**China**

# Shanghai Pudong International Airport Construction Project

**Report:** December, 2001
**Field Survey:** August, 2001

## 1. Project Profile and Japan's ODA Loan


Site Map: Shanghai

Site Photo: Shanghai Pudong International Airport

### 1.1 Background

It was expected that the annual volume of aerial transportation in China would rapidly increase to reach 100 million passengers and 2 million tons of Cargo by 2000 (the number of passengers was 51 million and the volume of cargo was 1.01 million tons in 1995). To prepare for this increased demand, the Chinese government planned to develop 41 major airports, including this project, and to expand the radar control system through the Ninth Five-Year Plan.


Shanghai City, in which traffic volume in 1995 reached 11.08 million in passengers (the third highest in China) and 370,000 tons in cargo (the second highest), was regarded as a center city for aerial transportation in China. It was expected that further economic development in the Pudong New Area, the location of this project, would increase the annual volume of aerial transportation in 2005 to 33 million in passengers and 1.2 million tons in cargo.

Although the current Hongqiao Airport had just seen completion of construction for expansion in 1996, it already faced more demands than its capacity could accommodate. In addition, further expansion was considered difficult since it is located in an area of dense population.[1] Thus, in order to respond to the increasing aerial demand in the Shanghai District, it became necessary by this project to construct a new airport, mainly for international services, in the Pudong District.

### 1.2 Objectives

To respond to the increasing aerial demand in Shanghai City, this project is to construct a new airport, apart from the current Hongqiao Airport, in the Pudong District mainly for international services (first phase).

[1] The Ninth Five-Year Plan includes the improvement of Hongqiao Airport and the construction of Pudong Airport.

### 1.3 Project Scope

Construction of an airport in Shanghai, Pudong District equipped with a runway (4,000m x 1), apron (34 spots), passenger terminal building (200,000 $m^2$), cargo terminal building (65,000$m^2$), other facilities related to the project and relevant works (utility facilities and vehicles). The ODA loan was to cover the total amount of the foreign currency portion of the project costs.

### 1.4 Borrower / Executing Agency

Ministry of Foreign Trade and Economic Co-operation of the People's Republic of China／Shanghai Municipal People's Government

### 1.5 Outline of Loan Agreement

| | |
|---|---|
| Loan Amount<br>Loan Disbursed Amount | 40,000 million yen<br>38,152 million yen |
| Date of Exchange of Notes<br>Date of Loan Agreement | September, 1997<br>September, 1997 |
| Terms and Conditions<br>Interest Rate<br>Repayment Period (Grace Period)<br>Procurement | <br>2.3%<br>30 years（10 years）<br>General untied |
| Final Disbursement Date | September, 2002 |

## 2. Results and Evaluation

### 2.1 Relevance

This project is one of the major airports targeted for development by the Ninth Five-Year Plan. At appraisal, it was reckoned that the economy of Shanghai City, mainly through the development of the Pudong District, would annually grow 10 to 12% in 5 years between 1996 and 2000. Accordingly, passenger transportation was estimated to increase by double of that of 1995 in 2000 and by triple of that of 1995 in 2005. Due to the difficulty expected in the further expansion of the already overloaded Hongqiao Airport, a plan for new airport construction was appropriate. In addition, since the City of Shanghai was planning at the time of field survey to establish the status of a hub airport in the Asian-Pacific region through Pudong International Airport as well as Hongqiao Airport,[2] the objectives of this project still coincide with development plan and policies of Shanghai City.

### 2.2 Efficiency

Despite a tight schedule, which aimed for completion in the 50th Year Anniversary of the national founding day of the People's Republic of China, this project was implemented on schedule and was completed in September 1999. According to the regulations of the Civil Aviation Authority of China, one-year test operation was implemented until August 2000. Full-scale operation was started from September 2000.

The project scope, which had been 200,000 $m^2$ at appraisal, was expanded to 280,000 $m^2$. Refuse disposal facilities (incinerators) had originally been supposed to be made with local currency, but were included in the ODA loan portion after revision of the project scope. Consulting services were planned when appraisal was made,[3] and during the process of project implementation, three types—(1) services related to the procurement of a batch of testing equipment of Pudong International Airport low current

[2] Quoted from the 'Report on the outline of the Tenth Five-Year Economic and Social Development Plan for (Draft)' made by the Mayor of Shanghai at the 4th plenary session of the 11th People's Congress of Shanghai on 7 February 2001. At the time of field survey, the second phase of Pudong Airport had already commenced by the rehabilitation of runway, which was estimated to be complete by 2004. The construction of the terminal building is planned to start in 2004. The completion of the second phase of construction is expected to be 2007 to 2008.

[3] In appraising, the following were planned: (1) baggage handling system, (2) airline information network, and (3) advice on large-scale air-conditioning.

systems, (2) services related to lighting blind-landing system, and (3) services related to the training for airport administrative staff —were done on the basis of a more concrete necessity.

As regards the cost of the project, the disbursed amount of the foreign currency loan was within the approved amount of the loan as of July 2001. The local currency portion overran by 54 million RMB (820 million yen) at the time of field survey. There was a slight redefinition in scope and thereby a cost overrun in the local currency part of the project. Nonetheless, the project was largely implemented according to the initial plan; thus it can be evaluated that the efficiency of implementation was high.

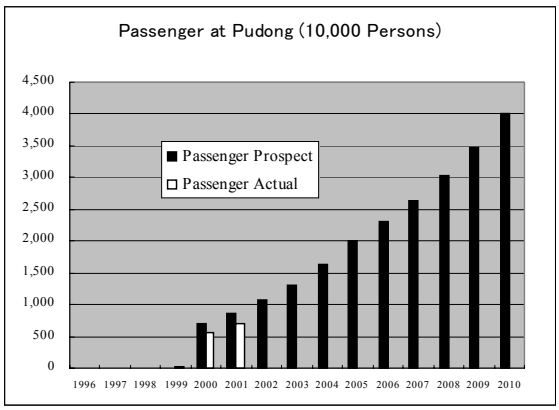
**2.3 Effectiveness**

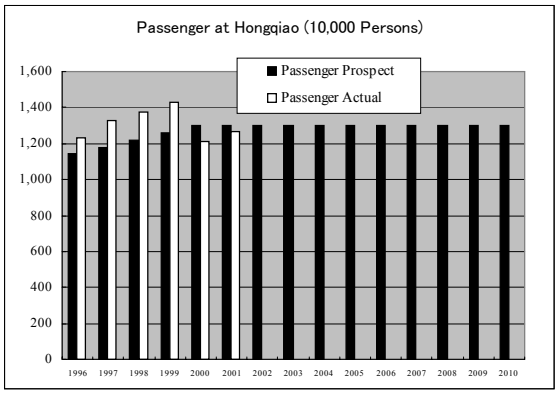
Here it is evaluated how much 'the response to increasing aerial demand in Shanghai'—the objectives of this project—was achieved.

1) Number of Passengers

Figure 1 compares the prospective number of passengers at appraisal and the actual number up to 2001 at Shanghai's Pudong and Hongqiao airports. At appraisal, the prospective number of passengers in both airports in 2000 was 7 million and 13 million respectively, and 20 million, in total. On the contrary, the actual number in the same year was 5.55 million and 12.14 million, respectively, and 17.69 million, in total – 88% of the prospective number at appraisal.[4] The actual number is lower than the prospective at appraisal. Constraining factors which discouraged the increase in passenger numbers can be pointed out as follows: (1) Hongqiao Airport had been dealing over capacity (annually a maximum 9.6 million passengers due to constraints in its design) at and after appraisal, (2) Pudong Airport operated on a tentative basis before full-scale operation began in September 2000, and (3) access to Pudong Airport was inconvenient. However, since the increase in passenger numbers was more than 20% in 2000—the year after the opening of Pudong Airport—the demand is expected to increase.

**Figure 1：Comparison of Prospective and Actual Number of Passengers at Pudong and Hongqiao Airports (Unit: 10,000 Passengers)**




Source: The prospective number was calculated from an appraisal document. The actual number was from Shanghai Airport Group Company.

Note: The actual number in 2001 was calculated by doubling the actual number of the first half-year.

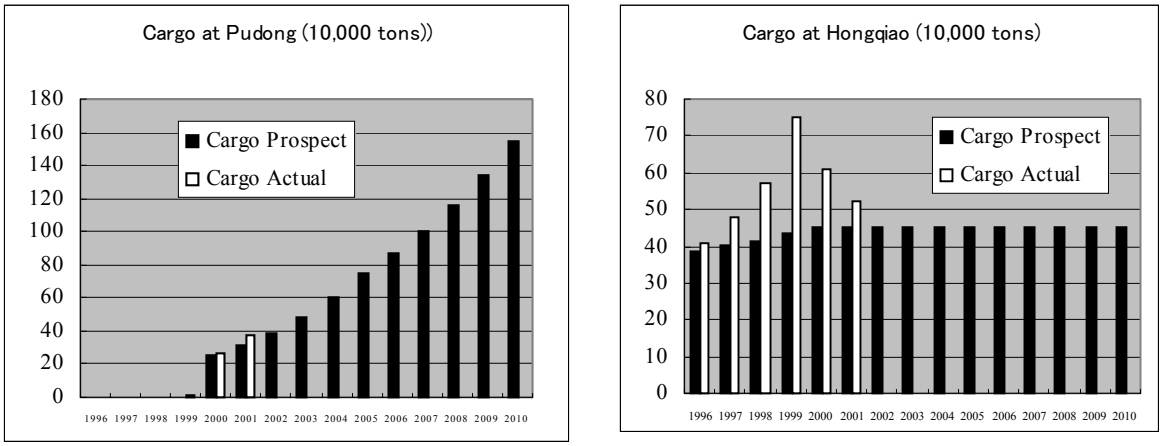
2) Cargo Volume

Figure 2 compares the prospective volume at appraisal and the actual volume up to 2001 in Pudong and Hongqiao airports. According to appraisal, the prospective volume of both airports in 2000 was 250,000

[4] Of 5.55 million passengers in Pudong Airport in 2000, 1.85 million passengers were using international services and 3.7 million were using domestic services. By contrast, of 12.14 million passengers in Hongqiao Airport 4.66 million passengers were using international services and 7.48 million were using domestic services.

tons and 450,000 tons respectively, and 700,000 tons in total. The actual volume has already exceeded the prospective—270,000 tons and 610,000 tons, respectively, and 880,000 tons in total. The growth rate was high in 1999 and 2000, showing a year-on-year increase by 34% and 24% respectively in total.. The cargo volume of Hongqiao Airport decreased from 750,000 tons in 1999 to 610,000 tons in 2000; it seems that cargo is shifting to Pudong Airport and that the volume of cargo in Pudong Airport is likely to increase.

**Figure 2：Comparison of Prospective and Actual Volume of Cargo at Pudong and Hongqiao Airports**



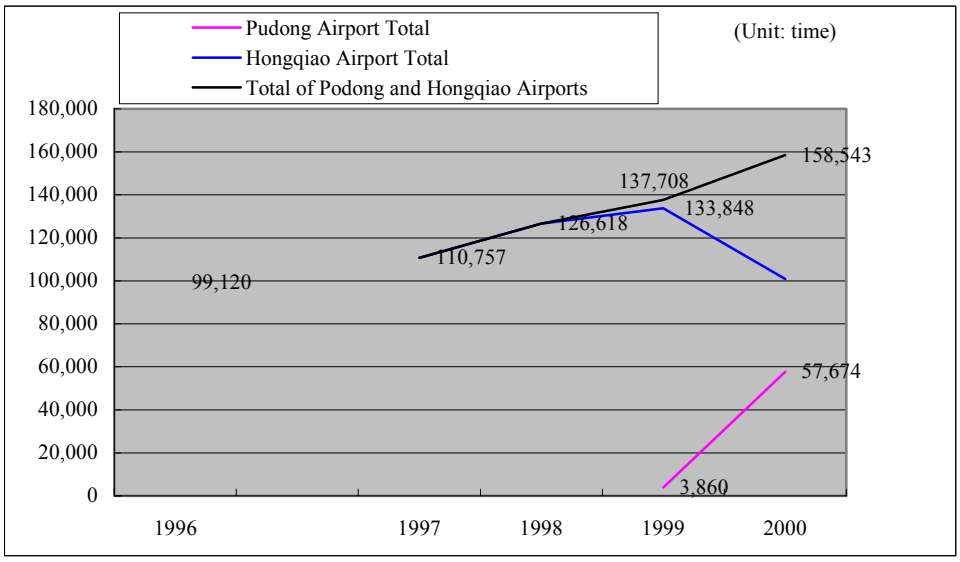

Source: Prospective volume is calculated from an appraisal document and actual volume was from Shanghai Airport Group Company.

Note: The actual volume in 2001 was calculated by doubling the actual number of the first half-year.

3) The Number of Craft Taking-off and Landing

The figure below explains the number of craft taking-off and landing at Pudong and Hongqiao airports. The number of craft taking-off and landing at both airports increases more than 10% at an annual average, illustrating more frequent taking-off and landing. In 2000, although the number of craft taking-off and landing at Hongqiao Airport decreased due to the opening of Pudong Airport, the number at both airports together increased considerably from the previous year due to the increase in the number at Pudong Airport.

**Figure 3 : Trends in the Number of Craft Taking-off and Landing at Pudong and Hongqiao Airports**




Source: Shanghai Airport Group Company

4) Financial Internal Return Rate

At appraisal, the financial internal return rate (FIRR) of this project was calculated at 5.3% by using service charges for taking-off and landing and passenger charges as benefits. After recalculation with the consideration of actual operation during the two years from opening, it actually turned out to be 4.7%. However, the gap from the initial prospect is minor; and this is considered an acceptable level.

Preconditions
Project life: 22 years after completion
Benefit: service charges for taking-off and landing, passenger charges for passing through the airport, ground service charges.
Costs: initial investments, maintenance and tax

5) Economic Internal Return Rate

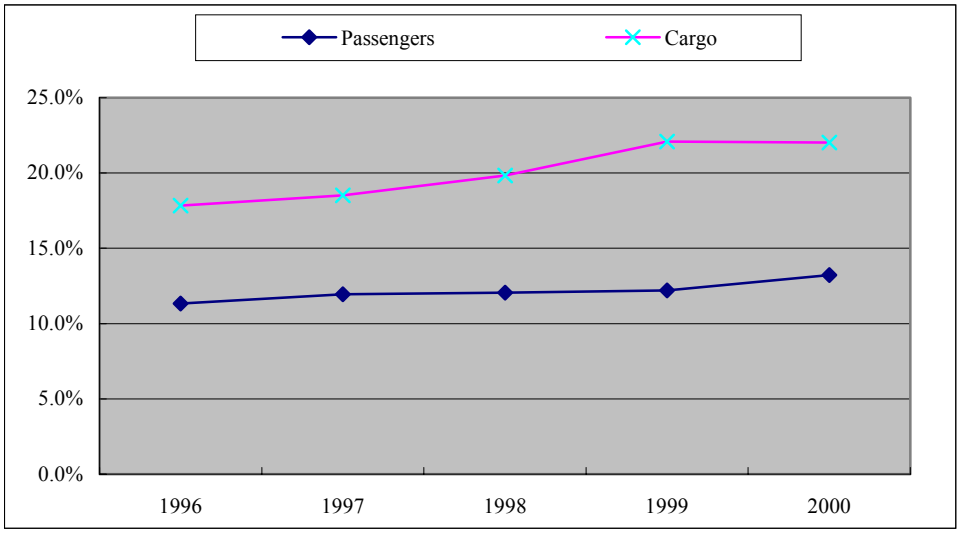
According to the feasibility study (F/S) carried out by the Chinese counterpart, the economic internal return rate (EIRR) of this project was calculated at 14.6% by identifying benefits to time and cost savings for labour when alternative means of transport such as railway, waterway and road were used. In the current survey, reference material for recalculation of the EIRR was not obtained from the Chinese counterparts, and so recalculation has not been made.

**2.4 Impact**

1) Response to Aerial Transportation Demand

Figure 4 shows the share of transportation volume at Pudong and Hongqiao airports to that of all civil airports in China. It explains that the two airports occupy a big share—20 % of cargo volume and 10 % of passengers—and that their share is still slightly increasing. In terms of the establishment of bases for aerial transportation in China's internationalization, this project exactly matches the increasing demand in aerial transportation.

**Figure 4：Share of Pudong and Hongqiao Airports in the Chinese Civil Airports**




Source: Evaluating Civil Aviation through statistics.

2) Growth Rate in Shanghai City and the Pudong New Area

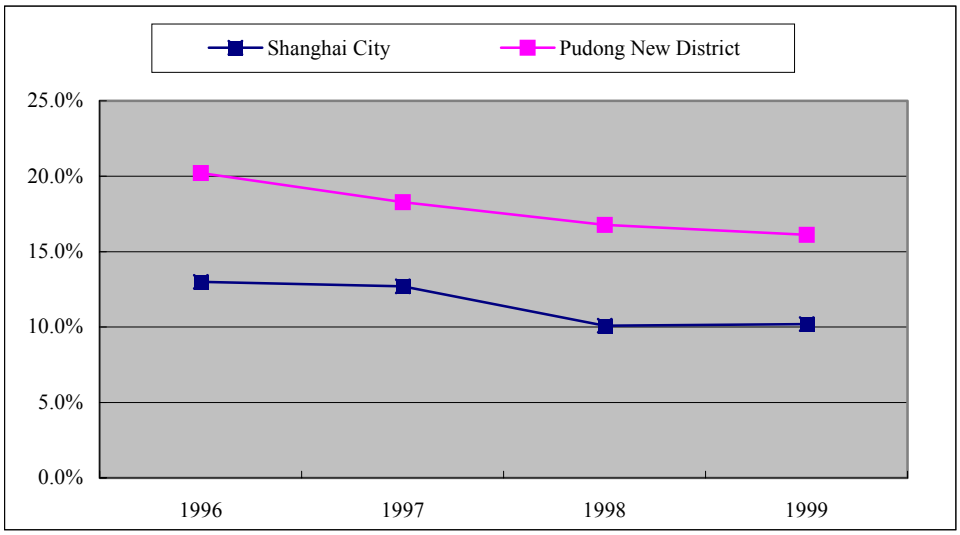
At appraisal, it was estimated that the economy of the whole of Shanghai City—mainly the development of Pudong New Area—would grow 10 to 12% annually between 1996 and 2000. The development of the Pudong New Area, driven by investments by foreign companies, was promoted as a model for China's reform and open door policies. It was decided to install infrastructures such as a new airport and a loop road connected to the city center.

The annual growth rate of Shanghai City and the Pudong New Area in Shanghai City is shown in Figure 5. Despite a slight decline in 1998 and 1999, annually 10 to 13% of the growth rate was achieved during the past four successive years. Among industries, the third industries grew rapidly. Since the construction plan for the linear motor car has suddenly emerged, the underground system connecting the new airport to the city center does not yet operate. Thus, access to the city is inconvenient, compared with the current Hongqiao Airport.[5] Nonetheless, Pudong New Area, in which Pudong Airport lies, records a high economic growth rate—annually 16 to 20%. Furthermore, it is expected that the installation of aerial infrastructure will contribute to further growth in the district. At field survey, the construction of the linear motor car system had already commenced in order to improve access from the city center to Pudong Airport.[6]

[5] At the time of the field survey, Pudong Airport is 40 to 45 km away from the city center, taking approximately one hour, and costing 30 Yuan by shuttle bus and 110 to 150 Yuan by taxi. Hongqiao Airport was 18 to 20km away from city center, taking 20 minutes, and costing 40 to 60 Yuan by taxi.

[6] Construction to connect the 30km from Longyanglu Station of the Second Line of the underground to Pudong Airport with 7 minute non-stop services. Construction had already begun at field survey. Experimental operation was planned to start from June 2002, single-track operation from early 2003, and full-scale operation from the end of 2003. In addition, construction extending the Second Line of the underground is also planned.

**Figure 5 : Annual Economic Growth Rate in Shanghai City and the Pudong New District (Actual Base)**




Source: Shanghai Statistics Yearbook, Statistics Yearbook for Shanghai Pudong New District

3) Resident Resettlement and Environmental Impacts

At appraisal, 5,000 households and 15,500 residents had already been resettled for the implementation of this project. As regards measures for resettlement, alternative accommodation and compensation were offered. In addition, vocational guidance was also provided according to necessity.

As for environmental issue, monitoring was implemented at the facilities for noise, sewage and refuse disposal in August 2000, but no problems were reported. As regards noise reduction measures, taking-off and landing were limited at night in consideration for residential areas. Drains were pumped out and waste disposed firstly by the airport's sewage disposal facility and secondly by a sewage disposal facility in Shanghai City. It was confirmed that the level of air pollution caused by the boiler of the refuse disposal facility achieved the government standard for air pollutant exhausts. The specifications of the incinerator also fulfilled the technical requirements for environmental protection products.

The airport is located in a transit area for migratory birds; therefore a measure to plant reeds and create an alternative transit area 11km away for birds was taken. This area was maintained as an environmental sanctuary by Shanghai Environment Protection Bureau; environmental maintenance and bird protection measures were simultaneously promoted. So far, there have been no reports of damage on safe flights due to collision of birds.

**2.5 Sustainability**

1) Maintenance System

In appraising, the operation and maintenance (O&M) after completion of this project were supposed to be carried out by the Shanghai Pudong International Airport Corporation. Currently, O&M is managed by the Shanghai International Airports Company Ltd. (Shanghai Guoji Jichang Gufeng Gongsi in Chinese), Operation and Management Company under Shanghai Airport Group Corporation Ltd., and Construction and Development Company under Shanghai Airport Group Corporation Ltd. (Shanghai Airport Group Corporation is their umbrella company). Shanghai International Airports Company Ltd. and Shanghai International Airport Company Ltd. were in charge of daily maintenance and small-scale repairs of the facilities. Repairs of the facilities will be put out to bidding if the guarantee period of the facilities expires. Maintenance Company, and Construction and Development Company under Shanghai Airport Group Corporation Ltd. are in charge of preplanned large and medium-scale maintenance and repairs on an out-sourcing basis. No problems in maintenance issues have been pointed out so far.

Since the airport had just opened, the response to beneficiaries' needs was gradually being considered by listening to the voices of the beneficiaries. In June 2000, the airport authority conducted a passengers' survey to measure satisfaction with the airport services offered by Pudong Airport. According to this survey, 88.5% of passengers answered 'satisfactory' or 'moderate.' Using this survey, problems such as the necessary improvement of drinking facilities, were swiftly redressed by the airport as much as possible.[7]

2) Finance

Table 6 is the balance sheet and profit and loss statement for the past four years of Shanghai International Airports Company Ltd., which maintains the airport. Table 6 also explains the actual revenue and expense records by item at Pudong Airport. Despite limits in the availability of analytical data due to the fact that the airport has only recently opened, it can be evaluated that, judging from the financial conditions in 2000, management stability, short-term solvency and profitability are fair, and that, as long as the current situation is maintained, there will be no critical concerns about sustainability and self-sufficient development.

**Table 6 : Balance Account Sheet and Statement of Profit and Loss of Shanghai International Airports Company Ltd.**

Unit: Million Yuan

Balance Sheet

| | 1997 | 1998 | 1999 | 2000 |
|---|---|---|---|---|
| Current Assets | 345 | 1,076 | 924 | 2,274 |
| Long-term Investment | 0 | 1,400 | 1,400 | 23 |
| Fixed Assets | 580 | 911 | 1,693 | 4,887 |
| Intangible Assets and Other Assets | 132 | 127 | 125 | 466 |
| Total Assets | 1,056 | 3,513 | 4,142 | 7,650 |
| | | | | |
| Current Liability | 137 | 179 | 217 | 2,244 |
| Long-term Liability | 22 | 16 | 14 | 1,050 |
| Capital | 897 | 3,318 | 3,912 | 4,356 |
| Total of Liability and Capital | 1,056 | 3,513 | 4,142 | 7,650 |

Source: Shanghai International Airport Company Ltd.

Note: Data from 1997 fiscal year to 1998 fiscal year refers to that of Shanghai Hongqiao International Airport Company Ltd..

Data of 1999 fiscal year is that of Pudong Airport as well as Shanghai Hongqiao International Airport Company Ltd..

Unit: million yuan

Profit-and Loss Statement

| | 1998 | 1999 | 2000 |
|---|---|---|---|
| Major Operating Revenues | 635 | 748 | 868 |
| Major Operating Expenses and Taxes | 136 | 153 | 357 |
| Profit from Major Operating Activities | 500 | 596 | 511 |
| Other Revenues | 89 | 140 | 146 |
| Other Expenses | 35 | 72 | 96 |
| Operating Profits | 554 | 663 | 561 |
| Non-Operating Revenues | 94 | 36 | 84 |
| Non-Operating Expenses | 1 | 2 | 4 |

[7] The drinking water problem arose since the Chinese requested hot water provision so that they could maintain their custom of tea-drinking. Hence, drinking fountains in the airport needed to supply hot water in addition to cool water.

| | | | |
|---|---|---|---|
| Net Profits | 647 | 698 | 642 |
| Income Tax | 97 | 104 | 97 |
| Net Profits after Tax | 550 | 594 | 545 |

Source: Shanghai International Airport Company Ltd.

Note: Data from 1997 fiscal year to 1998 fiscal year refers to that of Shanghai Hongqiao International Airport Company Ltd..

Data of 1999 fiscal year is that of Pudong Airport as well as Shanghai Hongqiao International Airport Company Ltd..

**Table 7: Revenue and Expense by Item of Pudong Airport**
**(Including Data of Companies other than Shanghai International Airports Company Ltd.)**

(Unit: 10,000 yuan)

| Item | 2000 | Janunary–June 2001 |
|---|---|---|
| **Revenue Item** | | |
| Service Charges for Taking-off and Landing | 3,256.70 | 2,080.71 |
| Passenger Charges for Passing through the Airport | 0.00 | 0.00 |
| Ground Service Charge | 10,314.81 | 5,476.55 |
| Aircraft Cleaning Charge | 0.00 | 0.00 |
| Transport Service Charge | 1,563.45 | 1,107.62 |
| Safety Inspection Charge | 2,165.28 | 1,502.75 |
| Specially-Equipped Vehicle Charge | 0.00 | 0.00 |
| Building Tenancy Charge | 13,617.36 | 7,551.04 |
| Advertisement Rate | 6,489.91 | 2,206.96 |
| Parking Fee | 1,1183.37 | 679.92 |
| Passenger Service Facility Charge | 10,019.83 | 7,100.82 |
| Airport Limousine Charge | 0.00 | 0.00 |
| Miscellaneous | 1,853.96 | 449.29 |
| Sub-total | 50,464.67 | 28,155.66 |
| **Expense Item** | | |
| Personnel Cost | 6,897.83 | 2,764.24 |
| Fringe-benefit Cost | 966.13 | 386.90 |
| Various Tax Expense | 2,445.61 | 1,374.48 |
| VAT | 9.00 | 37.00 |
| Income Tax | 3,139.57 | 1,188.83 |
| Other Cost | 58,488.63 | 34,627.96 |
| Sub-total | 71,946.77 | 40,379.41 |

Source: Shanghai International Airport Company Ltd.

Note: 'Other cost' includes depreciation cost, maintenance cost, contract charge for operation and maintenance, and business office charge.

## 3. Lessons Learned

None

## 4. Recommendations

None

**Comparison of Original Plan and Actual Scope**

| Item | Plan | Actual |
|---|---|---|
| ①Project Scope | | |
| (1) Air Field (landing aircraft 4E grade = equivalent to B747) | | |
| Runway | 4,000m×60m 1 lane | Same as plan |
| Taxiway | 4,000m×29m 2 lanes | |
| Apron | 34 spots | |
| Landing Area | 4,120m×300m | |
| (2) Passenger Terminal Facilities (applying passenger demand at peak time to Regulations on Civil Aviation) | | |
| Terminal Building | 200,000m$^2$ 1 sets | 280,000m$^2$ 1 sets |
| Parking Area | 130,000m$^2$ (3,400 cars) | Same as plan |
| (capacity to deal with passengers) | (20 million passengers/year) | (Same as plan) |
| (3) Cargo Terminal Facilities | | |
| Terminal Building | 65,000m$^2$ | Same as plan |
| (capacity to deal with cargo) | (750,000 tons/year) | (Same as plan) |
| (4) Utility Facilities | | |
| Telecommunications (besides those for airplanes) | information building 1,500 m$^2$, telephones 200,000 sets | Same as plan (Refuse disposal is also covered by the loan. Facility capacity is 30 tons per day.) |
| Oil Supply | oil supply 760,000 t/yr, oil reservoir 120,000 m$^3$ | |
| Water Supply | water supply 350,000 t/yr, pipe 31 km | |
| Drainage System | 3 pump sites, pipe 32 km | |
| Sewage and Water Treatment | primary disposal 200,000 t/yr (secondary disposal in city) | |
| Air conditioning | heating 50,000 kcal/h, cooling 100,000 kcal/h | |
| Power Supply | power supply 51,795kw | |
| Refuse Disposal Facilities (out of the ODA loan scope) | 220,000 t/day | |
| (5) Other Facilities and Works | | |
| Fire Fighting and Rescue | Vehicle equipment 15 sets, facility 3,567 m$^2$ | Same as plan |
| Aircraft Maintenance | 120 cars, facility 90,000 m$^2$ | |
| Road | totally approx. 1000 m | |
| (6) Land Acquisition and Resident Resettlement (out of the ODA loan scope) | | |
| | Completed 2,080 ha, 5,000 households, 15,500 residents | Same as plan |
| (7) Consulting Services | 6M/M (advice on special equipments) | Test laboratory<br>Class III consultancy<br>Airport personnel training |
| (8) Comprehensive Office Building (out of the ODA loan scope. Comprehensive Office Building was constructed as a separate project by the Civil Aviation Authority of China. Details are shown below. Lighting facility is out of the ODA loan scope although it belongs to this project.) | | |
| Control Tower | 5,000 m$^2$ | Same as plan |
| Lighting Facility (Flight Area) | every 15 m on runaway | |

| | | |
|---|---|---|
| Wireless Air Facility<br>Radar Facility<br>Communication Facility<br>Weather Facility | 2 sets of VOR/DME and 4 sets of NDB<br>ASR/SSR station of 500 $m^2$<br>VHF channel facilities<br>ILS 2 directions (Category II) | |
| ②Implementation Schedule | July, 1996～September, 1999 | July, 1996～August, 2000 |
| ③Project Cost<br>Foreign Currency<br>Local Currency<br><br>Total<br>ODA Loan Portion<br>Exchange Rate | <br>40,000 million yen<br>95,947 million yen<br>(= 7,055 million yuan)<br>135,947 million yen<br>40,000 million yen<br>1yuan＝13.6yen（1997） | <br>38,152 million yen<br>108,057 million yen<br>(= 7,109 million yuan)<br>146,209 million yen<br>38,152 million yen<br>1yuan＝15.2yen（1997） |