2.3.9 Airport Facilities

(1) General Information

The original scope of work of the JICA Study was 22 airports. Because of time constraints, 10 representative airports were actually surveyed with the selection made in consultation with the Civil Aviation Department (CAD).

Information on facilities at 22 airports appears in **Table 2.3.9.1**. Further information on the 10 airports surveyed by the Study Team appears as **Appendix 2.3.9-A**. The existing layout of 21 airports appears as **Appendices 2.3.9 D (1) to 2.3.9 D (21).**

(2) Derailed Information

The technical criteria established by the former USSR have been applied as technical standards of airport engineering in Kazakhstan being valid until January, 1997. There are differences between the standards and the ICAO standards and recommended practices. However, it is planned to revise it in accordance with the ICAO SARP's.

Airports were classified into six (6) classes according to their runway length, i.e. A, Б, B, Г, Д, and E (hereinafter referred to as (a), (b), (v), (g), (d) and (yeh) respectively). There was the standard that determined characteristics of airside infrastructures in USSR. Almaty and Karaganda are class (a) airports and the rest of the local airports are class (b) or (v). Burunday has a 1,140m runway so its class is (d), as are many other small airstrips studded all over the country. Runway information appears in **Table 2.3.9.2**.

Sizes of major civil facilities are in accordance with this standard with small difference.

Almaty and Karaganda, out of ten airports which the Study Team visited, are unique in their sizes and layout of airside facilities and passenger terminal buildings. All the other classes (b) and (v) airports are very similar regardless variation of traffic volume, excluding military facilities.

Table 2.3.9.2 Airport Classification in USSR Standard

Class Code	Runway Length	Airports
A (a)	3,200 m	Almaty, Karaganda
Б (b)	2,600	Aktau, Aktyubinsk, Kzyl-Orda, Zhambul, Zhezkazgan, Semipalatinsk, Shimkent
B (v)	1,800	Atyrau, Uralsk, Akmola, Pavlodar, Arkalyk, Balkhash, Kostanay, Kokchetau, Petropavlovsk, Taldy-Kurgan, Ust-Kamenogorsk, Ekibastuz
Г (g)	1,300	(none)
Д (d)	1,000	Burunday
E (yeh)	500	

note: Study Team visited those underlined

Table 2.3.9.1 Summary of Airport Facilities

	see note	Airport	Location from the Central City	Altitude of ARP (m)	Operation Hours	Land Area (ha)	Main Runway: Dimention	Main Runway: PCN	Main Runway: Year of Const.	Taxiway: Parallel	Taxiway: (full)	Taxiway: Exit, etc	Apron: Il-86	Apron: Others	Apron: An2/M8	Passenger Terminal: Capacity	Passenger Terminal: Floor Area	Passenger Terminal: Year of Const.	Control: Floor Area	Control: Year of Const.	Admin: Floor Area	Admin: Year of Const.	Fire Station: RFF CAT.	Fire Station: Floor Area	Fire Station: Year of Const.	Hangar: Floor Area	Hangar: Year of Const.
1		Petropavlovsk Петропавловск	11 km SE	138	01:00-14:00	132	2,500 x 42	36 /R/B/X/U	1971			1		4	x	200	2,750	1976	950	1975	360	1971	6	54	1972	350	1976
2		Kustanay Костанай	2 km W	182	24 hr	253	2,500 x 48	30 /R/B/X/T	1964	1	x	10		19		200	3,051	1974	72	1976	3,038	1978	7	93	1977	2,200	1980
3		Kokchetau Кокшетау	12.5 km NE	263	24 hr	249	2,500 x 45	27 /F/D/Y/T	1972			1		12	x	200	2,850	1975	1,439	1975	1,510	1977	6	260	1978		
4	v	Pavlodar Павлодар	12.8 km SE	125	24 hr	532	2,500 x 45	14 /R/A/X/T	1969			3		19	12	200	*3,300*	1972	360	1972	329	1960	7	84	1972		
5		Ekibastuz Экибастуз					2,500 x 42					1		6		200											
6	v	Uralsk Уральск	12 km SE	38	24 hr	384	2,400 x 42	15 /R/A/X/U	1972			1		4	x	200	*3,900*	1978	950	1976	366	1972	6	165	1973	504	1975
7		Arkalyk Аркалык	8 km NE	388	02:00 - 18:00	262	2,500 x 45	31 /F/C/Y/T	1971			1		14	x	200	2,930	1981	2,400	1977	240	1981	6	390	1980	990	1980
8	v	Akmola Акмола	18.5 km SE	354	24 hr	530	2,500 x 49	28 /R/B/X/T	1963	2		1		17	x	200	*3,100*	1965	1,473	1966	490	1964	7	438	1967		
9	v	Karaganda Караганда	20 km SE	537	24 hr	391	3,300 x 60	40 /R/A/X/T	1980			2	2	21		1,300	*34,400*	1993	94	1980	343	1980	7	339	1980	1,900	1983
10		Semipalatinsk Семипалатинск	8 km SE	232	24 hr	1,600	3,100 x 60	27 /R/B/Y/T	1941	1		9		19		400	1,200	1970	43	1937	840	1975	6	174	1936	506	1977
11		Urdzhar Урджар					x																				
12		Ust-Kamenogorsk Усть-Каменогорск	13 km E	284	00:00-17:00	349	2,500 x 42	22 /R/A/X/T	1969	1	x	7		31	x	200	394	1966	1,488	1975	822	1957	6	820	1960		
13		Zaysan Зайсан					x																				
14	v	Atyrau Атырау	5 km W	23	24 hr	86	2,350 x 44	17 /R/A/X/T	1974			3		17	34	200	*4,500*	1979	1,403	1976	1,271	1973	6	53	1940	990	1975
15	v	Aktyubinsk Актюбинск	5 km SE	220	24 hr	1,220	3,097 x 60	20 /R/A/X/T	1967	2		1	2	26	22	400	*4,200*	1964	456	1963	886	1956	7	115	1963		
16		Zhezkazgan Жезказган	8 km SE	381	24 hr	1,757	2,600 x 42	21 /R/B/X/T	1973			2		14	x	200	4,656	1985	1,528	1973	5,313	1984	6	390	1990	2,200	1986
17		Balkhash Балхаш	6 km NE	433	24 hr	300	2,500 x 42	19 /R/A/X/T	1967	1	x	3		11	16	200	1,193	1964	160	1937	160	1953	6	193	1970		
18		Taldy-Kurgan Талдыкорган	8 km NE	591	23:00-08:00	401	2,500 x 44	14 /R/A/Y/T	1974	2	x	7		26		200	912	1974	168	1975	144	1973	5	48	1974		
19	v	Aktau Актау	10 km N	22	24 hr	345	2,650 x 42	36 /F/C/Y/T	1983			2		18	24	200	*2,100*	1983	94	1983	131	1983	6	94	1983		
20	v	Kzyl-Orda Кзыл-Орда	12.5 km SE	130	02:00-14:00	290	2,700 x 42	37 /F/B/X/T	1986			1		12	27	n.a.	*200*	1985	96	1985	216	1985	6	504	1985		
21		Zhambul Жамбыл	8.5 km SE	658	24 hr	329	2,900 x 45	27 /F/B/X/T	1967	1		8		18	x	200	2,701	1974	428	1971	119	1960	6	554	1960	990	1989
22	v	Almaty Алматы	10 km NE	681	24 hr	698	4,400 x 60	36 /R/B/X/T	1968			5	12	48		700	*11,500*	1973	1,612	1968	152	1957	8	69	1970	16,067	1967
23	v	Burunday Бурундай	25 km NW	707	24 hr	71	1,135 x 35	30 ton	1970	1		2				100	*1,500*	1970	144	1971	2,495	1973	5	67	1977		
24		Shimkent Шымкент	12 km NW	411	24 hr	384	2,800 x 44	22 /R/A/X/T	1967	1		7		19		200	1,177	1968	883	1975	107	1963	6	170	1965	105	1965

note: "v" indicates the Study Team's visit

Source: Number of taxiways, number of apron parking positions — AIP
Other than the above — **Kaz Air**
Italic figures for Floor area of passenger terminal building — **Study Team**

(3) Airport Development

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

The necessity and the project size have been dramatically changed because of the declined demand for air transport. They are expected to be adequately downsized to meet the changes and demands. As the Government has financial difficulty and Kaz Air has been facing the crisis in financial management, the Government expect to introduce foreign investment to the airport development projects, particularly adopting BOT scheme to the cases of Almaty and Akmola.

Table 2.3.9.3 lists the development plans. More information for new passenger terminal building in Akmola is included in **Appendix 2.3.9-B**.

Table 2.3.9.3 Airport Facilities Development Plans and Project

Airport Name	Target Facility	Outline of the Development
Almaty	Existing PTB renovation	Remodeling of the existing domestic/CIS terminal into international. The existing international arrival building into domestic.
	Construction of a New Runway	Construction of a new parallel runway. Being halted due to a lack of funding.
	New Terminal	Construction of new terminal area in opposite side of the existing terminal apron.
Akmola	Reconstruction of the Airport	Reconstruction for a new capital airport.
Kzyl-Orda	New Passenger Terminal Building	Construction of new passenger terminal building.
Aktau	Runway Extension and New Passenger Terminal Building	Runway extension in 400 m. Construction of new passenger terminal building.
Atyrau	Relocation of Runway	Countermeasure against rising water level of the Caspian Sea. Four alternatives were developed.

(4) Runway and Runway Strip

a) Dimensions

i. Almaty

Almaty, as the sole ICAO designated international airport, has a 4,400m long runway to facilitate B-747 and Il-86 class aircraft. The runway strip is identified in accordance with the USSR standard. Two START buildings used for airport ATS are located sufficiently far from the runway so as not to infringe the transitional surface. The paved shoulders 7.5 m wide are provided partially. Construction of a

second parallel runway, 3,000 m long, started in 1992, but was halted in 1995 due to a lack of funding. It has been partially constructed and the exposed base has suffered some deterioration. This second runway is 200 m from the existing runway and its threshold is staggered from the main runway by 1,500 m . The new runway was planned to relieve the current aircraft noise problem and allow for major rehabilitation work in the main runway. However, due to close distance between both runways, simultaneous operation may not be possible. It will be necessary to plan how to utilize two runways.

ii. Karaganda

This is a rather new airport in Kazakhstan constructed in 1980. The width is 60 m unlike an any other airport. A paved shoulder 7.5 m wide is also provided.

iii. Other Airports (Classes (b) and (v))

The runway length varies from 2,400 m to 3,100 m to serve for Tu-154 class and Yk-40 class aircraft. About half of the runways are 42 m wide in accordance with the USSR standards. Among them, expansion of the runway width from 42 to 45 m is in progress in Aktau. The remaining are from 45 m to 60 m wide. Shoulder widths are generally narrow e.g. 0 to 3 m. The composition of the runway strip is somewhat unique as shown in **Figure 2.3.9.1**. The runway strip differs considerably form the ICAO standards. In all cases, except for Balkhash and Ekibastuz, non-paved runways are located close to main runways and these are usually grass-covered except for desert areas such as Kzyl-Orda and Aktau. These non-paved runways are for light aircraft operation, especially those fitted with snow skis during winter. Besides these grass strips, many airports have spaces, about 500 m square, designated as strips for An 2 operations.

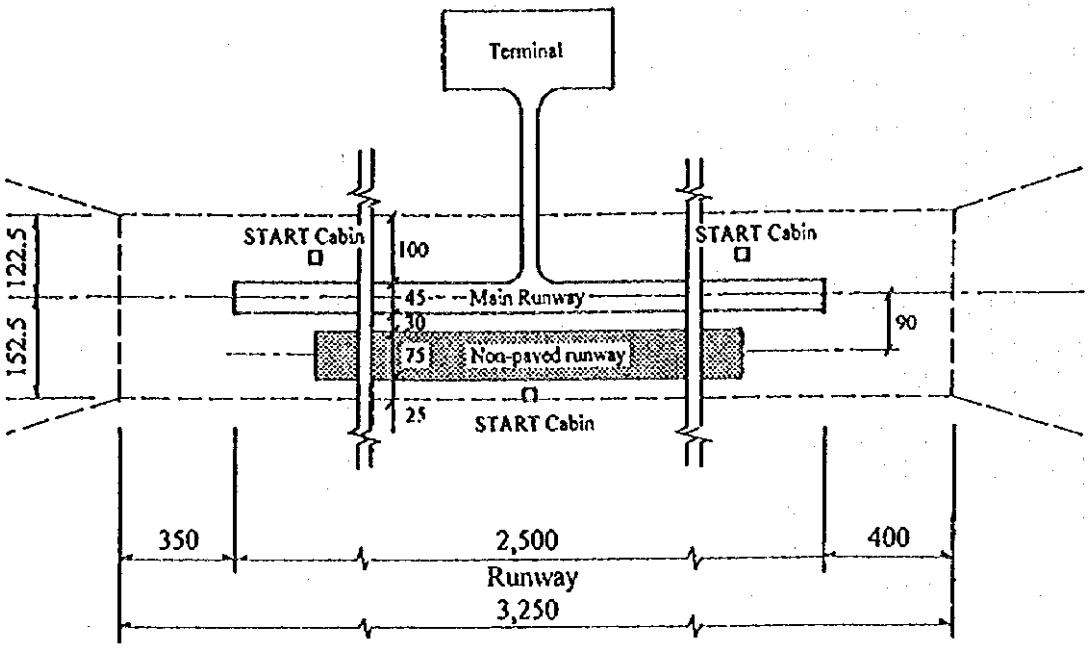


Fig. 2.3.9.1 Example of Runway Strip

iv. Burunday

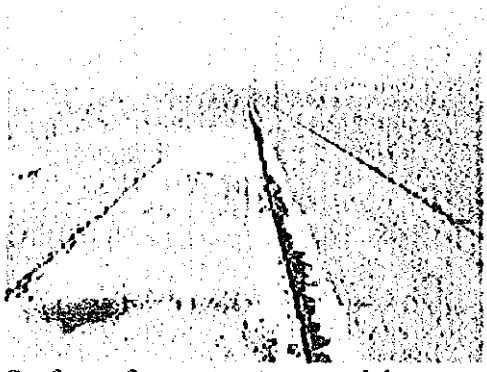
The single runway is 1,140 m long and 35 m wide.

b) Pavement

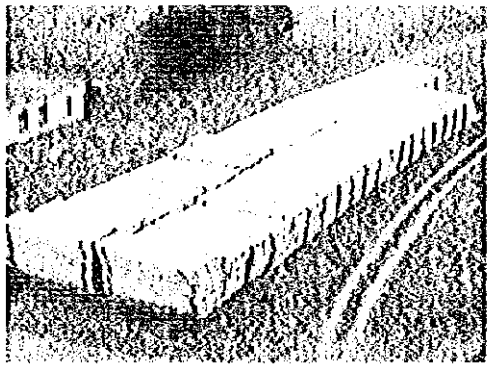
Most of runways are paved with cement concrete. At Aktyubinsk and some other airports, precast concrete slab pavement is adopted as shown in **Photo 2.3.9.1**. These slabs were produced in Russia, and it became difficult to import them since independence, together with the joint sealing material at some airports. Flexible pavement is used at a few airports preferably in the southern areas.

Present small budget had limited necessary maintenance works; such as repair of pavement deficiencies at every airport. Most of runway pavements, except Karaganda, are suffered aged and deteriorated.

Pavement strength is indicated by PCN number. PCN numbers were determined by the Kaz Aero Project organization.



Surface of cement concrete slabs
(Runway in Aktyubinsk)



Stocked slabs for runway extension
(Pavlodar)

Photo 2.3.9.1 Precast Cement Concrete Slabs

c) Slopes

The maximum longitudinal slope at the runways is 0.8 % of Semipalatinsk airport, according to AIP information. Unevenness of the pavement surface in certain spots were observed visually in some airports.

d) Second / Cross Wind Runway

Semipalatinsk has a 1,100 m long paved cross wind runway.

(5) Taxiway

i. Almaty

Taxiway system consists of five taxiways at the time being. A full parallel taxiway and connected two rapid exit taxiways were demolished because of the new

runway construction although the terminal area is located close to the end of the runway. The widths of taxiways are 18 to 23 m.

ii. Other Airports

Taxiway width varies from 18 to 30 m in ten airports that the Study Team visited. Taxiway pavement condition is almost same with runway. Taxiway configuration varies at each airport, from single exit taxiway to dual parallel taxiways with numbers of exit taxiways. At a typical local airport, the taxiway system is simple. One or two exit taxiway(s) connect the main loading apron with the runway. Another taxiway may be provided to connect another apron, or maintenance center. Taxiways for grass landing strip are not paved everywhere.

(6) Apron

i. Almaty

There are six apron areas spreading in the terminal area with a total area of 320,000 sq.m. The longest distance between aprons is some 1.4 km. The number of parking positions is as follows:

Aircraft type	Il-86	Tu-154	Il-62	Tu-134	Yk-40/An-24
Numbers	12	14	2	15	17

The aircraft parking is planned to nose-in configuration. As there are many parking aircraft, some small aircraft park on Taxiway-5, incidentally. It should be noted that unserviceable Tu-154s occupy large space.

ii. Karaganda

Number of parking positions by aircraft type are as follows:

Aircraft type	Il-86	Tu-154	Tu-134/An-24
Numbers	2	12	9

The dimensions is originally designed to accommodate USSR aircraft types and also it will be serviceable for Boeing B-747 class, by provision of two adjacent spots according to airport staff there. However, the passenger terminal building is not yet fully completed, and the demand for air transport has declined dramatically, apron in use is very limited.

iii. Other Airports

Relatively large spaces of apron are provided in self maneuvering configurations due to declined air demand. Besides Almaty and Karaganda, Aktyubinsk have parking positions designated for Il-86 aircraft whose wing span is 48 m. Most airports function as base airports for Tu-154, Tu-134, An-40, Mi-8 (helicopter) and numerous numbers of An-2 parking. However, most of aircraft are thought being unserviceable.

(7) Passenger Terminal Buildings

Drawings of the floor plans for the existing passenger terminal buildings have been collected and discussed with airport management as well as with the Kaz Aero Project, the state entity responsible for design of the airport facilities in Kazakhstan.

A summary of the characteristics of these airports are as follows.

a) Almaty

The Almaty Airport has three terminal buildings as shown in **Figure 2.3.9.2.**

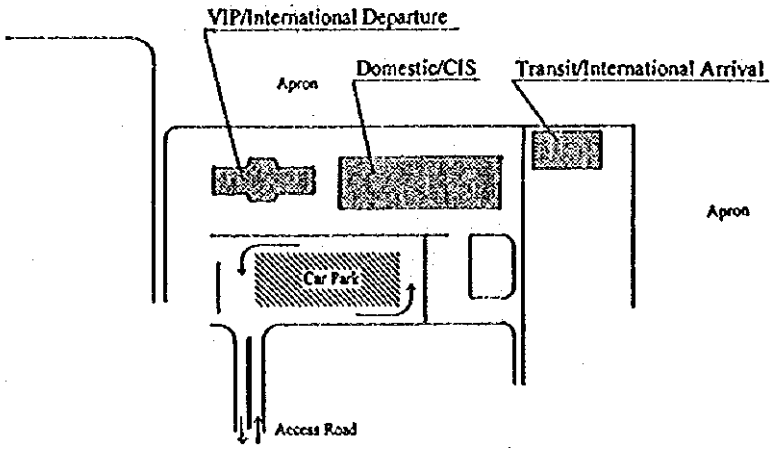


Fig. 2.3.9.2 Three Passenger Terminal Building in Almaty Airport

Domestic/CIS Terminal Building

Domestic passenger terminal building is based on 1 and 1/2 concept, having a curb length of 168m and the concourse is shared by both departing and arriving passengers, and visitors. The total floor area is 11,467m^2, 6,552m^2 for the ground floor and 4,915m^2 for the second floor respectively. It was built in 1978 and is a little larger than other terminals that were built in the same period, but the basic structure of the passenger handling system is the same. Major passenger handling is done on the ground floor, with the arriving passenger hall and baggage claim located to the left, and the departing passenger check-in, security control, customs control, departure lounge are located to the right, facing the airside while standing in the concourse. Large lounges, a bar, a restaurant and shops are located on the second floor. The condition of the building is fair and is usable for at least another 5 to 6 years assuming that service levels are maintained while coping with changes in demand.

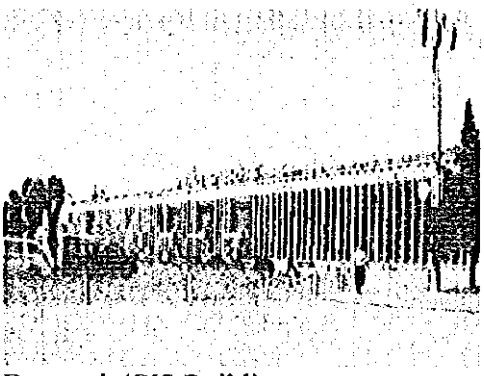
VIP/International departure terminal

VIP terminal was built in 1950's and is the oldest one of terminal buildings. It stands to the left of the DOM/CIS terminal building as seen from the landside. It has two wings, one used for the international departing passengers and the other for departing VIP passengers. At the center, a large hall is located, with the

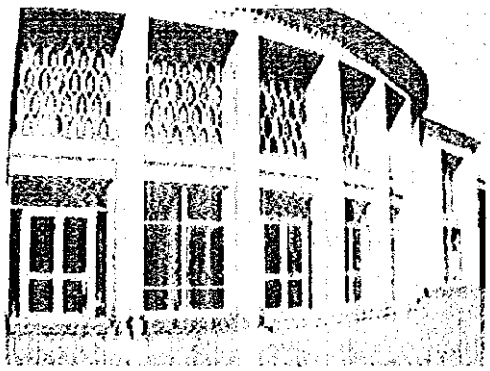
departure lounge on the ground floor and a duty free shop and buffet on the second floor. The building is in an exceptional condition seeming to represent the golden age of the Soviet Union. It is said to be designed by the Moscow Aeroproject.

Transit/International arrival terminal

International arrival passenger terminal building was built in 1994. It stands to the right of the DOM/CIS building as seen from the landside. It is said to have been built for cargo storage but converted into its present use, and hence is called as a temporary building. The building is approximately 36m deep and 55m long. The ground floor area is approximately 1,980m^2 and has a mezzanine of 1,080m^2.



Domestic/CIS Building
- Landside View



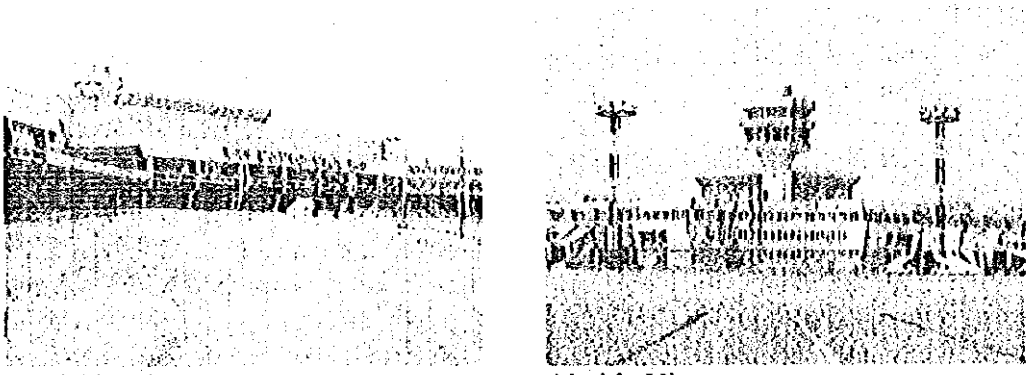
VIP/International Departure Building
- Exterior of Central Hall

Photo 2.3.9.2 Passenger Terminal Buildings in Almaty

b) Karaganda

Karaganda airport will have the largest terminal building, whenever the construction is finished. It has an international terminal unit at the end of one of the 2 wings as shown in **Figure 2.3.9.3**. This part has been completed and is presently used for both domestic and international traffic. According to the Kaz Aero Project, who designed the terminal in 1975 to 1978, the domestic terminal, still under construction, has the capacity to handle about 1,200/hour passengers both ways, approximately 600 for outbound and 600 inbound within the peak hour. Kaz Aero Project is presently considering one of the two wings will be converted to international use. This change could not be traced in the drawings provided for the Study Team.

Terminal building is based on a 2 level concept, equipped with two level road system. It is a 3 story building with arrival on the ground floor, departure on the second floor, and transit lounges on the third floor. It has a total floor area of 34,366m^2, 14,707m^2 for the ground floor, 14,292m^2 for the second floor and 5,367m^2 for the third. It is a typical building in Kazakhstan airport, ostentatious, extravagant and has all kinds of service rooms such as those for food storage, kitchens, pantries, paint shop, metal shop, etc. About one half of the total terminal area seems to have been allocated to these supporting service rooms.



Landside View　　Airside View

Photo 2.3.9.3 Passenger Terminal Building in Karaganda

c) Other Airports

From observation of eight airports, it is appears that almost all the local airport passenger terminal buildings in this country were built in the1960's and1970's, and were designed with the same concept.

The design concept is as follows,

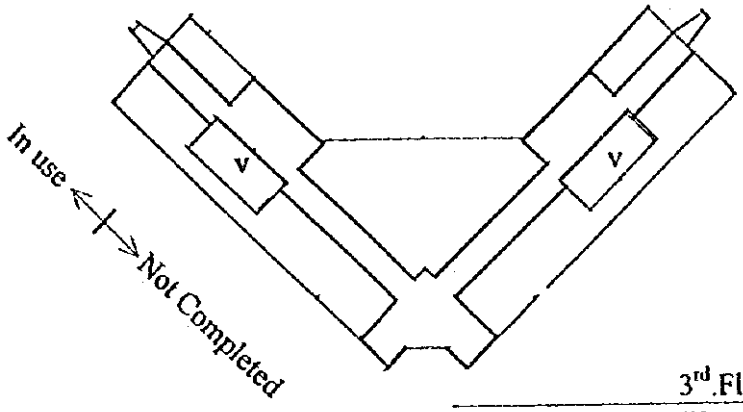
- 1 and 1/2 concept
- 6 meter structural module in the transversal direction
- domestic layout

Of these 5 airports, Atyrau, Aktyubinsk and Akmola have had extensive renovations to accommodate international passengers. Atyrau has had the largest extensions in the airside while the other 2 have had limited renovations within the original building premises. The floor areas range from 3,108m^2 to 4,486m^2 (see **Appendix 2.3.9-C**).

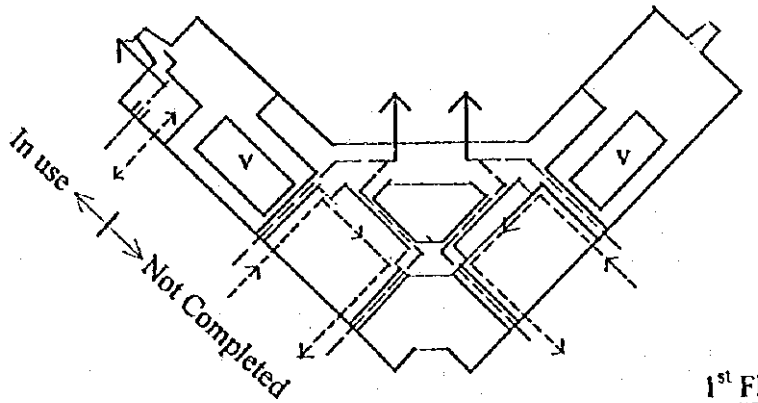
The condition of the buildings is fair, considering the their age. They are usable for several years to come, if required to handle domestic/CIS traffic only.

Exterior - Aktyubinsk　　Interior - Akmola

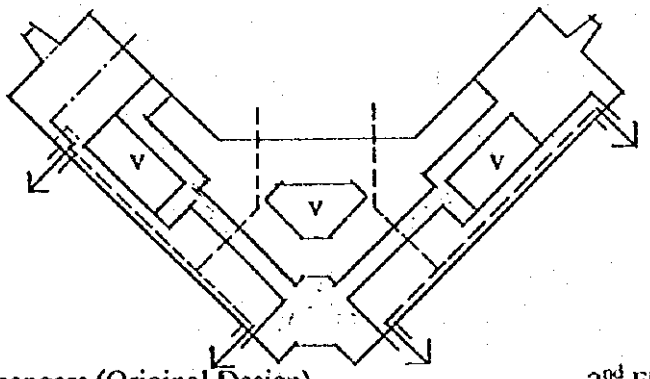
Photo 2.3.9.4 Examples of Passenger Terminal Building



3rd Floor Plan
(Transit Lounge) 1:3000



1st Floor Plan
(Arriving) 1:3000



2nd Floor Plan
(Departing) 1:3000

LEGEND
- – – – – – Domestic Passengers (Original Design)
- —·—·— International Passengers
- ---------- Baggage
- v Void

Fig. 2.3.9.3 Passenger Terminal Building in Karaganda Airport - Floor Plans

(8) Public Utilities

Since the demand on civil aviation is declining, there are no obvious shortages of capacity. However, most of them are deteriorated.

- The water supplies are from city mains or deep wells. In case of Aktau airport, source water is from the Caspian Sea.
- Electricity is supplied by two cable routes from the nearby city. Distribution systems depend on local conditions.
- Waste water is treated at the airport, or sent to a city treatment plant.
- Hot water is produced within the airport, or from outside where heating facility is near to the airport. Generally airport has its own boiler and a kerosene pipeline is often installed.
- Airport access for passengers is always provided only by road transport. Public transportation means are mainly taxis and buses which are operated by local administration generally.

2.3.10 Airport Operations

(1) Organization and Staffing

Information on organization and staffing was obtained to various levels of detail at 7 of the 9 airports covered in the First Field Survey. At all locations other than Almaty, airport and airline functions were organizationally integrated and it was not possible to attribute numbers of employees to each function, even at a macro level. From this limited data, however, two key issues were evident:

- staffing levels are very high by any standards and represent a major component of the excess capacity that exists throughout the Kazakhstan Air Transportation system; and
- organizational structures were highly centralized, with most local Airport/Airline Directors having many persons reporting directly to them (wide span of control) and limited substantive authority delegated to subordinate managers.

Staffing levels and spans of control for the airports surveyed appear in **Table 2.3.10.1.**

Table 2.3.10.1 Airport Staffing Levels and Spans of Control

Airport	Span of Control	Staffing Levels
Almaty	11	2724
Atyrau*	8	No information provided
Akmola*	15	1182
Karaganda*	5	1967
Pavlodar*	9	804
Aktau*	16	896
Kzyl Orda*	15	No information provided
Uralsk*	No information provided	"
Aktyubinsk*	"	"

* Combined airport and air carrier organization

For the purposes of analysis, Almaty airport is the most useful example because:

- it is the largest airport in Kazakhstan;
- it was the only airport which had been organizationally separated from the locally based air carrier component of Kazakhstan Airlines;
- its level of international traffic is far higher than that of any of the other airports; and
- more complete staffing and organizational information was provided than for any other airport.

The staffing levels of Almaty airport by function appear in **Table 2.3.10.2.** These were effective 3 June, 1996 and had been adjusted to reflect a planned reduction of 30 persons in the managerial ranks, primarily in staff services such as Financial and Personnel Administration.

The Study Team was advised that the overall staffing level at the Airport would be reduced by about 10% over the next year or so and, over the same period, it was expected that the responsibility for social services and the associated staff would be transferred to the local government.

It should be noted that these staffing figures do not include Air Navigation Services' staff since these belong to Kaz Aeronavigation. Furthermore, the figures include 784 persons assigned to ground handling and related activities, 161 to airline catering and 66 to state security. In many other countries, these functions would come under organizations other than the airport authority.

A mid-September 1996 edition of "Panorama" reported considerable speculation among airport employees about possible layoffs of 50% of the work force, as part of a downsizing program to be conducted by the Lufthansa-led LATAS company, subsequent to its assumption of management responsibilities one month earlier. In

the same article, this speculation was refuted by the Lufthansa's senior manager in Kazakhstan although the article did state that the airport manager and his deputy had been put on long-term leave and that other senior staff members would soon be replaced by western specialists.

Table 2.3.10.2 Almaty Airport Staffing Levels

Operational Services	Number of Staff
Administration	105
Air side maintenance	28
Apron control	88
Supply	29
State security	66
Ground handling	457
Air side transportation (passengers, cargo, fuel, etc.)	327
Airport security	193
Rescue & fire fighting	84
Computer center	36
Accounts payable & receivable	36
Heating, sanitation & other technical services	110
Aerodrome lighting	60
Flight refueling	100
Inflight catering	161
Mechanical engineering	59
Administration & economics	40
Services for foreign aircraft	12
Total Operational Services	1991
Social Services	
Hotel	155
Medical & sanitation	251
Kindergarten	105
Building operations & maintenance	183
Palace of culture	22
Culture and welfare	17
Total Social Services	733
Grand Total	2724

(2) Financial Management

The financial management system used falls below the standards based on Generally Accepted Accounting Principles (GAAP) used in developed countries. It was virtually impossible to use the balance sheets and profit-and-loss statements made available as management tools to derive performance ratios such as return on assets employed and debt/equity ratios. Furthermore, there are no management accounting systems in use which could be used for such functions as:

- planning, programming and budgeting;
- costing;
- performance measurement; and
- investment decision-making

The level of non-aeronautical or commercial revenues at the airports is very low. For example, at Almaty airport only 2.25% of the total revenues are derived from commercial sources. This is low even by the standards of former socialist countries or of socialist countries currently implementing free market reforms. For Example, the level at Noi Bai airport which serves Hanoi in Vietnam is 14%.

(3) Rescue and Fire Fighting

The Rescue and Fire Fighting Classification system for all airports in Kazakhstan is the same as used in the former USSR. There are nine Aerodrome RFF categories. There used to be nine categories specified in ICAO Annex 14 Aerodromes; however, the second edition published in July, 1995 now specifies ten categories. Information received on RFF services appears in **Table 2.3.10.3.**

Table 2.3.10.3 Airport Rescue and Fire Fighting Services

Airport	Category (USSR)	Large Vehicles	Medium Vehicles	Staff Levels	Response Time
Aktau	6	2	2	40	3 min.
Atyrau	6*	1	2	25	3 min.
Uralsk	6	1	2	-	3 min.
Aktyubinsk	7	2	1	47	3 min.
Akmola	7	1	2	28	3 min.
Karaganda	7	2	2	50	3 min.
Pavlodar	7	1	3	48	1.5 min.**
Almaty	8	3	2	120	3 min.

* Should be Category 7 which is based on the 700th movement of a TU-154 aircraft.

** The national standard for response times is <3 minutes. At Pavlodar the actual time achieved is 1.5 minutes.

All vehicles were of a very similar design and were manufactured in the former USSR or CIS states. The large MAS type vehicles carry 12, 000 liters of water and 900 liters of the PO 3 liquid foam concentrate. The medium KAMAZ type vehicles carry 4,000 liters of water and 250 liters of the PO 3 liquid foam concentrate. The vehicles ranged in age from 4 to 16 years. The condition of the vehicles varied between locations. There were signs of severe rusting at some locations, particularly at Aktau and Aktyubinsk. Many locations reported difficulties in maintaining the vehicles, primarily attributable to a lack of funds to purchase spare parts and maintenance equipment. One major vehicle at Karaganda had been out of service for 2 months for an engine overhaul which was being carried out with little more than basic hand tools; it would take another month to complete the overhaul.

As the largest of Kazakhstan's Airports, Almaty had by far the largest RFF service. Its complement of vehicles includes the following in addition to those listed in **Table 2.3.10.3:**

- a MAS vehicle converted to a mobile water tanker used for fast on-scene replenishment of the primary vehicles (the closest of the 46 hydrants on the airport are all located at least 1 Km from the runway);
- three old medium vehicles kept in reserve;
- one trailer for medical equipment;
- one set of stairs mounted on a pick-up truck for evacuating passengers from stricken aircraft; and
- one set of equipment for moving disabled aircraft, including one large tractor and four trailer mounted cradles.

Almaty has also purchased, at a cost of USD 620,000, a new large Barracuda RFF vehicle manufactured in the United Kingdom. It can carry 10,000 litters of water and 1,200 litters of foam agent. After receipt, it will be used in addition to the existing 5 primary RFF vehicles.

If the number of RFF vehicles used at each of the airports surveyed is compared to the minimum levels previously required by ICAO when it also specified 9 categories, all of the airports exceed these levels by 50 to 100%.

Karaganda has two RFF stations, each located near to the end of the runway and each with one large and one medium vehicle. Almaty keeps one large vehicle permanently stationed at the end of Runway 05.

Ambulances were observed at Atyrau and Karaganda, and one was reportedly located at Pavlodar but not at the RFF Station. No light Rapid Intervention Vehicles were seen at any location.

The general condition of RFF site buildings was poor and most sites were also dirty and untidy. In contrast the sites at Atyrau, Pavlodar and Almaty were clean and neat despite the age of the buildings. The Almaty RFF site will be relocated in either 1996 or 1997 after the anticipated completion of the second parallel runway.

Most airports had additional hydrants in the vicinity of the main runway with which to replenish vehicle water tanks. Some also had reservoirs or natural ponds anywhere from 0.5 to 4 Km from the main runway.

All airports reported having formal Emergency Plans. All claimed to conduct exercises once or twice per month using only airport staff. Larger exercises were also carried out once or twice per year, and involved emergency services and medical staff from the surrounding communities.

Most of the RFF crew members had been recruited and trained locally, either on the airport or at community fire stations. Some of the directors of RFF services and their crew chiefs had also received formal Airport RFF training during the time of the USSR at centers in Moscow, and at other locations outside of Kazakhstan.

The RFF site at Atyrau also had a Rescue Coordination Center covering the North Eastern Caspian Sea Area. One Mi-8 Rescue Helicopter was also located at Atyrau with a crew of 4 persons, including one paramedic.

(4) Airport Security

It was possible to obtain information on Security at 5 airports. At these and presumably at all airports, 2 organizations were usually represented: the National Security Organization (KNB); and the Airport Security Department. The Team only had any contact with the latter organization.

The airport security department is primarily responsible for:

- securing the perimeter of the airport;
- guarding vital installations such as fuel farms;
- apron security;
- screening outbound passengers and their luggage; and
- primary response in the event of actual or potential illegal acts against aircraft or passengers.

At some locations a dedicated and radio-equipped vehicles were available to make perimeter patrols. Where perimeters were observed, these were well fenced and the fencing was in good condition. The original perimeter at Almaty has been breached with the construction of a second parallel runway and temporary wire barriers have been erected. Direct apron access was always through controlled points as was apron access through terminal buildings. Access doors in terminal buildings for departing and arriving passengers were always found to be locked or guarded when not in use.

Most airports had x-ray machines for outgoing checked and carry-on luggage. Where there were no such machines, hand searches were conducted. All airports had walk-through metal detectors. All of the airports surveyed had little or nothing in the way of electronic surveillance and alarm systems, except for Almaty which

will soon install terminal surveillance systems.

All airports, except for Almaty, at which a security survey was conducted claimed to have a formal Airport Security Plan and to conduct exercises involving other governmental security agencies at least twice per year. The plan for Almaty was being prepared at the time of the survey, although the airport already had in place a considerable body of procedural material covering security activities in the airport's 24 designated security zones. Some airports also conducted local exercises at more frequent intervals using staff assigned to the airport.

During the time of the USSR, specialized aviation security training was available at Moscow's Sheremetyevo Airport; however, access to this source is no longer so readily available. Two senior aviation security officials have been trained as instructors at a special course conducted by ICAO in Kiev in October, 1995. These officials plan to establish a national aviation security program at the Civil Aviation Academy in Almaty.

None of the airports surveyed had experienced any illegal acts against aircraft but 4 airports reported 2 to 9 incidents of telephone calls making false claims of bomb threats and other such actions. In these cases, precautionary actions were taken such as aircraft searches. With the availability of telephone call tracing and recording equipment, the successful detection rate for such incidents has been high. The perpetrators have usually been children or drunks.

All Directors of Security felt that sound national plans and procedures were in place to allow advance notification of and preparation for potential illegal acts against aircraft or passengers identified through international intelligence sharing. Kazakhstan maintains a specially trained response team to counter illegal acts against passengers or aircraft

(5) Border Controls and Facilitation

All airports other than Almaty have low levels of international traffic to non-CIS states, most which is charter traffic involving "shop tourism" to Istanbul and the Arabian Gulf states, and emigration to Germany. Customs and Immigration officers are assigned to process these flights on an as-required basis. It was not possible to obtain any information to assess the efficiency of this processing.

Numerous complaints were received from representatives of foreign carriers regarding problems with border controls at Almaty airport. These included:

- unexplained refusals of entry or exit to passengers whose documents appeared to be in order;
- slow processing and inefficient shift changes during the processing of large numbers of passengers;
- Customs refusing to start processing outbound passengers more than 2 hours prior to departure and not processing more than 2 flight at any one time; and

- a lack of cooperation between the airport organizations and the border control agencies.

Kazakhstan requires Customs checks of outbound international passengers which is contrary to generally accepted international practices.

There is no evidence of a National Air Transportation Facilitation Program in Kazakhstan. This is required in Annex 9 (**Facilitation**) to the Convention on International Aviation to which Kazakhstan is a contracting state. None of the airports surveyed had local facilitation committees.

An Airport Operators' Committee was established in December, 1995 and meets monthly. The Chair is officially held by Kazakhstan Airlines but it never sends a representative to these meetings. In March 1996, the AOC sent a letter to the Minister of Transportation and Communications detailing the long-standing problems experienced by foreign carriers at Almaty Airport, including those associated with border control agencies. The Minister had subsequently visited the Airport and had promised early remedial action.

(6) Snow Removal from Runways, Aprons and Taxiways

All of Kazakhstan experiences a continental climate with a high annual range of temperatures. Some locations also experience heavy accumulations of snow and ice, particularly in the Northern and Eastern regions. Snow and ice removal programs were surveyed at Akmola, Karaganda and Pavlodar. The specialized equipment held at each location for this purpose appears in **Table 2.3.10.4**.

Table 2.3.10.4 Snow and Ice Removal Equipment

Airport	Heavy Ploughs	Large Plough & Brush	Small Plough & Brush	Snow Auger & Thrower	Snow Blowers	Ice Melters
Akmola	-	3	11	3	2*	2
Karaganda	2	4**	Several	3	2**	4
Pavlodar	1***	-	8	3	2	2
Almaty	2	5	3	2	2#	4

* All snow blowers were truck mounted first generation aircraft jet engines except for a locally built unit at Akmola comprising a propeller and radial piston engine from an Antonov 2 mounted on a truck.

** One snow blower jet engine was mounted on the rear of a large plough and brush.

*** One locally built large plough blade which could be mounted on a large truck.

\# These are larger than the snow blowers at the other airports, and comprise two axial flow jet engines mounted on the rear of a large truck with the jet flow directed by fixed connecting ducts.

Akmola also claimed to have 3 tractor driven ice cutters. All 4 locations had

devices for runway friction coefficient measurement. A new Saab saloon car complete with integrated Safeguard runway friction coefficient measuring equipment was purchased for Almaty in 1995 for USD 300,000.

The average time for clearing the runway, apron and one taxiway after a snowfall was claimed to be 50 minutes at Akmola, 4 hours at Karaganda and 30 minutes at Pavlodar. The time for Karaganda seems excessive given the large quantity of equipment available. At Almaty the standard time for clearing the runway, 2 taxiways and the apron was <60 min; however, because over 30% of the snow and ice clearing equipment had been lost due to unserviceability over the last 10 years, the clearance time could be up to 3 hours for a heavy snow fall.

The vehicle parking and maintenance yard at Pavlodar was noticeably cleaner and tidier than at either Akmola or Karaganda.

Chemical agents for snow and ice removal are not used at any of the four airports surveyed. Up to 5 years ago, Almaty was using a chemical agent called ANS (carbomide) which was manufactured in the Ukraine. It is no longer used because of a lack of funds and adequate supply. Its use was not restricted for any environmental reasons but was never left on any runway or aircraft movement area for more than one hour to avoid damage.

The admissible levels on runways for aircraft operation are:

- < 5 cm for dry snow;
- <10 cm of water; and
- <12 cm of slush.

(7) Maintenance of Runways, Aprons Taxiways and other Air Side Areas

Because of time constraints it was not possible to review the maintenance of runways, aprons and taxiways in any depth, except for Almaty.

Most of the maintenance work is conducted by airport staff and it is clear that, in most locations, they are doing a commendable job with limited equipment and funds. Despite these effort, the overall condition of these facilities is often poor, primarily due to aging, and major rehabilitation or reconstruction is required in many cases.

While runway friction coefficient testing is carried out regularly at airports experiencing significant snow and ice accumulation during the winter season, this is not the case at all airports which do not experience such conditions. These airports usually showed evidence of accumulated rubber deposits in the runway threshold areas from aircraft tires which can seriously degrade surface friction when wet; therefore, programs to periodically conduct friction coefficient tests and remove these deposits are required.

At some airports, portions of the areas at the end of runways where lighting systems were installed were not well graded.

Almaty Airport

The main runway is 4,400m long and is connected to the apron by 3 taxiways. The fourth and fifth taxiways no longer exist. These were eliminated because of the construction of a second parallel runway, with an intended length of 3,900m, which commenced in 1992 but which was not completed due to a shortage of funding.

Repairs to runways, taxiways and aprons is carried out between the spring and summer of each year, and primarily involves the repair and painting of pavement areas. The airport staff is generally able to handle this work but sometimes uses outside contractors for larger tasks. In 1995, major repairs to the center section of the runway were carried out by the Russian/German joint venture company OAT at a cost of USD 1.5 million.

LATAS arranged for further emergency repair runway work to be carried out over a 4 week period starting 8 September, 1996. This involved repairing a total of 30,000 meters of cracks and joints and 340 square meters of pot-holes.

LATAS plan to implement a runway overlay and lighting upgrading project in 1997 at a cost of $25.3 million

The biggest Air Side maintenance problem is grass cutting. During the time of the USSR, this task was shared between a local collective farm and airport staff, and the arrangement worked well. Now that this work is handled primarily by airport staff and, with limited equipment, it is difficult to do well. During the past year, there was a serious grass fire near the fuel farm which the RFF section was only able to extinguish with great difficulty.

2.3.11 Regulation

(1) General

During the time of the USSR, Aeroflot was responsible for most regulatory functions. After the termination of the USSR, the 12 newly created CIS republics concluded the "Agreement on Civil Aviation and Airspace Utilization" on 30 December, 1991. Under this agreement, a governing "Council on Aviation and Airspace Utilization" (CAAU) was established, with each participating state being represented by senior officials from their respective Ministries of Civil Aviation and Defense. The Interstate Aviation Committee (commonly known as the MAK committee) was established concurrently as a permanent executive body to implement the Agreement and any pursuant CAAU decisions.

The Agreement, which appears in full as **Appendix 2.3.11 (1)** to this report, covers the following main functions:

- Airspace utilization and air traffic control.
- Air safety standards.
- Certification and licensing of civil aviation activities, personnel, equipment,

facilities and enterprises.

- Education and training of aviation specialists.
- Accident and incident investigations.
- Research and development.
- International civil aviation policies and participation in the work of international organizations.
- Development of air navigation systems.
- International air schedules and tariff policies.
- Aviation security.

The Agreement was formally adopted by the Republic of Kazakhstan through Presidential Decree 899 endorsed and promulgated on 31 December, 1992. The Decree appear as **Appendix 2.3.11 (2).**

The functioning of the MAK Committee with respect to Kazakhstan has been limited to certain safety regulatory activities.

The Civil Aviation Department (CAD) of the Ministry of Transport and Communications (MOTC) was formed in January, 1994, with is primary responsibilities being Regulation and Policy Advice to the government. As a newly created organization with a staffing level of less than 20 persons, the CAD experienced considerable difficulties in fulfilling its mandate even to a minimal level.

Presidential Decree 2687 promulgated on 20 December, 1995 provided Kazakhstan with its National Civil Aviation Law (NCAL). (This cannot strictly be called the NCAL because it has received no legislative approval but it has the force of law until such approval has been received). Articles 6 and 7 call for the establishment of a Committee on Airspace Utilization and Civil Aviation (CAUCA) under the MOTC, which would replace the existing CAD and have expanded responsibilities.

Through Prime Ministerial Decree 533 promulgated on 30 April, 1996, the authorized staff strength of the existing CAD was increased to 40 persons effective 1 June, 1996. This decree also required the MOTC and Ministry of Finance to present, within a period of one month, a proposal to develop the CAD into the CAUCA.

As of mid-October 1996, the actual staff strength of the CAD had increased to 28 persons. The staffing program was continuing towards the authorized level of 40 persons but progress was hampered by the low salaries available to governmental employees. A number of organizational role statements and job descriptions had been prepared. No decision had been made on establishing the CAUCA but some consideration was being given to creating the position of a Second Deputy Director.

As of October 1996, there was no civil aircraft register for Kazakhstan and no

register of licensed aviation personnel.

Most funding for the CAD is from general governmental revenues. Since most licensing and certification functions are being performed by other organizations, such as the MAK Committee and Kazakhstan Airlines, the CAD is limited in the income it is able to receive from fees for regulatory services.

(2) Air Safety Regulation

a) Regulations and Standards

Since the promulgation of the NCAL in December, 1995, a start has been made on developing a body of regulations and standards pursuant to the NCAL. In most cases, the drafts are being produced by:

- examining the Standards and Recommended Practices (SARP's) produced by ICAO;
- examining the regulations and standards used by other states; and
- through consultations with Kazakhstan Airlines' specialists.

After drafting, regulations are then approved by the Minister of Transport and Communications, as well as by other concerned ministers, such as those for Justice and Defense. Depending on the importance of a particular regulation or standard, final promulgation is either by the Minister of Transport and Communications, or by a Deputy Prime Minister.

b) Certification and Licensing of Equipment, Facilities, Institutions and Operations

Any certification of air carriers, airports and airworthiness has been done by the MAK committee, with most of the expertise coming from Russia.

c) Personnel Licensing

Kazakhstan Airlines performed all personnel licensing functions from 1992 until the formation of a Personnel Licensing Commission in mid-1996. It comprises over 20 persons and is chaired by the Deputy Director of the CAD, with the Chief Pilot of Kazakhstan Airlines and the Rector of the Almaty Civil Aviation Academy serving as vice-chairpersons. As of October 1996, it is only issuing licenses to flight crew and air traffic controllers. Its flight crew licensing function is confined to the licenses issued after initial training and to the highest level of licenses, which are 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 Kazakhstan Airlines.

Medical certification is an integral part of the personnel licensing process. There is very large aviation medicine organization comprising a main center at Almaty airport with a total staff strength, as estimated by a CAD manager, of 300 to 500

persons. Furthermore, each airport has its own aviation medical unit staffed with about 15 persons. The schedule of medical examinations is:

- Flight crew: for the first 10 years of service, twice per year; and thereafter, every 3 months.
- Aircraft maintenance engineers: once per year.
- Air Traffic Controllers: once every 2 years.

Preflight medical examinations are conducted on all flight crew before each flight originating in Kazakhstan. It takes a few minutes and covers such checks as pulse, blood pressure, sobriety, etc.

d) Compliance Monitoring and Enforcement

As of October, 1996, the CAD had yet to start a program of regular compliance inspections and monitoring, meaning that air carriers and other air transportation organizations have been effectively self-regulating with little or no oversight. Inspections have been confined to those conducted after specific safety related occurrences. This situation has contributed to a number of serious incidents of non-compliance, particularly in relation to aircraft operators conducting "shop tourism" charters. In the first part of 1996, the Special Aviation Prosecutor of the CAD suspended the operations of 5 privately-owned air charter operators, registered in Kazakhstan, pending investigations of such incidents.

e) Perspectives of CAD Staff

The safety regulation managers in the CAD see their major problems and challenges as:

- finalizing a complete and viable body of air regulations and standards;
- reconstituting the CAD as a Civil Aviation Authority with a greater degree of autonomy than it now enjoys and which is able to generate most of its own funding requirements from licensing and certification revenues;
- difficulties in recruiting and attracting good staff due to low governmental salaries;
- a general lack of all basic resources such as modern office equipment, etc.;
- a lack of exposure to modern regulatory practices used in developed countries;
- encouraging the appointment of well-qualified chief pilots for each air carrier registered in Kazakhstan and then developing a sound personnel licensing regime, which will permit the CAD to delegate much of this function to the carriers while maintaining an effective oversight role; and
- correcting the problems associated with the cannibalization of aircraft for spare parts, because of sparing problems due to funding constraints and supply shortages.

(3) Economic Regulation

a) Roles and Responsibilities

Article 2 of the Interstate Agreement on Civil Aviation and Airspace Utilization stipulates that participating states should economically regulate air transport operations independently. Article 7 specifies areas of cooperative regulation including, in clause (j) of the Article, the coordination of international air schedules, and establishing and collecting aeronautical tariffs.

b) Domestic Regulation

As of October 1996, there has been no regulation of domestic air transportation operations in Kazakhstan in terms of market entry, market exit, routes or frequencies.

c) International Regulation

The basis of international economic regulation is the air service agreements (ASA). As of October 1996, 33 ASA's had been concluded or were being negotiated between Kazakhstan and other states, including those belonging to the CIS. Thirteen had been ratified, 11 signed and 9 initialed.

d) Operating Licenses

As of October 1996, there were 20 carriers licensed for commercial operations in Kazakhstan. It appears that there was no clear policy or procedural framework for issuing such licenses, or for ensuring compliance with the provisions of the licenses.

e) Constraints on Foreign Ownership

There are no specific provisions in the NCAL or pursuant regulations which limit the foreign ownership of airports or of air carriers licensed 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.

f) Perspectives of CAD Staff

The CAD's manager of economic regulatory activities sees the following main challenges and problems facing herself and her staff:

- recruiting experienced staff;
- obtaining complete and accurate data on air transportation operations;
- a general lack of all basic resources such as modern office equipment, etc.; and
- preparing tariff regulations.

CHAPTER 3

STRATEGY FOR NATIONAL AIR TRANSPORT DEVELOPMENT

CHAPTER 3 STRATEGY FOR NATIONAL AIR TRANSPORT DEVELOPMENT

3.1 The Generic Air Transportation System

3.1.1 Components and Interrelationships

The final product of the air transportation system of any state is capacity over distance expressed as either Available Seat Kilometers (ASK's) or Available Tonne Kilometers (ATK's). It comprises five major components: Air Carriers; Airports; Air Navigation Services (ANS); Regulatory; and Planning/Policy Making. The Air Carrier, Airports and ANS subsystems are capacity generators. The Regulatory component ensures that the production, sale and utilization of air transportation capacity are being conducted in a manner which is not contrary to public safety and economic well-being. The Planning/Policy component ensures that the system is developed and operated to serve national goals and interests. The interrelationship between these components is shown in **Figure 3.1.1.1**.

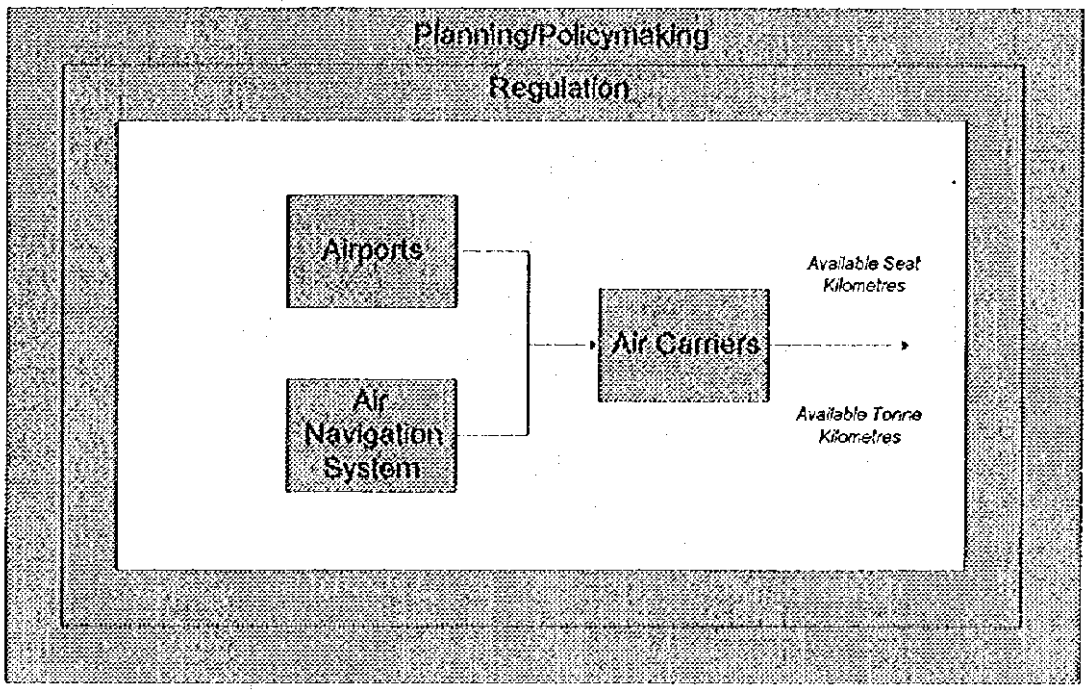


Figure 3.1.1.1 The Generic National Air Transportation System

3.1.2 Ownership and Responsibilities

Traditionally, the Airports and ANS components have been owned and operated by national and local governments. There is, however, a well established global trend of commercialising these components so that scale and nature of capacity production is more responsive to users' needs, and the operating and capital

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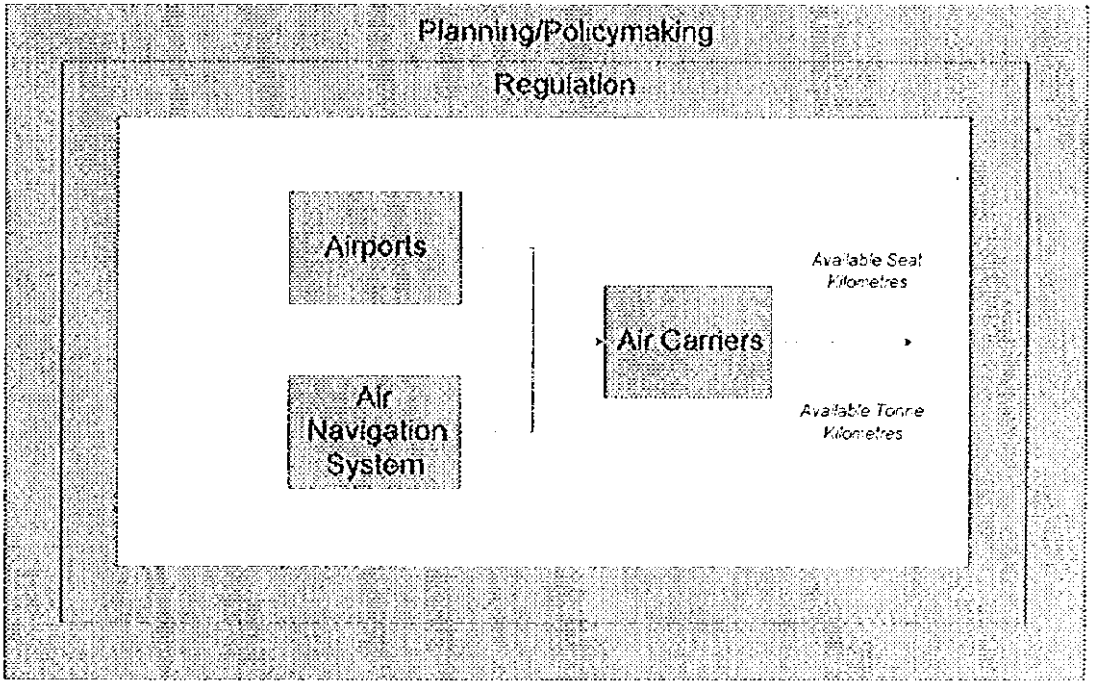

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funding required for production comes solely from users' revenues. In terms of ownership and organisation, a commercialised entity can take a variety of forms such as: an executing agency within a government department; a wholly state-owned corporation; a mixed state-owned/privately-owned corporation; or a wholly privately-owned corporation.

Safety and Economic regulation are natural functions of government. While numerous initiatives are underway to conduct regulatory activities in a more economical and efficient manner, the ultimate ownership and responsibility for these functions must remain with government.

National Planning and Policy Making are also natural functions of government but tend to work best when there is full consultation with stakeholders both within and outside of the air transportation community.

While many airlines throughout the world are still fully or partially owned by governments, these normally exist as separate corporate entities which are required to operate commercially. In return for fulfilling certain public policy obligations, such airlines normally operate within some form of economic regulatory framework which limits competition. The global trend is for these airlines to be privatised and the regulatory frameworks to be gradually dismantled. Deregulation is generally progressing much faster for domestic operations than for international operations.

3.2 Strategy for National Air Transport Development

3.2.1 Background and Context

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 as it strives to establish a viable nation-state.

Kazakhstan has only existed as a modern, sovereign state since the sudden demise of the USSR in late 1991. As such, its large area is sparsely populated by a variety of ethnic groups, the largest being Kazakh and Russian. It is bordered to the north and east respectively by the large and powerful neighbors of the Russian Federation and the People's Republic of China. Its economic system was developed as an integral component of the command-control economy of the USSR so, with the demise of this political entity, it was forced to immediately start the transformation to a market-orientated system without the benefit of experience or of prior preparation.

It is evident that, in terms of developing national policies and plans for any sector or sub-sector, the Government's actions will be guided by the need to:

- complete the transition to a market economy and reverse the decline in national GDP that has been ongoing since late 1991;
- maintain social harmony; and
- secure the independence and integrity of the nation state.

All of these major needs will impact on the development of national plans and policies for transportation and all are interrelated to some extent.

The ultimate constraints on air transport development will be economic because without the generation of true wealth, there can be no sustainable funding of services to meet social or political needs. On the other hand, sustainable wealth creation is only possible within a stable social and political environment.

Any air transport activity also needs to happen within a viable safety regime. There is a correlation between air safety regulation and economic performance. If the air safety regime is weak or even perceived as weak, the ultimate economic impact will be negative because of the adverse effect that this will have on consumer demand. On the other hand, excessive regulation can be counterproductive for reasons of unmanageability and cause unnecessary economic burdens on the operators.

The formulation of national policies and plans specific to the any transportation sub-sector, including air transportation, should therefore be governed by the need to: promote economic development, enhance safety, and meet vital social and political objectives.

3.2.2 Economic Factors

During the time of the USSR, air transportation was provided primarily as a social service and pricing bore no realistic relationship to the costs incurred. Consequently, the sudden and unplanned for introduction of market forces after the demise of the USSR has resulted in an overall decline of 75% in air transportation activity since 1991. Even if the decline in GDP, which has also occurred since 1991, is halted in 1996 and grows at an average annual rate of 4% per annum from 1997 and thereafter, and assuming that the rate of GDP growth and the rate of increase in demand for air transport are similar, then the 1991 traffic levels will not be achieved again until about the year 2033. If the average GDP growth rate is 8% per annum, those levels will not be reached until about the year 2015. Although these are rough estimates and many factors can increase or decrease the levels of demand for specific points served, they do help to convey some sense of the tremendous over-capacity that now exists and which, without corrective action, could exist for some years to come.

For the foreseeable future, all indications show that the main basis for GDP growth will be the exploitation, processing and sale of Kazakhastan's abundant natural resources. It can also be expected that this will stimulate the manufacture of

intermediate and finished goods which will heavily utilize the raw materials derived from these natural resources. Road, rail and pipeline represent the most efficient means of transporting these items to market. Any related increases in the demand for air transportation will come about due to:

- increased foreign and domestic business travel to and from these growing centers of production;
- increases in the disposable income of persons employed in the producing sectors or in servicing those sectors; and
- increases in the demand for the air transportation of high value-low weight/low volume items needed for the growing production of goods and services, and to meet increased consumer needs.

In the near term, "shop tourism" will continue to be a significant economic influence on the demand for air transport; however, as the free-market mechanisms become established for the production, importation, distribution and sale of consumer goods, this activity will diminish to insignificance.

Another near-term phenomenon is the demand for air transportation for the emigration of ethnic Russians and Germans to their historic homelands, and the internal migration out of the Semipalatinsk region to other regions, due to the contamination and other problems related to the earlier extensive nuclear testing program of the USSR. These population movements are unidirectional and will inevitably diminish, but these migrants could generate a significant amount of 'visiting friends and relations' traffic to and within Kazakhstan for an extended period of time.

There is currently no evidence of any major programs to develop tourism in Kazakhstan. Tourism is the world's largest single industry and responsible for 10-11% of the world's GDP. If it is significantly developed in Kazakhstan, then it will have a commensurate influence on the demand for air transportation.

3.2.3 Safety

There is ample evidence that air transportation is generally the safest mode of transportation, due in large measure to the commensurate development of effective national and international safety regulatory regimes. The general public perception of the level of safety for air transportation is, however, somewhat at variance with this reality. This can be attributed to the intrinsic nature of air transport, i.e. the separation of contact between aircraft and the Earth's surface, and to the fact that when air accidents do occur, these can be dramatic, catastrophic and widely publicized.

It is generally acknowledged that the air safety regulatory regime of Kazakhstan is deficient. Air carriers have been effectively self-regulating with little or no

oversight from an under-resourced Civil Aviation Department which is the national regulatory authority. It is also widely believed that this situation has contributed to a number of serious safety incidents, usually involving operators conducting "shop tourism" charters. In the Spring of 1996, the Government announced its intention to allocate more resources to the CAD. While an important step, much more still needs to be done to achieve a cost effective and progressive approach to safety regulation such as now exists in states such as the United Kingdom, Australia and New Zealand.

3.2.4 Social and Political Factors

The sudden decline of 'Aeroflot style' socially determined but highly uneconomical air services in late 1991 has obviously caused a certain sense of social deprivation among the population at large, particularly given the inadequacy of the rail and road surface systems for passenger transportation. While difficult to measure, the fact that reduced internal air transportation services are still heavily supported by cross-subsidization attests to this sensitivity.

Of equal importance is the need to cultivate a sense of nationhood and unity among Kazakhstan's ethnically diverse and dispersed population. One of the unfortunate legacies of the post USSR era has been outbreaks of inter-ethnic conflicts, and demands by certain ethnic groups for greater independence and to adjust existing national boundaries. While Kazakhstan has been free from such conflicts, the decision of the Government to relocate the capital from Almaty to Akmola was, in part, clearly a move to strengthen national unity.

By the Spring of 1996, it was evident that the airline component of Kaz Air was close to bankruptcy. From a strictly economic viewpoint, it may seem appropriate to wind up the company and allow internal and international air services to be provided by some of the small but numerous privately owned carriers, or by foreign-owned companies. Given the powerful symbolism that a national flag carrier represents in an environment where national unity needs to be strengthened, it is unlikely that such an option would be politically acceptable. While there needs to be a flag carrier, its size and production should be significantly influenced by economic realities.

A similar problem exists with the 22 airports which fully or partially serve civil air traffic. While it may well be politically unacceptable to close any of these outright, some drastic capacity reductions are clearly in order, including such measures as reduced hours of service, eliminating redundant services such as Ground Radar Controlled Approaches and selected facility closures. Furthermore, most of the current development plans for these airports, which originated during the supply-orientated USSR era and which promote the creation of even more capacity, clearly need to be discarded.

Such problems are invariably complex, often deep-rooted and require multifaceted solutions, but good internal transportation links are important to the extent that these tend to alleviate social grievances, and to reduce internal tensions by facilitating communications and inter-regional access for all residents.

The issue is not whether the Government should provide air or any other mode of transportation services, because this is an obligation that all government's face to some degree. It is how much should be provided and how should it be funded. The apparent "easy solution" is to fund these obligations through cross subsidization using profits generated from more economically viable services. This option has now fallen out of favor in many countries, however, because it tends to allow the inefficient service providers to continue to be inefficient and to discourage the efficient providers who see their profits diverted elsewhere. The net result is usually an overall decline in system efficiency. Generally a more efficient method of funding such obligations is through direct annual subsidies from governmental general revenue funds, with a system for encouraging recipients to become progressively more financially self-sufficient and, therefore, less dependent on subsidies.

3.2.5 Framework for formulating national policies and plans for air transport development

From the brief foregoing discussions, the current condition of the national economy, social fabric and transportation systems indicates that the development of the national air transportation sub-sector should be governed by national policies and plans formulated 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, selection, 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, except for government mandated services, 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 a direct subsidy regime;

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; application of integrated information management systems; and

13. active participation in global and regional civil aviation and air transportation associations.

3.3 Air Traffic Demand Forecast

3.3.1 General

(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 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 time. The latter is assumed to increase as the growth rate of GDP increases. In the "high case", the average saved time value is assumed to be higher than that of "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 is divided into 19 zones
- Neighboring countries are classified into Russia, East Europe, Central Asia, China and Mongolia.
- The remaining global area is 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. Basic socio-economic indices in the future appear in Table 3.3.1.1.

Table 3.3.1.1 Basic Socio-Economic Indices

ITEM	ANNUAL GROWTH RATE (%)			
	1995 ~ 2000	2000 ~ 2005	2005 ~ 2010	2010 ~ 2010
POPULATION	0.28	0.89	1.03	0.96
GDP	5.09	5.73	5.37	4.79

(5) Procedure of Air Traffic Demand Forecasts

Air traffic demand 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 (railway, 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 of every airport in Kazakhstan have decreased drastically since the year 1991, before which air passenger movements in the country had reached to 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 top 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. Of these, the regions where air passenger movements would increase to over 600~700 thousand, in 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 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.

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

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. (See Appendix-3.3.1 (1)~(3))

3.3.2 Air Traffic Demand Classifications

To make an appropriate air traffic demand forecast, the demand was classified in terms of the competitive situation of air transportation with railway and road transportation. Inter-regional air traffic demands within the area covering Kazakhstan and neighboring countries was regarded as competitive with the other modes. All other air traffic demands, that is international air traffic demands excluding inter-neighboring countries, were assumed as non-competitive. The following classifications were developed:

(1.1) Domestic Inter-Regional and Inter-Neighboring Countries Air Passenger Traffic Demands

(1.2) International Air Passenger Traffic Demands excluding those of Inter-Neighboring Countries

(2.1) Domestic Inter-Regional and Inter-Neighboring Countries Air Cargo Traffic Demands

(2.2) International Air Cargo Traffic Demands excluding those of Inter-Neighboring Countries

3.3.3 Major Preconditions

(1) Three Cases for Air Traffic Demand Forecast

The air traffic demand forecast was made for low ,medium and high cases. These took into account the current situation and transitional trends to a market-oriented socio-economy in local and neighboring countries, as well as global trends and prospects for economic development and air transportation.

a) Medium case

In the medium case, the GDP per capita and population of each zone were projected based on the projections made by World Bank and United Nations.

Details are given in the following Chapter. Passenger's " value of time saved" in transportation is assumed at a relatively low level because of difficult economic conditions and decreased personal incomes. However, it can be assumed that it will gradually increase along with GDP growth, as more travelers choose the "faster but more expensive" mode of air transportation as their earnings increase.

b) Low case

The growth rates of GDP per capita and the rate of increase in passenger's value of time saved are presumed to be lower than those of medium case.

c) High case

The growth rates of GDP per capita and the rate of increase in passenger's value of time saved are presumed to be higher than those of medium case.

(2) Target Years for Forecast

Demand forecasts will be made for the years of 2000, 2005, 2010 and 2020. 1995 is the "base year" for which various data on socio-economy and transportation sectors were analyzed, and the major data inputs were prepared for the traffic demand forecast.

(3) Presumption of Capital Relocation

In this study an air traffic demand forecast is carried out for the assumed case of capital relocation together with for the case of "without relocation". However, for the sake of simplicity, forecast results will be covered mainly for the case of capital relocation.

The air traffic demand forecast for the case with capital relocation was made based on the following assumptions of population movements from Almaty to Akmola:

- 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.

(4) Zoning

The definition and classification of objective zones for demand forecast was an important step. It was carried out by considering administrative zoning in Kazakhstan, and international statistics on trade and tourism (See Appendix-3.3.3 (1)~3.3.3 (4)).

Zoning has been defined and classified as follows:

- The territory of Kazakhstan is divided into 19 zones
- Neighboring countries are classified into Russia, East Europe, Central Asia, China and Mongolia.
- The remaining global area was classified into 8 zones based solely on the statistics for imports, exports and tourism between Kazakhstan and the foreign trading partner-country.

(5) GDP Growth Rates by Zone and by Case

a) General concept

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 growth rates of populations of the respective countries and regions. (See Appendix-3.3.3 (5)~(7)).

The projections for GDP growth rates by zone are shown in Table 3.3.3.1. While the growth rates of each zone (region) of Kazakhstan was forecast based on the projections for population and GDP per capita by region. These were recently determined by the Scientific Research Institute of Economy and Marketing of the Ministry of Economy. The projections of GDP per capita by World Bank for Kazakhstan were applied as a "control total" (See Appendix-3.3.3 (8)~(12)).

The projection of Population, GDP per capita and GDP made by the Institute are shown in Table 3.3.3.2 and the adjusted projections are shown in Table 3.3.3.3.

b) GDP growth rates in cases of "with- and without- capital relocation"

The GDP growth rates by zone in the case of "with the capital relocation" are shown in Table 3.3.3.4 and those of "without the capital relocation" are shown in Appendix-3.3.3 (13).

(6) Average Values of Time Saved

Average values of time saved by case, as applied in this stud, are shown in a later chapter, together with the parameters of the " modal share estimate model".

Table 3.3.3.1 Projections of Population, GDP per capita and GDP by Zone

(%)

		GDP per capita				Population				GDP			
		1995 -2000	2000 -2005	2005 -2010	2010 -2020	1995 -2000	2000 -2005	2005 -2010	2010 -2020	1995 -2000	2000 -2005	2005 -2010	2010 -2020
Kazakhstan	Low	4.3	4.3	3.8	3.3					4.59	5.23	4.87	4.29
	Medium	4.8	4.8	4.3	3.8	0.28	0.89	1.03	0.96	5.09	5.73	5.37	4.79
	High	5.2	5.2	4.8	4.3					5.49	6.13	5.88	5.30
Russia	Low	3.8	3.8	3.5	3.0					4.36	4.49	4.19	3.56
	Medium	4.3	4.3	3.8	3.3	0.54	0.67	0.67	0.55	4.87	5.00	4.49	3.87
	High	4.8	4.8	4.3	3.8					5.37	5.50	5.00	4.37
East Europe	Low	3.8	3.8	3.5	3.0					4.10	4.19	3.89	3.23
	Medium	4.3	4.3	3.8	3.3	0.29	0.38	0.38	0.22	4.60	4.69	4.19	3.53
	High	4.8	4.8	4.3	3.8					5.10	5.20	4.69	4.03
Central Asia	Low	3.8	3.8	3.5	3.0					4.36	4.49	4.19	3.56
	Medium	4.3	4.3	3.8	3.3	0.54	0.67	0.67	0.55	4.87	5.00	4.49	3.87
	High	4.8	4.8	4.3	3.8					5.37	5.50	5.00	4.37
China	Low	7.4	7.4	6.9	6.4					8.77	8.19	7.69	7.03
	Medium	7.9	7.9	7.4	6.9	1.28	0.74	0.74	0.59	9.28	8.70	8.19	7.53
	High	8.4	8.4	7.9	7.4					9.79	9.20	8.70	8.03
Mongoria	Low	3.8	3.8	3.5	3.0					4.36	4.49	4.19	3.56
	Medium	4.3	4.3	3.8	3.3	0.54	0.67	0.67	0.55	4.87	5.00	4.49	3.87
	High	4.8	4.8	4.3	3.8					5.37	5.50	5.00	4.37
Far East Asia	Low	2.5	2.5	2.0	1.7					3.15	2.90	2.40	1.76
	Medium	2.8	2.8	2.3	2.0	0.63	0.39	0.39	0.06	3.45	3.20	2.70	2.06
	High	3.1	3.1	2.6	2.3					3.75	3.50	3.00	2.36
Western Asia	Low	3.0	3.0	2.5	2.0					5.94	5.51	4.99	3.93
	Medium	3.5	3.5	3.0	2.5	2.86	2.43	2.43	1.89	6.46	6.02	5.51	4.44
	High	4.0	4.0	3.5	3.0					6.97	6.53	6.02	4.95
Other Asia	Low	4.5	4.5	4.0	3.5					6.47	6.12	5.61	4.63
	Medium	5.0	5.0	4.5	4.0	1.88	1.55	1.55	1.09	6.98	6.62	6.12	5.13
	High	5.5	5.5	4.0	3.5					7.49	7.13	5.61	4.63
Western Europe	Low	2.5	2.5	2.2	1.9					2.79	2.68	2.38	1.90
	Medium	2.8	2.8	2.5	2.2	0.28	0.18	0.18	0.00	3.09	2.98	2.68	2.20
	High	3.1	3.1	2.8	2.5					3.39	3.28	2.98	2.50
North America	Low	2.5	2.5	2.2	1.9					3.53	3.29	2.99	2.50
	Medium	2.8	2.8	2.5	2.2	1.01	0.77	0.77	0.59	3.83	3.59	3.29	2.80
	High	3.1	3.1	2.8	2.5					4.14	3.89	3.59	3.10
Australia	Low	2.4	2.4	2.1	1.8					3.96	3.65	3.34	2.70
	Medium	2.7	2.7	2.4	2.1	1.52	1.22	1.22	0.89	4.27	3.95	3.65	3.01
	High	3.0	3.0	2.7	2.4					4.57	4.25	3.95	3.31
Africa	Low	2.4	2.4	2.1	1.8					4.59	4.27	3.97	3.07
	Medium	2.7	2.7	2.4	2.1	2.14	1.83	1.83	1.25	4.90	4.58	4.27	3.37
	High	3.0	3.0	2.7	2.4					5.21	4.88	4.58	3.68
Others	Low	3.0	3.0	2.5	2.0					4.69	4.43	3.92	3.16
	Medium	3.5	3.5	3.0	2.5	1.64	1.39	1.39	1.14	5.19	4.94	4.43	3.67
	High	4.0	4.0	3.5	3.0					5.70	5.44	4.94	4.17

Note:GDP per capita is assumed based on the data of "Global Economic Prospects and Developing Countries, The World Bank 1996".
Population Growth Rate is estimated based on "World Population Prospects,United Nations,1990"

Table 3.3.3.2 Projections of Population, GDP per capita and GDP by Zone in Kazakhstan made by The Institute of Ministry of Economics

Unit: Million for GDP, Thousand for Population and GDP per capita

Region	item	Forecast by Scientific Rsearch Institute of Economy and Marketing								
							Annual average growth rate(%)			
		1995	2000	2005	2010	2020	1995 -2000	2000 -2005	2005 -2010	2010 -2020
Almaty	GDP(Tenge)	150,680	181,496	219,699	276,667	369,683	3.79	3.89	4.72	2.94
	GDP/capita	71	83	97	117	144	3.24	3.07	3.86	2.13
	Population	2,123	2,181	2,270	2,366	2,560	0.54	0.80	0.83	0.79
West Kaz.	GDP(Tenge)	28,968	34,055	40,294	51,038	76,319	3.29	3.42	4.84	4.11
	GDP/capita	43	49	55	65	87	2.50	2.26	3.57	2.91
	Population	669	695	735	782	877	0.77	1.13	1.23	1.16
Aktyubins.	GDP(Tenge)	44,422	50,787	58,074	72,875	104,334	2.71	2.72	4.65	3.65
	GDP/capita	59	66	71	83	105	2.16	1.50	3.24	2.37
	Population	749	770	817	874	990	0.54	1.20	1.36	1.26
Karagand	GDP(Tenge)	93,847	103,833	119,323	145,977	204,762	2.04	2.82	4.11	3.44
	GDP/capita	75	83	94	112	151	2.23	2.40	3.63	3.01
	Population	1,258	1,247	1,272	1,302	1,357	-0.18	0.41	0.47	0.42
Kustanay	GDP(Tenge)	83,605	87,264	97,672	118,628	160,900	0.86	2.28	3.96	3.09
	GDP/capita	80	84	92	110	144	1.03	1.93	3.53	2.73
	Population	1,049	1,040	1,058	1,080	1,120	-0.17	0.35	0.42	0.36
Atyrau	GDP(Tenge)	39,991	46,165	56,285	71,046	109,090	2.91	4.04	4.77	4.38
	GDP/capita	88	97	109	126	163	1.83	2.44	2.87	2.66
	Population	453	477	516	565	668	1.06	1.56	1.84	1.68
East Kaz.	GDP(Tenge)	78,050	85,386	98,121	118,876	165,128	1.81	2.82	3.91	3.34
	GDP/capita	84	92	104	122	162	1.93	2.40	3.35	2.88
	Population	933	927	946	972	1,017	-0.12	0.41	0.54	0.45
South Kaz.	GDP(Tenge)	35,303	37,737	42,873	51,171	69,232	1.34	2.59	3.60	3.07
	GDP/capita	18	18	19	20	23	0.11	0.88	1.76	1.32
	Population	1,983	2,108	2,293	2,508	2,978	1.23	1.69	1.81	1.73
Zhanbul	GDP(Tenge)	23,297	26,160	30,391	40,524	62,635	2.35	3.04	5.92	4.45
	GDP/capita	23	25	28	35	49	2.11	2.13	4.74	3.43
	Population	1,026	1,038	1,085	1,148	1,267	0.23	0.90	1.13	0.99
Akmola	GDP(Tenge)	41,772	45,598	54,978	70,285	108,095	1.77	3.81	5.04	4.40
	GDP/capita	50	54	61	74	102	1.48	2.75	3.80	3.28
	Population	839	851	895	950	1,058	0.28	1.03	1.19	1.09
Semipalat.	GDP(Tenge)	23,092	25,712	30,786	37,638	54,970	2.17	3.67	4.10	3.86
	GDP/capita	29	33	38	46	63	2.57	3.21	3.51	3.36
	Population	802	786	804	827	868	-0.39	0.44	0.58	0.49
Kokchetau	GDP(Tenge)	34,144	35,893	42,311	51,003	72,310	1.00	3.34	3.81	3.55
	GDP/capita	53	57	66	78	105	1.58	3.01	3.23	3.12
	Population	648	630	640	658	686	-0.57	0.33	0.56	0.42
Pavlodar	GDP(Tenge)	120,621	130,377	149,502	179,254	245,900	1.57	2.78	3.70	3.21
	GDP/capita	129	140	155	179	229	1.61	2.09	2.93	2.51
	Population	937	935	966	1,003	1,074	-0.04	0.67	0.75	0.69
North Kaz.	GDP(Tenge)	18,798	19,994	23,319	28,627	40,896	1.24	3.12	4.19	3.63
	GDP/capita	32	35	41	50	71	2.17	3.14	3.99	3.56
	Population	593	566	566	571	575	-0.91	-0.01	0.19	0.07
Kzyl Orda	GDP(Tenge)	14,956	18,316	23,899	28,907	45,519	4.14	5.47	3.88	4.65
	GDP/capita	22	26	32	36	48	3.34	3.86	2.22	3.03
	Population	668	694	749	812	948	0.77	1.55	1.62	1.56
Zhezkazgan	GDP(Tenge)	41,193	47,629	57,431	70,482	104,065	2.95	3.81	4.18	3.97
	GDP/capita	86	98	113	131	176	2.63	2.86	3.14	3.00
	Population	480	488	511	537	590	0.31	0.93	1.01	0.95
Turgai	GDP(Tenge)	12,215	11,999	13,457	16,558	22,796	-0.36	2.32	4.23	3.25
	GDP/capita	40	39	42	49	61	-0.30	1.39	3.09	2.24
	Population	307	306	320	339	374	-0.05	0.92	1.11	0.99
Mangistau	GDP(Tenge)	23,011	23,872	29,041	36,392	55,355	0.74	4.00	4.62	4.28
	GDP/capita	68	68	78	91	122	0.21	2.74	3.12	2.93
	Population	340	349	371	399	454	0.53	1.22	1.45	1.31
Taldykorg.	GDP(Tenge)	25,942	25,968	29,466	35,287	47,842	0.02	2.56	3.67	3.09
	GDP/capita	36	36	40	45	55	0.00	1.70	2.54	2.12
	Population	713	713	744	786	864	0.02	0.85	1.10	0.95
Total	GDP(Tenge)	933,907	1,038,240	1,216,923	1,501,234	2,119,833	2.14	3.23	4.29	3.51
	GDP/capita	56	62	69	81	104	1.86	2.32	3.23	2.53
	Population	16,569	16,801	17,559	18,479	20,324	0.28	0.89	1.03	0.96

Source: Scientific Research Institute of Economy and Marketing, Ministry of Economy

* : Simply applied the average annual growth rate during 2000-2010(10 years).

Table 3.3.3.3 Projections of Population, GDP per capita and GDP by Zone and by Case in Kazakhstan adjusted applying GDP per capita prospected by World Bank

Region	Item	Low Case				Medium Case				High Case			
		Annual Growth Rate(%)				Annual Growth Rate(%)				Annual Growth Rate(%)			
		1995 -2000	2000 -2005	2005 -2010	2010 -2020	1995 -2000	2000 -2005	2005 -2010	2010 -2020	1995 -2000	2000 -2005	2005 -2010	2010 -2020
Almaty	GDP(Tenge)	6.28	5.91	5.30	3.71	6.79	6.41	5.81	4.22	7.20	6.82	6.31	4.72
	GDP/capita	5.71	5.07	4.43	2.90	6.22	5.57	4.93	3.40	6.62	5.97	5.44	3.89
	Population	0.54	0.80	0.83	0.79	0.54	0.80	0.83	0.79	0.54	0.80	0.83	0.79
West Kaz.	GDP(Tenge)	5.77	5.42	5.42	4.89	6.27	5.93	5.93	5.40	6.68	6.33	6.44	5.90
	GDP/capita	4.96	4.24	4.14	3.69	5.47	4.74	4.64	4.19	5.87	5.14	5.14	4.69
	Population	0.77	1.13	1.23	1.16	0.77	1.13	1.23	1.16	0.77	1.13	1.23	1.16
Aktyubins.	GDP(Tenge)	5.18	4.71	5.22	4.43	5.68	5.21	5.73	4.94	6.09	5.61	6.24	5.44
	GDP/capita	4.61	3.46	3.81	3.14	5.12	3.96	4.31	3.64	5.52	4.36	4.81	4.13
	Population	0.54	1.20	1.36	1.26	0.54	1.20	1.36	1.26	0.54	1.20	1.36	1.26
Karagand	GDP(Tenge)	4.49	4.81	4.69	4.22	4.99	5.31	5.19	4.72	5.39	5.71	5.70	5.23
	GDP/capita	4.68	4.39	4.20	3.79	5.18	4.89	4.70	4.29	5.59	5.29	5.21	4.79
	Population	-0.18	0.41	0.47	0.42	-0.18	0.41	0.47	0.42	-0.18	0.41	0.47	0.42
Kustanay	GDP(Tenge)	3.28	4.26	4.54	3.87	3.77	4.76	5.04	4.37	4.17	5.16	5.55	4.87
	GDP/capita	3.46	3.90	4.11	3.50	3.95	4.49	4.61	4.00	4.35	4.89	5.11	4.50
	Population	-0.17	0.35	0.42	0.36	-0.17	0.35	0.42	0.36	-0.17	0.35	0.42	0.36
Atyrau	GDP(Tenge)	5.38	6.06	5.35	5.17	5.89	6.57	5.85	5.67	6.29	6.97	6.36	6.18
	GDP/capita	4.28	4.43	3.44	3.43	4.78	4.93	3.94	3.93	5.18	5.33	4.44	4.43
	Population	1.06	1.56	1.84	1.68	1.06	1.56	1.84	1.68	1.06	1.56	1.84	1.68
East Kaz.	GDP(Tenge)	4.25	4.81	4.49	4.12	4.75	5.31	4.99	4.62	5.15	5.71	5.49	5.13
	GDP/capita	4.38	4.38	3.93	3.65	4.88	4.88	4.43	4.15	5.28	5.28	4.93	4.65
	Population	-0.12	0.41	0.54	0.45	-0.12	0.41	0.54	0.45	-0.12	0.41	0.54	0.45
South Kaz.	GDP(Tenge)	3.77	4.57	4.17	3.84	4.27	5.07	4.68	4.35	4.67	5.47	5.18	4.85
	GDP/capita	2.51	2.83	2.32	2.08	3.00	3.32	2.81	2.57	3.40	3.72	3.30	3.07
	Population	1.23	1.69	1.81	1.73	1.23	1.69	1.81	1.73	1.23	1.69	1.81	1.73
Zhanbul	GDP(Tenge)	4.80	5.04	6.51	5.23	5.30	5.54	7.02	5.74	5.70	5.94	7.54	6.25
	GDP/capita	4.56	4.11	5.32	4.20	5.06	4.61	5.83	4.71	5.46	5.00	6.34	5.21
	Population	0.23	0.90	1.13	0.99	0.23	0.90	1.13	0.99	0.23	0.90	1.13	0.99
Akmola	GDP(Tenge)	4.21	5.82	5.62	5.18	4.71	6.33	6.12	5.69	5.11	6.74	6.63	6.20
	GDP/capita	3.92	4.74	4.38	4.05	4.41	5.25	4.88	4.56	4.81	5.65	5.38	5.06
	Population	0.28	1.03	1.19	1.09	0.28	1.03	1.19	1.09	0.28	1.03	1.19	1.09
Semipalat.	GDP(Tenge)	4.62	5.67	4.68	4.64	5.12	6.18	5.18	5.15	5.53	6.59	5.68	5.65
	GDP/capita	5.03	5.21	4.08	4.13	5.54	5.71	4.58	4.64	5.94	6.12	5.08	5.14
	Population	-0.39	0.44	0.58	0.49	-0.39	0.44	0.58	0.49	-0.39	0.44	0.58	0.49
Kokchetau	GDP(Tenge)	3.43	5.35	4.38	4.33	3.92	5.85	4.88	4.84	4.32	6.25	5.39	5.34
	GDP/capita	4.02	5.00	3.80	3.89	4.52	5.50	4.30	4.40	4.91	5.91	4.80	4.90
	Population	-0.57	0.33	0.56	0.42	-0.57	0.33	0.56	0.42	-0.57	0.33	0.56	0.42
Pavlodar	GDP(Tenge)	4.00	4.76	4.27	3.99	4.50	5.27	4.77	4.49	4.90	5.67	5.27	4.99
	GDP/capita	4.05	4.07	3.50	3.28	4.54	4.57	3.99	3.78	4.94	4.96	4.49	4.28
	Population	-0.04	0.67	0.75	0.69	-0.04	0.67	0.75	0.69	-0.04	0.67	0.75	0.69
North Kaz.	GDP(Tenge)	3.67	5.12	4.76	4.41	4.17	5.63	5.27	4.91	4.56	6.03	5.77	5.42
	GDP/capita	4.62	5.14	4.56	4.34	5.13	5.64	5.07	4.85	5.53	6.04	5.57	5.35
	Population	-0.91	-0.01	0.19	0.07	-0.91	-0.01	0.19	0.07	-0.91	-0.01	0.19	0.07
Kzyl Orda	GDP(Tenge)	6.63	7.51	4.45	5.43	7.14	8.02	4.96	5.94	7.55	8.43	5.46	6.45
	GDP/capita	5.82	5.87	2.78	3.81	6.33	6.38	3.28	4.31	6.73	6.78	3.77	4.81
	Population	0.77	1.55	1.62	1.56	0.77	1.55	1.62	1.56	0.77	1.55	1.62	1.56
Zhezkazgan	GDP(Tenge)	5.41	5.82	4.76	4.75	5.92	6.33	5.26	5.26	6.32	6.74	5.77	5.77
	GDP/capita	5.09	4.85	3.71	3.77	5.60	5.36	4.21	4.28	6.00	5.76	4.71	4.78
	Population	0.31	0.93	1.01	0.95	0.31	0.93	1.01	0.95	0.31	0.93	1.01	0.95
Turgai	GDP(Tenge)	2.03	4.30	4.81	4.02	2.52	4.80	5.32	4.53	2.91	5.20	5.82	5.03
	GDP/capita	2.09	3.35	3.66	3.00	2.58	3.85	4.16	3.50	2.97	4.24	4.66	4.00
	Population	-0.05	0.92	1.11	0.99	-0.05	0.92	1.11	0.99	-0.05	0.92	1.11	0.99
Mangistau	GDP(Tenge)	3.15	6.01	5.19	5.07	3.65	6.52	5.70	5.58	4.04	6.93	6.21	6.08
	GDP/capita	2.61	4.73	3.69	3.70	3.10	5.23	4.19	4.20	3.49	5.63	4.69	4.71
	Population	0.53	1.22	1.45	1.31	0.53	1.22	1.45	1.31	0.53	1.22	1.45	1.31
Taldykorg.	GDP(Tenge)	2.42	4.55	4.24	3.87	2.91	5.05	4.75	4.37	3.30	5.45	5.25	4.87
	GDP/capita	2.40	3.67	3.11	2.89	2.89	4.17	3.61	3.39	3.28	4.56	4.10	3.88
	Population	0.02	0.85	1.10	0.95	0.02	0.85	1.10	0.95	0.02	0.85	1.10	0.95
Total	GDP(Tenge)	4.59	5.23	4.87	4.29	5.09	5.73	5.37	4.79	5.49	6.13	5.88	5.30
	GDP/capita	4.30	4.30	3.80	3.30	4.80	4.80	4.30	3.80	5.20	5.20	4.80	4.30
	Population	0.28	0.89	1.03	0.96	0.28	0.89	1.03	0.96	0.28	0.89	1.03	0.96

Note:The sum of each regional GDP growth in value is not equal to that of the total since the each growth rate of GDP is obtained solely using growth rates(index) of each region and total. However there is no problem as far as each growth rate is applied for the forecast

Table 3.3.3.4 Annual GDP Growth Rates by Zone and by Case for Traffic Demand Forecast --- Capital Relocation ---

Region	Low Case				Medium Case				High Case			
	1995 -2000	2000 -2005	2005 -2010	2010 -2020	1995 -2000	2000 -2005	2005 -2010	2010 -2020	1995 -2000	2000 -2005	2005 -2010	2010 -2020
(Domestic)												
Almaty	6.28	5.91	5.30	3.71	6.79	6.41	5.81	4.22	7.20	6.82	6.31	4.72
West Kaz.	5.77	5.42	5.42	4.89	6.27	5.93	5.93	5.40	6.68	6.33	6.44	5.90
Aktyubinsk	5.18	4.71	5.22	4.43	5.68	5.21	5.73	4.94	6.09	5.61	6.24	5.44
Karagand	4.49	4.81	4.69	4.22	4.99	5.31	5.19	4.72	5.39	5.71	5.70	5.23
Kustanay	3.28	4.26	4.54	3.87	3.77	4.76	5.04	4.37	4.17	5.16	5.55	4.87
Atyrau	5.38	6.06	5.35	5.17	5.89	6.57	5.85	5.67	6.29	6.97	6.36	6.18
East Kaz.	4.25	4.81	4.49	4.12	4.75	5.31	4.99	4.62	5.15	5.71	5.49	5.13
South Kaz.	3.77	4.57	4.17	3.84	4.27	5.07	4.68	4.35	4.67	5.47	5.18	4.85
Zhanbul	4.80	5.04	6.51	5.23	5.30	5.54	7.02	5.74	5.70	5.94	7.54	6.25
Akmola	4.21	5.82	5.62	5.18	4.71	6.33	6.12	5.69	5.11	6.74	6.63	6.20
Semipalatinsk	4.62	5.67	4.68	4.64	5.12	6.18	5.18	5.15	5.53	6.59	5.68	5.65
Kokchetau	3.43	5.35	4.38	4.33	3.92	5.85	4.88	4.84	4.32	6.25	5.39	5.34
Pavlodar	4.00	4.76	4.27	3.99	4.50	5.27	4.77	4.49	4.90	5.67	5.27	4.99
North Kaz.	3.67	5.12	4.76	4.41	4.17	5.63	5.27	4.91	4.56	6.03	5.77	5.42
Kzyl Orda	6.63	7.51	4.45	5.43	7.14	8.02	4.96	5.94	7.55	8.43	5.46	6.45
Zhezkazgan	5.41	5.82	4.76	4.75	5.92	6.33	5.26	5.26	6.32	6.74	5.77	5.77
Turgai	2.03	4.30	4.81	4.02	2.52	4.80	5.32	4.53	2.91	5.20	5.82	5.03
Mangistau	3.15	6.01	5.19	5.07	3.65	6.52	5.70	5.58	4.04	6.93	6.21	6.08
Taldykorgan	2.42	4.55	4.24	3.87	2.91	5.05	4.75	4.37	3.30	5.45	5.25	4.87
(Intern'l-1)												
Russia	4.36	4.49	4.19	3.56	4.87	5.00	4.49	3.87	5.37	5.50	5.00	4.37
East Europe	4.10	4.19	3.89	3.23	4.60	4.69	4.19	3.53	5.10	5.20	4.69	4.03
Central Asia	4.36	4.49	4.19	3.56	4.87	5.00	4.49	3.87	5.37	5.50	5.00	4.37
China	8.77	8.19	7.69	7.03	9.28	8.70	8.19	7.53	9.79	9.20	8.70	8.03
Mongoria	4.36	4.49	4.19	3.56	4.87	5.00	4.49	3.87	5.37	5.50	5.00	4.37
(Intern'l-2)												
Far East Asia	3.15	2.90	2.40	1.76	3.45	3.20	2.70	2.06	3.75	3.50	3.00	2.36
Western Asia	5.94	5.51	4.99	3.93	6.46	6.02	5.51	4.44	6.97	6.53	6.02	4.95
Other Asia	6.47	6.12	5.61	4.63	6.98	6.62	6.12	5.13	7.49	7.13	5.61	4.63
Western Europe	2.79	2.68	2.38	1.90	3.09	2.98	2.68	2.20	3.39	3.28	2.98	2.50
North America	3.53	3.29	2.99	2.50	3.83	3.59	3.29	2.80	4.14	3.89	3.59	3.10
Australia,etc.	3.96	3.65	3.34	2.70	4.27	3.95	3.65	3.01	4.57	4.25	3.95	3.31
Africa	4.59	4.27	3.97	3.07	4.90	4.58	4.27	3.32	5.21	4.88	4.58	3.68
Others	4.69	4.43	3.92	3.16	5.19	4.94	4.43	3.67	5.70	5.44	4.94	4.17

GDP Growth Rate by Region (1995=1.0)

	Low Case				Medium Case				High Case			
	2000	2005	2010	2020	2000	2005	2010	2020	2000	2005	2010	2020
Almaty	1.3560	1.8066	2.3387	3.3677	1.3889	1.8951	2.5129	3.7976	1.4156	1.9687	2.6736	4.2395
West Kaz.	1.3235	1.7236	2.2441	3.6165	1.3555	1.8080	2.4133	4.0781	1.3816	1.8782	2.5656	4.5526
Aktyubinsk	1.2871	1.6199	2.0895	3.2240	1.3183	1.6992	2.2452	3.6355	1.3436	1.7652	2.3888	4.0585
Karagand	1.2456	1.5754	1.9812	2.9950	1.2757	1.6526	2.1288	3.3773	1.3003	1.7168	2.2650	3.7702
Kustanay	1.1751	1.4475	1.8073	2.6417	1.2035	1.5184	1.9419	2.9789	1.2267	1.5774	2.0661	3.3255
Atyrau	1.2996	1.7439	2.2628	3.7444	1.3310	1.8293	2.4313	4.2224	1.3566	1.9004	2.5869	4.7137
East Kaz.	1.2316	1.5577	1.9399	2.9041	1.2614	1.6340	2.0844	3.2748	1.2857	1.6974	2.2178	3.6558
South Kaz.	1.2034	1.5048	1.8462	2.6919	1.2325	1.5785	1.9838	3.0356	1.2562	1.6398	2.1107	3.3887
Zhanbul	1.2642	1.6164	2.2156	3.6904	1.2947	1.6956	2.3806	4.1615	1.3196	1.7614	2.5329	4.6457
Akmola	1.2289	1.6308	2.1431	3.5521	1.2586	1.7107	2.3027	4.0055	1.2828	1.7771	2.4501	4.4715
Semipalatinsk	1.2535	1.6519	2.0760	3.2676	1.2839	1.7328	2.2307	3.6847	1.3086	1.8001	2.3734	4.1134
Kokchetau	1.1835	1.5354	1.9026	2.9070	1.2121	1.6106	2.0443	3.2781	1.2354	1.6732	2.1751	3.6595
Pavlodar	1.2169	1.5357	1.8928	2.7983	1.2463	1.6110	2.0338	3.1555	1.2703	1.6735	2.1639	3.5227
North Kaz.	1.1974	1.5371	1.9397	2.9863	1.2264	1.6124	2.0842	3.3675	1.2500	1.6750	2.2175	3.7592
Kzyl Orda	1.3787	1.9799	2.4617	4.1776	1.4121	2.0769	2.6451	4.7109	1.4392	2.1576	2.8143	5.2590
Zhezkazgan	1.3017	1.7275	2.1793	3.4678	1.3332	1.8121	2.3417	3.9104	1.3588	1.8825	2.4915	4.3654
Turgai	1.1059	1.3551	1.7266	2.5618	1.1327	1.4319	1.8552	2.8888	1.1545	1.4875	1.9739	3.2249
Mangistau	1.1679	1.5638	2.0143	3.3020	1.1962	1.6404	2.1644	3.7235	1.2192	1.7041	2.3029	4.1567
Taldykorgan	1.1269	1.4074	1.7325	2.5314	1.1542	1.4763	1.8616	2.8546	1.1764	1.5337	1.9806	3.1867
Russia	1.2380	1.5422	1.8936	2.6876	1.2681	1.6181	2.0158	2.9454	1.2988	1.6974	2.1660	3.3214
East Europe	1.2224	1.5011	1.8168	2.4962	1.2521	1.5750	1.9340	2.7357	1.2824	1.6521	2.0781	3.0849
Central Asia	1.2380	1.5422	1.8936	2.6876	1.2681	1.6181	2.0158	2.9454	1.2988	1.6974	2.1660	3.3214
China	1.5227	2.2576	3.2699	6.4484	1.5585	2.3649	3.5062	7.2463	1.5949	2.4768	3.7584	8.1386
Mongoria	1.2380	1.5422	1.8936	2.6876	1.2681	1.6181	2.0158	2.9454	1.2988	1.6974	2.1660	3.3214
Far East Asia	1.1676	1.3469	1.5163	1.8050	1.1848	1.3809	1.5843	1.9424	1.2021	1.4279	1.6553	2.0898
Western Asia	1.3347	1.7449	2.2264	3.2723	1.3674	1.8315	2.3944	3.6956	1.4007	1.9219	2.5742	4.1713
Other Asia	1.3680	1.8407	2.4182	3.8019	1.4010	1.9307	2.5980	4.2863	1.4347	2.0247	2.6599	4.1818
Western Europe	1.1475	1.3097	1.4732	1.7788	1.1644	1.3486	1.5393	1.9140	1.1815	1.3885	1.6081	2.0591
North America	1.1895	1.3985	1.6203	2.0734	1.2070	1.4400	1.6930	2.2310	1.2247	1.4826	1.7687	2.4002
Australia,etc.	1.2141	1.4525	1.7119	2.2356	1.2323	1.4956	1.7888	2.4057	1.2504	1.5399	1.8689	2.5883
Africa	1.2518	1.5431	1.8743	2.5357	1.2703	1.5889	1.9585	2.7287	1.2889	1.6359	2.0462	2.9358
Others	1.2573	1.5616	1.8929	2.5840	1.2881	1.6391	2.0358	2.9183	1.3195	1.7200	2.1887	3.2939

3.3.4 Methodology and Procedure of Air Passenger Traffic Demand Forecast

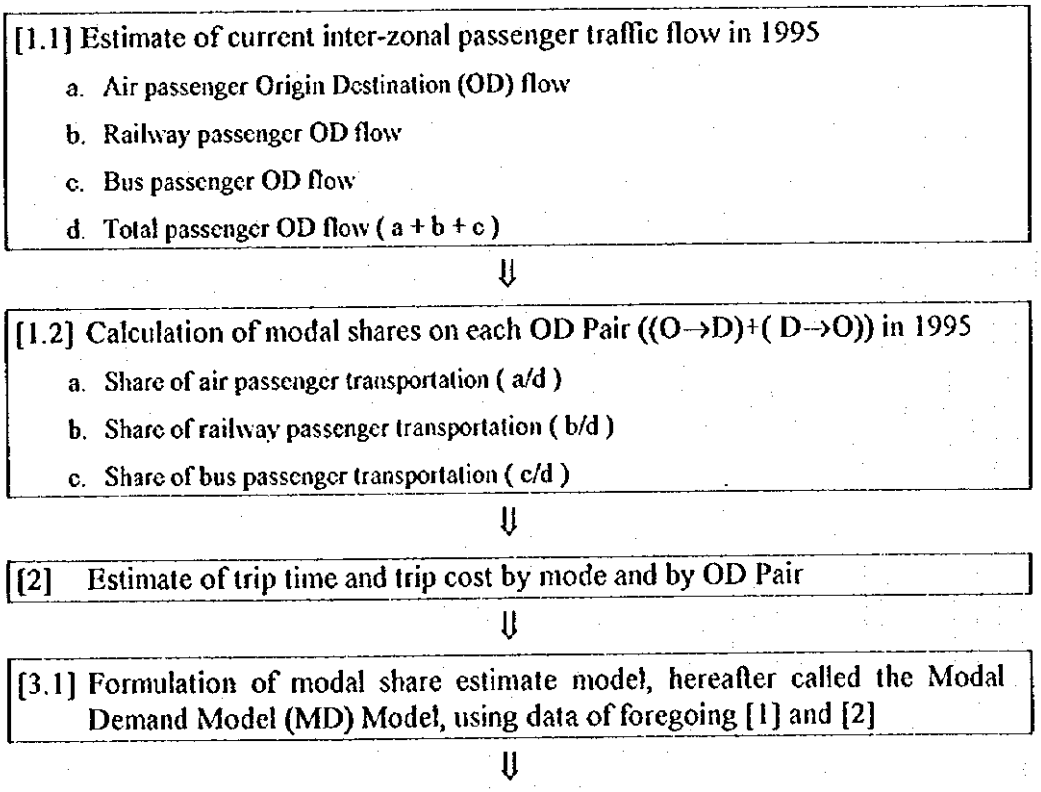
(1) Two Different Methods Applied for Air Passenger Traffic Demand Forecast

Air passenger traffic demand forecast were made by applying two different methodologies according to the different air transportation markets, that is one is competitive with other modes of transportation and another is non-competitive. The applied method for the competitive market is a step-by-step method. This typically includes the "modal share estimate model" which can rationally estimate each share of the respective modes of transportation, as will be described later in detail. This method will be applied for all inter-zonal air passenger traffic demands within the area covering Kazakhstan and the neighboring countries. Application of this method requires much time and effort.

Another method uses an "elasticity model" which will be applied for international air passenger traffic demands, other than those mentioned above.

(2) Procedure of Competitive Air Passenger Traffic Demand Forecast

Competitive air passenger traffic demand forecast were made by applying a step-by-step method of which the major components are briefly described as follows:



[3.2] Improvement of applicability of originally formulated MD Model by quantification of "dummy factors"(minus and none-minus additional time and / or cost) so that each modal share estimated by the model may approximate to the respective actual share. Hereafter, this step of work will be called a "reproduction of original situation".

⇓

[4] Forecast of total passenger traffic demand by OD pair and by case for target years

⇓

[5] Forecast of modal shares by OD Pair and by case for target years applying the MD Model

⇓

[6] Forecast of air passenger traffic demand by OD pair and by case for target years

Detail parts of the major components appear as **Appendix 3.3.4 (1)**.

3.3.5 The Results of Air Passenger Traffic Demand Forecast

The results of all inter-zonal air passenger traffic demands in both of competitive and non competitive transport markets are integrated into single OD pair tables classified by 19 regions in Kazakhstan which are shown in: Appendix-3.3.5 (1) for low case: 3.3.5 (2) for medium case: and 3.3.5 (3) for high case. Considering high volume of outputs, only some representative examples and brief summaries will be described here.

(1) An Example of Air Passenger Demand Forecasts for Almaty

As an example, the forecast results by case for Almaty zone are shown in **Table 3.3.5.1~3.3.5.3**.

Table 3.3.5.1 Air Passenger Movements (Arrival+Departure) by Region
-- Capital Replacement --
-- Low Case –

(Thousands)

	Code No.		1995	2000	2005	2010	2020
	(i)	(j)					
Almaty to/from							
Almaty	1	1	0.00	0.00	0.00	0.00	0.00
West Kasak.	1	2	1.60	2.13	3.01	4.46	8.65
Aktyubinsk	1	3	36.10	43.14	51.89	63.71	91.14
Karaganda	1	4	82.60	98.90	121.29	151.70	226.05
Kustanay	1	5	29.30	34.49	41.89	52.13	76.53
Atyrau	1	6	31.50	37.69	46.02	56.42	81.77
East Kazak.	1	7	22.10	26.51	32.77	41.34	62.71
South Kazak.	1	8	115.20	135.91	164.63	201.91	290.95
Zhambul	1	9	25.70	31.33	39.46	52.18	84.59
Akmola	1	10	60.80	73.92	94.83	122.45	180.52
Semipalatin.	1	11	49.10	58.42	71.46	87.68	127.58
Kokchetau	1	12	20.00	23.58	29.03	36.01	53.42
Pavlodar	1	13	88.60	105.91	130.85	164.64	249.18
North Kazak.	1	14	13.90	16.62	20.78	26.58	41.37
Kzyl-Orda	1	15	44.40	54.90	70.23	88.56	138.99
Zhezkazgan	1	16	44.10	52.82	64.34	78.37	112.61
Turgai	1	17	16.90	19.37	23.14	28.20	39.76
Mangistau	1	18	28.70	33.48	41.09	50.70	74.42
Taldykorgan	1	19	0.00	14.00	18.04	24.18	41.11
Subtotal			710.60	863.09	1064.75	1331.22	1981.37
Russia	1	20	517.00	601.63	702.11	818.86	1067.82
East Europe	1	21	40.80	48.56	58.99	72.89	105.51
Central Asia	1	22	40.60	48.04	57.68	69.98	98.11
China	1	23	52.40	63.75	76.49	90.84	123.49
Mongolia	1	24	8.60	9.88	11.27	12.74	15.74
East Asia	1	25	11.03	12.99	15.00	17.00	20.88
Western Asia	1	26	103.81	128.56	155.64	184.83	245.66
Other Asia	1	27	8.54	10.68	13.07	15.69	21.39
West Europe	1	28	106.00	124.04	142.71	161.66	199.59
North America	1	29	13.01	15.43	17.95	20.56	25.94
Oceania, etc.	1	30	2.04	2.44	2.86	3.29	4.19
Africa	1	31	0.24	0.29	0.35	0.41	0.52
Others	1	32	0.08	0.09	0.11	0.13	0.16
Subtotal			904.16	1066.37	1254.22	1468.86	1928.99
Total			1614.76	1929.47	2318.96	2800.09	3910.36

Table 3.3.5.2 Air Passenger Movements (Arrival+Departure) by Region
-- Capital Replacement --
-- Medium Case –

(Thousands)

	Code No.		1995	2000	2005	2010	2020
	(i)	(j)					
Almaty to from							
Almaty	1	1	0.00	0.00	0.00	0.00	0.00
West Kasak.	1	2	1.60	2.28	3.46	5.43	11.73
Aktyubinsk	1	3	36.10	44.34	55.01	69.58	105.62
Karaganda	1	4	82.60	102.10	129.95	168.36	269.42
Kustanay	1	5	29.30	35.58	44.83	57.74	90.90
Atyrau	1	6	31.50	38.71	48.73	61.49	94.42
East Kazak.	1	7	22.10	27.42	35.28	46.21	75.66
South Kazak.	1	8	115.20	139.99	175.45	222.25	341.76
Zhambul	1	9	25.70	32.54	42.85	59.10	104.37
Akmola	1	10	60.80	76.17	101.16	134.98	212.63
Semipalatin.	1	11	49.10	60.10	75.96	96.14	148.86
Kokchetau	1	12	20.00	24.32	31.05	39.86	63.39
Pavlodar	1	13	88.60	109.56	140.86	184.08	301.04
North Kazak.	1	14	13.90	17.23	22.47	29.90	50.46
Kzyl-Orda	1	15	44.40	56.79	75.60	98.99	167.76
Zhezkazgan	1	16	44.10	54.26	68.16	85.47	130.17
Turgai	1	17	16.90	19.90	24.51	30.76	45.97
Mangistau	1	18	28.70	34.44	43.66	55.55	86.75
Taldykorgan	1	19	0.00	14.64	19.94	28.17	53.48
Subtotal			710.60	890.38	1138.92	1474.05	2354.39
Russia	1	20	517.00	614.09	732.81	870.56	1176.71
East Europe	1	21	40.80	50.12	63.16	80.60	124.58
Central Asia	1	22	40.60	49.39	61.19	76.29	112.96
China	1	23	52.40	64.74	78.92	95.16	133.27
Mongolia	1	24	8.60	10.02	11.61	13.29	16.80
East Asia	1	25	11.03	14.33	18.13	22.41	32.19
Western Asia	1	26	103.81	145.97	198.96	264.83	432.68
Other Asia	1	27	8.54	12.16	16.82	22.16	35.65
West Europe	1	28	106.00	136.53	171.82	212.20	307.07
North America	1	29	13.01	17.07	21.81	27.35	40.79
Oceania, etc.	1	30	2.04	2.71	3.49	4.41	6.65
Africa	1	31	0.24	0.33	0.43	0.55	0.85
Others	1	32	0.08	0.10	0.14	0.18	0.28
Subtotal			904.16	1117.55	1379.30	1690.00	2420.47
Total			1614.76	2007.93	2518.21	3164.05	4774.86

Table 3.3.5.3 Air Passenger Movements (Arrival+Departure) by Region
-- Capital Replacement --
-- High Case --

(Thousands)

	Code No.		1995	2000	2005	2010	2020
	(i)	(j)					
Almaty to/from							
Almaty	1	1	0.00	0.00	0.00	0.00	0.00
West Kasak.	1	2	1.60	2.42	3.99	6.68	15.72
Aktyubinsk	1	3	36.10	45.44	58.26	76.15	121.72
Karaganda	1	4	82.60	105.13	139.26	187.74	319.60
Kustanay	1	5	29.30	36.62	47.97	64.23	107.46
Atyrau	1	6	31.50	39.66	51.53	67.13	108.41
East Kazak.	1	7	22.10	28.29	38.00	51.96	90.90
South Kazak.	1	8	115.20	143.80	186.88	245.46	399.37
Zhambul	1	9	25.70	33.70	46.62	67.47	128.27
Akmola	1	10	60.80	78.28	107.86	149.34	249.22
Semipalatin.	1	11	49.10	61.67	80.69	105.71	172.79
Kokchetau	1	12	20.00	25.02	33.21	44.32	74.86
Pavlodar	1	13	88.60	113.03	151.76	207.08	362.25
North Kazak.	1	14	13.90	17.80	24.32	33.87	61.31
Kzyl-Orda	1	15	44.40	58.59	81.45	111.32	201.61
Zhezkazgan	1	16	44.10	55.59	72.11	93.39	149.65
Turgai	1	17	16.90	20.39	25.93	33.61	52.84
Mangistau	1	18	28.70	35.33	46.35	61.03	100.59
Taldykorgan	1	19	0.00	15.28	22.13	33.27	69.53
Subtotal			710.60	916.05	1218.32	1639.75	2786.09
Russia	1	20	517.00	625.94	764.28	928.51	1301.82
East Europe	1	21	40.80	51.65	67.80	90.00	147.96
Central Asia	1	22	40.60	50.70	65.01	83.80	130.71
China	1	23	52.40	65.65	81.26	99.51	143.28
Mongolia	1	24	8.60	10.16	11.94	13.87	18.01
East Asia	1	25	11.03	15.15	20.16	26.05	40.43
Western Asia	1	26	103.81	156.95	228.50	323.24	586.27
Other Asia	1	27	8.54	13.11	19.43	27.15	48.32
West Europe	1	28	106.00	144.09	190.42	245.97	385.07
North America	1	29	13.01	18.09	24.35	32.04	52.01
Oceania, etc.	1	30	2.04	2.87	3.91	5.20	8.55
Africa	1	31	0.24	0.35	0.48	0.66	1.10
Others	1	32	0.08	0.11	0.16	0.21	0.37
Subtotal			904.16	1154.81	1477.70	1876.22	2863.91
Total			1614.76	2070.86	2696.02	3515.97	5649.99

(2) Summary of Air Passenger Traffic Demand Forecast

a) Decreased Air Passenger Traffic Demands since 1990

As already indicated, the air passenger traffic demands in Kazakhstan have decreased drastically since around 1991 (See Table 3.3.5.4). Forecast air passenger traffic demand trends for each region and all regions since the late 1990, when air passenger demands peaked, are shown in Figure 3.3.5.1~3.3.5.20. Forecast air passenger traffic demand for medium case are shown in Table 3.3.5.6.

Table 3.3.5.4 Number of Departured Passengers carried by Civil Aviation

(thousands)

Region	1990	1991	1992	1993	1994	1995
Almaty	2,294.2	2,259.7	1,675.2	1,371.8	1,062.3	1,062.8
WestKazak.	182.7	145.4	82.0	53.6	36.9	29.3
Aktyubinsk	422.0	352.8	172.9	88.8	49.7	37.7
Karaganda	675.4	634.0	386.4	254.1	120.0	112.1
Kustanay	469.5	394.7	250.0	158.7	55.1	51.2
Atyrau	524.1	429.1	276.9	161.0	101.2	84.5
EastKazak.	667.8	639.4	377.1	217.0	119.6	71.0
SouthKazak.	288.5	268.1	179.1	164.7	136.1	90.1
Zhambul	242.2	217.8	136.8	87.0	46.9	28.5
Akmola	423.2	380.4	202.3	135.0	74.7	70.9
SemipalaTrsk	366.2	342.2	198.4	132.6	57.2	31.6
Kokchetau	201.2	200.2	134.6	88.5	36.0	26.2
Pavlodar	439.8	394.9	250.0	149.9	95.3	71.6
NorthKazak.	142.7	119.2	71.7	41.1	18.2	8.3
KzylOrda	222.4	186.3	106.7	65.9	52.8	41.7
Zhezkazgan	283.3	267.7	184.6	234.5	76.4	56.0
Turgai	175.9	140.4	81.0	47.3	19.1	8.9
Mangistau	467.9	447.9	333.3	241.1	131.0	129.6
Taldykorgan	109.8	100.8	72.9	43.3	5.2	0.2
Total	8,558.8	7,920.8	5,171.9	3,635.9	2,293.7	2,010.2

Source: Committee of Statistics and Analysis

Table 3.3.5.5 Forecast Air Passenger Traffic Demand for All Region (medium case)

(thousand)

Region		Demand Passenger / Year (both way) 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
Atyrau	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

(thousand)

Region		Demand Passenger / Year (both way) 2005	2010	2020
Akmola	Dom.	154.95	215.14	369.15
	Int./CIS	152.99	208.38	330.63
	Total	307.94	423.52	699.78
Semipalatinsk	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
Zhazkazgan	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

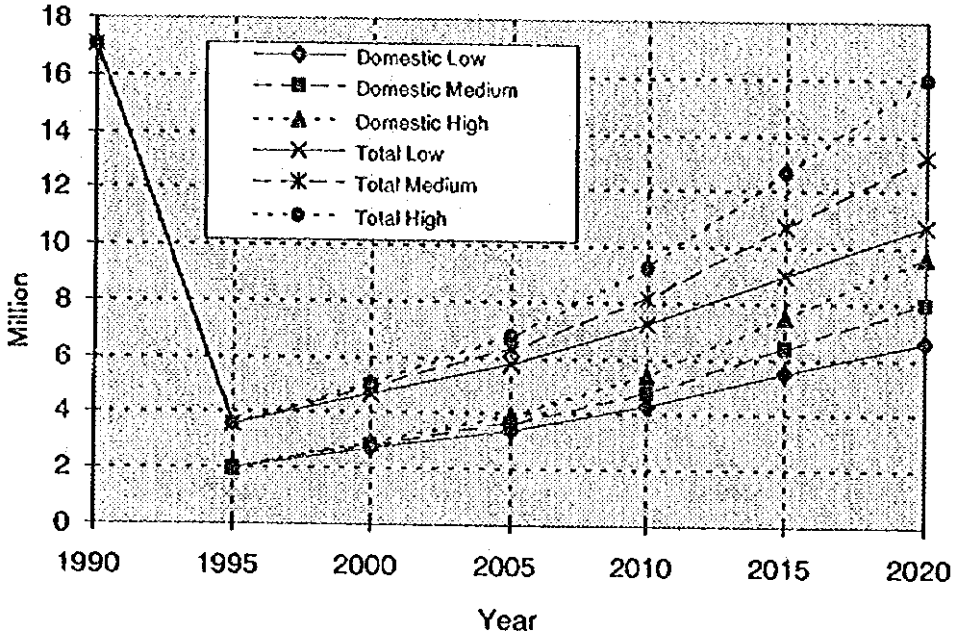


Figure 3.3.5.1 Air Passenger Forecast
-All Region: Total Passengers-

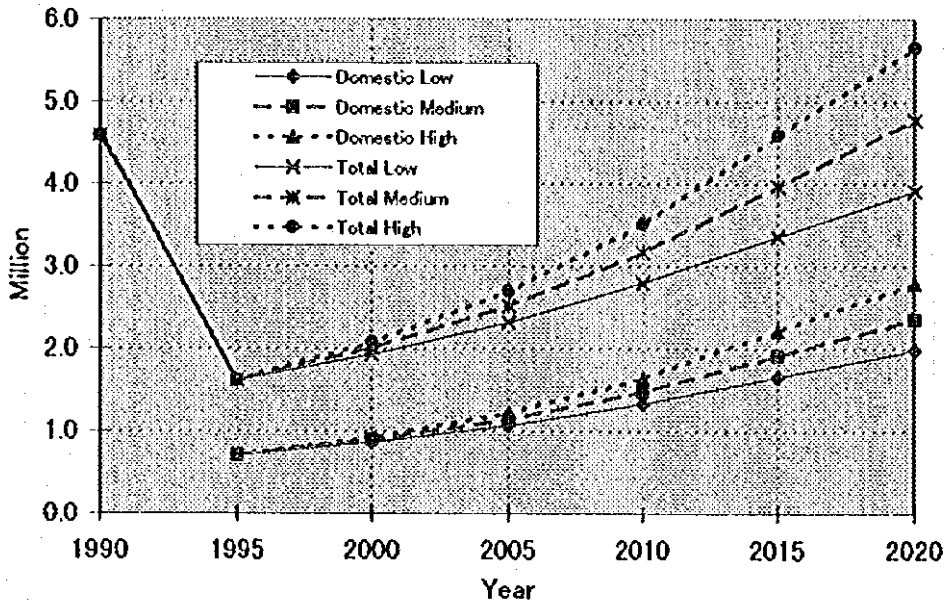


Figure 3.3.5.2 Air Passenger Forecast
- Almaty -

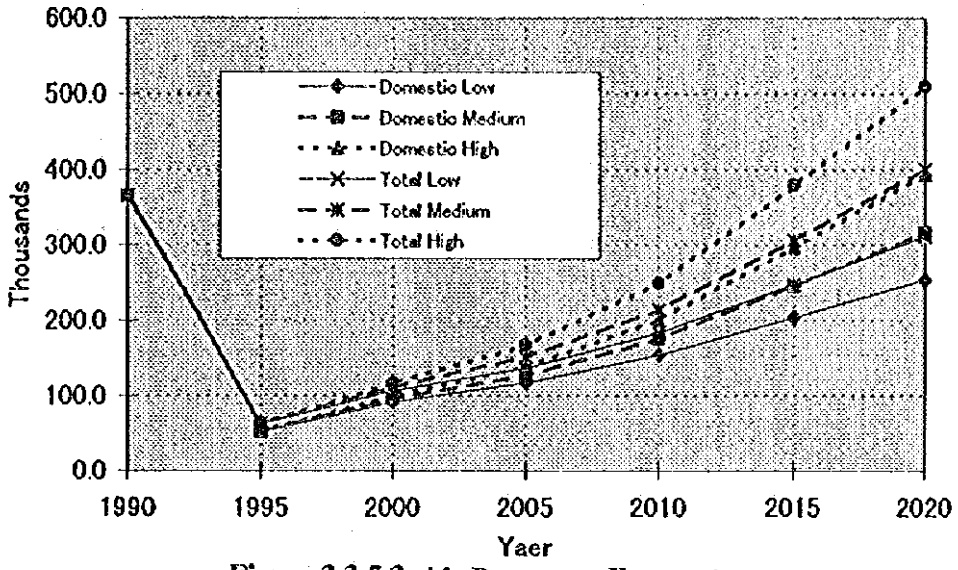


Figure 3.3.5.3 Air Passenger Forecast
-West Kazakhstan-

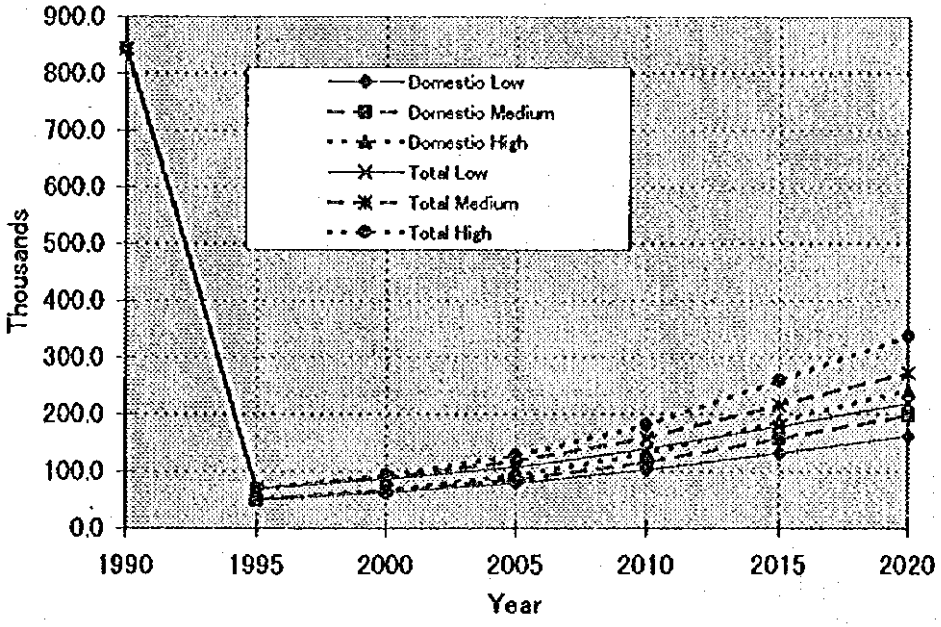


Figure 3.3.5.4 Air Passenger Forecast
- Aktyubinsk -

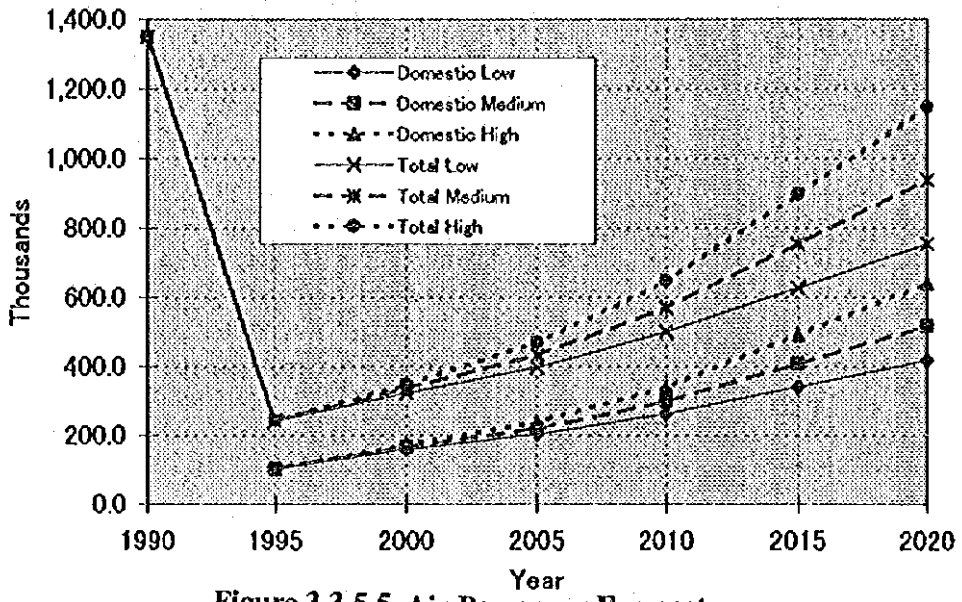


Figure 3.3.5.5 Air Passenger Forecast
- Karaganda -

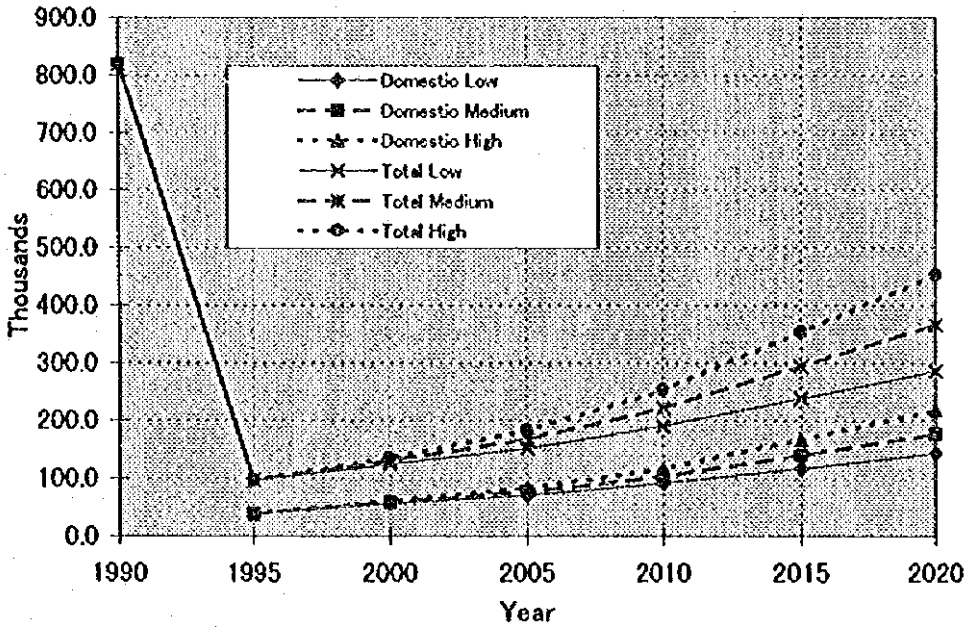


Figure 3.3.5.6 Air Passenger Forecast
- Kustanay -

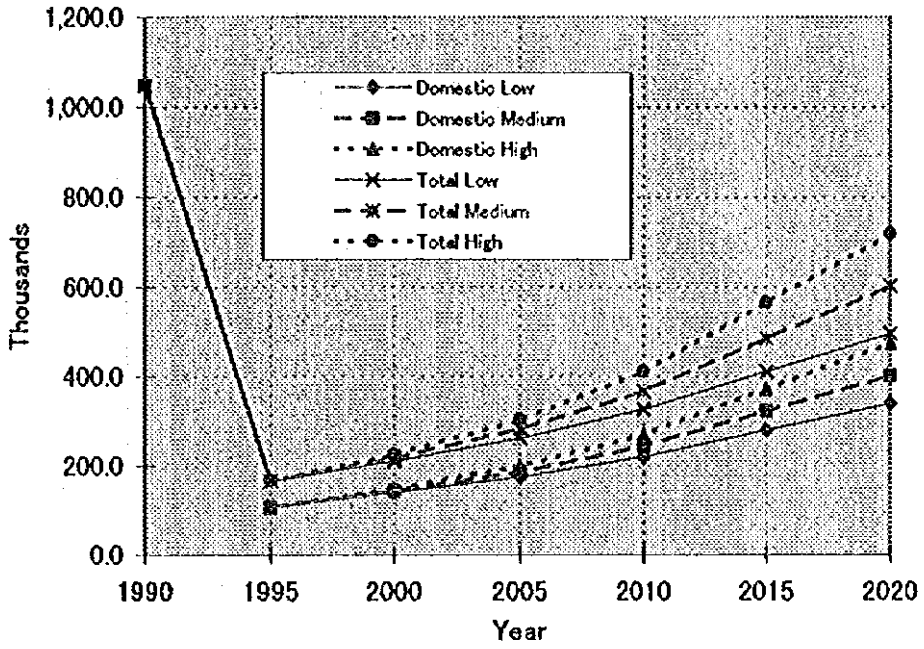


Figure 3.3.5.7 Air Passenger Forecast
- Atyrau -

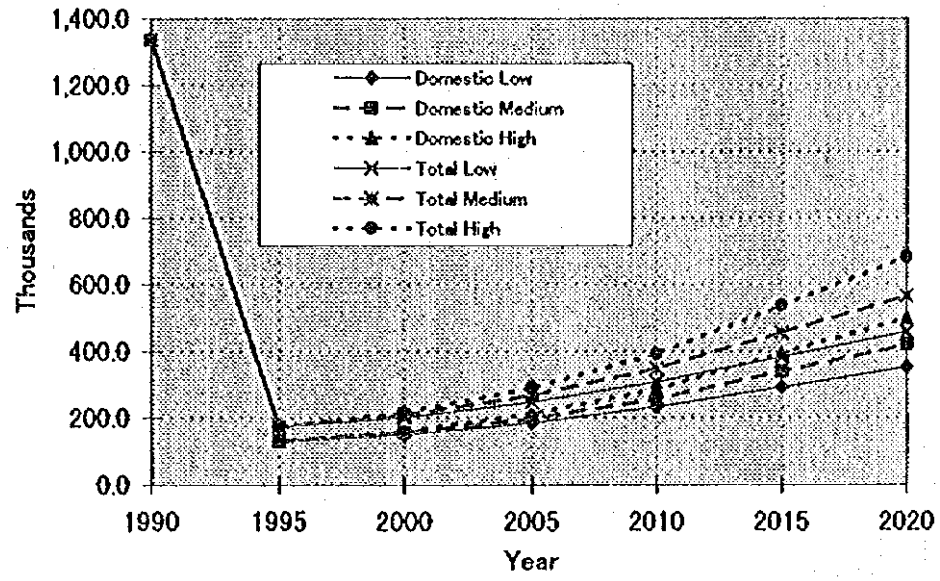


Figure 3.3.5.8 Air Passenger Forecast
- East Kazakhstan -

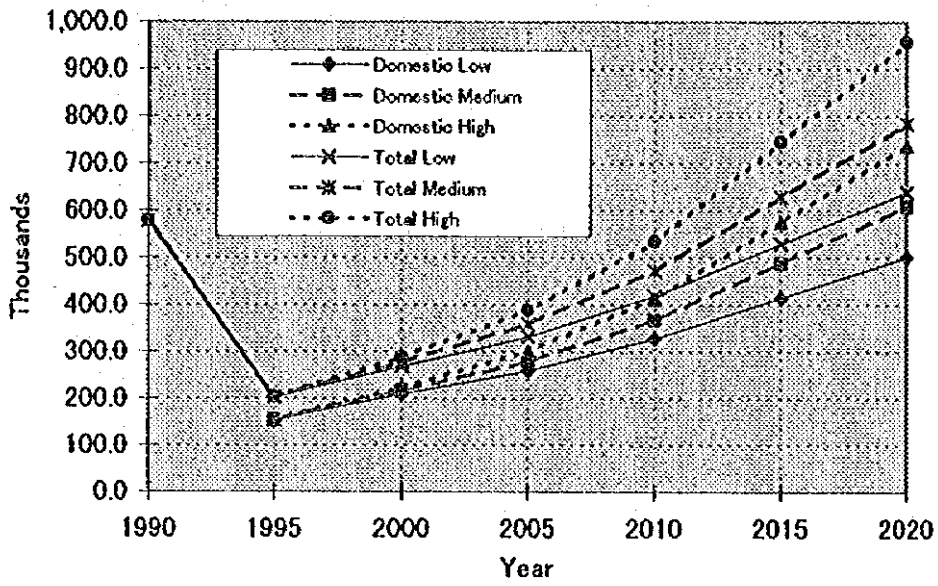


Figure 3.3.5.9 Air Passenger Forecast
- South Kazakhstan -

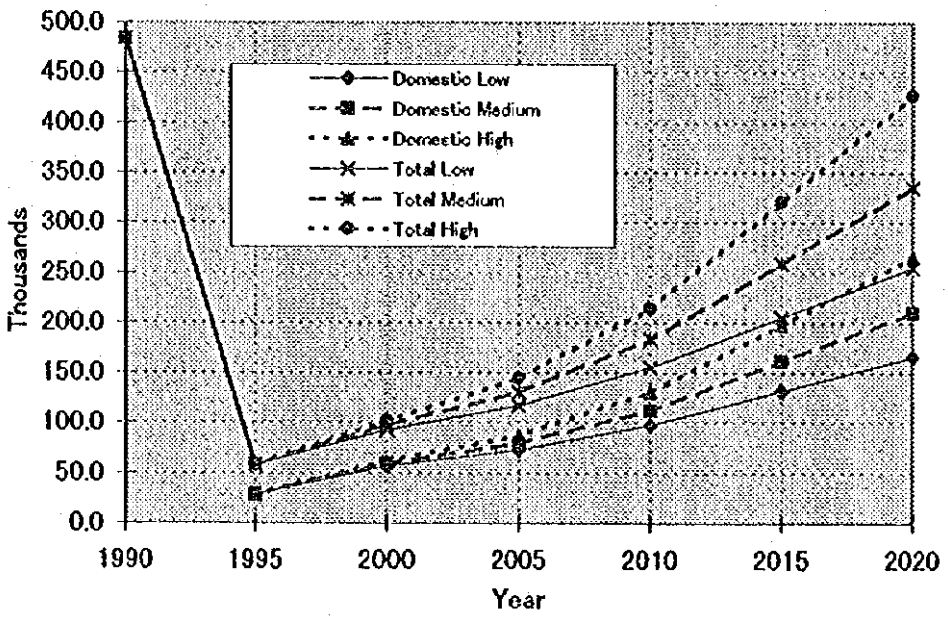


Figure 3.3.5.10 Air Passenger Forecast
- Zhambul -

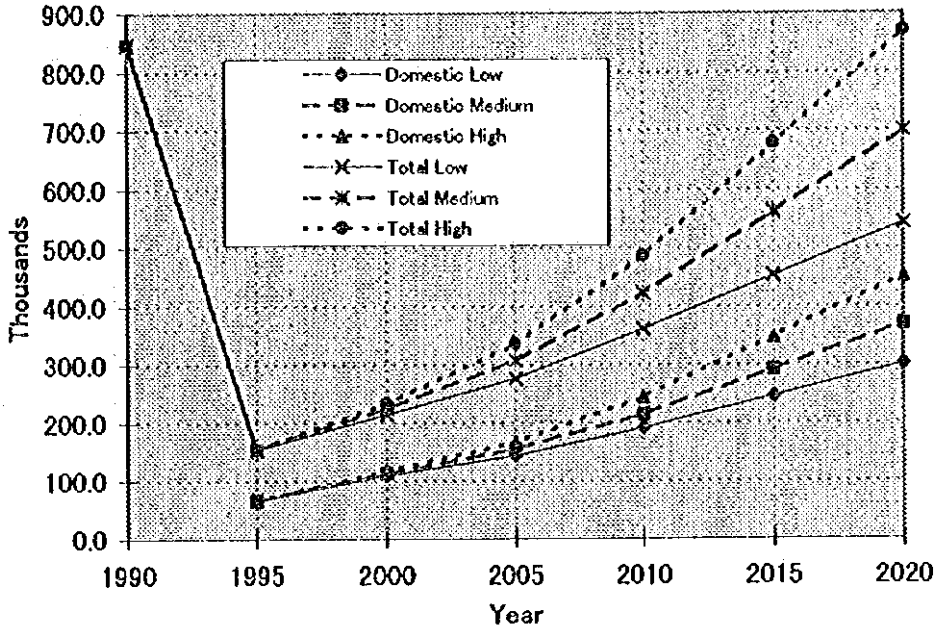


Figure 3.3.5.11 Air Passenger Forecast
- Akmola -

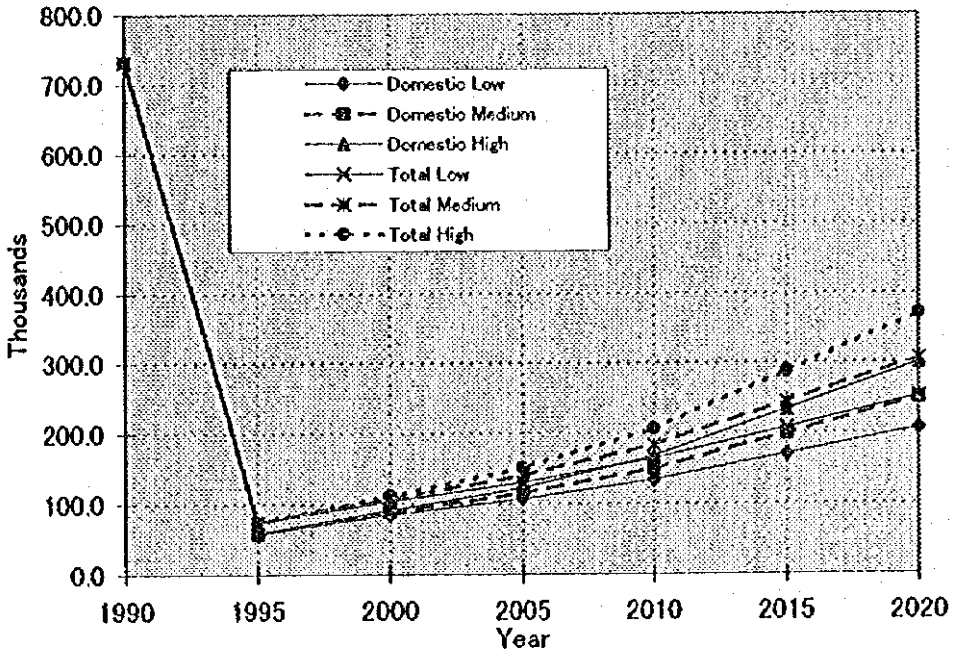


Figure 3.3.5.12 Air Passenger Forecast
- Semipalatinsk -

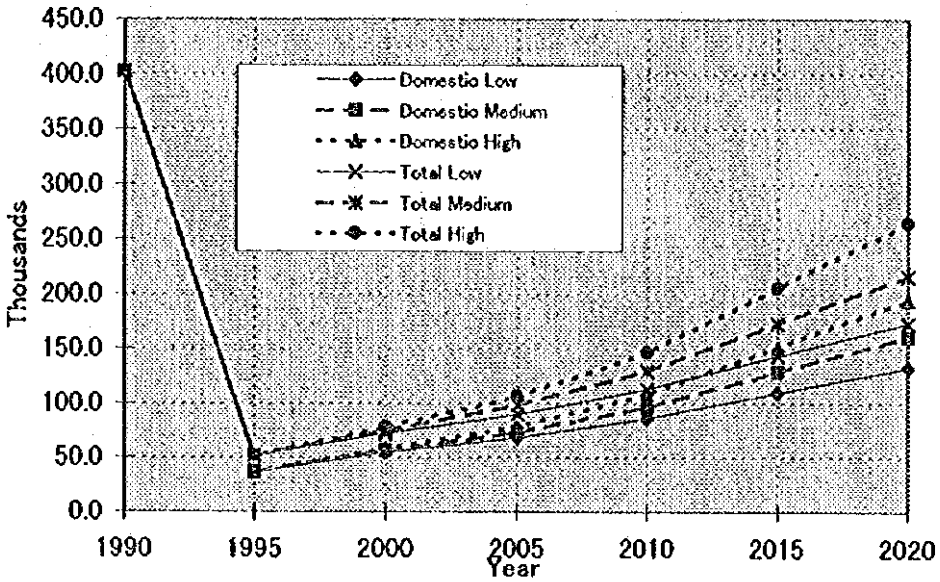


Figure 3.3.5.13 Air Passenger Forecast
- Kokchetau -

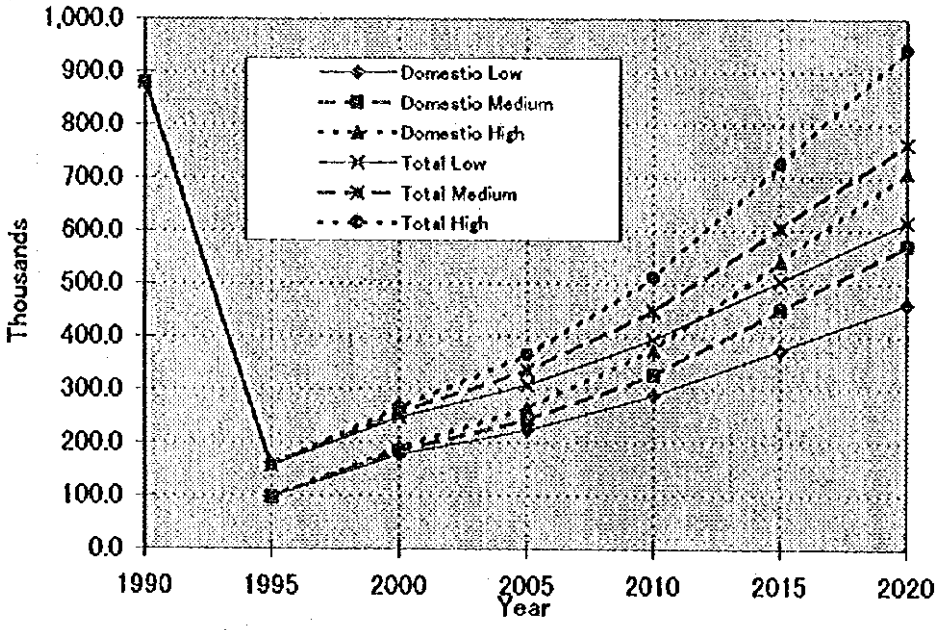


Figure 3.3.5.14 Air Passenger Forecast
- Pavlodar -

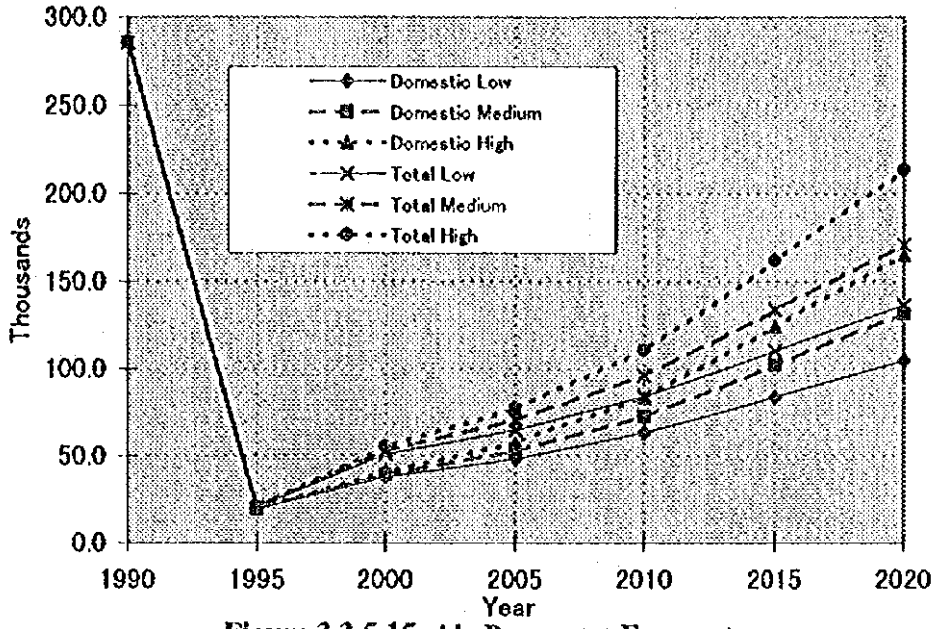


Figure 3.3.5.15 Air Passenger Forecast
-North Kazakhstan -

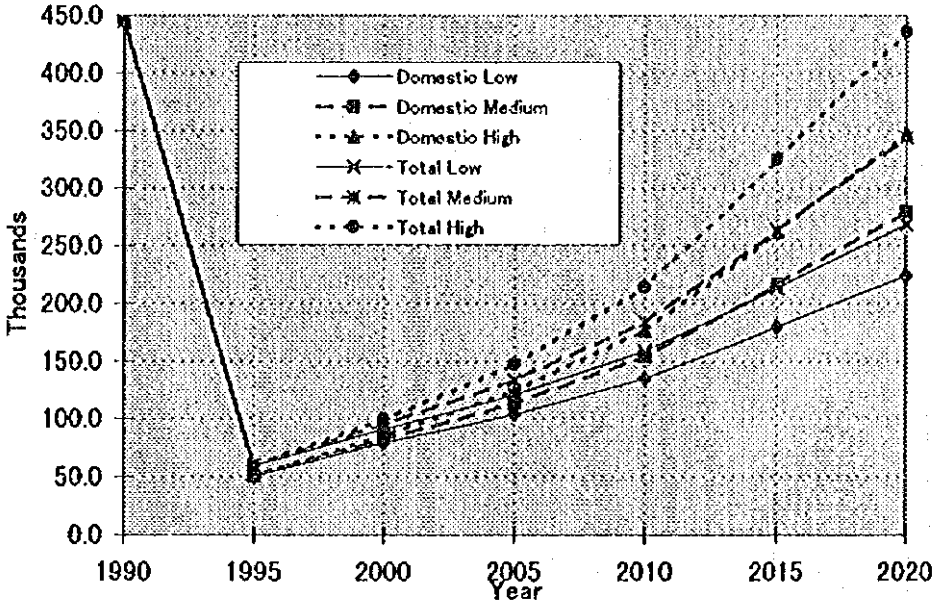


Figure 3.3.5.16 Air Passenger Forecast
- Kzyl Orda -

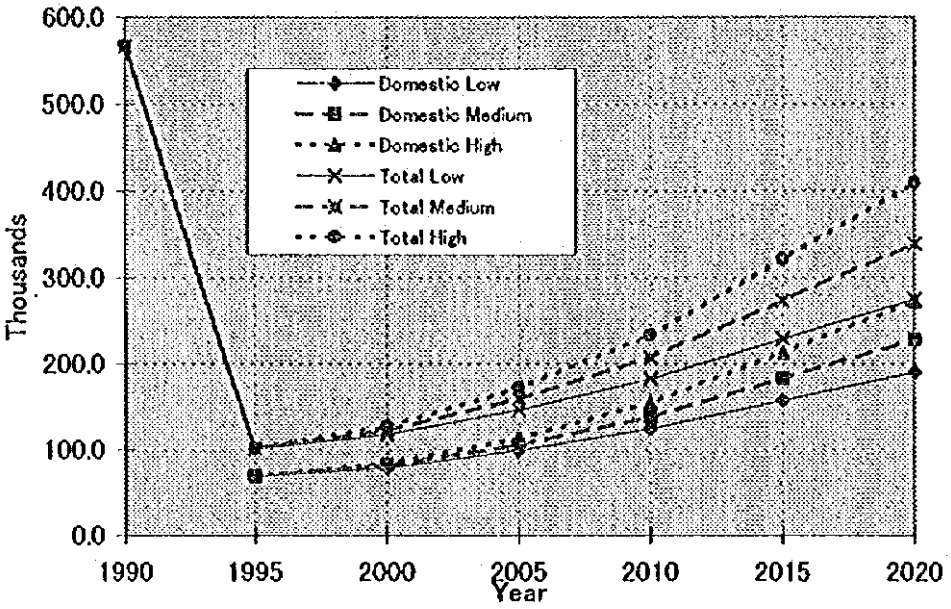


Figure 3.3.5.17 Air Passenger Forecast
- Zhezkazgan -

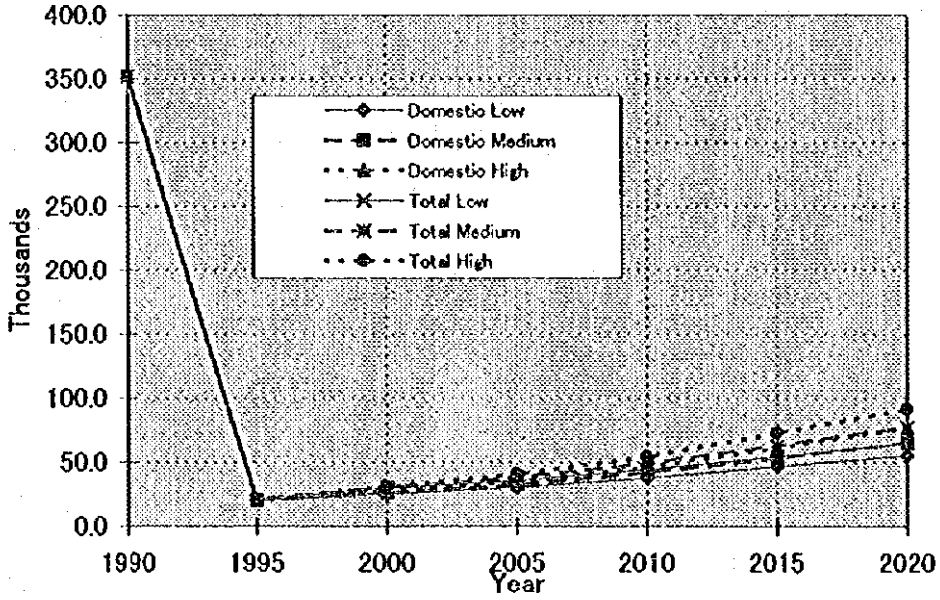


Figure 3.3.5.18 Air Passenger Forecast
- Turgai -

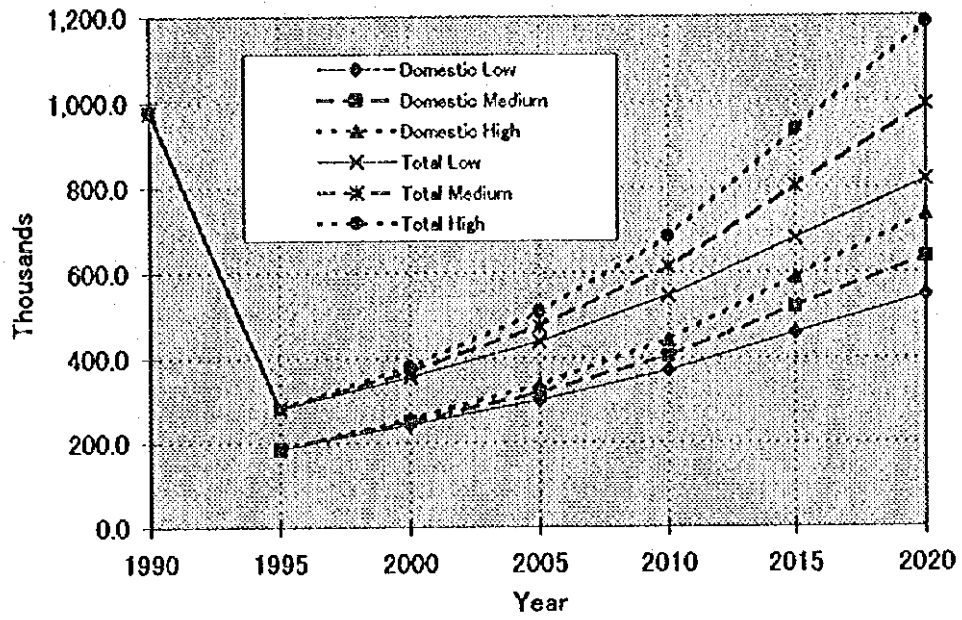


Figure 3.3.5.19 Air Passenger Forecast
- Mangistau -

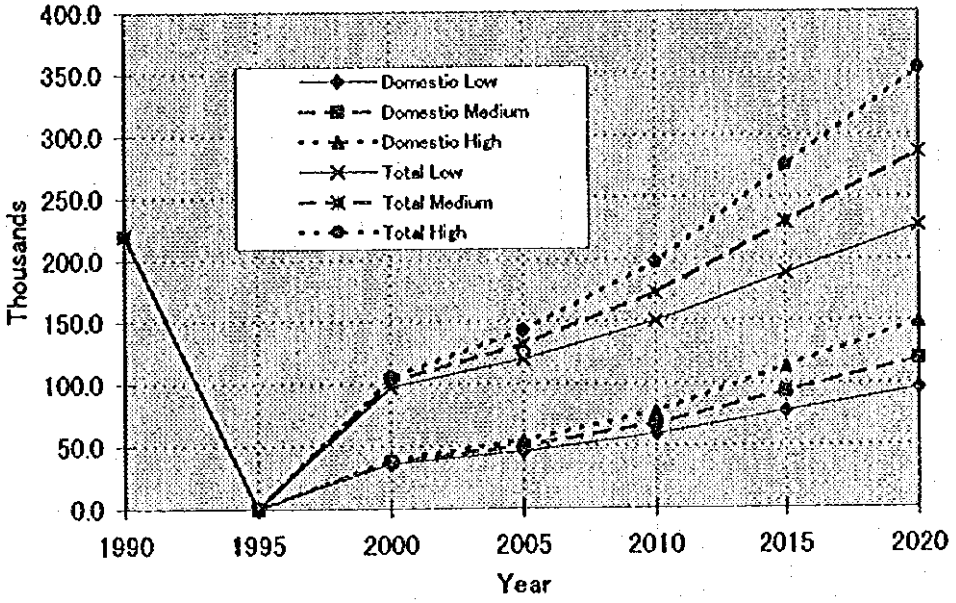


Figure 3.3.5.20 Air Passenger Forecast
- Taldy Kurgan -

b) Total Air Passenger Traffic Demand in Kazakhstan

Total air passenger traffic demand (Arrival + departure) dropped to approximately 20% of the peak demand in 1990. Forecasts indicate that the demand in 2020 should increase to about three times that of 1995 in the medium case, which will not result in a full recovery to the peak level of 1990.

However, the forecast demand in the high case indicates a recovery to the peak level of 1990 by the beginning of 2020's (See Fig 3.3.5.1).

c) Air Passenger Traffic Demands by Region

Air passenger movements for each region (zone) differ widely. Some typical features are mentioned as follows:

i. Almaty

Almaty is the top regions in Kazakhstan in terms of domestic and international air passenger traffic demands.

Total air passenger traffic demand for this Region in 1995 dropped to only 35 % of the peak demand in 1990 although this was less sever than the decrease to 20% for all of Kazakhstan. Air passenger movements were about 710 thousand domestic and 900 thousand of international air passengers (arrival+departure) in 1995 which accounts for about 45% of the total of Kazakhstan. Forecast results indicate that the total air passenger movements in the medium case will reach the 1990peak level by the year 2020 (See Figure 3.3.5.2).

ii. Other Regions

Regions other than Almaty have experienced greater declines in air passenger traffic demands since 1990. For example, in Karaganda the total air passenger movements dropped from about 1,350 thousands in 1990 to 242 thousand in 1995, or only about 18% of that in 1990. Another example is Taldy Kurgan where air passenger movements were about 220 thousand passengers in 1990 but it dropped to almost zero (See table 3.3.5.3).

However, the air passenger traffic demand for all these regions are expected to increase gradually along with the respective growth in Gross Domestic Products or people's incomes.

In 1995, all of these Regions experienced air passenger traffic demands of less than 200~300 thousands. The regions where air passenger movements may be expected to increase to over 600~700 thousand, in the medium case by 2020, are Karaganda, Atyrau, South Kazakhstan, Akmola, Pavlodar and Mangistau.

3.3.6 Air Cargo Demand Forecast

(1) Methodology

Air cargo demand forecasts were made by applying simple models which are formulated by regression analyses and other simple analyses on the relationship between air cargo and air passenger movements. Applied models are as follows:

a) Domestic and Neighboring Countries

$DAC_{tij} = \alpha_i \times DAP_{tij}$

where, DAC_{tij}: Air cargo movements between zone (i) and (j) for the target year (t) (ton)

DAP_{tij}: Air passenger movements between zone (i) and (j) for the target year (t) (passenger)

α_i: Parameters for zone (i) (See Appendix-3.3.6 (1))

Zone	Parameters(αi)	Zone	Parameters(αi)
Almaty	0.004841	Semipalatinsk	0.007142
West Kazakhstan	0.003926	Kokchetau	0.009266
Aktyubinsk	0.008324	Pavlodar	0.002302
Karaganda	0.003393	North Kazakhstan	0.008541
Kustanay	0.004813	Kzyl-Orda	0.002966
Atyrau	0.002096	Zhezkazgan	0.001695
East Kazakhstan	0.004841	Turgai	0.004841
South Kazakhstan	0.004841	Mangistau	0.006707
Zhambul	0.004841	Taldy-Kurgan	0.004841
Akmola	0.004049		

b) International excluding Neighboring Countries

$IAC_{tij} = \alpha \times IAP_{tij}$

where, IAC_{tij}: International air cargo movements between zone (i) and (j) for the target year (t) (ton)

IAP_{tij}: International air passenger movements between zone (i) and (j) for the target year (t) (passenger)

α: Parameter, α=0.05718; β is estimated as an average ratio of cargo ton per passenger based on the world transportation statistics(See Appendix-3.3.6 (2)).

(2) Forecast Results

Results of air cargo traffic demand by OD pair are shown in Appendix-3.3.6 (3) for the low case, Appendix-3.3.6 (4) for Medium case and Appendix-3.3.6 (5) for high case. It should be noted that the values for 1995 are estimated due to lack of actual data for OD pairs. Also it was noted that there was no available air cargo data on foreign international airlines.

International air cargo movements (excluding inter-neighboring countries) have increased since 1990 because the total air cargo ton-km increased from 80 in 1990

to 120 million net ton-km in 1995, despite the decline in air cargo carried by KAZ AIR (See chapter 2.3.2).

A summary of air cargo demand forecasts are shown in Appendix-3.3.6 (6).

Rough estimates of total air cargo movements for 1990 and 1995 obtained by applying average air passenger-km and forecast total air cargo movements are shown in Fig 3.3.6.1. Air cargo movement by region for medium case are shown in Table 3.3.6.2.

Table 3.3.6.1 Summary of Air Cargo Movement by Region Domestic and International by Case

-- Capital Replacement)-- (Departure + Arrivals) (ton)

All Regions		1990 Estimate	1995 Estimate	2000	2005	2010	2015	2020
Domestic:	:Low		10,535	21,581	26,126	31,558	37,607	43,657
	:Medium		10,535	23,403	30,942	40,654	53,015	65,377
	:High		10,535	24,564	34,391	47,744	65,965	84,185
Intn'l	:Low		52,994	47,282	56,870	68,156	80,847	93,538
	:Medium		52,994	51,352	67,206	87,261	112,835	138,408
	:High		52,994	53,997	74,632	102,108	139,590	177,073
Total	:Low	51,729	63,529	68,862	82,996	99,714	118,455	137,195
	:Medium	51,729	63,529	74,754	98,148	127,915	165,850	203,785
	:High	51,729	63,529	78,561	109,023	149,852	205,555	261,258

Note(1):The values in 1990 and 1995 are estimated deviding air cargo ton-km by average air passenger-km(See Appendix-3.2.4 (10)).

Note(2):Values for domestic and international are estimated applying component for estimeted cargo-tons for 1995 (See Appendix-3.2.6 (6)).

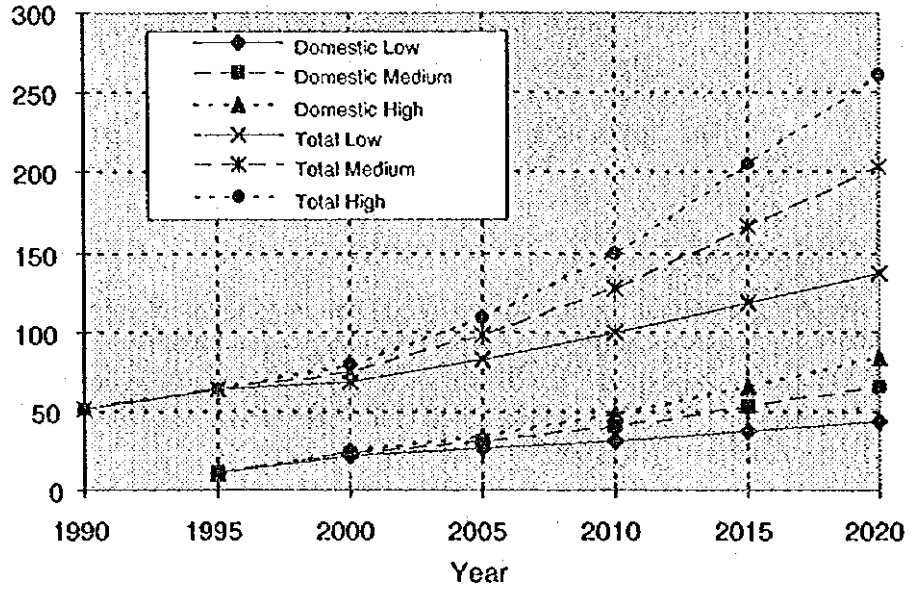


Fig 3.3.6.1 Air Cargo Forecast -All Region-

Table 3.3.6.2 Air Cargo Movement by Region (medium case)

(ton)

Region		Demand Cargo Movement / Year (both way) 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

(ton)

Region		Demand Cargo Movement / Year (both way) 2005	2010	2020
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

Table 3.3.6.2 Air Cargo Movement by Region (medium case)