PART II

MASTER PLANNING OF THE FOUR AIRPORTS

Chapter 3 Air Traffic Demand Forecast

CHAPTER 3 AIR TRAFFIC DEMAND FORECAST

3.1 SUMMARY

This chapter describes air traffic demand forecast, which principally determines airport facility requirements, i.e., the size of the airport and thus the scale of required investment. "The objective of forecasting is not to predict the future with precision, but to provide information that can be used to evaluate effects of uncertainty about the future."[1] It is noted that peak hour traffic volume is more important than annual traffic volume for evaluating facility requirements, and also that at relatively small airports like the four airports under this Study, changes in annual traffic volume will not always affect peak hour traffic volume since flight frequencies may be increased or decreased without changing peak hour traffic volume.

The basic methodology of the forecast is an econometric modeling of the total annual air passenger demand in the Philippines with GDP as a parameter. Three cases of the forecast, i.e., high, medium and low cases, are produced for three different scenarios of GDP growth rate. Annual air passenger demand of each of the four airports is estimated with a fixed share to the total air passenger demand in the Philippines. Annual aircraft movement forecast is carried out based on the result of air passenger forecast and the projection of aircraft introduction criteria, which determine type of aircraft to be used as a function of annual air passenger demand of a route. Peak hour forecast is finally undertaken to obtain important planning basis such as peak hour air passengers and peak hour aircraft movements.

The summary of air traffic forecast is presented in Table 3.1.1.

Table 3.1.1 Summary Results of Air Traffic Demand Forecast

Year	1995	2005	2015
Annual Passengers			
Bacolod	371,955	1,003,000	1,436,000
Iloilo	460,423	1,179,000	1,688,000
Tacloban	258,190	655,000	938,000
Legaspi	161,977	375,000	537,000
Annual Cargo Volume (ton)			
Bacolod	7,581	15,600	22,400
Iloilo	4,771	12,800	18,400
Tacloban	2,881	5,600	8,000
Legaspi	919	1,900	2,700

to be continued

[1] ICAO, Airport Planning Manual: Part 1 - Master Planning (Doc 9184-AN/902 Part 1)

Table 3.1.1 (Continued)

Year	1995	2005	2015
Annual Aircraft Movements			
Bacolod	24,444	7,060	8,890
Iloilo	14,486	9,280	11,400
Tacloban	3,094	5,010	6,730
Legaspi	2,332	4,360	5,130
Peak Hour Passengers (2-way)			
Bacolod	280	630	830
Iloilo	330	670	900
Tacloban	280	480	600
Legaspi	280	290	380
Peak Hour Aircraft Movements (2-way)			
Bacolod	2	3.9	4.5
Iloilo	3	4.6	5.4
Tacloban	2	3.2	3.8
Legaspi	2	3.0	3.2

Note: Aircraft movements does not include general aviation aircraft.

3.2 ANALYSIS OF PAST AIR TRAFFIC

3.2.1 Passenger Movement

Except for a demand stagnancy caused by economic recession that hit the Philippines between 1990 and 1992, the number of passengers using domestic airlines throughout the whole country of the Philippines has shown an average rate of increase of 2.7% in the period between 1986 and 1994. Ever since 1990 and, in particular, most recently in 1993 and 1994, the average rate of increase has been very high to reach at 10.3% annual growth reflecting the recent trend of economic recovery and growth.

The level of passenger movement at each of the target airport (Legaspi, Iloilo, Bacolod and Tacloban), although not uniform, has also shown a steady rate of increase since 1990 (see Table 3.2.1).

The following paragraphs give some consideration to the variation in passenger movements that have been witnessed by each of the target airport.

1) Legaspi Airport (Area 4, Region 5)

The number of passengers at this airport was 260,226 in 1986. However, this fell to 145,267 in 1994, representing a decline of approximately 56% or an average annual fall of 5.9%. Having said that, since 1990, when the annual passengers reached at a bottom of 117,454, there has been a steady recovery at an average annual growth rate of 5.8% per year until 1994.

Table 3.2.1 Air Passenger Movements

(unit: persons)

	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
Legaspi	260,226 3.4%	171,588	176,314	346,524	117,454 1.4%	145,491	144,260	138,461	145,267 1.50%	155,523
A.A.G.R			22.0%					5.8%		
						5.9%				
Iloilo	370,764 4.9%	404,086	376,692	442,078	414,936 5.0%	351,952	382,760	437,185	470,573 5.00%	460,423
A.A.G.R			2.9%					2.1%		
						2.1%				
Bacolod	309,757 4.1%	209,210	265,934	360,186	334,377 4.5%	324,987	324,502	384,657	317,202 3.40%	371,955
A.A.G.R			1.9%					2.2%		
						2.1%				
Tacloban	202,286 2.7%	217,969	271,340	476,056	196,821 2.3%	170,596	144,087	167,867	239,777 2.50%	265,995
A.A.G.R			0.7%					6.2%		
						3.1%				
Philippine Grand	7,630,558 100%	7,578,475	8,535,276	10,332,732	8,379,508 100%	8,039,598	7,755,197	8,377,026	9,430,004 100%	
A.A.G.R			2.4%					3.0%		
						2.7%				

Note : A.A.G.R ; Average Annual Grouth Rate

Source : DOTC/ATO

The overall fall in the number of passengers is considered to be the result of passengers preferring to use other mode of transport (road and intra-regional sea transport) as a result of improvements made in such modes. High rate of flight cancellation (nearly 10% of a total scheduled flights annually) due to climatic reasons must have caused loss of patronage in air and, as a result, attributed to the relatively low growth rate of air passengers. In turms of the airport's share in the total domestic passengers in the Philippines, this has also fallen from 3.4% to 1.5% in the period between 1986 and 1994.

2) **Iloilo Airport (Area 5, Region 6)**

Except for a slight decline that occurred during the recession from 1990 to 1992, the number of annual passengers at this airport has risen from 370,704 to 470,573 at an average growth rate of 2.1% in the period between 1986 and 1994. This rate of increase is, however, below the national average of 2.7%. The airport's share in the total domestic passengers in the Philippines was 5.0% in 1994, which represents practically no change from its share in 1986.

3) **Bacolod Airport (Area 5, Region 6)**

The trend of air passenger movements at this airport has been identical to that of Iloilo Airport, except for the slight period of decline brought about by the recession. The annual number of air passengers has increased at a rate of 2.1% between 1986 and 1994. The number of passengers fell in 1994 because the airport was closed due to the obstacles on the approach surface. The airport's share in the total domestic passengers in the Philippines was approximately 4.0% in 1994, which represents practically no change from its share in 1990.

4) **Tacloban Airport (Area 6, Region 8)**

The annual number of air passengers at this airport has declined after reaching at the peak of 476,056 in 1989. However, since 1992 when the number reached at the lowest of 144,087, the number has been increasing again and has reached at 265,995 per year in 1995. Based on the figures for the period between 1986 and 1995, the average rate of increase in this period has been 3.1% (excluding unusable values in mid years), and this is almost the same as the national rate of increase in domestic passengers. The airport's share in the total domestic airport passengers in the Philippines maintained almost same value of 2.7% (1986) and 2.5% (1994).

3.2.2 Cargo Movements

As was the case of air passenger movements, the volume of cargo movements in the whole country fell as a result of economic recession in 1992 and 1993 (see Table 3.2.2). However there has been almost no change in the level of movements since 1990. Although the overall volume has increased by approximately 60% from 103,043 ton in 1986 to 166,079 ton in 1994, this increase occurred between 1986 and 1990, and there has been little growth since then.

Despite this, the volumes of cargo movements at each of the target airports have, except for the drop caused by the recession in 1991, been increasing (although not at a uniform level). The following paragraphs give some consideration to the variation in cargo movement that have been witnessed at each target airport.

1) Legaspi Airport

In similar manner as air passenger movements, the air cargo movements have declined from 1,676 ton in 1987 to 444 ton in 1992 and then started to pick up again to reach at 936 ton in 1994. However, the cargo volume handled in 1994 is only a quarter of that in 1987 and slightly declined again to 919 in 1995. This decline is again considered to be the result of demand shifting away to other modes of transport due to improvements made in them as well as air patronage loss due to unreliability of air services previously mentioned. The airport's share of in the total domestic air cargo volume in the Philippines has fallen 1.1% in 1986 to 0.6% in 1994.

2) Iloilo Airport

Air cargo movements at this airport were characterized by a decrease from 5,654 ton in 1986 to 4,772 ton in 1995. In the mean time, cargo movements reached at the lowest of 3,481 ton in 1991 during the recession. Although it has recovered somewhat since then, the current level in 1995 is still lower than those experienced during the late 1980s. Judging from an increase in the cargo handling volume at Iloilo Sea Port, this decline in air cargo movements may be the result of cargo shifting away from air transport to sea transport. The fact that the airport's share in the total domestic air cargo volume in the Philipplies has fallen from 5.5% in 1986 to 3.9% as of 1994 may also be a reflection of this situation.

Table 3.2.2 Air Cargo Movements

(unit: kg)

	1986		1987	1988	1989	1990		1991	1992	1993	1994		1995
Legaspi	1,122,646	2.1%	1,676,386	1,570,702	822,224	740,426	0.4%	470,426	443,659	787,843	935,880	0.6%	919,194
A.A.G.R				11.0%						4.4%			
								2.2%					
Iloilo	5,654,000	5.5%	6,280,169	4,526,653	5,521,924	4,339,169	2.6%	3,481,364	5,154,130	5,042,934	5,134,575	3.9%	4,771,960
A.A.G.R				6.8%						1.9%			
								1.9%					
Bacoiod	1,974,000	1.9%	1,334,405	2,919,075	8,539,666	6,048,945	3.6%	4,441,200	5,405,921	11,471,771	5,245,734	3.2%	7,581,721
A.A.G.R				32.3%						4.6%			
								16.1%					
Tacloban	1,558,000	1.5%	NR	1,926,401	3,019,382	1,841,365	1.1%	1,813,413	4,251,219	1,730,216	2,547,016	1.5%	3,359,220
A.A.G.R				4.3%						12.8%			
								8.9%					
Philippine Grand Total	103,043,330	100%	134,212,658	157,631,644		166,305,356	100%	124,842,781	147,829,573	163,946,951	166,079,730	100%	
A.A.G.R				12.7%						0.03%			
								6.1%					

Note : A.A.G.R ; Average Annual Grouth Rate

Source : DOTC/ATO

3) Bacolod Airport

The statistics of air cargo volume at Bacolod in the last ten years shows somewhat erratic values as seen in Table 3.2.2. That is, it grew more than four times from 1,974 ton (1986) to 8,540 ton (1989) including over 30% drop to 1,334 ton (1987), then after falling down to 4,441 ton in 1991 it grew up to 7,581 ton in 1995 including one doubtful amount of 11,472 ton in 1993. It is thought that the recent positive growth trend of air cargo at Bacolod can be the result of recent urbanization and development in commercial activities taking place in Negros Occidental Province, which has Bacolod as its center. The share of the airport out of the total domestic air cargo volume in the Philippines has also increased rapidly from 1.9% in 1986 to 3.2 % as of 1995.

4) Tacloban Airport

Cargo movements at this airport have also been on the increase. Excluding the period of recession from 1990 to 1991, cargo movements have increased at an average of 8.9% in the period between 1986 and 1995. Whereas the cargo volume in 1986 was 1,560 ton, this has more than doubled to approximately 3,360 ton in 1995. It is thought that this increase is closely linked to the development of Cebu in the recent years. The airport's share in the total domestic air cargo volume in the Philippines remained unchanged between 1986 and 1995 at 1.5%. This fact indicates that the cargo handling volume at the airport has grown at the same rate as the national handling volume.

3.2.3 Aircraft Movements

After reaching at a peak in 1989, domestic aircraft movements in the Philippines decreased in the recession years of 1990 and 1991. Although it made a slight recovery in 1992, it has continued to fall the stagnate in 1993 and 1994 (see Table 3.2.3).

Following the liberalization of the airline industry in 1994, Air Philippines, Cebu Pacific Air and Grand International Airways have entered into the market in addition to Philippine Airlines, which had enjoyed a monopoly in the sector. It is thought that the continuing fall in the level of aircraft movements may be caused partially by the general restructuring of the industry that has been brought about by the entry into the market of these new airlines. Increase of the fleet size of PAL from BAC1-11 to B737 and introduction of A300 must be another factor which has contributed to decrease the number of aircraft movements.

Table 3.2.3 Aircraft Movements

(unit: movements)

	1986		1987	1988	1989	1990		1991	1992	1993	1994		1995
Legaspi	3,019	1.5%	3,506	3,684	3,824	3,678	1.3%	3,284	3,628	2,810	2,600	1.2%	2,332
A.A.G.R				5.1%				2.9%		9.5%			
Iloilo	8,465	4.2%	10,298	11,588	21,584	23,564	8.2%	13,248	19,244	16,552	15,508	7.2%	14,486
A.A.G.R				29.2%				6.2%		10.2%			
Bacolod	6,830	3.4%	13,654	17,024	34,132	34,112	11.9%	32,500	29,018	26,896	23,396	10.8%	24,444
A.A.G.R				49.5%				15.2%		6.9%			
Tacloban	4,014	2.0%	4,299	3,535	4,156	3,484	1.2%	2,514	2,416	2,276	3,488	1.6%	3,094
A.A.G.R				3.6%				2.9%		2.4%			
Philippine Grand Total	202,407	100%	213,690	232,381	303,079	285,719	100%	218,472	223,234	199,489	216,604	100%	
A.A.G.R				9.0%				0.9%		7.2%			

Note : A.A.G.R ; Average Annual Grouth Rate

Source : DOTC/ATO

The annual aircraft movements between 1986 and 1994 has remained more or less unchanged, with slight increase at a rate of 0.9%. Between 1986 and 1990, the total movements grew at a rate of 9.0%, however, the fact that it has declined at an average rate of 7.2% ever since 1990 indicates the aforementioned stagnation in aircraft movements among domestic airline as well as partially increase of average capacity of aircraft employed in domestic routes.

The following paragraphs describe an analyses on the variation in aircraft movements that have been experienced by each target airport.

1) **Legaspi Airport**

This airport faces to the special circumstances, i.e. frequent cancelation of flights as a result of meteorological condition. Aircraft movements here have dropped by an average rate of 2.9% per year from 3,019 movements in 1986 to 2,332 movements as of 1995. This decline in aircraft movements has been particularly in the period between 1992 and 1995. During this period, the number of movements has fallen from 3,628 to 2,332 at an average rate of 15.9% per year. It should be noted, however, that during this same period the numver of passengers increased from 144 thousands to 155 thousands. This fact simply represents the increased average capacity of aircraft. In fact this corresponds to the PAL's fleet change from BAC1-11 (109 seats) to B737-300 (141 seats). The airport's share out of the total domestic aircraft movements in the Pilippines has fallen from 1.5% in 1986 to 1.2% in 1995.

2) **Iloilo Airport**

Aircraft movements at this airport increased dramatically between 1986 and 1990 from 8,465 to 23,564 flights, however, following the recession and in the year up until 1995, the number of aircraft movements has declined at an average rate of 10.2% to the current figure of 14,486. This situation is thought to be the result of the business rationalization measures being aggressively implemented by the airline in response to passenger movement trends. Because the overall level of aircraft movements through out the Philippines has remained stable in the past ten years, this airport's share of the total domestic aircraft movements in the Philippines has increased from 4.2% in 1986 to 7.2% as of 1995.

3) **Bacolod Airport**

As is the case with Iloilo Airport, aircraft movements at Bacolod Airport has been on the rise since 1986, however, the rate of increase here is much higher at 15.2%. The aircraft movements has decreased since 1990 when there were 34,112 movements. However, it has started rise again in the recent times. This airport's share in the total domestic aircraft movements in the Philippines has increased from 3.4% in 1986 to 10.8% as of 1995.

4) Tacloban Airport

Aircraft movements at this airport have gradually declined over the past ten years from 4,014 movements in 1986 to 3,094 movements as of 1995. This is thought to be a result of rationalization measure carried out by airlines, because actual levels of passenger and cargo movements at this airport have been on the increase in this period. The average rate of decline between 1986 and 1995 has been 2.9% and that for between 1990 and 1995 has been 2.4%. Similarly, this airport's share in the total domestic aircraft movements in the Philippines has dropped from 2.0% in 1986 to 1.6% as of 1994.

3.3 SOCIO-ECONOMIC POLICIES

3.3.1 State Policies of the Philippines

The Ramos administration, aware of the Philippines failure to match the economic development of other ASEAN neighbors in the 1980s, is aiming to make up for this through compilation and implementation of the New Medium-Term Five Year Plan of 1993-1998. In addition to this, upon confirming the result of the said plan, it intends to develop policies that can contribute to longer terms development in the period up to 2010.

The 1993-1998 New Medium-Term Five Year Plan is based on the premise that the securing of human rights is a contributory factor in the strengthening of international economic competitiveness, and its guiding principle is that eradicating poverty through the creation of jobs will encourage economic vitalization and thus hasten the achievements of sustainable economic growth.

In order to effect this principle, it is important to decentralize socio-economic power to the regions, put the emphasis on private sector initiated in economic activities, in carry out policies that are based on public participation. In addition, with respect to estate in regional investment, it is important to accurately pursue efficiency through having a clear understanding of the social and economic benefits that can be achieved. By doing this, social parity can be maintained and stabilization of the macro economy can be achieved.

Through implementing policies described above the Government of the Philippines aims to achieve the following development targets by 1998:

a) Poverty incidence: to reduce this from the 1991 value of 39.2% to 30% by 1998.
b) An employment rate; to reduce this from the 1994 value of 9.1% to 6.6% by 19998.
c) Gross national product (GNP): to raise the annual growth rate of the GNP by 8.5-10.0% between 1994-1998.
d) Gross domestic product (GDP): to raise the annual growth rate from the 1994 value of 3.4-4.4% to 8.1-9.8% by 1998. In particular, it is intended to raise the GDP of areas other than NCR (Manila metropolitan region) from the 1994 value of 70.0% to 72.0% by 1998.

d) Gross domestic product (GDP): to raise the annual growth rate from the 1994 value of 3.4-4.4% to 8.1-9.8% by 1998. In particular, it is intended to raise the GDP of areas other than NCR (Manila metropolitan region) from the 1994 value of 70.0% to 72.0% by 1998.

e) Inflation rate: to keep inflation (9.0-10.0% in 1994) below 6.1% between 1995-1998 and bring it down to 4.0% by 19998.

f) National investment: to increase this from 24.5% of the GNP in 1994 to 29.5% by 19998. This is manly to consist of private sector investment, and the share of government investment is to be kept within 6%.

g) Population growth rate: to implement policies that we reduce this from the 2994 value of 2.86% to 2.0% by 1998, in order to alleviate the population density.

Specific proposals relating to the improvement of human rights, stabilization of the macro economy, building of the investment of economic structural framework, and preparation of the infrastructure, all required to achieve the above-mentioned targets, have been put forward together with ideas on policy management, and these policies are now moving into the execution stage.

3.3.2 Regional Medium-Term Five Year Plans

In response to the state's decision to implement the New Medium-Term Five Year Plan, the regions have also compiled similar plans and are implementing development policies that fit with local characteristics.

The following sections outline the development plans that had been adopted by each of the target regions and indicate perspectives for the future.

1) Region 5 (Legaspi Airport)

The main problems currently facing Region 5 are as follows:

a) High incidence of poverty and wide income differentials
b) Insufficient infrastructure (utilities, facilities)
c) High rate of population growth
d) Few employment opportunities
e) Rapid environmental deterioration
f) High malnutrition
g) High out-migration
h) High electric rates
i) Insufficient funds for investment

The potential and existing plus points in the region are as indicated below.

a) Abundant supply of skilled workers

b) Abundant iron and non-iron ore resources
c) Ground heat and water resources that can be used in power generation
d) Abundant tourism resources
e) Geographical convenience as the mid-point between Luzon and Visayas and Mindanao

It is important that the following issues be resolved in order to make the fullest use of these local features.

a) Improvement of the production based in agricultural in mining areas
b) Establishment of secondary industry centers (agro-industry)
c) Preservation and effective utilization of power generation resources (ground heat, water resources)

Through carrying out the above policies, it is intended to encourage a fair distribution of the development effect by appropriately locating the regional population, reduce the incidence of poverty, achieves sustainable economic development, and also preserve the environment. If success is to be achieve in achieving these targets, it is important for the local government to promote public participation in the making and execution of policies and to conduct sample monitoring of the effects of policy implementation.

Region 5 aims to achieve the following specific development targets by 1998 through implementation of the above-mentioned policies.

a) To achieve a growth rate in the gross regional domestic product (GRDP) of 5.8% in 1996, 6.9% in 1997 and 8.0% in 1998, which, using 1995 prices, represents an annual increase of 27 billion pesos.
b) To achieve a gross value added (GVA) annual growth rate in the industrial and commercial sectors of 9.9% and 7.5% respectively.
c) To achieve a GVA annual growth rate in agriculture of 2.8%, raise agricultural production from 8.8 billion pesos (1994) to 9.4 billion pesos.
d) To adjust the industrial structure as follows:
   Primary industry: 35.7% - 33.1%
   Secondary industry: 23.1% - 24.8%
   Tertiary industry: 41.2% - 42.1%.
e) To raise the employment rate from 94.75% (1994) to 90.7%.
f) To achieve a labor productivity level of 863 pesos/head in primary industry, 2137 pesos/head in secondary industry, and 1,700 pesos/head in tertiary industry.
g) To keep the inflation rate to within 6.07%.
h) To raise tax revenues by 2,872,762 million pesos between 1996 and 1998.

2) Region 6 (Iloilo Airport, Bacolod Airport)

The main problems currently facing Region 6 are as follows:

a) The poverty incidence is the second highest in the country at 61.8% (1989) (National average was 49.5%).
b) Fisheries resources are being rapidly depleted in the environment is deteriorating as a result of droughts, indiscriminate deforestation and reduced mangrove vegetation (only 12% of the region's area is green).
c) Education levels are low due to lack of social services.
d) Compared to other regions, the unemployment rate is high and productivity levels low due to the low growth rate of industry.
e) The infrastructure (roads, schools, communications, etc.) is insufficient.
f) Although the recent advance of democracy has had a positive effect, further improvement measures are still required in order to prepare an environment to encourage investment of both foreign and domestic capitals in the region.
g) It is necessary to further develop the capacity to promote regional autonomy.

The potential and existing plus factors in the region are as described below.

a) The fertile soil suitable for agricultural production is abundant.
b) The region is blessed with abundant fishing resources and boasts high levels of fisheries productivity. It is one of the highest producing regions in terms of prawns and tuna production in the Philippines.
c) There are numerous tourists spots such as Boracay and Guimaras Islands, and further future development of the tourist industry is possible.
d) The region possesses good ports and airports, and it is advantageously placed to play a major role in inter-regional transportation. In particular, Iloilo Port possesses naturally deep water conditions, which provides the great potential to act as the shipping center of the region's products.
e) The region is blessed with mineral resources, especially copper.
f) Geothermal power generation is possible.
g) The region possesses great potential to promote industrialization.

Based on these advantageous conditions, the regional government is aiming to achieve development with the following perspective in mind:

"A transform western Visayas Region (Region 6) as a highly productive integrated agro-industrial area within the context of human development, desired value, system, equity, justice, peace and order, public/private sector partnership, inter-regional linkage, sustainable development and

ecological soundness leading to an empowered citizenry and an enhanced quality of life for all."

The target areas are defined as follows:

a) Poverty alleviation
b) People empowerment
c) Enhancement and protection of the environment and natural resources
d) Equity and social justice
e) Improvement of peace and order
f) Attainment of political stability
g) Upgrading of managerial capability of local government executives
h) Sustainable economic growth

Concerning the spatial development framework, the target areas have been set as follows:

a) Development enhancement of the regional hierarchy of settlements in the definition of the role of each settlements in more socio-economic system.
b) Integration of intra- and inter region linkage.
c) Rational and sustainable utilization of the region's land and water resources.

The development targets have been laid down as follows:

a) Gross regional domestic product (GRDP): the annual growth rate between 1993-1998 is to be 7.0% with following specific aims:
   Primary industry: 3.59%,
   Secondary industry: 10.82%,
   Tertiary industry; 6.53%.
b) Employment rate: to raise thus from 92.73% (1994) to 93.09% by 1998.
c) Unemployment rate: to reduce this from 23.80% (1994) to 18.20% by 1998.
d) Inflation rate: to reduce from 10.56% (1994) to 8.06% by 1998.
e) Population: to hold the growth rate of 1.54% so that the population of 5,747 million in 1994 increases to 6,015 million by 1998.
f) Poverty incidence: to reduce this from 61.8% (1988) to 51.8% by 1998.

3) Region 8 (Tacloban Airport)]

The main problem areas currently facing region 8 are as follows:

a) Widespread poverty
b) Poor industrial development
c) Environmental degradation and depletion of national resources

d) High unemployment rate of adults and high underemployment rate of child labor
e) Low agricultural production
f) Inadequate infrastructure facilities

The region's potential and existing plus factors are as follows:

a) The land is relatively fertile and there are plentiful forestry resources.
b) The region is well endowed with fishing resources
c) The region is rich in both metallic and non-metallic mineral resources:
   Metallic -Copper, gold, manganese, iron, nickel, etc.
   Non-metallic - Limestone, bentonite, coal rock asphalt, etc.
d) The region possesses irrigable land that is yet to be exploited.
e) There are water resources which can be developed for power generation.

The regional government has set forth the objectives for local development as follows:

a) To ensure the economic and social well-being of the people
b) To promote industrial development.
c) To protect the environment and conserved natural resources.
d) To modernize agriculture, increase agricultural production and attain food sufficiency.
e) To generate more employment opportunities.
f) To effect participatory development through empowerment of the people.

Through implementation at the above mentioned policies Region 8 aims to achieve the strategic targets for local development by 1998 as follows:

a) Maintain tthe growth rate of the productive population at 2.06% and that of the population in general at 1.70%.
b) Bring down the poverty incidence from 36.8% (1994) to 32.6% by 1998 at an average annual rate of 1.06%.
c) Increase the average annual growth rate from the present value of 2.25% to 5.7%, and the target GRDP for 1998 is to be 26,236 million pesos.
d) Increase the GVA (gross value added) of the agriculture sector from 4.6% now to 31.9% by 1998; that of the industry sector from 7,374.1 million pesos (1994) to 9,656.4 million pesos; in that of the social service sector by 32.1% to 8,460 million pesos.
e) Aim for an employment rate of 98% and an underemployment rate of 23.9% in 1998.

3.4 AIRLINES' OPERATIONS PERSPECTIVE

It seems that the domestic airlines expect high growth of air traffic demand, because most of the new airlines, such as Air Philippines, Cebu Pacific Air and Grand International Airways plan to expand their fleets more or less double within 1996. PAL is also planning to introduce A320 (about 150 seats) for domestic services from 1997.

Particularly to the four airport, Air Philippines and Cebu Pacific already operate their B737 and DC-9 respectively on Manila - Iloilo twice daily each. Grand Air schedules to operate B737 on Manila - Iloilo and Manila - Tacloban once daily from June 1996. Air Philippines plans to start B737 operations on Manila - Bacolod and Manila - Tacloban,, and YS-11 operations on Manila - Legaspi from June or July 1996. Cebu Pacific intends to operate DC-9 on Manila - Tacloban hopefully from September 1996. Grand International Airways wish to operate B737 on Manila - Bacolod from July 1996.

These operators consider that Bacolod has more or less same level of demand as at Iloilo, and complaint unavailability of passenger terminal facility at Bacolod. (Existing terminal building is owned by PAL.)

3.5 PREVIOUS FORECASTS

3.5.1 Domestic Air Traffic Demand

In the past three years, studies on future domestic air traffic demand levels in the Philippines have been carried out by UNDP/ICAO, the Asian Development Bank (ADB), Aeroports de Paris (ADP) and Philippine Airline (PAL). Even allowing for the fact that the forecasting methods employed in each of these studies have been different, the result of each still shows a great disparity.

Table 3.5.1 Projected Growth of Domestic Air Passenger Traffic 1993-2005

Study Category	PAL	Aeroports de Paris	Dames & Mare (UNDP/ICAO)	Trend Value (NTPP)
Domestic Passenger Traffic Average Annual Grouth Rate	11.3%	8.7%	5.8%	3.0%

Source: ASIAN DEVELOPMENT BANK:
1994 Report and Recommendation for the Airport Development Project

An analysis report issued by the ADB in 1994 summarized findings of each study as follows:

"The average growth rate of 5.8% concluded by the Dames and More study (UNDP/ICAO), 1992 Civil Aviation Master Plan) is considered to be reasonable. However, at the time when the Dames and More forecast was made, the effect of the transition of Mactan Airport (Cebu) and Davao Airport to international status were not considered and all external-bound flights from these airports were counted as

domestic services going through Manila. If all such flights directly enter Mactan Airport and Davao Airport as international services, it is included that the average rate of growth of domestic traffic would come to 3.1%."

3.5.2 Air Traffic Demand at the Four Airports

1) Passenger Movement

The forecast level of air traffic demand at the four target airports in the aforementioned studies are indicated in Tables 3.5.2 through 3.5.5.

Table 3.5.2 Previous Forecast of Air Passenger Traffic at Legaspi Airport

	1990	1995	2000	2005	2010
NTPP	163,545	221,550	279,556	337,561	395,567
UNDP/ICAO	175,343	246,601	317,827	389,054	460,280
JAC	136,132	253,447	472,081	879,960	1,640,776
ADB	179,098	130,584	121,668	121,080	119,719
Actual	117,451	155,523	-	-	-

Source: UNDP/ICAO: 1992 Civil Aviation Master Plan and ADB:
1994 Report and Recommendation for the Airport Development Project
Note: Japan Airport Consultants Co. (JICA)

Table 3.5.3 Previous Forecast of Air Passenger Traffic at Iloilo Airport

	1990	1995	2000	2005	2010
NTPP	423,381	530,701	638,020	745,340	852,660
UNDP/ICAO	430,760	540,267	649,795	759,323	868,851
JAC	428,104	688,894	1,108,895	1,783,368	2,869,535
ADB	396,485	420,159	414,875	503,185	595,202
Actual	414,936	460,423	-	-	-

Source: UNDP/ICAO, ADB Report

Table 3.5.4 Previous Forecast of Air Passenger Traffic at Bacolod Airport

	1990	1995	2000	2005	2010
NTPP	-	-	-	-	-
UNDP/ICAO	353,624	433,421	513,204	592,987	672,770
JAC	-	-	-	-	-
ADB	345,666	400,885	404,730	490,880	580,647
Actual	334,377	371,955	-	-	-

Source: UNDP/ICAO, ADB Report

Table 3.5.5 Previous Forecast of Air Passenger Traffic at Tacloban Airport

	1990	1995	2000	2005	2010
NTPP	242,217	317,700	393,184	468,667	544,151
UNDP/ICAO	249,042	326,963	404,856	482,748	560,640
JAC	119,776	335,283	960,811	2,694,953	7,545,172
ADB	216,168	276,588	275,085	333,693	394,551
Actual	196,821	205,995	-	-	-

Source: UNDP/ICAO, ADB Report

The National Transportation Planning Projects (NTPP) forecast appeared in the report of the Study of National Airport System 1986-1990 is based on a method of trend forecasting that utilize time series analysis. The forecast in 1989 study report by JICA for the Mactan International Airport Development Project was made by use of multiple linear regression method. The ADB forecast appeared in the appendix of the financial evaluation report for Davao International Airport (Report and Recommendation for the Airport Development Project) represents an adjustment of the forecast made by UNDP/ICAO.

The large disparity in the forecast findings makes it difficult to form an evaluation, however, when one compares the forecast with actual traffic figures for 1995, it is worth noting that, except for the ADB forecast, all of the forecast values are well in excess of actual figures. When conducting the forecast for this study careful consideration should be given to movements in actual figures, and reference should be made to the findings of previous studies.

2) Cargo Movement

Concerning the demand for cargo transport, it has only been possible to obtain the forecast values of the 1994 ADB report, and these are shown in Table 3.5.6.

Table 3.5.6 Air Cargo Movement Forecast (unit: ton)

		1990	1995	2000	2005	2010
Legaspi	ADB	441	255	246	238	230
	Actual	740	919	-	-	-
Iloilo	ADB	6,614	4,584	5,116	5,710	6,373
	Actual	4,339	4,772	-	-	-
Bacolod	ADB	18,596	12,063	13,723	15,611	17,759
	Actual	6,049	7,581	-	-	-
Tacloban	ADB	417	284	327	376	432
	Actual	1,841	3,359	-	-	-

Source: ADB 1994 Report, DOTC/ATO

As seen there are large differences between the forecast and actual values for 1990 and 1995, it is necessary to examine the base date. Furthermore, the forecasting method for air cargo demands may need to be reconsidered and revised taking into consideration not only the aircraft movements but also transition of aircraft type to be deployed.

3) **Aircraft Movement**

Similarly, on the forecast values made in the ADB report have been obtained also for aircraft movements as shown together with actual figures in Table 3.5.7.

Table 3.5.7 Aircraft Movement Forecast

		1990	1995	2000	2005	2010
Legaspi	ADB	2,777	1,633	1,581	1,531	1,483
	Actual	3,678	2,332	-	-	-
Iloilo	ADB	10,861	8,622	9,626	10,747	11,999
	Actual	23,564	14,486	-	-	-
Bacolod	ADB	16,005	14,199	16,106	18,321	20,841
	Actual	34,112	24,444	-	-	-
Tacloban	ADB	3,157	3,022	3,474	3,993	4,590
	Actual	3,484	3,094	-	-	-

Source: ADB 1994 Report, DOTC/ATO

Here too, examination of the base data for some of the actual values is considered necessary. After the examination of the base data, a new forecast be prepared taking into consideration the changed conditions surrounding the airline industry in the Philippines of new companies into the market effected by the liberalization in 1994.

3.6 SOCIO-ECONOMIC FRAMEWORK

3.6.1 GDP of the Philippines

The economy of the Philippines which suffered a recession at the beginning of the 1990 began to recover in 1992 due to the adoption of new policies and the stabilization of domestic politics, recording favorable growth in more recent years.

Based on the past economic performance of the country and the review of the National and Regional Medium-Term Five Year Plans, future GDP of the Philippines is projected as shown in Table 6.3.1.

Table 3.6.1 Framework of Long-term National Economic Growth

(millions pesos at 1985 prices)

		High Case		Medium Case		Low Case	
Year		(million)	AAGR	(million)	AAGR	(million)	AAGR
Actual	1986	591,423		591,423		591,423	
	1990	720,691	5.1%	720,691	5.1%	720,691	5.1%
	1991	716,523	-0.6%	716,523	-0.6%	716,523	-0.6%
	1992	718,742	0.3%	718,742	0.3%	718,742	0.3%
	1993	734,155	2.1%	734,155	2.1%	734,155	2.1%
	1994	765,692	4.3%	765,692	4.3%	765,692	4.3%
Estimate	1995	804,640	5.5%	804,640	5.5%	804,640	5.5%
Projected	1998	1,065,144	9.8%*	1,016,433	8.1%	985,719	7.0%
	2000	1,265,498	9.0%	1,174,615	7.5%	1,107,554	6.0%
	2005	1,859,432	8.0%	1,609,324	6.5%	1,413,551	5.0%
	2010	2,607,950	7.0%	2,103,322	5.5%	1,719,800	4.0%
	2015	3,490,025	6.0%	2,684,431	5.0%	2,092,400	4.0%

Note*: "Medium-Term Philippine Development Plan"
Source: Actual: Statistical Yearbook 1995
Estimate, Projected: JICA Study Team

3.6.2 Regional Economic Growth

The growth of the gross regional domestic products (GRDP) is estimated for the three regions where the four studied airports are located, and also for NCR (Manila), Region 7 (Cebu), Region 11 (General Santos) and Region 4 (Pt. Princesa) in Table 3.6.2 because of the need to estimate the volume of passengers by route as part of the air traffic demand forecast for the four airports.

The estimates for the NCR, Region 11 and Region 4 are based on the Medium-Term Philippine Development Plan 1993 - 1998 while the estimate for Region 7 is based on the Study on Cebu Integrated Development Master Plan (1994, JICA), taking into consideration the region's promising prospect of

becoming an area of intensive economic development as one of the two key major areas in the Philippines together with the NCR.

Table 3.6.2 Assumed Growth of GRDP

(million pesos at 1985 prices)

Region \ Year	1994	1995	1998	2000	2005	2010	2015
NCR	227,634	240,154	284,601	328,892	450,610	588,929	751,639
(Manila)		5.5%	5.8%	7.5%	6.5%	5.5%	5.0%
Region 5	23,353	24,404	29,066	32,351	40,315	49,049	58,255
(Legaspi)		4.5%	6.0%	5.5%	4.5%	4.0%	3.5%
Region 6	57,170	60,314	72,856	81,861	106,389	136,548	170,164
(Iloilo, Bacolod)		5.5%	6.5%	6.0%	5.5%	5.0%	4.5%
Region 8	18,388	19,307	22,350	24,407	29,695	35,268	41,887
(Tacloban)		5.0%	5.0%	4.5%	4.0%	3.5%	3.5%
Region 7	50,294	53,060	68,714	82,390	127,935	192,000	282,110
(Cebu)		5.5%	9.0%	9.5%	9.2%	8.5%	8.0%
Region 11	51,590	54,427	68,562	79,232	113,748	148,664	189,737
(General Santos)		5.5%	5.8%	7.5%	6.5%	5.5%	5.0%
Region 4	121,717	128,411	161,760	186,933	256,114	334,730	427,200
(Pt. Princesa)		5.5%	5.8%	7.5%	6.5%	5.5%	5.0%

Source: Assumed JICA Study Team
Note: % shows Annual Average Growth Rate

3.7 ANNUAL AIR PASSENGER FORECAST

3.7.1 Forecast Method and Problems

In general , there are three main methods of forecasting the air passenger demand as given below:

a) Time series trend analysis

b) Econometric modeling

c) Factor analysis

Time series trend analysis can be useful when the air passenger traffic increases or decreases rather steadily. In the case of the four airport, the air passenger traffic have been fluctuated because of various reasons including the economic recession in the Philippines during 1989 - 1992. It is, therefore, judged inappropriate to apply time series analysis for the Study.

While econometric modeling often produces a plausible forecast, the availability of explanatory economic variables is limited in the Philippines. The applicability of a simplified regression model was, therefore, examined by the Study.

Factor analysis may be useful to analyze the present structure of air traffic. However, even though some significant determinants can be identified, meaningful values of these parameters over a long term are difficult to estimate. Given the preliminary nature of the Study, it was decided that factor analysis would not be conducted.

As described above, neither time series trend analysis nor econometric modeling using the GRDP as a factor were found to be capable of establishing a reliable forecast for the individual airports. Consequently, it was decided to forecast the volume of the domestic air passenger traffic for the entire Philippines in order to provide a base from which the air traffic demand of each of the four airports can be estimated using their shares of the domestic air passenger traffic and the past trends of such shares.

3.7.2 Annual Air Passenger Forecast for the Whole Philippine Airports

1) Time Series Trend Analysis

The time series trend analysis of the air passenger traffic for the period from 1986 to 1995 found that the correlation coefficient was low due to the slump of air passenger growth during the recession from 1989 to 1992. An alternative attempt to use the time series trend analysis for the period from 1991 to 1995 to eliminate an adverse impact of the recession produced the following regression model.

$$[PAX] = -1,262,938,038 + 638,109\ [YEAR],\ (R=0.9255)$$

where,
PAX : Annual passenger traffic of entire country
YEAR : Calendar year

2) GDP Regression Model Analysis

It is well-known that growth of the air traffic demand correlates to the growth of the total economy. The regression model of the GDP and air passenger traffic using data for the period from 1990 to 1994 showed a significant relationship between these as shown below.

Model A: $\ln [PAX] = -17.0789 + 2.4457 \ln [GDP],\ (R=0.9447)$

Model B: $[PAX] = -278,731,156 + 21,266,245 \ln [GDP],\ (R = 0.9493)$

where,

PAX : Annual passenger traffic of entire country

GDP : GDP in million pesos at constant 1985 prices

3) Forecast Results

The forecast results in the three cases described above are shown in Table 3.7.1. The national GDP figure used for the GDP regression model was taken from the medium case in Table 3.6.1

Table 3.7.1 Result of the Forecast by the Three Methodologies

	1995	2000	2005	2010	2015
1) Trend analysis	10,425,316	13,235,162	16,475,708	19,666,253	22,356,700
AAGR		4.9%	4.5%	3.6%	2.6%
2) GDP regression analysis					
Model A (Medium Case)	10,425,316	26,769,556	57,320,301	111,280,358	202,082,051
AAGR		20.8%	16.4%	14.2%	12.7%
Model B					
High Case	10,425,316	20,081,000	28,264,000	35,459,000	41,654,000
AAGR		14.0%	7.1%	4.6%	3.3%
Medium Case	10,425,316	18,496,000	25,192,000	30,885,000	36,073,000
AAGR		12.1%	6.3%	4.2%	3.2%
Low Case	10,425,316	17,246,000	22,434,000	26,604,000	30,775,000
AAGR		10.6%	5.4%	3.5%	3.0%

As the forecast results based on the trend analysis were affected by the decline of air passenger traffic during the period of economic recession from 1990 to 1992, these results were judged to be underestimated. In contrast, the forecast results based on Model A of the GDP regression analysis were believed to be overestimated. Consequently, it was decided to use the forecast results of Model B of the GDP regression analysis for the Study. The suitability of these results is verified in the next section.

4) Suitability of Forecast Results

(1) Verification Based on Likely Income Groups for Air Travel in the Philippines and Their Annual Use of Air Flights

The relationship between the time value judged by passengers based on the current transport tariff in the Philippines and the threshold income making people potential air passengers is analysed below for sea and air routes between Manila and Iloilo.

Between Manila and Iloilo

Current fare	:	Sea	- PHP 700
		Air	- PHP 1,460 + PHP 40 (tax, etc.) ≒ PHP 1,500
Traveling time	:	Sea	- 18.0 hours + 1.5 hours (waiting) = 19.5 hours
		Air	- 1.5 hours + 2.0 hours (waiting) = 3.5 hours

(PHP 1,500 - PHP 700) ÷ (19.5 hours - 3.5 hours) = PHP 50/hour

PHP 50 x 40 hours x 52 weeks = PHP 104,000/year

The above calculation means that anyone choosing air travel between Manila and Iloilo is required to be capable of paying a time value of PHP 50/hour and that those capable of paying this time value level have annual income of PHP 100,000. According to the Statistical Yearbook 1995 of the Philippines, the annual income group of PHP 100,000 or more was about 1,500,000 households and 12.5% of the total 12 million households in the Philippines.

Assuming that the ratio of this high income group increases to around 15% in the year 2015, about 9 million people will be able to afford air travel. Using the forecast air passenger volume of 36 million/year in 2015, the average number of trips by air by those which can afford them is about 4 trips/year which appears a reasonable figure.

(2) Verification Based on Actualized Potential Demand of Increased Flight Availability (Increased Flights by Existing and New Airlines)

In addition to the existing PAL flights at Iloilo Airport, Air Philippines introduced one return flight per day on February 1st, 1996 which was subsequently increased to 2 return flights per day on February 22nd while Cebu Pacific Airlines introduced 2 new return flights per day on February 16th, 1996. The resulting increase of passengers using Iloilo Airport compared to the figure in 1995 is shown below.

	1995	1996	Growth
February	34,582	38,709	11.9%
March	39,744	44,855	12.9%
April	40,592	56,591	39.4%
May	42,738	61,221	43.2%
June	37,324	45,389	21.6%
Total	194,980	246,765	26.6%

Although the available data are rather limited, it appears almost certain that an increased number of flights, reflecting the eagerness of new airlines to make inroads into the domestic market, will actualize the potential air demand. In other words, the forecast increase of flights in the future suggests the stimulation of economic development and a subsequent increase of the air demand due to economic development.

It is arguably difficult to estimate the size of the development-induced air demand based on currently available data. However, given the relevant data for Iloilo Airport, an estimated increase in the range of 30 - 40% is not over-optimistic.

Assuming the forecast air passenger volume of 22,356,700 in 2015 of the time series trend analysis to be the basis for estimation of the development-induced air demand, a 40% increase will make the figure to approximately 31.3 million. As the base figure is believed to be under-estimated due to the adverse impact of the recession in the early 1990's, the forecast figure of 36 million for the year 2015, adopted by the Study, can be regarded as a reasonable forecast.

3.7.3 Annual Air Passenger Forecast for the Four Airports

1) Forecast Method

As described earlier, the air passenger forecast for the four airports (Bacolod, Iloilo, Tacloban and Legaspi) is based on the future air passenger forecast for the whole Philippines referred to in 3.7.2 and the actual share of each airport in the past vis-a-vis the national air demand.

The passenger share by airport category of the national air demand in the Philippines shown in Table 3.7.2 was established to verify the suitability of this method. The international airports handle some 61% of the domestic air passenger demand while the airports handle some 23%. The remaining 16% is handled by other airports (secondary and feeder airports). The passenger shares of these three categories of airport have remained almost unchanged for the last six years.

The above findings suggest that the distribution of future air passengers based on the past share of the different categories of airport will produce a reasonable forecast even though an almost constant annual growth rate is assumed for each of the four airports.

Table 3.7.3 gives the analysis results of the passenger share of the four airports vis-a-vis the national demand for the period from 1990 to 1995 and the expected future share based on the past performance.

Table 3.7.2 Number of Domestic Air Passenger by Airport Category

(Unit : '000)

Year / By Category	1990	1991	1992	1993	1994	1995	Average shear
International Airport	4,952 (59.1)	4,808 (59.8)	4,746 (60.7)	5,188 (61.9)	5,824 (61.8)	6,411 (61.5)	60.8%
Trunkline Airport	2,090 (24.9)	1,917 (23.8)	1,818 (23.3)	1,877 (22.4)	1,940 (20.6)	2,310 (22.2)	22.9%
Others Airport (Secondary, Feeder)	1,338 (16.0)	1,315 (16.4)	1,256 (16.0)	1,312 (15.7)	1,665 (17.6)	1,704 (16.3)	16.3%
Total	8,380 (100.0)	8,040 (100.0)	7,820 (100.0)	8,377 (100.0)	9,430 (100.0)	10,425 (100.0)	

Source: DOTC/ATO

Table 3.7.3 Share of the Four Airports in the whole Philippines' Domestic Air Passengers

	Bacolod	Iloilo	Tacloban	Legaspi
Actual				
1991	4.04%	4.38%	2.48%	1.80%
1992	4.15%	5.37%	2.71%	1.84%
1993	4.59%	5.22%	2.43%	1.65%
1994	3.36%	4.68%	2.86%	1.54%
1995	3.57%	4.42%	2.48%	1.49%
Estimated & Applised				
2000	3.98%	4.68%	2.60%	1.65%
2005	3.98%	4.68%	2.60%	1.65%
2010	3.98%	4.68%	2.60%	1.65%
2015	3.98%	4.68%	2.60%	1.65%

Source : JICA Study Team

2) Forecast Results

Table 3.7.4 shows the forecast results of air passengers for the four airports based on the nationwide air passenger demand forecast Medium Case described in Section 3.7.2 and the respective share of each of the four airports.

Table 3.7.4 Air Passenger Forecasts for Bacolod, Iloilo, Tacloban and Legaspi Airports

		Bacolod	Iloilo	Tacloban	Legaspi
Actual	1995	371,955	460,423	258,100	155,523
Projected	2000	736,000	886,000	481,000	276,000
	2005	1,003,000	1,179,000	655,000	375,000
	2010	1,229,000	1,445,000	803,000	460,000
	2015	1,436,000	1,688,000	938,000	537,000

3.7.4 Annual Air Passenger Forecast by Routes

1) Present Routes

The present air transport routes of the four airports (Bacolod, Iloilo, Tacloban and Legaspi) are described below.

- Bacolod Airport : Bacolod - Manila
  Bacolod - Cebu
- Iloilo Airport : Iloilo - Manila
  Iloilo - Cebu
  Iloilo - Pt. Princess
  Iloilo - Gen. Santos
- Tacloban Airport : Tacloban - Manila
  Tacloban - Cebu
- Legaspi Airport : Legaspi - Manila
  Legaspi - Cebu
  Legaspi - Mastabe
  Legaspi - Virac

The number of passengers of the above routes in 1995 and the respective share of each route are shown in Table 3.7.5.

Table 3.7.5 Number of Air Passenger by Route in 1995

To/From Airport	Manila	Cebu	Pt. Princesa	Gen. Santos	Masbate	Virac	Total
Bacolod	316,906 (85.2)	52,499 (14.1)	—	—	—	—	371,955 (100)
Iloilo	353,774 (76.8)	87,596 (19.0)	7,974 (1.7)	8,164 (1.8)	—	—	460,423 (100)
Tacloban	228,623 (88.5)	28,537 (11.1)	—	—	—	—	258,190 (100)
Legaspi	126,438 (78.0)	17,125 (10.6)	—	—	7,552 (4.6)	10,116 (6.2)	155,523 (100)

Source: DOTC/ATO

2) Future Air Transport Network and Estimated Passenger Share by Route

All of the four airports are located in the Visaya Economic Zone and their links to Manila, the administrative and economic center of the country, and Cebu, the central city of the Bisaya Economic Zone, are essential for their future survival. In addition, it is reasonably forecast that no major change of the present air network of each airport will occur in the future in relation to exchanges within the local economic zones surrounding each individual airport and exchanges between historically established economic zones. As there are only few passengers transferring the aircraft at Manila or Cebu for their final destinations at present and the airlines have no plan to open new routes related to the four airports in the foreseeable future, it is assumed for the present study purposes that the present air transport network will remain unchanged.

Nevertheless, the weight of each route in terms of the passenger volume of each airport will inevitably change in relation to the progress of economic development in the relevant local economic zone. The air traffic demand level of an airport is believed to change to reflect the degree of progress of the economic zone to which the said airport belongs and that of other economic zones linked by air routes.

In view of such a correlation, the air traffic demand between one region and another is assumed to be generated with the economic levels (GRDP) of the relevant regional economic zones acting as functions. The air traffic demand between two regions can beestimated by the following gravity model.

$$Pij = Kij \cdot GRDPi \cdot GRDPj$$

where,

Pij : Air passenger volume between I-region and j-region

GRDPi, GRDPj : Economic magnitude of I-region GRDP and j-region GRDP

Kij : Coefficient for relationship between I-region and j-region

Estimated as $Kij = Pij^{1995}/GRDPi^{1995} \cdot GRDPj^{1995}$

Tables 3.7.6 through 3.7.9 show the share of air passengers by route of each airport, estimated on the basis of the GRDP figures in Section 3.6 and the value of K for each route determined by the 1995 value of the GRDP and the volume of passengers by route in 1995.

Table 3.7.6 Estimated Route Share of Passenger at Bacolod Airport

To/From Year	Manila	Cebu	Others	Total
1995 (Actual)	85.2%	14.1%	0.7%	100.0%
2000	84.1%	15.2%	0.7%	100.0%
2005	81.9%	17.4%	0.7%	100.0%
2010	79.8%	19.5%	0.7%	100.0%
2015	77.6%	21.7%	0.7%	100.0%

Table 3.7.7 Estimated Route Share of Passenger at Iloilo Airport

To/From Year	Manila	Cebu	Gen. Santos	Pt. Princess	Others	Total
1995 (Actual)	76.8%	19.0%	1.8%	1.7%	0.8%	100.0%
2000	74.7%	20.8%	1.8%	1.9%	0.8%	100.0%
2005	72.5%	23.0%	1.9%	1.8%	0.8%	100.0%
2010	70.2%	25.4%	1.8%	1.8%	0.8%	100.0%
2015	67.6%	28.2%	1.7%	1.7%	0.8%	100.0%

Table 3.7.8 Estimated Route Share of Passenger at Tacloban Airport

To/From Year	Manila	Cebu	Others	Total
1995 (Actual)	88.5%	11.1%	0.4%	100.0%
2000	87.2%	12.4%	0.4%	100.0%
2005	85.9%	13.7%	0.4%	100.0%
2010	84.2%	15.4%	0.4%	100.0%
2015	82.2%	17.4%	0.4%	100.0%

Table 3.7.9 Estimated Route Share of Passenger at Legaspi Airport

To/From Year	Manila	Cebu	Masbate	Virac	Others	Total
1995 (Actual)	78.0%	10.6%	4.6%	6.2%	0.4%	100.0%
2000	77.4%	11.8%	4.4%	6.0%	0.4%	100.0%
2005	76.7%	13.3%	4.1%	5.5%	0.4%	100.0%
2010	78.3%	12.2%	3.9%	5.2%	0.4%	100.0%
2015	78.9%	12.3%	3.6%	4.8%	0.4%	100.0%

The annual air passenger volume of the four airports by route was estimated by distributing the air passenger demand forecast of each airport in Table 3.7.1 into routes with passenger route shares in Tables 3.7.6 through 3.7.9. The results are given in Table 3.7.10 through Table 3.7.13.

Table 3.4.6 Passenger Forecast for Bacolod Airport by Route

To/From Year	Manila	Cebu	Others	Total
1995 (Actual)	316,906	52,449	2,600	371,955
2000	623,400	112,600	—	736,000
2005	827,200	175,800	—	1,003,000
2010	988,300	240,700	—	1,229,000
2015	1,121,500	314,500	—	1,436,000

Table 3.4.7 Passenger Forecast for Iloilo Airport by Route

To/From Year	Manila	Cebu	Gen. Santos	Pt. Princess	Others	Total
1995 (Actual)	353,774	87,596	8,164	7,974	2,915	460,423
2000	651,700	181,700	15,800	16,800	—	866,000
2005	861,400	273,300	22,500	21,800	—	1,179,000
2010	1,021,500	371,400	26,100	26,000	—	1,445,000
2015	1,149,700	481,100	28,700	28,500	—	1,688,000

Table 3.4.8 Passenger Forecast for Tacloban Airport by Route

To/From Year	Manila	Cebu	Others	Total
1995 (Actual)	228,623	28,539	1,030	258,190
2000	421,300	59,700	—	481,000
2005	564,600	90,400	—	655,000
2010	677,700	125,300	—	803,000
2015	773,000	165,000	—	938,000

Table 3.4.9 Passenger Forecast for Legaspi Airport by Route

To/From Year	Manila	Cebu	Masbate	Virac	Others	Total
1995 (Actual)	126,438	17,125	7,522	10,116	776	161,977
2000	214,400	32,500	12,100	17,000	—	276,000
2005	289,000	50,200	15,400	20,400	—	375,000
2010	362,000	56,200	17,900	23,900	—	460,000
2015	424,000	66,100	19,300	26,600	—	537,000

3.8 ANNUAL AIR CARGO FORECAST

3.8.1 Forecast Method

The results of the trial analysis of the annual air cargo volume using a similar method to that used for the air passenger forecast are described below.

No formula with a high correlation was obtained based on past data for each of the four airports by either time series trend analysis or econometric modelling analysis based on the GDP correlation. This result was the same as in the case of the air passenger forecast.

The time series trend analysis, however, produced a formula with a high correlation for the annual air cargo volume for the entire country, unlike the case of the air passenger forecast. No such formula was obtained by regression model analysis using the GDP as the factor.

Given the above findings, it was decided that, as in the case of the air passenger forecast, the domestic air cargo volume for the entire country would firstly be forecast and that the established national figure would be proportionally distributed to the four airports based on their respective domestic air cargo transportation share and past trends. The final forecast for each trunk airport would be established by adding the development-induced increase in the future.

3.8.2 Annual Air Cargo Forecast for the Whole Philippine Airports

The application of time series trend analysis for the period from 1986 to 1995 did not produce a high correlation coefficient because of the decline of air cargo traffic during the recession from 1989 to 1992. When the time series trend analysis was confined to the period from 1991 to 1996 to avoid the adverse influence of the above recession, the analysis produced the following regression model with a sufficiently high coefficient.

[CRG] = -28,287,404,573 + 14,272,736 [YEAR], (R= 0.9707)

where,

CRG : Annual air cargo traffic for the whole country in kilogram

YEAR : Calendar year

The forecast results are given in Table 3.8.1.

Table 3.8.1 Air Cargo Forecast for the Whole Philippine Airports

Unit : ton

	Whole Philippines	AAGR
Actual 1995	187,081	
2000	258,100	6.6%
2005	329,400	5.0%
2010	400,800	4.0%
2015	472,200	3.3%

3.8.3 Annual Air Cargo Forecast for the Four Trunkline Airports

1) Forecast Method

The forecast for the air cargo volume of the four airports (Bacolod, Iloilo, Tacloban and Legaspi) was conducted by distributing the forecast air cargo volume for the whole country in Table 3.8.1 to each of these airports in proportion to their past share in the countrywide air cargo volume.

The share of each trunk airport in the nationwide air cargo volume and estimated share in future years used for the present forecast are shown in Table 3.8.2.

Table 3.8.2 Shear of the Four Airports in the Whole Philippine Domestic Air Cargo

	Bacolod	Iloilo	Tacloban	Legaspi
Actual 1991	3.56%	2.79%	0.85%	0.38%
1992	3.66%	3.49%	0.95%	0.30%
1993	3.86%	3.06%	1.17%	0.48%
1994	3.16%	3.09%	1.53%	0.56%
1995	4.03%	2.55%	1.54%	0.49%
Estimate & Applied				
2000	3.65%	3.00%	1.30%	0.44%
2005	3.65%	3.00%	1.30%	0.44%
2010	3.65%	3.00%	1.30%	0.44%
2015	3.65%	3.00%	1.30%	0.44%

Source: JICA Study Team

2) Forecast Results

The air cargo forecast for each trunk airport is shown in Table 3.5.3. The figures in the table were established by multiplying the nationwide air cargo forecast by the respective market shares of the trunk airports. The figures for the future, rounded to the nearest 100, also include a 40% increment which represents the development-induced increase of the air cargo volume due to new flights introduced by newcomers in the market, etc. as described in the air passenger forecast for the trunk airports.

Table 3.8.3 Air Cargo Forecast for the Four Airports

Unit: ton

Year	Bacolod	Iloilo	Tacloban	Legaspi
1995 (Actual)	7,581	4,771	2,881	919
2000	18,300	10,100	4,400	1,500
2005	15,600	12,800	5,600	1,900
2010	19,000	15,600	6,800	2,300
2015	22,400	18,400	8,000	2,700

Source: JICA Study Team

3.9 ANNUAL AIRCRAFT MOVEMENT FORECAST

3.9.1 Aircraft Introduction Criteria

The forecast of aircraft movements depends on how airlines will meet the annual passenger demand, i.e. by increasing frequencies and/or by introducing larger aircraft. In general, larger aircraft will be used as demand on trunk routes rises, while airlines tend to increase frequencies rather than aircraft size where intense competition exists. According to PAL, they have no defined standard for the choice of aircraft types. DOTC neither has planning guidelines for aircraft introduction. However, it is possible to observe some relationship between annual air passenger traffic and type of aircraft to be used for domestic air services in the Philippines.

A300: There are presently four routes for which A300s are operated in the Philippines, i.e., Manila-Cebu, Manila-Davao, Manila-Puerto Princesa and Cebu-Davao, of which routes except Cebu-Davao are double trucking route with more than one airlines competing. The estimated annual air passengers in 1996 are 250,000-1,200,000 on those routes.

B737: B737s are most widely used for domestic air services in the Philippines. The estimated annual passengers for B737 routes range from 20,000 to 400,000. Among them, Manila-Iloilo, Manila-Cagayan de Oro, Manila-Bacolod and Manila-Tacloban are relatively high traffic routes with estimated annual passengers more than 250,000. PAL plans to introduce A300 to those routes by 1997 if airport facilities are improved by that time.

F50: F50s are used for low traffic routes up to annual air passenger traffic of 60,000. Except a few routes in which only short runway is available, such as Cebu-General Santos and Zamboanga-Jolo, F50s are used for routes with annual passenger traffic less than 30,000.

Based on the above information and the planned entry of new airlines, the following criteria are used to forecast type of aircraft to be used for each rote from/to the four airports.

a) TP (Turbo Prop: F50 with 54 seats) will be used for routes up to annual air passenger traffic of 30,000, which approximately corresponds to one daily return trip of F50.

b) SJ (Small Jet:B737, A320, DC9, etc. with average seats of 130) will be introduced where annual route air passenger traffic exceeds 30,000.

c) MJ (Medium Jet: A300 with 246 seats) will be introduced when annual route air passenger traffic exceeds 300,000, which approximately corresponds to one return trip of A300 and three return trips of B737 per day.

d) The proportion of A300 within total aircraft movements of a routes will increase as traffic increases, and only MJ will be used when route air passenger traffic exceeds 1,200,000.

According to the above planning guideline, the introduction of A300 is already probable for Iloilo-Manila and Bacolod-Manila routes. A300 will possibly be introduced for Tacloban-Manila, Legaspi-Manila and Iloilo-Cebu respectively in 1998, 2006 and 2007.

3.9.2 Annual Aircraft Movement Forecast

With this planning guideline, annual aircraft movements are estimated for each route from/to the four airports with an assumed annual average load factor of 75%. Annual aircraft movements at each airport are estimated as a sum of aircraft movements for each route in Table 3.9.1.

Table 3.9.1 Annual Aircraft Movement Forecast

Year	Bacolod				Iloilo			
	MJ (246)	SJ (130)	TP (54)	Total	MJ (246)	SJ (130)	TP (54)	Total
2000	2,270	3,250	0	5,520	2,450	3,920	800	7,170
2005	3,620	3,440	0	7,060	3,870	4,320	1,090	9,280
2010	4,810	3,500	0	8,310	5,990	2,950	1,290	10,230
2015	6,550	2,340	0	8,890	7,550	2,440	1,410	11,400
Year	Tacloban				Legaspi			
	MJ (246)	SJ (130)	TP (54)	Total	MJ (246)	SJ (130)	TP (54)	Total
2000	1,160	2,750	0	3,900	0	2,530	720	3,250
2005	1,920	3,090	0	5,010	0	3,480	880	4,360
2010	2,610	3,300	0	5,910	880	2,620	1,030	4,530
2015	3,240	3,480	0	6,730	1,170	2,820	1,140	5,130

Note: not including general aviation movements

3.10 PEAK HOUR FORECAST

3.10.1 Design Basis

Annual passenger demand and aircraft movements are decomposed into peak hour traffic, which is the design basis of various airport facilities. In particular, the size of terminal facilities -- aircraft stands, passenger terminal building and car park -- is more closely related to peak hour traffic rather than annual traffic.

Design peak hour is often defined as an average day of the peak month, which corresponds to the 30th to 40th busiest hour of the year in question. By using this for design purposes, the airport would experience 30 to 40 hours of over-capacity traffic in a year; however, the normal experience suggests that catering for excessive peak traffic is both uneconomical and unnecessary.

3.10.2 Methodology for Peak Hour Forecast

The methodology for decomposing annual traffic into design peak hour traffic is illustrated in Figure 3.10.1. The annual aircraft movements are multiplied by the peak day ratio to obtain design day aircraft movements. Then, by further multiplying by the peak hour factor, 2-way peak hour aircraft movements (departures plus arrivals) can be estimated. One-way peak hour aircraft movements (departures or arrivals) will finally be obtained by further multiplying by the heavy direction factor. The corresponding design day, 2-way peak hour and 1-way peak hour number of passengers will be calculated as the product of estimated aircraft movements, the number of aircraft seats by categories and the load factor of aircraft.

3.10.3 Planning Parameters

1) Design Day Ratio

Analyses of monthly variations of air passenger traffic at Bacolod, Iloilo, Tacloban and Legaspi Airports during 1993-1995 indicate design day ratios of 1/300, 1/298, 1/310 and 1/290 respectively. From these figures, the design day ratio of 1/300 is used commonly for the four airports for estimating the design day passenger traffic. A design day ratio of 1/340 is used for aircraft movements by assuming 85% passenger load factor of the design day (1/300 x 75% / 85% = 1/340).

2) Peak Hour Factor

The peak hour factor indicates the concentration of aircraft movements during design peak hour as a percentage of design day aircraft movements. It declines as design day aircraft movements increase so that it may represent peak spreading, i.e. patterns of peaking tend to become less pronounced over time, and thus the hourly peaks in activity rise at a slower rate than the annual traffic.

Figure 3.7.2 indicates the relationship between the peak hour factor and daily aircraft movements at major airports in the Philippines. The peak hour factors for the four airports indicate 0.2 to 0.25 at present, which are relatively high due to relatively few aircraft movements per day. However, it is anticipated that the peak hour factor will decline in the future as the values for Cebu and Manila Airports suggest.

A continuous line in the same figure shows planning guideline used for domestic airports in Japan. This line roughly coincides with the average characteristics of airports in the Philippines, and thus used for estimating the peak hour factors for the four airports.

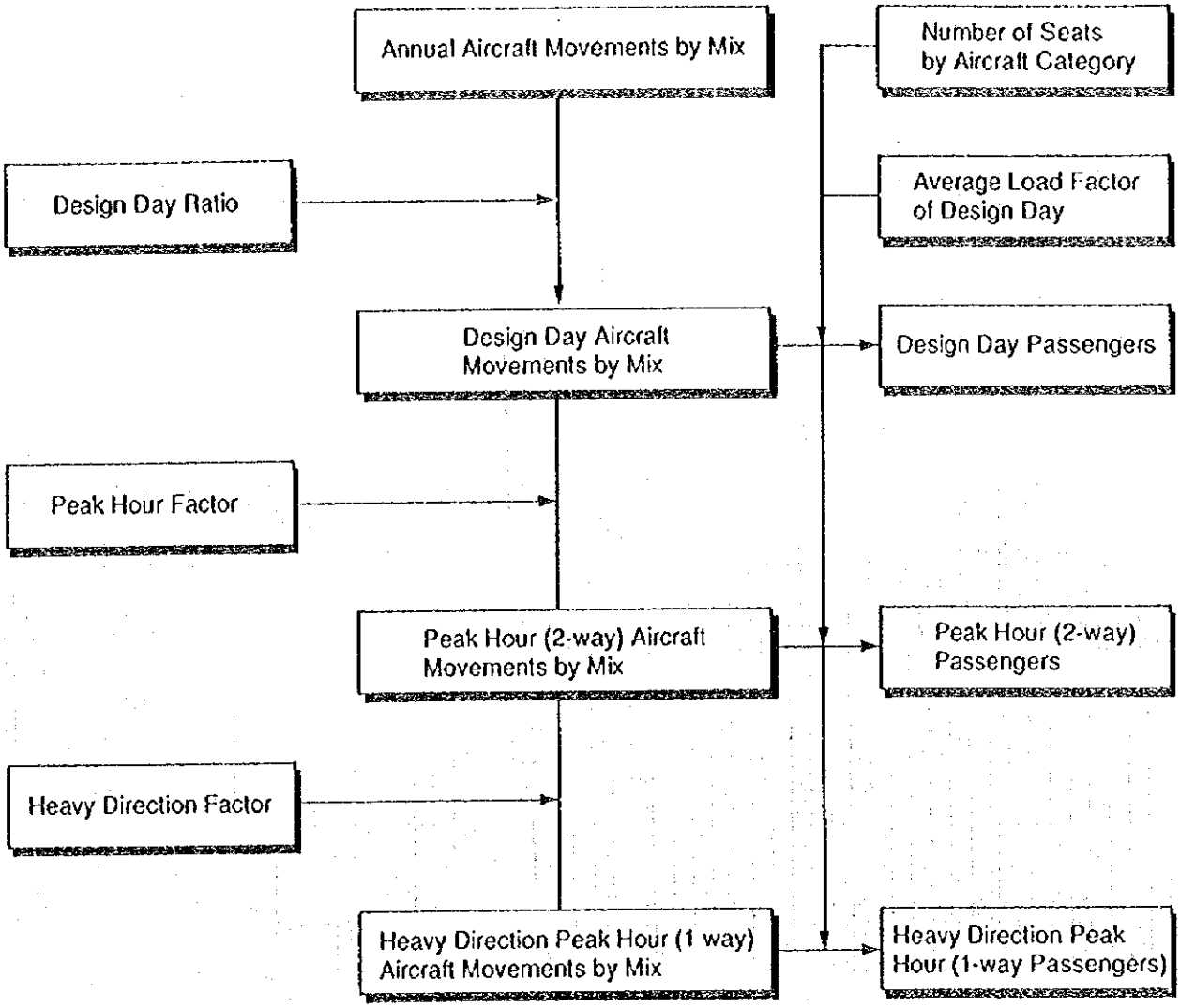

Figure 3.10.1 Work Diagram for Decomposing Annual Traffic to Design Peak Hour Traffic

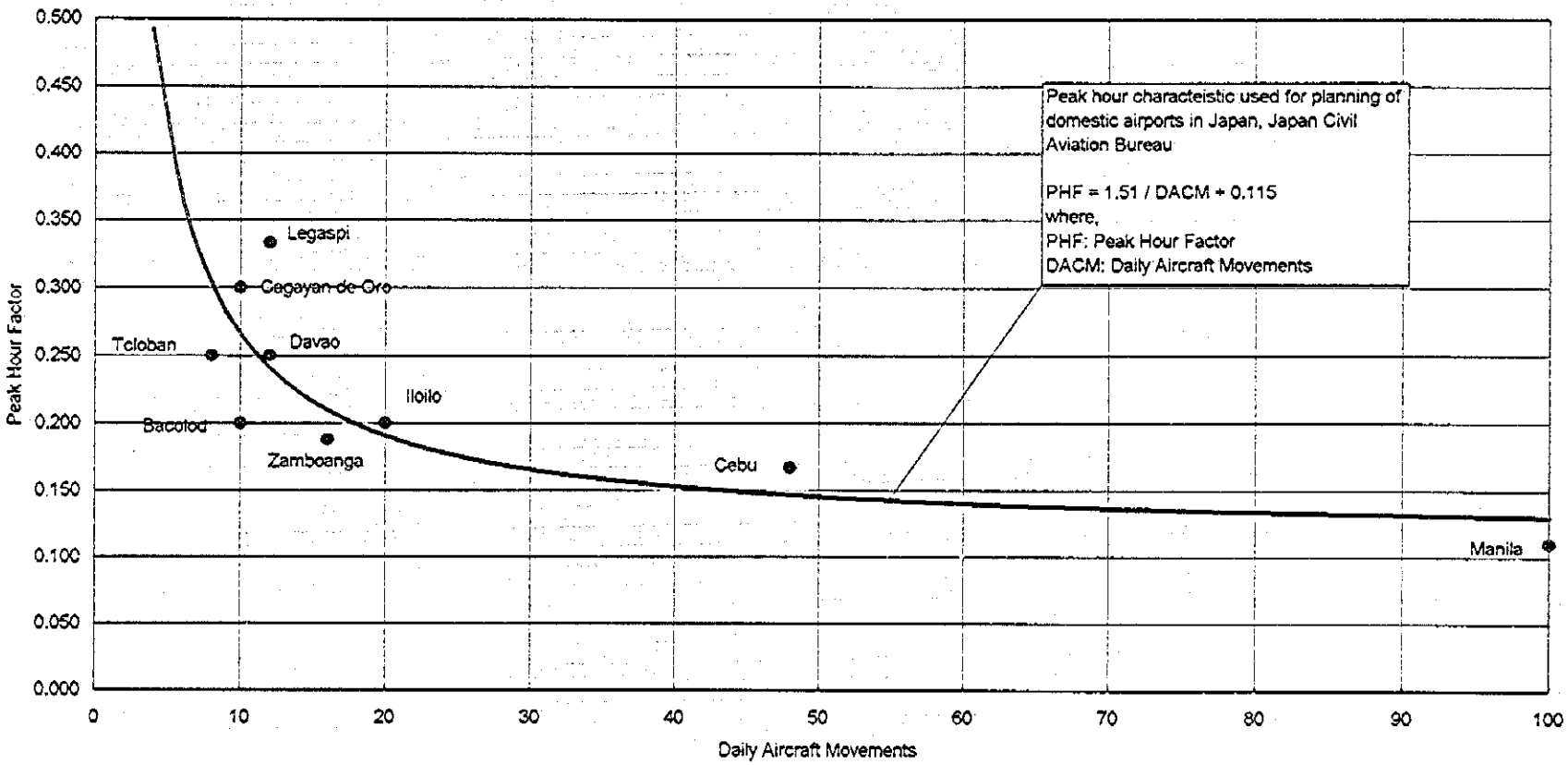

Figure 3.10.2 Peak Hour Facor vs. Daily Aircraft Movements at Airports in the Philippines (Domestic Aircraft Movements)

3) Heavy Direction Factor

The heavy direction factor is defined as the ratio of 1-way traffic (departures or arrivals) to 2-way traffic (departures plus arrivals) during design peak hour. It is generally situated between 0.6 and 0.75. Based on the analysis of current peak patterns at the four airports, the heavy direction factor of 0.67 is used for all the four airports.

4) Passenger Load Factor of the Design Day and Peak Hour

The passenger load factor of the design day and peak hour is generally higher than that of the annual average. It is assumed to be 85% as against the annual average of 75%, and used for converting aircraft movements of design day, 2-way peak hour and 1-way peak hour into respective design day and peak hour passenger traffic.

3.10.4 Estimated Peak Hour Traffic and the Summary of the Forecasts

The result of the peak hour forecast together with overall results of the air traffic demand forecasts are summarized in Table 3.10.1.

Table 3.10.1 Summary of Air Traffic Demand Forecasts

Item			2000				2005				2010				2015			
			Annual	Design Day	Peak Hour (2-way)	Peak Hour (1-way)	Annual	Design Day	Peak Hour (2-way)	Peak Hour (1-way)	Annual	Design Day	Peak Hour (2-way)	Peak Hour (1-way)	Annual	Design Day	Peak Hour (2-way)	Peak Hour (1-way)
Bacolod Airport	Passengers		736,000	2,450	510	340	1,003,000	3,340	630	420	1,229,000	4,100	720	490	1,436,000	4,790	830	550
	Cargo (ton)		12,300	-	-	-	15,600	-	-	-	19,000	-	-	-	22,400	-	-	-
	Aircraft Movements	MJ	2,270	7	1.4	0.9	3,620	11	2.0	1.3	4,810	14	2.5	1.7	6,550	19	3.3	2.2
		SJ	3,250	10	2.0	1.3	3,440	10	1.9	1.3	3,500	10	1.8	1.2	2,340	7	1.2	0.8
		TP	0	0	0.0	0.0	0	0	0.0	0.0	0	0	0.0	0.0	0	0	0.0	0.0
		Total	5,520	16	3.4	2.3	7,060	21	3.9	2.6	8,310	24	4.3	2.9	8,890	26	4.5	3.0
Iloilo Airport	Passengers		886,000	2,890	540	360	1,179,000	3,930	670	450	1,445,000	4,820	800	530	1,688,000	5,630	900	600
	Cargo (ton)		10,100	-	-	-	12,800	-	-	-	15,600	-	-	-	18,400	-	-	-
	Aircraft Movements	MJ	2,450	7	1.3	0.9	3,870	11	1.9	1.3	5,990	18	2.9	1.9	7,550	22	3.6	2.4
		SJ	3,920	12	2.2	1.4	4,320	13	2.2	1.4	2,950	9	1.4	1.0	2,440	7	1.1	0.8
		TP	800	2	0.4	0.3	1,090	3	0.5	0.4	1,290	4	0.6	0.4	1,410	4	0.7	0.4
		Total	7,170	21	3.9	2.6	9,280	27	4.6	3.1	10,230	30	5.0	3.3	11,400	34	5.4	3.6
Tacloban Airport	Passengers		481,000	1,610	400	270	655,000	2,190	480	320	803,000	2,680	540	360	938,000	3,120	600	400
	Cargo (ton)		4,400	-	-	-	5,600	-	-	-	6,800	-	-	-	8,000	-	-	-
	Aircraft Movements	MJ	1,160	3	0.8	0.6	1,920	6	1.2	0.8	2,610	8	1.5	1.0	3,240	10	1.8	1.2
		SJ	2,750	8	2.0	1.3	3,090	9	2.0	1.3	3,300	10	2.0	1.3	3,480	10	2.0	1.3
		TP	0	0	0.0	0.0	0	0	0.0	0.0	0	0	0.0	0.0	0	0	0.0	0.0
		Total	3,900	12	2.8	1.9	5,010	15	3.2	2.1	5,910	17	3.5	2.4	6,730	20	3.8	2.5
Legaspi Airport	Passengers		276,000	920	250	170	375,000	1,250	290	190	460,000	1,530	350	230	537,000	1,790	380	260
	Cargo (ton)		1,500	-	-	-	1,900	-	-	-	2,300	-	-	-	2,700	-	-	-
	Aircraft Movements	MJ	0	0	0.0	0.0	0	0	0.0	0.0	880	3	0.6	0.4	1,170	3	0.7	0.5
		SJ	2,530	7	2.0	1.4	3,480	10	2.4	1.6	2,620	8	1.8	1.2	2,620	8	1.8	1.2
		TP	720	2	0.6	0.4	880	3	0.6	0.4	1,030	3	0.7	0.5	1,140	3	0.7	0.5
		Total	3,250	10	2.6	1.7	4,360	13	3.0	2.0	4,530	13	3.0	2.0	5,130	15	3.2	2.2

Chapter 4 Airport Facility Requirements

Chapter 4 Airport Facility Requirements

CHAPTER 4 AIRPORT FACILITY REQUIREMENTS

4.1 SUMMARY

In this Chapter, major airport facility requirements are established in compliance with the relevant standards and recommended practices of the International Civil Aviation Organization (ICAO). The standards and practices of International Air Transport Association (IATA), Federal Aviation Administration of the United States (FAA) and the Civil Aviation Bureau of Japan are also referred to.

The medium case of air traffic demand forecast was used for this study for the following reasons:

a) Facility requirements are established based on high service standards. The risk of over investment will, therefore, become very high if high case forecast is used for planning.

b) Airports are usually developed to accommodate the forecast demand five years after the inauguration. Therefore, it will not be difficult to accommodate the traffic demand in the year of inauguration of the expanded (or new) facilities, even if actual traffic grows to the level of the high case forecast. In this case the next phase of the development should be accelerated.

c) If actual traffic growth is close to the low case forecast, it is not difficult to delay or reduce the scale of the development.

Tables 4.1.1 through 4.1.4 summarize the facility requirements of Bacolod, Iloilo, Tacloban and Legaspi Airport respectively.

Table 4.1.1 Summary of Airport Facility Requirements of Bacolod Airport

Item	Present Condition as of May 1996	Future Requirements			
		2000	2005	2010	2015
1. Annual Passengers	371,955	736,000	1,003,000	1,229,000	1,436,000
2. Annual Cargo (tons)	7,581	12,300	15,600	19,000	22,400
3. Annual Aircraft Movements	24,444	5,520	7,060	8,310	8,890
4. Peak Hour Passengers (2 ways)	280	510	630	720	830
5. Peak Hour Aircraft Movements (2 ways)	2	3.4	3.9	4.3	4.5
6. Largest Aircraft	B737	A300	ditto	ditto	ditto
7. Longest Haul	Manila	Manila	ditto	ditto	ditto
8. Aerodrome Reference Code	4C	4D	ditto	ditto	ditto
9. Operational Category	Non-Precision Instrument	Precision Category I	ditto	ditto	ditto
10. Runway Length Width	 1,958 m 30 m	 1,940 m 45 m	 ditto	 ditto	 ditto
11. Runway Strip Length Width	 2,000 m 150 m	 2,060 m 300 m	 ditto	 ditto	 ditto
12. Taxiway System Width	 2 Stub TWYs 23 m	 2 Stub TWYs 23 m	 ditto ditto	 ditto ditto	 ditto ditto
13. Passenger Loading Apron	MJ : 0 SJ/TP : 4 Total : 4	MJ : 3 SJ : 2 TP : 0 Total : 5	MJ : 3 SJ : 2 TP : 0 Total : 5	MJ : 4 SJ : 2 TP : 0 Total : 6	MJ : 4 SJ : 1 TP : 0 Total : 5
14. Passenger Terminal Building	1,003 m^2	5,100 m^2	6,300 m^2	7,200 m^2	8,300 m^2
15. Cargo Terminal Building	450 m^2	1,230 m^2	1,560 m^2	1,900 m^2	2,240 m^2
16. Administration Building	247 m^2	1,800 m^2	ditto	ditto	ditto
17. Fire Station Building	350 m^2	550 m^2	ditto	ditto	ditto
18. Access Road	2 lanes	2 lanes	ditto	ditto	ditto
19. Car Park	4,000 m^2	9,100 m^2	11,200 m^2	12,600 m^2	14,750 m^2
20. Air Navigation Systems	C-VOR LLZ/DME	D-VOR/DME ILS Cat I	ditto	ditto	ditto
21. Rescue and Fire Fighting Category Fire Fighting Vehicles	 Category 6 3	 Category 7 2	 Category 8 3	 ditto	 ditto
22. Public Utilities Power Supply Water Supply Sewage Disposal Solid waste Disposal Telephone Trunk Line	 45 kVA 3 t/day n.a. n.a. 3 lines	 970 kVA 140 t/day 140 t/day 0.9 t/day 9 lines	 1,110 kVA 170 t/day 170 t/day 1.0 t/day 10 lines	 1,220 kVA 200 t/day 200 t/day 1.1 t/day 10 lines	 1,350 kVA 220 t/day 220 t/day 1.3 t/day 11 lines
23. Fuel Supply Facility Tank Capacity	 total 76 kl	 100 kl x 3	 100 kl x 4	 100 kl x 5	 100 kl x 6

Table 4.1.2 Summary of Airport Facility Requirements of Iloilo Airport

Item	Present Condition as of May 1996	Future Requirements			
		2000	2005	2010	2015
1. Annual Passengers	460,423	886,000	1,179,000	1,445,000	1,688,000
2. Annual Cargo (tons)	4,771	10,100	12,800	15,600	18,400
3. Annual Aircraft Movements	14,486	7,170	9,280	10,230	11,400
4. Peak Hour Passengers (2 ways)	330	540	670	800	900
5. Peak Hour Aircraft Movements (2 ways)	3	3.9	4.6	5.0	5.4
6. Largest Aircraft	B737	A300	ditto	ditto	ditto
7. Longest Haul	Manila	Manila	ditto	ditto	ditto
8. Aerodrome Reference Code	4C	4D	ditto	ditto	ditto
9. Operational Category	Non-Precision Instrument	Precision Category I	ditto	ditto	ditto
10. Runway Length Width	 2,100 m 45 m	 1,930 m 45 m	ditto	ditto	ditto
11. Runway Strip Length Width	 2,220 m 150 m	 2,050 m 300 m	ditto	ditto	ditto
12. Taxiway System Width	 2 Stub TWYs 23 m	 2 Stub TWYs 23 m	 ditto ditto	 ditto ditto	 ditto ditto
13. Passenger Loading Apron	MJ : 0 SJ/TP : 4 Total : 4	MJ : 3 SJ : 2 TP : 1 Total : 6	MJ : 3 SJ : 2 TP : 1 Total : 6	MJ : 4 SJ : 1 TP : 1 Total : 6	MJ : 5 SJ : 1 TP : 1 Total : 7
14. Passenger Terminal Building	2,202 m^2	5,400 m^2	6,700 m^2	8,000 m^2	9,000 m^2
15. Cargo Terminal Building	960 m^2	1,010 m^2	1,280 m^2	1,560 m^2	1,840 m^2
16. Administration Building	138 m^2	1,800 m^2	ditto	ditto	ditto
17. Fire Station Building	300 m^2	550 m^2	ditto	ditto	ditto
18. Access Road	2 lanes	2 lanes	ditto	ditto	4 lanes
19. Car Park	6,000 m^2	9,450 m^2	11,900 m^2	14,000 m^2	15,750 m^2
20. Air Navigation Systems	C-VOR/DME	D-VOR/DME ILS Cat I	ditto	ditto	ditto
21. Rescue and Fire Fighting Category Fire Vehicles	 Category 6 3	 Category 7 2	 Category 8 3	 ditto	 ditto
22. Public Utilities Power Supply Water Supply Sewage Disposal Solid waste Disposal Telephone Trunk Line	 n.a. n.a. n.a. n.a.	 990 kVA 150 t/day 150 t/day 0.9 t/day 9 lines	 1,140 kVA 180 t/day 180 t/day 1.0 t/day 10 lines	 1,280 kVA 210 t/day 210 t/day 1.1 t/day 11 lines	 1,400 kVA 240 t/day 240 t/day 1.3 t/day 11 lines
23. Fuel Supply Facility Tank Capacity	 total 91 kl	 100 kl x 3	 100 kl x 4	 100 kl x 6	 100 kl x 7

Table 4.1.3 Summary of Airport Facility Requirements of Tacloban Airport

Item	Present Condition as of May 1996	Future Requirements			
		2000	2005	2010	2015
1. Annual Passengers	258,190	481,000	655,000	803,000	938,000
2. Annual Cargo (tons)	2,881	4,400	5,600	6,800	8,000
3. Annual Aircraft Movements	3,094	3,900	5,010	5,910	6,730
4. Peak Hour Passengers (2 ways)	280	400	480	540	600
5. Peak Hour Aircraft Movements (2 ways)	2	2.8	3.2	3.5	3.8
6. Largest Aircraft	B737	A300	ditto	ditto	ditto
7. Longest Haul	Manila	Manila	ditto	ditto	ditto
8. Aerodrome Reference Code	4C	4D	ditto	ditto	ditto
9. Operational Category	Non-Precision Instrument	Precision Category I	ditto	ditto	ditto
10. Runway Length Width	 2,140 m 45 m	 1,910 m 45 m	 ditto	 ditto	 ditto
11. Runway Strip Length Width	 2,260 m 150 m	 2,030 m 300 m	 ditto	 ditto	 ditto
12. Taxiway System Width	 2 Stub TWYs 23 m	 2 Stub TWYs 23 m	 ditto	 ditto	 ditto
13. Passenger Loading Apron	MJ : 0 SJ/TP : 4 Total : 4	MJ : 2 SJ : 2 TP : 0 Total : 4	MJ : 3 SJ : 2 TP : 0 Total : 5	MJ : 3 SJ : 2 TP : 0 Total : 5	MJ : 3 SJ : 2 TP : 0 Total : 5
14. Passenger Terminal Building	1,610 m^2	4,000 m^2	4,800 m^2	5,400 m^2	6,000 m^2
15. Cargo Terminal Building	180 m^2	660 m^2	840 m^2	1,020 m^2	1,200 m^2
16. Administration Building	350 m^2	1,800 m^2	ditto	ditto	ditto
17. Fire Station Building	260 m^2	550 m^2	ditto	ditto	ditto
18. Access Road	2 lanes	2 lanes	ditto	ditto	ditto
19. Car Park	5,600 m^2	7,000 m^2	8,400 m^2	9,450 m^2	10,500 m^2
20. Air Navigation Systems	C-VOR/DME	D-VOR/DME ILS Cat I	ditto	ditto	ditto
21. Rescue and Fire Fighting Category Fire Fighting Vehicles	 Category 6 3	 Category 7 2	 ditto	 ditto	 Category 8 3
22. Public Utilities Power Supply Water Supply Sewage Disposal Solid waste Disposal Telephone Trunk Line	 300 kVA n.a. n.a. n.a. 3 lines	 830 kVA 120 t/day 120 t/day 0.7 t/day 8 lines	 920 kVA 140 t/day 140 t/day 0.8 t/day 9 lines	 990 kVA 150 t/day 150 t/day 0.9 t/day 9 lines	 1,060 kVA 170 t/day 170 t/day 0.9 t/day 10 lines
23. Fuel Supply Facility Tank Capacity	 total 170 kl	 100 kl x 2	 100 kl x 3	 100 kl x 4	 100 kl x 4

Table 4.1.4 Summary of Airport Facility Requirements of Legaspi Airport

Item	Present Condition as of May 1996	Future Requirements			
		2000	2005	2010	2015
1. Annual Passengers	161,977	276,000	375,000	460,000	537,000
2. Annual Cargo (tons)	919	1,500	1,900	2,300	2,700
3. Annual Aircraft Movements	2,332	3,250	4,360	4,530	5,130
4. Peak Hour Passengers (2 ways)	280	250	290	350	380
5. Peak Hour Aircraft Movements (2 ways)	2	2.6	3.0	3.0	3.2
6. Largest Aircraft	B737	A320	ditto	A300	ditto
7. Longest Haul	Manila	Manila	ditto	ditto	ditto
8. Aerodrome Reference Code	4C	4C	ditto	4D	ditto
9. Operational Category	Non-Instrument	Precision Category I	ditto	ditto	ditto
10. Runway Length Width	 2,280 m 36 m	 2,010 m 45 m	ditto	ditto	ditto
11. Runway Strip Length Width	 2,380 m 150 m	 2,130 m 300 m	ditto	ditto	ditto
12. Taxiway System Width	 2 Stub TWYs 23 m	 2 Stub TWYs 15 m	ditto	 2 Stub TWYs 23 m	ditto
13. Passenger Loading Apron	MJ : 0 SJ/TP : 4 Total : 4	MJ : 0 SJ : 3 TP : 1 Total : 4	MJ : 0 SJ : 3 TP : 1 Total : 4	MJ : 2 SJ : 2 TP : 1 Total : 5	MJ : 2 SJ : 2 TP : 1 Total : 5
14. Passenger Terminal Building	913 m^2	2,500 m^2	2,900 m^2	3,500 m^2	3,800 m^2
15. Cargo Terminal Building	210 m^2	230 m^2	290 m^2	350 m^2	410 m^2
16. Administration Building	360 m^2	1,800 m^2	ditto	ditto	ditto
17. Fire Station Building	370 m^2	550 m^2	ditto	ditto	ditto
18. Access Road	2 lanes	2 lanes	ditto	ditto	ditto
19. Car Park	6,500 m^2	4,550 m^2	5,250 m^2	6,300 m^2	6,650 m^2
20. Air Navigation Systems	D-VOR/DME NDB	D-VOR/DME ILS Cat I	ditto	ditto	ditto
21. Rescue and Fire Fighting Category Fire Fighting Vehicles	 Category 4 4	 Category 6 2	ditto	 Category 7 2	ditto
22. Public Utilities Power Supply Water Supply Sewage Disposal Solid waste Disposal Telephone Trunk Line	 150 kVA n.a. n.a. n.a. 3 lines	 650 kVA 80 t/day 80 t/day 0.5 t/day 7 lines	 700 kVA 90 t/day 90 t/day 0.6 t/day 7 lines	 760 kVA 110 t/day 110 t/day 0.6 t/day 8 lines	 790 kVA 110 t/day 110 t/day 0.7 t/day 8 lines
23. Fuel Supply Facility Tank Capacity	 total 83 kl	 50 kl x 2	 50 kl x 2	 50 kl x 3	 50 kl x 3

4.2 RUNWAY STRIP AND OBSTACLE LIMITATION SURFACES

4.2.1 Aerodrome Reference Code and Operational Category

In accordance with ICAO's Annex 14 - Aerodrome, the aerodrome reference code of the four airports should be 4C at present (operating B737), and 4D when A300 class aircraft is expected to operate.

A precision approach, which reduces operational routine work of the flight crew during landing, is a procedure used worldwide for safe operations of modern jet aircraft. Therefore, operational category of the runway should be the precision approach category I so as to enhance the operational safety of the modern jet aircraft at trunkline airports.

4.2.2 Runway Strip

According to the ICAO standards for the dimensions of a runway strip, the strip for a precision approach runway code number 4 shall, wherever practicable, extend laterally at least to 150 m on each side of the center line of the runway. If it is considered impractical to provide 300 m wide runway strip due to the site conditions, a 150 m wide (75 m on each side) strip, which is recommended for non-instrument runway by ICAO and standard width of Runway Safety Area of FAA, shall be provided.

It is recommended that the strip should extend before the threshold and beyond the end of the runway at least for 60 m, and that an object situated on the runway strip which may endanger aircraft should be regarded as an obstacle and should, as far as practicable, be removed. No fixed object, other than visual aids required for air navigation purposes and satisfying the relevant frangibility requirements in Annex 14, shall be permitted on a runway strip within 60 m of the runway center line.

4.2.3 Runway End Safety Area

It is recommended to provide a runway end safety area at each end of the runway strip. The runway end safety area should extend from the end of runway strip for as great a distance as practicable, but for at least 90 m. The width of the runway end safety area should be at least twice that of the associated runway (2 x 45 m = 90 m). It is recommended that an object situated within a runway end safety area which may endanger aircraft should be regarded as an obstacle and should, as far as practicable, be removed.

4.2.4 Obstacle Limitation Surfaces

The following obstacle limitation surfaces shall be established, in accordance with ICAO standards, for a precision approach runway category I:

a) conical surface;
b) inner horizontal surface;
c) approach surface;

c) approach surface;
d) transitional surfaces; and
e) take-off climb surface.

The following obstacle limitation surfaces should be established, in accordance with ICAO recommendations, for a precision approach runway category I:

a) inner approach surface;
b) inner transitional surfaces;
c) balked landing surface; and

New objects or extensions of existing objects under these surfaces shall be controlled as stipulated in ICAO Annex 14. It is recommended that existing objects above these surface should, as far as practicable, be removed except when an object is shielded by an existing immovable object, or the object would not adversely affect the safety or regularity of aircraft operations.

Dimensions of obstacle limitation surfaces are shown in Figures 4.2.1 and 4.2.2.

4.3 RUNWAY, TAXIWAY AND APRON

4.3.1 Runway

1) Number and Orientation of Runway

The number and orientation of runway(s) at an airport should be such that the usability factor of the airport is not less than 95% with the maximum permissible 20 Kt cross-wind components.

2) Runway Dimensions

The required runway lengths for takeoff at the maximum payload to Manila are calculated for various types of aircraft as shown in Table 4.3.1 (see Appendix 4.3.1 for more details):

Table 4.3.1 Typical Takeoff Runway Length at Maximum Payload to Manila

Airport	Aircraft	Runway Length
Bacolod	B737-300	1,730 m
	A320	1,940 m
	A300	1,740 m
Iloilo	B737-300	1,720 m
	A320	1,930 m
	A300	1,730 m
Tacloban	B737-300	1,740 m
	A320	1,910 m
	A300	1,720 m
Legaspi	B737-300	1,770 m
	A320	2,010 m
	A300	1,800 m

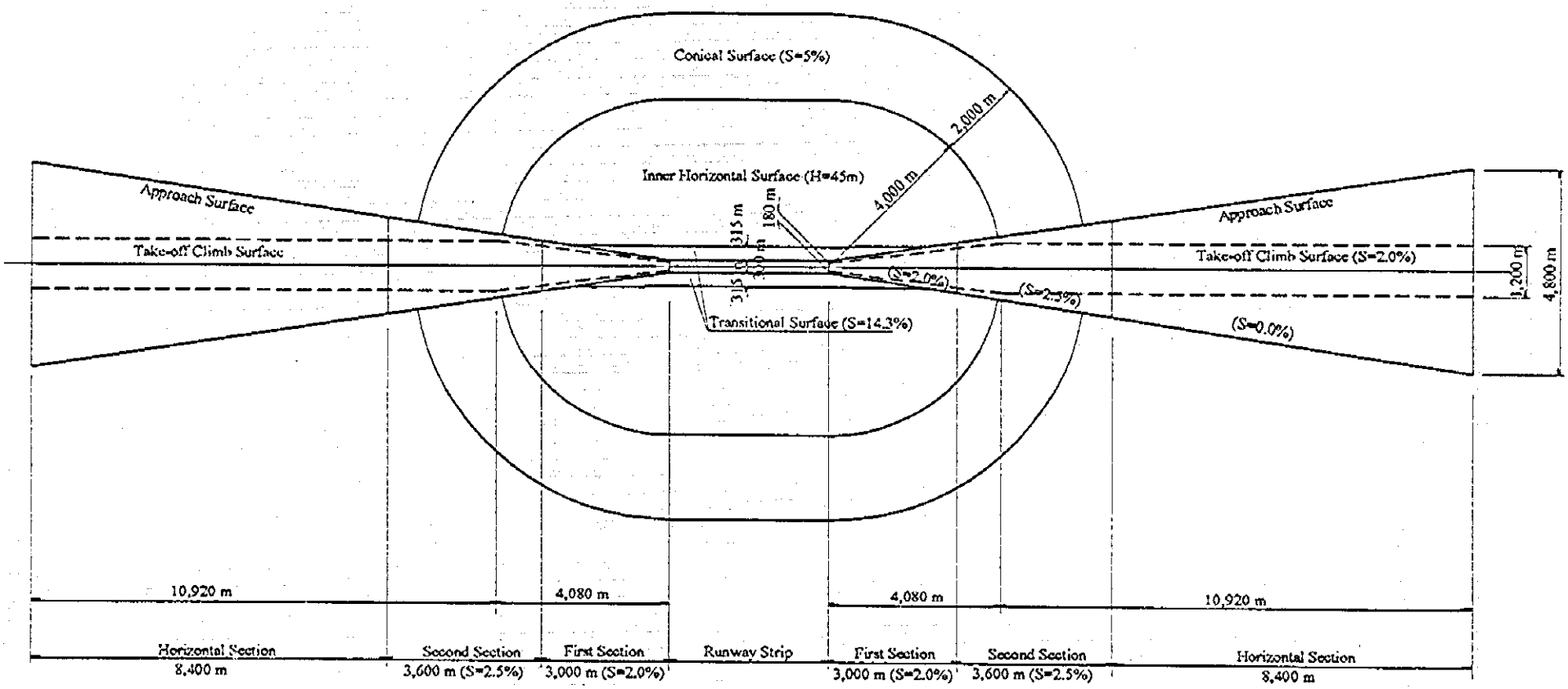

Figure 4.3.1 Obstacle Limitation Surfaces (1)

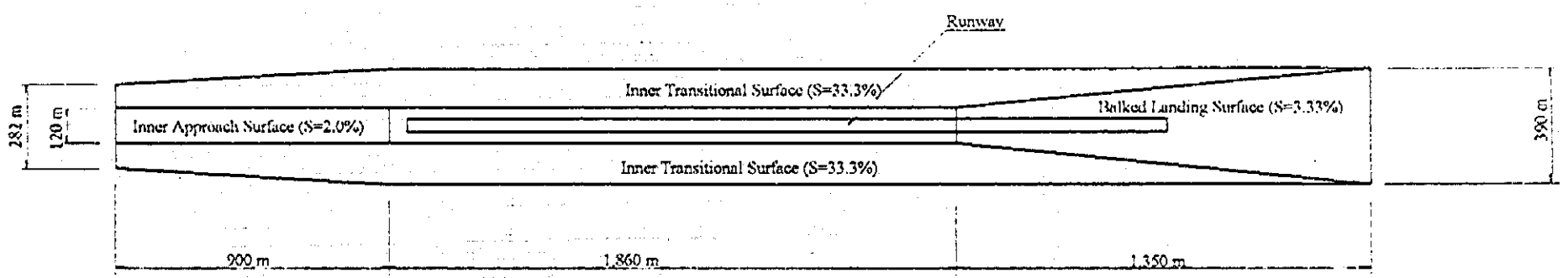

Figure 4.3.2 Obstacle Limitation Surfaces (2)

To allow the above-mentioned aircraft's takeoff to Manila at the maximum payload, Minimum runway lengths of Bacolod, Iloilo and Tacloban and Legaspi Airports should be 1,940m, 1,930m, 1,910m and 2,010m respectively.

The width of the runway should be 45 m with 7.5 m shoulders on each side, in accordance with the recommendations by ICAO for the aerodrome reference codes 4C and 4D.

4.3.2 Taxiway and Taxiway Strip

A complete parallel taxiway with right angle exits may be economically justifiable when the number of instrument approaches exceeds four during the peak hour. As the forecasted peak hour one-way aircraft movements of Bacolod, Iloilo, Tacloban and Legaspi Airports are less than four even in the year 2015, no parallel taxiway is required.

Minimum widths of the taxiway serving for A320 and A300 classes of aircraft should be 15 m and 23 m respectively. Minimum widths of the shoulders for 15 m and 23 m wide taxiways should be 5 m and 7.5 m respectively. A taxiway strip should extend symmetrically on each side of the taxiway center line to distances of 26 m and 40.5 m for A320 and A300 classes of aircraft respectively.

4.3.3 Apron

The required numbers of aircraft stands are calculated based on the peak hour aircraft movement forecast and assumed turn-around time. Aircraft are classified as shown in Table 4.3.2 for the planning of the aircraft parking apron.

Table 4.3.2 Aircraft Classification for Aircraft Parking Apron

Class	Aircraft Types	Design Aircraft	Wing Span	Overall Length	Clearance on Apron
MJ	A300	A300	44.8 m	53.6 m	7.5 m
SJ	A320, B737, DC-9	A320	34.1 m	37.6 m	4.5 m
TP	F50	F50	27.1 m	26.9m	4.5 m

Turnaround times are assumed for planning purpose as shown in Table 4.3.3.

Table 4.3.3 Aircraft Turnaround Time

Class	Turnaround Time (min.)
MJ	80
SJ	60
TP	60

Tables 4.3.4 summarizes the calculation results of required number of stands for Bacolod, Iloilo, Tacloban and Legaspi.

Table 4.3.4 Required Number of Aircraft Stands

Airport & Class	2000	2005	2010	2015
Bacolod				
MJ	3	3	4	4
SJ	2	2	2	1
TP	0	0	0	0
Total	5	5	6	5
Iloilo				
MJ	3	3	4	5
SJ	2	2	1	1
TP	1	1	1	1
Total	6	6	6	7
Tacloban				
MJ	2	3	3	3
SJ	2	2	2	2
TP	0	0	0	0
Total	4	5	5	5
Legaspi				
MJ	0	0	2	2
SJ	3	3	2	2
TP	1	1	1	1
Total	4	4	5	5

4.4 PASSENGER AND CARGO TERMINAL BUILDING

4.4.1 Passenger Terminal Building

The floor area required for the passenger terminal building was calculated by multiplying the number of peak hour passengers and unit floor area per passenger. Unit floor areas of 10 sq. m per peak hour passenger were adopted for passenger terminal as planning practice based on other projects. The results of the calculations are shown in Table 4.4.1.

Table 4.4.1 Required Floor Area of Passenger Terminal Building

Airport	2000	2005	2010	2015
Bacolod	5,100 m^2	6,300 m^2	7,200 m^2	8,300 m^2
Iloilo	5,400 m^2	6,700 m^2	8,000 m^2	9,000 m^2
Tacloban	4,000 m^2	4,800 m^2	5,400 m^2	6,000 m^2
Legaspi	2,500 m^2	2,900 m^2	3,500 m^2	3,800 m^2

4.4.2 Cargo Terminal Building

The floor area of the cargo terminal building was estimated based on the annual cargo volume and unit cargo handling capacity. A handling capacity of 15 ton per sq. m for Bacolod and Iloilo Airports and 10 ton per sq. m for Tacloban and Legaspi Airports were used for estimating the cargo handling area based on experience of other projects. Total floor area of a cargo terminal building is generally estimated to be 1.5 times of the cargo handling area.

Table 4.4.2 Required Floor Area of Cargo Terminal Building (sq. m)

Airport	2000	2005	2010	2015
Bacolod	1,230 m^2	1,560 m^2	1,900 m^2	2,240 m^2
Iloilo	1,010 m^2	1,280 m^2	1,560 m^2	1,840 m^2
Tacloban	660 m^2	840 m^2	1,020 m^2	1,200 m^2
Legaspi	230 m^2	290 m^2	350 m^2	410 m^2

4.5 OTHER BUILDINGS

4.5.1 Control Tower Building

The control tower should be high enough to observe the surface of runway thresholds with an angle of depression not less than 35'. The approximate minimum eye level of controllers will be about 35 m above the runway elevation. Floor area of tower cab should be about 60 sq. m to accommodate air traffic controllers, control consoles, staircase, and others.

4.5.2 Administration Building

The floor space required for administrative and operational functions will be about 1,800 sq. m as per the current practice at Japanese airports.

4.5.3 Fire Station Building

The floor space required for fire station building will be about 550 sq. m based on examples at other airports.

4.6 ROAD AND CAR PARK

4.6.1 Access Road

The required number of traffic lanes for the access road is determined by the volume of vehicular traffic. From the traffic survey results (refer to Appendix B), unit demands of vehicular traffic (two ways) per passenger (two ways) at Bacolod, Iloilo, Tacloban and Legaspi were estimated to be 1.50, 3.05, 1.06 and 1.49 respectively. On the bases of these figures, 1.5 vehicles per passenger was used for planning of access roads of Bacolod, Tacloban and Legaspi Airports. For Iloilo Airport 3.0 vehicles per passenger was used for the planning. The volume of vehicular traffic was estimated by multiplying this unit demand and number of air passengers as shown in Table 4.6.1. The number of lanes was estimated based on the following road capacities.

a) Two lanes for two direction (carriage way width = 7.0m) 2,500 vehicles / two direction / hr
b) Multiple lane road 2,200 vehicles / lane / hr

Table 4.6.1 Volume of Traffic and Required Number of Lanes (One Way)

	2000	2005	2010	2015
Number of Vehicle Traffic				
Bacolod	770	950	1,080	1,250
Iloilo	1,620	2,010	2,400	2,700
Tacloban	600	720	810	900
Legaspi	380	440	530	570
Number of Lanes				
Bacolod	1	1	1	1
Iloilo	1	1	1	2
Tacloban	1	1	1	1
Legaspi	1	1	1	1

4.6.2 Car Park

The parking demand for vehicles was estimated based on the number of peak hour passengers (two ways) and unit parking demand per hourly passenger. Current unit parking demands per passenger observed at Bacolod, Iloilo, Tacloban and Legaspi Airports were 0.48, 0.41, 0.54 and 0.32 respectively (refer to Appendix B). On the bases of the above figures 0.5 vehicle parking per passenger was used for the planning of the car park.

A unit space of 35 sq. m was adopted to estimate the required area for the car park. This unit space includes parking lot, driveways and islands within a car park. The results of the calculations are summarized in Table 4.6.2.

Table 4.6.2 Number of Parking Lots and Space of Car Park

	2000	2005	2010	2015
Number of Parking Lots				
Bacolod	260	320	360	420
Iloilo	270	340	400	450
Tacloban	200	240	270	300
Legaspi	130	150	180	190
Space of Car Park (m^2)				
Bacolod	9,100	11,200	12,600	14,750
Iloilo	9,450	11,900	14,000	15,750
Tacloban	7,000	8,400	9,450	10,500
Legaspi	4,550	5,250	6,300	6,650

4.7 AIR NAVIGATION SYSTEMS

Air navigation systems, including radio navigation aids, aeronautical ground lights, meteorological observation systems, Air Traffic Control (ATC) and aeronautical telecommunication systems should be provided to allow precision approach category I operations, and to facilitate the safe, orderly and expeditious flow of air traffic.

The following major equipment and systems are required for the four airports.

Radio Navigation Aids

a) Category I Instrument Landing System (ILS) or Microwave Landing System (MLS) for main approach direction
b) VHF Omnidirectional Range (VOR)/Distance Measuring Equipment (DME)
c) Navaids Monitoring and Control System

Aeronautical Ground Lights

a) Precision Approach Category I Lighting System (PALS Cat-I) for main approach direction
b) Simple Approach Lighting System (SALS) for secondary approach direction (if it is practical)
c) Precision Approach Path Indicators (PAPI) for both runway approaches
d) Runway Edge Lights, Runway Threshold and Wing Bar Lights, Runway End Lights, Stopway Lights, and Taxiway Edge Lights
e) Aerodrome Beacon, Apron Flood Lights, Illuminated Wind Direction Indicator, and Obstacle Lights
f) Aeronautical Ground Light Monitoring and Control System

Meteorological Observation System

a) Transmissiometer (Runway Visual Range) and Ceilometer for main approach direction
b) Automatic Weather Observation, Data Collecting, Recording and Display System
c) Communication Facilities for Meteorological Services, etc.

ATC and Aeronautical Telecommunication System

a) VHF and HF Radio Communication Facilities and Multi Channel Magnetic Tape Recorder as existing.
b) PC / Fax Machine and VSAT as planned in "Nationwide Air Navigation Modernization Project Phase III".

4.8 RESCUE AND FIRE FIGHTING SERVICES

The level of protection for rescue and fire fighting was determined based on the dimensions of the aircraft using the airport, as adjusted for their frequency of operations, in accordance with "Airport Service Manual Part 1 Rescue and Fire Fighting" (ICAO). The aerodrome categories for an A320 (B737) and an A300 are category 6 and 8 respectively. If number of operations of A300 class aircraft is less than 700 in the busiest consecutive three months, the minimum level of protection for rescue and fire fighting will be category 7. Therefore, the levels of protection required at the four airports were estimated as shown in Table 4.8.1.

Table 4.8.1 Required Level of Protection for Rescue and Fire Fighting

	2000	2005	2010	2015
Bacolod	Category 7	Category 8	Category 8	Category 8
Iloilo	Category 7	Category 8	Category 8	Category 8
Tacloban	Category 7	Category 7	Category 7	Category 8
Legaspi	Category 6	Category 6	Category 7	Category 7

Table 4.8.2 shows minimum usable amounts of extinguishing agents and fire fighting vehicles required for categories 6, 7 and 8.

Table 4.8.2 Minimum Usable Amounts of Extinguishing Agents and Fire Fighting Vehicles

	Category 6	Category 7	Category 8
Water for Protein Foam Production (L)	7,900	12,100	18,200
Discharge Rate (L/min.)	4,000	5,300	7,200
Dry Chemical Powder (kg)	225	225	450
Number of Fire Fighting Vehicles	2	2	3

Note: Based on foam meeting performance level B

4.9 AIRPORT UTILITIES

The demands for airport utilities were estimated based on the average unit demands of airports in Japan shown in Table 4.9.1.

Table 4.9.1 Unit Demands for Utilities

Utilities	Unit Demand	
Electricity	Passenger Terminal Building :	100 VA / m^2
	Cargo Terminal Building :	60 VA / m^2
	Administration Building and Others :	80 VA / m^2
Water / Sewage	Passenger Terminal Building :	0.023 ton / m^2 / day
	Cargo Terminal Building :	0.003 ton / m^2 / day
	Administration Building and Others :	0.010 ton / m^2 / day
Solid Waste	Passenger Terminal Building :	0.072 kg / m^2 / day
	Cargo Terminal Building :	0.144 kg / m^2 / day
	Administration Building and Others :	0.144 kg / m^2 / day
Telephone	Passenger Terminal Building :	0.005 extension / m^2
	Cargo Terminal Building :	0.005 extension / m^2
	Administration Building and Others :	0.025 extension / m^2
	Trunk Line:	1 trunk line / 10 extensions

Electric power requirements for air navigation systems were estimated to be approximately 200 kVA, and included in the total power requirement. Airport utilities should be sufficient for the estimated demand in Tables 4.9.2 through 4.9.5.

Table 4.9.2 Estimated Demand of Electric Power Supply (unit : kVA)

Item	2000	2005	2010	2015
Electricity (kVA)				
Bacolod	970	1,110	1,220	1,350
Iloilo	990	1,140	1,280	1,400
Tacloban	830	920	990	1,060
Legaspi	650	700	760	790
Water Supply (ton/day)				
Bacolod	140	170	200	220
Iloilo	150	180	210	240
Tacloban	120	140	150	170
Legaspi	80	90	110	110
Sewerage (ton/day)				
Bacolod	140	170	200	220
Iloilo	150	180	210	240
Tacloban	120	140	150	170
Legaspi	80	90	110	110
Solid Waste (ton/day)				
Bacolod	0.9	1.0	1.1	1.3
Iloilo	0.9	1.0	1.1	1.3
Tacloban	0.7	0.8	0.9	0.9
Legaspi	0.5	0.6	0.6	0.7
Telephone (lines)				
Bacolod	90 (9)	98 (10)	104 (10)	111 (11)
Iloilo	91 (9)	99 (10)	107 (11)	113 (11)
Tacloban	82 (8)	87 (9)	91 (9)	95 (10)
Legaspi	72 (7)	75 (7)	78 (8)	80 (8)

Note: Numbers of telephone lines in ( ) indicate required numbers of external trunk lines.

4.10 AVIATION FUEL SUPPLY SYSTEM

Fuel consumption was estimated by multiplying the assumed trip fuel and the number of departing flights for each aircraft type. The required fuel storage capacity was based on the requirement that the airport has a storage capacity sufficient for provided with seven days of consumption. The tank capacity was planned to be 1.25 times that of the storage requirement.

Table 4.10.1 Estimated Weekly Fuel Consumption and Required Tank Capacity

	2000	2005	2010	2015
Weekly Fuel Consumption (kl)				
Bacolod	237	332	394	471
Iloilo	269	386	507	573
Tacloban	153	236	293	340
Legaspi	56	85	125	125
Tank Capacity (kl)				
Bacolod	100kl x 3	100kl x 4	100kl x 5	100kl x 6
Iloilo	100kl x 3	100kl x 5	100kl x 6	100kl x 7
Tacloban	100kl x 2	100kl x 3	100kl x 4	100kl x 4
Legaspi	50kl x 2	50kl x 2	50kl x 3	50kl x 3
Land Area (sq. m)				
Bacolod	3,150	3,150	3,850	3,850
Iloilo	3,150	3,850	3,850	4,550
Tacloban	2,800	3,150	3,150	3,150
Legaspi	2,275	2,275	2,600	2,600

The land area required for the fuel storage and supply facilities was based on Japanese experience.