-400
Asiana Airlines	OZ739	19:15	19:26	PHNOM PENH	48	A320-200
Asiana Airlines	OZ120	19:10	19:28	SAIPAN	50	B767-300
Korean Air	KE137	19:20	19:31	NADI	21	A330-200
Korean Air	KE1411	19:20	19:35	DAEGU	1	B737-900
Eva Air	BR159	19:20	19:35	TAIPEI	122	A330-200
Korean Air	KE011	19:30	19:39	LOS ANGELES	8	B747-400
Singapore Airlines	SQ015	19:25	19:41	SINGAPORE	124	B777-312ER
Korean Air	KE679	19:25	19:44	HANOI	33	A330-300
Asiana Airlines	OZ733	19:35	19:46	HANOI	37	B767-300

China Southern Airlines	CZ672	19:40	19:49	SHENYANG	103	A319-100
Air China	CA148	19:40	19:51	WEIHAI	108	B737-300
Asiana Airlines	OZ8533	19:40	19:51	BUSAN	3	A320-200
Asiana Airlines	OZ703	19:45	19:53	MANILA	38	A321-100
Asiana Airlines	OZ723	19:45	19:55	HONG KONG	32	A330-300
Korean Air	KE085	19:30	19:56	NEWYORK	15	B747-400
Cathay Pacific Airways	CX419	19:45	19:58	HONG KONG	123	A330-300
Shenzhen Airlines	ZH9788	19:55	20:00	SHENZEN	114	B737-800
Asiana Airlines	OZ601	19:50	20:06	SYDNEY	43	B777-200ER
Mandarin Airlines	AE961	20:05	20:12	KAOHSIUNG	105	Embraer E-190
Korean Air	KE629	20:05	20:16	DENPASAR	19	A330-300
Korean Air	KE051	20:00	20:17	HONOLULU	22	B747-400
Asiana Airlines	OZ743	20:10	20:18	BANGKOK	34	B767-300
Korean Air	KE653	20:10	20:20	BANGKOK	10	B777-300
Asiana Airlines	OZ204	20:00	20:20	LOS ANGELES	40	B747-400
Korean Air	KE607	20:00	20:23	HONG KONG	28	B747-400
Asiana Airlines	OZ222	20:00	20:23	NEWYORK	49	B747-400
Korean Air	KE1405	20:05	20:25	BUSAN	2	B737-900
Asiana Airlines	OZ357	20:20	20:25	CHONGQING	46	A320-200
Philippine Airlines	PR469	20:20	20:28	MANILA	121	A330-300
Asiana Airlines	OZ731	20:10	20:30	HO CHI MINH	31	B777-200ER
Korean Air	KE623	20:00	20:32	MANILA	27	B777-200ER
Asiana Airlines	OZ603	19:40	20:34	SAIPAN	41	A321-100
Asiana Airlines	OZ747	20:15	20:35	PHUKET	45	B767-300
Asiana Airlines	OZ709	20:20	20:37	CEBU	30	A321-100
China Xiamen Airlines	MF872	20:30	20:40	XIAMEN	130	B737-700
Korean Air	KE637	20:40	20:48	PHUKET	26	A330-300
Asiana Airlines	OZ3235	21:00	20:49	SANYA	47	A321-100
Asiana Airlines	OZ707	20:45	20:56	CLARK FIELD	36	A321-100
Qatar Airways	QR821	21:00	21:00	DOHA	113	A330-200
China Southern Airlines	CZ684	21:05	21:03	HARBIN	110	A320-200
Korean Air	KE073	20:55	21:06	TORONTO	9	B747-400
Korean Air	KE631	21:00	21:11	CEBU	16	B737-900
Thai Airways International	TG657	21:15	21:19	BANGKOK	125	A330-300
Asiana Airlines	OZ353	21:20	21:21	HAIKOU	32	A321-100
Korean Air	KE881	21:35	21:31	WUHAN	11	B737-800
Korean Air	KE111	21:30	21:40	GUAM	23	B777-200ER
Philippine Airlines	PR489	21:50	21:42	CEBU	122	A330-300
China Southern Airlines	CZ676	21:45	21:46	DALIAN	108	A321-200
Korean Air	KE005	21:40	21:59	LAS VEGAS	7	B777-200ER
Cebu Pacific Air	5J195	21:35	22:03	MANILA	117	A320-200
China Eastern Airlines	MU2004	22:00	22:05	KUNMING	128	A320-200
China Eastern Airlines	MU2040	22:00	22:09	SANYA	127	A320-200
Cebu Pacific Air	5J129	22:05	22:15	CEBU	119	A320-200
Asiana Airlines	OZ6075	23:00	23:00	KOROR	30	#N/A
Emirates	EK323	23:55	23:59	DUBAI	111	B777-300ER

Date: 2nd March 2009

Airline	Flight	EDT	RDT	Destination	Gate	Aircraft
Turkish Airlines	TK091	0:05	0:12	ISTANBUL	107	A330-200
Korean Air	KE9707	1:55	1:54	TOKYO/HANEDA	18	#N/A
Lufthansa Airlines	LH716	7:45	7:51	SHENYANG	126	A340-300
Korean Air	KE787	8:00	8:10	FUKUOKA	8	A330-300
Japan Airlines	JL956	8:00	8:15	TOKYO/NARITA	109	B767-300ER
Air Macau	NX825	8:00	8:29	MACAU	117	A321-100
Korean Air	KE831	8:20	8:35	SHENYANG	26	A330-300
Korean Air	KE621	8:25	8:38	MANILA	21	A330-300
China Eastern Airlines	MU2044	8:30	8:40	QINGDAO	128	A320-200
Asiana Airlines	OZ8531	8:30	8:43	BUSAN	2	A320-200
Philippine Airlines	PR467	8:30	8:45	MANILA	119	A320-200
China Southern Airlines	CZ340	8:40	8:47	GUANGZHOU	101	A320-200
Korean Air	KE603	8:30	8:49	HONG KONG	27	B747-400
Asiana Airlines	OZ331	8:40	8:51	BEIJING	32	A320-200
Korean Air	KE893	8:45	8:53	SHANGHAI/PUDONG	10	B777-200ER
Air China	CA134	8:45	8:56	QINGDAO	102	B737-300
China Eastern Airlines	MU2018	8:55	8:58	WEIHAI	118	A320-200
Cathay Pacific Airways	CX415	8:50	8:58	HONG KONG	121	A330-300
Asiana Airlines	OZ369	8:50	9:01	GUANGZHOU	49	A330-300
Korean Air	KE827	8:55	9:04	SHENZEN	14	A330-300
Asiana Airlines	OZ701	8:50	9:06	MANILA	45	B777-200ER
Asiana Airlines	OZ309	9:00	9:08	WEIHAI	48	A321-100
Asiana Airlines	OZ156	9:10	9:14	FUKUSHIMA	35	A320-200
Korean Air	KE1401	9:00	9:15	BUSAN	1	B737-900
China Eastern Airlines	MU5052	9:05	9:15	SHANGHAI/PUDONG	129	A321-200
Korean Air	KE775	9:10	9:18	KOMATSU	11	B737-900
Singapore Airlines	SQ603	9:00	9:18	SINGAPORE	124	B777-312
China Eastern Airlines	MU5088	9:05	9:20	BEIJING	127	A320-200
Cathay Pacific Airways	CX421	9:15	9:22	HONG KONG	123	B777-200
Asiana Airlines	OZ576	9:10	9:22	SAKHALINSK	37	A321-100
Korean Air	KE691	9:10	9:25	TAIPEI	6	A330-300
Asiana Airlines	OZ122	9:15	9:27	NAGOYA	43	B767-300
Asiana Airlines	OZ172	9:20	9:28	OKINAWA	34	A321-100
Korean Air	KE819	9:25	9:30	CHANGSHA/Datuopu	20	B737-900
Korean Air	KE701	9:20	9:32	TOKYO/NARITA	15	B777-300
Asiana Airlines	OZ721	9:20	9:32	HONG KONG	40	B777-200ER
Asiana Airlines	OZ132	9:30	9:33	FUKUOKA	36	B767-300
Korean Air	KE851	9:15	9:36	BEIJING	22	B777-300
Air China	CA138	9:30	9:40	BEIJING	106	A330-200
Japan Airlines	JL950	9:30	9:41	TOKYO/NARITA	112	B777-300
Asiana Airlines	OZ301	9:40	9:44	DALIAN	38	A320-200
Korean Air	KE769	9:45	9:50	AKITA	16	B737-800
Asiana Airlines	OZ371	9:40	9:50	SHENZEN	42	A321-100
Asiana Airlines	OZ162	9:40	9:52	HIROSHIMA	33	B767-300
Asiana Airlines	OZ303	9:40	9:54	CHANGCHUN	47	A321-100
Korean Air	KE723	9:45	9:55	OSAKA/KANSAI	23	A330-300

Asiana Airlines	OZ361	9:40	9:56	SHANGHAI/PUDONG	39	B747-400
Asiana Airlines	OZ333	9:50	9:58	BEIJING	50	B767-300
Korean Air	KE031	9:50	9:59	DALLAS	12	B777-200ER
Korean Air	KE695	9:45	10:00	Tribhuvan	19	B777-200ER
Korean Air	KE845	9:40	10:02	QINGDAO	28	B737-800
Korean Air	KE837	10:00	10:11	YANTAI	10	B737-800
Thai Airways International	TG659	10:05	10:13	BANGKOK	122	B777-200
Asiana Airlines	OZ152	10:10	10:13	SENDAI	41	B767-300
Korean Air	KE825	10:00	10:15	YANJI	8	B737-900
Asiana Airlines	OZ112	10:00	10:16	OSAKA/KANSAI	32	A330-300
Air France	AF267	10:05	10:18	PARIS	110	B777-200ER
Asiana Airlines	OZ102	10:00	10:18	TOKYO/NARITA	31	B777-200ER
Korean Air	KE981	10:00	10:20	VLADIVOSTOK	18	B737-800
Cathay Pacific Airways	CX417	10:15	10:21	HONG KONG	121	A330-300
Korean Air	KE093	10:00	10:22	WASHINGTON	24	B777-200ER
Iran Air	IR800	10:35	10:25	TOKYO/NARITA	130	B747-200
Korean Air	KE035	10:05	10:27	ATLANTA	21	B747-400
Garuda Indonesia	GA871	10:35	10:31	DENPASAR	113	A330-300
Korean Air	KE703	10:20	10:34	TOKYO/NARITA	9	B777-300
Asiana Airlines	OZ317	10:30	10:37	QINGDAO	45	A320-200
Vietnam Airlines	VN937	10:15	10:39	HANOI	111	A330-200
Korean Air	KE765	10:10	10:42	SAPPORO	17	A330-300
Korean Air	KE805	10:35	10:45	TIANJIN	27	B747-400
Vietnam Airlines	VN939	10:35	10:47	HO CHI MINH	107	A321-231
Asiana Airlines	OZ327	10:50	10:57	TIANJIN	48	A320-200
Asiana Airlines	OZ363	10:50	10:59	SHANGHAI/PUDONG	43	A321-100
Northwest Airlines	NW008	11:00	11:02	SEATTLE	115	B757-700
Thai Airways International	TG629	10:50	11:07	BANGKOK	125	A330-300
Asiana Airlines	OZ711	10:55	11:10	TAIPEI	40	B767-300
Malaysia Airlines	MH067	11:00	11:16	KUALA LUMPUR	108	A330-200
Korean Air	KE613	11:20	11:26	HONG KONG	11	B737-800
FINNAIR	AY042	11:10	11:29	HELSINKI	126	A340-300
Korean Air	KE001	11:20	11:39	LOS ANGELES	7	B777-200ER
Asiana Airlines	OZ104	11:30	11:41	TOKYO/NARITA	30	B777-200ER
China Southern Airlines	CZ314	11:45	11:50	SHANGHAI/PUDONG	102	B737-800
Korean Air	KE037	11:40	11:57	CHICAGO	10	B777-200ER
Korean Air	KE897	11:45	11:59	SHANGHAI/PUDONG	22	A330-200
Air China	CA172	11:45	12:01	TIANJIN	103	B737-300
Asiana Airlines	OZ349	11:45	12:03	NANJING	46	A321-100
China Southern Airlines	CZ686	12:00	12:06	DALIAN	104	A321-200
China Eastern Airlines	MU550	12:00	12:11	YANTAI	127	A320-200
Korean Air	KE855	11:40	12:13	BEIJING	16	B737-900
Korean Air	KE081	11:00	12:16	NEWYORK	14	B747-400
China Southern Airlines	CZ318	12:05	12:26	BEIJING	107	A321-200
United Airlines	UA882	12:15	12:29	CHICAGO	122	B777-200
Asiana Airlines	OZ572	12:10	12:34	KHABAROVSK	50	A321-100
Asiana Airlines	OZ339	12:30	12:40	HARBIN	38	A321-100
Japan Airlines	JL962	12:25	12:42	OSAKA/KANSAI	114	B767-300ER
Japan Airlines	JL952	12:25	12:44	TOKYO/NARITA	112	B767-300ER
China Eastern Airlines	MU218	12:45	12:46	YANCHENG	128	A320-200
China Southern Airlines	CZ682	12:45	12:49	SHENYANG	105	A321-200
Asiana Airlines	OZ541	12:45	13:00	FRANKFURT	39	B777-200ER
China Eastern Airlines	MU5042	13:00	13:06	SHANGHAI/PUDONG	123	A321-200
Korean Air	KE757	12:55	13:06	NAGOYA	20	B737-900
China Airlines	CI161	13:00	13:13	TAIPEI	121	A340-300
Air China	CA140	13:05	13:17	HANGZHOU	108	A319-100
Korean Air	KE789	13:10	13:18	FUKUOKA	6	A330-300
Korean Air	KE951	13:00	13:21	DUBAI	23	B777-200ER
Korean Air	KE869	13:00	13:23	DALIAN	17	B737-900
Korean Air	KE841	13:10	13:25	QINGDAO	15	A330-300
China Southern Airlines	CZ338	13:20	13:32	GUANGZHOU	109	A321-200
China Southern Airlines	CZ688	13:20	13:34	CHANGCHUN	106	A321-200
China Eastern Airlines	MU2034	13:35	13:36	QINGDAO	130	A320-200
Air China	CA124	13:05	13:39	BEIJING	111	A330-200
Shanghai Airlines	FM828	13:40	13:41	SHANGHAI/PUDONG	125	B737-700
Asiana Airlines	OZ573	13:10	13:45	TASHKENT	47	A330-300
Asiana Airlines	OZ359	13:35	13:48	HANGZHOU	43	A321-100
All Nippon Airways	NH172	13:30	13:53	OSAKA/KANSAI	117	A320-200
Korean Air	KE907	13:10	13:53	LONDON	28	B747-400
Asiana Airlines	OZ501	13:15	13:58	PARIS	40	B777-200ER
Asiana Airlines	OZ335	13:20	14:03	BEIJING	42	B767-300
Korean Air	KE905	13:25	14:09	FRANKFURT	24	B747-400
Air China	CA128	14:00	14:11	QINGDAO	103	B737-800
Korean Air	KE901	13:45	14:14	PARIS	27	B747-400
Asiana Airlines	OZ365	14:10	14:16	SHANGHAI/PUDONG	41	A320-200
Lufthansa Airlines	LH717	13:55	14:19	MUNICH	126	A340-300
Asiana Airlines	OZ307	14:20	14:24	YANTAI	38	A320-200
Japan Airlines	JL954	14:00	14:26	TOKYO/NARITA	113	B747-400
Korean Air	KE935	14:20	14:26	PRAGUE	26	A330-300
Asiana Airlines	OZ114	14:10	14:39	OSAKA/KANSAI	30	B767-300
Korean Air	KE725	14:25	14:44	OSAKA/KANSAI	9	A330-300
Air Astana	KC910	14:10	14:46	ALMATY	115	B757-200
China Southern Airlines	CZ6074	14:35	14:49	YANJI	107	A321-200
All Nippon Airways	NH908	14:30	14:55	TOKYO/NARITA	119	A320-200
KLM Royal Dutch Airlines	KL866	14:35	14:58	AMSTERDAM	110	B747-400M
Lufthansa Airlines	LH713	14:45	15:04	FRANKFURT	124	A340-600
Korean Air	KE839	14:50	15:06	WEIHAI	18	B737-800
Asiana Airlines	OZ124	15:00	15:08	NAGOYA	31	B767-300
Asiana Airlines	OZ142	15:10	15:10	KUMAMOTO	34	A320-200
United Airlines	UA892	15:05	15:13	SAN FRANCISCO	122	B777-200
Korean Air	KE017	15:00	15:16	LOS ANGELES	12	B747-400
Shandong Airlines	SC4090	15:20	15:19	YANTAI	127	B737-300
Asiana Airlines	OZ134	15:10	15:19	FUKUOKA	32	B767-300
China Southern Airlines	CZ3066	15:10	15:21	CHANGSHA/Datuopu	112	A320-200
Cathay Pacific Airways	CX411	15:15	15:23	HONG KONG	121	A330-300
Korean Air	KE627	15:20	15:34	JAKARTA	7	A330-300
Korean Air	KE793	15:35	15:36	NAGASAKI	17	B737-900
Asiana Airlines	OZ337	15:40	15:48	BEIJING	42	A320-200
Korean Air	KE953	15:50	15:55	CAIRO	21	A330-200
Asiana Airlines	OZ367	16:00	16:04	SHANGHAI/PUDONG	47	A320-200

Korean Air	KE641	15:55	16:07	SINGAPORE	15	B777-300
Asiana Airlines	OZ751	16:00	16:14	SINGAPORE	41	A330-300
China Eastern Airlines	MU560	16:10	16:20	QINGDAO	118	A320-200
China Eastern Airlines	MU5034	16:20	16:24	SHANGHAI/PUDONG	117	A321-200
Shandong Airlines	SC4082	16:30	16:35	QINGDAO	124	B737-300
Asiana Airlines	OZ202	16:30	16:47	LOS ANGELES	43	B747-400 Combi
Korean Air	KE671	16:50	17:04	KUALA LUMPUR	26	A330-300
Asiana Airlines	OZ106	17:10	17:18	TOKYO/NARITA	30	B767-300
Korean Air	KE629	17:15	17:25	DENPASAR	6	A330-300
Air China	CA136	17:25	17:27	DALIAN	114	B737-800
China Eastern Airlines	MU580	17:25	17:30	NANJING	126	A320-200
Korean Air	KE651	17:20	17:32	BANGKOK	23	B777-300
Thai Airways International	TG635	17:30	17:43	BANGKOK	121	B777-300
Singapore Airlines	SQ016	17:40	17:54	SAN FRANCISCO	122	B777-312ER
Korean Air	KE687	17:55	17:58	SIEMREAP	14	B737-800
Korean Air	KE763	17:55	18:06	NIIGATA	34	B737-900
Japan Airlines	JL984	18:00	18:09	NAGOYA	112	B767-300ER
Japan Airlines	JL964	18:00	18:19	OSAKA/KANSAI	113	B767-300ER
Korean Air	KE125	18:15	18:29	MELBOURNE	22	A330-200
Singapore Airlines	SQ018	18:15	18:31	VANCOUVER	124	B777-212ER
Korean Air	KE781	18:25	18:37	FUKUOKA	8	A330-300
Korean Air	KE747	18:25	18:38	OKAYAMA	18	B737-900
Korean Air	KE673	18:40	18:45	KOTA KINABALU	16	B737-800
Asiana Airlines	OZ741	18:20	18:47	BANGKOK	50	A330-300
Asiana Airlines	OZ272	18:25	18:49	SEATTLE	45	B777-200ER
China Southern Airlines	CZ370	18:45	18:51	SHANGHAI/PUDONG	103	B737-800
China Southern Airlines	CZ684	18:50	18:51	HARBIN	109	A320-200
Korean Air	KE071	18:40	18:55	VANCOUVER	19	B777-200ER
All Nippon Airways	NH942	18:55	18:57	NAGOYA	117	A320-200
Korean Air	KE705	18:40	18:59	TOKYO/NARITA	10	B777-300
Asiana Airlines	OZ108	18:50	19:04	TOKYO/NARITA	40	B777-200ER
Air Canada	AC064	18:45	19:06	VANCOUVER	119	B767-300ER
Korean Air	KE681	18:45	19:06	HO CHI MINH	31	A330-300
Korean Air	KE689	18:50	19:08	PHNOM PENH	20	B737-800
Korean Air	KE751	18:50	19:09	NAGOYA	9	B747-400
Korean Air	KE853	18:55	19:11	BEIJING	24	B737-900
Asiana Airlines	OZ739	19:15	19:18	PHNOM PENH	47	A320-200
Asiana Airlines	OZ116	19:10	19:20	OSAKA/KANSAI	36	A321-100
Korean Air	KE721	19:05	19:23	OSAKA/KANSAI	21	B777-200ER
Korean Air	KE121	19:10	19:26	SYDNEY	27	B747-400
Korean Air	KE129	19:05	19:28	AUCKLAND	12	B777-200ER
Asiana Airlines	OZ325	19:30	19:31	GUILIN	38	A321-100
Asiana Airlines	OZ236	19:15	19:33	CHICAGO	46	B777-200ER
Korean Air	KE895	19:05	19:34	SHANGHAI/PUDONG	17	B777-200ER
Korean Air	KE1411	19:20	19:36	DAEGU	1	B737-900
Singapore Airlines	SQ015	19:25	19:36	SINGAPORE	123	B777-312ER
Korean Air	KE679	19:25	19:40	HANOI	28	A330-300
Asiana Airlines	OZ8533	19:30	19:40	BUSAN	3	A320-200
Korean Air	KE885	19:30	19:43	KUNMING	32	A330-200
Korean Air	KE085	19:30	19:44	NEWYORK	15	B747-400
Asiana Airlines	OZ733	19:35	19:45	HANOI	45	B767-300
China Southern Airlines	CZ672	19:40	19:47	SHENYANG	114	A319-100
Cathay Pacific Airways	CX419	19:45	19:50	HONG KONG	121	A330-300
Korean Air	KE011	19:30	19:50	LOS ANGELES	6	B747-400
Air China	CA148	19:40	19:52	WEIHAI	102	B737-300
Eva Air	BR159	19:20	19:54	TAIPEI	125	A330-200
Korean Air	KE637	19:40	19:56	PHUKET	7	A330-300
Asiana Airlines	OZ703	19:45	20:01	MANILA	37	A321-100
Asiana Airlines	OZ723	19:45	20:04	HONG KONG	49	A330-300
Korean Air	KE867	19:50	20:06	ULAANBAATAR	14	A330-300
Asiana Airlines	OZ601	19:50	20:06	SYDNEY	43	B777-200ER
Korean Air	KE623	20:00	20:08	MANILA	26	A330-300
Iran Air	IR801	19:15	20:09	IMAM KHOMEINI	130	B747-200
Mandarin Airlines	AE961	20:05	20:11	KAOHSIUNG	105	Embraer E-190
Korean Air	KE051	20:00	20:12	HONOLULU	8	B747-400
Korean Air	KE1405	20:05	20:14	BUSAN	2	B737-900
Korean Air	KE607	20:00	20:14	HONG KONG	23	B747-400
Asiana Airlines	OZ204	20:00	20:16	LOS ANGELES	41	B777-200ER
Asiana Airlines	OZ731	20:10	20:18	HO CHI MINH	39	B777-200ER
Asiana Airlines	OZ321	20:20	20:21	CHANGSHA/Datuopu	48	A321-100
Asiana Airlines	OZ603	20:10	20:25	SAIPAN	42	A321-100
Asiana Airlines	OZ747	20:15	20:27	PHUKET	35	B767-300
Korean Air	KE653	20:10	20:29	BANGKOK	10	B777-300
Asiana Airlines	OZ743	20:10	20:32	BANGKOK	40	B767-300
Philippine Airlines	PR469	20:20	20:35	MANILA	122	A330-300
Shandong Airlines	SC4096	20:20	20:37	JINAN	127	B737-800
Asiana Airlines	OZ8535	20:30	20:38	BUSAN	3	A320-200
Air China	CA126	18:10	20:47	BEIJING	108	B737-800
Qatar Airways	QR821	21:00	20:53	DOHA	113	A330-200
Korean Air	KE655	20:40	20:56	MUMBAI	27	A330-300
Asiana Airlines	OZ707	20:45	21:07	CLARK FIELD	34	A321-100
Korean Air	KE631	21:00	21:24	CEBU	11	B737-900
Thai Airways International	TG657	21:15	21:29	BANGKOK	124	A330-300
Korean Air	KE111	21:30	21:36	GUAM	15	B777-200ER
China Southern Airlines	CZ676	21:45	21:40	DALIAN	109	A321-200
Korean Air	KE061	21:30	21:42	SAO PAULO	12	B777-200ER
Cebu Pacific Air	5J195	21:35	21:45	MANILA	117	A320-200
Cebu Pacific Air	5J129	22:05	22:33	CEBU	119	A320-200

Date: 3rd March 2009

Airline	Flight	EDT	RDT	Destination	Gate	Aircraft
Emirates	EK323Y	0:05	0:00	DUBAI	111	B777-300ER
Lufthansa Airlines	LH718	7:35	8:04	BUSAN	126	A340-300
Asiana Airlines	OZ8531	8:30	8:31	BUSAN	3	A320-200
Korean Air	KE787	8:00	8:42	FUKUOKA	8	A330-300

China Eastern Airlines	MU2044	8:30	8:57	QINGDAO	128	A320-200
Asiana Airlines	OZ331	8:40	9:02	BEIJING	35	A320-200
Philippine Airlines	PR467	8:30	9:11	MANILA	119	A320-200
Korean Air	KE1401	9:00	9:14	BUSAN	1	B737-900
Korean Air	KE603	8:30	9:18	HONG KONG	27	B777-200ER
Korean Air	KE621	8:25	9:22	MANILA	15	B777-300
Asiana Airlines	OZ701	8:50	9:28	MANILA	41	B747-400
Air China	CA134	8:45	9:30	QINGDAO	102	B737-300
Korean Air	KE893	8:45	9:33	SHANGHAI/PUDONG	20	B737-900
Asiana Airlines	OZ605	9:00	9:33	SAIPAN	38	A321-100
Asiana Airlines	OZ309	9:00	9:35	WEIHAI	47	A321-100
Korean Air	KE831	8:20	9:37	SHENYANG	26	A330-300
Asiana Airlines	OZ128	9:00	9:37	TOYAMA	42	A321-100
Asiana Airlines	OZ132	9:30	9:39	FUKUOKA	36	B767-300
China Eastern Airlines	MU2018	8:55	9:40	WEIHAI	127	A320-200
Cathay Pacific Airways	CX415	8:50	9:42	HONG KONG	123	A330-300
China Eastern Airlines	MU5052	9:05	9:48	SHANGHAI/PUDONG	131	A321-200
Korean Air	KE865	9:15	9:56	GUANGZHOU	17	A330-300
China Eastern Airlines	MU5088	9:05	9:58	BEIJING	129	A320-200
Korean Air	KE691	9:10	10:00	TAIPEI	9	A330-300
Asiana Airlines	OZ162	9:40	10:02	HIROSHIMA	32	B767-300
Singapore Airlines	SQ603	9:00	10:04	SINGAPORE	124	B777-312
Asiana Airlines	OZ122	9:15	10:08	NAGOYA	34	B767-300
Air China	CA138	9:30	10:14	BEIJING	103	B737-800
Asiana Airlines	OZ735	9:20	10:17	HO CHI MINH	37	A321-100
Asiana Airlines	OZ112	10:00	10:17	OSAKA/KANSAI	40	B777-200ER
Asiana Airlines	OZ172	9:20	10:19	OKINAWA	31	A321-100
Cathay Pacific Airways	CX421	9:15	10:21	HONG KONG	121	A330-300
Asiana Airlines	OZ721	9:20	10:25	HONG KONG	45	A330-300
Asiana Airlines	OZ301	9:40	10:27	DALIAN	48	A320-200
Korean Air	KE845	9:40	10:28	QINGDAO	23	B737-800
Japan Airlines	JL950	9:30	10:31	TOKYO/NARITA	112	B777-300
Asiana Airlines	OZ351	9:40	10:33	YANJI	50	A321-100
Korean Air	KE773	9:45	10:34	HAKODATE	15	B737-900
Korean Air	KE703	10:20	10:36	TOKYO/NARITA	22	B777-300
Asiana Airlines	OZ152	10:10	10:39	SENDAI	33	B767-300
Korean Air	KE701	9:20	10:41	TOKYO/NARITA	14	B777-300
Asiana Airlines	OZ361	9:40	10:41	SHANGHAI/PUDONG	43	B747-400
Asiana Airlines	OZ166	9:50	10:46	TAKAMATSU	30	A320-200
Korean Air	KE723	9:45	10:49	OSAKA/KANSAI	6	A330-300
Asiana Airlines	OZ333	9:50	10:51	BEIJING	49	A330-300
Korean Air	KE809	10:00	10:54	ZHENGZHOU	18	B737-900
Asiana Airlines	OZ102	10:00	10:56	TOKYO/NARITA	39	B777-200ER
Korean Air	KE093	10:00	11:02	WASHINGTON	27	B777-200ER
Asiana Airlines	OZ711	10:30	11:04	TAIPEI	42	B767-300
Asiana Airlines	OZ317	10:30	11:08	QINGDAO	41	A321-100
Air France	AF267	10:05	11:10	PARIS	110	B777-300ER
Thai Airways International	TG659	10:05	11:13	BANGKOK	122	B777-200
Korean Air	KE851	9:15	11:15	BEIJING	21	A330-200
Thai Airways International	TG629	10:50	11:17	BANGKOK	125	A330-300
Korean Air	KE887	10:00	11:18	XIAMEN	16	B737-800
Cathay Pacific Airways	CX417	10:15	11:25	HONG KONG	123	A330-300
Asiana Airlines	OZ363	10:50	11:25	SHANGHAI/PUDONG	47	A330-300
Orient Thai Airlines	OX301	11:25	11:25	BANGKOK		B747-300
Korean Air	KE765	10:10	11:27	SAPPORO	8	A330-300
Northwest Airlines	NW008	11:00	11:31	SEATTLE	115	B757-700
Garuda Indonesia	GA871	10:35	11:33	DENPASAR	113	A330-300
Asiana Airlines	OZ327	10:55	11:34	TIANJIN	34	B767-300
Vietnam Airlines	VN939	10:35	11:35	HO CHI MINH	108	A321-231
Korean Air	KE031	9:50	11:37	DALLAS	10	B777-200ER
Vietnam Airlines	VN937	10:15	11:39	HANOI	109	A330-200
Korean Air	KE035	10:05	11:45	ATLANTA	24	B747-400
Korean Air	KE981	10:00	11:48	VLADIVOSTOK	20	B737-800
Korean Air	KE805	10:35	11:50	TIANJIN	19	B777-200ER
Korean Air	KE933	10:30	11:56	ZURICH	28	A330-300
China Southern Airlines	CZ314	11:45	11:57	SHANGHAI/PUDONG	102	B737-800
Korean Air	KE081	11:00	11:59	NEWYORK	12	B747-400
Aircalin	SB701	10:30	12:03	NOUMEA	111	A330-200
FINNAIR	AY042	11:10	12:05	HELSINKI	126	A340-300
China Eastern Airlines	MU550	12:00	12:07	YANTAI	127	A320-200
Korean Air	KE001	11:20	12:08	LOS ANGELES	7	B777-200ER
Air China	CA172	11:45	12:10	TIANJIN	103	B737-300
Korean Air	KE613	11:20	12:12	HONG KONG	11	B737-800
Asiana Airlines	OZ104	11:30	12:13	TOKYO/NARITA	31	A330-300
China Southern Airlines	CZ686	12:00	12:14	DALIAN	104	ATR 72-500
Uzbekistan Airways	HY512	11:15	12:15	TASHKENT	117	B757-200
Korean Air	KE037	11:40	12:24	CHICAGO	14	B777-200ER
China Southern Airlines	CZ318	12:05	12:27	BEIJING	105	A321-200
Korean Air	KE897	11:45	12:30	SHANGHAI/PUDONG	23	B777-200ER
Asiana Airlines	OZ369	8:50	12:34	GUANGZHOU	46	A330-300
Japan Airlines	JL952	12:25	12:38	TOKYO/NARITA	112	B767-300ER
Asiana Airlines	OZ339	12:30	12:43	HARBIN	30	A321-100
United Airlines	UA882	12:15	12:51	CHICAGO	124	B777-200
Japan Airlines	JL962	12:25	12:55	OSAKA/KANSAI	111	B767-300ER
SAT Airlines	HZ112	12:45	12:56	SAKHALINSK	131	B737-200
China Southern Airlines	CZ682	12:45	12:57	SHENYANG	106	A321-200
China Eastern Airlines	MU2024	12:50	13:00	CHANGSHA/Datuopu	129	A320-200
Korean Air	KE869	13:00	13:08	DALIAN	16	B737-900
Air China	CA140	13:05	13:10	HANGZHOU	107	A319-100
China Eastern Airlines	MU5042	13:00	13:12	SHANGHAI/PUDONG	125	A321-200
China Airlines	CI161	13:00	13:15	TAIPEI	121	A340-300
Korean Air	KE789	13:10	13:15	FUKUOKA	6	A330-300
Asiana Airlines	OZ164	12:30	13:17	YONAGO	32	A320-200
Air China	CA124	13:05	13:19	BEIJING	110	A330-200
Korean Air	KE757	12:55	13:22	NAGOYA	18	B737-900
Korean Air	KE841	13:10	13:23	QINGDAO	22	B777-200ER
Lufthansa Airlines	LH719	13:15	13:25	MUNICH	126	A340-300
China Southern Airlines	CZ688	13:20	13:28	CHANGCHUN	109	A321-200
China Southern Airlines	CZ338	13:20	13:35	GUANGZHOU	114	A321-200
China Eastern Airlines	MU2034	13:35	13:37	QINGDAO	128	A320-200

Korean Air	KE907	13:10	13:40	LONDON	12	B747-400
Asiana Airlines	OZ359	13:35	13:47	HANGZHOU	40	B767-300
Korean Air	KE847	13:45	13:50	JINAN	20	B737-900
Asiana Airlines	OZ335	13:20	13:53	BEIJING	41	B777-200ER
All Nippon Airways	NH172	13:30	13:54	OSAKA/KANSAI	117	A320-200
Asiana Airlines	OZ541	13:00	13:59	FRANKFURT	43	B777-200ER
Korean Air	KE905	13:25	14:05	FRANKFURT	27	B747-400
Air China	CA128	14:00	14:13	QINGDAO	103	B737-800
Asiana Airlines	OZ365	14:10	14:15	SHANGHAI/PUDONG	47	A321-100
Mongolian Airlines	OM302	13:55	14:17	ULAANBAATAR	102	B737-800
Asiana Airlines	OZ114	14:10	14:21	OSAKA/KANSAI	34	B767-300
Korean Air	KE955	14:10	14:23	ISTANBUL	26	A330-300
Japan Airlines	JL954	14:00	14:26	TOKYO/NARITA	113	B747-400
Asiana Airlines	OZ521	13:35	14:29	LONDON	45	B777-200ER
Korean Air	KE725	14:25	14:29	OSAKA/KANSAI	9	B777-200ER
Korean Air	KE901	13:45	14:40	PARIS	28	B747-400
Korean Air	KE839	14:50	15:01	WEIHAI	24	B737-800
Korean Air	KE017	15:00	15:12	LOS ANGELES	22	B747-400
United Airlines	UA892	15:05	15:14	SAN FRANCISCO	124	B777-200
Asiana Airlines	OZ307	14:20	15:20	YANTAI	46	A320-200
Cathay Pacific Airways	CX411	15:15	15:29	HONG KONG	123	B747-400
Shandong Airlines	SC4090	15:20	15:31	YANTAI	127	B737-300
Asiana Airlines	OZ176	15:10	15:35	MATSUYAMA	30	A320-200
Korean Air	KE627	15:20	15:39	JAKARTA	7	A330-300
Asiana Airlines	OZ134	15:10	15:40	FUKUOKA	31	B767-300
All Nippon Airways	NH908	14:30	15:42	TOKYO/NARITA	121	A320-200
Asiana Airlines	OZ124	15:10	15:44	NAGOYA	32	B767-300
Asiana Airlines	OZ367	15:40	15:44	SHANGHAI/PUDONG	47	A320-200
Korean Air	KE641	15:55	15:59	SINGAPORE	8	B777-200ER
Asiana Airlines	OZ751	16:00	16:09	SINGAPORE	41	A330-300
China Eastern Airlines	MU5034	16:20	16:24	SHANGHAI/PUDONG	117	A321-200
Shandong Airlines	SC4082	16:30	16:36	QINGDAO	128	B737-300
China Eastern Airlines	MU560	16:10	16:43	QINGDAO	118	A320-200
Asiana Airlines	OZ202	16:30	16:56	LOS ANGELES	45	B747-400
Asiana Airlines	OZ214	16:45	17:04	SAN FRANCISCO	40	B777-200ER
Korean Air	KE671	16:50	17:07	KUALA LUMPUR	12	A330-300
Asiana Airlines	OZ713	15:10	17:09	TAIPEI	36	A321-100
Korean Air	KE023	16:50	17:12	SAN FRANCISCO	10	B777-200ER
Korean Air	KE941	17:15	17:23	TASHKENT	14	A330-300
Korean Air	KE629	17:15	17:28	DENPASAR	21	A330-300
Air China	CA136	17:25	17:33	DALIAN	108	B737-800
Thai Airways International	TG635	17:30	17:39	BANGKOK	121	B777-300
Asiana Airlines	OZ106	17:10	17:41	TOKYO/NARITA	35	A321-100
Asiana Airlines	OZ573	17:20	17:43	TASHKENT	47	A330-300
Korean Air	KE651	17:20	17:45	BANGKOK	23	B777-300
Singapore Airlines	SQ016	17:40	17:46	SAN FRANCISCO	124	B777-312ER
Korean Air	KE957	17:40	17:54	TEL AVIV	27	B747-400
Korean Air	KE763	17:55	18:03	NIIGATA	16	B737-900
Singapore Airlines	SQ017	17:55	18:06	SINGAPORE	122	B777-212ER
Japan Airlines	JL984	18:00	18:11	NAGOYA	114	B767-300ER
Japan Airlines	JL964	18:00	18:13	OSAKA/KANSAI	113	B767-300ER
Air China	CA126	18:10	18:16	BEIJING	102	B737-800
Delta Air Lines	DL092	18:05	18:21	ATLANTA	112	B777-200ER
Asiana Airlines	OZ577	18:10	18:24	ALMATY	46	B767-300
Korean Air	KE687	17:55	18:30	SIEMREAP	24	B737-800
Korean Air	KE747	18:25	18:38	OKAYAMA	20	B737-900
Asiana Airlines	OZ757	18:35	18:43	KOTA KINABALU	38	A321-100
Korean Air	KE781	18:25	18:45	FUKUOKA	15	B777-200ER
China Southern Airlines	CZ370	18:45	18:56	SHANGHAI/PUDONG	110	B737-800
Air Canada	AC064	18:45	18:58	VANCOUVER	119	B767-300ER
Korean Air	KE705	18:40	19:04	TOKYO/NARITA	12	B747-400
All Nippon Airways	NH942	18:55	19:06	NAGOYA	117	A320-200
Korean Air	KE751	18:50	19:09	NAGOYA	23	B747-400
Korean Air	KE689	18:50	19:10	PHNOM PENH	11	B737-800
Asiana Airlines	OZ108	18:50	19:11	TOKYO/NARITA	37	B767-300
Korean Air	KE019	18:20	19:14	SEATTLE	9	B777-200ER
Korean Air	KE853	18:55	19:15	BEIJING	21	B777-200ER
Korean Air	KE129	19:05	19:17	AUCKLAND	17	B777-200ER
Korean Air	KE681	18:45	19:18	HO CHI MINH	26	A330-300
Korean Air	KE721	19:05	19:20	OSAKA/KANSAI	6	B747-400
Asiana Airlines	OZ739	19:15	19:24	PHNOM PENH	50	A320-200
Korean Air	KE1411	19:20	19:27	DAEGU	1	B737-900
Eva Air	BR159	19:20	19:27	TAIPEI	125	A330-200
Korean Air	KE895	19:05	19:30	SHANGHAI/PUDONG	34	B737-900
Asiana Airlines	OZ116	19:10	19:32	OSAKA/KANSAI	35	A321-100
Korean Air	KE673	18:40	19:34	KOTA KINABALU	18	B737-800
Korean Air	KE137	19:20	19:34	NADI	27	A330-300
Korean Air	KE121	19:10	19:37	SYDNEY	8	B747-400
Asiana Airlines	OZ8533	19:30	19:39	BUSAN	2	A320-200
Asiana Airlines	OZ741	18:20	19:40	BANGKOK	49	A330-300
Korean Air	KE679	19:25	19:43	HANOI	22	A330-300
Korean Air	KE085	19:30	19:44	NEWYORK	7	B747-400
Singapore Airlines	SQ015	19:25	19:47	SINGAPORE	123	B777-312ER
Korean Air	KE011	19:30	19:47	LOS ANGELES	24	B747-400
Asiana Airlines	OZ733	19:35	19:48	HANOI	45	B767-300
China Southern Airlines	CZ672	19:40	19:50	SHENYANG	103	A319-100
Cathay Pacific Airways	CX419	19:45	19:53	HONG KONG	121	A340-300
Asiana Airlines	OZ767	19:40	19:56	DELHI	47	A330-300
Korean Air	KE123	19:35	19:58	BRISBANE	12	A330-300
Asiana Airlines	OZ601	19:50	20:01	SYDNEY	43	B777-200ER
Korean Air	KE051	20:00	20:09	HONOLULU	19	B747-400
Asiana Airlines	OZ603	20:10	20:13	SAIPAN	38	A321-100
Asiana Airlines	OZ723	20:00	20:14	HONG KONG	30	B767-300
Korean Air	KE1405	20:05	20:16	BUSAN	3	B737-900
Korean Air	KE607	20:00	20:16	HONG KONG	32	B777-300
Korean Air	KE623	20:00	20:18	MANILA	15	A330-300
Asiana Airlines	OZ747	20:15	20:20	PHUKET	39	B767-300
Asiana Airlines	OZ204	20:00	20:23	LOS ANGELES	48	B777-200ER
Asiana Airlines	OZ731	20:10	20:29	HO CHI MINH	40	B747-400
Asiana Airlines	OZ703	19:45	20:31	MANILA	42	A321-100

Philippine Airlines	PR469	20:20	20:46	MANILA	122	A330-300
Qatar Airways	QR821	21:00	20:54	DOHA	113	A330-200
Asiana Airlines	OZ707	20:45	20:57	CLARK FIELD	31	A321-100
China Southern Airlines	CZ684	21:05	21:01	HARBIN	108	MD-90-30
Korean Air	KE631	21:00	21:07	CEBU	20	B737-900
Korean Air	KE073	20:55	21:12	TORONTO	28	B747-400
Korean Air	KE653	20:10	21:14	BANGKOK	10	B777-300
Thai Airways International	TG657	21:15	21:24	BANGKOK	124	A330-300
Korean Air	KE881	21:35	21:30	WUHAN	11	B737-800
Korean Air	KE667	20:40	21:39	CHIANG MAI	16	B737-800
China Southern Airlines	CZ676	21:45	21:43	DALIAN	110	A321-200
Asiana Airlines	OZ222	20:00	21:46	NEWYORK	46	B747-400
Korean Air	KE005	21:40	21:48	LAS VEGAS	27	B777-200ER
Cebu Pacific Air	5J195	21:35	21:51	MANILA	117	A320-200
Korean Air	KE111	21:30	21:53	GUAM	14	B777-200ER
Cebu Pacific Air	5J129	22:05	22:17	CEBU	119	A320-200

Date: 4th March 2009

Airline	Flight	EDT	RDT	Destination	Gate	Aircraft
Emirates	EK323Y	0:05	0:14	DUBAI	111	B777-300ER
Air China	CA144D	3:10	3:14	YANJI	108	#N/A
Lufthansa Airlines	LH716	7:45	8:00	SHENYANG	126	A340-300
Korean Air	KE787	8:00	8:11	FUKUOKA	19	A330-300
Japan Airlines	JL956	8:00	8:17	TOKYO/NARITA	105	B767-300ER
Korean Air	KE831	8:20	8:28	SHENYANG	7	A330-300
Korean Air	KE621	8:25	8:33	MANILA	23	B777-300
Asiana Airlines	OZ8531	8:30	8:35	BUSAN	2	A320-200
Philippine Airlines	PR467	8:30	8:37	MANILA	119	A320-200
China Eastern Airlines	MU2044	8:30	8:46	QINGDAO	118	A320-200
Korean Air	KE603	8:30	8:53	HONG KONG	26	B747-400
Korean Air	KE925	8:40	8:55	Madrid Barajas Airport	24	B777-200ER
Cathay Pacific Airways	CX415	8:50	8:57	HONG KONG	121	A330-300
Asiana Airlines	OZ369	8:50	9:03	GUANGZHOU	48	A330-300
China Eastern Airlines	MU2018	8:55	9:07	WEIHAI	127	A320-200
Korean Air	KE1401	9:00	9:10	BUSAN	1	B737-900
Asiana Airlines	OZ701	8:50	9:10	MANILA	45	B767-300
Asiana Airlines	OZ309	9:00	9:12	WEIHAI	37	A321-100
Korean Air	KE827	8:55	9:14	SHENZEN	8	B737-800
Air China	CA134	8:45	9:16	QINGDAO	103	B737-300
Asiana Airlines	OZ154	9:00	9:16	ASAHIKAWA	28	A320-200
China Eastern Airlines	MU5052	9:05	9:20	SHANGHAI/PUDONG	129	A321-200
Korean Air	KE893	8:45	9:23	SHANGHAI/PUDONG	6	A330-200
China Eastern Airlines	MU5088	9:05	9:25	BEIJING	128	A320-200
Korean Air	KE775	9:10	9:26	KOMATSU	18	B737-900
Korean Air	KE851	9:15	9:28	BEIJING	12	B777-300
Cathay Pacific Airways	CX421	9:15	9:30	HONG KONG	123	A330-300
Korean Air	KE691	9:10	9:33	TAIPEI	10	A330-300
Korean Air	KE767	9:25	9:35	AOMORI	9	B737-800
Asiana Airlines	OZ721	9:20	9:36	HONG KONG	39	A330-300
Asiana Airlines	OZ122	9:15	9:37	NAGOYA	30	A330-300
Japan Airlines	JL950	9:30	9:39	TOKYO/NARITA	112	B777-300
Air China	CA138	9:30	9:41	BEIJING	114	B737-800
Singapore Airlines	SQ603	9:00	9:44	SINGAPORE	124	B777-312
Asiana Airlines	OZ162	9:40	9:46	HIROSHIMA	34	B767-300
Korean Air	KE785	9:30	9:47	KAGOSHIMA	25	B737-900
Asiana Airlines	OZ132	9:30	9:50	FUKUOKA	32	B767-300
Asiana Airlines	OZ371	9:40	9:50	SHENZEN	49	B767-300
Korean Air	KE845	9:40	9:51	QINGDAO	16	B737-800
Korean Air	KE701	9:20	9:51	TOKYO/NARITA	27	B777-300
Asiana Airlines	OZ303	9:40	9:54	CHANGCHUN	47	A321-100
Asiana Airlines	OZ361	9:40	9:56	SHANGHAI/PUDONG	42	A321-100
Asiana Airlines	OZ301	9:40	9:59	DALIAN	43	A320-200
Korean Air	KE723	9:45	10:00	OSAKA/KANSAI	21	A330-300
Asiana Airlines	OZ158	10:00	10:02	MIYAZAKI	36	A320-200
Asiana Airlines	OZ333	9:50	10:02	BEIJING	46	B767-300
Korean Air	KE819	9:25	10:05	CHANGSHA/Datuopu	14	B737-900
Korean Air	KE825	10:00	10:07	YANJI	11	B737-900
Asiana Airlines	OZ112	10:00	10:11	OSAKA/KANSAI	31	A330-300
Asiana Airlines	OZ102	10:00	10:14	TOKYO/NARITA	35	B747-400
Korean Air	KE837	10:00	10:17	YANTAI	20	B737-800
Korean Air	KE035	10:05	10:17	ATLANTA	7	B747-400
Thai Airways International	TG659	10:05	10:20	BANGKOK	122	B777-200
Korean Air	KE093	10:00	10:21	WASHINGTON	23	B777-200ER
Cathay Pacific Airways	CX417	10:15	10:22	HONG KONG	121	A330-300
Asiana Airlines	OZ152	10:10	10:24	SENDAI	33	B767-300
Korean Air	KE765	10:10	10:26	SAPPORO	19	A330-300
Korean Air	KE703	10:20	10:32	TOKYO/NARITA	15	B777-300
Vietnam Airlines	VN937	10:15	10:34	HANOI	111	A321-231
Asiana Airlines	OZ317	10:30	10:39	QINGDAO	38	A321-100
Asiana Airlines	OZ711	10:30	10:42	TAIPEI	50	A321-100
Air France	AF267	10:05	10:45	PARIS	110	B777-200ER
Korean Air	KE805	10:35	10:49	TIANJIN	26	A330-200
Vietnam Airlines	VN939	10:35	10:54	HO CHI MINH	109	A330-300
Northwest Airlines	NW008	11:00	10:57	SEATTLE	115	B757-700
Asiana Airlines	OZ363	10:50	11:01	SHANGHAI/PUDONG	41	A321-100
Asiana Airlines	OZ327	10:50	11:06	TIANJIN	48	A321-100
Thai Airways International	TG629	10:50	11:12	BANGKOK	125	A330-300
Malaysia Airlines	MH065	11:00	11:16	KUALA LUMPUR	108	A330-200
Korean Air	KE081	11:00	11:18	NEWYORK	28	B747-400
Korean Air	KE613	11:20	11:31	HONG KONG	24	B737-800
Asiana Airlines	OZ349	11:45	11:46	NANJING	47	A320-200
Korean Air	KE037	11:40	11:51	CHICAGO	21	B777-200ER
Korean Air	KE897	11:45	11:53	SHANGHAI/PUDONG	27	B777-200ER
China Southern Airlines	CZ314	11:45	11:57	SHANGHAI/PUDONG	102	B737-800
Air China	CA172	11:45	12:00	TIANJIN	103	B737-300

China Eastern Airlines	MU550	12:00	12:02	YANTAI	131	A320-200
Asiana Airlines	OZ104	11:30	12:04	TOKYO/NARITA	31	B777-200ER
China Southern Airlines	CZ686	12:00	12:06	DALIAN	104	A321-200
Korean Air	KE855	11:40	12:13	BEIJING	12	B777-200ER
Japan Airlines	JL952	12:25	12:37	TOKYO/NARITA	114	B767-300ER
Asiana Airlines	OZ572	12:25	12:42	KHABAROVSK	30	A321-100
Korean Air	KE001	11:20	12:44	LOS ANGELES	22	B777-200ER
Japan Airlines	JL962	12:25	12:46	OSAKA/KANSAI	112	B767-300ER
United Airlines	UA882	12:15	12:48	CHICAGO	122	B777-200
China Eastern Airlines	MU2024	12:50	12:55	CHANGSHA/Datuopu	128	A320-200
China Southern Airlines	CZ682	12:45	12:57	SHENYANG	106	A321-200
SAT Airlines	HZ112	12:45	13:01	SAKHALINSK	130	B737-200
China Eastern Airlines	MU580	12:50	13:02	NANJING	123	A320-200
Korean Air	KE757	12:55	13:03	NAGOYA	20	B737-900
Korean Air	KE869	13:00	13:07	DALIAN	28	B737-900
Air China	CA124	13:05	13:11	BEIJING	111	A330-200
China Airlines	CI161	13:00	13:11	TAIPEI	121	A340-300
China Eastern Airlines	MU5042	13:00	13:15	SHANGHAI/PUDONG	118	A321-200
Korean Air	KE841	13:10	13:17	QINGDAO	10	A330-300
Korean Air	KE789	13:10	13:17	FUKUOKA	17	A330-300
China Southern Airlines	CZ688	13:20	13:21	CHANGCHUN	115	A321-200
Asiana Airlines	OZ501	13:15	13:23	PARIS	46	B777-200ER
China Southern Airlines	CZ338	13:20	13:31	GUANGZHOU	108	A321-200
Korean Air	KE981	13:20	13:31	VLADIVOSTOK	18	B737-800
Korean Air	KE907	13:10	13:34	LONDON	14	B747-400
Asiana Airlines	OZ335	13:20	13:39	BEIJING	43	B777-200ER
All Nippon Airways	NH172	13:30	13:41	OSAKA/KANSAI	117	A320-200
China Eastern Airlines	MU2034	13:35	13:42	QINGDAO	129	A320-200
Asiana Airlines	OZ359	13:35	13:43	HANGZHOU	45	B767-300
Korean Air	KE905	13:25	13:45	FRANKFURT	15	B747-400
Air China	CA140	13:05	13:51	HANGZHOU	109	A319-100
Shanghai Airlines	FM828	13:40	13:54	SHANGHAI/PUDONG	125	B737-700
Air China	CA128	14:00	14:01	QINGDAO	103	B737-800
Lufthansa Airlines	LH717	13:55	14:04	MUNICH	126	A340-300
Japan Airlines	JL954	14:00	14:07	TOKYO/NARITA	113	B777-200
Korean Air	KE949	13:55	14:11	Fiumicino Airport (Leonardo Da Vinci Internaitonal	12	B777-200ER
Mongolian Airlines	OM302	13:55	14:18	ULAANBAATAR	102	B737-800
Korean Air	KE915	14:00	14:24	MUNICH	23	A330-200
Asiana Airlines	OZ114	14:10	14:27	OSAKA/KANSAI	32	A330-300
Asiana Airlines	OZ307	14:20	14:29	YANTAI	42	A320-200
Korean Air	KE901	13:45	14:31	PARIS	22	B747-400
Asiana Airlines	OZ365	14:20	14:32	SHANGHAI/PUDONG	34	B767-300
Korean Air	KE725	14:25	14:40	OSAKA/KANSAI	26	A330-300
KLM Royal Dutch Airlines	KL866	14:35	14:46	AMSTERDAM	110	B747-400M
All Nippon Airways	NH908	14:30	14:48	TOKYO/NARITA	119	A320-200
China Southern Airlines	CZ6074	14:35	14:53	YANJI	105	A321-200
Lufthansa Airlines	LH713	14:45	14:59	FRANKFURT	124	A340-600
Korean Air	KE839	14:50	15:01	WEIHAI	27	B737-800
Korean Air	KE923	14:50	15:07	MOSCOW	21	B777-200ER
United Airlines	UA892	15:05	15:09	SAN FRANCISCO	122	B777-200
China Southern Airlines	CZ3066	15:10	15:19	CHANGSHA/Datuopu	109	A320-200
Asiana Airlines	OZ367	15:15	15:21	SHANGHAI/PUDONG	47	A320-200
Korean Air	KE017	15:00	15:21	LOS ANGELES	9	B747-400
Cathay Pacific Airways	CX411	15:15	15:23	HONG KONG	121	A330-300
Shandong Airlines	SC4090	15:20	15:23	YANTAI	130	B737-300
Asiana Airlines	OZ134	15:10	15:26	FUKUOKA	41	B767-300
Korean Air	KE627	15:20	15:32	JAKARTA	24	A330-300
Asiana Airlines	OZ124	15:20	15:33	NAGOYA	30	A330-300
Korean Air	KE953	15:50	15:58	CAIRO	28	A330-200
Vladivostok Airlines	XF744	15:50	16:01	VLADIVOSTOK	114	A320-200
Korean Air	KE693	16:00	16:04	TAIPEI	14	B737-900
Asiana Airlines	OZ751	16:00	16:06	SINGAPORE	46	A330-300
Korean Air	KE641	15:55	16:14	SINGAPORE	22	B777-300
China Eastern Airlines	MU560	16:10	16:17	QINGDAO	117	A320-200
China Eastern Airlines	MU5034	16:20	16:22	SHANGHAI/PUDONG	118	A321-200
Shandong Airlines	SC4082	16:30	16:41	QINGDAO	128	B737-300
Asiana Airlines	OZ202	16:30	16:47	LOS ANGELES	40	B747-400
Korean Air	KE671	16:50	16:59	KUALA LUMPUR	7	A330-300
Asiana Airlines	OZ214	16:45	17:03	SAN FRANCISCO	31	B777-200ER
Korean Air	KE629	17:15	17:22	DENPASAR	12	A330-300
Asiana Airlines	OZ106	17:10	17:30	TOKYO/NARITA	36	B767-300
Korean Air	KE651	17:20	17:34	BANGKOK	10	B777-300
Thai Airways International	TG635	17:30	17:36	BANGKOK	121	B777-300
Air China	CA136	17:25	17:38	DALIAN	103	B737-800
Singapore Airlines	SQ016	17:40	17:54	SAN FRANCISCO	122	B777-312ER
Korean Air	KE763	17:55	18:06	NIIGATA	20	B737-900
Japan Airlines	JL984	18:00	18:15	NAGOYA	112	B767-300ER
Korean Air	KE687	17:55	18:17	SIEMREAP	11	B737-800
Japan Airlines	JL964	18:00	18:19	OSAKA/KANSAI	113	B767-300ER
Air China	CA126	18:10	18:21	BEIJING	108	B737-800
Asiana Airlines	OZ741	18:20	18:28	BANGKOK	46	A330-300
Korean Air	KE125	18:15	18:31	MELBOURNE	9	A330-200
Korean Air	KE781	18:25	18:37	FUKUOKA	26	A330-300
Korean Air	KE747	18:25	18:40	OKAYAMA	34	B737-900
Asiana Airlines	OZ757	18:35	18:42	KOTA KINABALU	42	A321-100
Asiana Airlines	OZ272	18:25	18:45	SEATTLE	47	B777-200ER
China Southern Airlines	CZ370	18:45	18:52	SHANGHAI/PUDONG	110	B737-800
Korean Air	KE071	18:40	18:54	VANCOUVER	27	B777-200ER
China Southern Airlines	CZ684	18:50	18:56	HARBIN	107	A320-200
Korean Air	KE705	18:40	18:59	TOKYO/NARITA	14	B777-300
Korean Air	KE689	18:50	19:04	PHNOM PENH	16	B737-800
Korean Air	KE751	18:50	19:05	NAGOYA	10	B747-400
All Nippon Airways	NH942	18:55	19:07	NAGOYA	117	A320-200
Asiana Airlines	OZ108	18:55	19:10	TOKYO/NARITA	41	A330-300
Korean Air	KE681	18:45	19:11	HO CHI MINH	24	A330-300
Korean Air	KE729	19:05	19:12	GUAM	8	A330-300
Korean Air	KE129	19:05	19:15	AUCKLAND	6	B777-200ER
Korean Air	KE853	18:55	19:16	BEIJING	18	B737-900
Korean Air	KE895	19:05	19:19	SHANGHAI/PUDONG	33	B737-800

Asiana Airlines	OZ120	19:10	19:22	SAIPAN	36	B767-300
Asiana Airlines	OZ737	19:15	19:24	SIEMREAP	50	A321-100
Korean Air	KE121	19:10	19:25	SYDNEY	23	B747-400
Korean Air	KE1411	19:20	19:28	DAEGU	1	B737-900
Asiana Airlines	OZ236	19:15	19:31	CHICAGO	43	B777-200ER
Korean Air	KE085	19:30	19:39	NEWYORK	21	B747-400
Korean Air	KE679	19:25	19:40	HANOI	7	A330-300
Air China	CA148	19:40	19:42	WEIHAI	102	B737-300
China Southern Airlines	CZ672	19:40	19:44	SHENYANG	103	A319-100
Korean Air	KE011	19:30	19:44	LOS ANGELES	17	B747-400
Cathay Pacific Airways	CX419	19:45	19:47	HONG KONG	121	A330-300
Asiana Airlines	OZ8533	19:30	19:47	BUSAN	3	A320-200
Asiana Airlines	OZ733	19:35	19:49	HANOI	39	B767-300
Eva Air	BR159	19:20	19:51	TAIPEI	125	A330-200
Korean Air	KE637	19:40	19:53	PHUKET	9	A330-300
Asiana Airlines	OZ723	19:45	19:57	HONG KONG	45	B747-400
Asiana Airlines	OZ703	19:45	20:00	MANILA	47	A321-100
Asiana Airlines	OZ601	19:50	20:10	SYDNEY	40	B777-200ER
Asiana Airlines	OZ323	20:00	20:12	CHENGDU	38	A320-200
Korean Air	KE051	20:00	20:15	HONOLULU	19	B747-400
Korean Air	KE607	20:00	20:15	HONG KONG	28	B747-400
Asiana Airlines	OZ204	20:00	20:20	LOS ANGELES	31	B777-200ER
Asiana Airlines	OZ743	20:10	20:20	BANGKOK	34	B767-300
Asiana Airlines	OZ747	20:15	20:22	PHUKET	37	B767-300
Asiana Airlines	OZ603	20:10	20:23	SAIPAN	46	A321-100
Philippine Airlines	PR469	20:20	20:25	MANILA	122	A330-300
Korean Air	KE623	20:00	20:27	MANILA	22	A330-300
China Xiamen Airlines	MF872	20:30	20:30	XIAMEN	130	B737-700
Korean Air	KE1405	20:05	20:31	BUSAN	5	B737-800
Asiana Airlines	OZ731	20:10	20:32	HO CHI MINH	32	A330-300
Asiana Airlines	OZ709	20:20	20:35	CEBU	42	A321-100
Singapore Airlines	SQ015	19:25	20:39	SINGAPORE	123	B777-312ER
Korean Air	KE653	20:10	20:44	BANGKOK	27	B777-300
Korean Air	KE655	20:40	20:49	MUMBAI	15	A330-300
Asiana Airlines	OZ707	20:45	20:51	CLARK FIELD	35	A321-100
Mandarin Airlines	AE961	20:05	20:57	KAOHSIUNG	105	Embraer E-190
Korean Air	KE631	21:00	21:00	CEBU	14	B737-900
Qatar Airways	QR821	21:00	21:02	DOHA	113	A330-200
Thai Airways International	TG657	21:15	21:33	BANGKOK	124	A330-300
Korean Air	KE111	21:30	21:35	GUAM	24	B777-200ER
Korean Air	KE061	21:30	21:38	SAO PAULO	12	B777-200ER
Philippine Airlines	PR489	21:50	21:45	CEBU	122	A320-200
Cebu Pacific Air	5J195	21:35	21:51	MANILA	117	A320-200
Cebu Pacific Air	5J129	22:05	22:16	CEBU	119	A320-200
China Southern Airlines	CZ676	21:45	22:48	DALIAN	107	A321-200

Date: 5th March 2009

Airline	Flight	EDT	RDT	Destination	Gate	Aircraft
Emirates	EK323Y	0:05	0:06	DUBAI	111	B777-300ER
Turkish Airlines	TK091	0:15	0:12	ISTANBUL	109	A340-300
Korean Air	KE787	8:00	8:09	FUKUOKA	28	A330-300
Air Macau	NX825	8:00	8:11	MACAU	126	A321-100
Japan Airlines	JL956	8:00	8:23	TOKYO/NARITA	106	B767-300ER
China Eastern Airlines	MU2044	8:30	8:39	QINGDAO	118	A320-200
Korean Air	KE831	8:20	8:43	SHENYANG	19	A330-300
Korean Air	KE621	8:25	8:45	MANILA	10	B777-300
Korean Air	KE603	8:30	8:50	HONG KONG	7	A330-300
Philippine Airlines	PR467	8:30	8:56	MANILA	119	A320-200
Korean Air	KE893	8:45	8:58	SHANGHAI/PUDONG	24	B777-200ER
Air China	CA134	8:45	9:01	QINGDAO	102	B737-300
Cathay Pacific Airways	CX415	8:50	9:03	HONG KONG	123	A330-300
China Eastern Airlines	MU2018	8:55	9:04	WEIHAI	128	A320-200
Korean Air	KE793	8:50	9:05	NAGASAKI	11	B737-900
Asiana Airlines	OZ369	8:50	9:07	GUANGZHOU	46	A330-300
Asiana Airlines	OZ701	8:50	9:09	MANILA	40	B747-400
China Eastern Airlines	MU5088	9:05	9:11	BEIJING	129	A320-200
Korean Air	KE1401	9:00	9:12	BUSAN	2	B737-900
Asiana Airlines	OZ309	9:00	9:16	WEIHAI	50	A320-200
Asiana Airlines	OZ605	9:00	9:17	SAIPAN	42	A321-100
Singapore Airlines	SQ603	9:00	9:19	SINGAPORE	124	B777-312
China Eastern Airlines	MU5052	9:05	9:21	SHANGHAI/PUDONG	127	A321-200
Cathay Pacific Airways	CX421	9:15	9:26	HONG KONG	121	B777-300
Asiana Airlines	OZ156	9:10	9:27	FUKUSHIMA	48	A320-200
Korean Air	KE691	9:10	9:30	TAIPEI	26	A330-300
Korean Air	KE851	9:15	9:33	BEIJING	12	B777-200ER
Asiana Airlines	OZ122	9:15	9:33	NAGOYA	30	B767-300
Asiana Airlines	OZ735	9:20	9:34	HO CHI MINH	36	A321-100
Asiana Airlines	OZ576	9:10	9:36	SAKHALINSK	37	A321-100
Asiana Airlines	OZ721	9:20	9:37	HONG KONG	39	A330-300
Korean Air	KE701	9:20	9:38	TOKYO/NARITA	9	B777-300
Korean Air	KE865	9:15	9:41	GUANGZHOU	23	A330-300
Asiana Airlines	OZ142	9:30	9:46	KUMAMOTO	38	A320-200
Japan Airlines	JL950	9:30	9:48	TOKYO/NARITA	112	B777-300
Asiana Airlines	OZ172	9:20	9:48	OKINAWA	41	B767-300
Air China	CA138	9:30	9:50	BEIJING	103	B737-800
Asiana Airlines	OZ132	9:30	9:51	FUKUOKA	31	B767-300
Asiana Airlines	OZ361	9:40	9:52	SHANGHAI/PUDONG	43	B747-400
Asiana Airlines	OZ162	9:40	9:53	HIROSHIMA	34	B767-300
Korean Air	KE819	9:25	9:54	CHANGSHA/Datuopu	16	B737-800
Korean Air	KE845	9:40	9:56	QINGDAO	20	B737-800
Korean Air	KE769	9:45	9:57	AKITA	14	B737-800
Asiana Airlines	OZ303	9:40	9:58	CHANGCHUN	28	A320-200
Korean Air	KE773	9:45	10:01	HAKODATE	17	B737-900
Asiana Airlines	OZ301	9:40	10:01	DALIAN	47	A320-200
Korean Air	KE695	9:45	10:03	Tribhuvan	27	B777-200ER

Korean Air	KE723	9:45	10:04	OSAKA/KANSAI	8	A330-300
Asiana Airlines	OZ333	9:50	10:08	BEIJING	49	B777-200ER
Korean Air	KE031	9:50	10:08	DALLAS	6	B777-200ER
Asiana Airlines	OZ112	10:00	10:10	OSAKA/KANSAI	35	A330-300
Asiana Airlines	OZ351	9:40	10:10	YANJI	45	A321-100
Korean Air	KE887	10:00	10:15	XIAMEN	22	B737-800
Korean Air	KE093	10:00	10:16	WASHINGTON	10	B777-200ER
Asiana Airlines	OZ102	10:00	10:18	TOKYO/NARITA	40	B747-400
Thai Airways International	TG659	10:05	10:20	BANGKOK	122	B777-200
Cathay Pacific Airways	CX417	10:15	10:23	HONG KONG	123	B777-300
Korean Air	KE035	10:05	10:24	ATLANTA	7	B747-400
Korean Air	KE9823	10:05	10:25	MUDANJIANG	18	#N/A
Asiana Airlines	OZ152	10:10	10:26	SENDAI	33	B767-300
Korean Air	KE765	10:10	10:28	SAPPORO	19	A330-300
Vietnam Airlines	VN937	10:15	10:32	HANOI	111	A330-200
Korean Air	KE703	10:20	10:34	TOKYO/NARITA	15	B777-300
Garuda Indonesia	GA871	10:35	10:38	DENPASAR	113	A330-300
Asiana Airlines	OZ317	10:30	10:45	QINGDAO	42	A321-100
Vietnam Airlines	VN939	10:35	10:52	HO CHI MINH	109	A321-231
Korean Air	KE805	10:35	10:59	TIANJIN	24	B747-400
Korean Air	KE933	10:30	11:05	ZURICH	21	A330-300
Asiana Airlines	OZ327	10:50	11:09	TIANJIN	48	A321-100
Asiana Airlines	OZ363	10:50	11:12	SHANGHAI/PUDONG	41	A321-100
Asiana Airlines	OZ711	10:55	11:14	TAIPEI	46	B767-300
Northwest Airlines	NW008	11:00	11:16	SEATTLE	115	B757-700
FINNAIR	AY042	11:10	11:17	HELSINKI	126	A340-300
Malaysia Airlines	MH067	11:00	11:19	KUALA LUMPUR	108	A330-200
Thai Airways International	TG629	10:50	11:21	BANGKOK	125	A330-300
Korean Air	KE081	11:00	11:24	NEWYORK	9	B747-400
Korean Air	KE613	11:20	11:28	HONG KONG	23	B737-800
Korean Air	KE001	11:20	11:33	LOS ANGELES	8	B777-200ER
China Southern Airlines	CZ314	11:45	11:48	SHANGHAI/PUDONG	102	B737-800
Asiana Airlines	OZ104	11:30	11:52	TOKYO/NARITA	32	A330-300
Korean Air	KE897	11:45	11:53	SHANGHAI/PUDONG	27	B737-900
Korean Air	KE037	11:40	11:56	CHICAGO	14	B777-200ER
Air China	CA172	11:45	11:58	TIANJIN	103	B737-300
China Southern Airlines	CZ318	12:05	12:09	BEIJING	105	A321-200
China Southern Airlines	CZ686	12:00	12:11	DALIAN	104	ATR 72-500
China Eastern Airlines	MU550	12:00	12:15	YANTAI	127	A320-200
United Airlines	UA882	12:15	12:27	CHICAGO	122	B777-200
Japan Airlines	JL962	12:25	12:39	OSAKA/KANSAI	112	B767-300ER
Asiana Airlines	OZ339	12:30	12:41	HARBIN	36	A321-100
Japan Airlines	JL952	12:25	12:46	TOKYO/NARITA	114	B767-300ER
China Southern Airlines	CZ682	12:45	12:50	SHENYANG	106	A321-200
China Eastern Airlines	MU218	12:45	12:59	YANCHENG	123	A320-200
China Eastern Airlines	MU2016	12:50	13:02	GUILIN	128	A320-200
Asiana Airlines	OZ541	12:45	13:05	FRANKFURT	39	B777-200ER
Korean Air	KE757	12:55	13:11	NAGOYA	11	B737-900
Korean Air	KE869	13:00	13:13	DALIAN	16	B737-900
Korean Air	KE951	13:00	13:16	DUBAI	12	B777-200ER
China Eastern Airlines	MU5042	13:00	13:19	SHANGHAI/PUDONG	118	A321-200
China Airlines	CI161	13:00	13:23	TAIPEI	121	A340-300
Air China	CA140	13:05	13:25	HANGZHOU	110	A319-100
Korean Air	KE789	13:10	13:26	FUKUOKA	10	B777-200ER
Air China	CA124	13:05	13:29	BEIJING	111	A330-200
Korean Air	KE841	13:10	13:33	QINGDAO	28	A330-300
Korean Air	KE907	13:10	13:35	LONDON	24	B747-400
China Southern Airlines	CZ688	13:20	13:37	CHANGCHUN	109	A321-200
China Southern Airlines	CZ338	13:20	13:39	GUANGZHOU	107	A321-200
All Nippon Airways	NH172	13:30	13:41	OSAKA/KANSAI	117	A320-200
Asiana Airlines	OZ335	13:20	13:44	BEIJING	45	A330-300
China Eastern Airlines	MU2034	13:35	13:46	QINGDAO	129	A320-200
Asiana Airlines	OZ359	13:35	13:52	HANGZHOU	47	B767-300
Korean Air	KE905	13:25	13:56	FRANKFURT	21	B747-400
Air China	CA144	13:40	13:58	YANJI	102	B737-800
Asiana Airlines	OZ521	13:35	14:01	LONDON	40	B777-200ER
Korean Air	KE901	13:45	14:07	PARIS	23	B747-400
Japan Airlines	JL954	14:00	14:10	TOKYO/NARITA	113	B767-300ER
Air China	CA128	14:00	14:15	QINGDAO	108	B737-800
Asiana Airlines	OZ114	14:10	14:23	OSAKA/KANSAI	32	B767-300
Asiana Airlines	OZ365	14:10	14:25	SHANGHAI/PUDONG	42	A320-200
Air Astana	KC910	14:10	14:30	ALMATY	115	B757-200
Asiana Airlines	OZ307	14:20	14:33	YANTAI	41	A320-200
Korean Air	KE725	14:25	14:37	OSAKA/KANSAI	7	A330-300
Korean Air	KE935	14:20	14:44	PRAGUE	17	A330-300
All Nippon Airways	NH908	14:30	14:48	TOKYO/NARITA	119	A320-200
Korean Air	KE839	14:50	15:03	WEIHAI	11	B737-800
Lufthansa Airlines	LH713	14:45	15:09	FRANKFURT	124	A340-600
China Southern Airlines	CZ3066	15:10	15:12	CHANGSHA/Datuopu	105	A320-200
United Airlines	UA892	15:05	15:14	SAN FRANCISCO	122	B777-200
Asiana Airlines	OZ124	15:00	15:18	NAGOYA	34	B767-300
Korean Air	KE017	15:00	15:21	LOS ANGELES	9	B747-400
Asiana Airlines	OZ367	15:15	15:27	SHANGHAI/PUDONG	46	A320-200
Shandong Airlines	SC4090	15:20	15:28	YANTAI	127	B737-300
Cathay Pacific Airways	CX411	15:15	15:31	HONG KONG	121	A330-300
Korean Air	KE627	15:20	15:35	JAKARTA	19	A330-300
Eva Air	BR169	15:20	15:37	TAIPEI	123	A330-200
Korean Air	KE641	15:55	16:14	SINGAPORE	15	B777-300
China Eastern Airlines	MU560	16:10	16:16	QINGDAO	117	A320-200
Asiana Airlines	OZ751	16:00	16:19	SINGAPORE	39	A330-300
Asiana Airlines	OZ134	16:00	16:25	FUKUOKA	32	B767-300
China Eastern Airlines	MU5034	16:20	16:33	SHANGHAI/PUDONG	118	A321-200
Shandong Airlines	SC4082	16:30	16:37	QINGDAO	128	B737-300
Asiana Airlines	OZ202	16:30	16:51	LOS ANGELES	43	B747-400
Asiana Airlines	OZ214	16:45	16:57	SAN FRANCISCO	41	B777-200ER
Korean Air	KE023	16:50	17:04	SAN FRANCISCO	8	B777-200ER
Korean Air	KE671	16:50	17:07	KUALA LUMPUR	26	A330-300
Vladivostok Airlines	XF802	15:45	17:09	KHABAROVSK	114	Tupolev Tu-154M
Asiana Airlines	OZ106	17:10	17:28	TOKYO/NARITA	37	B767-300
Korean Air	KE629	17:15	17:38	DENPASAR	22	A330-300

Thai Airways International	TG635	17:30	17:42	BANGKOK	121	B777-300
Air China	CA136	17:25	17:43	DALIAN	103	B737-800
China Eastern Airlines	MU580	17:25	17:46	NANJING	126	A320-200
Singapore Airlines	SQ016	17:40	17:52	SAN FRANCISCO	123	B777-312ER
Korean Air	KE651	17:20	17:55	BANGKOK	10	B777-300
Korean Air	KE957	17:40	17:59	TEL AVIV	24	B747-400
Korean Air	KE763	17:55	18:12	NIIGATA	16	B737-900
Korean Air	KE687	17:55	18:14	SIEMREAP	23	B737-800
Japan Airlines	JL984	18:00	18:18	NAGOYA	114	B767-300ER
Asiana Airlines	OZ272	18:00	18:21	SEATTLE	40	B777-200ER
Delta Air Lines	DL092	18:05	18:23	ATLANTA	113	B777-200ER
Air China	CA126	18:10	18:25	BEIJING	102	B737-800
Japan Airlines	JL964	18:00	18:27	OSAKA/KANSAI	112	B767-300ER
Korean Air	KE747	18:25	18:30	OKAYAMA	20	B737-900
Korean Air	KE781	18:25	18:32	FUKUOKA	9	B777-200ER
Singapore Airlines	SQ018	18:15	18:35	VANCOUVER	122	B777-212ER
Korean Air	KE019	18:20	18:38	SEATTLE	17	B777-200ER
Korean Air	KE705	18:40	18:53	TOKYO/NARITA	6	B747-400
All Nippon Airways	NH942	18:55	18:56	NAGOYA	117	A320-200
China Southern Airlines	CZ684	18:50	18:59	HARBIN	108	A320-200
China Southern Airlines	CZ370	18:45	19:01	SHANGHAI/PUDONG	110	B737-800
Korean Air	KE751	18:50	19:03	NAGOYA	10	B747-400
Korean Air	KE681	18:45	19:03	HO CHI MINH	30	A330-300
Korean Air	KE853	18:55	19:06	BEIJING	19	B777-200ER
Korean Air	KE689	18:50	19:09	PHNOM PENH	34	B737-800
Korean Air	KE895	19:05	19:11	SHANGHAI/PUDONG	18	B737-900
Air Canada	AC064	18:45	19:14	VANCOUVER	119	B767-300ER
Korean Air	KE129	19:05	19:16	AUCKLAND	8	B777-200ER
Asiana Airlines	OZ116	19:10	19:20	OSAKA/KANSAI	35	B767-300
Asiana Airlines	OZ741	18:20	19:20	BANGKOK	47	A330-300
Korean Air	KE121	19:10	19:24	SYDNEY	21	B747-400
Eva Air	BR159	19:20	19:27	TAIPEI	125	A330-200
Korean Air	KE721	19:05	19:28	OSAKA/KANSAI	24	B747-400
Korean Air	KE1411	19:20	19:31	DAEGU	3	B737-900
Asiana Airlines	OZ737	19:15	19:32	SIEMREAP	38	A321-100
Asiana Airlines	OZ108	18:50	19:35	TOKYO/NARITA	48	B777-200ER
Asiana Airlines	OZ739	19:15	19:37	PHNOM PENH	42	A320-200
Asiana Airlines	OZ8533	19:30	19:41	BUSAN	2	A320-200
Korean Air	KE679	19:25	19:43	HANOI	28	A330-300
Korean Air	KE123	19:35	19:49	BRISBANE	23	A330-300
Asiana Airlines	OZ733	19:35	19:51	HANOI	36	B767-300
China Southern Airlines	CZ672	19:40	19:53	SHENYANG	104	A319-100
Korean Air	KE637	19:40	19:55	PHUKET	26	A330-300
Cathay Pacific Airways	CX419	19:45	19:58	HONG KONG	123	A330-300
Korean Air	KE137	19:20	20:00	NADI	12	A330-200
Singapore Airlines	SQ015	19:25	20:00	SINGAPORE	124	B777-312ER
Korean Air	KE867	19:50	20:03	ULAANBAATAR	17	A330-300
Asiana Airlines	OZ723	19:45	20:07	HONG KONG	46	B747-400
Asiana Airlines	OZ601	19:50	20:07	SYDNEY	49	B777-200ER
Asiana Airlines	OZ767	19:40	20:10	DELHI	43	A330-300
Mandarin Airlines	AE961	20:05	20:15	KAOHSIUNG	105	Embraer E-190
Korean Air	KE623	20:00	20:18	MANILA	22	A330-200
Asiana Airlines	OZ222	20:00	20:21	NEWYORK	41	B747-400
Asiana Airlines	OZ703	19:45	20:21	MANILA	50	A321-100
Korean Air	KE607	20:00	20:23	HONG KONG	9	B777-300
Asiana Airlines	OZ603	20:10	20:25	SAIPAN	31	B767-300
Asiana Airlines	OZ321	20:20	20:26	CHANGSHA/Datuopu	47	A321-100
Korean Air	KE051	20:00	20:28	HONOLULU	6	B747-400
Philippine Airlines	PR469	20:20	20:29	MANILA	121	A330-300
Asiana Airlines	OZ357	20:20	20:31	CHONGQING	37	A320-200
Korean Air	KE653	20:10	20:33	BANGKOK	14	B777-300
Korean Air	KE1405	20:05	20:35	BUSAN	1	B737-900
Asiana Airlines	OZ731	20:10	20:36	HO CHI MINH	45	B747-400
Korean Air	KE011	19:30	20:37	LOS ANGELES	7	B747-400
Asiana Airlines	OZ709	20:20	20:38	CEBU	30	A321-100
Korean Air	KE085	19:30	20:39	NEWYORK	15	B747-400
Asiana Airlines	OZ204	20:00	20:41	LOS ANGELES	39	B777-200ER
Asiana Airlines	OZ707	20:45	20:52	CLARK FIELD	32	A321-100
Asiana Airlines	OZ747	20:55	20:57	PHUKET	34	B767-300
Qatar Airways	QR821	21:00	21:01	DOHA	113	A330-200
Korean Air	KE631	21:00	21:06	CEBU	11	B737-900
Thai Airways International	TG657	21:15	21:26	BANGKOK	122	A330-300
Korean Air	KE073	20:55	21:40	TORONTO	27	B747-400
China Southern Airlines	CZ676	21:45	21:42	DALIAN	109	A321-200
Cebu Pacific Air	5J195	21:35	21:44	MANILA	117	A320-200
Korean Air	KE111	21:30	21:46	GUAM	19	B777-200ER
Korean Air	KE881	21:35	21:51	WUHAN	16	B737-800
Philippine Airlines	PR489	21:50	21:54	CEBU	124	A320-200
China Eastern Airlines	MU2004	22:00	22:03	KUNMING	127	A320-200
China Eastern Airlines	MU2040	22:00	22:13	SANYA	128	A320-200
Cebu Pacific Air	5J129	22:05	22:16	CEBU	119	A320-200
Asiana Airlines	OZ6075	23:00	23:10	KOROR	41	A321-100
Emirates	EK323	23:55	23:50	DUBAI	111	B777-300ER