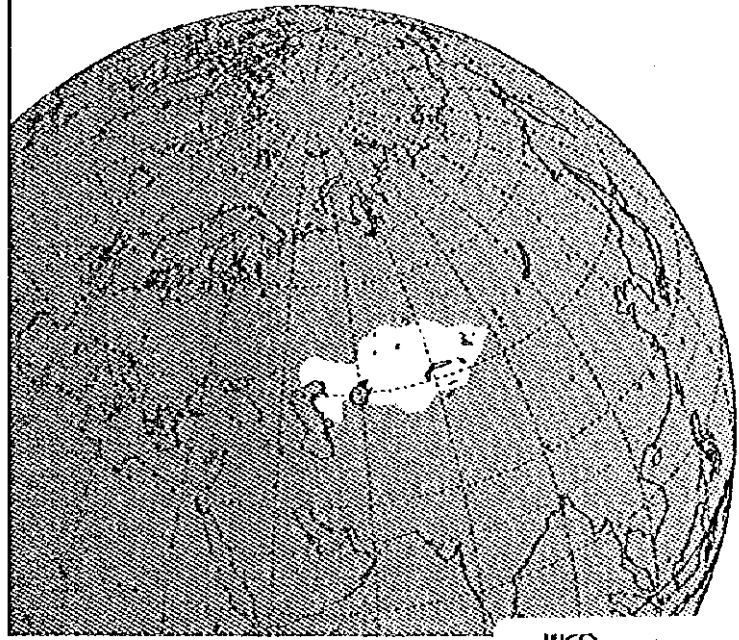


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ҚАЗАҚСТАН РЕСПУБЛИКАСЫ АҢГЛЫҚ БАҒАМДАНУ АКАДЕМИЯСЫ

THE STUDY
ON
AIR TRANSPORT DEVELOPMENT
IN
THE REPUBLIC OF KAZAKHSTAN



FINAL REPORT

Volume I : Summary

March 1997

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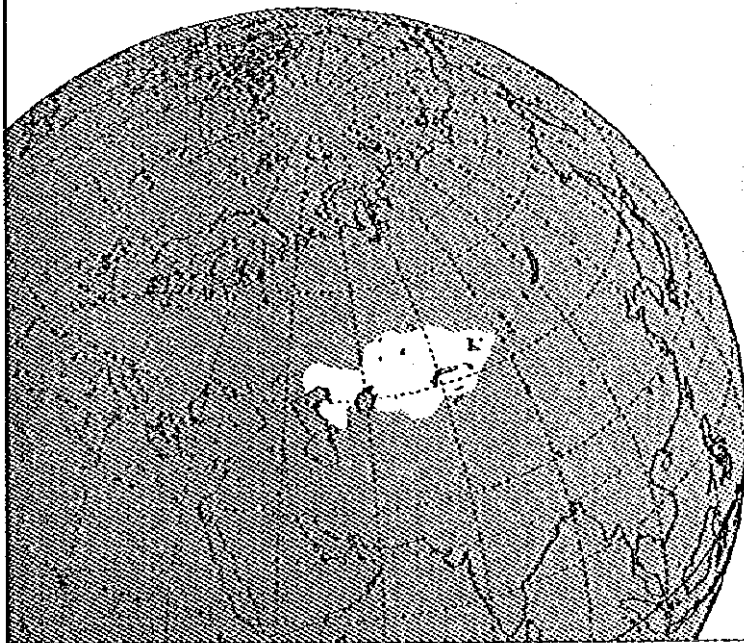
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ҚАЗАҚСТАН
РЕСПУБЛИКАСЫ
АҢГЛЫҚ БАҒАМДАНУ АКАДЕМИЯСЫ

JAPAN INTERNATIONAL COOPERATION AGENCY(JICA)

**MINISTRY OF TRANSPORT AND COMMUNICATIONS
THE REPUBLIC OF KAZAKHSTAN**

**THE STUDY
ON
AIR TRANSPORT DEVELOPMENT
IN
THE REPUBLIC OF KAZAKHSTAN**

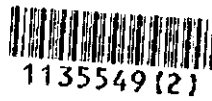


FINAL REPORT

Volume I : Summary

March 1997

PACIFIC CONSULTANTS INTERNATIONAL, TOKYO, JAPAN



NOTE

The following exchange rate was adopted throughout this report.

US\$ 1.00 = T 70.3 = Yen 113 (October 1996)

T 0.622 = Yen 1

T: Kazakhstan Tenge

PREFACE

In response to a request from the Government of the Republic of Kazakhstan, the Government of Japan decided to conduct a study on Air Transport Development and entrusted the study to the Japan International Cooperation Agency (JICA).

JICA sent to Kazakhstan a study team headed by Mr. Makoto Tanaka of Pacific Consultants International three times between March 1996 and January 1997.

The team held discussions with the officials concerned of the Government of Kazakhstan, and conducted field surveys at the study area. After the team returned to Japan, further studies were made and the present report was prepared.

I hope that this report will contribute to the promotion of the project and to the enhancement of friendly relations between our two countries.

I wish to express my sincere appreciation to the officials concerned of the Government of Kazakhstan for their close cooperation extended to the team.

March 1997

A handwritten signature in black ink, appearing to read 'Kimio Fujita', written in a cursive style.

Kimio Fujita

President

Japan International Cooperation Agency

March 1997

Mr. Kimio Fujita
President
Japan International Cooperation Agency
Tokyo, Japan

Letter of Transmittal

Dear Sir:

We are pleased to submit to you the final report on the Study on Air Transport Development in the Republic of Kazakhstan. The report contains the results of master planning for development of air transport in Kazakhstan (Target Year: 2020), feasibility study on high priority airports to be selected from the master plan (Target Year: 2005), and proposals for enhancing the management and operation of the air carrier component of the National Associated Airlines of Kazakhstan.

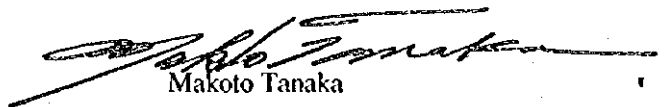
The report presents long term development master plans for the most important nine airports in Kazakhstan. The results of comparison of these airport development plans indicate that the development projects of Akmola, Almaty, Aktau, Aktyubinsk, Atyrau and Pavlodar have high priority and less problems in implementation. These six were selected for the feasibility study accordingly. The feasibility study on the development projects of the six airports indicates that the projects are technically, economically and environmentally feasible. The highest development priority of the six should be accorded to Akmola to serve the new national capital.

For developing the existing Akmola Airport to a gateway of the new capital, we recommend that the Government of Kazakhstan implement this project as a top priority.

Since the development plan premises the relocation of the national capital from Almaty to Akmola, the airport development plan should be reviewed and amended as necessary along with the actual relocation activities. Also it is recommended that all of the activities involved in the design stage of project implementation be conducted in accordance with the laws and standards of Kazakhstan, taking local conditions into account, and in full collaboration with Kazakhstan side.

We wish to take this opportunity to express our sincere gratitude to your Agency, the Ministry of Foreign Affairs, the Ministry of Transport and the Overseas Economic Cooperation Fund of Japan. We also wish to express our deep gratitude to the Ministry of Transport and Communications, Committee for Utilization of Air Space and Civil Aviation and other agencies concerned of the Republic of Kazakhstan for the close cooperation and assistance extended to us during our study.

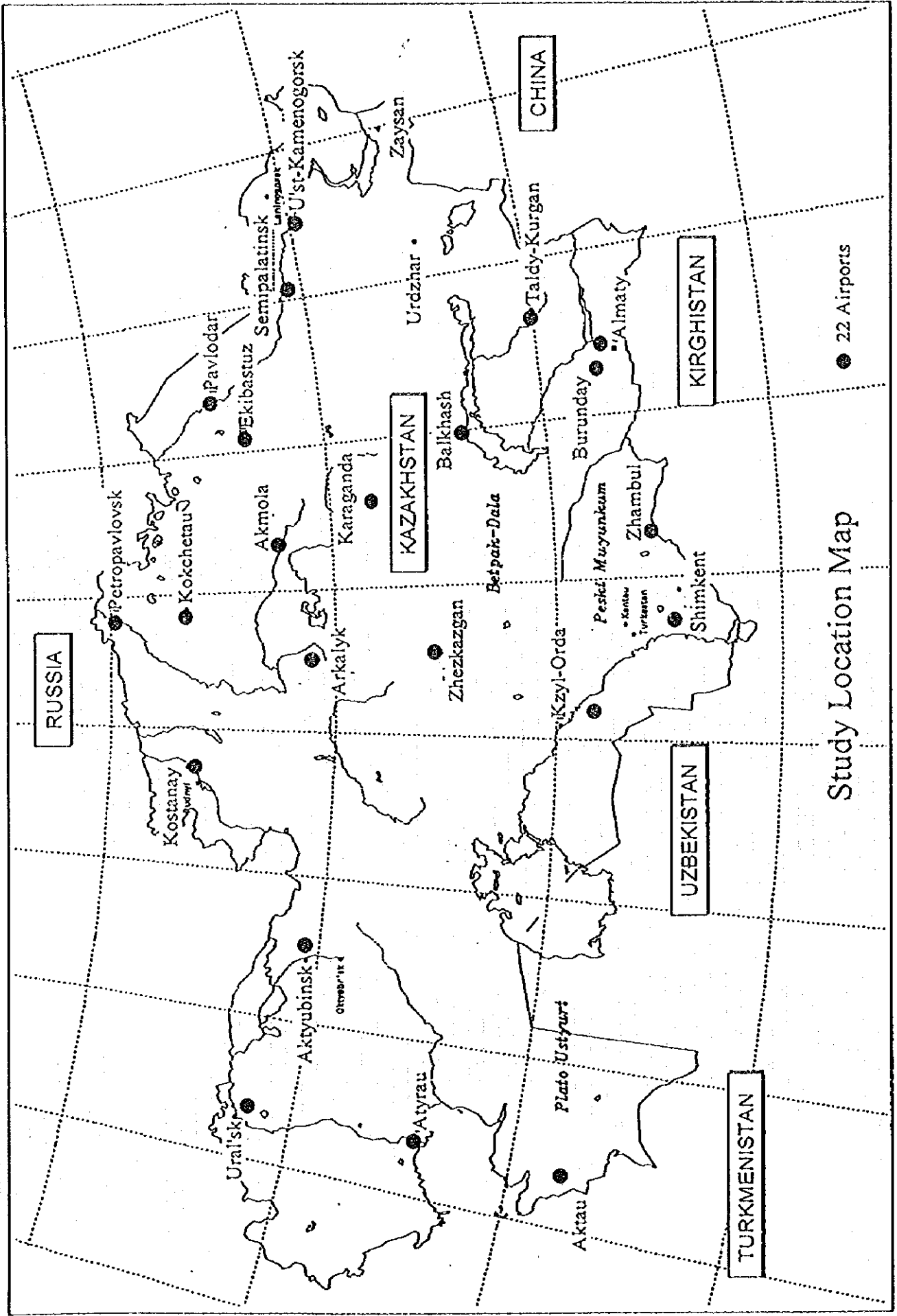
Very truly yours,

A handwritten signature in black ink, appearing to read 'Makoto Tanaka', with a long horizontal flourish extending to the right.

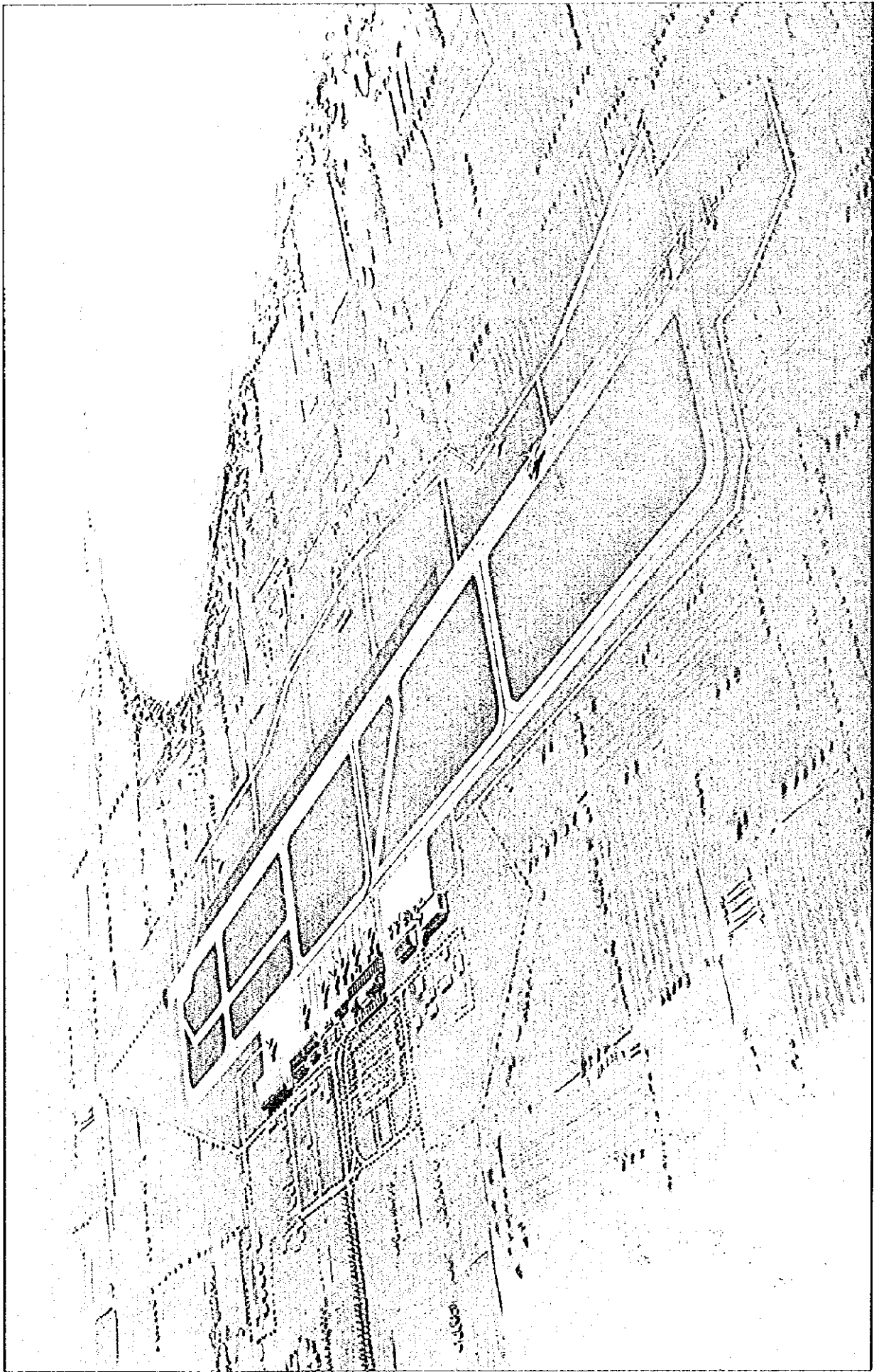
Makoto Tanaka

Team Leader

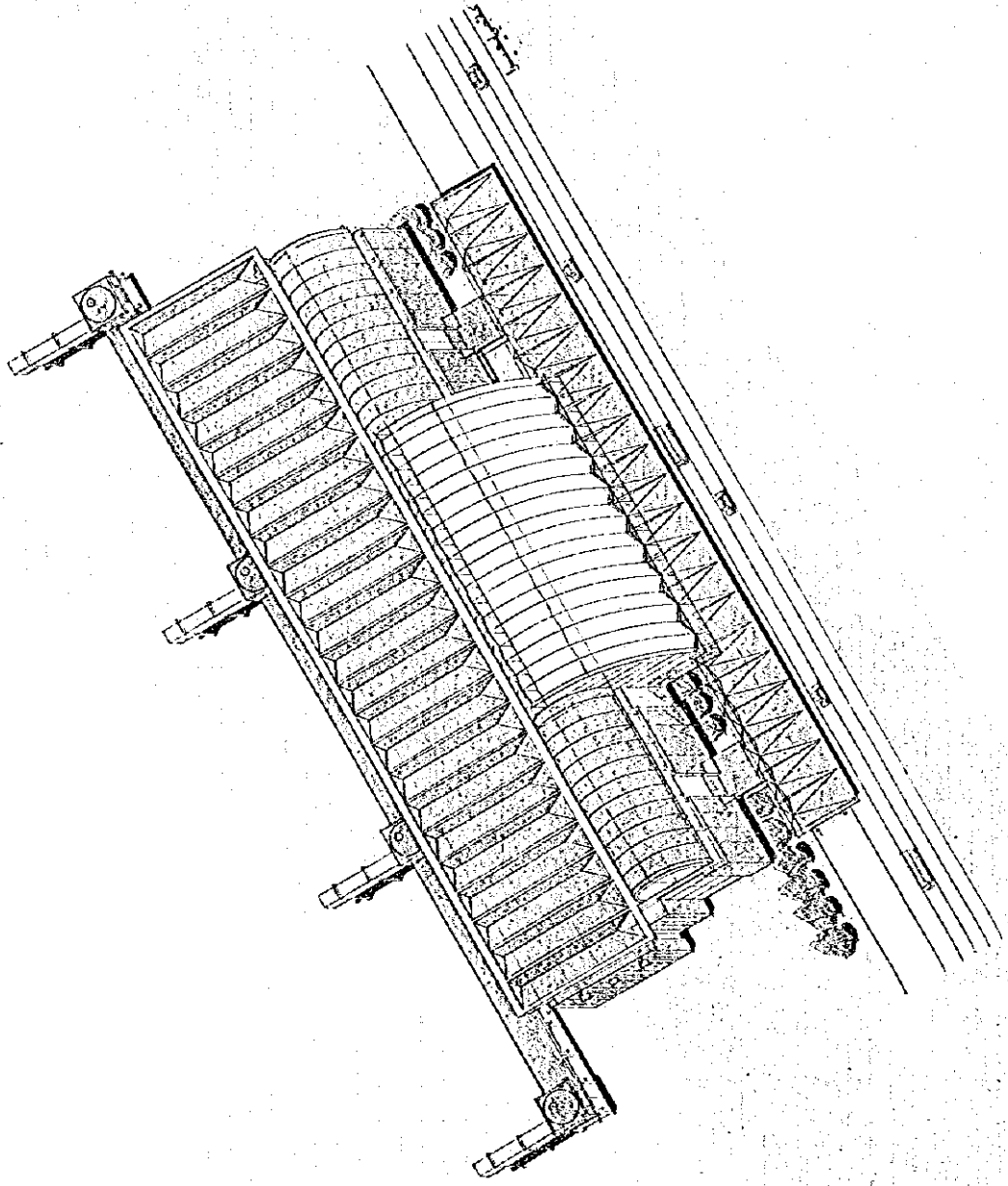
Study Team for the Air Transport Development Project



Study Location Map



Akmola International Airport Master Plan Perspective View (Target Year:2020)



Akmola International Airport Passenger Terminal Building Exterior View

**THE STUDY
ON
AIR TRANSPORT DEVELOPMENT
IN
THE REPUBLIC OF KAZAKHSTAN**

**FINAL SUMMARY REPORT
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Outline of Airports Development Project

1. PROJECT BACKGROUND

Kazakhstan is a large but sparsely populated Central Asian country which has only existed as a sovereign state since the sudden demise of the USSR in late 1991. Its economic system was an integral component of the command-control economy of the USSR. With the demise of that political entity, it had to immediately start the transition to a market-orientated system without prior experience or preparation. This soon led to major disruptions in economic activity. The transportation systems inherited from the USSR were poorly configured and generally outmoded.

The Government of Kazakhstan recognized that safe, efficient and effective transportation systems were essential to establish a viable national economy, promote international trade and maintain social harmony. To this end, it requested the Government of Japan to assist in modernizing the national air transportation system. Accordingly, The Japan International Cooperation Agency was assigned to conduct a Study on Air Transport Development in cooperation with the Government of Kazakhstan.

2. PRESENT CONDITIONS AND PROBLEMS

Due to the widespread economic disruptions after independence in 1991, the overall level of air transportation activity rapidly declined by about 80% and there have since been only limited signs of a recovery. There was a commensurate decline in revenues while the costs of providing air transportation capacity stayed the same or, in many cases, increased to levels determined by market forces. The resulting financial crises led to further degradation in the already outmoded infrastructure.

The establishment of Kazakhstan Airlines in 1993 to organize and operate the national air transportation system on a modified "Aeroflot" model was not successful and the Government undertook a series of measures to disassemble it:

- A Civil Aviation Department was established in January 1994 but has been unable to adequately fulfill its safety and economic regulatory functions, mandated under the 1995 Civil Air Law, due to a severe lack of resources.
- Since April 1994, the Atyrau subsidiary of Kazakhstan Airlines has been operated by a closed joint stock company formed by the subsidiary and the Magdenli transportation company of Turkey.
- Kaz Aeronavigation was established in June 1995 to provide airport and enroute air navigation services. While it has embarked on a modernization program, it is hampered by a lack of revenues, primarily due to the non-payment of fees by the Kazakhstan's air carriers.
- Air Kazakhstan, a new national carrier, was established in August 1996 and took control of various staff members and physical assets from Kazakhstan Airlines. It's start-up has been hampered by a lack of funding, a deteriorated asset base, the cost of high staffing levels and unregulated competition from other carriers registered in Kazakhstan.

- Almaty Airport was separated from Kazakhstan Airlines and, since August 1996, its management, operation and development has been transferred to a consortium led by the Lufthansa company of Germany.
- The Government decreed that, by September 1996, 10 additional airports were to be separated from the regional subsidiaries of Kazakhstan Airlines and reincorporated as open joint stock companies.

The Government has decided to relocate the national capital from Almaty to Akmola and has, therefore, given a high priority to the development of Akmola airport.

3. STUDY OUTLINE

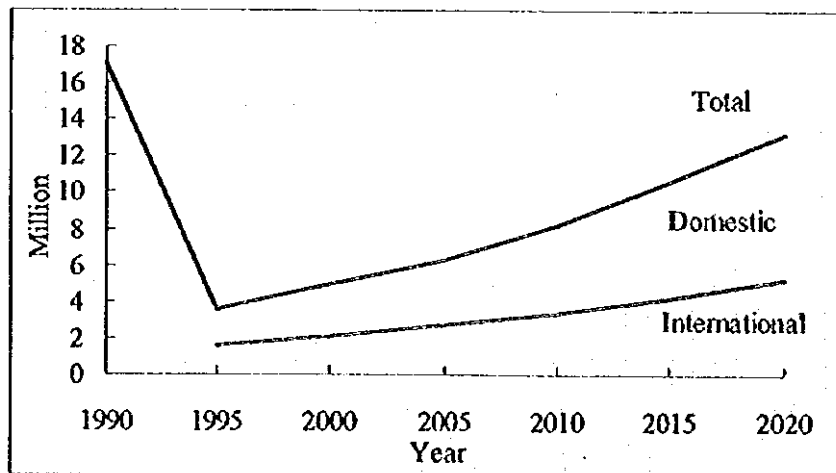
The Study consists of the following with the target years of 2005 and 2020:

- A Strategy for National Air Transport Development
- A Development Guideline for Air Traffic Control Facilities
- A National Airport Development Strategy, including guidelines for commercialization of ownership and operations
- Feasibility Studies for the Airports at Almaty, Akmola, Aktau, Atyrau, Aktyubinsk and Pavlodar.
- Recommendations for Modernizing the National Air Carrier
- A Strategy for Developing the National Air Transportation Safety and Economic Regulatory Regimes

The airport feasibility studies were made based on an assumption that the capital relocation would be completed till the year 2020, with 250 thousand population moving.

4. AIR TRAFFIC DEMAND FORECAST

Air traffic demand was forecast based on the assumed social-economic framework. In the medium growth case, the total air passenger in Kazakhstan, including international, CIS and domestic, is estimated to be 6.3 and 13 million in 2005 and 2020, respectively.



Total Air Passenger Demand (All Regions)

5. AIRPORT PROJECT COSTS

Airport Cost Item	Akmola (US\$ 1,000)	Almaty (US\$ 1,000)	Aktau (US\$ 1,000)	Aktyubinsk (US\$ 1,000)	Atyrau (US\$ 1,000)	Pavlodar (US\$ 1,000)
I Compensation	8,748	400	0	0	0	0
II Preliminary General Cost	25,779	32,144	13,198	13,488	18,473	18,591
III Construction / Installation	151,577	155,408	74,146	64,464	77,440	75,265
1 Civil Works	26,453	34,031	3,713	10,869	9,666	11,148
2 Architectural Works	48,760	56,870	19,120	14,623	19,627	16,272
3 Air Navigation Systems	26,103	32,658	20,998	22,230	20,715	20,998
4 Supporting Facilities	28,982	3,363	16,772	3,957	13,498	12,516
5 Special Equipment	7,499	14,358	6,802	6,926	6,895	7,489
6 Contingencies	13,780	14,128	6,741	5,860	7,040	6,842
IV Construction Cost	186,104	187,953	87,344	77,952	95,913	93,856
V Consulting Cost	15,158	15,541	7,415	6,446	7,744	7,526
Project Cost	201,262	203,493	94,758	84,398	103,657	101,383

6. AIRPORT PROJECT IMPLEMENTATION PROGRAM

Work Items	Year	1	2	3	4	5
1 Financial Arrangement, Loan Agreement of Project and Contract of Consultant		=====				
2 Topographic Survey and Soil Investigation		====				
3 Basic Design and Detailed Design		====	=====			
4 Land Acquisition			(=====)			
5 Pre-Qualification, Tendering and Contract for Construction			====			
6 Construction Works				=====	=====	=====
7 Test Operation and Flight Check, etc.						=

7. AIRPORT CONSTRUCTION PROGRAM

Work Items		Year	1	2	3
1	Civil Works				
1.1	Airside Facilities (Runway, Taxiway, Apron and Other Civil Works)				
1.2	Landside Facilities (Access Road, Terminal Road, Car Park and Other Civil Works)				
2	Architectural Works				
2.1	Passenger Terminal Building				
2.2	Administration Building				
2.3	Control Tower and Navigation Building				
2.4	Other Buildings				
3	Airport Utilities				
3.1	Air Navigation Systems				
3.2	Power Supply				
3.3	Air Conditioning and Heating Facility				
3.4	Sanitary Works				
4	Test Operation and Flight Check, etc.				

8. ENVIRONMENTAL IMPACT OF THE AIRPORT PROJECTS

Initial Environmental Evaluations were initially carried out at 22 airports in Kazakhstan to select items for Environmental Impact Analyses at the 6 airports selected for feasibility studies. The analyses were conducted for the following 11 items:

- Motor vehicle noise levels
- Probability of damage to residential areas due to aircraft accidents
- Bird strike hazards
- Hazards due to rising levels of the Caspian Sea
- Fauna and flora
- Ground water
- Air pollution
- Surface water pollution
- Aircraft noise levels
- Land subsidence
- Muddy water discharge during construction

The overall assessment was that the projects would have few adverse environmental impacts at the six locations provided that certain defined monitoring and preventative measures were taken. Special attention needs to be given to aircraft noise at Almaty and rising levels of the Caspian Sea at Atyrau.

9. ECONOMIC AND FINANCIAL VIABILITY AND CONCLUSION

Economic and Financial analyses were conducted for all six airport projects. The results indicated that the projects were clearly economically and financially viable for both Almaty and Akmola, but somewhat less viable for the four other airports. The continued operation of all six of these airports, however, would represent the minimum number necessary for a national air transportation network, a vital requirement for promoting economic development, international trade and social harmony. It is also reasonable to expect that the viability of all six airports would improve in step with Kazakhstan's overall development. For these reasons, it is recommended that all airports be developed as proposed. If necessary, support can be provided through soft loans from foreign Official Development Assistance programs and financial assistance from the Government.

Summary of Economic and Financial Analyses

	Akmola	Almaty	Aktau	Atyrau	Aktyubinsk	Pavlodar
economic analysis						
EIRR (%) (base case)	11.86	30.97	12.20	5.06	0.97	7.99
at the cost +10%	10.81	29.03	11.20	4.28	0.22	7.02
at the cost -10%	13.06	33.23	13.51	6.04	1.81	9.10
at the traffic +10%	12.95	33.01	13.39	5.95	1.73	9.0
at the traffic -10%	10.70	28.84	11.09	4.11	0.15	6.92
Benefit / Cost ratio at 5% discount rate	1.89	6.05	1.92	0.95	0.58	1.29
EPNV (million Tenge)						
at 5% discount rate	13,854	79,899	7,701	53	-2,493	2,743
at 10% discount rate	2,107	34,854	1343	-2,457	-3,268	-1046
at 15% discount rate	-2,163	15,646	-969	-3,076	-3,206	-2,249
financial analysis						
FIRR (%)	7.78	19.48	0.00	-4.68	-5.82	-3.23

CHAPTER 1
INTRODUCTION

CHAPTER 1 INTRODUCTION

1.1 General

The Republic of Kazakhstan is an inland country situated in the Central Asia and borders Russia, China, Kirghizstan, Turkmenistan, Uzbekistan, and the Caspian Sea. The total land area is about 2.717 million sq. km (seven times as large as Japan), and its population is approximately 17 million. Because of the size of the country, air transport is an important means of transportation in Kazakhstan.

After the independence in 1991, the Government of Kazakhstan became a full member of the international community. In order to develop the country in this new environment, the government introduced reforms to establish a market-oriented economy instead of the previous command-control economy, and to change its industrial structure from one based on producing raw materials to one producing finished goods.

The changes to the national economy require restructuring of the current transport system to enable easy and reliable access to international markets and to develop transportation capacity. Because of the topography of Kazakhstan, air transport is expected to play vital role in developing international contacts.

Most of the air transportation infrastructure of Kazakhstan is, however, too degraded and outmoded to meet the international standards of service and safety. The Government of Kazakhstan has therefore decided to develop and modernize this infrastructure and has requested the Government of Japan to conduct a study on air transport development in the Republic of Kazakhstan.

In response to a request from the Government of the Republic of Kazakhstan (hereinafter referred to as "the Government of Kazakhstan", GOK), the Government of Japan (GOJ) decided to conduct a Study for Air Transport Development in the Republic of Kazakhstan (hereinafter referred to as "the Study"), in accordance with the relevant laws and regulations in force in Japan.

The Japan International Cooperation Agency (hereinafter referred to as "JICA"), the official agency responsible for the implementation of the technical cooperation programs of the Government of Japan, was entrusted to carry out the Study in close cooperation with the concerned authorities of the Republic of Kazakhstan.

JICA dispatched a team to conduct the Study in Kazakhstan in March 1996, based on the Scope of Work and the Minutes of Meeting for the Study, agreed upon between the Government of Kazakhstan and JICA on November 8th 1995.

1.2 Objectives of the Study

The objectives of the Study were as follows:

- 1) To formulate a master plan for development of air transport in Kazakhstan, - Target Year: 2020
- 2) To conduct a feasibility study on high priority airport(s) to be selected from the master plan, - Target Year: 2005
- 3) To prepare proposals for enhancing the management and operation of the air carrier component of the National Associated Airlines of Kazakhstan
- 4) To transfer technology and knowledge to the Kazakhstan counterparts during the course of the Study.

1.3 Scope and Schedule

1.3.1 The Scope of the Study

The scope of the Study consisted of the following four major phases.

- (1) Study the existing conditions of air transport,
- (2) Formulation of strategies and a master plan for development of air transport,
- (3) Feasibility Study of selected priority project(s) and
- (4) Analyses and recommendations for modernization of the national air carrier.

The four phases consisted of twenty-nine (29) work items shown in Figure 1.1, "Basic Work Flow".

Note: In this study, capital relocation to Akmola was assumed as precondition as follows;

- by the year 2000, fifty thousand residents;
- by the year 2005, an additional hundred thousand residents and;
- by 2010, a further additional hundred thousand residents.

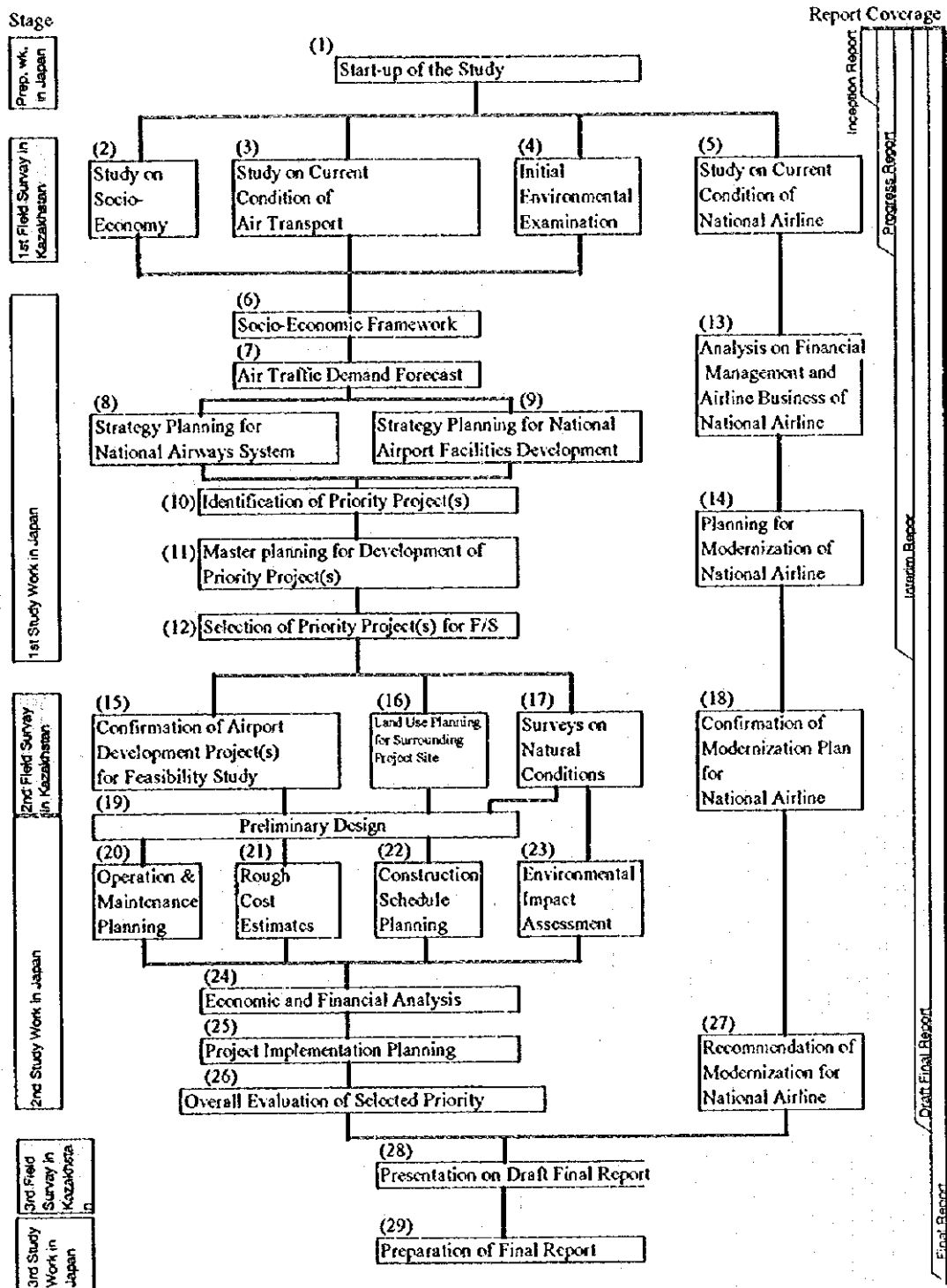


Figure 1.1 Basic Work Flow

1.3.2 Study Schedule and Submission of Reports

The Study started in middle of March, 1996 and has completed by the end of March, 1997. It was divided into seven (7) stages.

- 1) Preparatory Work in Japan - Start-up of the Study and Preparation of Inception Report
- 2) First Field Survey in Kazakhstan - Presentation of Inception Report, Study of Existing Conditions and Preparation of Progress Report
- 3) First Study Work in Japan - Air Traffic Demand Forecast, Master Plan for Air Transport Development, Analysis of National Airline and Preparation of Interim Report
- 4) Second Field Survey in Kazakhstan - Presentation of Interim Report and Surveys for Feasibility Study
- 5) Second Study Work in Japan - Feasibility Study for Priority Project(s), Improvement Plan for National Airlines and Preparation of Draft Final Report
- 6) Third Field Survey in Kazakhstan - Presentation of Draft Final Report
- 7) Third Study Work in Japan - Preparation of Final Report and completion of the Study

Figure 1.2 shows the activity and report preparation at each stage.

Year / Month	1996											1997		
	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	
Work in Kazakhstan		█					█				█			
Work in Japan	□		▬						▬			▬		
Submission of Report	↑ Inception Report		↑ Progress Report		↑ Interim Report		↑ Draft Final Report			↑ Final Report			↑ Final Report	

Figure 1.2 Study Schedule

1.4 Study Organization

The Study was carried out by the JICA Study Team under the supervision of the JICA. The Advisory Committee was organized to assist the Study Team. The Study was conducted in close coordination with concerned authorities of the Government of Kazakhstan.

The Counterpart Team was established by the Ministry of Transportation and Communications (MOTC), the counterpart agency for coordination on the Kazakhstan side, to cooperate with the Study Team.

The Steering Committee was established to organize and coordinate the work of the Kazakhstan side. The Steering Committee consisted of the following members;

- Director of Civil Aviation Department, MOTC
- President of Kazakhstan Airlines
- General Director of Kaz Aeronavigation
- Director of Kaz Aero Project
- Committee for the Utilization of Foreign Capital

The overall organizational framework is shown in Figure 1.3.

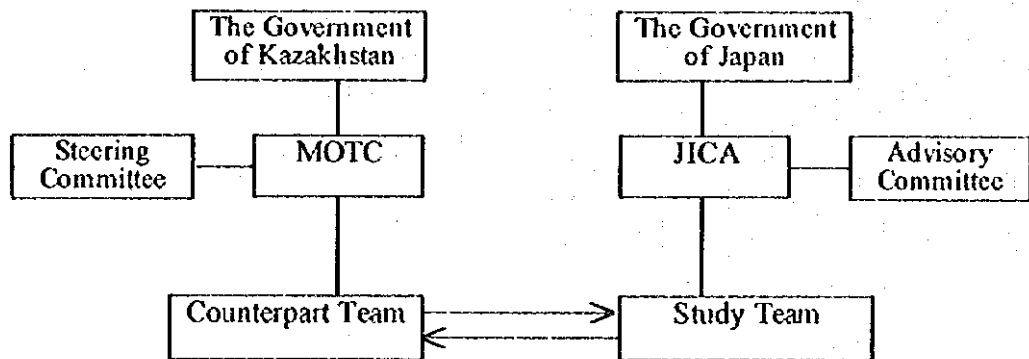


Figure 1.3 Study Organization

The members of the Japanese side and the Kazakhstan side, who were involved in the Study, appear in the following list.

(1) Japanese side

a) The Advisory Committee

- Mr. Shinji MATSUMAE : Leader / Civil Aviation Planning
Deputy Director
Construction Division
Aerodrome Department
Civil Aviation Bureau
Ministry of Transport
- Mr. Takao TAKAHASHI : Airport Facilities Planning
Special Assistant to the Director
Air Traffic Services Planning Division
Air Traffic Services Department
Civil Aviation Bureau
Ministry of Transport
- Mr. Masaki ISHII : Civil Aviation Management
Special Assistant to the Director
Construction Division
Aerodrome Department
Civil Aviation Bureau
Ministry of Transport
- Mr. Minoru Yoshida : Deputy Director
4th Division
Operations Department II
The Overseas Economic Cooperation Fund
(OECF)

b) JICA Coordinator

- Mr. Makoto ASHINO : Deputy Director
1st Social Development Study Division
Social Development Study Department
Japan International Cooperation Agency
- Mr. Toru NAITOH : Coordinator
1st Social Development Study Division
Social Development Study Department
Japan International Cooperation Agency

c) The Study Team

- Mr. Makoto TANAKA : Team Leader / Airport Planner
Mr. Masato TAMURA : Deputy Team Leader / Airport Planner
Mr. Hayato NAGASAWA : Airport Civil Engineer
Mr. Kanji EHIRA : Airport Architect
Mr. Shouhei NAGATAKE : Air Navigation System Specialist

Mr. Ryujiro YAMAGISHI	: Demand Forecast / Economic and Financial Analysis Specialist
Mr. Toru YORITATE	: Civil Engineer (Geotechnical Investigation)
Mr. Takenobu SUZUKI	: Environmental Specialist
Mr. Yutaka YAMADA	: Civil Engineer (Construction & Cost Estimates)
(Mr. Guy CHIASSON (former)	: Management & Operations Specialist (Airline Service)
Ms. Jessica MORRIS (successor)	: Management & Operations Specialist (Airline Service)
Mr. Peter E. J. DAVIES	: Management, Operation & Training Specialist (Airport)
Mr. Katsuetu MASUYA	: Financial Analyst
Mr. Toru BABA	: Translator (Russian / English / Japanese)
Mr. Hidehisa YOSHIDA	: Working Coordinator

(2) Kazakhstan Side

a) Steering Committee

Mr. Salimov Bekpulat	: Acting Director, Chairman, Committee for Utilization of Air Space and Civil Aviation, MOTC
(Mr. Serik Buranbaev	: Director, Civil Aviation Department, MOTC)
Mr. Bekturov R.S.	: President, Air Kazakhstan
(Mr. Dimitry A. Dushimov	: Kazakhstan Airlines)
Mr. Turiskali M. Madigozhin	: General Manager, Kaz Aero Navigation (KAN)
Mr. Raisov A. Raisovich	: Director, Kaz Aero Project

b) Counterpart Team

Mr. Bakatay Naryshev	: Deputy Director, CUASCA, MOTC
Mr. Jumabekov Cadiraly	: First Vice President, Kazakhstan Airlines (Management)
Mr. Buryak I. Gordeevich	: Deputy General Director, KAN (COM)
Mr. Nikitin A. Kupriyanovich	: Deputy General Director, KAN (Finance)
Mr. Sevepyukhin V. Ivanovich	: Deputy General Director, KAN (ATC)
Mr. Goborkhin G. Kirillovich	: Chief Engineer, Kaz Aero Project

Ms. Uysimbaeva G.S. : Chief Specialist, International Relations,
CUASCA
(Mr. Iliassov Aiyar Acting Chief, International Affairs, CAD)
Ms Uysimbaeva G.S. : Chief Specialist, International Affairs, CAD

CHAPTER 2

CURRENT CONDITIONS OF AIR TRANSPORT IN KAZAKHSTAN

CHAPTER 2 CURRENT CONDITIONS OF AIR TRANSPORT IN KAZAKHISTAN

2.1 Socio-Economic Conditions in Kazakhstan

2.1.1 General

The Republic of Kazakhstan is the second largest of the former Soviet republics. The climate varies considerably from one place to another. Levels of precipitation also vary. The official language is Kazakh, while Russian remains the interethnic language. The Kazakhs are descended from Mongol and Turkish tribes which settled in the area around the first century BC. During Soviet period, there were big transformations which greatly altered the economy and lifestyle of the country. On 16 December 1991, Kazakhstan declared its independence and it was recognized as a cofounder of the Commonwealth of Independent States (CIS) at a meeting in Almaty on 21 December 1991.

Major political changes and legislative measures taken after the Independence included :

- The Government's consistent disavowal of any tendencies toward Islamic fundamentalism.
- In February 1993, a new political movement, the Union of Kazakhstan, was established with a declared aim of promoting social harmony and countering radical nationalism. Its membership represented most of the ethnic groups and regions of Kazakhstan. Later in 1993, the Union was organized as a political party, the People's Unity Party (PUP).
- In July 1994, the Supreme Kenges approved the transfer of the capital to the northern city of Akmola (formerly Tselinograd) by approximately the year 2000.
- A referendum on extending the President's term of office until 1 December 2000 was supported by more than 95% of the votecast with 91% of the electorate participators.
- On 31 August 1995, the new constitution was adopted.

(1) Relationships with the CIS and other countries.

President Nazarbayev strongly defended the preservation of the CIS. In January 1993, Kazakhstan and six other CIS members signed a charter pledging closer political and economic integration.

In early 1994, Kazakhstan and the neighboring countries of Kyrgystan and Uzbekistan formed a trilateral economic area. In February 1995, an Interstate Council was established to supervise its implementation.

The relationship with the neighboring Russian Federation was clarified in May 1992 when the two countries signed a treaty of friendship, cooperation and mutual assistance. It was to be valid for a period of 25 years and provided, inter alia, for Russian assistance to establish Kazakhstan's military forces. This treaty was strengthened by further Russian-Kazakh agreements, concluded in January 1995, which provided for a customs union and currency convertibility between the two countries, as well as closer military ties.

In January 1995, an agreement on reciprocal citizenship was signed which granted ethnic minorities of Russia and Kazakhstan the "patronage" of both states.

In March 1995, Mr. Nazarbayev established a new forum on inter-ethnic issues - the Association of Peoples of Kazakhstan - which was to have the status of a "consultative presidential body".

(2) Formation of Non-nuclear State

After the dissolution of the USSR at the end of 1991, Kazakhstan stated its commitment to become a non-nuclear state, either by destroying its nuclear weapons or transferring these to the Russian Federation. At that time, the Soviet nuclear warheads still deployed in Kazakhstan effectively made the country the fourth largest nuclear power in the world.

In September 1992, Kazakhstan's Supreme Kenges ratified the first Strategic Arms Reduction Treaty, which had been signed by the USA and the USSR in July 1991. Its provisions of affected Kazakhstan as a successor state to the USSR. In December 1993, the Kenges ratified the Treaty on the Non-proliferation of Nuclear Weapons. Kazakhstan was to have eliminated or removed all nuclear weapons by the end of the 1990's. The USA provided substantial technical and financial aid in return Kazakhstan for dismantling the remainder of its nuclear arsenal.

(3) Government

Under the terms of the 1993 Constitution, supreme legislative power is vested in the 177-member Supreme Kenges, which is elected by universal adult suffrage for a

five-year term. The president of the Republic, who is directly elected every five years, is the Head of State and holds supreme executive power, in conjunction with the Council of Ministers. The President appoints the Prime Minister and Deputy Prime Ministers, as well as the Ministers of Foreign Affairs, Defense, Finance and Internal Affairs. The remaining ministers are nominated by the Prime Minister. Government appointments are subject to approval by parliament.

For administrative purposes, Kazakhstan is divided into 21 local government areas (19 regions and two cities). Under the new constitution adopted on 31 August 1995, supreme legislative power is divided between two Houses: the Upper Chamber and the Lower House. The Upper Chamber consists of 47 members who are elected for two years, and the Lower House consists of 67 members (called Mazhilis) who are who are elected for four years.

2.1.2 Demographic Characteristics

(1) Total Population

The population in Kazakhstan at the beginning of the year 1995 was 16 million 333 thousands, a decrease of about 307 thousand from the level of 16 million 986 thousands in 1993. The main cause of this decrease was the increased emigration of non-Kazakh people, especially Russians and Germans. The natural increase of the population in 1995 was 0.95%, an almost 10% decrease from the high rates of the mid-1980's. It should be noted that there were increase in immigration of Kazakhs, mainly from the CIS, Iran, China and Mongolia.

The birth and marriage rates have substantially decreased, while the death rate has increased.

Administratively and territorially, Kazakhstan is divided into 19 states and two special zones (states) of Almaty city and Leninsk city. These are subdivided into Regions, Cities, Districts, Workers' Settlements (small towns) and villages.

In terms of population, the biggest state is South Kazakhstan, the second-biggest Karaganda, and Almaty City ranks the third. However, the population of the Kazakhstan is generally evenly dispersed throughout the republic.

Each of the component ratios of the total population has changed slightly since 1985. The level of city population in 1995 was 57.63% or 1.59% higher than in

1985.

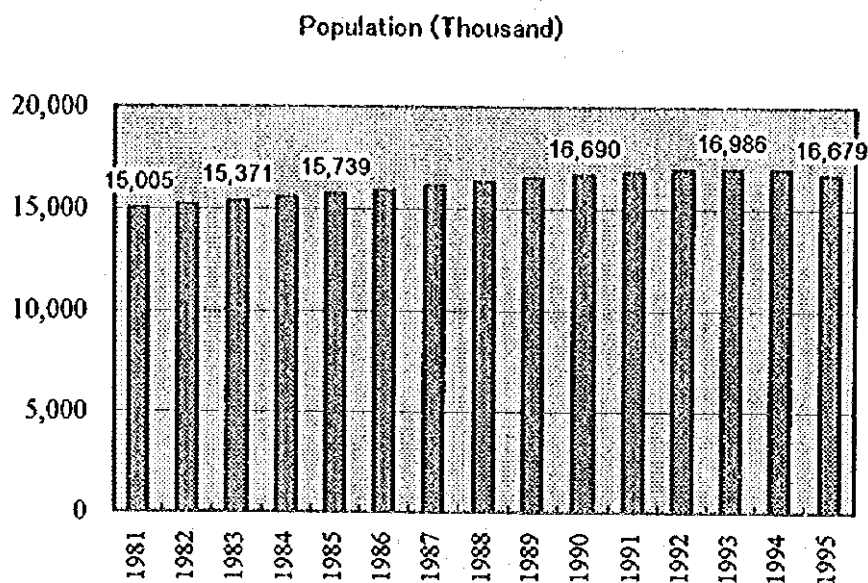


Figure 2.1 Population

2.1.3 Macro-economy and Regional Industry

(1) Economic Problems since 1991

Kazakhstan has been facing economic problems similar to those of the other CIS countries in making the transition from a centrally planned to a market-based economic system. The republic has been obliged to seek new markets where there were real needs and to establish a rational set of relative prices to optimize resource allocation and achieve some macro economic stability.

Since independence, Kazakhstan has experienced painful transitions due to the collapse of the Soviet central planning and internal trading systems. This has brought about annual contractions in all sectors of the Kazakh economy during 1991-94, with output severely hampered by widespread payment arrears between enterprises.

As a result of Kazakhstan's traditional dependence on the Russian Federation, as well as its initial decision to remain within the rouble zone, the country's economy was considerably influenced by developments in Russia, particularly, a dramatic rise in the annual rate of inflation. The foreign exchange rate, which is closely related to the price index, showed dramatic fluctuations during the same period.

However, the drastic monthly and annual rates of inflation experienced during 1992-1994 began to decrease in 1995. The annual rates of inflation(as a % of the previous period) in 1995 decreased rapidly to 239.3% for industrial products and 309.6% for consumer goods respectively from 3,018.0% and 2,364.3% in 1994. The drastic fluctuation in the exchange rates lessened somewhat in 1995.

Industrial production has been a rapidly decreasing since 1991. However, the monthly decrease lessened in 1995 which may indicate an impending turning point to a recovery.

(2) Economic Structure

The economic structure or industrial composition by sector changed during the period of economic hardship since 1991. The following significant changes are evident from the changes have become evident in the number of employees of different industries

- The share of material production decreased from 72.2% in 1990 to 64.6% in November, 1995. The share of non-material production increased from 27.8% in 1990 to 35.4% in November, 1995.
- In the material producing sector, the share of agriculture dropped from 18.6% in 1990 to 14.1% in November, 1995 while the share of industry increased from 21.8% in 1990 to 23.4% during the same period.
- In the non-physical sector, the shares of health, physical culture and social insurance, and education increased respectively from 6.8% and 11.7% in 1990 to 9.4% and 15.2% in November, 1995

The number of employees in material production shrank dramatically during 1990-1995, especially in the agriculture, transport, trade and public catering sectors.

Number of employees in the non-physical sector has declined slightly, but big declining was in science and science-related sectors.

(3) Exports and Imports

The total levels of exports and imports in 1995 (January-November) reached US\$ 4,559.3 million for exports and US\$ 3,466.7 million for imports respectively accounted for about a US\$ 1,330 million increase and US\$ 27 millions decrease compared to the previous period. In 1995, the Republic's largest trading partner was the Russian Federation, accounting for 42.1% and 47.9% of the Republic's

total exports and imports. The level of trade with the other CIS countries was next highest after Russia. Besides the CIS countries, other large customers are Germany, Great Britain, Netherlands and Italy in Europe, and China and Korea in Asia

Export-import transactions in 1995 (January-December) show that the exports and imports amounted to US\$ 4,559.3 and 3,466.7 million respectively, representing a trade surplus of US\$ 1,092.6 million.

The major export goods are raw materials of oil and metals, while the imports are manufactured products such as machinery, chemicals, etc.

In total, the current account of Kazakhstan recorded deficits while the capital account recorded surpluses, with the overall balance for each year showing surpluses.

(4) Wages of Workers in Kazakhstan

The levels of real wages in Kazakhstan has drastically declined since in 1991-1993. According to estimates, the average monthly wage fell to 178.5 rouble in 1991 from 265.0 rouble in 1990 and it fell further to 61.2 rouble in 1992. However, since the introduction of the Tenge as the national currency in November of 1993, real wages have been trending upwards, accompanied by a stabilization of prices

(5) Gross domestic products

According to rough estimates, the gross domestic products (GDP) has increased to 49,206 million tenge in 1995 from 26,838 in 1993, a growth of 180 %

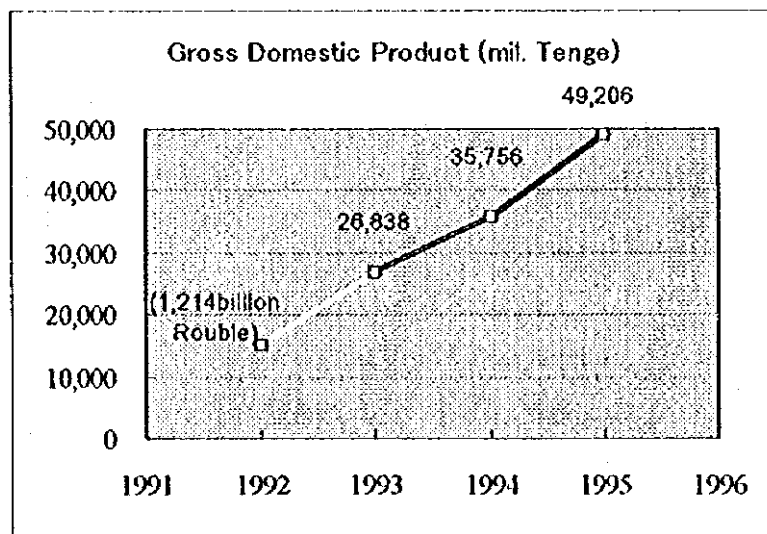


Figure 2.2 Gross Domestic Product

(6) Regional gross domestic products

It is noteworthy that the RGDP's per capita vary considerably between region, indicating considerable differences in productivity.

(7) Regional Industries

The main characteristics by region may be summarised as follows:

<Name of State>	<Main Industries & Main Characteristics>
Akmola:	Planned location of new capital. Machine industry.
Aktyubinsk:	Industrial city developed along railway. Machinery, oil refinery, fertilizer and food industries.
Almaty:	Capital. 500MW x 2 thermal power stations. Textile machine industry and leather industry.
Zezkazkan:	Production and refining of copper; however obsolete facilities and public nuisance are big problems.
South Kazakhstan:	Oil refinery and industries for textiles, leather, machinery and automobiles. Environment is contaminated.
Zhambul:	Lead producing center. 200 MW x 6 thermal power stations. The biggest industrial complex in the former Soviet Union.
Zhezkazgan:	Copper producing center. Environmental contamination.
Atyrau:	Petrochemical industry, metal industry & food industry.
Karaganda:	Coal producing center. Environmental contamination.
Kokchetau:	Production of measurement tools.
Pavlodar:	Biggest coal field in the former USSR.
Kustanay:	Iron and steel industry. Textile and leather industry.
Kzyl-Orda:	Refining of copper and zinc. Food industry.
Mangistau:	Chemical industry and food manufacturing industry.
Pavlodar:	Production of aluminum. Oil refinery and food industry.
North Kazakhstan:	Audio machine manufacturing.
Semipalatinsk:	Nuclear testing area. Textile, leather and food industries.
West Kazakhstan:	Petrochemical fur and leather industries.
East Kazakhstan:	Production of zinc and magnesium. Petroleum and automobile industries. The facilities are obsolete.

2.1.4 Prospects of Economy in Kazakhstan

At present, there are no short-term or long-term economic development plans, authorized by the Government. There have been recent indications of a stabilization and recovery in prices and production. However, more time will be needed to establish a nation-wide, market-based division of labor so that an appropriate allocation of resources can be achieved. According to forecasts of the Ministry of Economy, annual growth rates in GDP are expected to be 102.0% for 1996-1997.

Long-term economic development plans have recently been completed by economists and researchers in the Scientific Research Institute of Economy and Marketing under the Ministry of Economy.

2.1.5 The Transportation System of Trends in Kazakhstan

Transportation systems in Kazakhstan have suffered considerable degradation. After the demise of USSR, freight and passenger demand for all transport modes drastically decreased due to tremendous drops in real wage and in paired production. Most of the population cannot afford vacation and non-urgent travel. The traffic demand for all transport modes is still decreasing and an early recovery cannot be expected until a recovery in people's earnings occurs.

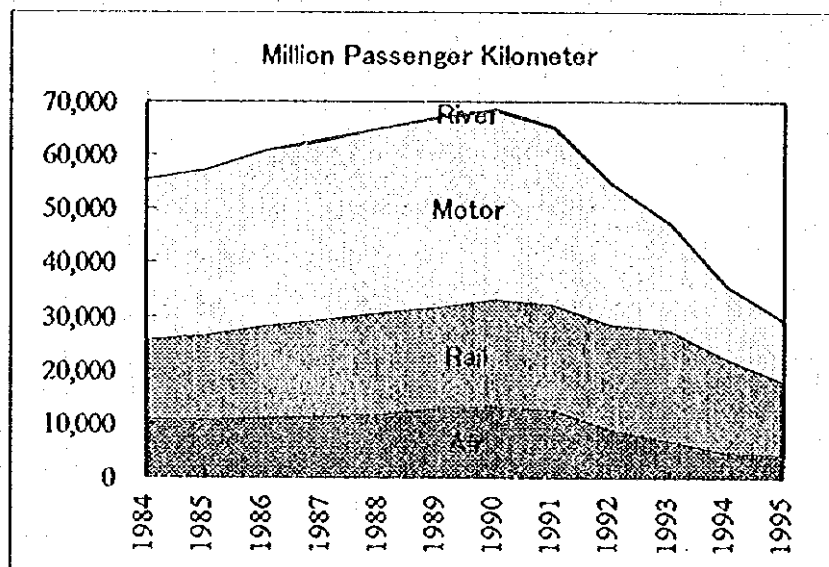


Figure 2.3 Transportation Statistics (1) Passenger

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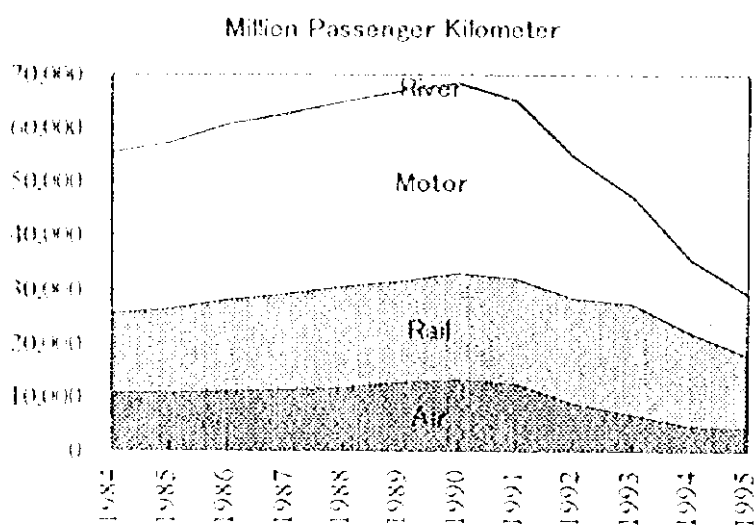


Figure 2.3 Transportation Statistics (t) Passenger

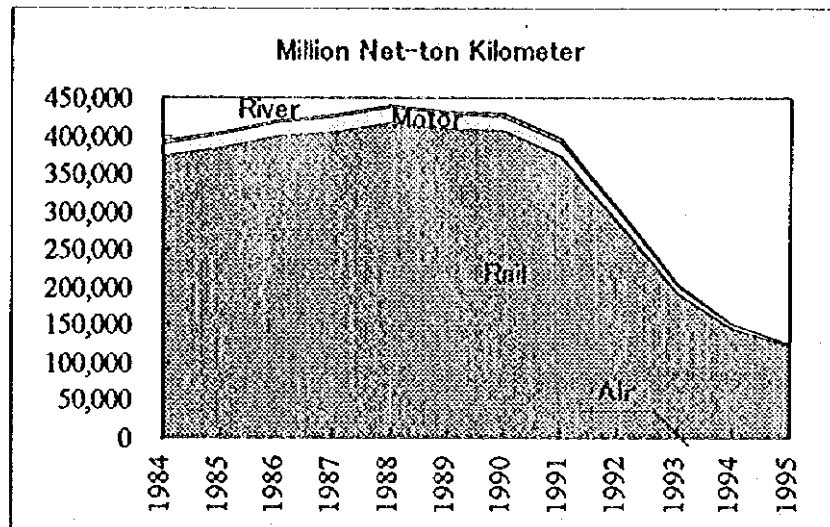


Figure 2.3 Transportation Statistics (2) Freight

2.2 National Air Transport Policies and Plans

Kazakhstan is a large country with a sparse population and an undeveloped surface transportation system with poor inter-city and inter-region links. Air transport, therefore, is vital to the nation and will remain so far the foreseeable future, particularly for passenger transportation. Since independence, air transportation has also become an important means of linking Kazakhstan with the international community.

The Republic became a member of the International Civil Aviation Organization (ICAO) in 1992 and has established international routes through bilateral air service agreements. Such agreements have been signed or ratified with 35 countries.

Many problems have been experienced since independence, including;

- deterioration of aircraft, facilities, equipment and systems
- non-compliance with the international standards
- unclear responsibilities for control and regulation
- drastic diminution of demand (about on 80% reduction since 1990)
- reduced and increased costs for the National Associated Airlines of Kazakhstan (Kaz Air)
- financial difficulties experienced by the national government

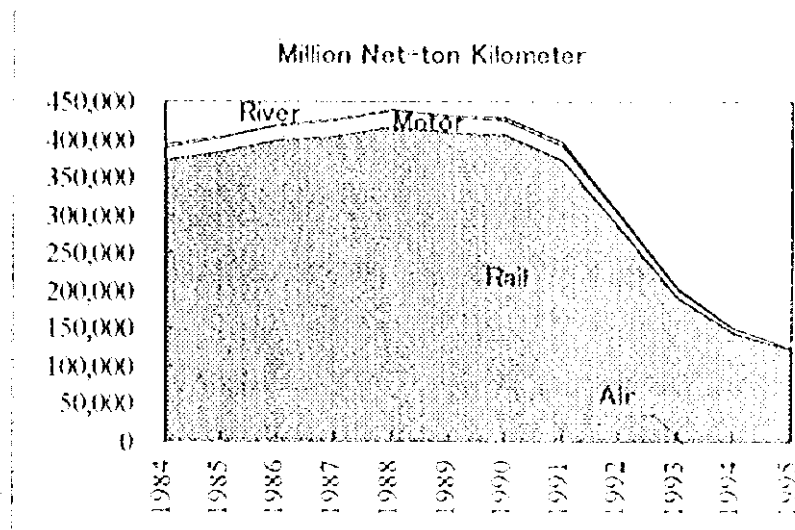


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- unclear responsibilities for control and regulation
- drastic diminution of demand (about an 80% reduction since 1990)
- reduced and increased costs for the National Associated Airlines of Kazakhstan (Kaz Air)
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A number of the initiatives has been taken to address specific needs.

(1) Establishment and Strengthening of the Civil Aviation Department

Kaz Air, the state-owned company, at its inception in August 1993 was originally constituted like the Aeroflot with the air carrier, airport, air navigation and regulatory functions highly integrated. The Government subsequently became aware that this structure was not conducive to effective and efficient air transport operations in a market environment and decided to disassemble it. The Civil Aviation Department (CAD) of the Ministry of Transportation and Communications (MOTC) was created in January, 1994, to assume the national policy making and regulatory roles.

The Government has decided to increase the resources of the CAD to enable it better to fulfill its functions. As of 1 June, 1996, the number of staff of this organization will be more than doubled to 40 persons. Furthermore, the CAD has been tasked with developing a proposal to transform itself into an entity, which can ensure the Government meets its obligations under the Civil Aviation Law.

(2) Establishment of Kaz Aeronavigation

Air navigation services had been handled by the various subsidiary companies of Kaz Air. The government was aware that these kind of services should be delivered by a separate government owned entity so Kaz Aeronavigation was created on 1 June, 1995, It assumed control of all navigation services and It is fully dependent on user fees for its operation.

Kaz Aeronavigation has, for the past 3 to 4 years, been engaged in a program to upgrade enroute air navigation services. There are 18 Area Control Centers (ACC's); 3 of these, at Almaty, Aktyubinsk and Akmola, will be upgraded and automated by the year 1999.

(3) Promulgation of Civil Aviation Law

Shortly after the termination of the USSR, the 12 CIS republics formed the Interstate Aviation Committee (MAC) located in Moscow. Its primary role is safety regulation with most of the expertise coming from Russia.

In order to strengthen the air transportation policy and regulatory role of the

national government, the first National Civil Aviation Law was promulgated through a presidential decree in December 1995. However, 31 provisions of the new air law had not been implemented because of the shortage of CAD's human resources. It is expected that this problem will be largely resolved with the strengthened CAD.

(4) Reorganization of Kaz Air

During the first part of 1996, the financial condition of Kaz Air became extremely precarious such that it was close to bankruptcy. Under the Prime Minister's decree of 30 April, 1996, a senior official of the Kazakhstan Commercial Bank has appointed as a new president of Kaz Air to conduct a thorough assessment of its financial and operational condition and to report his findings to the Government. At the end of three month period, all of airports were to be separated from Kaz Air. The air carrier component was to be consolidated into a single entity "Air Kazakhstan". The Kaz aviation construction company and the Civil Aviation Academy were also to be separated.

(5) Seeking Foreign Investment

Due to the countries economic difficulties, the Government already stopped financing air transport development and has become heavily indebted to Kaz Air. The Government is seeking foreign investment to ensure the future economic viability of the airport and airline components of Kaz Air. The only current major restriction on the foreign ownership of any enterprise due for privatization is that 51% of the equity must remain under the government ownership. Significant foreign investment interest has only demonstrated in developing the airports of Almaty, Atyrau and Akmola. No such interest has been shown in the air carrier component of Kaz Air.

2.3 Current Conditions of Air Transport

2.3.1 General

The current condition of air transport of Kazakhstan can best be understood through a review the issues related to safety, economic efficiency, level of service

and development prerogatives.

(1) Air Safety

All air transportation activity should be conducted within an acceptable safety framework. Much of the aircraft fleet, airport facilities and navigational aids in use in Kazakhstan are well maintained and operated. Most of the equipment, however, is obsolete and does not meet international standards.

Aircraft accidents have increased since independence primarily because of non-compliance by new air carriers with established safety regulations and a lack of regulatory enforcement.

Modernization of Air Traffic Services has commenced with a program covering three ACCs. No such program exists for ATS at airports. START cannot taxi located near the runway infringe ICAO standards and recommended practices regarding obstacles on runway strips and the penetration of transition surfaces.

Airport lighting systems and markings are often also at variance with ICAO SARPS.

Airport pavements have generally been well maintained but at some locations these have deteriorated such that major reconstruction work is required. Friction coefficient measurements are only made at airports experiencing snow and ice covering.

(2) Low Economic Efficiency

a) Excess Capacity

After independence, there was rapid and dramatic decline in all air transport activity. Because there has been very little recovery from these low levels, there is considerable excess capacity throughout the whole system.

An important component of this excess capacity is a large and underutilized workforce, which is far in excess of what is required to maintain, operate and manage the system now or in the foreseeable future.

Regarding air navigation services, GCA continues to be used along with ILS. Both of which provide approach guidance to landing aircraft. In most other countries,

GCA's were removed after ILS's were installed. In Kazakhstan, GCA is for military operation and back-up of ILS. In Kazakhstan, GCA's are used for military operations and to back-up the ILS.

Despite this excess capacity, many large scale and costly development projects are still being seriously considered at most locations.

Most airports have no master plans which provide for well-coordinated and efficient airport development in response to demand forecasts.

b) Low Productivity

The standard of general and technical education and training in Kazakhstan is high, however, overall productivity is low. A primary example of this is the low number of flying hours by air crew and low aircraft utilization.

This primarily comes from systemic overmanning, the lack of a service-orientated culture throughout the workforce, poor internal communications and information systems, and outmoded management systems.

(3) Poor Quality of Services

A market economy is by its very nature customer-orientated. There is a noticeable lack of customer-orientation and, therefore, a generally low level of services. Route planning, flight scheduling and other services provided on the ground and in the air are often conducted without sufficient attention to customers' needs. Signage and public address systems, even at international airports, rarely use the English language along with Russian and Kazakh.

(4) Lack of Understandings of Investment Management in a Market Environment

There is a wide spread perception among managers at all levels within the air transportation system that most problems can be solved by increased funding alone. Coupled with this is an almost total lack of awareness of the criteria that potential investors routinely use to assess risk and return, and of the conditions which are applied when they commit funds for extended periods.

(5) Changes Needed for Sustained Development

The major problems which currently impair the efficiency and effectiveness of the Kazakhstan National Air Transportation System have been discussed only briefly.

These apply to all institutions to same degree and are multi-related by nature. For sustained development, all need to be addressed concurrently, and in a focused and coordinated manner.

2.4.2 Air Traffic Statistics

The yearly traffic departures at all of major airports have been decreasing since 1990. At the Almaty airport the number of passengers has decreased by 60% to 858,808 in 1995 from 2,138,332 in 1990. Departing cargo tonnage at Almaty in 1995 has also decreased by more than 60 % since 1990. At the Karaganda airport, depart passengers and cargo traffic in 1995 decreased to 112,096 passengers and 68.6 tons from 675,360 passengers and 2779.5 in 1990, only 16.5% and 2.5% of the respective levels in 1990.

It is noteworthy that the total cargo ton-kilometers carried in Kazakhstan was 17.6% in 1995 higher than is 1984. This increase reflects the increase of the air passengers who travel for shop tourism in foreign countries Turkey, Germany, Austria, etc. The total air passenger-km however shows such as is only 41.9% or The level in 1984.

Most air passengers traveled for vacation and recreation purposes before 1991, but now most air passengers are traveling for business and official purposes.

Another feature is that the air passenger travel on short routes has decreased sharply. On a typical short air route the frequency of air service dropped from 4 flights/week to only one flight/week.

It should be not, however, noteworthy that the total passenger-km has not decreased so drastically as the total number of air passengers carried. This may be due to the longer distances traveled.

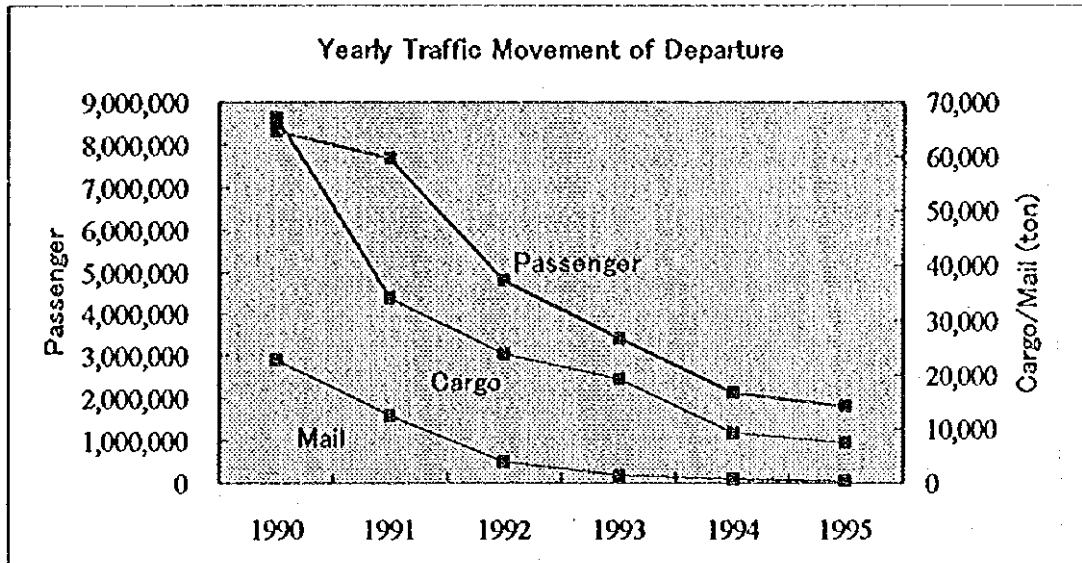


Figure 2.4 Air Traffic Statistics

2.3.3 Air Route Network

Kaz Air provides services to a total of 54 domestic, CIS and international destinations.

Domestic service is provided to 24 points in Kazakhstan. Many flights are operated by regional subsidiaries and do not pass through the main hub Almaty. Only a few points have daily services at regular departure times.

There are 17 CIS points with direct service. Moscow (Domodedovo, a domestic airport) has daily service from Almaty by Kaz Air, in addition to regional scheduled and charter services from outlying points. The frequency to the other CIS destinations is generally once or twice a week.

There are 13 points served internationally. Flight frequencies are limited, however, especially to Western Europe where competition is the greatest. International travel is the only growing segment of the air transportation sub-sector.

2.3.4 Airways System

(1) Responsible Authority

The Authority responsible for providing ATS within the Kazakhstan Flight Information Regions is the state enterprise Kaz Aeronavigation, an independent body directly regulated by the Civil Aviation Department of the Ministry of

Transport and Communications.

Kaz Aeronavigation has three departments.

(2) Air Space Management Organization

Kaz Aeronavigation controls airways and Terminal Control Areas (TMA), The rest of the Kazakhstan's airspace is under Military control.

(3) Flight Information Region

The airspace of Kazakhstan is divided into 9 FIRs Normally each FIR has several Area Control Centers (ACC).

(4) Area Control Center

The airways of Kazakhstan are controlled by 18 ACC's. The existing 18 ACC's will be consolidated into 3 automated ACC's at Almaty, Actyubinsk, and Akmora. Tentative dates for completion of automated ACC's are during: 1996 at Almaty, 1997 at Aktyubinsk and 1999 at Akmola. The dates for consolidating the other ACC's are not known this time.

Normally, an ACC comprises military and civil sectors. The military sector is manned by military personnel. Civil and military sector controllers are located side-by-side or in different rooms within the ACC's.

(5) Terminal Control Area (TMA)

TMA's are usually have a radius of 80 - 100 km and an altitude limitation of about 4,500 m depending on airport characteristics. (In the case of Aktau, these dimensions are 60 km and 3,000 m. Almaty's upper limit is 5,700m)

(6) ICAO Airspace Classification

The ICAO air space classification system (category A through G) is not used in Kazakhstan, but it is being considered for future use.

2.3.5 Air Traffic Control Facilities

(1) Operational Equipment

Generally, the following operational equipments are installed in ACC's and approach control offices in Kazakhstan.

- Radar displays
- Microphones
- Radio communication selector panels
- Telephones
- Clocks
- Recorders (in EQ room, 16 channels)
- Graphic systems
- Weather displays including altimeter settings, wind speed and direction displays
- Aerodrome lighting panels (at GCA position)
- VDFs (VHF DF)

(2) Radar

The average age of the radars is 14 years. The GCA's are Czech made and the other radars are made in Russia.

a) Enroute

Each ACC has its own Air Route Surveillance Radar (ARSR). The ARSR is a primary radar. Eighteen ARSR's with range of 350 km cover Kazakhstan airspace. The update rate of the ARSR is 3 rpm but variable to 6 rpm when traffic is heavy.

b) Terminal

Airport Surveillance Radars (ASRs) with Secondary Surveillance Radar (SSR) are located at the main airports and used for approach control. The coverage of these radars is about 150 km and the update rate is 10 rpm.

Precision Approach Radars (PAR) are also installed to provide GCA services.

c) RDP system

i. Terminal

Radar Data Processing (RDP) systems are in operation at the main airports. The system processes radar data fed by the ASR and provides air traffic controllers with numeric information on circular displays.

ii. Enroute

A new radar data processing system from the Siemens company of Germany has been installed at Almaty ACC and is undergoing final trials. The same system will

be installed at Aktyubinsk ACC during the second half of 1997 and Akmola during the first half of 1999 by a subcontract with Thomson-CSF. The system processes radar data from ACC radars and provides ACC controllers with Alpha Numeric data on square plan view displays.

(3) Communications Equipment

a) Telephone

Each ACC has hot lines with neighbouring ACC's except for Urumqi in China. All ACC's have reliable direct telephone links with ATC facilities in Kazakhstan and CIS countries.

b) Teletype Network

Almaty Communications Centre is the main station and automatically exchanges information for aircraft operations such as flight planning messages, weather messages, NOTAMs, etc.

c) Air Ground Communication

The average age of air/ground communications equipment is about 15 years but it is still generally working well. The present ACC air / ground communication sites will be linked to the 3 new ACCs by land-line or by leased satellite links in future.

2.3.6 Air Traffic Services Operations

(1) Legal Authority

The legal authority for Air Traffic Services in Kazakhstan is the National Civil Aviation Law which was promulgated by a presidential decree in December, 1995.

(2) ATS Rules

ATS rules and regulations provided by the Republic of Kazakhstan are the same as those stipulated in the AIP (Aeronautical Information Publication) of Russia.

(3) Air Traffic Control

Types of ATC Service

The types of air traffic control in Kazakhstan appear below. These ATC facilities are all located within the airport.

- Area Control (ACC)
- Approach Control (Approach)
- GCA
- Aerodrome Control (START or Control Tower)

a) ACC

Normally the ACC and Approach Control Office are located in the same room. The ACC's area is divided into 2 or 3 sectors and each sector console is equipped with the circular plan view display of air route surveillance radar information.

b) Approach Control

Approach control has 2 or 3 control positions. If the approach control facility has 3 control positions, the function is shared by the approach, feeder, and final (GCA) positions. The approach and feeder positions are equipped with ASR displays and PAR for final positioning.

c) Control Tower (START)

In Kazakhstan, aerodrome control is normally performed from control cabs called "START" which are located near the both ends of the runway. Each START is manned by one controller and the START near the runway in use plays the role of "Main" and the other START becomes "Sub". The START controller's main job is to confirm the whether the runway is clear or not.

d) Separation Standards

i. Vertical Separation

- up to 8,100 m: 300 m
- up to 12,100 m: 500 m
- up to 12,100 m: 1,000 m (airspace above 12,100 m is for military use only)

ii. Lateral Separation (under radar control)

- Approach area with automated system: 10 km
- Approach area without automated system: 5 km

iii. Longitudinal Separation

- On airways: 30 km (under radar control)
- In approach area: 20 km (under radar control)

- Procedural control: 10 minutes

(4) **Aeronautical Information Service (AIS)**

The function of the AIS is to provide aeronautical information for the territory of Kazakhstan by: providing pre-flight briefing to pilots; the handling of NOTAM's; and reviewing, amending and updating the Aeronautical Information Publication (AIP) published by Russia. Kazakhstan uses the Russian AIP and the differences are published in the Aeronautical Information Circulars (AIC).

(5) **Weather Service**

a) **Meteorological Observation System**

The meteorological observation site is normally located at the first floor of the START and provides cloud height, amount of cloud and other latest weather information to air traffic control facilities. Runway Visual Range RVR equipments are installed at main airports. The observation site is manned by 2 meteorologists.

b) **Weather Forecasting and Briefing Office**

The weather forecasting and briefing office is located adjacent to the AIS briefing office and provides meteorological data to flight crew members. Information from the meteorological satellite system is used for weather forecasting. This office is also manned by meteorologists.

c) **VOLMET (Voice Meteorological Broadcast)**

VOLMET is not used in Kazakhstan due to a lack of funds.

(6) **Management and Organization**

KazAeronavigation (KAN) was established in Kazakhstan on 1 June, 1995 as a government-owned company responsible for providing terminal and enroute air navigation services to civil air traffic. Prior to this, air navigation service units had been an integral parts of Kaz Air. It should be noted that KAN only has authority over ANS units at 19 of Kazakhstan's 22 airport locations. It has no authority over those at Urdzhar, Zaysan and Ekibastuz which are too small and under equipped to be part of KAN. There are currently 18 ACC's, most of which are located at airports, under the control of KAN.

KAN's total workforce is 2941 persons. Of these, 2825 are located at the field sites

and 116 at headquarters. The largest categories of employees are Air Traffic Controllers, and Maintenance Engineers and Technicians, comprising 711 and 847 persons respectively. There are 450 Communications/Operations staff and another 21 persons are employed as Aeronautical Information Services Specialists. The dramatic decline in aircraft movements since 1991 has not resulted in a commensurate decline in KAN's workforce. Senior management is now considering consolidating some services at certain airports and reducing the hours of service to reduce the current and foreseeable overcapacity.

(7) Financial Management

KAN is totally dependent on user charges for its revenues which are collected through the Almaty Headquarters. Most of the revenues are from foreign carriers while Kaz Air is seriously in arrears in its payments. It was not possible to obtain any financial information on KAN, but it was stated that revenues were sufficient to cover expenses. There was some intimation, however, that the intention to reduce the workforce was attributable to financial constraints.

2.3.7 Navigation Aids

(1) Type of NAVAIDS

Kazakhstan uses the following NAVAIDS:

- RSBN
- NDB
- VOR
- VOR/DME
- ILS
- VDF

(2) RSBN

There are 9 RSBN's in Kazakhstan. The RSBN's are unique to the CIS countries and are used for domestic flights. These systems are located within the airport boundaries, provide range and azimuth information, and are used as both enroute NAVAIDS and ILS locator beacons.

(3) NDB

In Kazakhstan, NDB's are used:

- to define Low and Medium Traffic airways;
- as a locator for ILS's; and
- as a non-precision instrument approach aid.

Most of Kazakhstan's air route structure is based on NDB's. These equipments are old (NDB's made in 1968 are still used) and will be replaced by VOR's for international air routes. The NDB's will continue to be used in Kazakhstan as air navigation aids for domestic air routes.

(4) VOR/DME

There is one VOR and there are 9 VOR/DME sites in Kazakhstan. Old Russian made NDBs will be replaced by VOR/DME's made in Germany (Alcatel) and a VOR/DME route structure will be established for international flights.

(5) ILS

There are Russian made ILS systems at 20 airports and, at 14 of these, ILS's are installed at both ends of the runway. Renewal of the ILS system at Karaganda was carried out from 1990 to 1991.

(6) Aeronautical Ground Lights

The following aeronautical ground lighting systems are in operation at main airports in Kazakhstan:

- Precision approach lighting system (CAT-I)
- Runway edge lights
- Runway threshold lights
- Taxiway edge lights

2.3.8 Airport System and Facilities

The JICA Study Team conducted site surveys at ten airports in Kazakhstan, instead of the original program to cover all of the airports. This was suggested by the Civil Aviation Department taking into consideration local conditions and also the time limitation of the Study. The current condition of airport facilities, was determined

through observation and from information provided by Kaz Air.

(1) Airport

There are 21 large and medium size airports which primarily facilitate regular air services. Besides the airports, there are more than 100 aerodromes for general aviation work such as crop spraying, oil exploration, etc.

Almaty and Aktyubinsk are designated as international airports. The Almaty airport is the gateway airport for the Republic and also functions as a hub airport for the domestic air network. The Government intends to increase the numbers of international airports to be 11: Aktau, Atyrau and Uralsk in the western area; Ust-Kamenogorsk in the eastern area; Zambal and Simikent in the southern area; Karaganda and Akmola in the central area; and Kostanay in the northern area.

Most of airports are administered and operated by subsidiary companies of Kaz Air which were established to manage airport and air carrier components at each airport, with an exception of the Ekibastuz airport which is operated by local government. Among the airports, there are five (5) joint-use aerodromes administered and operated by the military. However, this airport ownership system will be changed due to the Prime Minister's decree issued on April 30, 1996. According to the decree, the airport components of Kaz Air will be separated from the air carrier components. Some profitable airports may be privatized. There is no in detailed Government policy for airport ownership and development.

(2) Technical standard

The technical criteria established by the former USSR will be applied as technical standards for airport engineering in Kazakhstan until January, 1997. There are differences between these standards and the ICAO standards and recommended practices. However, these are to be revised in accordance with the ICAO SARPS.

(3) Airport development

Regarding airport development projects, there are some airports, such as Karaganda, Aktau and Kzyl-Orda, where projects have been halted because of a lack of financing. There is another project relocation of the national capital from Almaty into Akmola.

The need for and scope of these projects have dramatically changed because of the reduced demand for air transport. These projects need to be modified accordingly. Because of the financial difficulties of the Government and Kaz Air has been facing the crisis in financial management, the Government hopes to obtain foreign investment for airport development projects, such as BOT agreements at Almaty and Akmola.

2.3.9 Airport Management, Operations and Maintenance

Information on airport operations and maintenance was obtained for 9 locations: Kzyl-Orda; Aktau; Atyrau; Uralsk; Aktyubinsk; Akmola; Karaganda; Pavlodar; and Almaty.

(1) Rescue and Firefighting

There are 9 Rescue and Firefighting (RFF) categories used for airports in Kazakhstan, based on standards inherited from the USSR. The categories are computed in a similar way to those specified in ICAO Annex 14. The airports surveyed had Categories ranging from 6 to 8 and operated a 24 hour service. The numbers of RFF vehicles at each site exceeded the minimum numbers for comparable ICAO categories by 50 to 100%. Two standard types of vehicles are used; a large 12,000/900 litres (water/liquid foam concentrate) vehicle and a medium 4,000/250 litres vehicle. No light Rapid Intervention Vehicles are in use, and only some locations have ambulances. Some of the vehicles were quite old and not in very good condition, and financial constraints are hampering maintenance activities at some locations. All sites claimed to have formal emergency plans and to conduct on airport exercises once or twice per month. Larger exercises were usually carried out twice per year and also involved local fire fighting services and hospitals. Most staff are recruited and trained locally, but some of the senior members had received formal Airport RFF training in other republics during the time of the USSR.

(2) Aviation Security

Two security organizations are usually represented at each airport: the Airport Security Department, and the National Security Organization. Most of the actual security functions are conducted by the former organization and include:

- airport perimeter security;
- guarding vital installations such as fuel farms;
- apron security;
- screening outbound passengers and luggage; and
- primary responses against illegal acts against aircraft or passengers.

Most airports had some electronic screening equipment for passengers and their baggage and, where no such devices existed, hand searches were conducted. All airports had little in the way of electronic surveillance systems. Most airports surveyed claimed to have formal security plans and to conduct exercises at least twice per year, which also involved other national security organizations. Most of the airport security staff had received police or military training prior to recruitment. Some senior officials had received formal aviation security training in other republics of the USSR. There is a plan to establish such training at the Civil Aviation Academy in Almaty. None of the airports reported any actual incidents of illegal acts against aircraft or passengers.

(3) **Border Controls**

Numerous complaints had been received from representatives of foreign carriers regarding Customs and Immigration services at Almaty airport, through which most of Kazakhstan's international traffic passes. These included:

- unexplained refusals of entry /exit to passengers with apparently valid documentation;
- slow processing and inefficient shift changing practices;
- limiting periods for preflight processing even when the airport is busy; and
- a lack of cooperation between staff of the airport and border control agencies.

There is no National Facilitation Programme in Kazakhstan as required by ICAO Annex 9 Facilitation.

(4) **Airside Snow and Ice Removal and Maintenance**

Except for Almaty, all airports surveyed appeared to have sufficient snow and ice removal equipment to clear the apron, one runway and taxiway in most conditions within an hour. Maintenance is proving problematic for some of the older equipment and generally there are insufficient funds for replacements. Chemicals

are not used for snow and ice removal.

Maintenance of runways, taxiways and aprons is generally being carried out fairly well given the general shortage of funding, but many of these surfaces are beyond maintenance and need major reconstruction or rehabilitation work. Although many airports have friction coefficient testing devices, these only appeared to be used after snow and ice removal, and there was no evidence of any programmes to conduct tests on and remove heavy deposits of rubber near runway threshold areas.

2.3.10 Regulation

(1) General

After the termination of the USSR in late 1991, the 12 CIS republics formed the Interstate Aviation Committee with the primary role being safety regulation.

The Civil Aviation Department (CAD) of the Ministry of Transport and Communications (MOTC) was formed in January, 1994 with its primary responsibilities being Regulation and Policy Advice to the government. With an initial staffing level of only 20 persons, the CAD has experienced considerable difficulty in fulfilling its mandate.

A presidential decree promulgated on 20 December, 1995 provided Kazakhstan with its National Civil Aviation Law. This cannot strictly be called the National Civil Aviation Law because it has received no legislative approval but it has the force of law until such approval has been received.

Through a prime ministerial decree promulgated on 30 April, 1996, the authorized staff strength of the existing CAD was increased to 40 persons effective 1 June, 1996. Within approximately 3 months thereafter, the Government will decide whether this should be expanded into the Committee on Airspace Utilization and Civil Aviation.

(2) Air Safety Regulation

As previously mentioned, any independent Air Safety Regulation in Kazakhstan has been conducted by the Interstate Committee on Aviation for the CIS states. Most of this activity was confined to licensing and certification of air carriers,

maintenance bases, airports, airworthiness etc. Kaz Air performed personnel licensing functions. Very little was done in the way of compliance monitoring and enforcement, meaning that air carriers and other air transportation organizations have been effectively self-regulating with little or no oversight.

The situation has improved somewhat since the promulgation of the National Air Law (NAL) in December, 1995. For example, a start has been made on developing a body of regulations and standards pursuant to the NAL.

A Personnel Licensing Commission has also been formed. Currently, it is only issuing licenses to flight crew and air traffic controllers but, so far, this function is confined to the licenses issued after initial training and to the highest level of licenses, which are those normally issued to those persons crewing VIP flights. All flight crew type conversion licensing and all maintenance engineer licensing functions have been delegated by the Commission to Kaz Air.

The CAD intends to start a programme of regular compliance inspections and monitoring after 1 June, 1996. Inspections to date have been confined to those conducted after specific safety related incidents have occurred.

(3) Economic Regulation

As of May 1996, there has been no economic regulation of domestic air transportation in Kazakhstan. The many regional components of Kaz Air seem to be able to determine their own routes and frequencies. This activity will commence after 1 June, 1996. It appears that a more interventionist role is envisaged for the CAD regarding economic regulation than is now the case in countries with progressive air transportation sub-sectors. The CAD specialists have already been informally advised to adopt a careful and "minimal intervention" approach in this regard.

The basis of international economic regulation is the Air Service Agreement have been negotiated or are being negotiated between Kazakhstan and about 25 states, including those belonging to the CIS. The Government has also licensed up to 20 private air charter carriers, which are primarily involved in "shop tourism" operations to Istanbul and the Gulf States.

There are no specific provisions in the NAL which limit the foreign ownership of airports or of air carriers registered in Kazakhstan; however, there are provisions in other legal instruments which currently limit, to a maximum of 49%, the level of foreign ownership of any state-owned enterprises to be privatized.

CHAPTER 3
STRATEGY FOR NATIONAL AIR TRANSPORT
DEVELOPMENT

CHAPTER 3 STRATEGY FOR NATIONAL AIR TRANSPORT DEVELOPMENT

3.1 Strategy for National Air Transport Development

There are currently no formal, integrated national plans and policies for Air Transport Development in Kazakhstan. So far, the Government has been limited to taking a number of measures to respond to the more pressing needs of this sub-sector.

When developing national policies and plans for any sector, the Government will be guided by the need to: complete the transition to a market economy and reverse the continuous decline in national GDP since late 1991; maintain social harmony; and secure national independence and integrity.

Given the current condition of the national economy, social fabric and transportation systems, the formulation of national policies and plans for air transportation development should be within a framework composed of the following elements:

1. Promotion of balanced development among regions;
2. promotion of social harmony and a sense of unified nationhood in ways which are economically realistic and efficient;
3. promotion of strategic industrial development initiatives;
4. compatibility with policies and plans for developing other transportation modes;
5. reduction in the overall excess capacity in the air transportation sub-sector;
6. within the context of overall capacity reduction, refurbishment and development of well-defined elements of the sub-sector to meet near, medium and long term economic and social demands;
7. establishment of an effective and efficient air safety regulatory regime;
8. existence of a viable national flag carrier which can develop in the increasingly competitive global environment by a combination of sound management, good business practices and transitional governmental measures to protect its markets;
9. continuation and, where feasible, acceleration of the commercialization of the airports and air navigation system so that services are produced in accordance with sound business practices, in response to real users' needs and where the full costs of operation and development are met from user fees;
10. progressive elimination of cross subsidization within or between the air carrier, airports, and air navigation service components of the national air transportation

system and, where necessary, replacement with direct subsidy regimes;

11. encouragement of foreign investment in sub-sector development through the timely availability and completeness of information for potential investors, and transparency and consistency in the application of contract and foreign investment processes;
12. accelerated adoption of cost-effective methods and technologies throughout the sub-sector, e.g. implementation of satellite-based Communications, Navigation and Surveillance systems for Air Traffic Management; and
13. active participation in global and regional civil aviation and air transportation associations.

3.2 Air Traffic Demand Forecast

(1) Purpose and Methodology

The air traffic demand forecasts were prepared to provide data for use in planning a comprehensive program to improve air transportation in Kazakhstan. To make appropriate forecasts, all air passenger and cargo traffic demands were analyzed and studied for each zonal (Originating-Destination) OD pair. These were further classified into air traffic which was competitive with railway and road transportation, and non-competitive air traffic. Zonal OD pairs within the area covering Kazakhstan and neighboring countries were regarded as competitive, and international OD pairs, excluding those from/to neighboring countries, were non-competitive.

In accordance with these classifications, two different methodologies were applied: competitive air traffic demands were forecast by applying a Modal Demand (MD) Model (a typical feature of which makes it possible to theoretically estimate shares of different modes for each OD pair); while non-competitive international air traffic demands were forecast by applying a simple "elasticity model".

(2) Scenario of Three Cases for Forecast

Air traffic demands were forecast for three different cases: medium; low; and high. These were based on: the current situation, and transitional trends to a market-oriented socio-economy in local and neighboring countries; as well as global trends for economic development and air transportation. Differences for each case were assumed based on GDP growth rates and the traveler's average value of time saved.

The latter is assumed to increase as the growth rate of GDP increases. In the "high case", the average time saved value is assumed to be higher than that of the "medium case". This means more travelers choose faster but more expensive modes of air transportation in the high case than in the medium case.

(3) Zoning

Considering the administrative zoning and the statistics of international trade and tourism in Kazakhstan, zoning for the forecast was made as follows:

- The territory of Kazakhstan was divided into 19 zones
- Neighboring countries were classified as Russia, East Europe, Central Asia, China and Mongolia.
- The remaining global area was classified into 8 zones.

(4) Socio Economic Framework

a) GDP Growth Rates by Zone and by Case for Target Years

Projections of GDP growth rates by country were produced by applying the World Bank and United Nations projections of growth rates for GDP per capita, and of growth rates of populations for those countries and their regions.

While the growth rates of each zone (region) of Kazakhstan were forecast based on the prospects for population and GDP per capita by region recently determined by the Scientific Research Institute of Economy and Marketing of Ministry of Economy, the projection of GDP per capita by World Bank for Kazakhstan was applied as a "control total". The years 1995, 2000, 2010 and 2020 were set as target years and the year 1995 was regarded as the base year.

(5) Procedure of Air Traffic Demand Forecasts

Air traffic demands by zone and by OD pair for target years were forecast by the application of the MD Model, the elasticity model and other models, using the data sets:

- GDP growth rate by zone and by case for target years
- Zonal OD traffic flow by mode (rail, road and air) in 1995
- Transport Conditions (Trip Time and Trip Cost)

(6) Results of Traffic Demand Forecast

a) Air Passenger Traffic Demands

The air passenger traffic demands for every airport in Kazakhstan have decreased drastically since 1991, before which air passenger movements had reached a peak. Total air passenger traffic demand (arrival + departure) dropped approximately to 20% of the peak demand in 1990.

Forecast results indicate that the demand in 2020 will be triple that in 1995 for the medium case, meaning that it will have hardly recovered to the 1990 level. However, the forecast demand for the high case indicates recovery to the peak level of 1990 by the beginning of 2020's. Almaty is by far the main region in Kazakhstan in terms of domestic and international air passenger traffic demands.

Total air passenger traffic demands in the Almaty Region in 1995 dropped to 35% of the peak demand in 1990 in spite of the larger decrease to 20% for all of Kazakhstan. Air passenger movements in this Region were about 710 thousand domestic and 900 thousand international air passengers (arrival + departure) in 1995, accounting for about 45% of the total for Kazakhstan. Forecast results indicate that the total air passenger movements in the medium case will recover to the 1990 peak by the year 2020. In the high case, it is estimated to reach about 5.65 million total air passenger movements.

For all other Regions, the results of the forecast indicate that air passenger movements will increase gradually depending on the growth of Gross Domestic Products or people's earnings. In 1995, all of these Regions experienced reduced air passenger traffic demands of less than 200-300 thousand. The regions where air passenger movements would increase to over 600-700 thousand, in the medium case by 2020, are Karaganda, Atyrau, South Kazakhstan, Akmola, Pavlodar and Mangistau.

b) Forecast Results of Air Cargo Movements

According to statistics from Kazakhstan, the total air cargo movements in ton-km recently recorded the highest levels since 1984 despite the fact that the quantity of air cargo carried by Kaz-Air has drastically decreased since 1990. From this, it can be assumed that international air cargo carried by foreign airlines has rapidly

increased in recent years. The forecast results indicate that the total cargo tons in the medium case for the year 2020 will be about 200 thousand tons or about five times the estimated level in 1995.

Tables 3.1 and 3.2 summarize the results of air traffic demand forecast.

(7) Comparison between "with Capital Replacement" and "without Replacement"

According to the forecast results, the total passenger movements at Almaty in the medium case for the year 2020 shows: 4,826 thousand "without capital relocation" and 4,775 thousand "with capital relocation", meaning about 50 thousand passengers would be lost in 2020 due to capital relocation. At Akmola, the passenger movements would increase from 632 thousand to 700 thousand in 2020 due to capital relocation.

Table 3.1 Summary of Air Passenger Traffic Demand Forecast

Region	Demand Passenger / Year (both way)			(thousand)
	2005	2010	2020	
Almaty	Dom.	1,138.92	1,474.05	2,354.39
	Int./CIS	1,379.30	1,690.00	2,420.47
	Total	2,518.22	3,164.05	4,774.86
West Kazak	Dom.	127.61	175.36	316.99
	Int./CIS	24.33	38.55	83.64
	Total	151.94	213.91	400.63
Aktyubinsk	Dom.	85.68	115.40	198.69
	Int./CIS	31.75	43.21	74.72
	Total	117.43	158.61	273.41
Karaganda	Dom.	220.20	297.78	518.15
	Int./CIS	213.82	272.06	419.87
	Total	434.02	569.84	938.02
Kustanay	Dom.	76.80	103.10	177.08
	Int./CIS	91.32	118.81	189.44
	Total	168.12	221.91	366.52
Aytarau	Dom.	187.01	243.89	402.46
	Int./CIS	95.80	123.91	199.23
	Total	282.81	367.80	601.69
East Kazak	Dom.	199.35	258.11	419.65
	Int./CIS	69.66	90.63	145.88
	Total	269.01	348.74	565.53
South Kazak	Dom.	279.09	366.72	609.26
	Int./CIS	79.77	105.48	175.28
	Total	358.86	472.20	784.54
Zhambul	Dom.	79.64	112.59	210.35
	Int./CIS	51.15	70.98	125.08
	Total	130.79	183.57	335.43
Akmola	Dom.	154.95	215.14	369.15
	Int./CIS	152.99	208.38	330.63
	Total	307.94	423.52	699.78
Sempalatinsk	Dom.	114.63	149.86	249.54
	Int./CIS	25.69	33.88	56.60
	Total	140.32	183.74	306.14
Kokchetau	Dom.	73.15	96.03	160.98
	Int./CIS	24.99	33.02	55.38
	Total	98.14	129.05	216.36
Pavlodar	Dom.	243.01	327.90	572.41
	Int./CIS	93.02	120.09	191.34
	Total	336.03	447.99	763.75
North Kazak	Dom.	52.82	72.68	131.49
	Int./CIS	17.79	23.53	39.21
	Total	70.61	96.21	170.70
Kzyl-Orda	Dom.	113.38	153.79	279.61
	Int./CIS	19.97	30.29	64.37
	Total	133.35	184.08	343.98
Zharkazgan	Dom.	106.18	138.15	227.93
	Int./CIS	53.37	68.90	110.87
	Total	159.55	207.05	338.80
Turgai	Dom.	32.53	41.69	65.26
	Int./CIS	5.43	7.20	11.93
	Total	37.96	48.89	77.19
Mangistau	Dom.	318.12	404.37	636.89
	Int./CIS	156.65	209.02	356.27
	Total	474.77	613.39	993.16
Taldy Kurgan	Dom.	49.84	67.50	119.29
	Int./CIS	81.58	105.26	167.06
	Total	131.42	172.76	286.35

Table 3.2 Summary of Air Freight Traffic Demand Forecast

Region	Demand Cargo Movement / Year (both way)			(ton)
	2005	2010	2020	
Almaty	Dom.	5,062	6,542	10,418
	Int./CIS	29,266	37,181	56,528
	Total	34,328	43,723	66,946
West Kazak	Dom.	628	865	1,568
	Int./CIS	551	752	1,307
	Total	1,179	1,617	2,875
Aktyubinsk	Dom.	420	561	951
	Int./CIS	589	786	1,305
	Total	1,009	1,347	2,256
Karaganda	Dom.	1,011	1,363	2,358
	Int./CIS	3,514	4,530	7,112
	Total	4,525	5,893	9,470
Kustanay	Dom.	391	524	898
	Int./CIS	2,379	3,071	4,783
	Total	2,770	3,595	5,681
Atyrau	Dom.	1,037	1,344	2,193
	Int./CIS	1,471	1,930	3,176
	Total	2,508	3,274	5,369
East Kazak	Dom.	1,030	1,317	2,097
	Int./CIS	2,058	2,654	4,181
	Total	3,088	3,971	6,278
South Kazak	Dom.	1,317	1,726	2,849
	Int./CIS	1,143	1,477	2,343
	Total	2,460	3,203	5,192
Zhambul	Dom.	376	531	990
	Int./CIS	1,468	1,993	3,340
	Total	1,844	2,524	4,330
Akmola	Dom.	710	892	1,675
	Int./CIS	3,972	5,547	8,881
	Total	4,682	6,439	10,556
Semipalatinsk	Dom.	542	706	1,171
	Int./CIS	319	416	686
	Total	861	1,122	1,857
Kokchetau	Dom.	394	514	851
	Int./CIS	767	993	1,604
	Total	1,161	1,507	2,455
Pavlodar	Dom.	1,230	1,655	2,877
	Int./CIS	931	1,193	1,871
	Total	2,161	2,848	4,748
North Kazak	Dom.	254	349	630
	Int./CIS	192	252	417
	Total	446	601	1,047
Kzyl-Orda	Dom.	525	710	1,286
	Int./CIS	465	611	1,064
	Total	990	1,321	2,350
Zhazkazgan	Dom.	435	562	914
	Int./CIS	1,091	1,412	2,285
	Total	1,526	1,974	3,199
Turgai	Dom.	159	204	319
	Int./CIS	49	64	104
	Total	208	268	423
Mangistau	Dom.	1,374	1,746	2,745
	Int./CIS	3,470	4,570	7,598
	Total	4,844	6,316	10,343
Taldy Kurgan	Dom.	227	309	549
	Int./CIS	1,452	1,861	2,902
	Total	1,679	2,170	3,451

3.3 Air Route Network

The planned Air route network is based on the demand forecast and the strategy for air transport development. It has to contribute a unification of the Republic, balanced development of each area and economic development. Due to relocation of the capital two national centers emerge: the economic center of Almaty and the political center of Akmola.

Economic activities with neighboring countries and new international relationships with other countries will continue to develop.

The air route network consists of "Hub and Spoke" structure and direct route structure, depending on the volume of demand for each air route.

Assuming two flights by 60-seat aircraft a day as the minimum frequency or service to users, direct service is planned for more than 30 thousands passengers per annum per route. Route demand or less than 30 thousand per annum would be through hub airports.

Figure 3.1 and Figure 3.2 show the air route networks for domestic and international traffic for the target year 2020.

The base OD forecast mentioned previous has been recomposed by airports taking the air route network into consideration. Tables 3.3 and 3.4 gives the air traffic demand by airport for passengers and freight respectively.

Note: Medium Case of the forecast results were applied for the study hereafter.

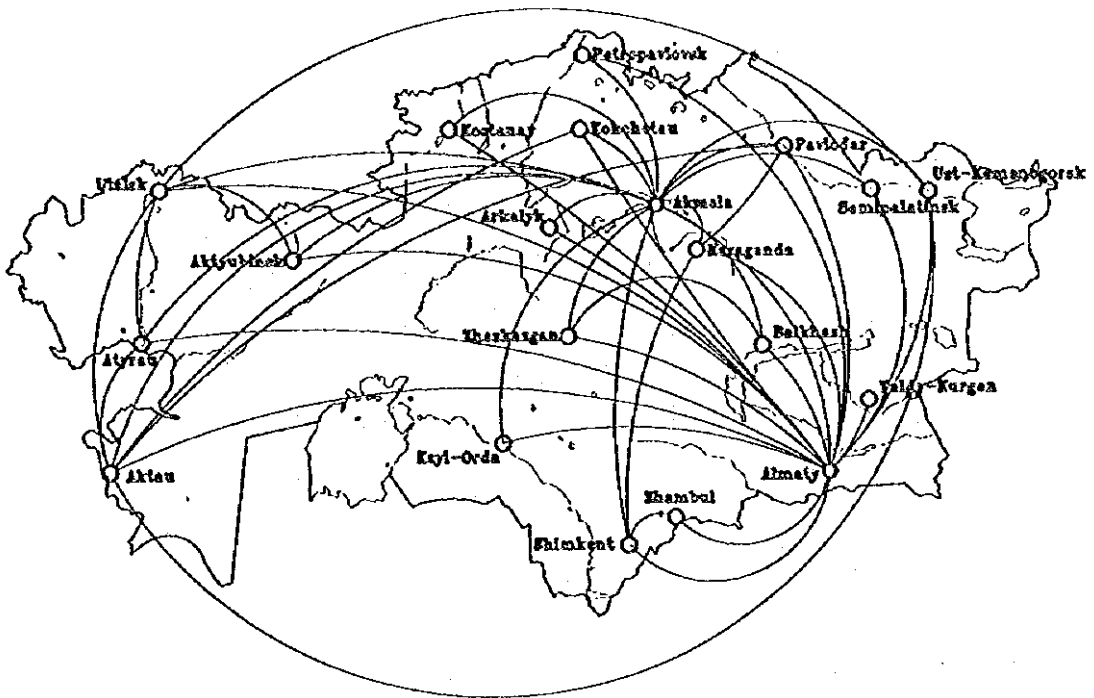


Figure 3.1 Domestic Air Route Network (Year 2020)

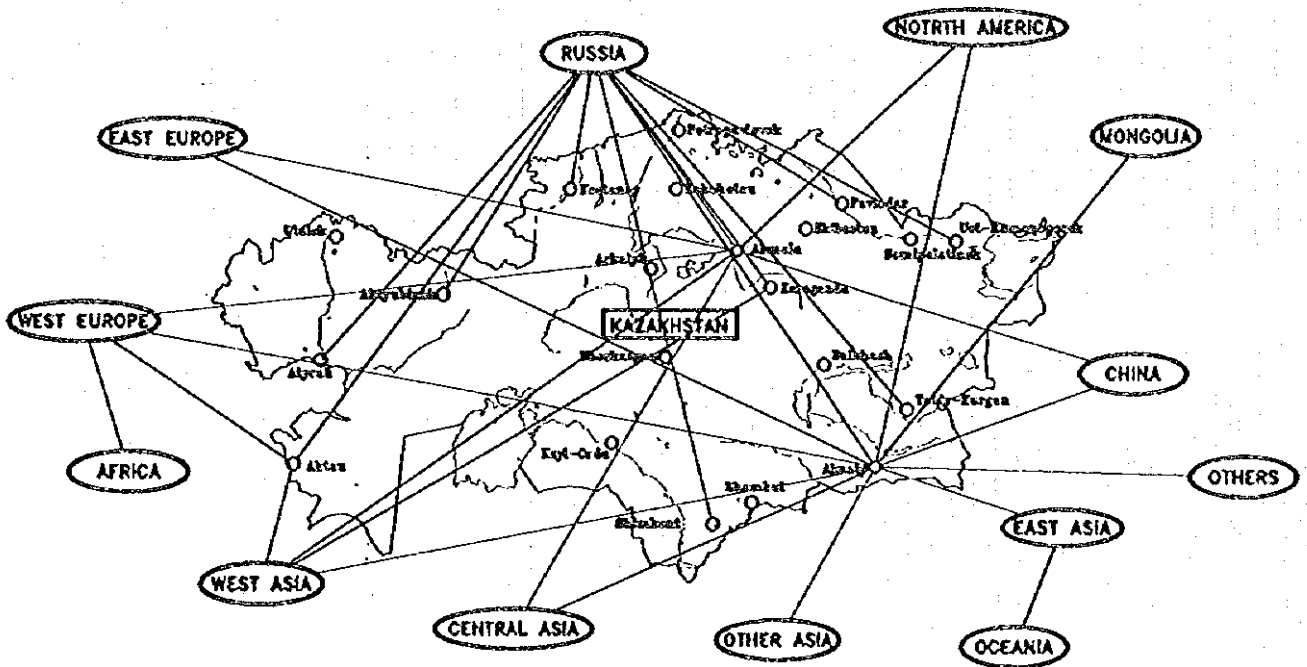


Figure 3.2 International Air Route Network (Year 2020)

Table 3.3 Air Passenger Traffic Demand by Airport

Airport (Region)	Year			(thousand)
	1995	2005	2020	
Akmola (Akmola)	-Dom. -Int. -Total	1,001 237 1,237	2,315 1,294 3,609	
Aktau (Mangistau)	-Dom. -Int. -Total	430 56 486	845 225 1,070	
Akt'yubinsk (Akt'yubinsk)	-Dom. -Int. -Total	117 0 117	269 61 330	
Almaty (Almaty)	-Dom. -Int. -Total	2,568 2,163 4,731	3,374 3,057 6,431	
Ayrau (Ayrau)	-Dom. -Int. -Total	242 41 283	519 83 602	
Karaganda (Karaganda)	-Dom. -Int. -Total	343 91 434	774 208 982	
Pavlodar (Pavlodar)	-Dom. -Int. -Total	292 44 336	675 89 764	
Shimkent (South Kazakhstan)	-Dom. -Int. -Total	322 37 359	712 77 789	
Ust.Kamenogorsk (East Kazakhstan)	-Dom. -Int. -Total	255 0 255	496 31 527	
Zhambul (Zhambul)	-Dom. -Int. -Total	131 0 131	335 0 335	
Arkalyk (Turgai)	-Dom. -Int. -Total	- - 21	38 0 38	2020
Balkhash (Zhezkazgan)	-Dom. -Int. -Total	- - 31	63 0 63	2020
Kokchetau (Kokchetau)	-Dom. -Int. -Total	- - 52	98 0 98	2020
Kostanay (Kostanay)	-Dom. -Int. -Total	- - 97	168 0 168	2020
Kzyl Orda (Kzyl Orda)	-Dom. -Int. -Total	- - 60	133 0 133	2020
Petropavlovsk (North Kazakhstan)	-Dom. -Int. -Total	- - 21	71 0 71	2020
Semipalatinsk (Semipalatinsk)	-Dom. -Int. -Total	- - 74	133 0 133	2020
Taldy Kurgan (Taldy Kurgan)	-Dom. -Int. -Total	- - NA	151 0 131	2020
Ural'sk (West Kazakhstan)	-Dom. -Int. -Total	- - 63	152 0 152	2020
Zhezkazgan (Zhezkazgan)	-Dom. -Int. -Total	- - 71	118 0 118	2020

Table 3.4 Air Freight Traffic Demand Forecast by Airport

Airport (Region)	Year			(ton)
	1995	2005	2020	
Akmola (Akmola)	-Dom.	12,560	29,936	421
	-Int.	8,866	31,305	0
	-Total	2,385	21,426	61,241
Aktau (Mangistau)	-Dom.	5,265	9,871	866
	-Int.	377	6,371	0
	-Total	2,882	5,642	16,242
Akyubinsk (Akyubinsk)	-Dom.	1,213	2,544	2,910
	-Int.	0	385	0
	-Total	593	1,213	2,930
Almaty (Almaty)	-Dom.	23,731	25,143	5,452
	-Int.	46,096	69,784	226
	-Total	20,355	69,827	5,678
Atyrau (Atyrau)	-Dom.	2,249	4,815	1,899
	-Int.	86	173	0
	-Total	1,439	2,334	1,899
Karaganda (Karaganda)	-Dom.	4,002	6,512	1,503
	-Int.	308	2,601	0
	-Total	2,604	4,311	1,503
Pavlodar (Pavlodar)	-Dom.	1,554	3,339	2,172
	-Int.	102	205	0
	-Total	1,034	1,656	1,503
Shymkent (South Kazakhstan)	-Dom.	2,324	4,939	2,172
	-Int.	179	373	3,261
	-Total	1,431	2,503	219
Ust. Kamenogorsk (East Kazakhstan)	-Dom.	3,084	6,079	3,480
	-Int.	0	148	0
	-Total	1,878	3,084	3,271
Zhambul (Zhambul)	-Dom.	1,845	4,334	1,903
	-Int.	0	0	0
	-Total	983	1,845	1,903
Arkalyk (Turgai)	-Dom.	-	206	421
	-Int.	-	0	0
	-Total	118	206	421
Balkhash (Zhezkazgan)	-Dom.	-	408	866
	-Int.	-	0	0
	-Total	261	408	866
Kokchetau (Kokchetau)	-Dom.	-	1,360	2,910
	-Int.	-	0	0
	-Total	664	1,360	2,910
Kostanay (Kostanay)	-Dom.	-	2,768	5,452
	-Int.	-	0	226
	-Total	1,666	2,768	5,678
Kzyl Orda (Kzyl Orda)	-Dom.	-	802	1,899
	-Int.	-	0	0
	-Total	473	802	1,899
Petropavlovsk (North Kazakhstan)	-Dom.	-	629	1,503
	-Int.	-	0	0
	-Total	127	629	1,503
Sempalatinsk (Sempalatinsk)	-Dom.	-	1,031	2,172
	-Int.	-	0	0
	-Total	454	1,031	2,172
Taldy Kurgan (Taldy Kurgan)	-Dom.	-	1,693	3,261
	-Int.	-	0	219
	-Total	NA	1,693	3,480
Ural'sk (West Kazakhstan)	-Dom.	-	1,176	3,271
	-Int.	-	0	0
	-Total	563	1,176	3,271
Zhezkazgan (Zhezkazgan)	-Dom.	-	903	1,903
	-Int.	-	0	0
	-Total	608	903	1,903

CHAPTER 4

**NATIONAL AIR NAVIGATION SYSTEM
DEVELOPMENT**

Chapter 4 National Air Navigation System Development

4.1 Review of Air Navigation System Modernization Plan

Kazairnavigation is implementing on Air Navigation System modernization plan. Its main objective is the establishment of automated ACC's at Almaty, Aktyubinsk and Akmola, and to consolidate the existing 18 Area Control Centers (ACC's) into the three automated ACCs. When this project completed, the enroute Air Traffic Control (ATC) system for Kazakhstan will have been upgraded to international standards. It will meet anticipated needs until completion of a phased transition to a Future Air Navigation Systems (FANS) environment over the next 10-20 years.

4.2 Review of Airways Network

The present inadequate airway systems will not be able to ensure safe and efficient air traffic flows in future. Improved Communications, Navigation and Surveillance systems, such as those available from modern ground-based nav aids, communications systems, FANS, etc, will be necessary to provide adequate services for air transportation. International air traffic movements are increasing at an annual rate of 5% per year. The rates for Europe and Asia are even higher. The demand for overflights of Kazakhstan will increase proportionately and could represent an important source of air transportation system development revenue. Overflight and revenues will only increase if there is a more efficient utilization of civil/military airspace, and more modern nav aids and communications systems are installed which meet ICAO standards.

4.3 Development Guideline for Air Traffic Control Facilities.

(1) Short term development plan (to 2005)

- Construction of control tower to international standards
- Installation of Automated Radar Terminal System (ARTS) at major airports which interface with Flight Data Processing (FDP) and Radar Data Processing (RDP) systems at the automated ACCs.
- Installation of Airport Surface Detecting Equipment (ASDE) at Almaty and Akmola.
- Installation of Precision Approach Path Indicator (PAPI) and runway center line lighting at major airports.

(2) Long term development plan (to 2020)

- VIIF Data Link

- Automatic Dependent Surveillance (ADS)
- Mode 'S' Secondary Radar
- Microwave Landing System (MLS)

See Table 4.1.

4.4 Management and Organization

There is excess capacity throughout the Air Navigation System. Kaz Aeronavigation (KAN) needs to improve services and reduce costs within a safety regime which is compliant with ICAO Standards and Recommended Practices.

KAN management recognizes the problem of overstaffing and is considering measures which could reduce staff levels by up to 50% in certain categories by the year 2003. Up to 900 persons, or about 30% of KAN's total workforce of 2941, as of June 1996, were employed in management and the overhead functions (personnel administration, financial administration, legal services, public relations, registry services, etc.). KAN management should continue their staff reduction program and take additional measures to reduce managerial and overhead staff.

KAN has recently taken action to transition to the Future Air Navigation Systems (FANS) environment which covers every aspect of Communications, Navigation, Surveillance and Air Traffic Management (CNS/ATM). Implementation of FANS will offer numerous efficiency gains to air carriers. Many states, including some neighboring Kazakhstan, are already planning their transition to a FANS environment. Some, such as Russia, will have made a partial transition by the end of 1996. KAN management should expedite planning the transition to a FANS environment without further delay.

Table 4.1 Existing Facilities and Future Requirement

Type of airspace	CNS	Existing facilities	KAN's modernization plan	Short term (2005)	Long term (2020)	FANS transition plan
Enroute	Communications	VHF voice HF voice	Satellite communication.	VHF voice AMSS (voice/data)	VHF(voice/data) AMSS (voice/data) Mode-s data link	1.PHASE-I Development, trials, Preparational demonstration.
	Navigation	NDB VOR DME RSBN	VOR/DME	VOR/DME RNAV/RNP INS/RS	RNAV/RNP GNSS INS/RS	2.PHASE-II Gradual implementation and use of FANS system.
	Surveillance and ATC	ARSR 18 ACCs	Collocation of SSR Automated ACC (Almaty, Akmoia and Aktyubinsk) ACC consolidation (18 ACCs → 3 automated ACCs)	Collocation of SSR Automated ACC (Almaty, Akmoia and Aktyubinsk) ACC Consolidation (18 ACCs → automated ACCs)	ADS Mode-s ATFM (Air Traffic Flow Management)	3.PHASE-III FANS CNS service available in parallel with the existing systems in order that appropriately equipped aircraft have operating credits based solely on FANS systems.
Terminal	Communications	VHF voice		VHF voice	VHF(voice/data) Mode-s data link	4.PHASE-IV Terrestrial systems not required for FANS CNS. Progressively dismantled.
	Navigation	NDB VOR/DME ILS RSBN	VOR/DME	NDB VOR/DME CAT-I, ILS RNAV/RNP INS/RS	NDB VOR/DME CAT-II/III ILS/MLS RNAV/RNP INS/RS GNSS	5.PHASE-V FANS CNS systems are the sole system.
	Surveillance and ATC	START ASR SSR mode A/C IFR Room	ARTS/Almaty Akmoia Aktyubinsk	Control tower ASR SSR mode A/C ARTS ASDE	Control tower ASR SSR mode A/C SSR mode-S ARTS ASDE ADS	

CHAPTER 5
NATIONAL AIRPORT SYSTEM DEVELOPMENT

CHAPTER 5 NATIONAL AIRPORT SYSTEM DEVELOPMENT

5.1 Airport Development Strategy

The overall development strategy will be governed by the need to optimize the effectiveness and efficiency of the national airport system. Within this context, the main elements of the strategy will be;

1. Correcting existing problems to ensure operations meet internationally accepted standards for safety and service.
2. Achieving cost effective development based on: sound, realistic and regularly updated demand forecasts; thorough economic and financial analyses; and flexible approaches to respond to changing circumstances.
3. Coordinated and comprehensive master planning at the national and site levels with implementation prioritized and phased over the short (5 to 7 years), medium (10 to 15 years) and long (20 to 25 years) terms thereafter.

5.2 Airport Classification

Airports are classified to identify their role in the national airport system.

Primary Airport The most important airports which can serve all point-to-point international and domestic traffic, and can also function as hubs.

Secondary Airport The second most important group of airports that serve large areas as terminals for domestic trunk lines and short haul international flights.

Regional Airport Airports which serve smaller geographic areas than secondary airports and which also feed primary and secondary airports.

After considering demographics, Regional GDP's, demand forecasts and the decision to relocate the national capital to Akmola, a proposed classification of the airports of Kazakhstan appears in Table 5.1.

Table 5.1 Airport Classification

Airport classification	Airport
Primary Airport (2)	Akmola, Almaty
Secondary Airport (7)	Aktau, Aktyubinsk, Atyrau, Karaganda, Pavlodar, Shimkent, Ust-Kamenogorsk
Regional Airport (12)	Arkalyk, Balkhash, Ekibastuz, Kokchetau, Kostanay, Kzyl-Orda, Petropavlovsk, Semiparatinsk, Taldy-Kurgan, Uralsk, Zhambul, Zhezkazgan

5.3 Operations and Maintenance

5.3.1 Rescue and Fire Fighting

There was excess RFF capacity, in terms of both vehicles and staff, at all locations.

The condition of vehicles varies widely by locations. Training programs, contingency plans and procedures were all generally satisfactory.

It is recommended that:

- there should be an immediate moratorium on the purchase of all new RFF vehicles;
- the numbers of RFF vehicles and staff at each location should be reduced to a levels based on ICAO SARP's and realistic forecasts of air traffic movements;
- the most serviceable vehicles should be redistributed to the airports to the new levels, and the other vehicles cannibalized for spare parts; and
- Pavlodar should be designated as a national training site because of its high quality RFF program.

5.3.2 Security

Airport security was generally found to be satisfactory. Because of the global sensitivities associated with Aviation Security this function should be exempted from any near term work force downsizing initiatives at airports.

5.3.3 Border Controls and Facilitation

More complaints were received from users about disruptive border controls than on any other aspect of airport operations at Almaty Airport. Border control facilitation and, therefore, international airport throughput rates and customer satisfaction can be improved significantly through better organization, procedures and training, and with minimal capital outlays. This requires National Facilitation

Programs, and National Air Transport and Airport Facilitation Committees, specified in ICAO Annex 9. These should be established, if necessary with outside expert assistance.

5.3.4 Snow Removal from Runways, Aprons and Taxiways

Snow and ice removal programs was generally satisfactory, except at Almaty which sometimes experienced problems of clearing the runway, 2 taxiways and the apron within the 60 minute standard. This is due to over 30% of snow and ice clearing equipment being lost due to unserviceability over the last 10 years. Six additional items of equipment should, therefore, be procured for Almaty.

5.3.5 Maintenance of Runways, Aprons Taxiways and other Air Side Areas

Airport staff appear to be doing a commendable job with limited equipment and funds but a number of maintenance related deficiencies were observed at some locations. The situation has already improved at Almaty with the runway repairs carried out in September/October 1996 by the Lufthansa-led consortium which is now managing the airport.

There needs to be a full commitment, based on national standards, to engineering life-cycle management for each facility, and to coordinated life cycle management between organizations responsible for different facilities.

It is recommended that surplus RFF personnel should assist with air side maintenance programs when necessary.

Runway friction coefficient testing is only carried out during winter for snow and ice conditions, but not for wet weather at other times. It is recommended that CAD establish and enforce a national standard for runway friction testing during wet weather based on ICAO Annex 14.

5.4 Ownership, Management and Organization

At the beginning of the First Field Survey on 1 April, 1996, all 20 of the 21 airports were components of Kazakhstan Airlines, a state-owned enterprise. The exceptions were at Atyrau and Ekibastuz. Since 1994, the former has been managed and partially owned by a closed joint stock company formed by the

Turkish transportation company, "Magdenil" and the Atyrau subsidiary of Kazakhstan Airlines. The letters Privately owned.

Integrated air carrier/airport enterprises were established as separate legal subsidiaries of Kazakhstan Airlines at all locations except for Almaty, where a discrete air carrier and a discrete airport enterprise were established.

In early June 1996, the Government entered into a contract with a consortium led by Lufthansa to manage Almaty airport for 10 years with an option for a subsequent partial privatization. It is not known if any privatization action has taken place but Lufthansa/Almaty Airport Ground Services has been managing the airport since mid-August 1996.

Ten airports were scheduled for separation from Kazakhstan Airlines and reincorporation as open joint stock companies by 10 September, 1996: Aktyubinsk, Akmola, Aktau, Atyrau, Karaganda, Kostanay, Pavlodar, Uralsk and Shymkent. It is not clear how will affect the existing closed joint stock company at Atyrau. At the remaining airports, the combined air carrier/airport enterprises would continue with the air carrier component providing: general aviation, and domestic passenger and cargo services.

It was reported on 28 September, 1996 that Aktyubinsk Airport was to be privatized.

5.4.1 Commentary on Current Ownership, Management and Organizational Issues

(1) Excess Capacity

There is considerable excess capacity at all airports in relation to current and near term users' needs. This is manifested by long hours of operation, and high levels of staff, facilities and equipment. Consequently, the revenue base has declined much more than the cost base. The ensuing problem of high financial deficits has been further exacerbated by high levels of payments in arrears, with the central government being the biggest debtor. Revenues from non-aeronautical commercial services, a major source of airport revenues in many countries, are virtually negligible. Employees often do not receive salaries for extended periods. The value of much of the large physical asset base has declined significantly due to

insufficient funds for maintenance.

(2) Management Framework

The management frameworks are not conducive to running airports in a business-like manner. Complex organizational structures coupled with minimal decentralization of authority make it difficult to respond efficiently and effectively to the needs of the markets to be served. Furthermore, there is little evidence of a 'service culture' among employees at any level. The absence of airport facilitation programs has resulted in inefficient and uncoordinated border controls. The financial systems are totally inadequate as management tools.

(3) Need for Commercialization

Kazakhstan's airports need to be commercialized within a viable regulatory regime such that:

- aeronautical services are produced efficiently in response to users' needs and to internationally accepted safety standards;
- revenue producing non-aeronautical services are optimized; and
- where the full costs of airport operations and development are met from user fees, and revenues from non-aeronautical services.

There are many benefits to be gained from well planned and implemented airport commercialization programs regardless of whether these involve continued governmental ownership or some form of privatization. These are, however, invariably complex exercises requiring significant assistance from outside experts. While it would be desirable to implement such a program for all of Kazakhstan's airports in the near term, this is clearly impractical.

It would be more appropriate for the Government to undertake two concurrent initiatives:

- Develop and implement a coherent national airport commercialization program for those airports which have been reincorporated as separate open joint stock companies.
- For the other airports, implement a series measures to improve efficiency and

effectiveness.

5.4.2 National Airport Commercialization Program

To develop and implement this Program, it is necessary to understand the:

- status of the airports in terms of their operational and financial conditions;
- commercialization actions already taken;
- generic commercialization process; and
- options for ownership and corporate structures.

The first item has already been described so the last 3 items will be reviewed briefly in turn.

(1) Commercialization Actions Already Taken

Some foundations of a National Airport Commercialization Program have already been laid. These include the 10 year management contract for Almaty Airport with a Lufthansa-led consortium and the separation of 10 more airports from Kazakhstan Airlines for reincorporation as open joint stock companies.

(2) The Commercialization Process

The generic commercialization process involves 3 basic steps: a market analysis; restructuring; and cost reductions. These steps do not necessarily have to be taken sequentially. If an enterprise is near bankruptcy, significant cost reduction measures will be needed, as emergency measures, prior to completion of any market survey and restructuring efforts.

(3) Ownership and Corporate Structure

The commercialization process can be used to put any entity on a business-like footing regardless of ownership and corporate structure. It can, however, involve significant changes in both. Often, an airport is incorporated prior to any commercialization process. Incorporation in itself can be a powerful driver for commercialization by imposing basic business structures on entities previously integrated into governmental departments.

There is also an obvious linkage between commercialization and privatization since privately owned entities need to be profitable on a sustainable basis to survive. In

addition to privatizing ownership, it is also possible to privatize airport functions and services by outsourcing these to the private sector.

There are 3 basic policy options for airport privatization:

- State retains ownership and investment responsibilities but transfers airport management and operations to the private sector.
- State retains ownership but transfers investment as well as operations and management responsibilities to the private sector.
- Ownership, operation and investment responsibilities transferred to the private sector.

A more comprehensive description of 10 options for the ownership and corporate structure of Kazakhstan's airports, together with a process for guiding governmental decision-makers in selecting the most appropriate options, has been appended to the main report.

5.4.3 Selected Near Term Efficiency and Effectiveness Improvement Opportunities

(1) Delegation of greater authority to Airport Corporations and Airport Directors

The national or local government landlords should allow airport directors greater authority, particularly regarding economic matters such as: attracting new businesses, and setting staffing levels and staff salaries. In return, the owners should expect greater accountability for corporate performance.

(2) Organization

Organization is necessary to make the most efficient and effective use of all available resources to achieve the desired outputs. Appropriate organizational models for the airports of Kazakhstan should meet the following criteria:

- be conducive to achieving the airport's primary goals of producing safe and economical capacity in response to users' needs and enhancing profits from commercial activities;
- group and consolidate functions which produce similar services;
- reduce the span of control of the airport director; and

- adopt the concept of unified responsibility for facility life cycle management.

The basic organizational structure proposed for each airport reduces to four the number of subordinate managers reporting directly to the Airport Director:

- **Airport Operations.** Responsible for all operational functions related to producing and safe guarding air side and land side capacity.
- **Business Development.** Responsible for all activities related to bringing new aeronautical and non-aeronautical businesses to the airport.
- **Engineering Services.** Responsible for all engineering activities related to the life cycle management of all facilities and equipment.
- **Administration.** Responsible for the provision of all staff services such as: financial administration, human resources administration, legal services, etc.

(3) Financial Management

An organizational structure must have a compatible financial management system so that managers responsible for certain functions can easily monitor and control associated expenses and revenues. It also provides an important means of performance assessment. The current financial management system for the airports of Kazakhstan does not adequately meet these needs. A new financial management system will need to have two components: one for financial accounting; and another for managerial accounting.

Financial accounting provides a means of tracking revenues and expenditures, and of using this information to provide consolidated profiles of the total financial status of the business in the form of statements which detail: assets, liabilities and equity; and profits and losses. Important performance indicators can also be derived from these statements.

Management accounting is accounting for decision-making. It involves planning, programming and budgeting both expenditures and revenues over various periods for the business enterprise, and its main components. Actual expenditures and revenues are then regularly assessed against budgeted amounts so that variances can be identified and corrective actions taken.

(4) High Staff Levels

Airports staffing complements are very high. This issue should be addressed as part of any strategy for improving the efficiency of airport operations.

a) Approaches for Adjusting Staff Levels

The most accurate way to determine appropriate staffing levels is through a process re-engineering project. This involves conducting detailed analyses of the tasks performed by all staff involved in each production process. It can take much time and effort. A faster approach for determining indicative staffing levels is to review the staff complements and then identify areas where efficiencies could be achieved based on the commonly accepted best practices used elsewhere. These include: reducing supervisory and administrative staff, simplifying administrative procedures and reducing shift work.

b) Computing New Staffing Levels

Another fast approach for determining indicative staffing levels is to use airports at other locations for comparative analyses. An accurate breakdown of staffing figures was only available for Almaty so this was used as the comparative example for Kazakhstan.

Hanoi International Airport in Vietnam and the airport model developed in the 1995 World Bank Study "Airport Infrastructure: The Emerging Role of the Private Sector" were used. The available information was adjusted based on different passenger and cargo throughputs, and functions performed by airport staff. These comparisons confirm that the staffing complement at Almaty airport is very high and, that for planning purposes, the core staff level of 686 persons could be progressively reduced to 350 to 400 persons as part of an overall efficiency improvement program.

c) Planning and Implementing a Downsizing Program

Work force downsizing is a naturally a very emotive issue; therefore, it is very important that any downsizing actions are carefully planned and implemented. To be successful, a downsizing program requires:

- full and regular consultations between the airport's owners and employees;

- phased staff reductions; and
- incentive programs for affected employees, such as: early retirement, severance payments, and job retraining and reassignment.

5.5 Initial Environmental Evaluation

Initial Environmental Evaluations (IEE) of 22 airports in Kazakhstan were carried out to select items for Environmental Impact Analyses, to be conducted in the second field survey, Feasibility Studies for Selected Priority Projects. The results from the IEEs of the main airports are as in Table 5.2.

Table 5.2 IEE for Main Airports

Items	Airport					
	Akmola	Aktau	Aktyubinsk	Almaty	Atyrau	Pavlodar
Vehicle noise levels				○		
Hazard (risk of aircraft accidents)	○		○	○	○	○
Hazard (risk of rising of the Caspian Sea)		○			○	
Ground water			○			
Migratory birds	○	○				
Air pollution	○		○	○	○	○
Water pollution	○			○	○	
Aircraft noise levels	○		○	○	○	○
Land subsidence	○					
Muddy water discharge in construction place	○	○	○	○	○	○

An outline of the field survey for selected priority projects is as follows:

- (1) Hazards
 - The rate of aircraft accidents during landing and take off
 - Bird hazards
 - Weather conditions
 - Risk of rising levels of the Caspian Sea
- (2) Groundwater
 - Water requirements of the project
 - Capacity of the aquifer
- (3) Fauna and Flora
 - The state of migratory birds in the vicinity of the airport: migration routes, staging points, numbers, species, migratory seasons

- (4) Air Pollution**
 - Air pollution levels
 - Weather conditions
 - Local topography
- (5) Water Pollution**
 - Water pollution levels
 - Treatment system of sewage and surface water
 - Water use in the vicinity of the airport
- (6) Soil Contamination**
 - Factors relating to soil contamination
- (7) Noise**
 - Aircraft noise measurement and forecasts
 - Motor vehicle noise
- (8) Land Subsidence**
 - Existence of soft ground (peat, etc.)
 - Water requirements and planned pumping
- (9) Environmental Impact during Construction Phase**
 - Countermeasures for the emission of muddy water, dust and noise during the construction phase