3.4 Air Route Network

The development of the air route network of Kazakhstan will be based on the existing main 21 airports which currently handle large and medium aircraft for international and domestic services.

The current air route network is in a state of transition in parallel with the transition to a market economy. Even though traffic levels have declined significantly since 1991 (except for international traffic) the number of air routes was higher in the Spring of 1996 than at the same time in 1995. Shop tourism to the Middle East and the emigration of ethnic Russians and Germans to their historic homelands should diminish as the general social and economic situation improves. Subsidized air fares, which are an inheritance from the era of the USSR, will be progressively replaced by market-based air fares.

The development of the air network will be determined by the Strategy for National Air Transport Development presented in 3.2 and demand forecasts. It should contribute to national unification and balanced economic development between the various regions of the country. It also needs to be efficient and effective to support a market-driven economy.

Reform of the national economy is intended to: secure greater economic independence; develop industries based on Kazakhstan's abundant natural resources industry: and promote the growth of export-orientated industries. Transportation will be expected to support industrial development by facilitating the efficient distribution of materials and products, and access to markets.

Kazakhstan is divided into the following five economic-geographic areas:

AREA	REGIONS
Northern Kazakhstan	Kostanay, Kokchetau, Pavlodar
Southern Kazakhstan	Almaty, Taldy-Kurgan, Zhambul, South Kazakhstan, Kzyl-Orda
Western Kazakhstan	Mangistau, Atyrau, Aktyubinsk
Eastern Kazakhstan	Semipalatinsk
Central	Zhezkazgan, Karaganda, Akmola, Turgai

Each area has developed trade with neighboring countries and beyond. These links are expected to grow. In order to support external and internal economic links, the total transportation structure can be modeled as per Figure 3.4.1.

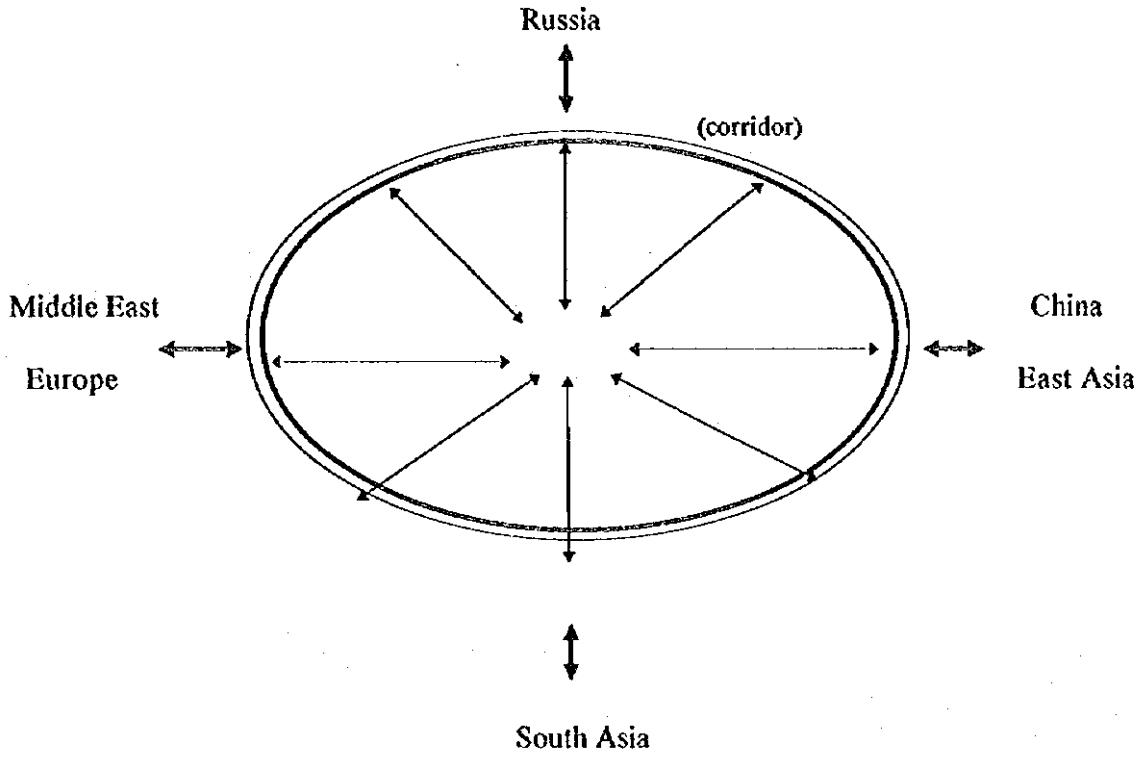

Figure 3.4.1 Transport Structure of Kazakhstan

The national capital is to be relocated from Almaty to Akmola. Even though the relocation program has yet to be finalized, in terms of the size, timing and financing, it is assumed that the relocation will be completed before 2020, the target year of the Study. Almaty will continue to be the major commercial center. Akmola, as the new capital, will attract economic as well as political and administrative activity.

Any transportation system comprises vehicles, terminals and ways. Air transport is a relatively cheap and easy form of transportation to establish because no surface ways, such as roads and rail lines, are required.

As the traffic volume of demand for each route increases, a "Hub and Spoke" structure becomes more appropriate in terms of economy of aircraft operations and service frequencies. Direct service between two small airports is often not possible or infrequent for economic reasons. This traffic, therefore, can be combined with other small volumes to other ultimate destinations and fed (creating a spoke) to a large (hub) airport. It is then redistributed to combine with traffic from other origins to feed (creating another spoke) the destination airport.

While direct point-to-point service is always favored by passengers for reasons of time and convenience, a frequent hub service is better than an infrequent service or no service at all. If the demand reaches a certain threshold, then frequent and direct point-to point services becomes economically viable.

The following basic criteria can be applied to air route network planning:

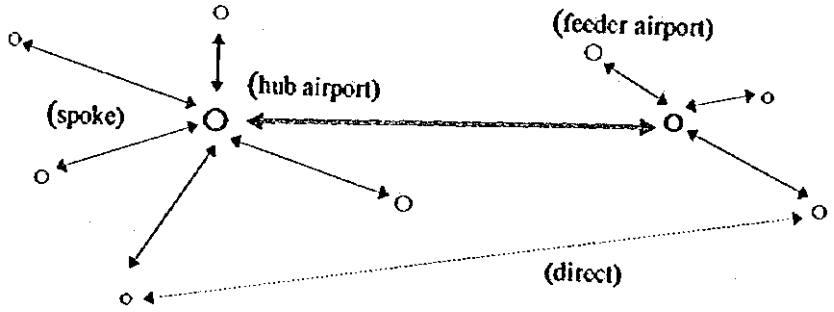

Figure 3.4.2 Concept of Hub and Spoke Structure

a) Direct service is provided on a route with a total demand of more than 30 thousand passengers per annum. It is assumed that one return flight, two operations a day, with a 60-seat aircraft is a minimum frequent service for user convenience (assuming an average load factor of 70 %).
b) Service through to a hub airport is provided for a route with a total demand of less than 30 thousand passengers per annum. (one stop enroute to the destination airport)

Figures 3.4.3 and **3.4.4** show the domestic and international air route networks respectively for the target year 2020.

Accordance with air route network, air passenger and cargo demand is calculated as shown in **Table 3.4.1** and **3.4.2**.

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

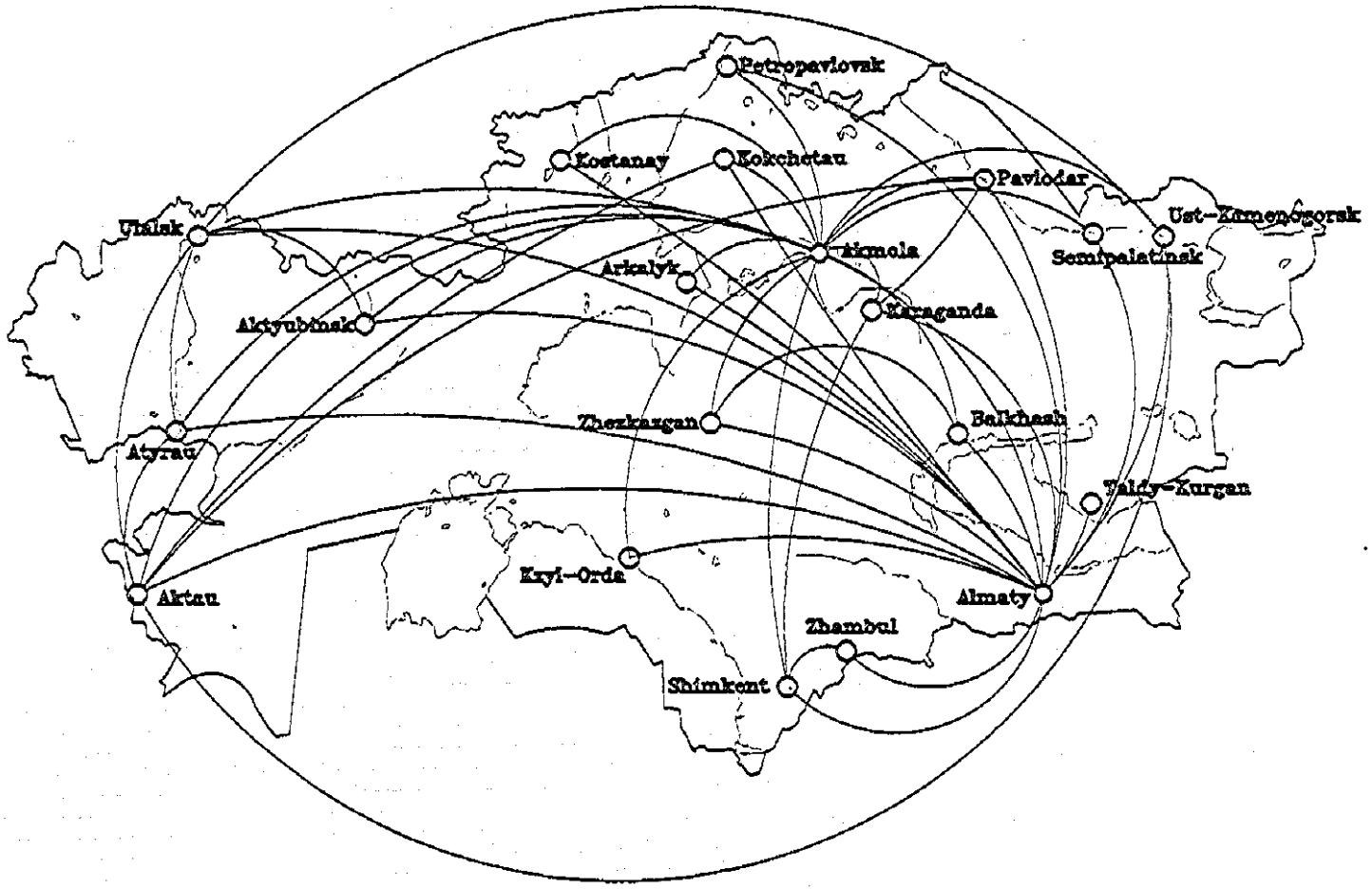

Fig 3.3.3 Domestic Air Route Network (Year 2020)

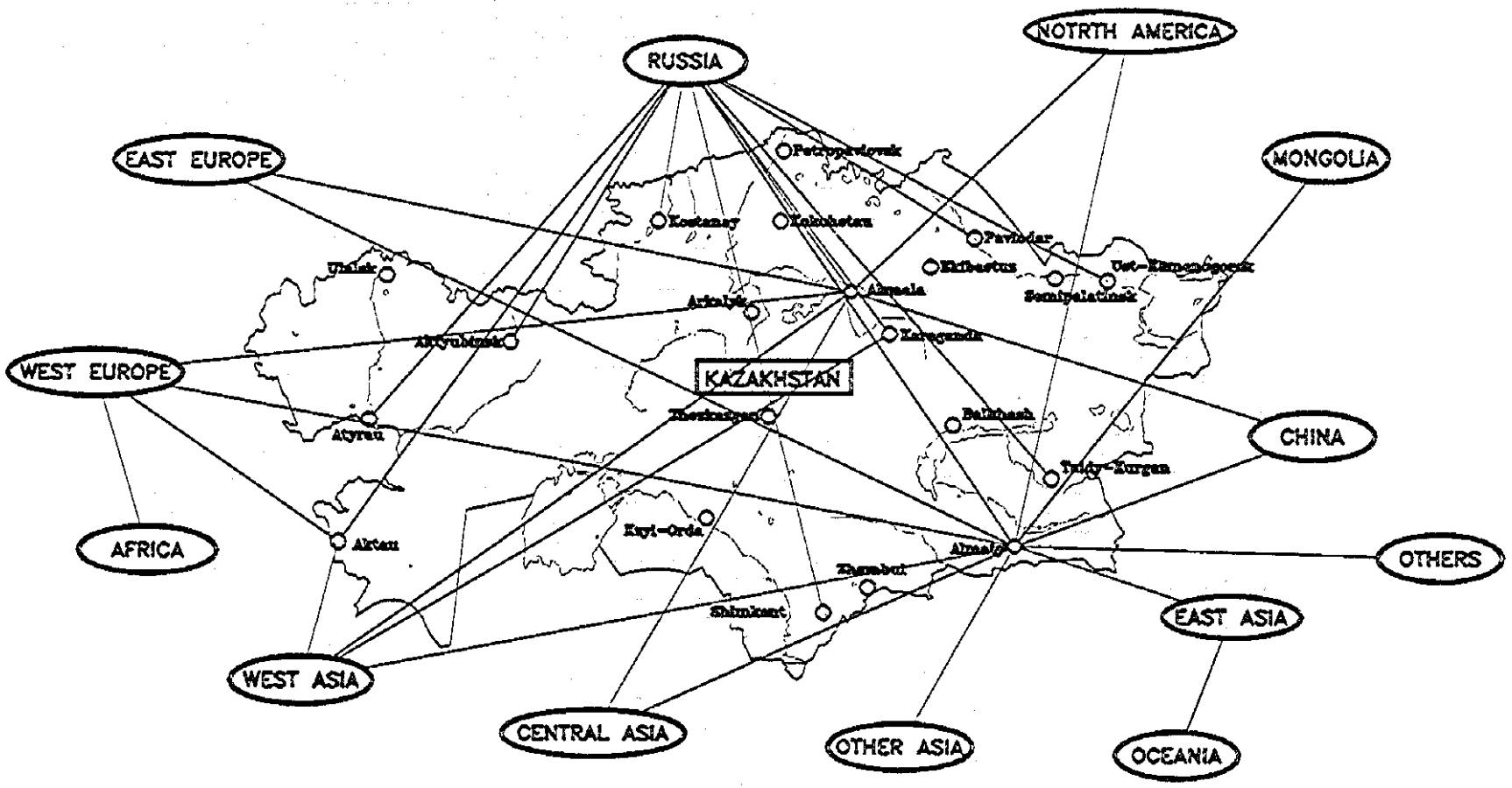

Fig 3.3.4 International Air Route Network (Year 2020)

Table 3.4.1 Air Passenger Traffic Demand by Airport

(thousand)

Airport (Region)		Year 1995	2005	2020
Akmola	-Dom.	-	1,001	2,315
(Akmola)	-Int.	-	237	1,294
	-Total	154	1,237	3,609
Aktau	-Dom.	-	430	845
(Mangistau)	-Int.	-	56	225
	-Total	281	486	1,070
Aktyubinsk	-Dom.	-	117	269
(Aktyubinsk)	-Int.	-	0	61
	-Total	69	117	330
Almaty	-Dom.	-	2,568	3,374
(Almaty)	-Int.	-	2,163	3,057
	-Total	1,615	4,731	6,431
Atyrau	-Dom.	-	242	519
(Atyrau)	-Int.	-	41	83
	-Total	167	283	602
Karaganda	-Dom.	-	343	774
(Karaganda)	-Int.	-	91	208
	-Total	242	434	982
Pavlodar	-Dom.	-	292	675
(Pavlodar)	-Int.	-	44	89
	-Total	157	336	764
Shimkent	-Dom.	-	322	712
(South Kazahstan)	-Int.	-	37	77
	-Total	203	359	789
Ust Kamenogorsk	-Dom.	-	255	496
(East Kazahstan)	-Int.	-	0	31
	-Total	174	255	527

(thousand)

Airport (Region)		Year 1995	2005	2020
Arkalyk	-Dom.	-	38	77
(Turgai)	-Int.	-	0	0
	-Total	21	38	77
Balkhash	-Dom.	-	63	138
(Zhezkazgan)	-Int.	-	0	0
	-Total	31	63	138
Kokchetau	-Dom.	-	98	216
(Kokchetau)	-Int.	-	0	0
	-Total	52	98	216
Kostanay	-Dom.	-	168	320
(Kostanay)	-Int.	-	0	47
	-Total	97	168	367
Kzyl Orda	-Dom.	-	133	344
(Kzyl Orda)	-Int.	-	0	0
	-Total	60	133	344
Petropavlovsk	-Dom.	-	71	171
(North Kazakhstan)	-Int.	-	0	0
	-Total	21	71	171
Semipalatinsk	-Dom.	-	133	286
(Semipalatinsk)	-Int.	-	0	0
	-Total	74	133	286
Taldy Kurgan	-Dom.	-	131	241
(Taldy Kurgan)	-Int.	-	0	45
	-Total	NA	131	286
Ural'sk	-Dom.	-	152	465
(West Kazakhstan)	-Int.	-	0	0
	-Total	63	152	465
Zhambul	-Dom.	-	131	335
(Zhambul)	-Int.	-	0	0
	-Total	58	131	335
Zhezkazgan	-Dom.	-	118	253
(Zhezkazgan)	-Int.	-	0	0
	-Total	71	118	253

Table 3.4.2 Cargo Traffic Demand by Airport

(ton)

Airport (Region)		Year 1995	2005	2020
Akmola (Akmola)	-Dom.	-	12,560	29,936
	-Int.	-	8,866	31,305
	-Total	2,385	21,426	61,241
Aktau (Mangistau)	-Dom.	-	5,265	9,871
	-Int.	-	377	6,371
	-Total	2,882	5,642	16,242
Aktyubinsk (Aktyubinsk)	-Dom.	-	1,213	2,544
	-Int.	-	0	385
	-Total	593	1,213	2,930
Almaty (Almaty)	-Dom.	-	23,731	25,143
	-Int.	-	46,096	69,784
	-Total	20,355	69,827	94,926
Atyrau (Atyrau)	-Dom.	-	2,249	4,815
	-Int.	-	86	173
	-Total	1,439	2,334	4,989
Karaganda (Karaganda)	-Dom.	-	4,002	6,512
	-Int.	-	308	2,601
	-Total	2,604	4,311	9,113
Pavlodar (Pavlodar)	-Dom.	-	1,554	3,339
	-Int.	-	102	205
	-Total	1,034	1,656	3,544
Shimkent (South Kazahstan)	-Dom.	-	2,324	4,939
	-Int.	-	179	373
	-Total	1,431	2,503	5,312
Ust Kamenogorsk (East Kazahstan)	-Dom.	-	3,084	6,079
	-Int.	-	0	148
	-Total	1,878	3,084	6,227

(ton)

Airport (Region)		Year 1995	2005	2020
Arkalyk (Turgai)	-Dom.	-	206	421
	-Int.	-	0	0
	-Total	118	206	421
Balkhash (Zhezkazgan)	-Dom.	-	408	866
	-Int.	-	0	0
	-Total	261	408	866
Kokchetau (Kokchetau)	-Dom.	-	1,360	2,910
	-Int.	-	0	0
	-Total	664	1,360	2,910
Kostanay (Kostanay)	-Dom.	-	2,768	5,452
	-Int.	-	0	226
	-Total	1,666	2,768	5,678
Kzyl Orda (Kzyl Orda)	-Dom.	-	802	1,899
	-Int.	-	0	0
	-Total	473	802	1,899
Petropavlovsk (North Kazakhstan)	-Dom.	-	629	1,503
	-Int.	-	0	0
	-Total	127	629	1,503
Semipalatinsk (Semipalatinsk)	-Dom.	-	1,031	2,172
	-Int.	-	0	0
	-Total	454	1,031	2,172
Taldy Kurgan (Taldy Kurgan)	-Dom.	-	1,693	3,261
	-Int.	-	0	219
	-Total	NA	1,693	3,480
Ural'sk (West Kazakhstan)	-Dom.	-	1,176	3,271
	-Int.	-	0	0
	-Total	563	1,176	3,271
Zhambul (Zhambul)	-Dom.	-	1,845	4,334
	-Int.	-	0	0
	-Total	983	1,845	4,334
Zhezkazgan (Zhezkazgan)	-Dom.	-	903	1,903
	-Int.	-	0	0
	-Total	608	903	1,903

CHAPTER 4

NATIONAL AIR NAVIGATION SYSTEM DEVELOPMENT

CHAPTER 4 NATIONAL AIR NAVIGATION SYSTEM DEVELOPMENT

4.1 The Generic Air Navigation System

The Air Navigation System (ANS) facilitates the safe and efficient movement of aircraft from point-of-origin to point-of-destination by ensuring that, from engine start-up to engine shut-down, aircraft are under some form of continuous control or surveillance. The ANS comprises two major components: Terminal; and Enroute.

Terminal services are those necessary to move an aircraft from the terminal stand to the take-off point and then through a climb-out pattern to joining an air route, or conversely from leaving an air route through descent and landing at an airport and taxing up to the terminal stand.

Enroute services are those necessary to move an aircraft in level flight for the major part of the journey, usually on prescribed air routes.

The main constituent functions of the Air Navigation System are:

- Air Traffic Services
- Aeronautical Information Services
- Communications and Navigation Facilities
- Meteorological Services
- Search and Rescue Services

4.2 Review of air navigation system modernization plan

4.2.1 General

To improve safety and make the Air Navigation System more cost effective, Kazairnavigation (KAN) is implementing a modernization plan. Foreign Civil aircraft flying in airspace managed by Kazakhstan are equipped with modern navigation equipment, such as SSR transponders, used for ATC. In future, these aircraft will also be equipped with Mode-S transponders and VHF data link equipment.

The ATS system of Kazakhstan is largely obsolete. Airways are not fully covered by VOR/DME's. Enroute radar coverage is incomplete and air traffic controllers must often use non-radar separation standards. Some navigation aids do not meet the ICAO standards and can only be used by CIS aircraft equipped with special airborne equipment.

This inadequate and obsolete ANS infrastructure is a legacy of the former USSR and does not provide acceptable levels of service. It inhibits the efficient utilization of Kazakhstan's airspace.

The main component of the modernization plan is the establishment of automated

ACC's at Almaty, Aktyubinsk and Akmola and the progressive consolidation of the other existing ACC's into these three centers. After this component has been implemented, the new facilities will be upgraded to international standards and will meet anticipated needs until completion of a phased transition to a Future Air Navigation Systems (FANS) environment over the next 10 to 20 years.

The installation of automated ATC equipment at Almaty has been completed and is now undergoing reliability tests. The Aktyubinsk ACC project has been started and is expected to be completed during the second half of 1997. Completion of the Akmola ACC project is expected in the first half of 1999.

4.2.2 ATC System

The modernization plan will bring the following improvements to the ATS system.

- The modernized ATC system will improve flight safety. Automation and the introduction of SSR's will make more information available to Area Controllers than is available with the present system using only PSR's This will facilitate safer and more efficient air traffic management.
- The advanced ATC system will enable more efficient airspace utilization because of reduced separation standards, and increase the overall capacity of the ATS system to cope with future air traffic growth.
- ATC automation and the consolidation of ACC's will reduce staffing levels for both air traffic controllers and maintenance personnel.
- The Automated ATC system allows nonverbal coordination and traffic hand-overs between ATC facilities. This will reduce the controllers' workload and reduce the risk of mistakes and misunderstandings.
- The automated ATC systems reduce the level of routine tasks performed by controllers, enabling them to concentrate on the more crucial aspects of air traffic management.

4.2.3 New Automated ACC

(1) ATC automation

a) FDP and RDP

Air traffic control at automated centers involves both Flight Data Processing (FDP) and Radar Data Processing (RDP) systems. Flight plans are sent to the FDP system via AFTN networks for processing. The RDP system processes radar data from enroute radars to provide air traffic controllers with current traffic information.

The basic functions of the RDP system are:

- PSR/SSR data detection and SSR data tracking;
- correlation of RDP data and FDP data; and
- displaying, in alpha-numeric form, data such as aircraft position, altitude, callsign, etc.

b) Flight Planning Procedures

The FDP system maintains a file of Repetitive Flight Plans for flights operating at scheduled times of the day or week. Repetitive flight plans are stored by the FDP system and prior to the Estimated Time of Departure (ETD) the relevant flight plan is entered into a file in readiness for activation. Any discrete flight plan will go directly to the file.

c) Electronic Data Display

Normally flight progress strips are produced by strip printers at ACC's but, in Kazakhstan, electronic methods are being used to present information. Flight plan data is displayed and flight progress information is updated automatically on the electronic data display, as shown in **Figure 4.2.3.1**.

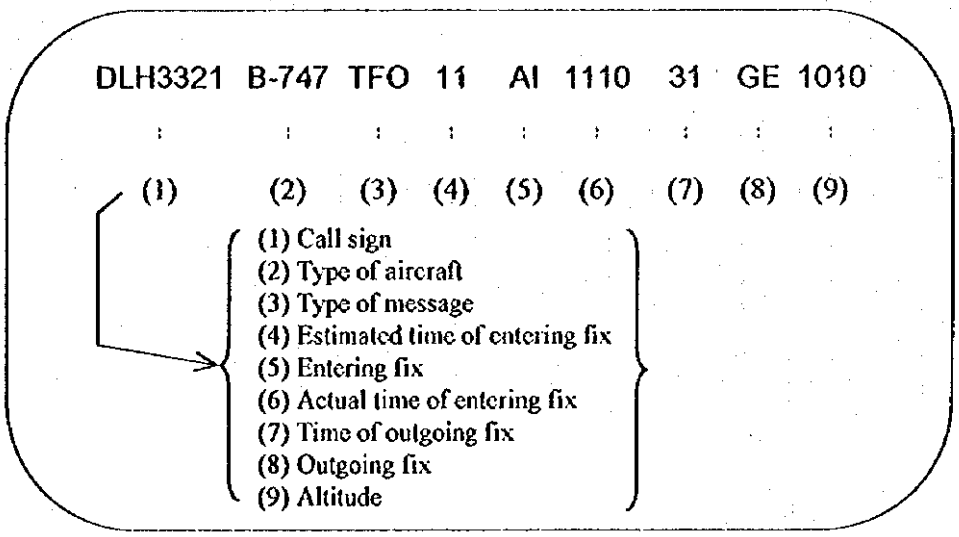

Figure 4.2.3.1 Example of Flight Progress Information Display

d) Video Maps

Several maps are displayed for use in different colors.

(2) ACC consolidation

The functions of 15 existing ACC's are to be consolidated into three automated centers as follows:

- Almaty ------ Ayagus, Balkhash, Pavlodar, Semipalatinsk, Zhambul
- Aktyubinsk - Aktau, Atyrau, Aralsk, Kzyl-Orda, Uralsk
- Akmola------ Arkarik, Karaganda, Kostanay, Petropavlovsk, Zhezkazgan

Figure 4.2.3.2 appears new ACC boundary.

This consolidation of Area Control functions is a primary objective of the modernization plan.. The radars and air/ground remote communications sites for the 15 ACC's will be linked to the three automated ACC's by MOTC landlines or by leased satellite links (see **Figure 4.2.3.3**, **Figure 4.2.3.4**). With this configuration, the 15 ACC's can be phased out as their the functions are assumed by the automated ACC's.

(3) Collocation of SSR

SSR's are to be collocated with the primary radars currently equipping the existing ACC's. SSR is used as an ATC automation sensor and provides data such as aircraft identification, position, altitude, etc. for presentation on the PVD. This reduces the possibility of aircraft misidentification when only PSR's are used.

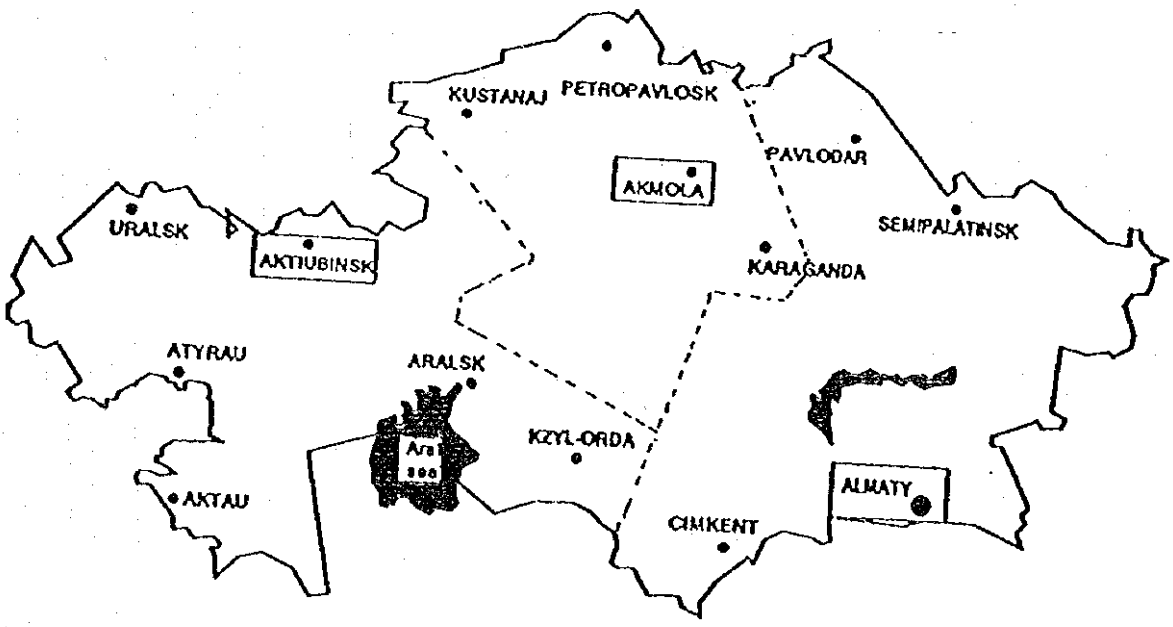

Figure 4.2.3.2 New ACC Boundary

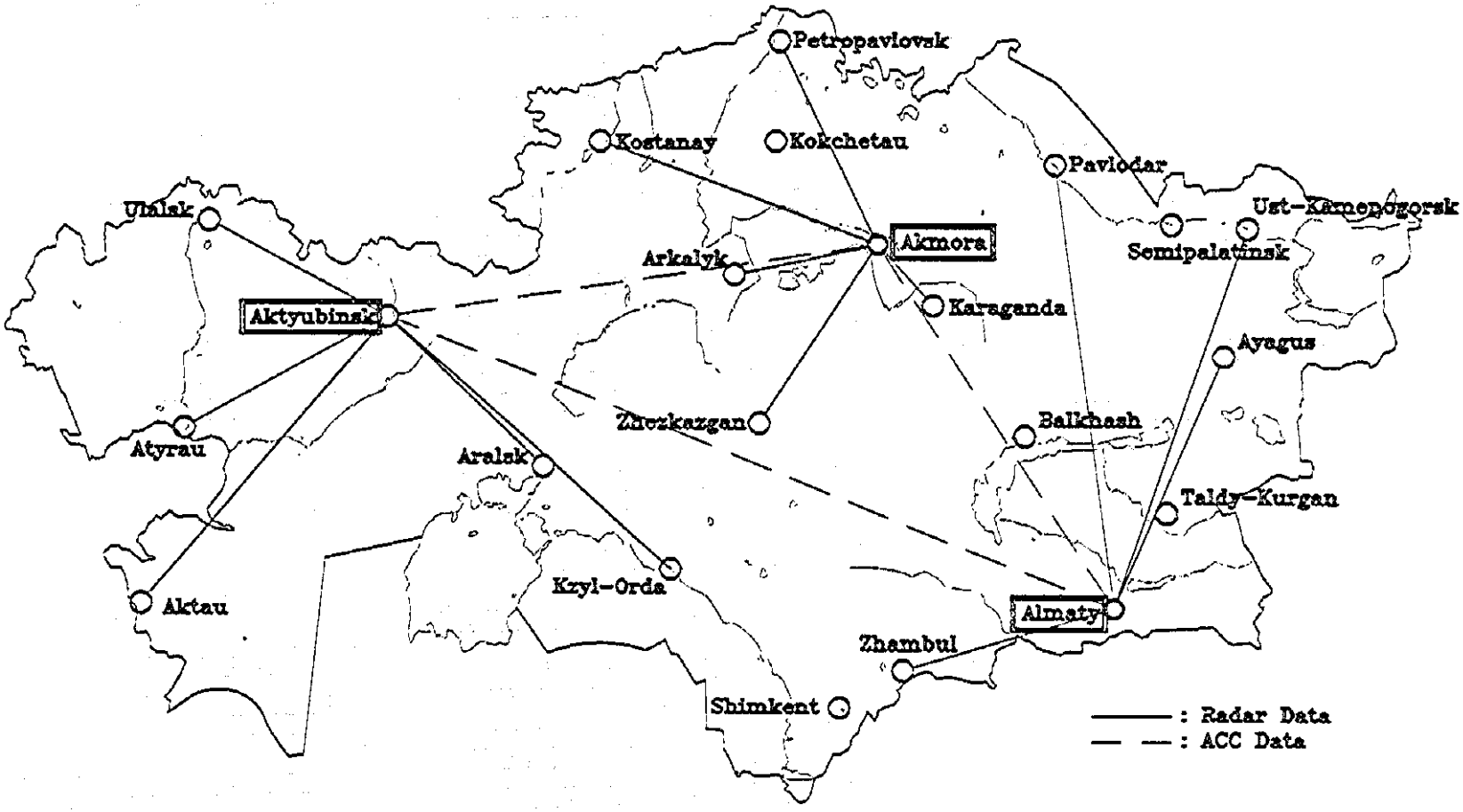

Fig. 4.2.3.3 Radar Links

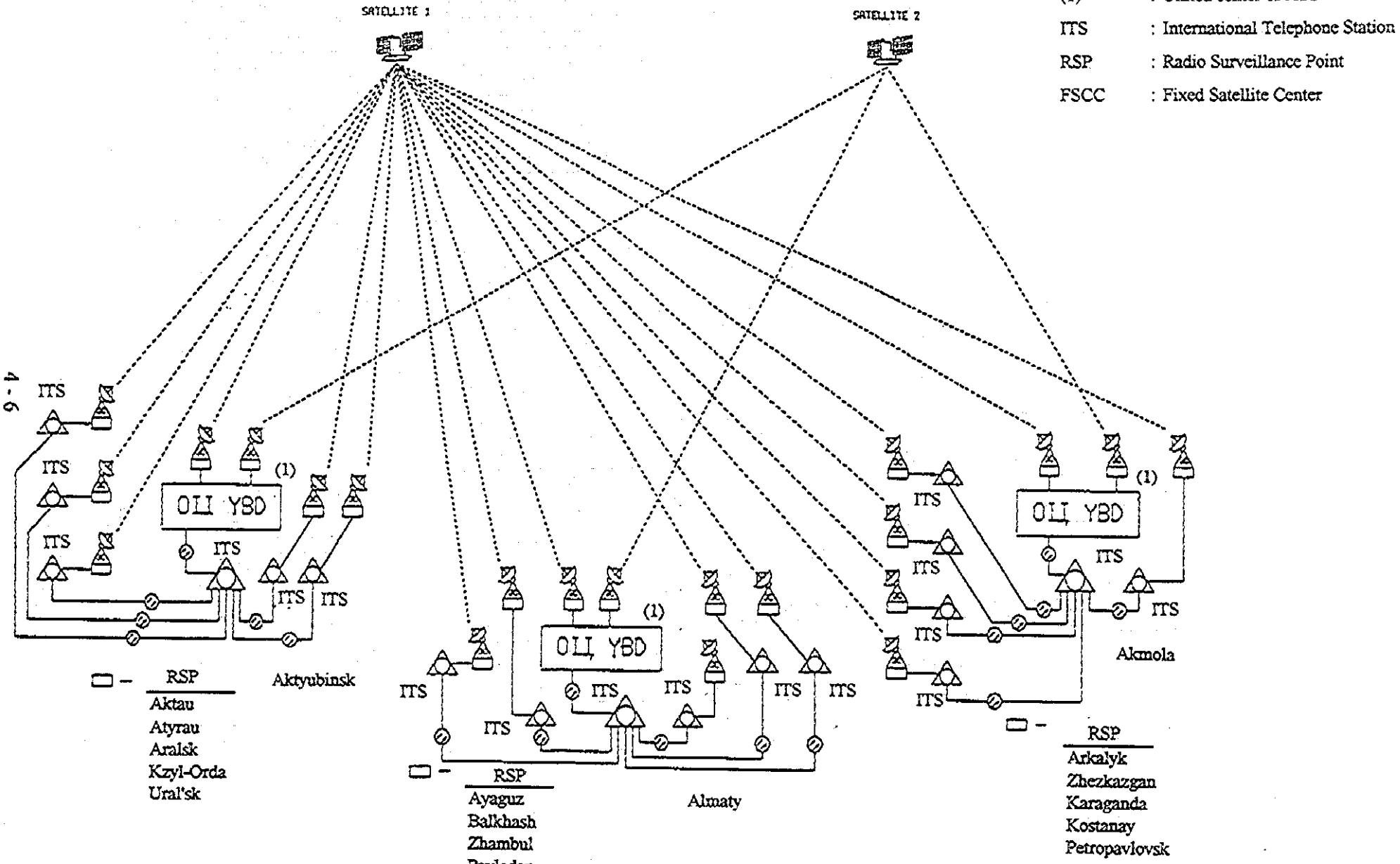

Fig. 4.2.3.4 Communication proposed chart in the international network

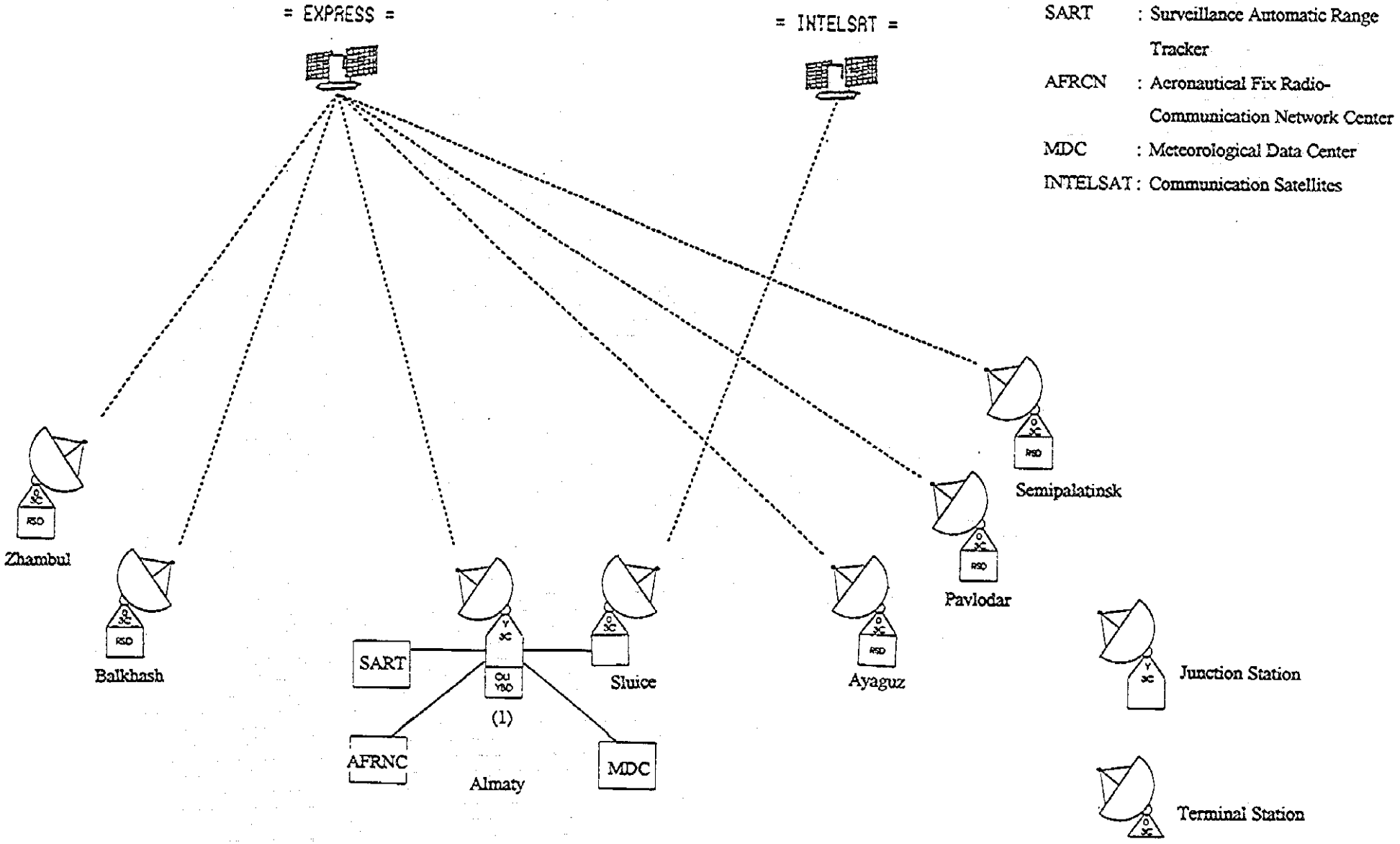

Fig. 4.2.3.5 Structural chart of satellite communication system for ATS in RK (I Stage) - Almaty

4.2.4 Recommendation

The modernization plan has been well planned. The following recommendations are intended to improve the management and reliability of ACC operations.

a) Installation of automated flow control and conflict alert functions at the Almaty ACC as predetermined traffic levels are reached.

b) The current modernization plan does not provide adequate working space at Almaty and Aktyubinsk. Furthermore, any existing surplus space should be reserved for future expansion.

c) The new ACC should be functionally designed to support ATC operations. Amenities for maintaining staff in good mental and physical condition should be included in the design. Air conditioning should be provided for the air traffic controllers as well as for the electronic equipment.

4.3 Review of the Airways Network

4.3.1 Air Route Structure

(1) Domestic routes

Existing published airways and ATS routes in Kazakhstan are shown in **Figure 4.3.1.1** and **Figure 4.3.1.2**. The domestic air route structure is based on NDB's whereas VOR/DMEs are used for international routes.

Traffic density is high around the Almaty area and air routes are also concentrated south-eastern region of Kazakhstan.

There are no published airways around Akmola. Since this will be the future capital city of Kazakhstan, it will be necessary to establish the following airways connecting Akmola and major airports in Kazakhstan (**Figure 4.3.1.3**).

- Akmola - Karaganda
- - Zhezkazgan
- - Arkalyk
- - Aktyubinsk
- - Kostanay
- - Kokchetau - Petropavlovsk
- - Ekibastuz - Pavlodar - Semipalatinsk - Ust Kamenogorsk

Note: An ATS route is a specified route designated for channeling traffic flows. The term "ATS route" can be used to mean: airway, air route, advisory route, controlled or uncontrolled route, etc.

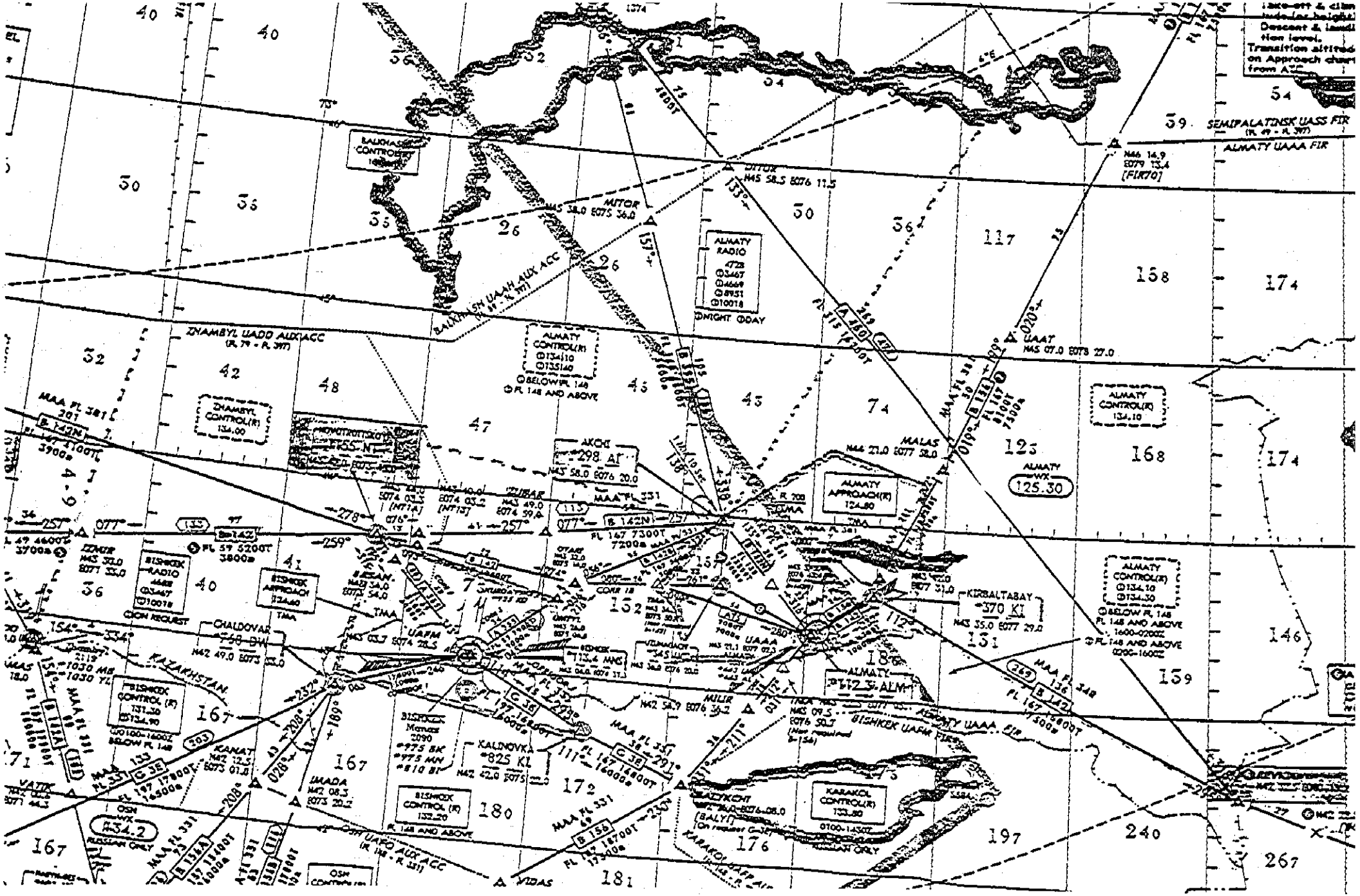

Fig. 4.3.1.1 Airways Network (Visirity of Almaty)

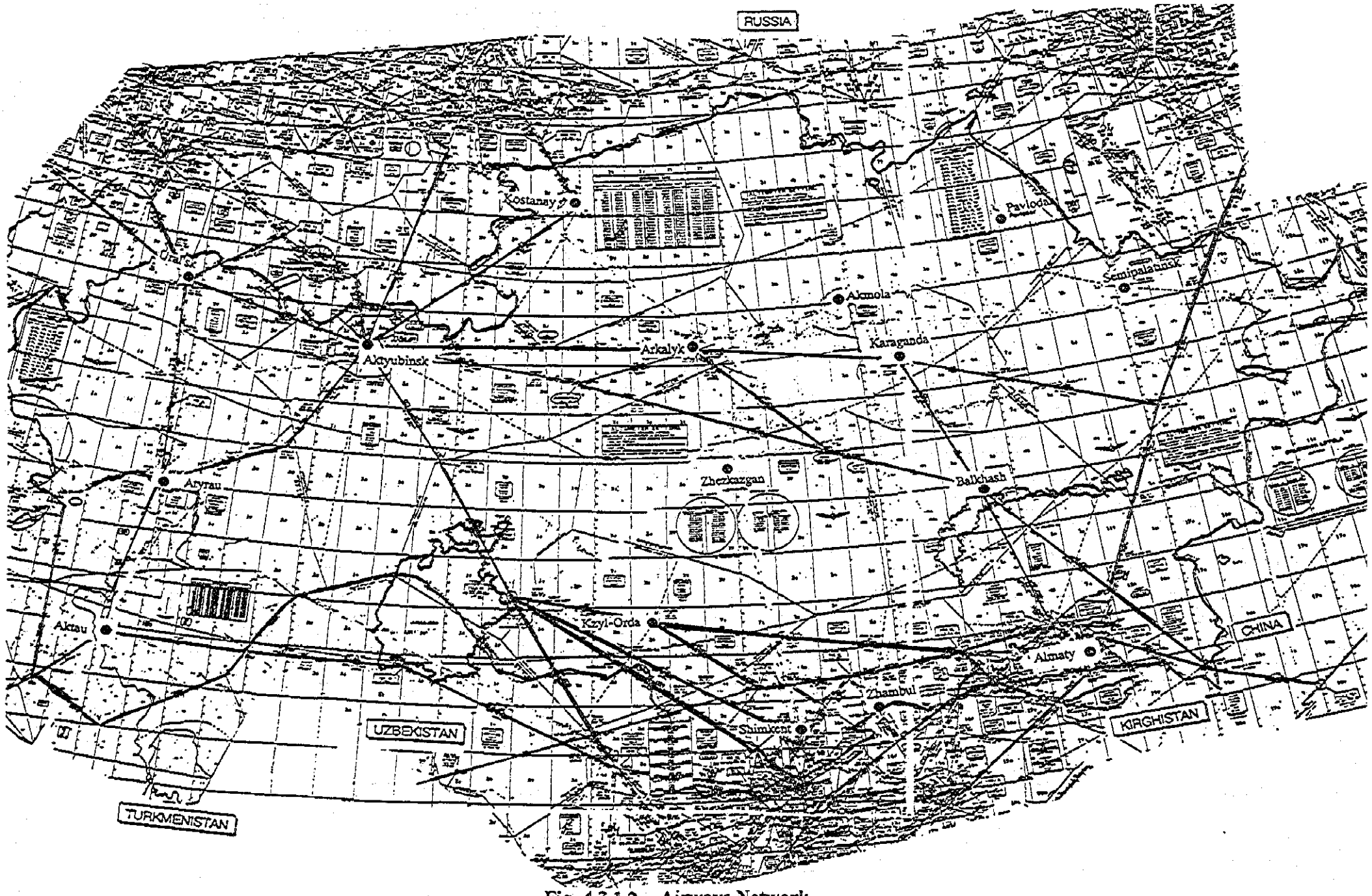

Fig. 4.3.1.2. Airways Network

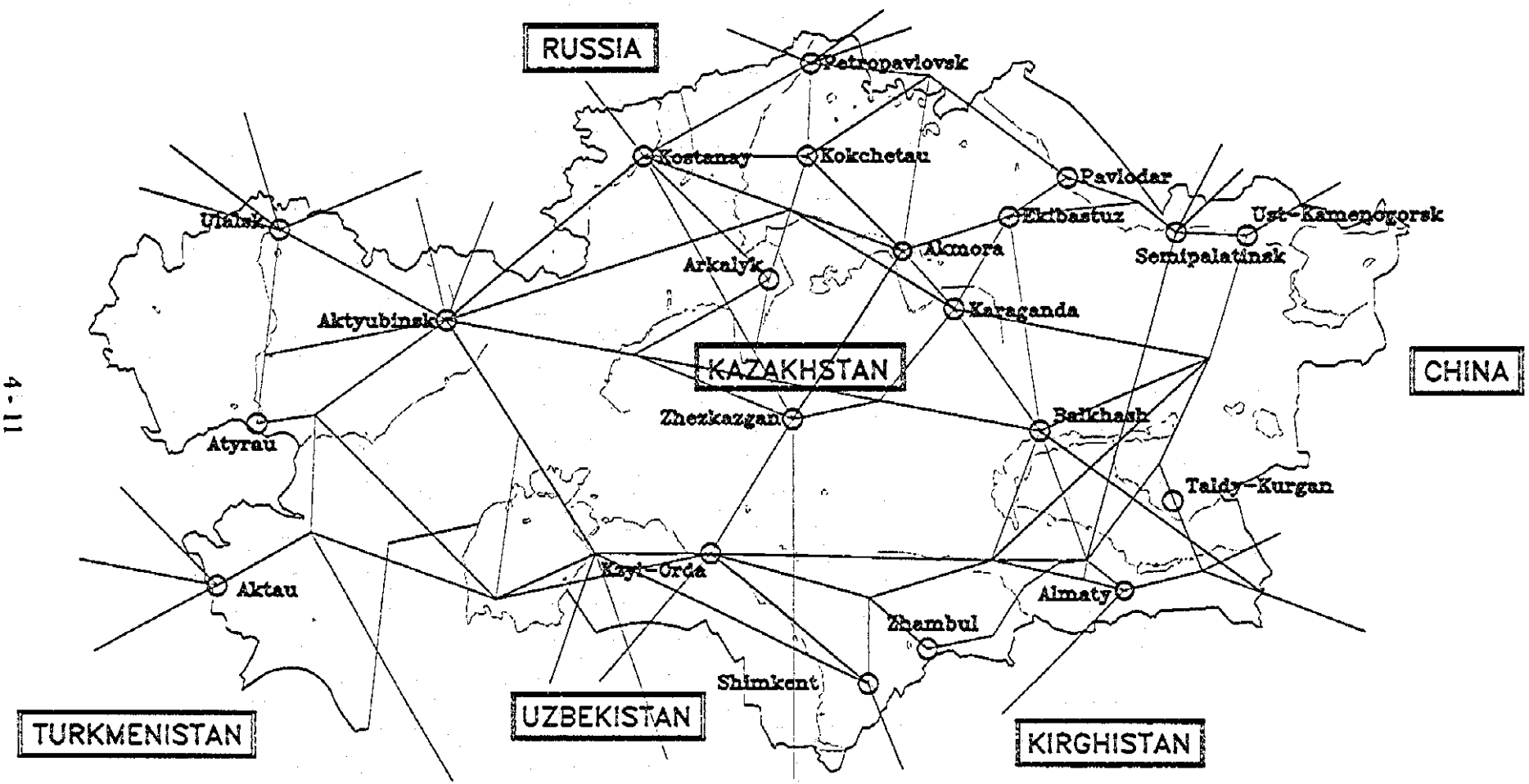

Fig. 4.3.1.3 Future ATS Route

(2) International routes

The existing international air route structure is concentrated at Almaty.

i. Almaty - Europe
   Almaty - Akchi - Novotroitsk - Turkestan - Kzyl Orda - Kankey -Chelker - Aktyubinsk - Uralsk - G-3
   Almaty - Akchi -Balkhash - Karajal - Turgay
   - Aktyubinsk - Uralsk - G-3

ii. Almaty - China
   Almaty - Revki - Urumqi (to Beijing and other Chinese cities)

iii. Almaty - Siberia
   Almaty - B-156 - Bokis - Novosibirsk

iv. Almaty - Tashkent
   Almaty - Akchi - Novotroitsk - Akkol - Shimkent - Tashkent

Other international flights use the following routes.

v. Europe - China
   Uralsk - Aktyubinsk - Turgay - Karajal - Balkhash - Revki - Urumqi
   Uralsk - Aktyubinsk - Chelker - Kaukey - Kzyl Orda - Turkestan-Akchi - Almaty - Revki - Urumqi

vi. Europe - Tashkent
   Uralsk - Aktyubinsk - Chelker - Kaukey - Bikas - Relok - Tolak - Tashkent

vii. Europe - India and South East Asia
   Uralsk - Aktyubinsk - Chelker - Kawkey - Odima - Amdar - Kabul

viii. Europe/Middle East - China
   Tashkent - Shimkent - Akkol - Novotroitsk - Almaty - Revki - Urumqi

International air traffic will increase in future, especially overflights from Europe to China, India and other Far East or South East Asian countries. It will represent an important source of development revenue for the air transportation system. Overflights and the resulting revenues will only increase, however, if there is a more efficient utilization of civil/military airspace, and navaid and communications systems are installed which meet ICAO standards.

4.4 Strategy for Development of the Air Navigation System

Besides the current activities for modernizing the ANS, the following measures should also be taken to meet the ICAO Standards and Recommended Practices. These will improve safety and increase system capacity.

4.4.1 Modernization of the system

(1) Near term improvements

a) Communication

VHF radio is used for air/ground communications between pilots and controllers and there is good coverage within Kazakhstan's FIR's above 6,000 meters. Radio communications for international air traffic is conducted in English by international agreement. Most controllers in Kazakhstan have a limited command of English; therefore, language training is needed for controllers handling international traffic.

b) Navigation

The enroute navigation aids in Kazakhstan consist of numerous NDB's, one VOR, 9 VOR/DMEs and some RSBN's.

RSBN's give azimuth and distance information to aircraft but do not meet ICAO standards. They can only be used by CIS aircraft equipped with special receivers and will be replaced by VOR/DMEs in future. When this has been done, there will be full VOR/DME coverage of all international routes, thereby improving both safety and efficiency. Parts of some international routs have neither NDB's or VOR/DME's. VOR/DME's should be installed at key points on the route. New systems to provide aircraft with precise navigation guidance already exist and are being further developed. These will replace current enroute navigation aids starting no later than the year 2010. Until that time, NDB's and VOR/DME's will be the main enroute navigation aids in Kazakhstan.

(2) Transition to Future Air Navigation Systems (FANS)

The present Air Navigation System (ANS) provides international air traffic services for civil aviation via a serial chain of national air traffic service providers. The provision of these services is based on the availability of Communication, Navigation, Surveillance (CNS) systems, and air traffic control systems with various levels of capabilities. These three functions allow air space management (ASM) and air traffic flow management (AFTM) which, taken together, constitutes air traffic management (ATM).

The current international civil aviation ANS system began its development in 1946 using the technology available at that time. All the CNS systems were and, in the main, still are dependent on ground-based facilities. While the current system has served aviation well, a number of shortcomings are leading to problems which will inhibit the future growth of global air traffic.

The International Civil Aviation Organization (ICAO), proposed a new system to solve the expected problems at a conference in 1991. This is the so-called Future Air Navigation System (FANS). With the agreement of the contracting states, the system is being developed for implementation and operation from the year 2010. In fact , introduction of the system began in 1995 for routes between Australasia and the USA and it has since been introduced in a number of other areas. This trend is likely to continue.

FANS uses two global satellite systems and data communication links, one provided by the USA and the other by Russia. It provides CNS for more efficient ATM. FANS uses radio signals propagated via satellites which are less constrained than those from ground stations. This improves coverage and reliability. Its implementation is being carried out to replace the existing systems in a seamless manner.

All contracting states to ICAO should already be planning the transition to FANS and, where appropriate, expediting its introduction where it is clearly cost-effective to do so. **Table 4.4.1.1** shows the transition of CNS functions from the current system to the FANS.

a) Communication

Future communications will be through VHF/HF communications (data/voice), SSR Mode-S data link and AMSS (data/voice). Data links will be used for regular and formatted communications, and voice communications for extraordinary and emergency situations. The systems will serve both the Aeronautical Fixed Telecommunications Networks and the Aeronautical Mobile Telecommunications Networks in an integrated manner..

b) Navigation

The Global Navigation Satellite System (GNSS) will be the basis of future navigation systems and will evolve as the sole means of electronic navigation, eventually replacing the current long and short range navigation systems. It will provide global coverage and, without additional ground-based augmentation, it will be accurate enough for en-route navigation and non-precision approaches.

c) Surveillance

Surveillance will be carried out by satellite-based Automatic Dependent Surveillance (ADS) systems and ground- based Mode-S Secondary Surveillance Radars (SSR) to enable controllers to monitor traffic separations and manage airspace efficiently.

ADS is enabled by aircraft automatically transmitting, via an air-ground data link, aircraft position-related data derived from on-board navigation systems. SSR Mode-S will improve surveillance function by enabling greater azimuth accuracy.

d) Air Traffic Management (ATM)

The main outcome the new CNS systems will be improved ATM. Information transfer between ground and aircraft systems will be possible during all phases of flights and between all FIR's. The main functions of ATM remain unchanged. However, the global scope of the new CNS systems enables better harmonization and increased integration of existing services.

Table 4.4.1.1 General Comparison of Current CNS and Future CNS (FANS)

Type of airspace	Current			Future (FANS)		
	Communications	Navigation	Surveillance	Communications	Navigation	Surveillance
Oceanic or Continental en-route airspace	• HF voice communications • VHF voice communications	• Omega/Loran C • NDB • VOR/DME • INS/IRS • Barometric altimeter	• Primary radar • SSR Mode-A/C • Position report by HF voice	• VHF (voice/data) • AMSS (voice/data) • HF(only in Polar region) • SSR Mode-S data link	• RNAV/RNP • GNSS • INS/IRS • Barometric altimeter • GNSS altimeter	• ADS • SSR Mode-s
Terminal area with high density traffic	• VHF voice communications	• NDB • VOR/DME • ILS • INS/IRS • Barometric altimeter	• Primary radar • SSR Mode-A/C	• VHF (voice/data) • SSR Mode-S data link	• RNAV/RNP • GNSS • MLS • NDB • VOR/DME • Barometric altimeter • INS/IRS	• SSR Mode-A/C • SSR Mode-S • ADS

Remarks: Abbreviation

ADS: Automatic Dependent Surveillance
AMSS: Aeronautical Mobil Satellite Service
GNSS: Global Navigation Satellite System
INS: Inertial Navigation System
RNAV: Area Navigation
RNP: Required Navigation Performances
IRS: Inertial Reference System

4.4.2 Rationalization of Civil and Military Airspace.

All of Kazakhstan's airspace is under the control of the Ministry of Defense, except for airways and terminal control areas. The availability of airspace for civilian use is restricted because of the wide scope of military control. Pilots require clearance from military controllers to deviate from airways. Civilian controllers are also constrained from routing traffic off-airways without military authorization.

This situation needs to change if a more efficient utilization of national airspace is to be achieved.. This is very achievable without compromising national security. The introduction of Flexible Use of Airspace (FUA) by the 33 European Civil Aviation Conference (ECAC) states from 28 March 1996 is an excellent approach for the Government of Kazakhstan to adopt. It is based on 3 levels of Airspace Management: Strategic; Pre-tactical and Tactical. It also provides for the introduction of Conditional Routes, Temporary Segregated Areas, Cross Border Areas and Reduced Co-ordination Airspace Procedures.

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4.4.3 Publication of the Kazakhstan AIP

Kazakhstan has not published either its AIP or AIC and uses the Russian AIP instead. However, this does not adequately cover all of Kazakhstan's civil aviation system. A national AIP should be published and distributed in accordance with ICAO procedures.

4.5 Development guideline for air navigation system facilities.

4.5.1 General

Based on air traffic forecasts, the number of aircraft movements will not change significantly in the near term so, at least in terms of capacity, the present ATS system will suffice. In the long run, however, it will need to be expanded and further modernized to meet expected air traffic demands. Development plans are presented for air traffic control facilities and air navigation systems for the next 10-20 years.

All future requirements for air navigation system development appear in **Table 4.5.1.1.**

Table 4.5.1.1 Existing Facilities and Future Requirement

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

4.5.2 Short Term Development Plan for The Year 2005

(1) Control tower

The most pressing problem for terminal ATS is the lack of a modern and properly equipped control tower. In Kazakhstan, aerodrome control is provided from control cabs called START. These are low structures which do not allow adequate visual surveillance. Furthermore, their locations near runways infringe standard obstacle clearance limits.. The START should be discontinued and the modern control towers, which meet accepted standards, should be constructed as soon as possible. A typical control tower design is shown in Appendix-4.5.2.

(2) ARTS

Automated Radar Terminal Systems (ARTS) should be installed at Almaty, Aktyubinsk, and Akmola, and at other major airports as traffic increases. This system processes primary and secondary radar data to provide approach controllers with Alpha/Numeric (A/N) information on aircraft. It also allows the exchange of radar hand-off data with the RDP systems at Automated ACC's.

In the typical ARTS installation, the displays are presented in two configurations;

I. A/N display consoles located in an IFR room.

II. Bright display equipment in a control tower.

A bright display allows controllers to see radar data clearly in daylight conditions.

(3) ASDE

Airport Surface Detection Equipment (ASDE) should be installed at Almaty and Akmola airports. It is a radar system used to control the movement of aircraft and vehicles on the ground at airports. The antenna is normally installed on the top of the control tower and the indicator is in the tower cab.

(4) Ground / ground voice communications

There is a requirement for a direct speech circuit between Almaty and Urumqi. HF is still used for sending and receiving control transfer messages. The installation of a direct telephone line (Hot line) is necessary to allow rapid and accurate coordination between the ACC's.

(5) Light weight headset

The use of lightweight headsets for controllers and communicators should be introduced at all ACC's and approach control rooms. These would help to reduce the noise levels that controllers have to deal with and reduce the possibility of retransmitting background noise when a microphone is activated.

(6) Voice recorder

With few exceptions, all airports require upgraded recording facilities to allow the recording, and storing for up to 30 days, of all ATS voice transactions.

(7) Light gun

A light gun should be installed in each control tower. This enables aircraft having radio trouble or vehicles operating in the airport movement areas to be cleared by light signals from the control tower.

(8) Language training equipment

Language training systems, such as Linguaphone, should be allocated for English training at all locations providing international ATS.

(9) NDB

Although NDB's should be replaced by VOR's, if some NDB stations need to be kept operational to serve local traffic, installation of more modern solid-state systems should be considered.

(10) VOR/DME

VOR/DME should be installed at Akmola and some other sites. Enroute IFR traffic needs the more precision navigation information provided by VOR/DME's. All international routes should be covered by VOR/DME's.

Traffic levels on domestic routes are not high and, except for trunk routes, it is unlikely to increase to the point where the provision of VOR/DMEs could be economically justified.

(11) ILS

Almaty, Aktyubinsk, Akmola and some major airports in Kazakhstan are equipped with ICAO standard type ILS's but, at other airports, aircraft require additional onboard equipment which is compatible with CIS type ILS's. Obsolete and non-standard ILS's should be replaced by reliable, modern, standard equipment.

(12) Airport lighting

The airport lighting system of Almaty should be supplemented by runway center line lights and touchdown zone lights to meet CAT-II operational requirements.. Without center line lights, ILS Runway 23 at this airport does not meet ICAO standards for CAT II and should not be published as such.

4.5.3 Long Term Development Plan for The Year 2020

(1) VHF data link / AMSS (Aeronautical Mobil Satellite Services)

VHF data links through the Aeronautical Mobile Satellite Service will be required to enable efficient ATS voice and data communications.

(2) Automatic Dependent Surveillance (ADS)

ADS means that aircraft position data is automatically computed and transmitted to ground stations through a geostationary satellite communication channels. ADS updates will be sent from aircraft to the ATC system at intervals of 10 seconds to 10 minutes.

(3) SSR Mode-S

Mode-S SSR with enhanced the capability for discrete addressing with individual aircraft. It provides improved azimuth accuracy and an air/ground data link between aircraft and ATS systems. SSR Mode-S will be used in both terminal and enroute airspace.

(4) MLS

Although the ICAO ILS/MLS transition plan is still in effect, there are now many uncertainties regarding the future usage of this system. The USFAA has canceled its MLS program and many Asia-Pacific region states are deciding in favor of the use of satellite-based systems for approach guidance.

CHAPTER 5

NATIONAL AIRPORT SYSTEM DEVELOPMENT

CHAPTER 5 NATIONAL AIRPORT SYSTEM DEVELOPMENT

5.1 The Generic Airport System

An airport is a transportation terminal which provides linkages with surface modes of transportation and with the Air Navigation System (ANS). An airport can also be considered as an integrated system with its primary products being Land Side, Air Side and Terminal Airspace Capacity for the conduct of air transportation activities. These products are often referred to as aeronautical services.

5.1.1 Aeronautical Services

Land Side Capacity is for passengers and freight. It is produced and safeguarded by providing services for passengers prior to embarkation and after disembarkation, and for freight prior to loading and after unloading.

Air Side Capacity is for aircraft. It is produced and safeguarded by providing services for aircraft between departing from the terminal stand and take-off, or from landing to arrival at the terminal stand.

Terminal Airspace Capacity is also for aircraft. It is produced to enable the safe and efficient movement of arriving and departing aircraft between the airport and the air route system. The integrated capacity producing functions of any airport system appear in **Figure 5.1.1**.

5.1.2 Non- aeronautical Services

Non-aeronautical services are the secondary products of the airport system which, while distinct from capacity production, can nevertheless represent an important source of revenue and funding source for capacity production as well as profits for the airport's owners. These can represent a wide range of commercial activities such as merchandise retail outlets, restaurants, rental car agencies, hotels, car parks and various types of industrial facilities.

5.1.3 Components of Production

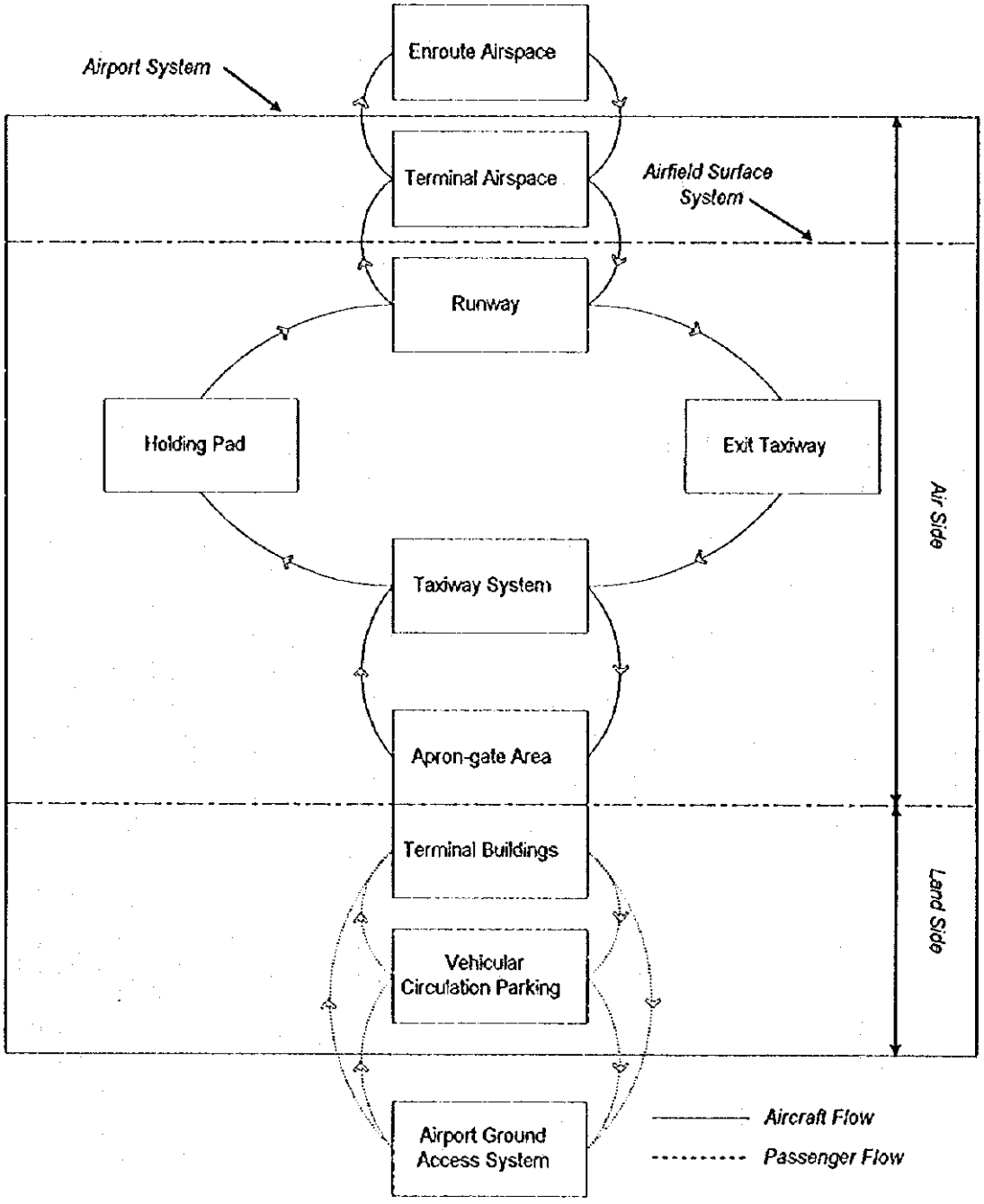
Both hardware and software components are necessary for service production.

Hardware components which are needed by airport staff to produce and safeguard capacity include facilities and equipment such as runways, terminals, air traffic control towers and rescue and fire fighting equipment. Typical hardware components required for producing non-aeronautical services include retail facilities in terminals, and hotels and industrial parks located on land owned by the airport operating authority.

Software components necessary for producing both aeronautical and non-

aeronautical services comprise organizational structures, contracts and operating plans and procedures.

The total airport system functions best when both the hardware and software components are designed and established in a complementary fashion. This chapter describes approaches for optimizing the efficient and effective production of all services at Kazakhstan's airports.



Source: Planning & Design of Airports, by Horonjeff & McKelvey, Publisher McGraw-Hill

Figure 5.1.1 The Airport System

5.2 National Airport Development Strategy

(1) Resolving existing problems

Kazakhstan's airports are generally deficient in terms of accepted international technical standards and levels of service. Many of the airport facilities and equipment, while often providing abundant capacity, are nevertheless outmoded or in a degraded condition. Airport users are, therefore, not receiving acceptable levels of service for the funding being provided through charges and taxes. Airports need to be safe, reliable and amenable to users, particularly to foreign carriers and passengers who represent important sources of revenues and investment funding.

(2) Achieving cost-effective development

Airport development should be based on:

- sound, realistic and regularly updated demand forecasts supported by market research;
- thorough financial analyses; and
- flexible approaches to respond to changing circumstances.

Existing facilities should be well maintained, and incorporated into any planned development whenever this is supported by sound cost-benefit analysis.

(3) Coordinated and comprehensive development

Coordinated and comprehensive development can be achieved through a number of approaches:

A National Airport Master Plan should be prepared to ensure balanced and integrated airport development to support a growing national route network.

Master Plans for each airport are required within the framework of the national plan. These define the airport's future roles, future facility specifications and layouts, and transitional strategies.

Phased Development is necessary to match investment, development and demand over extended periods. The development horizons are usually short term (5-7 years), medium term (10-15 years) and long term (20-25years).

Prioritized Development within these terms further enhances the cost-effectiveness of investment decisions. An airport classification system is helpful when setting priorities.

5.3 Airport Classification

Airport classification is used to define the role of each airport in the national system. It is used by some governments to guide decisions for financial assistance and investment. It can also indicate ownership, such as major international gateway airports belonging to a central government, and smaller international or regional airports belonging to local governments.

The following classification system is proposed for Kazakhstan:

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

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

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

In Kazakhstan, Almaty and Aktyubinsk are currently designated and registered with ICAO as international airports. In order to foster international links, the Government has decided to increase the number of international airports to eleven. This appears to be inappropriate given:

- the large and persisting decline in traffic levels since 1991;
- the need to concurrently upgrade and maintain facilities at many locations even though most will be receiving only a portion of a limited total traffic base; and
- a dispersion of services which will be inconvenient and costly to carriers, passengers and shippers alike.

Table 5.3.1.1 shows: populations and GDP for each region; and forecast passenger demands to the year 2020 in terms of percentages of the national total. Using these indicators the airports have been classified as follows:

(1) Primary airports (2): Almaty and Akmola

Almaty, the current capital, will continue to be the major commercial center. Akmola, as the new capital, will attract economic as well as political and administrative activity. Both are expected to function as hubs in the national airport system. It has been assumed the relocation to Almaty will be completed before the year 2020.

(2) Secondary airports (7)

These are located in 5 areas as indicated in the following table:

AREAS	AIRPORT
Northern Kazakhstan	Pavlodar
Southern Kazakhstan	Shimkent
Western Kazakhstan	Aktau, Atyrau & Aktyubinsk
Eastern Kazakhstan	Ust-Kamenogorsk

(3) Regional airports (12)

The remaining airports will function primarily as feeder airports to the Primary and Secondary airports, and are located as per the following table:

AREA	AIRPORT
Northern Kazakhstan	Petropavlovsk, Kostanay, Kokchetau, Ekibastuz
Southern Kazakhstan	Taldy-Kurgan, Zhambul, Kzyl-Orda
Western Kazakhstan	Uralsk
Eastern Kazakhstan	Semipalatinsk
Central Kazakhstan	Zhezkazgan, Balkhash, Arkalyk

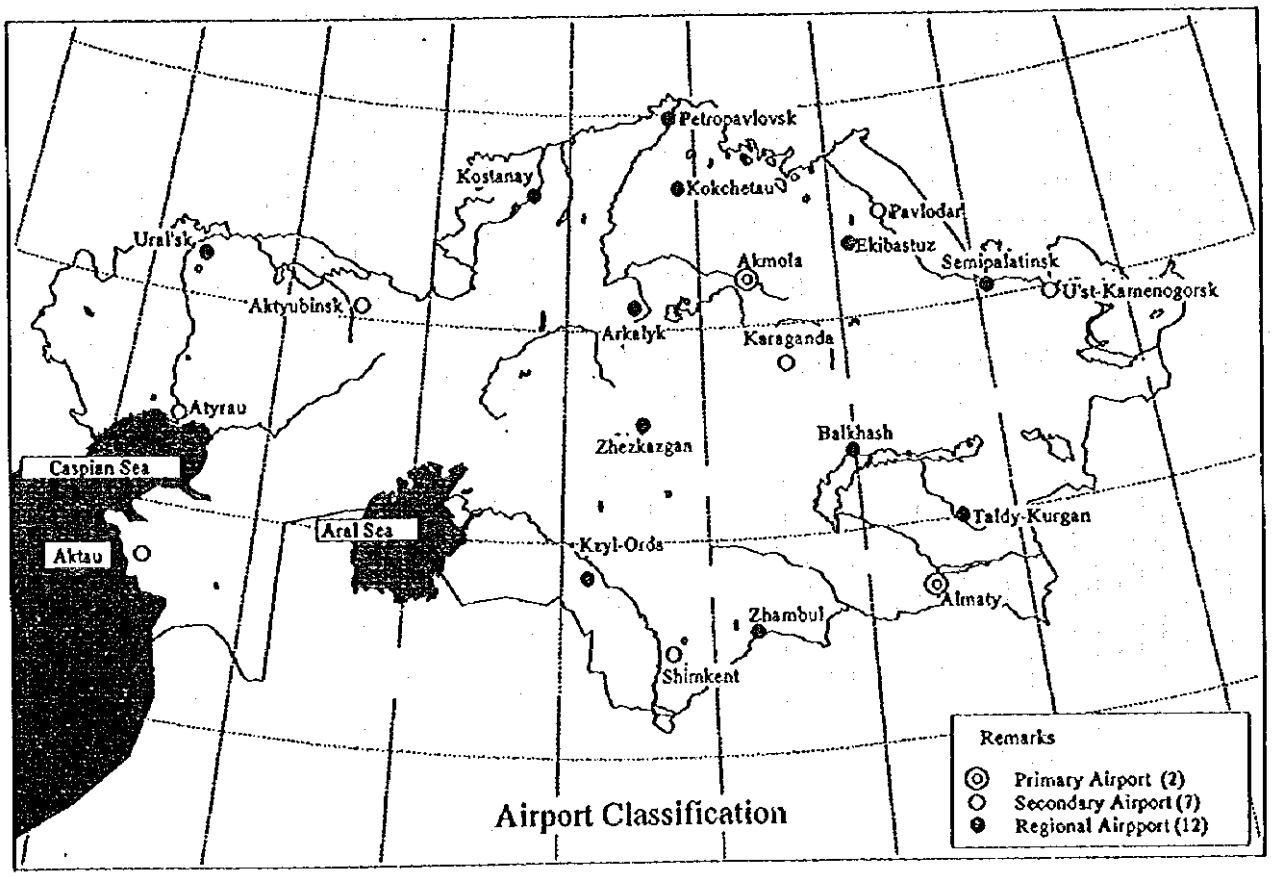


Figure 5.3.1 Airport Classification

Table 5.3.1.1 Airport Classification (Year 2020)

area	region	airport	population of region (%)	GDP of region (%)	PAX (%), basic demand	airport classification
Northern Kazakhstan	North Kazakhstan	Petropavlovsk	2.8	1.9	1.3	3
	Kostany	Kostanay	5.5	7.4	2.8	3
	Kokchtau	Kokchetau	3.4	3.3	1.6	3
	Pavlodar	Pavlodar	5.3	11.3	5.8	2
		Ekibastuz	-	-		3
Southern Kazakhstan	Almaty	Almaty	11.3	15.3	36.1	1
	Taldy-Korgan	Taldy -Kurgan	3.9	2.2	2.2	3
	Zhambul	Zhambul	6.2	2.9	2.5	3
	South Kazakhstan	Shimkent	14.6	3.2	5.9	2
	Kzyl-Orda	Kzyl-Orda	4.7	2.1	2.6	3
Western Kazakhstan	Mangistau	Aktau	2.2	2.6	7.5	2
	Atyrau	Atyrau	3.3	5.0	4.5	2
	West Kazakhstan	Uralsk	4.3	3.5	3.0	3
	Aktyubinsk	Aktyubinsk	4.9	4.8	2.1	2
Eastern Kazakhstan	East Kazakhstan	Ust-Kamenogorsk	5.0	7.6	4.3	2
	Semiparatinsk	Semiparatinsk	4.3	2.5	2.3	3
Central Kazakhstan	Zhezkazgan	Zhezkazgan	2.9	4.8	2.6	3
		Balkhash				3
	Karaganda	Karaganda	6.7	9.4	7.1	2
	Akmola	Akmola	6.4	6.2	5.2	1
	Turgai	Arkalyk	1.8	1.1	0.6	3

note: airport classification (1: primary airport, 2: secondary airport, 3: regional airport)

5.4 Operations and Maintenance Planning

During the First Field Survey in Kazakhstan, 8 of airports the 22 airports were visited. With the exception of Almaty, the available survey time at all locations was only one half day to one full day and, for various logistical reasons, it was not always possible to fully utilize the limited times available. Furthermore, requested information and data was often not available. Despite this situation, it was possible to make assessments, to varying degrees, of airport operations and maintenance in the areas of :

- Rescue and Fire Fighting;
- Airport Security;
- Border Controls and Facilitation;
- Snow Removal from Runways, Aprons and Taxiways; and
- Maintenance of Runways, Aprons, Taxiways and other Air Side Areas.

The results of these assessments appear in **2.3.10**.

5.4.1 Rescue and Fire Fighting

(1) Commentary on the current situation

There was excess RFF capacity, in terms of both vehicles and staff, at all locations. This was partly due partly to institutional reasons because the RFF Service Categories of the former USSR were still in use, and the minimum equipment lists for these categories were higher than for the ICAO equivalents per ICAO **Annex 14 Aerodromes**. Furthermore, the equipment and staffing levels had been set using pre-1991 aircraft movement volumes which were, on average, four times higher than in 1996.

The condition of vehicles varied widely by locations. Poor serviceability was usually attributed to a lack of funds for spare parts; however, the rusting and poor cleanliness observed at some sites was probably due more to negligence than resource shortages.

Training programs were generally satisfactory, as were emergency contingency plans and procedures.

(2) Recommended actions

- There should be an immediate moratorium on the purchase of all new RFF large and medium vehicles.
- There should be an early reduction in the numbers of RFF large and medium vehicles at each location to a level that is no more than one vehicle per airport above the levels recommended by ICAO for equivalent categories. This should represent a 20 to 25 % reduction at about half of the locations.
- The RFF categories at each location should be reformulated based on ICAO SARP's and realistic forecasts of air traffic movement levels, and vehicle complements further readjusted as required.

- The Civil Aviation Department, in cooperation with the airport directors, should prepare and implement a National RFF Vehicle Reallocation Program. This would redistribute the most serviceable vehicles to the various airports to the new levels, and allocate the other vehicles for cannibalization for spare parts.
- RFF staffing levels should be reduced in line with the vehicle reductions.
- Given the reduced availability of formal Airport RFF training programs since the termination of the USSR and recognizing the high standards of the Pavlodar RFF unit in all areas, the CAD should designate Pavlodar as a national training site. Its staff, vehicles and equipment should be increased accordingly from the surpluses resulting from the general resource reduction activities.

5.4.2 Security

(1) Commentary on the current situation

Airport security was generally found to be satisfactory from observations and discussions at the sites visited.

(2) Recommendations

Aviation Security has emerged as one of the most important and most sensitive air transportation activities over the last 20 years. For this reason, aviation security units should be exempted from any near term workforce downsizing initiatives to reduce excess capacity at airports.

5.4.3 Border Controls and Facilitation

(1) Commentary on the current situation

More complaints were received from users about border controls and related facilitation procedures than about any other aspect of airport operations at Almaty Airport, through which most of the international traffic passes.

It is the sovereign right of every state to protect its borders but, as a contracting state to the 1944 Chicago Convention which established the ICAO, Kazakhstan should do so in ways which minimize any inconvenience to flight crew, passengers and shippers. Clearly, this was not the case at Almaty Airport at the time of the First Field Survey from April to June 1996. Complaints received from foreign carriers are summarized in **2.3.10 (5).**

It has been found elsewhere that airport facilitation and, therefore airport throughput rates and customer satisfaction, can be improved significantly through better organization, procedures and training, and with minimal capital outlays.

The most important prerequisite for efficient facilitation is a high level of cooperation between the airport authorities and the various border control agencies (Immigration, Customs and Public Health). Each usually come under

different governmental departments which naturally give the highest priority to exercising their respective control functions. The most effective mechanisms for achieving the required level of cooperation are National Facilitation Programs, and National Air Transport and Airport Facilitation Committees, established as per the Standards and Recommended Practices for Facilitation which appear in ICAO Annex 9 to the Chicago Convention on International Civil Aviation. None of these have been established in Kazakhstan.

Traditionally, very little international technical assistance has been offered for improving airport facilitation in developing countries. This is most regrettable given the high yields that such assistance can produce.

Consideration also needs to be given to streamlining specific border control procedures. While it is considered necessary to inspect originating checked baggage for security reasons, most governments do not require such inspections by the Customs organization. Kazakhstan is still one of the exceptions in this regard.

A number of other fairly simple measures to improve facilitation are now becoming commonplace. For example, many countries now use a the dual channel (Red/Green) system for screening arriving baggage whereby passengers with nothing to declare proceed through the green channel, and those with items to declare proceed through the red channel. The Customs authorities exercise their control by reserving the right to make spot checks of any baggage passing through the green channel. Facilitation can be further improved by simplifying and integrating the border control documentation that passengers need to complete on arrival, and also by having one official conduct inspections on behalf of all border control agencies. Kazakhstan has yet to adopt any of these measures.

It also needs to be recognized that the first and last officials from the host country that international travelers encounter are border control officials who can, therefore, significantly influence a traveler's image of the country for better or worse. For this reason, more states now provide special training in interpersonal skills, public relations etc. to border control officials so that their conduct, appearance, proficiency and demeanor will be exemplary. This is another matter worthy of attention by the border control agencies.

(2) Recommendations

The assistance of an expert be sought to implement the provisions of ICAO Annex 9 in Kazakhstan. This would include undertaking the following tasks in cooperation with a counterpart authority identified by the Government:

- design and help establish a National Air Transportation Facilitation Program, including a National Air Transportation Committee and a Facilitation Committee for Almaty Airport;
- prepare a set of plans and procedures for covering facilitation activities at Almaty Airport;

- design and conduct a series of in-country seminars and training programs on airport facilitation to be jointly attended by airport and border control staff from Almaty and other airports; and
- arrange one overseas study tour of 2 weeks duration for about 5 airport and border control professional staff to visit airports with highly regarded facilitation programs.

It is estimated that this expert would require at least 4 work months in-country and cost an estimated US$ 67,500. This would include fees, living expenses, assignment travel and communications costs (telephones, fax, correspondence, report publishing etc.). It does not include in-country travel, office equipment and salaries of local staff.

The total estimated cost (excluding air fares) of the study tour would be US$ 10,600.

5.4.4 Snow Removal from Runways, Aprons and Taxiways

(1) Commentary on the current situation

Snow and ice removal programs was generally found to be satisfactory from observations and discussions at the sites visited. The only exception was at Almaty which sometimes experienced problems of meeting the standard of clearing the runway, 2 taxiways and the apron within 60 minutes. During heavy snowfalls, this could take up to 3 hours. This problem is due to over 30% of snow and ice clearing equipment being lost due to unserviceability over the last 10 years. This seems to be borne out by comparing the equipment inventory of Almaty with that of 3 other locations, all of which have less total surface area to clear and much less traffic.

(2) Recommendations

The following additional snow and ice clearing equipment should be procured for Almaty:

- three small plough and brush units;
- two snow augers and throwers; and
- one ice melter.

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

(1) Commentary on the current situation

Because of time and other constraints, it was only possible to review in any depth the maintenance of runways, aprons and taxiways and other air side areas at Almaty.

The general impression was that airport staff are trying to do their best with limited equipment and funds; however, this is not always sufficient to meet safety

standards. Deficiencies noted at some locations included: uneven aircraft movement surfaces due to poorly implemented lighting installations; and broke lighting fixtures. As indicated in **2.3.10,** the situation in Almaty has improved considerably after the takeover of the management of the airport by LATAS, the Lufthansa-led consortium, in mid-August 1996.

It was noted that runway friction coefficient testing is only carried out during winter for snow and ice conditions but not for wet weather at other times. This is contrary to generally accepted practice.

(2) Recommendations

There should be a firm commitment to facility life-cycle management at all locations and engineering services conducted to ensure an integrated approach to the planning, design, construction, maintenance and operation of each facility. Furthermore, life-cycle management should also be coordinated between facilities that are operationally related, even though these may be the responsibility of separate organizations, e.g. electronic navigation aids and runway lighting systems. This issue is discussed in more detail in **5.4.3 2) c) ii.**

The CAD should establish, disseminate and enforce a national standard for runway friction testing during wet weather at all airports based on ICAO **Annex 14** and other guidance material.

Where air side maintenance programs, such as grass cutting and the cleaning of aircraft movement surfaces are hampered by equipment shortages, surplus RFF personnel should be used to assist in these functions.

5.5 Ownership, Management and Organization

5.5.1 Commentary on Current Ownership, Management and Organizational Issues

The history of the ownership of Kazakhstan's airports and the status as of October 1996 is covered in **2.3.8**. The current condition of Kazakhstan's airports is covered in **2.3.10**.

(1) Excess capacity

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

(2) Management Framework

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

(3) Need for Commercialization

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

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

Most airports have traditionally been government owned. There is now a well established world-wide trend to commercialize airports. This is because governments are unable to fund the many competing demands for public services, so airports are increasingly being required to respond to users' needs while becoming financially self-sustaining in terms of both current operations and future development.

A review of the experiences of other states clearly reveals the benefits to be gained from well planned and implemented airport commercialization programs regardless of whether these involve continued governmental ownership or some form of privatization. These are, however, invariably complex exercises requiring significant assistance from outside experts, even in developed countries.

A sound commercialization program would inevitably result in numerous measures to solve all of the major problems mentioned earlier. While it would be highly desirable to implement such a program for all of Kazakhstan's airports in the near term, this is clearly impractical.

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

- Develop and implement a coherent national airport commercialization program for those airports which have been reincorporated as separate open joint stock companies.
- For any airport where the Government will probable remain the sole owner for some time to come, implement a series of efficiency and effectiveness improvement measures related to the specific problems identified during the Study Team's Field Surveys.

5.5.2 National Airport Commercialization Program

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

- status of the airports in terms of their operational and financial conditions, as already described in **2.3.8 and 2.3.10,** and with further commentary in **5.5.1** ;
- commercialization actions already taken;
- generic commercialization process; and
- options for ownership and corporate structures.

The last 3 items will be reviewed in turn.

(1) Commercialization Actions Already Taken

Some of the foundations of a National Airport Commercialization Program have already been laid.

In April 1994, ATMA, a closed joint stock company, was established between the Atyrau subsidiary of Kazakhstan Airlines, and the Magdenil Ground Services and Transport Company of Turkey to manage and develop Atyrau airport. ATMA owns most of the facilities and equipment at the airport, and is the exclusive provider of passenger and cargo handling services.

In August 1996, a consortium led by Lufthansa commenced a 10 year management contract for Almaty Airport. The contract also made for provision for a possible partial privatization of the ownership of the airport with the consortium acquiring 51% of the equity.

Also in August 1996, the Government decided to separate a further 10 airports from Kazakhstan Airlines and reincorporate these as open joint stock companies. These are located at Aktyubinsk, Akmola, Aktau, Atyrau, Karaganda, Kostanay, Pavlodar, Petropavlovsk, Uralsk and Shimkent. By October 1996, this separation and reincorporation had been completed for all airports except those at Karaganda and Shimkent. This was an initial step taken to prepare these airports for further commercialization action. By late September 1996, the Government had already announced its intention to privatize Aktyubinsk airport. It is known whether this decision will result in the ATMA company at Atyrau being converted from a closed to an open joint stock company.

The 10 remaining airports were to remain part of combined airport/air carrier enterprises at: Arkalyk, Balkhash, Ekibastuz, Kokchetau, Kzyl-Orda, Semipalatinsk, Taldy-Kurgan, Ust-Kamenogorsk, Zhambul and Zhezkazgan. The future ownership status of these airports was unclear.

(2) Brief Description of the Commercialization Process

The generic commercialization process involves 3 basic steps: a market analysis; restructuring; and cost reductions. These steps do not necessarily have to be taken sequentially. If an enterprise is near bankruptcy, significant cost reduction measures will be needed, as emergency measures, prior to completion of any market survey and restructuring efforts. Furthermore, cost reductions often occur in parallel with market analyses and restructuring since both involve identifying cost saving opportunities in terms of products to be discontinued and efficiency gains. Each step will be outline briefly in turn.

a) Market Analysis

Successful market analysis involves:

- identifying current and potential customers;
- identifying the products that those customers wish to purchase in terms of quality, quantity, location and price;
- assessing the current and potential profitable production and distribution capabilities of the enterprise; and
- deciding which customers are to be served and goods, and services to be produced.

Customers and products can be both be discussed in terms of Aeronautical and Non-aeronautical services.

i. Aeronautical Services

In the case of airports, the primary customers are air carriers and general aviation operators. The products are capacities to enable those customers to conduct their operations profitably and safely. Sale of capacity generates aeronautical revenues such as landing fees, aircraft parking fees and passenger service fees. It is widely accepted practice to set such fees at levels which will cover operating and development costs but which will not yield any surpluses for distribution to the

owners. The bases of the market analysis component for aeronautical services are air transport demand forecasts supplemented by market research to define customers and products.

ii. Non -aeronautical Services

There are considerable opportunities at many airports for producing commercial services not directly related to aircraft operations. Examples include: retail services; hotels; car parking; and appropriate industrial activities conducted on airport properties. Revenues from these services may be used to subsidize the cost of aeronautical services and also to generate profits for distribution to the owners. The determination of those services needs to be based on special market analyses otherwise the airport risks becoming burdened by loss-making activities.

b) Restructuring

Once customers and products have been clearly defined, the next step is to design the most efficient processes for creating and distributing those products. With respect to airports, restructuring is not only necessary to make efficiency gains but also to ensure that domestic operations are conducted in compliance with national air safety regulations, and international operations with ICAO's Standards and Recommended Practices (SARP's). Two basic approaches are available for this purpose:

- incremental improvements to existing processes; or
- process re-engineering.

For the airports of Kazakhstan, production has long been based on a bureaucratic command and control system rather than a market driven system, thereby creating and institutionalizing many inefficiencies. In this situation, process re-engineering is the preferred option.

Process Re-engineering involves designing and implementing all processes completely anew by following the steps presented in **Figure 5.5.1**.

From this, it will be possible to identify, along with associated costs and timing, the total needs for:

- staff by numbers and skill level;
- materials and supplies
- facilities and equipment; and
- work instruments such as information systems, operating plans, internal procedures and organizational structures.

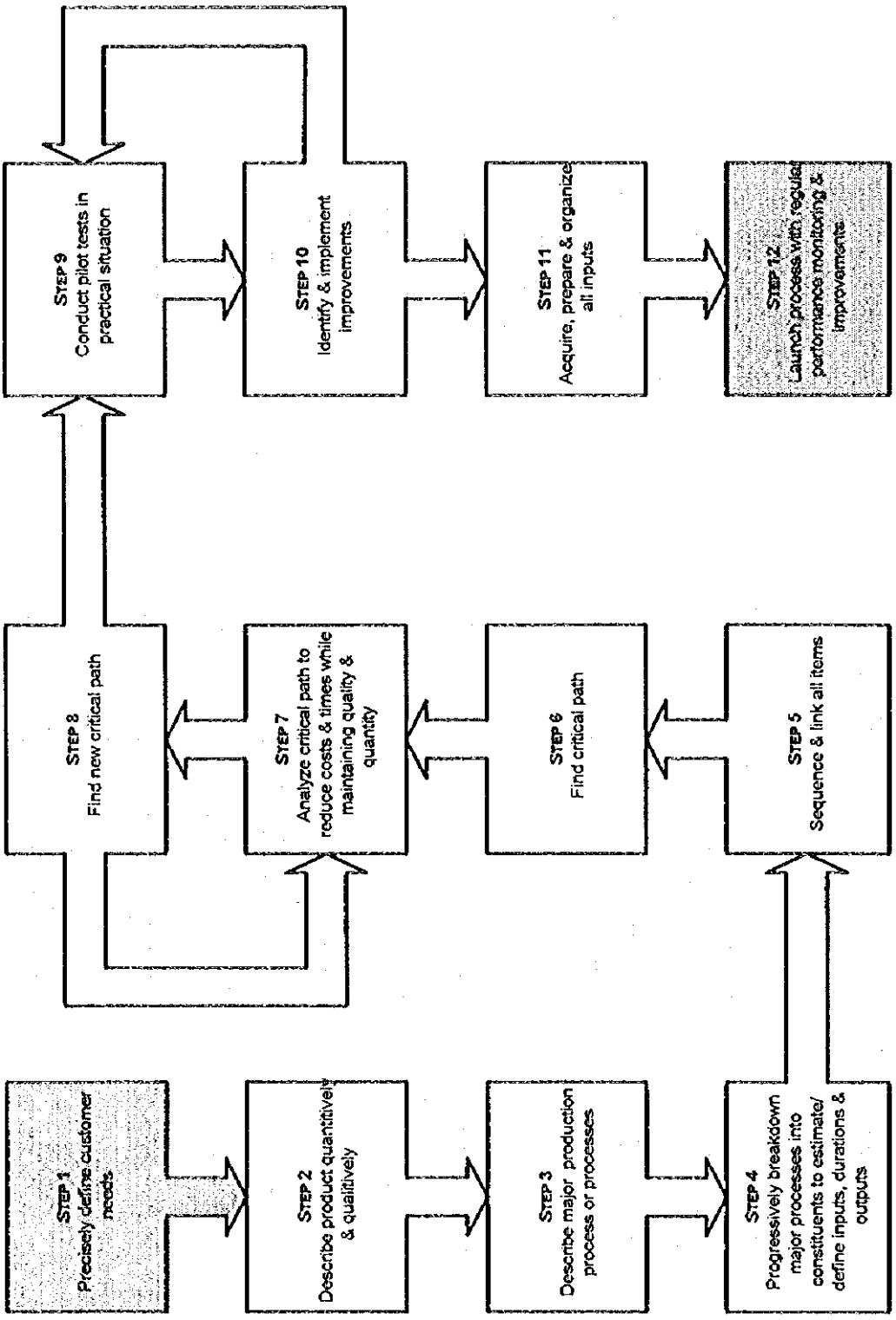


Figure 5.5.1 Process Re-engineering

By comparing these outcomes with the current airport structure, it will be possible to determine those staff and other assets which:

- can be retained and upgraded;
- need to be acquired; and
- are surplus to requirements.

Process re-engineering is a complex exercise and almost always requires the extensive outside expertise. It would take a reputable management consulting firm 6 to 12 months to re-engineer all processes for an average size airport in Kazakhstan.

c) Cost Reductions

Cost reductions can be identified during both market analyses and restructuring. An outcome of the market analyses will be the identification of products which are no longer required or are required in less quantity, both now and in the foreseeable future. During restructuring, cost reductions will be identified through the design of more efficient production processes. As indicated earlier, pre-emptive cost reductions are often necessary and possible. For example, despite the drastic decline in traffic levels at Kazakhstan's airports since 1991, most are still operating on a 24 hour basis. It is possible to significantly reduce the hours of operation and related resource requirements at many of these locations, provided that this is properly coordinated to ensure the availability of alternate airports for emergencies.

It is necessary to pay particular care and attention to the design and implementation of cost reduction programs involving work force downsizing. This can significantly minimize the adverse impacts on surplus employees and also demonstrate the opportunities available to those staff who will be remaining with a more efficient enterprise.

Specific guidelines on work force downsizing will be provided later in 5.5.3 (4).

(3) Ownership and Corporate Structure

The commercialization process outlined above can be used to put any entity on a business-like footing regardless of ownership and corporate structure. It can, however, can involve significant changes in both. Often, an airport is incorporated prior step to any commercialization process. It is thereby transformed from being an integral part of a governmental department to a separate legal entity structured as a business enterprise, but with 100% of the equity governmentally owned. Incorporation in itself can be a powerful driver for commercialization by imposing basic business structures on entities previously integrated into governmental departments. Capital funding for such airports is typically obtained from the commercial debt markets with the owner (government) guaranteeing any loans.

There is also an obvious linkage between commercialization and privatization since privately owned entities need to be profitable on a sustainable basis to survive. In fact, it is often necessary to initiate commercialization prior to

privatization because prospective purchasers will have no interest in acquiring money losing enterprises, unless the sale prices are appropriately discounted, or operations are subsidized by the vendor to allow the purchaser sufficient opportunity to make the enterprises profitable.

The decision to partially or fully privatize a government-owned airport is usually based on the need to:

- secure funding from the equity markets as well as the debt markets;
- minimize political interference; and
- to increase non-aeronautical revenues from commercial services.

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

The linkage between incorporation, privatization of ownership and privatization of functions appears **Figure 5.5.2**.

There are 3 primary policy options for airport privatization:

a) State retains Ownership and Investment Responsibilities but transfers Airport Management and Operations to the Private Sector

This is often described as Outsourcing and is the most common option, having been in use well before the onset of privatization of ownership. The main versions of this option are Service Concession Contracts, Contracting Out and Management Contracts.

b) State retains Ownership but transfers Investment as well as Operations and Management Responsibilities to the Private Sector

This option involves the awarding of a long-term concession to a private party to exploit a given range of airport services provided that the party agrees to: fund the development and upgrade the related facilities; manage, operate and maintain these facilities; and transfer the services and facilities to the owner at the end of the concession period. The most common version of this option is known as a Build-Operate-Transfer (BOT) agreement.

c) Ownership, Operation and Investment Responsibilities to the Private Sector

This option is full privatization and while the least frequently used to so far, there is clear evidence that it will gain popularity given the notable successes it has achieved in the United Kingdom. In most cases, the land used for airport operations is not included in the assets sold, instead being transferred through a perpetual concession (99 years or more) granted to the new owners.

(4) Selecting the Most Appropriate Options

A more comprehensive description of available options for the ownership and corporate structure of Kazakhstan's airports, together with a process for guiding senior governmental decision-makers in selecting the most appropriate options, appears as **Appendix 5.5.2 (1)**.

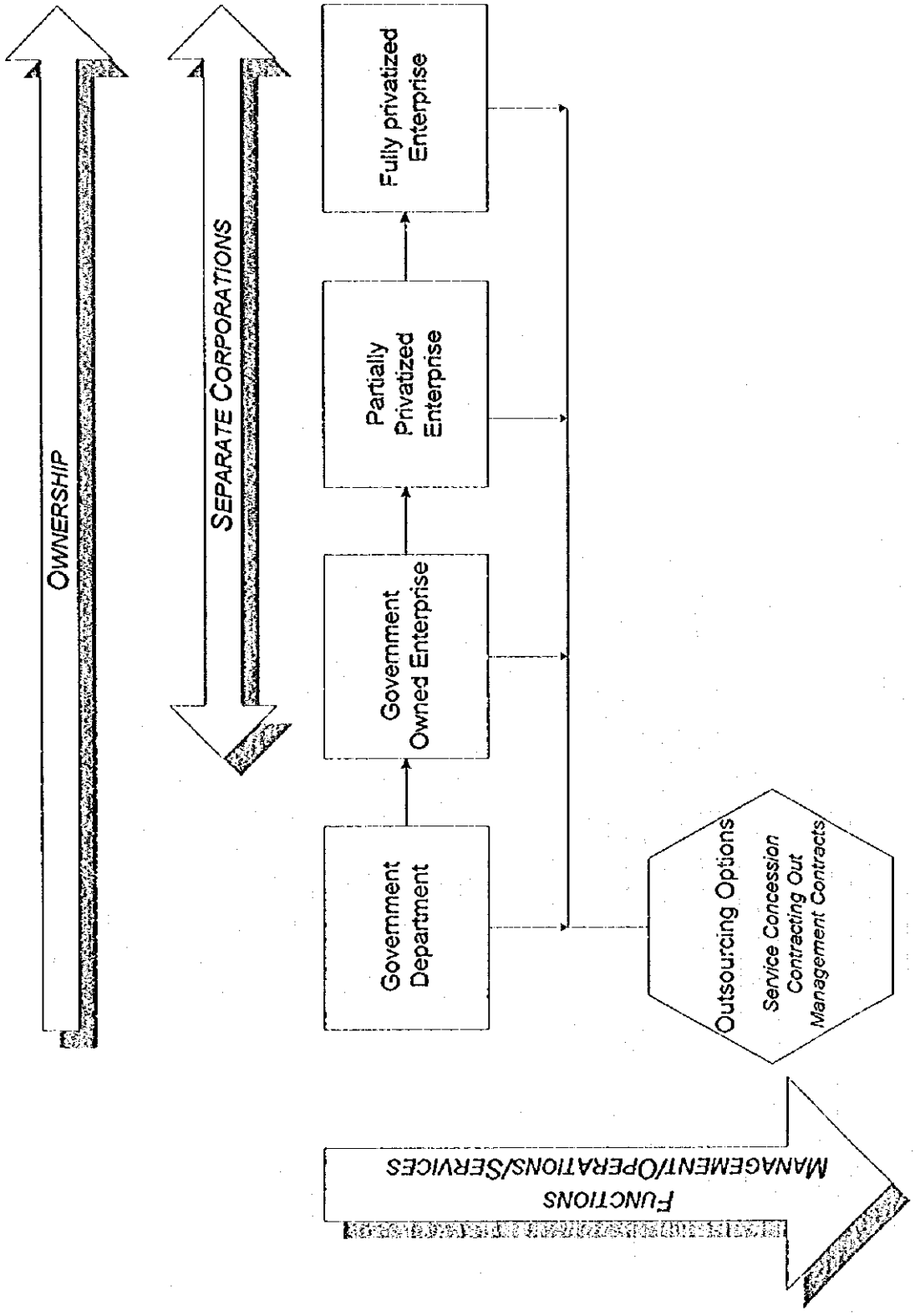


Figure 5.5.2 Privatization of Ownership & Functions

5.5.3 Selected Near Term Efficiency and Effectiveness Improvement Opportunities

These opportunities are presented in response to specific needs and problems identified by during the field surveys in Kazakhstan; however, each would also be an integral part of any comprehensive commercialization program.

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

An enterprise will be function more efficiently if the owners allow its management the maximum flexibility to achieve the goals and objectives set by those same owners. The limits of such flexibility's are determined by:

- laws and regulations established by governments;
- generally accepted standards of business ethics; and
- authorities delegated by the owners.

To facilitate the commercialization airports in Kazakhstan, the national or local government landlords should take early action to allow the Airport Corporations and/or Airport Directors to:

- set all aeronautical charges based on the economic costs of creating the relevant capacity producing services and apply these uniformly to all users (See Note 1);
- enter into contracts with all current and future concessionaires, and negotiate concession fees based on market rates;
- identify and attract new businesses to increase both aeronautical and non-aeronautical revenues;
- access the commercial debt markets, under terms predetermined by the governmental authority, to fund airport development activities;
- set the salary and benefit levels of staff;
- determine whether to provide services using airport staff or by contracting out;
- set staffing levels for the various activities conducted at the airport; and
- retain all revenues other than what is required to pay taxes, with any surpluses to be used in the following order of priority: reducing aeronautical charges and/or improving services, performance pay for staff, and dividend payments to the government.

Note 1

Many governments require airports to fulfill public service obligations for social, economic and security reasons. The decision to mandate such services is an accepted role of any government, but it is neither reasonable or efficient to require airports to both provide and fund such services through cross subsidization from their other revenue sources. An airport's obligation to funding public services should be limited to the taxes paid on its revenues, the same as for any other corporate entity. These services should separately funded by the sponsoring

governmental agencies under agreements with the airport corporation.

a) Balancing Responsibility, Authority and Accountability

If a manager at any level is made responsible for achieving certain goals and objectives, he or she is entitled to have the necessary authority to fulfill that responsibility. If greater authority is delegated to the Airport Director he/she, in turn, can further delegate some elements of this authority to senior subordinate managers. If the airport owner is willing to delegate to the Director the foregoing authorities, it is reasonable for the owner to expect the Director, in return, not to misuse these and to be accountable for corporate performance. **It is a fundamental principle of decentralized management that there should be a commensurate match between the authority delegated and the accountability expected in return.**

b) Achieving Accountability

Accountability is best achieved by establishing performance targets for each manager and requiring periodic reporting of results against those targets. Failure to achieve these targets could result in a range of actions. These include: providing further assistance to the manager, if the reasons for failure are outside of his/her control; or disciplinary action, if failure is due to incompetence or negligence. Conversely, a system of incentives can be established for exceeding performance targets. To be viable, performance targets should be periodically established between a manager and his/her superior manager, or with the business owner.

Performance targets require performance indicators. General financial performance indicators for any business will be covered in **5.5.3 (3) a).** A range of performance indicators specific to airport operations are available, the most common being:

- cost per aircraft movement;
- revenue per aircraft movement;
- cost per enplaned and deplaned passenger;
- revenue per enplaned and deplaned passenger;
- cost per enplaned and deplaned tonne of cargo; and
- revenue per enplaned and deplaned tonne of cargo.

For commercial services, a common performance indicator is financial level of retail sales per passenger.

The most appropriate means to negotiate and establish performance targets is during the periodic planning, programming and budgeting process which is part of the managerial accounting system described in **5.5.3 (3) b).** This is normally conducted annually.

Another method of achieving managerial accountability is through periodic audits. **Independent audits** of consolidated financial statements should be conducted

annually. **Internal audits**, which are really management assessments, should be conducted on a cyclical basis with each audit usually focusing on a particular aspect of a businesses operations, such as: inventory controls, contract management, management of employee pay and benefits etc.

It is often incorrectly assumed that a decentralized management system, with a high degree of delegated authority, means a potentially dangerous loss of control by the owners. In fact, the reverse is true, if the foregoing concepts are properly applied.

(2) Organization

Organization is necessary to make the most efficient and effective use of all available resources to achieve the desired outputs. An organization, therefore, is not an end in itself but a means to an end and should always be considered in this context. Major organizational issues at the airports of Kazakhstan need to be reviewed in turn as a prerequisite to developing an appropriate organizational structure.

a) Separation of Air Carrier and Airport Functions

The airport and air carrier functions have long been separated at Almaty. The functions were due for separation at 10 of the 20 remaining airport locations during the latter half of 1996.

b) Centralized Authority

The managerial system at most of the sites surveyed was highly centralized, with the director of each enterprise having many persons reporting directly to them (a wide span of control) and limited substantive authority delegated to subordinate managers. This issue has already been discussed in 5.5.3 (1) and will now be addressed in the context of organization.

Span of control is the term used to describe the number of managers and other subordinates a senior manager reporting has directly to him or her. It is important because, if the span of control is too wide, this can indicate that there is insufficient delegation of authority to subordinate staff. This can result in the senior manager being overburdened from dealing with a wide range of relatively minor matters, at the expense focusing on more significant matters and important strategic issues. Typically, the directors of an airport of the same relatively small size as those in Kazakhstan would have a span of control of 5 or less,. This is much lower than exists in Kazakhstan even if the managers of air carrier activities are discounted.

With the advent of improved managerial methods and systems, limiting the span of control has become somewhat less important resulting in "flatter organizations". For such organizations to succeed, however, it is essential to have:

- effective and efficient information sharing throughout the organization;
- a competent and empowered work force which is focused on its products, responsive to its customers and accountable for its performance; and
- a sound financial management framework.

None of these elements exist within Kazakhstan's airport system at the present time.

c) Roles of Departments

i. Line and Staff Functions

The organization of any large entity comprises components for performing line and staff functions. A **line function** is one involved directly in the production of the main outputs of the entity. In the case of an airport, these outputs are capacity and commercial services. A **staff function** is one which primarily facilitates the activities of those departments responsible for line functions. Common staff functions are: financial management, human resource management (recruitment, training, labor relations etc.), planning, administration, informatics and legal services. The distinction between line and staff functions is not always clear. For example, planning can be considered either as a line or staff function depending on the context in which it occurs.

At the airports of Kazakhstan, there generally appears to be a rational organizational separation between line and staff functions. What is significant, however, is the large number of persons engaged in staff functions. For example, at Almaty airport 950 persons out of a total work force of 2724 is engaged in staff functions. Of these, 733 are engaged in providing social services such as clinics, kindergartens and cultural activities. Quite apart from the costs involved, devoting so much of the airport's resources to these activities creates a large and institutionalized distraction for managers from what should be their main concern: producing safe and economical capacity in response to customers needs and enhancing commercial revenues.

Regarding social services for employees, it is worth noting that more companies in developed countries are engaged in providing these services, such as child day-care and fitness centers. These are, however, usually:

- very limited in scale;
- costed and provided as part of employees benefit packages; and
- assessed in terms of contributions to productivity improvements for the company.

During the First Field Survey, Kazakhstan Airlines' officials stated several times their intention to arrange the transfer of social service organizations to more appropriate entities such as local governments. Furthermore, the initial but very modest attempts at cost reductions through down-sizing appear to be correctly concentrating on all staff services, a major component of overhead costs.

ii. Operational and Engineering Activities

Many of the activities which take place at airports can also be categorized as either operational or engineering in nature.

As the name implies, **Operational** activities are those which involve the operation of facilities and equipment. These are often the final step in the capacity production process and frequently involve direct contact with users.

At some locations, all airport operations functions are performed by one organizational entity, while at others it is shared between several departments such as Air Side Operations, Rescue Fire fighting/Security, Ground Handling and Aircraft Refueling. At all locations, terminal Air Navigation Services are performed by the separate state owned enterprise Kaz Aeronavigation.

iii. Ground Handling

Airports enterprises in Kazakhstan have traditionally carried out land side and air side ground handling, including aircraft refueling and catering inflight meals, for the air carrier components of Kazakhstan Airlines.

At airports in many other countries, each carrier usually does its own inflight catering or buys the service from another carrier or a company which specializes in catering services. Aircraft refueling is usually contracted out to one or more commercial oil companies. Other aircraft ground handling services are usually done by each carrier for its own aircraft, contracted out to another carrier or contracted out to a specialized ground handling company. Passenger, baggage and cargo ground services are usually performed by carriers, the airport enterprise or by specialized ground handling companies.

The trend in developed countries is to move away from the monopolistic provision of ground handling services, usually by the airport authority. At major airports in the United Kingdom, there are eight ground handling companies at London Heathrow, three at London Gatwick and five at Manchester. Many of the smaller UK airports usually have at least two separate ground handling companies.

A new regulation for all member states of the European Union will come into effect in late 1997 which will require any airports with passenger throughputs exceeding three million per year to have at least two ground handling companies by the year 2001.

Where ground handling is performed by carriers or specialized providers, the airport authority charges rental to cover the costs of the spaces and facilities supplied for these services, and also sets and enforces safety standards for their provision, particularly on air side areas.

Engineering activities involve the design, procurement, construction and installation of facilities and equipment and their subsequent maintenance throughout their operational life.

Generally speaking, the responsibility for all engineering functions related to the facilities and equipment at the airports of Kazakhstan is organizationally well consolidated. There is some fragmentation but this is generally limited in scale. One institutional separation, rather than fragmentation, is that Kaz Aeronavigation is responsible for the considerable quantity of electronic equipment used for ANS communications, navaids, and radar systems etc. whereas the airport engineering organizations are responsible for electronic equipment used elsewhere, such as terminal information systems. This separation is common in many other states.

One problem with the organizational fragmentation of engineering services is that the groups responsible for designing, procuring, constructing and installing facilities and equipment often do not pay sufficient attention to the associated maintenance needs over the operational life, particularly in terms of personnel, procedures, training, the provision of spare parts, and repair and overhaul programs. All facilities and equipment have a generic life cycle which is illustrated in **Figure 5.5.3.** Too often, maintenance needs are not addressed until the facility or equipment is near to commissioning. This usually results in either maintenance being neglected, leading to reduced performance and a shortened operational life, or in expensive measures to hurriedly establish an effective maintenance program. It is necessary to start to address maintenance issues during the Project Definition Phase of the project component of the life cycle, and progressively develop the maintenance program throughout the subsequent phases so that it is in place at the time of commissioning. One way to help achieve this is to make a single group responsible for all engineering activities throughout the facility or equipment life cycle, rather than have one group responsible for design, procurement, construction and installation, and a separate group responsible for maintenance.

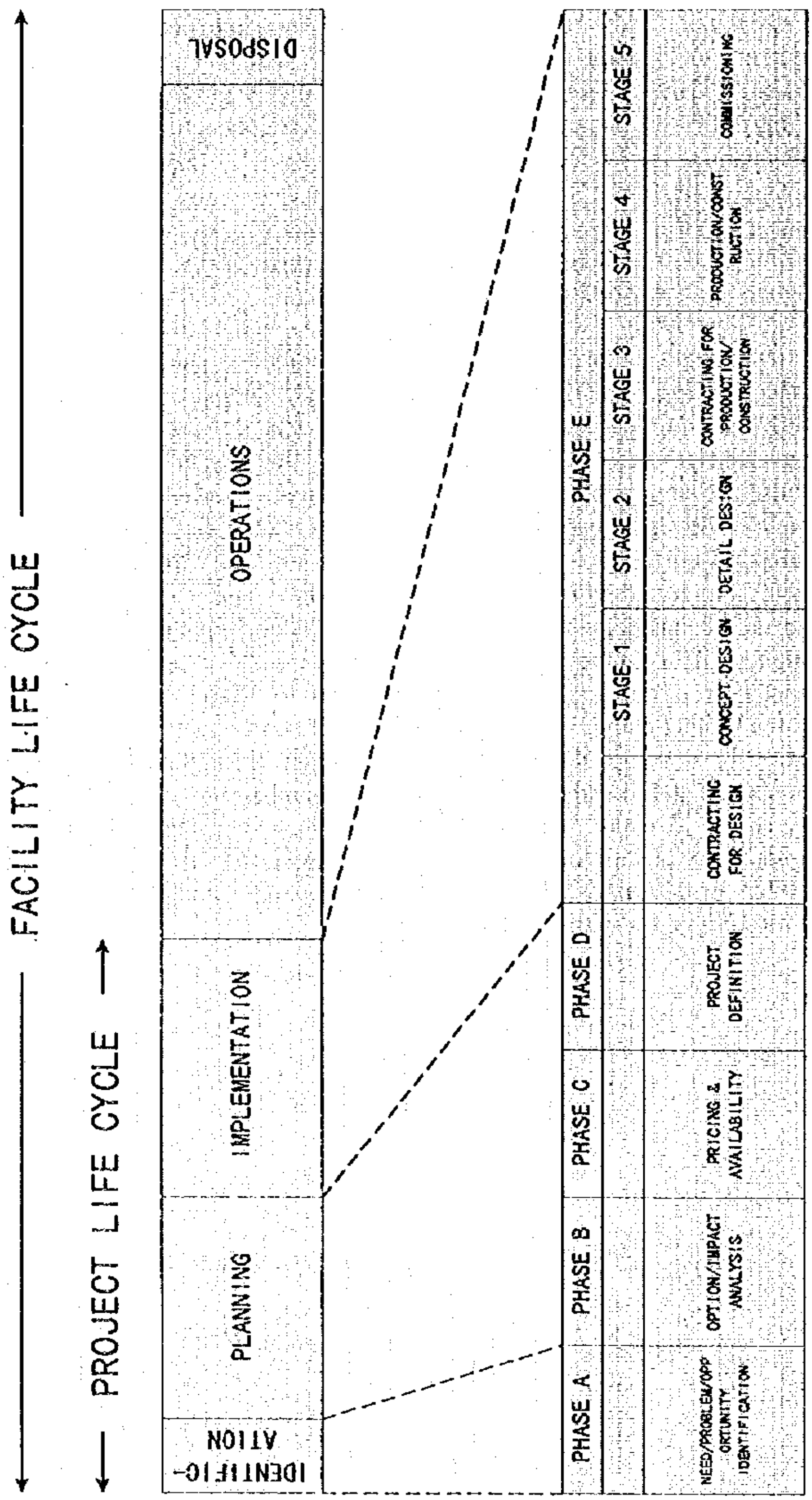


Figure 5.5.3 Facility Life Cycle

iv. Non-aeronautical Commercial Services

The level of non-aeronautical commercial services' production at airports in Kazakhstan is very low For example, Almaty only derives 2.25% of its revenues from commercial activities. The main reason is that the managerial approach, organization and the level of expertise currently in place do not support revenue generating activities such as marketing and sales. Many of the most efficient airports throughout the world now generate well over 50% of their revenues from non-aeronautical services, providing funds for improving services to users, improved pay and benefits to employees, and higher profits for the airport owners. Particular attention needs to be paid to increasing the commercial services and revenues at all airports.

d) Organizational Development

As indicated in **5.5.2 (2) b),** organizational design is an outcome of a restructuring process. It is possible, however, to take pre-emptive measures to improve the basic organizational structure of Kazakhstan's airports, recognizing that it may well be necessary to make some final adjustments, particularly at the more detailed level, following a restructuring.

Given the foregoing discussions, it is evident that the determination of appropriate organizational models for the airports of Kazakhstan should meet the following criteria:

- be conducive to achieving the airport's primary goals of producing safe and economical capacity in response to users' needs and enhancing profits from commercial activities;
- group and consolidate functions which produce similar services but without creating rigid functional hierarchies;
- reduce the span of control of the airport director; and
- adopt the concept of unified responsibility for facility life cycle management.

The proposed basic organizational structure for each airport appears in **Figure 5.5.4.**. It can be seen that this reduces to 4 the number of subordinate managers reporting directly to the Airport Director. The functions of each of these consolidated departments will be described briefly in turn.

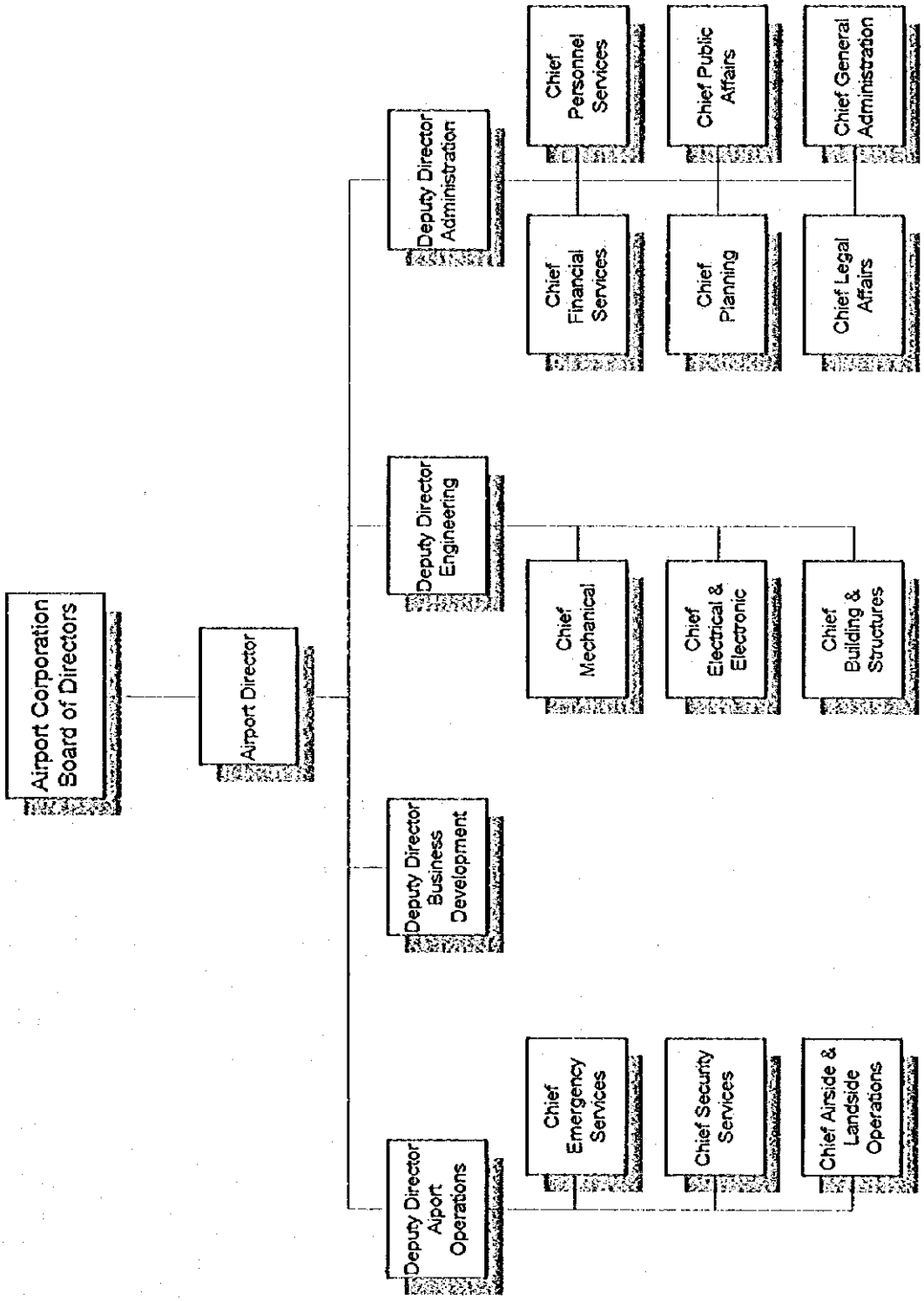


Figure 5.5.4 Proposed Basic Organizational Structure for a Kazakhstan Airport

i. Airport Operations

This department would be responsible for all operational functions related to the producing and safe guarding air side and land side capacity. It would be managed by a deputy director* and would normally comprise the following 3 sections, each headed by a chief:

- Air Side/land side operations
- Emergency Services
- Security Services

* While not responsible for producing air navigation services, this manager would be responsible for operational coordination with the local Kaz Aeronavigation unit

ii. Business Development

This department would be responsible for all activities related to bringing new aeronautical and non-aeronautical businesses to the airport. Such business would be in the form of more:

- scheduled carrier services;
- non-scheduled carrier services;
- general aviation activity; and
- non-aeronautical businesses to produce concession income.

It would also be responsible monitoring and managing the agreements with companies providing commercial services to ensure that product quality and customer satisfaction are maintained, and revenues are maximized.

It would be a small department initially with staff trained and experienced in marketing, sales and contract negotiations but, because of the potential benefits it could bring to the airport, its manager should report directly to the airport director. It could grow further in relation to its success in bringing new business to the airport.

iii. Engineering Services

This department would be responsible for all engineering activities related to the life cycle management of all facilities and equipment regardless of whether these are used for producing capacity or commercial services or both. It would be managed by a deputy director and normally comprise the following 4 sections, each headed by a chief:

- **Buildings and Structures** responsible for the design, construction and maintenance of all buildings, pavements and other structures, including water and sewerage systems;
- **Mechanical Systems** responsible for the specification, procurement, installation and maintenance of all fixed and mobile mechanical equipment, including internal combustion engines and turbines for electrical power generation, RFF and all other vehicles;

- **Electrical and Electronic Systems** responsible for the specification, procurement, installation and maintenance of all electrical generation and distribution equipment, together with electrically powered systems such as airfield and runway lighting, baggage conveyors and elevators. It would also be responsible for all electronic systems other than those used for Air Navigation Services. These would include electronic equipment used in airport terminals, such as video display systems, telephone systems and computer systems.

Many large and complex systems used at airports, such as electrical generation and distribution and large air conditioning systems, integrate electrical, mechanical, electronic and even structural sub-systems. By having all the engineering expertise resident in one department, those resources can be allocated flexibly to provide services as needed.

iv. Administration

This department would be responsible for the provision of all staff services and for any other functions, such as public relations, which do not logically fall within the scope of the responsibilities of the other 3 departments. It would be managed by a deputy director and normally comprise the following 6 sections, each headed by a chief:

- Finance;
- Human Resources;
- Planning;
- Public Relations;
- Legal; and
- General Administrative and Secretariat Services.

At smaller airports, some of these major functions within each department could be organizationally combined to reduce the total number of sections, e.g. Emergency Services and Security Services within the Airport Operations Department. Furthermore, because of the complexities and sensitivities often associated with public relations and legal issues, it may be more appropriate to have the responsible section heads report directly to the Airport Director. In fact, the Airport Director should have the ultimate authority to determine the final organizational structure within resourcing and performance mandates determined by the airport's owners.

e) Production and Internal Communications

It needs to be emphasized that the proposed organizational structure which appears in **Figure 5.5.4** is intended to represent responsibilities for producing services and for the efficient and effective management of all resources of production. It does not represent production processes nor is it a depiction of rigid communications channels between the various organizational components of

the airport.

Figure 5.5.5 integrates the various major organizational components into the basic production and financial management structure for the airport. It can be seen that the Airport Operations, Commercial Services and Engineering Services organizations fulfill the line functions necessary for direct creation of the primary and secondary products of Capacity and Commercial Services respectively. It can also be seen that the Engineering Services organizations are part of the production structure for both product sets. The Administration organizations facilitate the production functions of these line organizations. The detailed design of production processes and, therefore, the direction and coordination of the activities involved will require the full cooperative efforts of all deputy directors and their subordinate managers. This can best be achieved by encouraging open communications between staff at all levels, regardless of formal organizational structures. This can be facilitated by having efficient and effective management information systems which will be addressed in 5.5.3 (3) Financial Management.

f) Outsourcing

In each of the brief descriptions provided above on the proposed departments the term "responsible for" has been used to mean that the services may be provided by airport staff members or under contract, whichever is the most cost-effective option. It should be noted that many of the most efficient and profitable airports throughout the world now outsource (contract out) many functions and services. The concerned departmental deputy director and section chief should be primarily responsible for determining which services under their responsibility should be contracted out and, therefore, should be responsible for the both the contracting process and subsequent contract management. The Finance Section, within the Administration Department should be responsible for ensuring that any contracting action complies with existing financial and other relevant regulations.

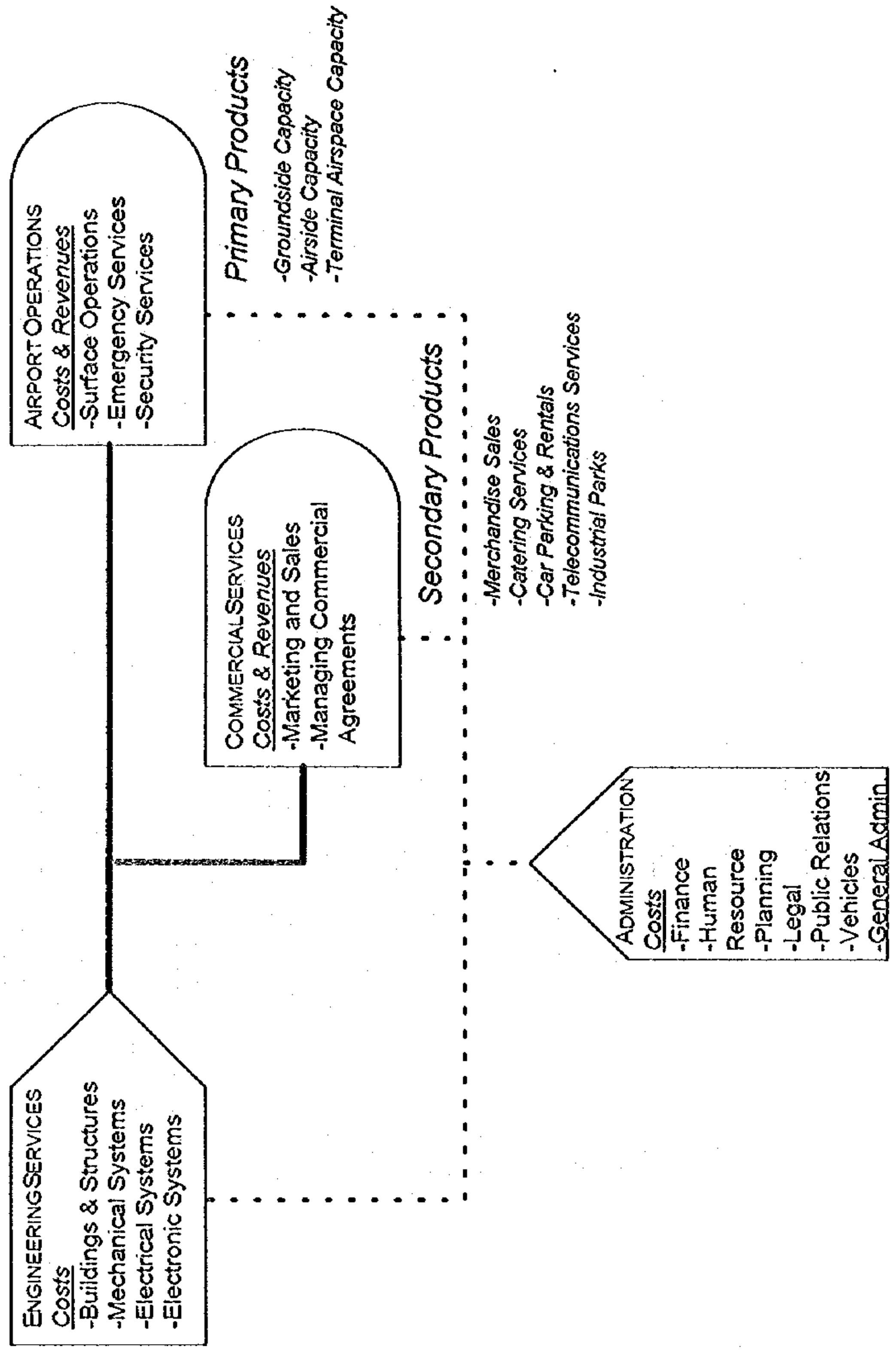


Figure 5.5.5 Airport Production and Financial Management Structure

(3) Financial Management

There is a now well established international trend for airports to operate as business enterprises rather than as bureaucratic governmental organizations. Operating in a commercial environment means producing goods or services in response to users needs, at a prices the users are willing to pay and which will: cover all production costs, provide funds for future development and pay dividends to shareholders. To be effective, an organizational structure must have a compatible financial management system so that managers responsible for certain functions can easily monitor and control associated expenses and revenues. A sound financial management system will also provide an important means of performance assessment thereby encouraging improvements in efficiency and effectiveness.

The current financial management system for the airports of Kazakhstan does not adequately meet these needs. This section of the report is intended to provide guidance in this regard from a managerial perspective, recognizing that the actual establishment of such a system will require considerable professional accounting expertise.

The financial management system will need to have two components: one for financial accounting; and another for managerial accounting.

a) Financial Accounting

Financial accounting is historical accounting. It provides a means of tracking revenues and expenditures, and of using this information to provide consolidated profiles of the total financial status of the business in the form of statements which detail: assets, liabilities and equity; and profits and losses. Important indicators can be derived from these statements such as: return on assets employed, share price/earnings ratios and debt/equity ratios. These and other indicators provide a means for owners to set performance targets for the business and to assess performance against those targets.

b) Management Accounting

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

A management accounting system requires the establishment of a hierarchy of Responsibility Centers, each showing attributable expenditures and, in some cases, attributable revenues. For example, the Almaty Airport would be represented by one responsibility center managed by the Airport Director and show expenditures and revenues. This would be disaggregated into four subordinate responsibility centers, one for each of the deputy directors. For the larger departments, it may be appropriate to further disaggregate into subordinate

responsibility centers at the section level. Once established, each responsibility center manager would have a budget which is compatible with his/her organizational responsibilities, and would be expected to manage expenditures and revenues associated with the activities conducted to fulfill those responsibilities. Each manager would also be responsible for completing periodic performance reports showing expenditure and revenue variances and any corrective actions taken or intended. These would be submitted to his/her superior who is also the next manager up in the responsibility center hierarchy; therefore, performance reports are rolled up to produce a single report for the whole airport.

A management accounting system also provides a useful means for capturing and presenting expenditure and revenue data in formats which facilitate analysis for improving performance and for planning purposes.

Figure 5.4.5 shows the basic proposed financial management structure for a Kazakhstan airport. The responsibility centers established for the Deputy Directors of Airport Operations and Commercial Services would have both cost and revenue components because these organizations are where the primary and secondary products are finalized, distributed and sold to customers. The revenues thereby generated, however, will be used to fund all production costs, including those incurred by the Engineering Services and Administration organizations. From this figure, it can be seen that all organizational components are directly engaged in cost control. Both the Engineering Services and Administration organizations also have a real, if apparently less direct, role in revenue generation because their efficiency and effectiveness will contribute to determining the levels of quantity and quality of the final products. These in turn will affect the revenue generating capability of the airport.

(4) High Staff Levels

As indicated in earlier, the staffing complement of airports is very high by any comparable norms in other countries. As part of a comprehensive strategy for transforming Kazakhstan's airports into an efficient entities this issue needs to be addressed. This part of the report will prescribe indicative staffing levels as targets to be applied with appropriate modifications over time.

a) Approaches for Adjusting Staff Levels

The most accurate way to determine appropriate staffing levels is as part of a process re-engineering project as described in **5.4.2 (2) b).** This will involve conducting detailed analyses of the positions all staff involved in a production process in terms of the tasks performed. The resulting data would then be used to identify: task duplications, task redundancies, additional tasks which should be carried out, improvements in work methods, etc. This can all take much time and effort.

A faster approach for determining indicative staffing levels is to review the staff complements and then identify areas where efficiencies could be achieved based

on the commonly accepted best practices used at airports elsewhere. Each of the main areas will be discussed briefly in turn.

i. Departmental Managers

All organizations are headed by a manager. It is not uncommon in bureaucratic organizations to also find a permanent deputy manager, in addition to functional subordinate managers, and who has no discrete function other than that of a deputy manager. This is indicative of a lack of delegated authority and accountability within the organization. Such positions should be eliminated and more authority and accountability delegated to the functional subordinate managers, including the authority to act on behalf of the manager in his/her absence.

ii. Regulations Plans and Procedures

All organizations need a body of internal regulations, plans, procedures and other such work instruments to function efficiently but, when these are developed to excess, productivity can be seriously impaired. In organizations created under a Command and Control Economy, where management was largely conducted by decree and regulation, there tends to a large number of staff dedicated to producing such instruments. Furthermore, these should be never be developed or modified without some form of prior cost-benefit analyses, and the all of those in existence should be periodically reviewed with a view to eliminating any which are no longer relevant. Managers themselves should be primarily responsible for developing work instruments, with temporary assistance from internal working groups or outside expertise as required. Permanent positions dedicated to this work should be eliminated.

iii. Administration

Some line departments have a large number of personnel dedicated to administration which are in addition to the personnel in staff departments who are primarily engaged in performing administrative functions. As in the case for regulations, plans and procedures, excessive administrative work is symptomatic of a bureaucratic rather than a product oriented organization. Administration can be reduced by eliminating unnecessary tasks, automating other tasks and by having all other staff share in performing necessary administrative functions.

iv. Shift Work

Because most of the services at airports are provided continuously or over extended periods during any one day, it is necessary that many staff work shifts. Excessive shift work, however, is expensive and often unnecessary.

The most obvious way to reduce shift work is to reduce the hours of airport operation. With the dramatic and enduring decline in traffic at most of Kazakhstan's airports since 1991, there is much scope for such measures. Extraordinary traffic movements outside of the normal (reduced) hours of operation can be met by overtime work.

For departments responsible for facility maintenance, it is often more cost effective to have only one or a few persons available for any evening or night shifts. They can respond to any equipment failures and if they are sufficiently knowledgeable on the equipment in question they can restore it to service. If not, they can call out a qualified person or, if back-up equipment is available, corrective action can be taken the following day. A properly established maintenance organization will have policies in place to guide the duty engineer or technician under such circumstances.

There is even some flexibility for staffing shifts for operational functions. For example, Airport Security should be a continuous activity, but certain functions related to passenger and cargo movements can cease or be scaled back during light traffic periods, or when the airport is not operating.

In computing staffing requirements for functions where shift work is required the following factors need to be taken into account:

- hours to be covered by shifts;
- the number of persons required for each shift;
- the length of the standard work-week;
- average annual leave allowance per person per year;
- average sick leave and miscellaneous leave per person per year;
- number of days of public holidays per person per year;
- average number of training days outside of working hours per person per year; and
- average staff turnover per year due to retirements, resignations, promotions, etc.

b) Computing New Staffing Levels

During the course of their Field Surveys in Kazakhstan, the Study Team was only able to obtain accurate information on airport staffing levels at Almaty. This was because Almaty was the only location at which the airport and air carrier components of Kazakhstan Airlines were then separately incorporated and for which accurate staffing data could be obtained. The staffing levels at Almaty airport as of June, 1993 appear in **Table 2.3.10.2.**

One fast approach for determining indicative staffing levels for planning purposes is to use airports at other locations for comparative analyses.

Hanoi International Airport (HIA) in Vietnam offers a good example. This airport compares reasonably well with Almaty in two respects:

- First, in traffic levels. In 1994, the throughput for HIA was 1,080,000 passengers and 15,800 tonnes of cargo. For the same year, the throughput for Almaty was 900,000 passengers and 5,100 tonnes of cargo.
- Second, the economic and social environment. While Vietnam is still a socialist country, its economy has been undergoing a progressive transition

from the command-control model to the market model since 1986. That transition started later in Kazakhstan but the pace of transition has been somewhat faster.

In April 1994, the total **adjusted** staffing level at HIA was 613 persons. To make the comparisons with Almaty valid, this figure has been adjusted to exclude air navigation services staff and social services staff (kindergartens, medical centers, etc.) but also to include an extra 50 persons to allow for the fact that Almaty has a significant snow-clearing workload for half of each year. All ground handling is performed separately by Vietnam Airlines.

In June 1996, the total **adjusted** staffing level at Almaty was 686 persons. To make the comparisons with Hanoi valid, this figure has been adjusted to exclude all ground handling functions as well as social services staff. All air navigation services are performed separately by Kaz Aeronavigation.

It can be seen that Almaty had a 12% higher staff complement than HIA with 17% lower passenger and 68% lower cargo throughputs.

A review of the staffing complement of HIA during a 1995 Feasibility Study carried out by the Japan International Cooperation Agency recommended that the staffing level be progressively reduced to a total 365 persons over a 4 year period with a distribution as follows:

- Airport Operations 201 persons
- Business Development 8 persons
- Engineering Services 80 persons
- Administration 76 persons

  Total 365 persons

By way of further comparisons, one other example is offered. The airport model developed in the 1995 World Bank Study "Airport Infrastructure: The Emerging Role of the Private Sector" had a staffing complement of 381 persons. If this was adjusted to include security and snow clearing, it would increase to about 580 persons. The annual throughputs used in this model were 5,000,000 passengers and 25,000 tonnes of cargo, both about 5 times higher than at Almaty. If the staffing level of 580 persons were reduced by 200 persons (5 persons per 100,000 passengers and per 5,000 tonnes of freight), to match throughput levels of 1,000,000 passengers and 5,000 tonnes of cargo per year (Almaty levels), then the staffing complement would be 380 persons.

While not precise, these comparative figures indicate that the staffing complement at Almaty airport is very high and, that for planning purposes, the core level of 686 persons could be progressively reduced to less than to 350 to 380 persons as part of an overall efficiency improvement program. The actual levels should be determined through specific production process analyses. It is reasonable to assume that similar adjustments could be made at the other airports in Kazakhstan.

c) Planning and Implementing a Downsizing Program

Work force downsizing is a naturally a very emotive issue; therefore, it is very important that any downsizing actions are carefully planned and implemented. Experience elsewhere has clearly demonstrated that such action minimizes any labor unrest. To be successful, a downsizing program requires:

- full and regular consultations between the airport's owners and employees;
- phased staff reductions; and
- incentive programs for affected employees, such as: early retirement, severance payments, and job retraining and reassignment.

5.6 Initial Environmental Evaluation

(1) Purpose

In order to maintain sustainable development, it is of great importance to take environmental matters into full consideration in the implementation of development projects. The purpose of this Initial Environmental Evaluation is to examine the environmental impact which might be caused by airport development, and to select items for Environmental Impact Analyses, which are to be carried out in the second field survey in Kazakhstan, Feasibility Studies for Selected Priority Projects.

(2) Contents of Study

- During the first stage, the following data and information were collected: General Information, Laws and Standards, National Environmental Program, Issues at Present, and Current Conditions.
- The second stage was site investigation and data analysis of the natural and social environment around the project sites to clarify which areas may be affected by the project.
- The third stage was "screening". Screening is a check list procedure used to determine whether it is necessary to consider environmental factors in a development project.
- The fourth stage was "scoping". Scoping is the selection of the major environmental items which may be expected to impact the area surrounding the airport after the implementation of the project. This is performed by means of a check list.
- The last stage was "overall evaluation". The overall evaluation was done to show the coming study plan and judge the necessity of the EIA.

(3) Data and Information Collection

a) <u>General</u>

The Republic of Kazakhstan covers 2.6 million square kilometers in central Asia. The country stretches 1,700 km from north to south and 3,000 km from east to west. Kazakhstan's territory includes steppes, deserts, plains, and mountain ranges. Kazakhstan's climate varies widely. Temperatures range from -40 degrees centigrade in the winter in the northern hills to 45 degrees centigrade in the deserts in the summer. Most of Kazakhstan receives little precipitation. The desert regions of the south average about 10 centimeters of rain every year. The northern steppes get about 25 cm, and about 53 cm of rain and snow fall yearly near the highlands of the southeast. Areas of permafrost exist in some mountain regions.

Three major river systems in Kazakhstan provide much of the water used for agriculture and industry. In the west, the Ural and Emba rivers flow south from the Ural Mountains across the Caspian Lowlands and into the Caspian Sea. The

Syr Darya (River) begins in the Tien Mountains and eventually reaches the Aral Sea. The river is fed by freshwater glaciers but becomes salty along the lower half of its course. In northern Kazakhstan are the Irtysh, the Ishim, and the Tobol rivers. After crossing into Russia, these tributaries of the Ob River eventually reach the Arctic Ocean.

Kazakhstan has nearly 50,000 lakes, most of which are less than 1 square mile (2.59 km^2) in size. For much of the year, the smaller lakes either dry up or become marshy bogs. Lakes in the lowlands and deserts are salty, while those in the northern steppes and in the mountains have fresh water.

Based on "1994 IUCN List of Threatened Animals", the total number of threatened species in Kazakhstan is as follows:

- By status category -

Extinct	10	species	Vulnerable	18	species
Rare	10	species	Indeterminate	3	species
Insufficiently known	8	species			

Kazakhstan has three distinct settlement zones. Ethnic Kazakhs populate the southern and western regions of the country. In the steppes and plains of the north and northeast, the inhabitants are generally ethnic Slavs (Russians and Ukrainians). Based on 1995 data, about 7.6 million Kazakhs inhabit Kazakhstan, making up 46% of the country's population of 16.7 million. Kazakhstan is also home to 5.8 million Russians and 821,000 Ukrainians. Together, they form 40% of the population. The country also has 507,000 Germans and large groups of Uzbeks, Tatars, and Koreans.

b) Laws and Standards

Environmental management in Kazakhstan is based on "The Nature Conservation Law of Kazakhstan" approved in 1991, by the government of the former USSR. In 1993, the Kazakhstan government enacted the Environmental Impact Assessment Act and strengthened environmental management. At present, the Ministry of Ecology and Bioresources and local Nature Conservation Committees carry out environmental management. The organization chart of the Ministry of Ecology and Bioresources is shown in **Appendix - 5.6 (1)**

i. Nature conservation law

"The Nature Conservation Law of Kazakhstan" states the obligations and rights of the citizen, the role of public bodies with regard to nature conservation, and refers to stimulating awareness and education. The contents of "The Nature Conservation Law of Kazakhstan" are as follows:

Chapter 1	Outline
Chapter 2	Obligations and rights of citizens with regard to nature conservation

Chapter 3	Government organizations and public bodies dealing with nature conservation
Chapter 4	Economic system of nature conservation and utilization
Chapter 5	Establishment of environmental standards
Chapter 6	Ecological assessment
Chapter 7	Ecological requirement for economic activities
Chapter 8	Areas with endangered or partially destroyed ecosystems
Chapter 9	Protected areas
Chapter 10	Management of nature conservation
Chapter 11	Citizen participation in nature conservation
Chapter 12	Ecological culture and education
Chapter 13	The settlement of disputes regarding conservation
Chapter 14	Public employees' and citizens' responsibility with regard to violations of the nature conservation law.
Chapter 15	Compensation for damage with regard to violations of the nature conservation law.
Chapter 16	International cooperation for nature conservation. There are no conservation guidelines specifically for airport construction projects.

ii. Environmental impact assessment System

The Kazakhstan Environmental Impact Assessment (EIA) System is defined in "The Nature Conservation Law of Kazakhstan" and based on "The Temporary Directive for Environmental Impact Assessment (EIA) on Economical Activity Planning in Kazakhstan" that was drawn up by the Ministry of Ecology and Bioresources and approved in 1993. "The Directive" applies to any kind of construction or economic development planning, and refers not only to the natural environment but also to the social environment.

The organization leading the project (called **A** hereafter) must submit detailed data on the project and an EIS (Environmental Impact Statement) based on "the Directive" to the environmental management organizations (called **B** hereafter), i.e., the Ministry of Ecology and Bioresources, and local Nature Conservation Committees. **A** must obtain approval from **B**. If **B** does not approve the project, **A** must revise the project and the EIS, and resubmit the EIS.

The contents of "The Temporary Directive for Environmental Impact Assessment (EIA) on Economical Activity Planning in Kazakhstan" are as follows:

1. General Statutes
2. Terminology and Definitions
3. Principles of Environmental Impact Assessment (EIA)
4. Status and the Order of EIA Procedures
5. Stages (Levels) of EIA
6. Obligations of Participants in Conducting the EIA
7. Responsibility of Participants in Conducting the EIA
8. Use of the Present Instructions

The Directive states that an EIA is required for the construction of airports with runways more than 2 km in length.

iii. Standards

- Aircraft Noise Standards -

Time	Max. noise level dB(A)
Daytime (7:00 - 23:00)	85
Nighttime (23:00 - 7:00)	75

Note 1: Only main items are shown.
2: Standards as of 1993.

- Air Quality Standards -

Item	Daily average (mg/m^3)	Item	Daily average (mg/m^3)
NOx	0.06	Pb	0.0003
NO2	0.04	Phenol	0.003
SO2	0.05	Formaldehyde	0.003
CO	3.00		
Dust (SIO2)	0.15		

Note 1: Only main items are shown.
2: Standards as of 1993.

- Water Quality Standards -

Item	Fishery (mg/l)	Drinking (mg/l)	Dangerous (mg/l)
Cr+6	0.02	0.05	3
BOD	-	3 mgO_2/l	-
Fe	0.1	0.3	3
Copper	0.001	1.0	3
Zink(2+)	0.01	1.0	3
Mercury	0.0001	0.0005	1
Arsenic	0.05	0.001	2
Oil-Products	0.05	0.001	4

Note 1: Only main items are shown.
2: Standards as of 1993.

c) National Environmental Program

The preservation of the environment is connected with the sustainable usage of natural resources and the protection or the regeneration of them. Therefore, programs to decrease pollutants in the air and water are being carried out in Kazakhstan. They will create fertile soil and good conditions for vegetation and animals. The main objective of the program is the creation of favorable conditions for the residents of Kazakhstan. The programs are as follows:

- To improve the efficiency of sewage treatment so that the water meets the standards.
- To decrease the volume of pollutants into air from industry to 40% of current levels, and from motor vehicles to 75% of current levels, and to eliminate pollutant release into ponds.
- To increase the capacity to produce equipment for ecological protection.
- To improve soil usage and fertility, and take precautions against erosion.
- To increase the forest area to 136,900 ha and the green-belts in the cities to 47,500 ha.
- To rebuild the irrigation system and improve fresh water usage by 15 - 20%
- To increase the volume of recycled water from 11.7 to 21.3 billion m^3 annually thereby reducing fresh water needs by 30.6%.
- To increase the production of fries in ponds and take preventive measures against declines in the number of fish in the environment.
- To protect the plant and animal kingdoms and their habitats.
- To prohibit industrial and agricultural construction in migration areas, i.e., river flood zones, lakes, water reservoirs, and pastures.
- To control the utilization of agricultural chemicals.
- To improve the control of industrial radioactive emissions.
- To introduce new ideas for the sustainable usage of natural resources and new methods for protecting the environment.

d) Issues at Present

i. Environmental destruction in the Aral Basin

The Aral Sea is a saltwater lake that lies in both Kazakhstan and Uzbekistan. It had an area of about 6,800 km^2 in 1960, making it the fourth largest inland lake in the world. However, the excessive intake of water for land resource development over the last 30 years has caused the lake to shrink. Experts believe the Aral Sea may disappear completely in about 30 years. The dumping of fertilizers, chemicals, and waste from irrigation systems and factories has caused severe pollution in the lake and the surrounding area. Almost half of the people living near the Aral Sea suffer illnesses caused by toxic substances in the air and water.

ii. Radioactive contamination

Around Semipalatinsk, located in the northeastern part of Kazakhstan, 20 nuclear test sites were used during the time of the USSR. Nuclear tests were carried out 470 times at these sites during the period 1949 - 1989. The sites were subsequently closed down, but environmental destruction and health damage due to long-term radioactive contamination has been reported. Concerning the water resources of South-West Buhtarminsk (near Ust-Kamenogorsk), a weak anomaly field 90 km2 in size has been identified with surface Cesium-137 activity of 120-150 micro Curie/m2. However, the radioactivity levels of almost all the polluted sites do not exceed standards.

iii. Environmental pollution due to the development of natural resources

Kazakhstan is a large producer of nonferrous metals; consequently air, water, and soil pollution is a serious problem in Ust-Kamenogorsk, Zhezkazgan, Balkhash, Shimkent and Zhambul, etc., where there are smelting factories. In Karaganda, there is air pollution due to blast furnaces and cement plants.

iv. Rising of the Caspian Sea

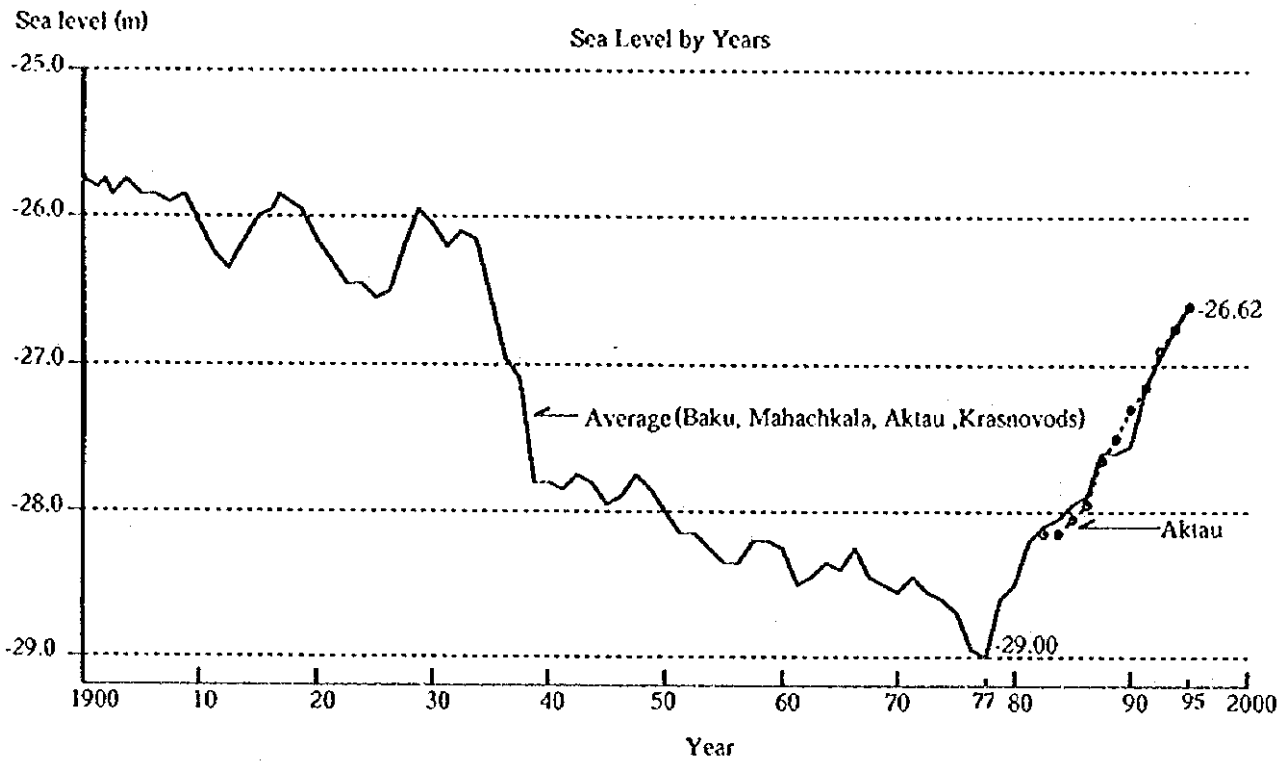
The Caspian Sea is the largest body of water without outflow on the globe. The river Volga (Russia), Kura (Azerbaidjan), Ural (Kazakhstan), Terek (Russia) and a number of smaller rivers are tributaries to the Caspian Sea.

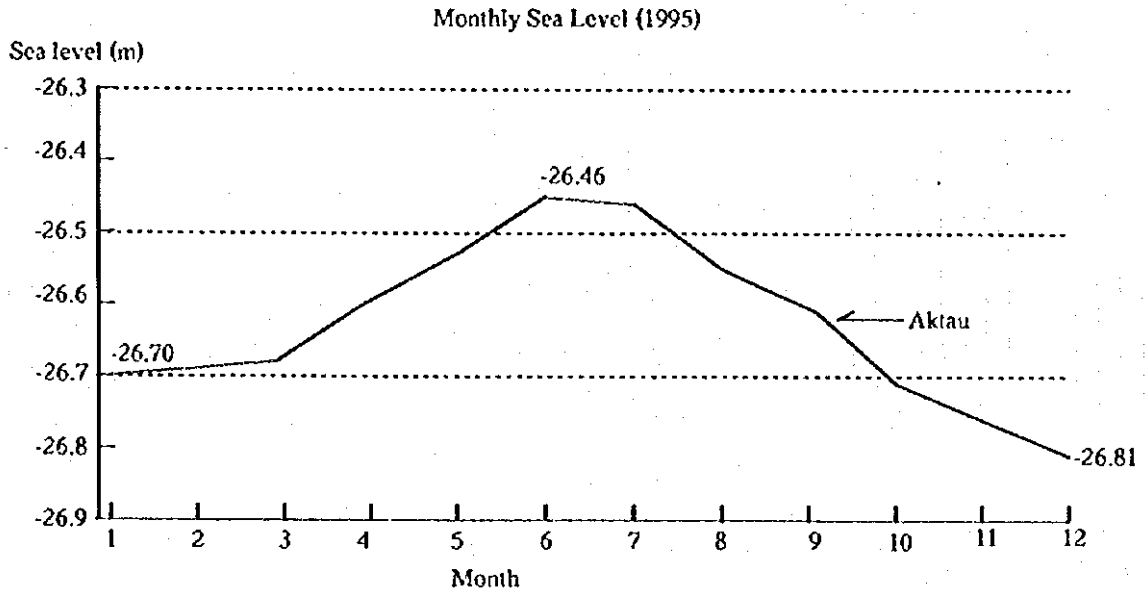
The rise of the Caspian Sea has been going on for 18 years (1978-1995) (**Figure 5.6.1**). In the course of that period the level rose 2.4 m and by 1995 reached the mark -26.62m (Figure 5.6.1). The average rise for that time period was about 13 cm per year and in 1995 the level fluctuated in a 35 cm range. This rise in the Caspian Sea is no extraordinary phenomenon. Similar rises in height and annual average rises were observed in the 18th and 19th centuries.

A study by the Kazakh Scientific-Research Hydrometeorological Institute shows that the present rise of the sea is mainly caused by an increased river flow into the sea and by increased precipitation, and also by some reduction in the amount of sea water evaporation. The rate of the sea level rise was to a certain extent aggravated by the limited inflow of sea water into Kara-Bogaz-Gol Bay (Turkmenistan) in the period from March, 1980 to June, 1992.

To determine the probabilities of the sea reaching various levels, the observed water flow balance for 1556-1992 were used. The problem of forecasting sea levels was solved by using a model with a water balance equation which considers these factors - the inflow to the sea without water consumption, the runoff into Kara-Bogaz-Gol Bay under present conditions, and evaporation.

When planning any construction in the coastal zone it is necessary to have at one's disposal the figures on high water level probabilities for the near and more distant futures. The calculations made at the Kazakh Scientific-Research Hydro-meteorological Institute show that with a confidence coefficient of 96% the sea levels in the year 2000 and 2010 will not exceed -26.3m and -26.2m, respectively.





Source:1. Mangistauskaya hydrometerological observatory
(Aktau city in Magistauskaya state)

2.Kazak Scientific Reserch Institie of Monitoring, Environment and Climate

Figure 5.6.1 The Level of the Caspian Sea

The investigation results indicated a very low probability of continuing rises in the sea and a quite probable cessation of the rising in the near term and a transition to a period of stabilization followed by a slight trend towards reduction in the level of the sea.

However, the cause of the rise is not precisely known. There are at least a dozen possible explanations, in two broad categories: tectonic forces and climatic change of which the main factor is that of precipitation in the Volga basin.

Due to the shallow coastal water and heavy winds in the northeastern part of the Caspian Sea, the sea level fluctuates substantially. The high water level due to the strong winds may last from a few hours to a few days. The Kazakh Scientific-Research Hydro-meteorological Institute estimated the probability of occurrence of waves of various heights as follows:

Aktau region: The Mangyshlack peninsula from Saura village to Peschany cape, the probability of a wave of .92 meters is twice in 100 years.

Atyrau region: The coast from the mouth of the Ural river 52 degrees east longitude, the probability of a rising wave of 1.95m is twice in 100 years. At Atyrau city, flooding was recently caused by a rise of the sea level, caused by an increase of Ural river flow and wind effects.

e) Current conditions

i. Air pollution

The results of observations of air pollution in some cities in Kazakhstan in 1995 showed that the most polluted sites were located in Leninogorsk (east of Semipalatinsk) and Shimkent. This is due to pollutants from metallurgic companies. The state of air pollution in cities in Kazakhstan is characterized by the following major pollutants:

- Dust:

Concentrations near the legal limit (LCL=0.15mg/m^3) were observed in 50 % of investigated cities. The most polluted air was found in Aktau (4xLCL) and also in Zhezkazgan (2xLCL). Compared with 1994, the dust concentration had risen in Zhezkazgan and Temirtau (close to Karaganda); on the other hand, it had decreased in Shimkent. Other cities had the same levels as 1994.

(LCL: Legal concentration limit, set by the Ministry of Health)

- SO_2:

The average concentration exceeded the LCL (=0.05mg/m^3) in Leninogorsk (2-3xLCL) and Ust-Kamenogorsk (2-3xLCL). Compared with 1994, there was no significant change in the SO_2 concentrations in the other cities.

- CO:

The average concentration was near the LCL (=3.0mg/m^3) in all cities. Compared with 1994, it had increased slightly in Semipalatinsk, Shimkent and Petropavlovsk.

- NO3 (Nitrogen Peroxide):

In 40 % of the cities in Kazakhstan, the concentration was near the LCL (=0.04mg/m^3) or slightly exceeded it. The highest average concentrations were observed in Leninogorsk (2xLCL) and Petropavlovsk (1.5xLCL). Compared with 1994, NO3 content had increased in Zhezkazgan, Zyryanovsk (close to Ust-Kamenogorsk), and Ust-Kamenogorsk, and it had decreased in Almaty and Ekibastuz.

- Phenol:

The highest average phenol concentrations were observed in Temirtau (2xLCL, LCL=0.003mg/m^3) and Pavlodar (1.8xLCL). A level of 1.3xLCL was observed in Almaty, Zhezkazgan, Karaganda and Ust-Kamenogorsk. The levels in other cities did not exceed the LCL. Compared with 1994, air pollution from phenol had decreased slightly in Almaty, Zyryanovsk and Temirtau, and increased in Zhezkazgan and Ust-Kamenogorsk.

- Formaldehyde:

The high average concentrations of formaldehyde were found out in Leninogorsk (6xLCL, LCL=0.003mg/m^3), Aktyubinsk (4.7xLCL), Almaty (2.3xLCL), Shimkent (2xLCL) and Zhambul (2xLCL). Compared with 1994, the concentration had increased in Aktyubinsk and decreased in Almaty, Zhambul, Zyryanovsk, Leninogorsk and Petropavlovsk.

- Pb:

Average lead concentration increased only in Shimkent (3.3xLCL, LCL=0.0003 mg/m^3). Compared with 1994, the lead content in the air of Shimkent had increased twofold, while the lead concentration in the air of the other cities had not changed markedly.

ii. Surface water quality.

Observations in 1995 showed that the basin of the Ural river (running through Uralsk and Atyrau) was the most polluted. Compared with 1994, the water quality of this basin had deteriorated significantly and the basin of the Ilek river (running through Aktyubinsk) had been heavily polluted, up to 65xLCL for Boron. The water quality of the Shu river (southern Kazakhstan) had deteriorated also with a doubling of the pollution index. The water quality of the basin of the Irtysh river (running through Ust-Kamenogorsk and Semipalatinsk) had improved substantially and the pollution index had decreased compared to 1994. The pollution index of the Sarysu river (central area of Kazakhstan) had decreased from 3.68 to 0.63. The quality of the other river basins had not changed.

(4) Initial Environmental Evaluation

a) Outline of the project

Table 5.6.1 shows the outline of the project.

b) Environmental condition of the project sites

Table 5.6.2 (i) to (xiii) shows the environmental condition of each project site.

Table 5.6.1 Outline of the Project

Item	Content
Project Name	The Study on Air Transport Development in the Republic of Kazakhstan.
Background	An increase in air traffic demand to the year 2020.
Objectives	To formulate a master plan, conduct a feasibility study, improve the management and operation of air transport.
Location	All areas of Kazakhstan.
Executing Agency	Ministry of Transport and Communications, the Republic of Kazakhstan.
Beneficiaries	People in Kazakhstan and visitors.
Type of Project	Air transport development in Kazakhstan.
Airport Types	International / Domestic
Size	Master plan for 22 airports. Feasibility Study not yet defined.
Other Facilities	Terminal building / facilities for lighting, radio communication, fuel storage, etc.
The Number of users / Type of planes	Not yet defined
The Number of departing and arriving aircraft	Not yet defined
Other Special matters	None

Table 5.6.2 Environmental Conditions of the Project Sites

i. Airport: Akmola

SOCIAL ENVIRONMENT	
Item	Condition
Inhabitants (residents, indigenous people, their views on the project, etc.)	There are no residents in the vicinity of the airport.
Land Use (urban area, farmland, historic spot, scenic spot, hospital, etc.)	There are commercial fish ponds and a large lake in the vicinity of the airport. Other areas are grassland and wheat fields.
Economy / Transport (commerce, agriculture, industry, bus terminal, etc.)	The livelihood of the village people near the airport is agriculture and livestock farming. There is one access road to the airport with light traffic.
NATURAL ENVIRONMENT	
Item	Condition
Topography / Geology (steep slope, soft ground, wet land, faults, etc.)	The land in the vicinity of the airport is level. There are wetlands and lakes located in the vicinity of the airport.
Fauna and Flora and their habitats (rare species, mangroves, coral reefs, etc.)	Migratory birds use the large lake near the airport as a staging point. The species are common (geese and ducks etc.).
POLLUTION	
Item	Condition
Complaints (pollution as the uppermost concern, etc.)	None(There are no residents in the vicinity of the airport.)
Countermeasures (regulatory measures, compensation, etc.)	Migratory birds (Investigate the routes and species of migratory birds.) Water quality (Investigate the treatment system of the surface water from the airport.) Land subsidence (Investigate the existence of soft ground.)
Others	None

ii. Airport: Aktyubinsk

SOCIAL ENVIRONMENT	
Item	Condition
Inhabitants (residents, indigenous people, their views on the project, etc.)	There are many residents surrounding the airport. About 50,000 people inhabit the town which is located about 6km from the airport.
Land Use (urban area, farmland, historic spot, scenic spot, hospital, etc.)	Besides the residential areas, the land in the vicinity of the airport is a sparse grassland
Economy / Transport (commerce, agriculture, industry, bus terminal, etc.)	Aktyubinsk has heavy industries (Cr, Cu, etc.), chemical industries and agricultural equipment production. There is one access road to the airport with light traffic.
NATURAL ENVIRONMENT	
Item	Condition
Topography / Geology (steep slope, soft ground, wet land, faults, etc.)	The land in the vicinity of the airport is level.
Fauna and Flora and their habitats (rare species, mangroves, coral reefs, etc.)	There are no habitats for rare animals and plants.
POLLUTION	
Item	Condition
Complaints (pollution as the uppermost concern, etc.)	None
Countermeasures (regulatory measures, compensation, etc.)	Consider aircraft accidents, groundwater (the pumping volume), air pollution, and aircraft noise levels.
Others	None

iii. Airport: Almaty

SOCIAL ENVIRONMENT	
Item	Condition
Inhabitants (residents, indigenous people, their views on the project, etc.)	There are many residents in the vicinity of the airport. A densely populated area is located 4km away from the end of the runway.
Land Use (urban area, farmland, historic spot, scenic spot, hospital, etc.)	Besides the residential areas, the land in the vicinity of the airport is farmland.
Economy / Transport (commerce, agriculture, industry, bus terminal, etc.)	Almaty has many kinds of industries. There is one access road to the airport with heavy traffic.
NATURAL ENVIRONMENT	
Item	Condition
Topography / Geology (steep slope, soft ground, wet land, faults, etc.)	The land in the vicinity of the airport is level.
Fauna and Flora and their habitats (rare species, mangroves, coral reefs, etc.)	There are no habitats for rare animals and plants.
POLLUTION	
Item	Condition
Complaints (pollution as the uppermost concern, etc.)	No information
Countermeasures (regulatory measures, compensation, etc.)	Consider traffic noise in 2020, aircraft accidents and pollution. Investigate and forecast aircraft noise levels.
Others	None

iv. Airport: Shimkent

SOCIAL ENVIRONMENT	
Item	Condition
Inhabitants (residents, indigenous people, their views on the project, etc.)	There are many residents in the vicinity of the airport.
Land Use (urban area, farmland, historic spot, scenic spot, hospital, etc.)	Besides the residential areas, the land in the vicinity of the airport is farmland
Economy / Transport (commerce, agriculture, industry, bus terminal, etc.)	Shimkent is the hub of the mining region in the south and supports lead and chemical factories and fruit canneries. There is one access road to the airport with light traffic.
NATURAL ENVIRONMENT	
Item	Condition
Topography / Geology (steep slope, soft ground, wet land, faults, etc.)	There are several small hills in the vicinity of the airport.
Fauna and Flora and their habitats (rare species, mangroves, coral reefs, etc.)	No information
POLLUTION	
Item	Condition
Complaints (pollution as the uppermost concern, etc.)	No information
Countermeasures (regulatory measures, compensation, etc.)	Consider aircraft accidents, groundwater, air pollution, water pollution, soil contamination. Forecast aircraft noise levels, and investigate fauna and flora.
Others	None

v. Airport: Atyrau

SOCIAL ENVIRONMENT	
Item	Condition
Inhabitants (residents, indigenous people, their views on the project, etc.)	Atyrau City is located 6km away from the airport. Many residents, several schools and hospitals are in the vicinity of the airport.
Land Use (urban area, farmland, historic spot, scenic spot, hospital, etc.)	The land in the vicinity of the airport is a sparse grassland.
Economy / Transport (commerce, agriculture, industry, bus terminal, etc.)	Atyrau City produces oil and natural gas. There is one access road to the airport with light traffic.
NATURAL ENVIRONMENT	
Item	Condition
Topography / Geology (steep slope, soft ground, wet land, faults, etc.)	The land in the vicinity of the airport is level. The difference between the Caspian Sea level and the runway is 2.0m. Almost all the soil in the vicinity of the airport is salty.
Fauna and Flora and their habitats (rare species, mangroves, coral reefs, etc.)	There are no habitats for rare animals and plants.
POLLUTION	
Item	Condition
Complaints (pollution as the uppermost concern, etc.)	None
Countermeasures (regulatory measures, compensation, etc.)	Consider aircraft accidents, air pollution, water pollution, aircraft noise levels, and rising of the Caspian Sea level.
Others	None

vi. Airport: Karaganda

SOCIAL ENVIRONMENT	
Item	Condition
Inhabitants (residents, indigenous people, their views on the project, etc.)	A village (4,500 in population) is located about 12km from the airport.
Land Use (urban area, farmland, historic spot, scenic spot, hospital, etc.)	There are grasslands and wetlands in the vicinity of the airport.
Economy / Transport (commerce, agriculture, industry, bus terminal, etc.)	Karaganda is famous for coal and ferrous metal production. The livelihood of the village people is livestock farming. There is one access road to the airport with light traffic.
NATURAL ENVIRONMENT	
Item	Condition
Topography / Geology (steep slope, soft ground, wet land, faults, etc.)	The land in the vicinity of the airport is level.
Fauna and Flora and their habitats (rare species, mangroves, coral reefs, etc.)	There are migratory birds. Three demoiselle cranes were found in the vicinity of the airport on 7 May 1996.
POLLUTION	
Item	Condition
Complaints (pollution as the uppermost concern, etc.)	None
Countermeasures (regulatory measures, compensation, etc.)	Consider groundwater (the pumping volume), fauna and flora, and aircraft noise levels.
Others	None

vii. Airport: Kzyl-Olda

SOCIAL ENVIRONMENT	
Item	Condition
Inhabitants (residents, indigenous people, their views on the project, etc.)	There are no residents in the vicinity of the airport. "Dachyas" are located in the vicinity of the airport.
Land Use (urban area, farmland, historic spot, scenic spot, hospital, etc.)	The land in the vicinity of the airport is grassland.
Economy / Transport (commerce, agriculture, industry, bus terminal, etc.)	Kzyl-Olda City produces furniture, textiles and other goods for export to Germany. There is one access road to the airport with light traffic.
NATURAL ENVIRONMENT	
Item	Condition
Topography / Geology (steep slope, soft ground, wet land, faults, etc.)	The land in the vicinity of the airport is level. There are several small rivers. Salty soil stretches as far as the eye can see.
Fauna and Flora and their habitats (rare species, mangroves, coral reefs, etc.)	There are no habitats for rare animals and plants, only bushes (50cm in height) were found.
POLLUTION	
Item	Condition
Complaints (pollution as the uppermost concern, etc.)	There are no residents in the vicinity of the airport.
Countermeasures (regulatory measures, compensation, etc.)	Consider groundwater (the pumping volume), water pollution , soil contamination , and land subsidence.
Others	None

viii. Airport: Aktau

SOCIAL ENVIRONMENT	
Item	Condition
Inhabitants (residents, indigenous people, their views on the project, etc.)	There are no residents in the vicinity of the airport.
Land Use (urban area, farmland, historic spot, scenic spot, hospital, etc.)	The land in the vicinity of the airport is grassland.
Economy / Transport (commerce, agriculture, industry, bus terminal, etc.)	Aktau is famous for oil and natural gas production, and a nuclear power plant. There are many factories related to these industries. There is one access road to the airport with light traffic.
NATURAL ENVIRONMENT	
Item	Condition
Topography / Geology (steep slope, soft ground, wet land, faults, etc.)	The land in the vicinity of the airport is level. The Caspian Sea is 10km from the airport. The difference between the Caspian Sea level and the runway is 22.0m.
Fauna and Flora and their habitats (rare species, mangroves, coral reefs, etc.)	Foxes, Steppe-antelopes, Gophers, Hares, Lizards, Sea-Gulls and Swallows, etc., inhabit the vicinity of the airport. Migratory (Flamingos, Swans) birds are well known.
POLLUTION	
Item	Condition
Complaints (pollution as the uppermost concern, etc.)	There are no residents in the vicinity of the airport.
Countermeasures (regulatory measures, compensation, etc.)	Consider the rising of the Caspian Sea level. Investigate the routes of the migratory birds.
Others	None

ix. Airport: Pavlodar

SOCIAL ENVIRONMENT	
Item	Condition
Inhabitants (residents, indigenous people, their views on the project, etc.)	A village (5,000-10,000 in population) with one school is located about 5km from the airport.
Land Use (urban area, farmland, historic spot, scenic spot, hospital, etc.)	Except for the village, almost all of the area in the vicinity of the airport is grassland.
Economy / Transport (commerce, agriculture, industry, bus terminal, etc.)	Pavlodar City produces coal, agricultural equipment, chemicals (Aluminum, Silica, etc.) and other products. The livelihood of the village people is livestock farming. There is one access road to the airport with light traffic.
NATURAL ENVIRONMENT	
Item	Condition
Topography / Geology (steep slope, soft ground, wet land, faults, etc.)	The land in the vicinity of the airport is level.
Fauna and Flora and their habitats (rare species, mangroves, coral reefs, etc.)	There are no habitats for rare animals and plants.
POLLUTION	
Item	Condition
Complaints (pollution as the uppermost concern, etc.)	None
Countermeasures (regulatory measures, compensation, etc.)	Consider aircraft accidents, air pollution, and aircraft noise levels.
Others	None

x. Airport: Uralsk

SOCIAL ENVIRONMENT	
Item	Condition
Inhabitants (residents, indigenous people, their views on the project, etc.)	A village (pop. 2,000) with two schools and one hospital is located about 6km from the airport.
Land Use (urban area, farmland, historic spot, scenic spot, hospital, etc.)	There are mostly wheat fields in the vicinity of the airport.
Economy / Transport (commerce, agriculture, industry, bus terminal, etc.)	There is one access road to the airport with light traffic.
NATURAL ENVIRONMENT	
Item	Condition
Topography / Geology (steep slope, soft ground, wet land, faults, etc.)	The land in the vicinity of the airport is levels.
Fauna and Flora and their habitats (rare species, mangroves, coral reefs, etc.)	There are no habitats for rare animals and plants.
POLLUTION	
Item	Condition
Complaints (pollution as the uppermost concern, etc.)	None
Countermeasures (regulatory measures, compensation, etc.)	Consider groundwater (the pumping volume), air pollution , water pollution, and aircraft noise levels.
Others	None

xi. Airport: Ust-Kamenogorsk, Balkhash, Kostanay, Semipalatinsk

SOCIAL ENVIRONMENT	
Item	Condition
Inhabitants (residents, indigenous people, their views on the project, etc.)	There are many residents in the vicinity of the airport.
Land Use (urban area, farmland, historic spot, scenic spot, hospital, etc.)	No information
Economy / Transport (commerce, agriculture, industry, bus terminal, etc.)	Ust-Kamenogorsk produces non-ferrous metals. Balkhash produces chemical products. Kostanay produces iron, steel and textiles. Semipalatinsk produces leather goods.
NATURAL ENVIRONMENT	
Item	Condition
Topography / Geology (steep slope, soft ground, wet land, faults, etc.)	The land in the vicinity of the airport is level.
Fauna and Flora and their habitats (rare species, mangroves, coral reefs, etc.)	No information
POLLUTION	
Item	Condition
Complaints (pollution as the uppermost concern, etc.)	None
Countermeasures (regulatory measures, compensation, etc.)	Consider aircraft accidents, traffic noise levels, groundwater, fauna and flora, air pollution, water pollution, soil contamination, aircraft noise levels, and land subsidence.
Others	None

Note: information from topographic map

xii. Airport: Arkalyk, Ekibastuz, Kokchetau, Petropavlovsk, Zhambul, Zhezkazgan

SOCIAL ENVIRONMENT	
Item	Condition
Inhabitants (residents, indigenous people, their views on the project, etc.)	There are no residents.
Land Use (urban area, farmland, historic spot, scenic spot, hospital, etc.)	No information
Economy / Transport (commerce, agriculture, industry, bus terminal, etc.)	These towns produce maize, coal and lignite, furniture, leather, farm machines, lead, and copper.
NATURAL ENVIRONMENT	
Item	Condition
Topography / Geology (steep slope, soft ground, wet land, faults, etc.)	The land in the vicinity of the airport is level.
Fauna and Flora and their habitats (rare species, mangroves, coral reefs, etc.)	No information
POLLUTION	
Item	Condition
Complaints (pollution as the uppermost concern, etc.)	None
Countermeasures (regulatory measures, compensation, etc.)	Consider groundwater, fauna and flora, water pollution, soil contamination, and land subsidence.
Others	None

Note: information from topographic map

xiii. Airport: Urdzhar, Zaysan

Due to a lack of current information and the inability to carry out an on-site investigation, the following items should be considered when planning new airports at these sites:

- Resettlement
- Traffic and public facility
- Split of communities
- Cultural property
- Water right
- Hazard
- Topography
- Soil erosion
- Groundwater
- Fauna and flora
- Landscape
- Air pollution
- Soil contamination
- Land subsidence

(5) Screening

Screening is a check list procedure used to determine whether it is necessary to consider environmental factors in a development project. **Table 5.6.3** shows the entire "screening" evaluation results. The details of the "screening" of each project are included in **Appendix - 5.6 (2)**.

(6) Scoping

Scoping is the determination of major environmental items which may be expected to impact the area surrounding the airport after the implementation of the project. This will be performed by means of a check list. **Table 5.6.4** shows the entire "scoping" evaluation results. The details of the "scoping" of each project are included in **Appendix - 5.6 (3)**.

(7) OECF Environmental Check-list

Recognizing the importance of environmental issues, OECF (Overseas Economic Cooperation Fund of Japan) has made a check-list for environmental impact assessments to aid in the planning of infrastructure development projects. **Table 5.6.5** shows the entire "OECF Environmental Check-list" evaluation results. The details of the "OECF Environmental Check-list" for each project are included in **Appendix - 5.6 (4)**.

(8) Overall evaluation

The survey results on 22 airports are shown below. Environmental items were selected from the Initial Environmental Evaluation for Environmental Impact Assessment. The results from ten airports (Akmola, Aktyubinsk, Almaty, Shimkent, Atyrau, Karaganda, Kzyl-Olda, Aktau, Pavlodar, Uralsk) were determined by an on-site investigation, the remaining data was taken from existing records. The items noted in each category are points of concern at that site.

a) Akmola

Hazards: Risk of aircraft accidents

Fauna and Flora: Migratory birds
Air Pollution
Water Pollution: Treatment of the surface water on the airport
Noise: Aircraft noise levels
Land Subsidence
Environmental Impact during Construction Phase: Muddy water discharge

b) Aktyubinsk

Hazards: Risk of aircraft accidents

Groundwater
Air Pollution
Noise: Aircraft noise levels
Environmental Impact during Construction Phase: Muddy water discharge

c) Almaty

Hazards: Risk of aircraft accidents

Air Pollution
Water Pollution
Noise: Aircraft noise levels, Motor vehicle noise levels
Environmental Impact during Construction Phase: Muddy water discharge

d) Shimkent

Hazards: Risk of aircraft accidents

Groundwater
Fauna and Flora
Air Pollution
Water Pollution
Soil Contamination
Noise: Aircraft noise levels
Land Subsidence
Environmental Impact during Construction Phase: Muddy water discharge

e) Atyrau

Hazards: Risk of rising of the Caspian Sea and aircraft accidents

Air Pollution
Water Pollution

Noise: Aircraft noise levels
Environmental Impact during Construction Phase: Muddy water discharge

f) Karaganda

Groundwater

Fauna and Flora: Migratory birds
Noise: Aircraft noise levels
Environmental Impact during Construction Phase: Muddy water discharge

g) Kzyl-Olda

Groundwater

Water Pollution: Effect of anti-freeze chemicals
Soil Contamination: Effect of anti-freeze chemicals
Land Subsidence
Environmental Impact during Construction Phase: Muddy water discharge

h) Aktau

Hazards: Risk of rising of the Caspian Sea

Fauna and Flora: Migratory birds
Environmental Impact during Construction Phase: Muddy water discharge

i) Pavlodar

Hazards: Risk of aircraft accidents

Air Pollution
Noise: Aircraft noise levels
Environmental Impact during Construction Phase: Muddy water discharge

j) Uralsk

Groundwater

Air Pollution
Water Pollution
Noise: Aircraft noise levels
Environmental Impact during Construction Phase: Muddy water discharge

k) Ust-Kamenogorsk, Balkhash, Kostanay, Semipalatinsk

Motor vehicle noise levels, Hazards, Groundwater, Fauna and flora, Air Pollution, Water Pollution, Soil contamination, Aircraft noise, Land subsidence, Environmental Impact during Construction Phase

l) Arkalyk, Ekibastuz, Kokchetau, Petropavlovsk, Zhambul, Zhezkazgan

Groundwater, Fauna and flora, Water Pollution, Soil contamination, Land subsidence, Environmental Impact during Construction Phase

m) Urdzhar, Zaysan

Resettlement, Motor vehicle noise levels, Split communities, Cultural Property, Water rights, Hazards, Topography, Soil erosion, Groundwater, Fauna and flora,

Landscape, Air Pollution , Water Pollution, Soil contamination, Noise (Aircraft noise levels), Land subsidence, Environmental Impact during Construction Phase

(9) Field Survey of the Feasibility Study

A proposed outline of the field survey regarding selected priority projects is as follows:

a) Hazards
- The rate of aircraft accidents during landing and take off
- Bird hazards
- Weather conditions
- Risk of rising of the Caspian Sea

b) Groundwater
- Water requirements of the project
- Capacity of the aquifer

c) Fauna and Flora
- The state of migratory birds in the vicinity of the airport: migration routes, staging points, numbers, species, migratory seasons

d) Air Pollution
- Air pollution levels
- Weather conditions
- Local topography

e) Water Pollution
- Water pollution levels
- Treatment system of sewage and surface water
- Water use in the vicinity of the airport

f) Soil Contamination
- Factors relating to soil contamination

g) Noise
- Aircraft noise measurement and forecasts
- Motor vehicle noise

h) Land Subsidence
- Existence of soft ground (peat, etc.)
- Water requirements and planned pumping

i) Environmental Impact during Construction Phase
- Countermeasures for the emission of muddy water, dust and noise during the construction phase.

Table 5.6.3 Screening (all airports)

No.	Environmental Item	A-1	A-2	A-3	A-4	A-5	A-6	A-7	A-8	A-9	A-10	A-11	A-12	A-13	A-14	A-15	A-16	A-17	A-18	A-19	A-20	A-21	A-22
	Social Environment																						
1	Resettlement	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	?	?
2	Economic Activities	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3	Traffic and Public Facilities	-	-	?	?	?	?	?	?	-	-	?	?	?	-	-	-	?	?	-	?	?	?
4	Split of Communities	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	?	?
5	Cultural Property	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	?	?
6	Water Rights and Rights of Common	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	?	?
7	Public Health Condition	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
8	Waste	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
9	Hazards (Risk)	?	Y	Y	-	Y	Y	-	-	?	-	-	-	Y	-	?	Y	-	Y	-	Y	?	?
	Natural Environment																						
10	Topography and Geology	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	?	?
11	Soil Erosion	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
12	Groundwater	-	?	-	?	?	?	?	?	-	?	?	?	?	?	-	-	?	?	?	?	?	?
13	Hydrological Situation	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
14	Coastal Zone	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
15	Fauna and Flora	?	-	-	?	?	?	?	?	-	?	?	?	?	-	?	-	?	?	-	?	?	?
16	Meteorology	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
17	Landscape	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	?	?
	Pollution																						
18	Air Pollution	?	?	?	-	?	?	-	-	?	-	-	-	?	-	-	?	-	?	?	?	?	?
19	Water Pollution	?	-	?	?	?	?	?	?	?	-	?	?	?	?	-	-	?	?	?	?	?	?
20	Soil Contamination	-	-	-	?	?	?	?	?	-	-	?	?	?	?	-	-	?	?	-	?	?	?
21	Noise and Vibration	?	Y	Y	-	?	?	-	-	Y	?	-	-	?	-	-	?	-	?	?	?	?	?
22	Land Subsidence	?	-	-	?	?	?	?	?	-	-	?	?	?	?	-	-	?	?	-	?	?	?
23	Offensive Odors	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Overall Evaluation	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y

Note 1: "Y": Some impact is expected.
"- ": No impact is expected. IEE / EIA is not necessary.
"?": Extent of impact is unknown (Examination is needed. Impact may become clear as study progresses.)

Note 2: The evaluation should be made with reference to the "Environmental Guide Lines for Infrastructure Projects, Airport, 1994,1, JICA"

Note 3: A-1:Akmola, A-2:Aktyubinsk, A-3:Almaty, A-4:Arkalyk, A-5:Balkhash, A-6:Shymkent, A-7:Zambul, A-8:Zhezkazgan, A-9:Atyrau, A-10:Karaganda, A-11:Kokchetau, A-12:Ekibastuz, A-13:Kostanay, A-14:Kzyl-Olda, A-15:Aktau, A-16:Pavlodar, A-17:Petropavlovsk, A-18:Semipalatinsk, A-19:Ural'sk, A-20:U'st-Kamenogorsk, A-21:Urdzhar, A-22:Zaysan

Table 5.6.4 Scoping (all airports)

No.	Environmental Item	A-1	A-2	A-3	A-4	A-5	A-6	A-7	A-8	A-9	A-10	A-11	A-12	A-13	A-14	A-15	A-16	A-17	A-18	A-19	A-20	A-21	A-22
	Social Environment																						
1	Resettlement	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	C	C
2	Economic Activities	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3	Traffic and Public Facilities	-	-	C	C	C	C	C	C	-	-	C	C	C	-	-	-	C	C	-	C	C	C
4	Split of Communities	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	C	C
5	Cultural Property	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	C	C
6	Water Rights and Rights of Common	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	C	C
7	Public Health Condition	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
8	Waste	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
9	Hazards (Risk)	C	B	B	-	B	B	-	-	C	-	-	-	B	-	C	B	-	B	-	B	C	C
	Natural Environment																						
10	Topography and Geology	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	C	C
11	Soil Erosion	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
12	Groundwater	-	C	-	C	C	C	C	C	-	C	C	C	C	C	-	-	C	C	C	C	C	C
13	Hydrological Situation	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
14	Coastal Zone	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
15	Fauna and Flora	C	-	-	C	C	C	C	C	-	C	C	C	C	-	C	-	C	C	-	C	C	C
16	Meteorology	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
17	Landscape	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	C	C
	Pollution																						
18	Air Pollution	C	C	C	-	C	C	-	-	C	-	-	-	C	-	-	C	-	C	C	C	C	C
19	Water Pollution	C	-	C	C	C	C	C	C	C	-	C	C	C	C	-	-	C	C	C	C	C	C
20	Soil Contamination	-	-	-	C	C	C	C	C	-	-	C	C	C	C	-	-	C	C	-	C	C	C
21	Noise and Vibration	C	B	B	-	C	C	-	-	B	C	-	-	C	-	-	C	-	C	C	C	C	C
22	Land Subsidence	C	-	-	C	C	C	C	C	-	-	C	C	C	C	-	-	C	C	-	C	C	C
23	Offensive Odors	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Note 1: "A": Serious impact is expected.
"B": Some impact is expected.
"C": Extent of impact is unknown (Examination is needed. Impact may become clear as study progresses.)
"-": No impact is expected. IEE / EIA is not necessary.

Note 2: The evaluation should be made with reference to the "Environmental Guide Lines for Infrastructure Projects, Airport, 1994,1, JICA"

Note 3: A-1:Akmola, A-2:Aktyubinsk, A-3:Almaty, A-4:Arkalyk, A-5:Balkhash, A-6:Shymkent, A-7:Zambul, A-8:Zhezkazgan, A-9:Atyrau, A-10:Karaganda, A-11:Kokchetau, A-12:Ekibastuz, A-13:Kostanay, A-14:Kzyl-Olda, A-15:Aktau, A-16:Pavlodar, A-17:Petropavlovsk, A-18:Semipalatinsk, A-19:Ural'sk, A-20:U'st-Kamenogorsk, A-21:Urdzhar, A-22:Zaysan

Table 5.6.5 OECF - Environmental Evaluation List (all airports)

CHECK ITEM	A-1	A-2	A-3	A-4	A-5	A-6	A-7	A-8	A-9	A-10	A-11	A-12	A-13	A-14	A-15	A-16	A-17	A-18	A-19	A-20	A-21	A-22
Pollution;																						
1. Aquatic organisms, fisheries & other water utilization.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	C	C
2. Water pollution caused by sewage and soil erosion.	C	-	C	C	C	C	C	C	C	-	C	C	C	-	-	C	-	C	C	C	C	C
3. Aircraft noise pollution.	C	B	B	C	C	C	-	-	B	C	-	-	C	-	-	-	-	C	C	C	C	C
Natural Environment;																						
1. Ecological effects.	C	-	-	C	C	C	C	C	-	C	C	C	C	-	C	C	-	C	-	C	C	C
2. Erosion of river and beach	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3. Effects on landscape	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Social Environment;																						
1. Effect on historical ruins and cultural assets.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2. Effect on existing infrastructure.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3. Resettlement.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Others;																						
1. Environmental impact during construction phase.	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
2. Environmental monitoring system (In the case of no existing plan: "-")	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Note 1) "A": An adverse effect would unquestionably be induced by the project.
"B": An adverse effect is likely to be induced by the project.
"C": It cannot be confirmed at this stage whether an adverse effect is likely or not.
"-": There is no possibility of an adverse effect being induced by the project.

Note 2) A-1:Akmola, A-2:Aktyubinsk, A-3:Almaty, A-4:Arkalyk, A-5:Balkhash, A-6:Shymkent, A-7:Zambul, A-8:Zhezkazgan, A-9:Atyrau, A-10:Karaganda, A-11:Kokchetau, A-12:Ekibastuz, A-13:Kostanay, A-14:Kzyl-Olda, A-15:Aktau, A-16:Pavlodar, A-17:Petropavlovsk, A-18:Semipalatinsk, A-19:Ural'sk, A-20:U'st-Kamenogorsk, A-21:Urdzhar, A-22:Zaysan