AVIATION PLANNING SERVICES

AIR TRAFFIC DEMAND FORECASTS
VII

SAN JOSE, COSTA RICA
1993

1. INTRODUCTION

This report presents an evaluation of alternative airport sites for the potential development of a replacement for Juan Santamariá International Airport in San José, Costa Rica. The study was commissioned by the Ministry of Public Works and Transportation (MOPT) in Costa Rica, which was sponsored by the Canadian International Development Agency (CIDA) under the Capital Project Preliminary Study mechanism of the Professional Services section, within CIDA's Industrial Cooperation Program.

This report constitutes Volume II of a four volume set of documents which will be presented to the MOPT. The four volumes are as follows:

- Volume I: Executive Summary;
- **Volume II: Air Traffic Demand Forecast, 1991-2030;**
- Volume III: Site Selection;
- Volume IV: Economic Feasibility.

The overall objective of the entire study was to develop air traffic demand forecasts, evaluate alternative airport sites and recommend the most favourable one, carry out a technical and economic feasibility study, conduct an environmental impact study, and prepare preliminary airport drawings in order to relocate the Juan Santamariá International Airport in San José, Costa Rica.

1.1 Purpose

The report contained in this volume defines the basis for the estimation of airport land requirements, appropriate terminal size, number of runways and gates, infrastructure requirements, etc., to meet adequately the future demand.

This volume presents a complete set of aviation forecasts and projections for

the period 1991-2030 for the new international airport, which would replace Juan Santamariá International Airport as the primary gateway to Costa Rica. The report is organized in five major sections, each one covering a specific aspect of the forecasting process, as shown in the table of contents.

1.2 Terms of Reference

The air traffic forecasting requirements for the new international airport are set out in the Terms of Reference provided to Aviation Planning Services (APS) by the Minister of Public Works and Transportation (MOPT) for the Republic of Costa Rica. The terms relevant to forecasting require APS to:

A. Compile all available information of previous studies, as well as all statistical information required for this study.

B. Corroborate and update demand forecasts for people and cargo transportation in international services to the year 2010.

C. As part of the economic evaluation of the new site, make air passenger and cargo demand projections to the year 2030.

2 METHODOLOGY & DATA SOURCES

This section provides an overview of the methodology employed in preparing the air traffic demand forecast. More detailed descriptions are found in the relevant sections. The major sources of data are also listed herein.

2.1 Methodology

The Consultants interviewed various organizations and individuals during the course of the ongoing study. The information and statistics gathered during these meetings were used to substantiate and update previous air traffic forecasts that were supplied to APS by the MOPT. The forecasting studies reviewed included the following:

1) Japan International Cooperation Agency (JICA)
"The Study on the Development of Three International Airports in the Republic of Costa Rica, Draft Final Report", 1991 - 2010, August 1992.

2) BEL Ingenieria
"CINDE, Revision del Plan Maestro Para El Aeropuerto Juan Santamariá, Informe Final", 1990 - 2005, September 1990.

3) R. Dixon Speas Associates (RDSA)
"Estudio del Desarrollo del Aeropuerto Internacional Juan Santamariá, Informe Final", 1978 - 1996, for MOPT, October 1977.

The assumptions, methodologies and results of each study were examined with the purpose of selecting the most 'reasonable' forecast and updating it as necessary. A forecast, by definition, is an assessment of future events based on historical data and current assumptions about future trends. Thus, the two older studies by BEL and RDSA were useful for their methodological content and, with the advantage of hindsight, for looking back and examining the appropriateness of various assumptions.

As the JICA study was the most recently completed study, the results of that study were chosen for corroboration and update, the latter being required as the forecasts were based on data that are now 12 to 18 months old. The JICA forecast period ends with 2010; hence, it was necessary to make independent projections to the year 2030 as required by the Terms of Reference. It was found, however, that the JICA study included some assumptions and methodology that were inappropriate to the situation under examination. The results of the current study are derived, in part, from the JICA study, but mainly from APS independent analysis. A new set of assumptions along with the addition of 1991 traffic data, the examination of longer series of historical data and the experience and insight gained from an additional year of economic, infrastructure, tourism, etc., developments.

Several examples of the problematic issues with the JICA study include the following. The JICA results rely heavily on regression analysis, which appears to be based on a very short time series of data (approximately five years) that was also a recovery period. Also, GDP forecasts were prepared internally by JICA, which do not conform to leading organizations in the field that use econometric models. The use of the Costa Rica GDP forecast is additionally questioned for its use in forecasting exports to another country, since the demand comes from the foreign country and not Costa Rica.

Finally, regarding aircraft types that will utilize the international airport, the JICA study proposes the continued use of aging aircraft such as the Boeing 707 and DC-3 throughout the forecast period, which is highly unlikely. Also, within months of the release of the draft forecast, Boeing 747s were operated by LACSA (January 1992 SJO Tower data) out of San José in addition to long-range widebody services by TACA, something which the JICA study had not foreseen until 2005.

APS obtained the most recent GDP forecasts available from econometric

models produced by such groups as Wharton Econometric Forecasting Associates, Data Resources Inc., International Monetary Fund, etc., and, through a judgemental process, modified the forecasts. The time series of data were also updated to include 1991 data. Regional distributions of demand were reapportioned in several cases and growth rates slightly altered. In spite of the changes, the results of this forecast are within the range of the JICA forecast. As mentioned above, the APS results are also projected an additional twenty years, to the year 2030. Throughout this study reference is made to the JICA forecast and specific alterations to the varied assumptions and methodologies.

Even with the update, however, the nature of forecasting is such that the results are estimates based on a set of assumptions regarding the current situation and expectations about the future. Any change in the underlying assumptions will necessarily alter the forecast and, therefore, the forecasts should serve only as a guide for facility planning. The airport must maintain a degree of flexibility in its design in order to allow for unforeseen changes in traffic behaviour.

2.2 Data Sources

In addition to the forecasts mentioned above, APS utilized the following data sources for the forecast section of the study:

- Centaur
- Centram Enterprises
- Data Resources Inc. (DRI)
- Department of Planning
- Dept. of Census & Statistics
- Evans Econometrics
- Institut Costarricense de Turismo (ICT)
- Inter-American Development Bank (IDB)

MOPT (DGAC)

Neotropica Foundation

Official Airline Guide

Royal Bank of Canada

SJO Tower Records, January 1992

Tico Times

U.S. Office of Management & Budget

Wharton Econometric Forecasting Associates (WEFA)

World Bank, IMF.

3 THE ECONOMY - AN OVERVIEW

The following sections provide an overview of the current economic situation in Costa Rica. The human resources and economic performance of the country are briefly discussed to demonstrate the growth capabilities of the country.

3.1 Geography

Costa Rica is located in Central America between the eighth and eleventh north parallels, with Panama to the south and Nicaragua to the north. The country covers 51,100 square kilometres and is bordered on the east and west by the Caribbean Sea and Pacific Ocean.

Three volcanic mountain ranges, Guanacaste, Tilarán and Central, run from the northwest to the southeast of the country. The Central Valley is south of the Central Range with altitudes ranging from 600 to 1,500 metres above sea level. The valley is actually two small valleys separated by the Continental Divide. The capital city, San José, is located in the Central Valley along with two-thirds of the country's population. The Talamanca Range, which contains the highest peak in Costa Rica, Chirripó at 3,189 metres, begins in the southern part of Costa Rica and continues into Panama.

The rainy season lasts from May to November while the dry season extends from December to April. During the rainy season some regions receive more than 7600 millimetres of rain while others receive less than 700 mm in the same period. The annual rainfall is approximately 2500 mm for the Central Valley, 2000 to 3500 mm for the Pacific Coastland and 4000 mm for the Atlantic Coastland.

Twenty percent, about 10,000 square kilometres, of the country is protected by law for the preservation of national parks, biological reservations, wildlife

refuges, recreation areas and national monuments.

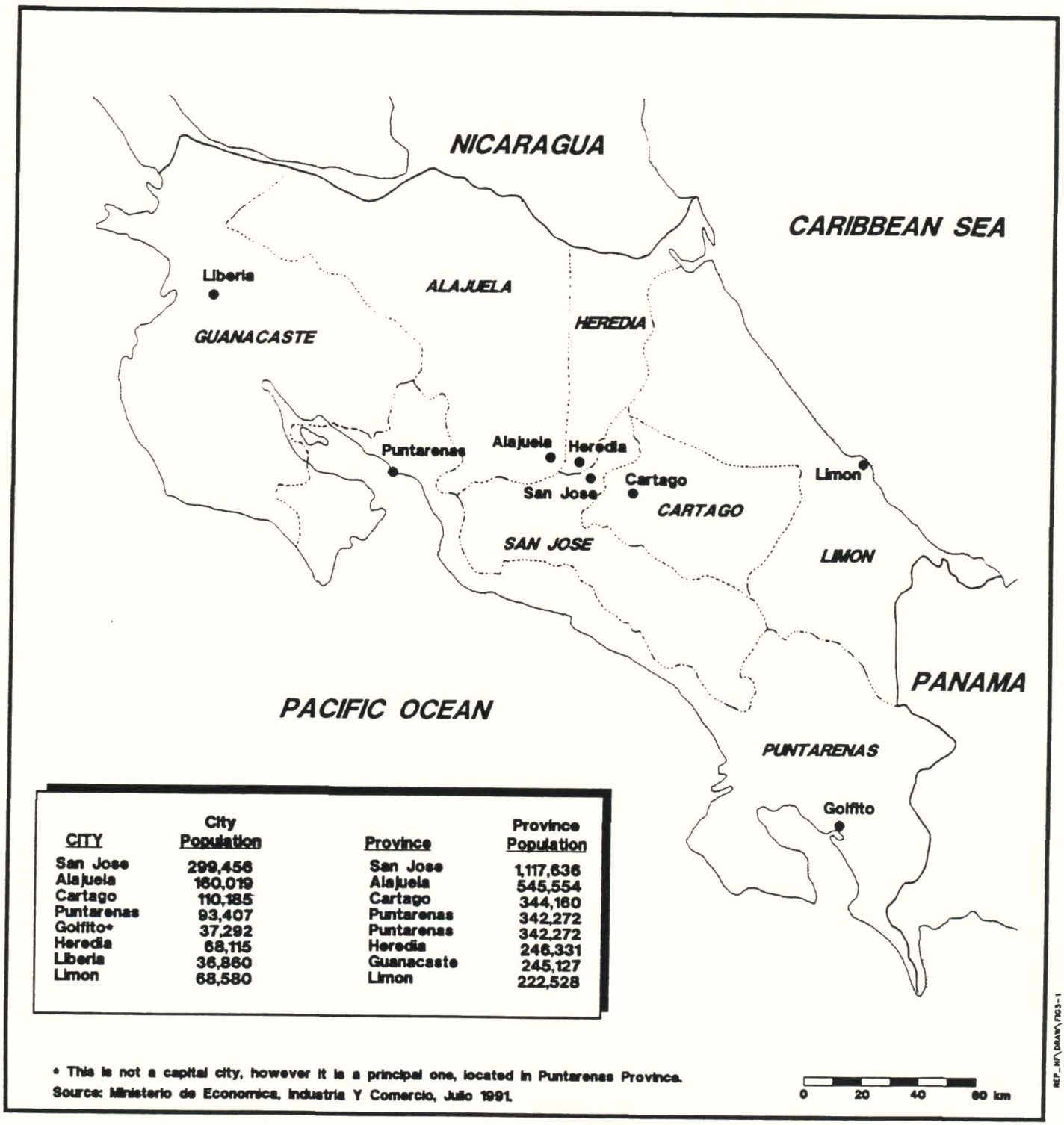
3.2 Population

The population of Costa Rica is 3,137,300 (1992). During the period 1987 - 1991, population growth registered 2.38% per annum. The principal cities of the country are also the capitals of the seven provinces, as shown on the map in Figure 3.1.

Costa Rica has the highest literacy rate of all of the Latin American countries, at 93%. The country also has socialized medicine which has contributed to a life expectancy of 73 and 78 years for men and women, respectively, from an average of 63 years in 1965 and 70 years in the late 1970's. About 10% of the country's GNP goes to public health.

The population is expected to continue to grow at an average annual rate of 2.3%. The Central Valley is expected to absorb about 60% of the population growth and eventually form one large metropolitan area.

FIGURE 3.1
Provincial Map of Costa Rica



CITY	City Population
San Jose	299,456
Alajuela	160,019
Cartago	110,185
Puntarenas	93,407
Golfito*	37,292
Heredia	68,115
Liberia	36,860
Limon	68,580

Province	Province Population
San Jose	1,117,636
Alajuela	545,554
Cartago	344,160
Puntarenas	342,272
Puntarenas	342,272
Heredia	246,331
Guanacaste	245,127
Limon	222,528

* This is not a capital city, however it is a principal one, located in Puntarenas Province.

Source: Ministerio de Economica, Industria Y Comercio, Julio 1991.

3.3 Labour Force

A growing number of the population continues to be employed; however, the unemployment rate is still rising, as shown in Table 3.1. Costa Ricans enjoy a high level of education as compared to their Central and Latin American counterparts and, therefore are more upwardly mobile and, perhaps, more likely to travel.

TABLE 3.1
Employment & Unemployment Rates in Costa Rica
1990-1991

	1990	1991
Total Population (1,000)	2,992	3,062
Annual Growth	2.38%	2.37%
Employed Population (1,000)	1,067	1,125
Annual Growth	4.6%	5.5%
Unemployment Rate	4.6%	5.6%

Source: Centram Enterprises

For national planning purposes the country is divided into six regions as shown in Figure 3.2. Table 3.2 shows a percentage breakdown of regional industrial employment. Manufacturing, agriculture, wholesale and retail commerce, and social services employ over 65% of the working population. The Central Region has the largest manufacturing sector while the other regions employ their largest groups in agriculture.

Figure 3.3 presents the percentage breakdown for the entire Costa Rican employed population by industrial sector of the economy. The private sector employs over 84% of the working population. The Central Government and Municipalities employ approximately 8%.

FIGURE 3.2
Costa Rica Regional Planning Divisions

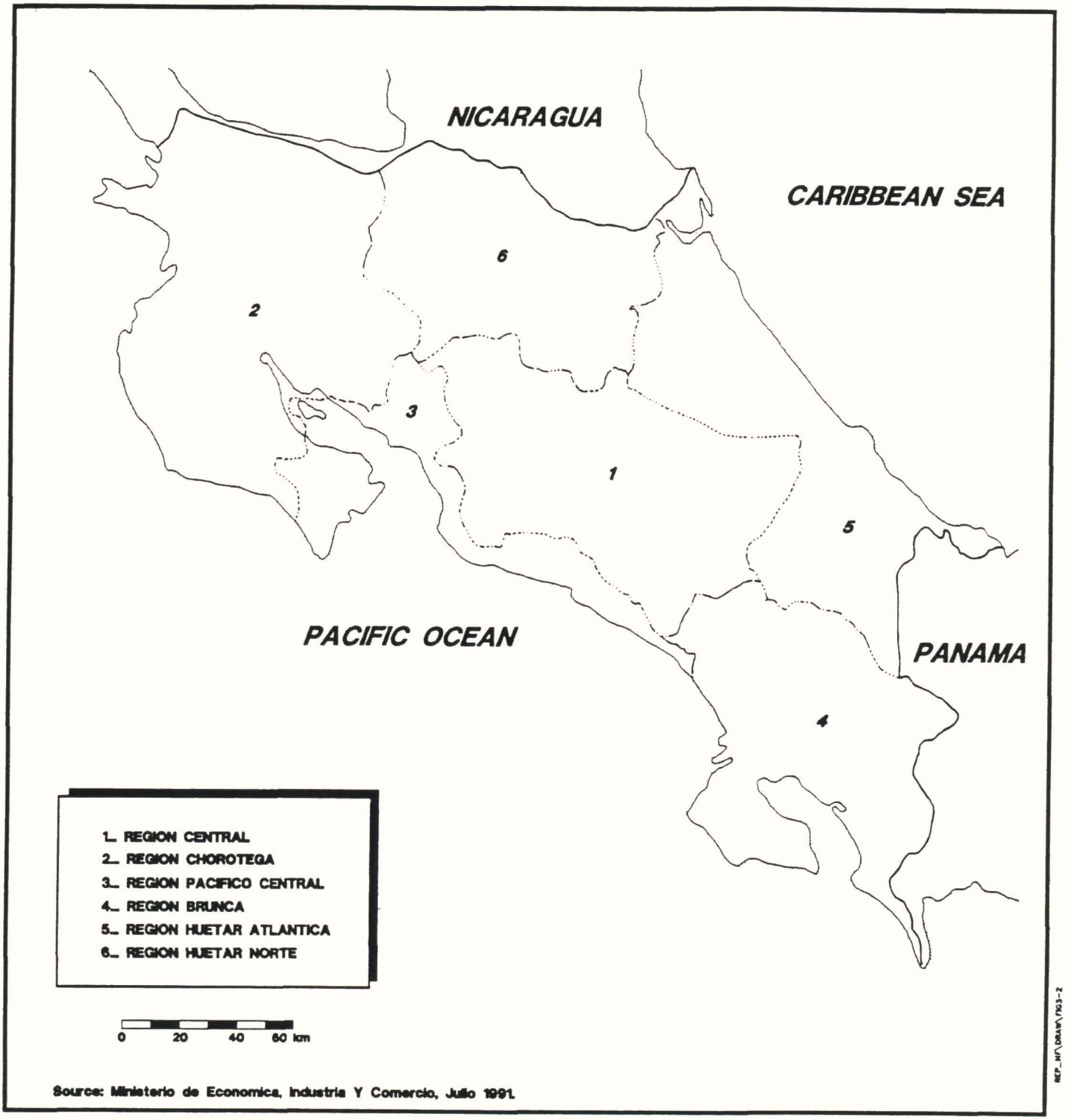


TABLE 3.2

RELATIVE DISTRIBUTION OF OCCUPATIONS BY PLANNING REGION AND TYPE OF INDUSTRY JULY 1991

DISTRIBUCION RELATIVA DE LA POBLACION DESOCUPADA POR REGION DE PLANIFICACION SEGUN RAMA DE ACTIVIDAD JULIO DE 1991

RAMA DE ACTIVIDAD	TOTAL	REGION DE PLANIFICACION					
		CENTRAL	CHORO-TEGA	PACIFIC CENTRAL	BRUNCA	HUETAR ATLANT.	HUETAR NORTE
COSTA RICA TOTAL	100.0	100.0	100.0	100.0	100.0	100.0	100.0
AGRI. CAZA SILV. PESCA	14.2	8.3	34.6	26.4	24.2	33.4	26.5
EXPL. MINAS Y CANTERAS	0.1	0.0	1.9	0.0	0.0	0.0	0.0
INDUST. MANUFACTURERAS	22.4	28.3	3.9	14.7	6.5	6.4	4.1
ELECTRICI. GAS Y AGUA	0.6	0.9	0.0	0.0	0.0	0.0	0.0
CONSTRUCCION	9.8	10.5	13.5	6.5	6.4	9.1	4.1
COME. POR MAYOR Y MENOR	14.8	14.7	15.4	18.0	14.5	14.5	10.1
TRANS. ALMACE. Y COMUNIC	4.0	3.7	3.8	5.7	1.6	6.6	6.1
ESTABLEC. FINANCIEROS	2.9	3.5	0.0	0.0	3.2	1.3	4.1
SERV. COMUN. SOC Y PERS.	14.3	12.5	17.2	16.4	27.5	9.2	26.8
NO BIEN ESPECIFICADO	1.2	1.5	0.0	0.8	1.6	0.0	0.0
BUSCA POR PRIMERA VEZ	15.6	16.1	9.6	11.5	14.5	19.5	18.4

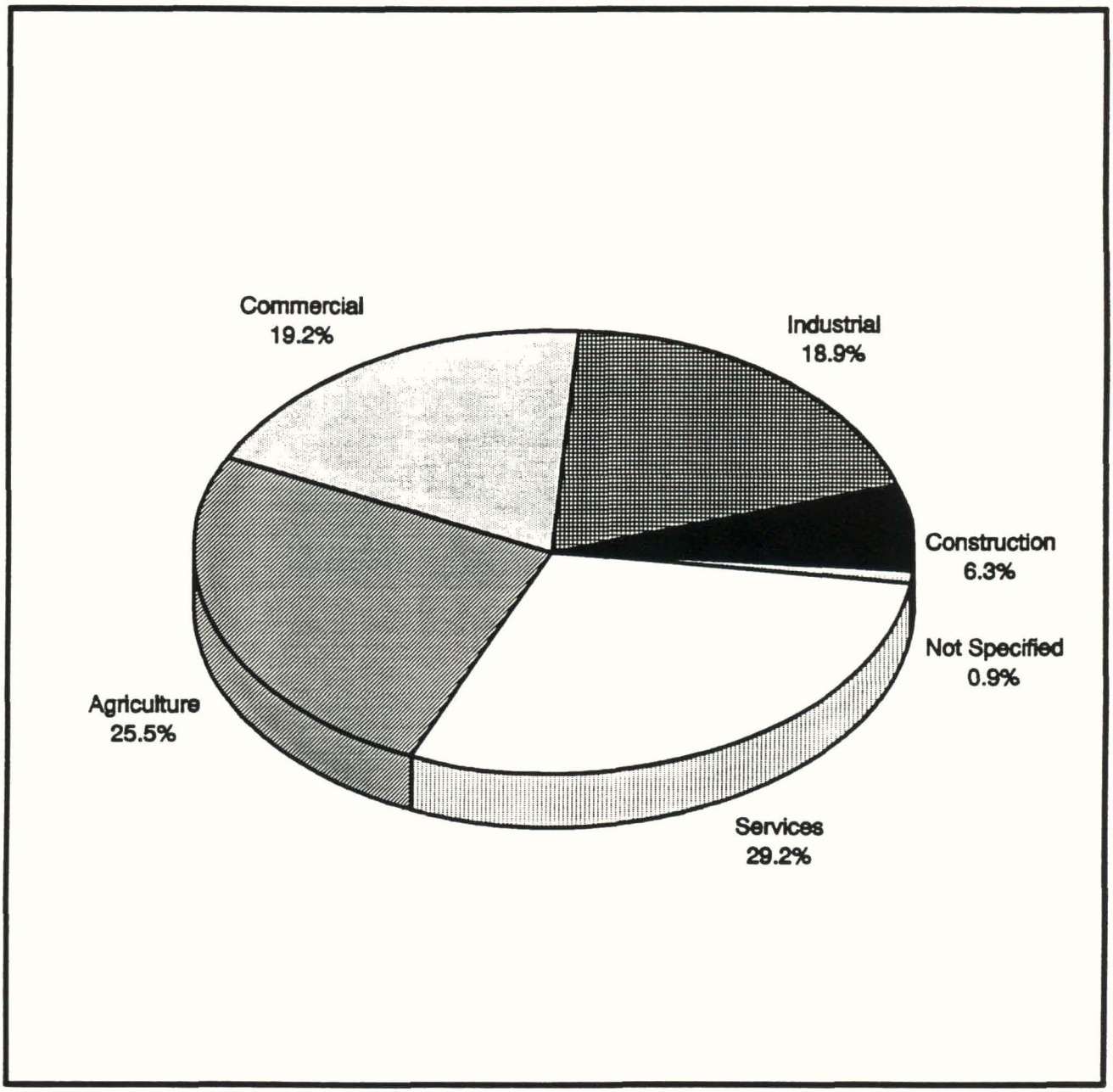
Note: Shaded regions indicate industry(ies) of greatest concentration in region.

SOURCE: Encuesta de Hogares de Propositos Multiples Modulo de Empleo, Julio 1991.
Ministerio de Economio, Industria Y Comercio, Noviembre 1991.

FIGURE 3.3

Employment in Costa Rica Categorized by Occupational Sector

July 1991



Source: Department of Census & Statistics

3.4 Infrastructure

The demand for infrastructure items, such as electricity, is greater than the current capacity in Costa Rica where power outages are frequent. The road system does not meet commercial and tourist needs and, although current national development plans call for an improvement, the natural barriers (mountains and deep gorges) and the expensive nature of construction will probably slow the process of road improvement and development. For the period 1991 - 1996, $US 363.7 million has been allocated for road and construction improvement. The ports on the Caribbean coast are under reconstruction following the earthquake of April 1991 and ports on the Pacific Coast, Puntarenas and Caldera are being modernized. The expenditures planned for all ports total $111.4 million US, for the period 1991 - 1996. Airport expenditures are planned at $7.3 million while railroads will receive $24.2 million. The country is currently in the process of increasing the capacity of its telecommunications facilities, which was already considered significant in Latin America.

3.5 Other Economic Factors

3.5.1 Gross Domestic Product

The 1992 GDP for Costa Rica is estimated to reach US $5.7 billion. This represents a real growth of 2.6% over 1991, which had experienced a 1.0% increase over 1990. Table 3.3 lists several economic indicators for the period 1990 - 1991. It can be seen from Figure 3.4 that Costa Rica experienced negative growth at the beginning of the 1980's and has recovered at various positive rates during the remainder of the decade.

The recovery in the 1980's was due in part to an emphasis on non-

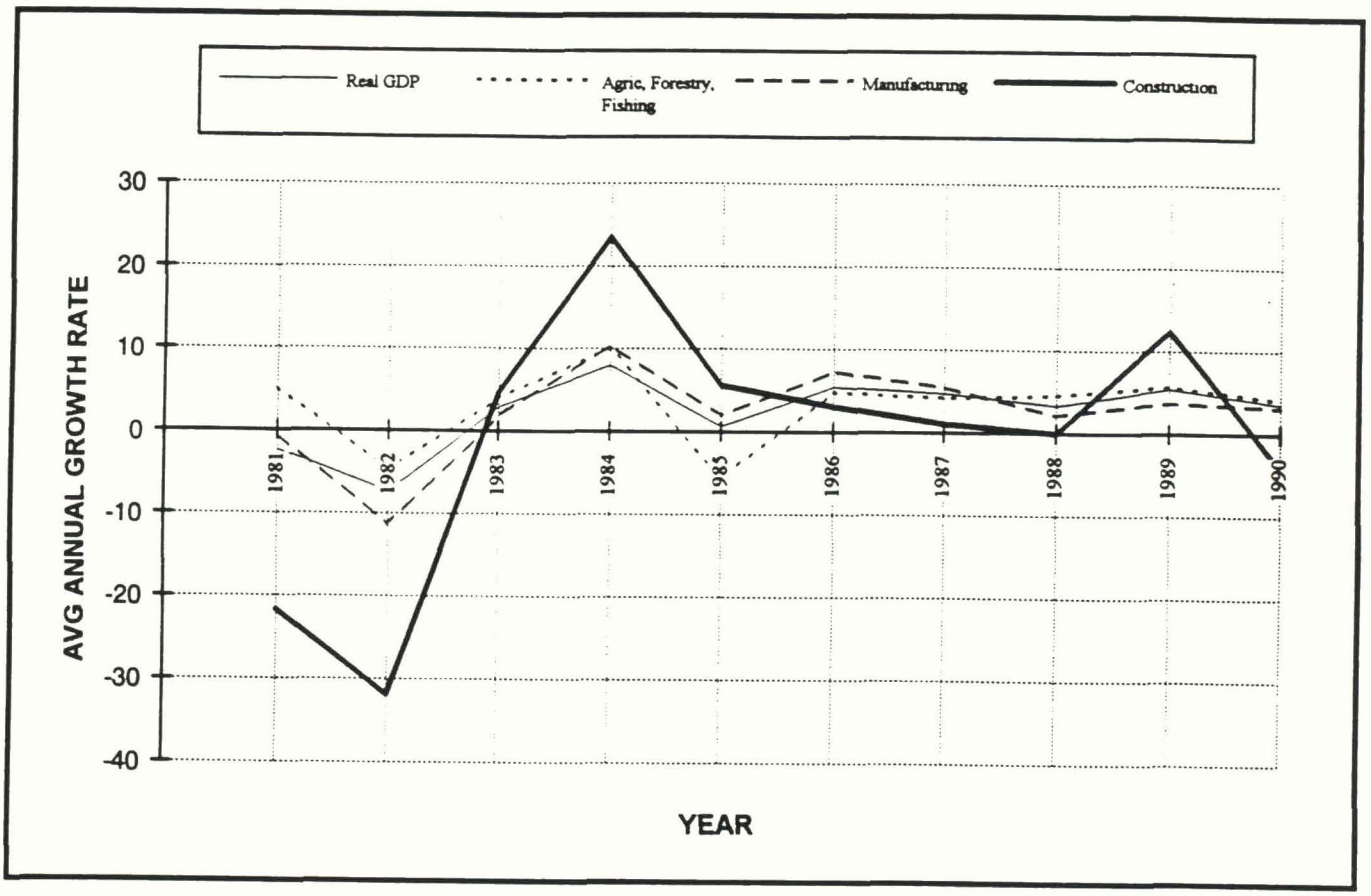
TABLE 3.3

Costa Rican Economic Indicators
1990 - 1991
(In millions of U.S. $ unless noted)

	Actual 1990	Preliminary 1991
Domestic Indicators		
Gross Domestic Product	5,650	5,501
Annual Rate of Growth	9.7%	-2.5%
Real GDP Growth %	3.6%	1.0%
Income per Capita Current U.S. Growth	7.1%	-4.8%
Commercial Trade		
Exports (U.S. $ Mills.)	1,436.64	1,590.14
Annual Growth	1.6%	10.7%
Imports (U.S. $) CIF	2,026.10	1,852.74
Annual Growth	18.9%	-8.6%
Commercial Deficit (U.S. $)	589.46	262.61
Annual Growth	72.0%	-45.6%
Price Index & Inflation Annual Rates of Growth		
Consumer's Price Index	27.3%	25.3%
Inflation Rate	27.3%	25.3%
Public Finances		
Expenditures	77,850	98,000
Growth	32.3%	25.9%
Revenues	63,764	72,700
Growth	9.3%	14.0%
Fiscal Deficit	-14,086	-25,300
Growth	159.4%	79.6%
Deficit as % of GDP	4.4%	3.1%

Source: Statistics and Census Office through Centram Enterprises

FIGURE 3.4
Costa Rican Output, 1981 - 1990
Average Annual Growth Rates



Average Annual Growth Rates (%)

Costa Rica	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
Real GDP	-2.3	-7.3	2.9	8	0.7	5.5	4.8	3.4	5.5	3.6
Agric, Forestry, Fishing	5.1	-4.7	4	10.1	-5.5	4.8	4.2	4.6	5.8	4.1
Manufacturing	-0.5	-11.4	1.8	10.4	2	7.3	5.5	2.2	3.8	3.2
Construction	-21.7	-31.9	4.7	23.6	5.6	3.1	1.1	0	12.4	-4.1

Source: IDB, 1991.

traditional exports. While coffee and bananas have been the traditional leaders in exports, the recent drop in prices on the world market is an additional impetus for looking to non-traditional sectors for foreign exchange earnings. Tourism is now the fastest growing industry in the country. It ranked second to banana earnings in 1991 and is expected to surpass all other Costa Rican export industries in 1992 in terms of foreign exchange earnings.

As in many other countries, government debt problems continue to hamper the growth of Costa Rica and, because the debt is with international organizations such as the IMF, the country could have little control over fiscal constraints under which the debt is to be repaid, if it encounters difficulty in making payments.

3.5.2 Trade Balance, Exports, Imports

A summary of Costa Rican exports is shown in Figure 3.5. Principal exports include coffee, bananas, textiles, sugar, meat, manufactured products and agricultural products. The U.S. and European Community provide the principal markets for Costa Rican exports, followed by Central America, Puerto Rico and Canada. A breakdown of exports by destination for the period 1989 - 1991 is provided in Figure 3.6.

Principal imports include raw material, capital and consumer goods, fuels and machinery. The major suppliers of these imports include U.S.A., Japan, Central America and Europe. The trade balance since 1987 is shown in Table 3.4 below.

TABLE 3.4
Exports, Imports And Trade Balance
(US $ Millions)

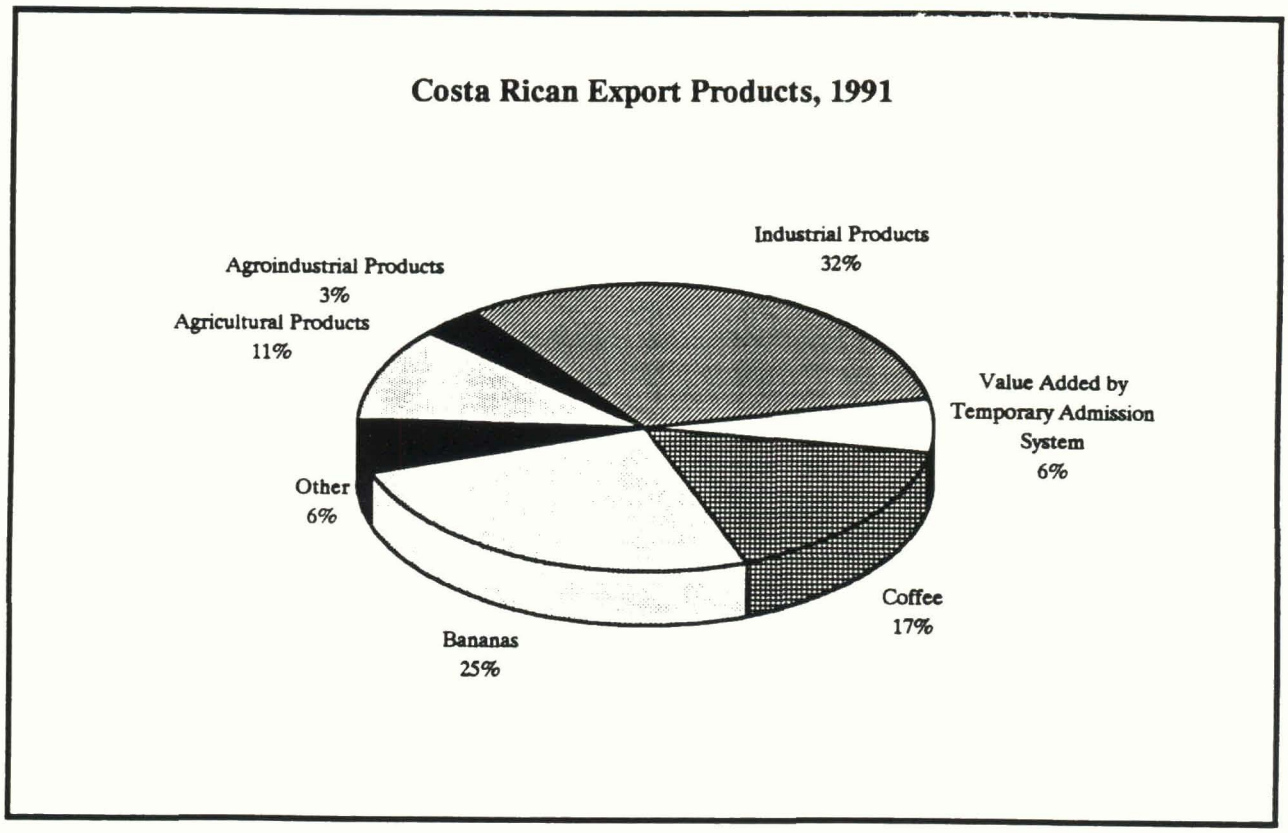
Year	Exports	Imports	Trade Balance
1987	1,158	1,380	-222
1988	1,246	1,410	-164
1989	1,415	1,737	-322
1990	1,437	2,026	-589
1991	1,590	1,853	-263
1992	1,664	2,021	-357

Source: Export Promotion Center, JICA Study.

3.5.3 Inflation

The 1992 mid-year inflation rate was reported at 12.03% with the government continuing its efforts to curtail inflation and keep the annual rate below 16%. From 1980 to 1985, the average annual increase in the consumer price index was 34.8% reducing to 18.9% during 1985 to 1991. During the period 1980-1991, the average annual inflation rate was 25.9% (Source: Department of Census and Statistics).

FIGURE 3.5
COSTA RICAN EXPORT PRODUCTS, 1989-1991

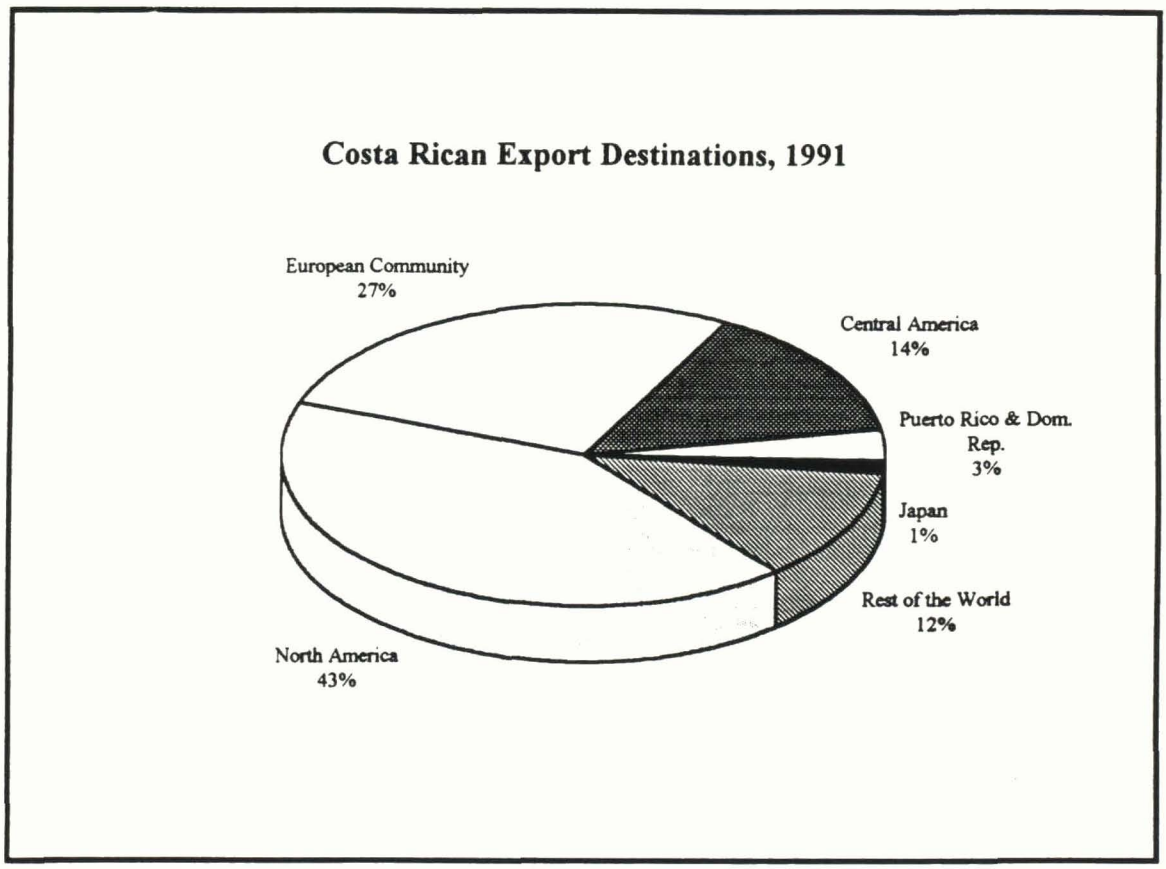


Costa Rican Exports
1989-1991
(Thousands of Dollars)

PRODUCT	1989	1990	1991	1991 % of Total Exports
Traditional Products	707,319	666,522	766,038	48.1%
Coffee	286,208	245,419	263,624	16.6%
Bananas	307,173	316,958	402,872	25.3%
Other	113,938	104,145	99,542	6.2%
Non-Traditional Products	654,464	702,918	729,556	51.7%
Agricultural Products	131,511	153,389	167,527	10.5%
Agroindustrial Products	56,808	52,260	52,865	3.3%
Industrial Products	466,145	497,269	509,164	32.0%
Value Added by Temporary Admission System	74,855	81,161	94,544	5.9%
TOTAL EXPORTS	1,436,638	1,450,601	1,590,138	100.0%

Source: Export Promotion Center

FIGURE 3.6
Costa Rican Exports By Destination, 1989-1991



Costa Rican Exports By Destination, 1989-1991
(Thousands of Dollars)

Destination	1989	1990	1991	1991 % of Total Exports
North America	592,541	607,427	663,180	41.7%
European Community	367,531	403,767	435,000	27.4%
Finland	15,184	12,753	7,448	0.5%
Central America	170,470	181,891	229,915	14.5%
Puerto Rico & Dom. Rep.	51,998	60,467	52,437	3.3%
Japan	8,666	15,204	20,270	1.3%
Rest of the World	245,162	181,845	189,336	11.9%
TOTAL EXPORTS	1,436,638	1,450,601	1,590,138	

Source: Export Promotion Center through Centram Enterprises

4 TOURISM

Tourism has become one of the most important industries in Costa Rica during the past several years, in terms of the foreign exchange earnings generated. The projected growth of this industry and its importance to the economy should not be overlooked when forecasting air traffic demand as it is the tourists who have created the most substantial and growing portion of this demand. Moreover, it is the airport that facilitates the arrival of a large portion of tourists to Costa Rica. Hence, the potential growth of tourism is strongly linked to the ability of the airport and the country to support the tourism demand.

The following sections outline the importance of tourism to the economy, the origin and habits of the tourists and the ability of Costa Rica to accommodate the tourists.

4.1 Role in National Economy

The tourism industry is positioned to be Costa Rica's highest foreign exchange earning industry of 1992, following a second place finish to bananas in 1991. Table 4.1 shows the value of foreign exchange earnings since 1989.

TABLE 4.1
Tourism Industry in Costa Rica
1989-1997

	Foreign Exchange Earnings from Tourism	Number of International Tourists	Receipts per Tourist
1989	$206 million	375,951	$548
1990	$314 million	435,037	$722
1991	$335 million	504,652	$664
1992e	$500+ million	580,000	$862

Source: Centram Enterprises, ICT

During the last six years, tourism has achieved the highest rate of growth of

all industries. Since 1988, the average annual growth rate of international tourists has been greater than 15%. However, despite the boom being experienced in tourism, to date, it is insufficient to close the current account imbalance.

The current tourism goals of the government, as stated by Tourism Minister Chacon, are to "procure a specialized tourism, where (tourists) stay more, spend more, but their passing leaves the least impact on our resources and our culture" (Tico Times, June 5, 1992).

The number of tourists that can reasonably be accommodated in Costa Rica is dependent on the most constraining of the following elements:

i) Capacity of existing hotels, those under construction and those in planning stages,
ii) Road, air and sea transport quality, convenience and capacity,
iii) Infrastructure to support the industry,
iv) Capacity of preserves and park areas.

The national economy will not benefit to the extent possible if it does not support the development of the fundamental requirements that sustain a growing tourism industry. These requirements are discussed in following sections.

4.2 Tourism Development Policy

Only seven percent of Costa Rica's coastlines have any kind of regulatory plans. The unrestricted growth of tourism could destroy the very elements that attract many tourists to Costa Rica, namely the ecology. A number of issues require the attention of Costa Rican government policy in order to maintain sustainable tourism development while also protecting the environment:

i) A portion of earnings from the industry should be put back into the infrastructure required to sustain and operate the industry.

ii) Regulations, standards and development plans for tourist areas should be developed and put into national policy.

iii) The capacity of national preserves and parks should not be exceeded.

The government has clearly recognized the need for tourist facilities and supports their development by offering investment incentives, such as exemptions from land taxes and the duty free importation of goods necessary for tourist related projects.

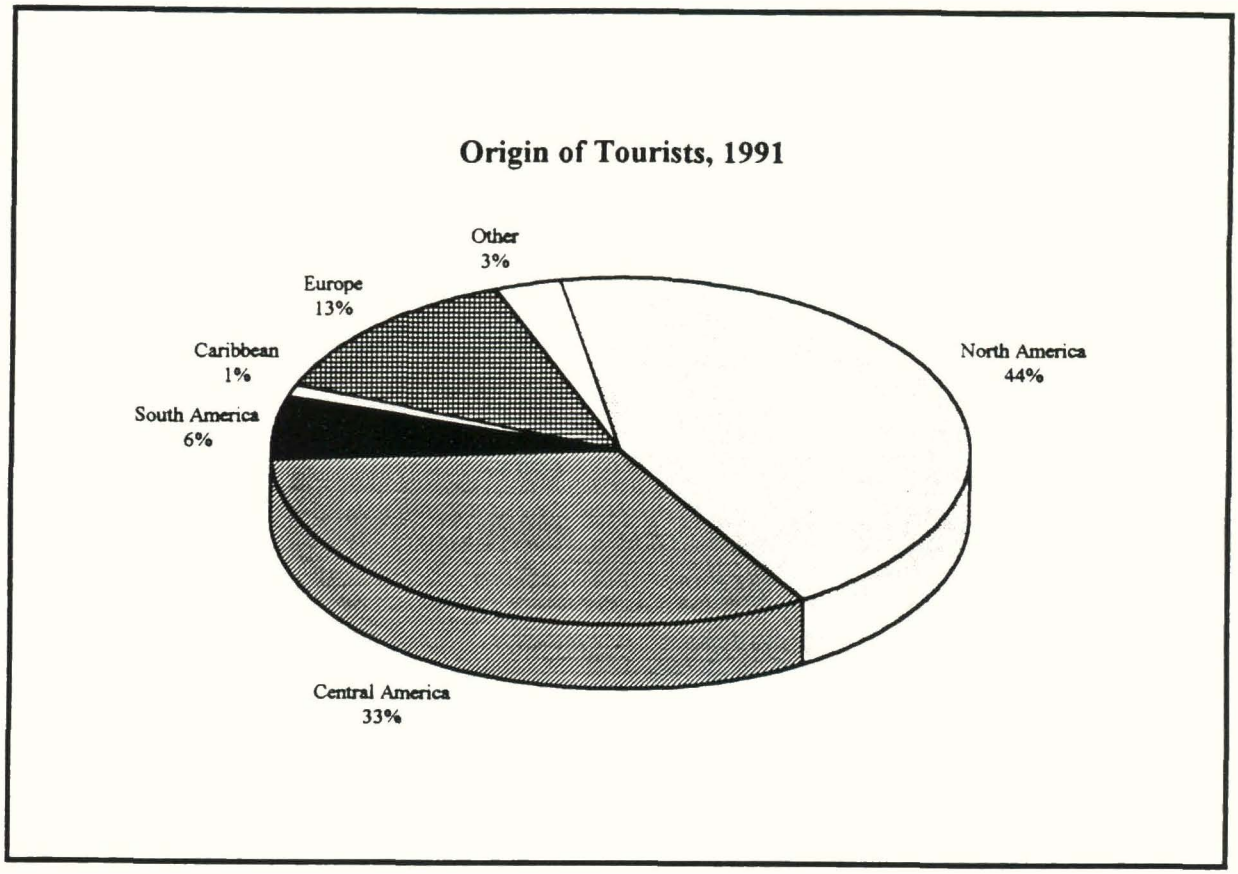
4.3 Source of Tourists

The greatest proportion of tourists arriving in Costa Rica by all modes of transportation, originate in North America and Central America; however, those from North America increased at a much higher rate than those from Central America from 1982 to 1990. Figure 4.1 shows the breakdown of tourists by region of origin for 1991 and their annual growth rates since 1982.

In 1991, North America and Central America together provided almost 77% of international tourists to Costa Rica. From 1982 to 1991 the average annual growth rate of tourist arrivals was 3.5% From 1988-1991, the growth rate was 15.3% annually. For North America, this period was also a time of economic retrenchment, leading to the possible conclusion that Costa Rica represents a less expensive tourist destination for many North American travellers.

International passenger traffic arriving at SJO is increasingly comprised of tourists. In 1991, over 70% of international arrivals were travelling for the purpose of pleasure. Thus, less than 30% of international passengers are travelling for business or VFR- (visiting friends and relatives) related purposes.

FIGURE 4.1
Origin of International Tourists Arriving in Costa Rica by Air, Land & Sea
1991



Average Annual Growth Rates (%)

Period	North America	Central America	South America	Caribbean	Europe	Other	Total
1982-1987	4.2	-13.4	-6.8	-11.0	-0.5	2.0	-6.3
1987-1991	17.0	9.6	8.8	7.1	15.5	16.7	13.4
1982-1991	11.7	-2.9	0.8	-2.7	8.0	10.1	3.5

Source: ICT

4.4 Modes of Transportation to Costa Rica

International arrivals to Costa Rica are via air, land and sea. The proportion of international arrivals for each of these modes has remained relatively constant at approximately 71.3%, 28.2% and 0.5% for air, land and sea, respectively (percentages based on 1990/1991 average).

i) Although three airports in Costa Rica, Liberia, Limón and San José, are designated as international airports, only Juan Santamariá at San José currently receives scheduled international flights. Liberia is expected to begin receiving international charters at the end of 1992 or early 1993. Visitors generally take taxis or tour busses to their final destination points.

ii) Those visitors travelling by road generally enter Costa Rica via the Interamerican highway. The improvement of this and other roads is expected to increase the proportion of North and Central American tourist traffic by land. Sixty-eight to eighty-two percent of all Central American tourists arrived by road during the last decade, which is several times greater than the average for tourists from all countries, presumably due in part to the close proximity of the Central American tourists' points of origin.

iii) The port of Limón receives cruise ships; however, this facility was severely damaged during the earthquake of April 1991. National development plans include the reconstruction of the port facilities.

4.5 Tourist Destinations in Costa Rica

The primary tourist activities of air passengers are listed in Table 4.2. Each column lists the percentage of visitors from the particular country who participated in the various activities. These columns sum to greater than one hundred percent as some travellers engaged in more than one activity. American, European and Canadian tourists arriving at SJO represented 54% of international tourist arrivals in 1990 (Anuario Estadistico de Turismo 1990, ICT) and 71% of SJO tourist arrivals. A weighted average of these tourists' preferences reveals that the two most popular activities for tourists visiting Costa Rica are "sun and sand" and ecotourism.

The popular beach areas are found primarily on the Pacific coast in the provinces of Guanacaste and Puntarenas. The popularity of these areas is expected to grow, which is indicated by ICT projections that show hotel accommodation construction in 1992 and beyond largely in these two provinces. Ecotourism activities are available throughout the country.

TABLE 4.2

Tourist Activities Undertaken in 1991 by Country of Tourist Origin

Activity	Percentage of Passengers by Country of Residence			Weighted Average
	U.S.	Europe	Canada	
Sun and sand	54.0%	63.8%	81.4%	59.7%
Fishing	12.9%	4.9%	7.9%	10.5%
Surfing	9.3%	7.0%	12.4%	9.2%
Rafting	8.6%	7.6%	6.6%	8.1%
Other Sports Activities	16.0%	14.2%	24.8%	16.7%
Ecotourism	50.3%	47.6%	61.2%	51.1%
Conferences	9.0%	11.0%	5.8%	9.0%
Client Visits	13.8%	11.9%	7.0%	12.5%
Professional Course	1.9%	2.2%	1.7%	1.9%
Spanish Training	11.7%	13.9%	20.7%	13.4%

Note: Columns do not sum to 100% due to tourists engaging in more than one activity.
Source: ICT 1992, Encuesta Aerea de Extranjeros

4.6 Current and Projected Accommodation

4.6.1 Current Accommodation

In July 1992, the ICT had a total of 261 registered accommodation facilities containing 7,987 rooms. Table 4.3 provides a breakdown of these facilities and rooms by province and room quality rating. In addition, an investigation by the ICT in 1992 found that approximately 8,000 additional rooms already exist but are not registered, presumably in an attempt to avoid a 3% tax. Table 4.4 shows the annual number of registered rooms since 1980, the growth rate of hotel rooms and the associated growth rate of tourist arrivals.

4.6.2 Projected Accommodation

4.6.2.1 Number of Rooms Projected

The pace of authorization for hotel building permits has increased dramatically over the past two years. Figure 4.2 graphs the number of hotel rooms authorized for construction by the ICT from 1986 to 1992. Only 1,066 hotel rooms were approved for construction from 1986 to 1989. However, between 1990 and March 1992, over 4,500 rooms received building authorizations.

According to ICT projections, for the period 1992 to 1996, 1,659 rooms in new facilities are currently scheduled for construction. During 1993 to 1998, 544 rooms received building authorizations within existing facilities or facilities currently under construction. It should be noted that the ICT projections are essentially the number of current contracts and do not account for those projects which have not yet received approval. The average annual growth rate of rooms for 1980 to 1991

TABLE 4.3

Total Available Rooms Registered With The ICT
Costa Rica, 1992

Province	No. of Accom Facilities	Total No. of Rooms	No. of Facilities (No. of Rooms) Quality Level						Facilities no Quality Rating	Rooms no Quality Rating
			0	1	2	3	4	5		
San José	64	2,810	9 (177)	13 (397)	15 (349)	12 (997)	1 (172)	2 (455)	11	263
Alajuela	15	295	4 (29)	2 (83)	1 (37)	0	0	0	8	146
Cartago	6	41	0	3 (29)	0	0	0	0	3	12
Heredia	14	473	0	1 (24)	3 (45)	4 (92)	1 (181)	1 (0)	4	131
Guanacaste	55	1,775	7 (222)	16 (414)	6 (120)	9 (438)	0	0	16	581
Puntarenas	79	2,093	23 (428)	14 (371)	9 (183)	4 (234)	0	0	25	877
Limon	28	500	7 (124)	6 (188)	6 (126)	0	0	0	8	62
Total	261	7,987	50 (980)	55 (1,506)	40 (860)	29 (1761)	2 (353)	3 (455)	75	2,072

Source: Instituto Costarricense de Turismo, Listado de Servicios de Hospedaje, 08/07/92

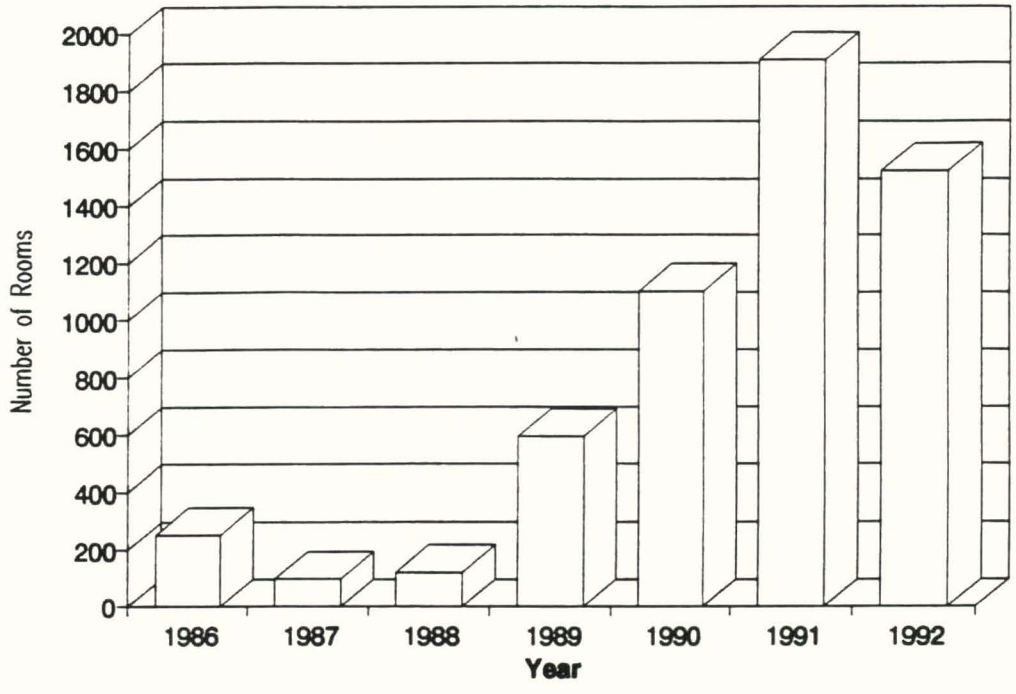
TABLE 4.4

ICT Registered Rooms and International Visitors

Year	Number of Rooms Offered	Number of International Visitors
1980	4,186	332,883
1981	4,268	333,102
1982	4,402	371,582
1983	4,695	326,142
1984	4,771	273,901
1985	4,866	261,552
1986	5,270	260,840
1987	5,017	277,861
1988	5,289	329,386
1989	5,456	375,951
1990	6,713	435,037
1991	7,196	504,649
Average Annual Growth Rate 1980-1991:		
Number of Rooms Offered:		5.0%
Number of International Visitors:		3.9%

Source: ICT

FIGURE 4.2 Number of Rooms Approved With Tourist Contract



Source: ICT

was 5.0% while the growth rate of international visitors was 3.9%.

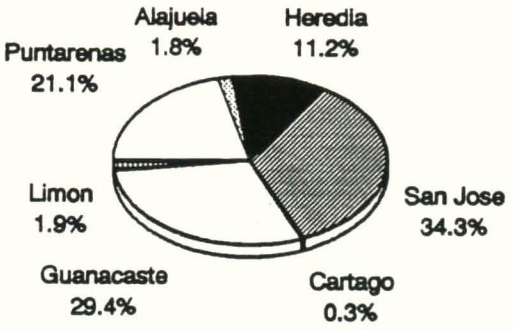
4.6.2.2 Location of Projected Rooms

The investment in hotel facilities for the period 1986 to 1998 was studied by the ICT. Figure 4.3(a) illustrates the current commitment of funds to hotel facility construction in the various provinces for this period. There is a substantial variation in the cost of room construction, varying from approximately ¢709,000 to almost ¢18,000,000 with an average of ¢7,600,000 per room. The number of new rooms for 1986 to 1998 are categorized by province in Figure 4.3(b) and are concentrated on the Pacific Coast. Investment commitments will probably increase for the latter years of the projected period, that is, from 1996 to 1998, more rooms will be constructed than currently indicated.

Examining all registered accommodation in Costa Rica in 1998, Figure 4.3(c) demonstrates that the province of San José is projected to continue to offer the greatest proportion of rooms followed by the provinces of Guanacaste and Puntarenas. Heredia, Limon, Alajuela and Cartago offer substantially fewer hotel facilities. It is reasonable to assume that, as the country develops its tourist facilities, the number of rooms in each province will be somewhat proportional to the tourist demand for accommodation in each province.

The National Development Plan 1990-1994, calls for the development of various tourist areas. Possibly the most ambitious of these is the Papagayo Tourist Project, located on the shores of the Gulf of Papagayo, with the intention to build 12,000 new rooms. Following nearly 12 years of discussion regarding this project, the official ground turning ceremony occurred in August 1992.

FIGURE 4.3(a)
Current and Projected Investment in Hotel Accommodation
1986 - 1998



Total Investment
¢ 33,077,826,670

FIGURE 4.3(b)
Construction of Hotel Rooms
1986 - 1998

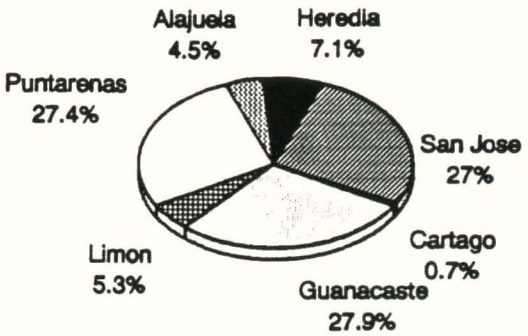
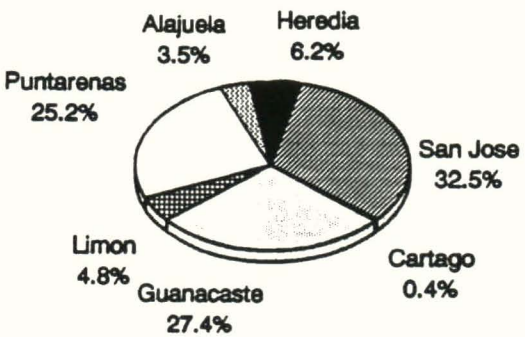


FIGURE 4.3(c)
Distribution of Total Hotel Rooms Projected to 1998
1986 - 1998



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Source: ICT, August 1992

4.7 Constraints on Passenger Demand

Costa Rica cannot experience unrestrained growth in the number of air passengers visiting the country due to constraints imposed by the capacity of accommodation facilities and the restriction on the number of people that can visit various national protected areas without causing irrevocable damage.

Approximately 50% of international tourists engage in ecotourism in Costa Rica, although the duration of this activity can vary greatly among tourists. It is beyond the scope of this study to quantify the particular capacities of each park; however, a study by the Neotropica Foundation examined the "carrying capacity" for Costa Rica's national parks. It should be stressed that measures should be taken to ensure that the capacities are not exceeded and that the visiting process does not harm the very elements for which the tourists travel to view and experience.

4.7.1 Accommodation Capacity

Costa Rica has been experiencing a boom in its tourism industry; however, in the longer term, according to an investment consulting firm, its accommodation capacity is not expected to be able to keep pace with the demand. This section will show that, until 1995, with current investment plans, accommodation facilities will not impose constraints on the forecasted influx of tourists.

It is important to recognize that Costa Rica receives tourists by land and sea, in addition to air, and that the country can only lodge the number of tourists for which it has a capacity. Hence, this study develops:

i) a method of estimating the accommodation facilities required for tourists arriving by all modes of transportation, given a

demand for air traffic, and

ii) a method of calculating the number of international visitors that can be accommodated with a given capacity of hotel facilities based on current patterns of travel and accommodation preferences.

4.7.1.1 Methodology

This section describes a methodology for deriving a reasonable approximation of the number of hotel rooms required for any given number of annual international arrivals by air in Costa Rica. Figure 4.4 presents this methodology and is explained below.

The "Encuesta Aerea de Extrajeros 1992" ICT report provides the results of a study of U.S., European and Canadian air passenger behaviour with respect to accommodation and activities while in Costa Rica. As passengers from these countries represent over 60% of all international arrivals at SJO, their lodging habits are deemed to be adequately representative of all international arrivals for the purposes of this study. Also, for the purposes of this study, the preferences of air travellers are assumed to be the same for those arriving by land. Travellers arriving by sea are assumed to overnight on board their ships and are, therefore, not considered as requiring Costa Rica accommodation facilities.

Figure 4.4. Explanation of Methodology:

1. As noted previously in section 4.4, international tourist arrivals by air represent 71.3% of the total annual tourists, with 28.2% arriving by land and 0.5% arriving by sea (1990/1991

FIGURE 4.4
Accommodation Capacity Methodology

1	Total Number of International Air Arrivals
	⇓
	÷ .713
	=
2	Total Annual International Arrivals
	⇓
	÷ .753
	=
3	Total International Arrivals Using Hotels
	⇓
	* .47
	=
4	Total International Arrivals Using Hotels in 5 Month Peak Period
	⇓
	*6.5 days stay in hotel
	=
5	Total Bed-Nights Required During Peak Period
	⇓
	÷ 152 nights
	=
6	Total Beds Required During Peak Period
	⇓
	÷ 1.38 persons per room
	=
7	Total Rooms Required If Always Filled to 100% Capacity
	⇓
	÷ .53
	=
	Total Rooms Required With 66.35% of Available Registered Rooms and 40% of Available Non-Registered Rooms Used, Where Number of Registered Rooms = Number of Non-Registered Rooms

Source: APS Analysis

average). Therefore, given the annual international air arrivals, it is possible to estimate the total annual international arrivals.

2. The following percentages for the share of international air arrivals staying in hotels, pensions, etc., for residents of U.S., Europe and Canada.

	% Using Hotels, Pensions, Etc.
% of U.S. residents	75.3%
% of European residents	75.0%
% of Canadian residents	76.0%

The average percentage use of hotels weighted by the respective regional share of arrivals, yields 75.3% usage of hotels, pensions, etc. by international arrivals.

3. Since the demand for hotel services is not spread evenly throughout the year, it is necessary to determine the number of rooms required to satisfy the peak demand of all visitors. The peak 5 months of both 1990 and 1991 are January, March, July, August and December with approximately 47% of all international arrivals arriving during these months (Source: ICT, "Jan-Dec, 1990 -1991", Cuadro No.1).

4. The average length of visitor stay is expected to reach 6.5 days in 1993 according to an article by Eng. Luis Manuel Chacon J., Executive President - Minister of Tourism in the 1991 - 1992 CANATUR Annual Guide of Associates. Multiplying international arrivals staying at hotels in the peak period by average stay provides the number of bed-nights required to satisfy the peak period demand.

5. As the peak 5 month period contains 152 nights, the number

of beds required to cover peak demand is calculated by dividing the number of bed-nights demanded by the number of nights available. Once the number of beds required is known, an estimation of the number of occupants per room and the occupancy rate of an average room will provide an estimate of the required number of rooms.

6. In order to estimate the average number of occupants per room, the number of international air arrivals for 1991 was put through the preceding analysis. In the final step, it was assumed that the occupancy rates at ICT registered and non-registered were 66.35% and 40% respectively and that there were 8,000 rooms of each type. The occupancy rate for registered rooms of 66.35% is based on the 1991 annual average (ICT). This yielded an average 1.38 persons per room.

7. Therefore, if it is assumed that 1.38 persons occupy each room and that the average occupancy rate for available hotel capacity is currently 53% (registered and non-registered rooms), then the number of beds required can be divided by both of these numbers to arrive at the number of rooms required. It would also be possible to categorize the number of rooms required by the room standard level based on the recorded patterns of demand of U.S., European and Canadian resident visitors; however, that level of detail is not required for this study.

4.7.1.2 Capacity Demanded

The preceding method of estimation of the number of rooms required to satisfy international visitor demand was applied to

the APS air traffic forecast (Section 6), the results appearing in Table 4.5. The forecasted room requirements are based on an assumption of a higher growth rate of the number of ICT-registered rooms as compared to non-registered rooms. The investment required to build these rooms is also approximated at US $65,000 per room as suggested by the Minister of Tourism, to provide a preliminary indication of the potential realism of achieving the room growth implicit in the air traffic forecasts. The period 1991-1995 is estimated to require an investment of approximately US $76.5 million in order to build the necessary accommodation. Without considering the time value of money, the total investment required from 1991-2010 could total more than $641 million. This value, of course, assumes that the travelling habits of tourists, such as duration of stay, location of accommodation in Costa Rica, occupancy rates, etc., remain approximately the same.

4.7.1.3 ICT Projected Capacity

The ICT projections for hotel capacity by the year 1995 fall within the range of the forecasted tourist traffic. Given the rate of room increase, it is most likely that sufficient accommodation will also be in place for the year 2000. Associated infrastructure must also continue to be improved along with development plans to ensure the preservation of clean beaches and the environment.

TABLE 4.5
FORECASTED ROOM REQUIREMENTS BASED ON PROJECTED AIR TRAFFIC DEMAND & INVESTMENT REQUIRED IN HOTEL ACCOMMODATION
1991 - 2030

Year	(Total Forecast Int'l Pax Divided by 2) Int'l arrivals	Total Int'l Visitors	Total Int'l Visitors Using Hotels	Peak Period Bed-Nights Demanded	Total beds reqd in peak	Total rooms required with 1.38 persons/rm	Total rooms required with 66.35%If in reg rooms 40% If in non-reg rooms and ...	Number registered rooms	Number non-reg rooms
1991**	504,649	707,783	532,960	1,628,194	10,712	7,762	for 1991: reg rms= non-reg rms 14,646	7,323	7,323
1995	639,000	896,213	674,849	2,061,662	13,564	9,829	for 1995: 10% more reg rooms* 17,396	9,112	8,284
2000	835,000	1,171,108	881,844	2,694,034	17,724	12,843	for 2000: 30% more reg rooms 20,354	11,500	8,854
2005	1,048,000	1,469,846	1,106,794	3,381,255	22,245	16,120	for 2005: 50% more reg rooms 23,107	13,864	9,243
2010	1,316,500	1,846,424	1,390,357	4,247,540	27,944	20,250	for 2010: 50% more reg rooms 29,027	17,416	11,611
2020	1,812,500	2,542,076	1,914,183	5,847,829	38,473	27,879	for 2020: 50% more reg rooms 39,964	23,978	15,985
2030	2,503,000	3,510,519	2,643,421	8,075,650	53,129	38,499	for 2030: 50% more reg rooms 55,188	33,113	22,075

* 10% more registered rooms than non-registered rooms, and so forth for the other years.

** Actual number of international tourists used in calculation.

Year	Total Registered Rooms Required	Incremental Rooms To Build	Approximate Cost Per Room		Investment Required To Build Rooms	
			1992 USD	1992 1,000***	1992 USD	1992 1,000***
1991	-	-				
1991-1995	9,112	1,125	$68,000	9,180	$76,497,403	10,480,144
1995-2000	11,500	2,388	$68,000	9,180	$162,389,676	22,247,386
2000-2005	13,864	2,364	$68,000	9,180	$160,773,880	22,026,022
2005-2010	17,416	3,552	$68,000	9,180	$241,541,616	33,091,201
2010-2020	23,978	6,562	$68,000	9,180	$446,199,782	61,129,370
2020-2030	33,113	9,135	$68,000	9,180	$621,171,270	85,100,464

*** Conversion Rate:
1 USD = ¢135

Source: APS Analysis

5 OVERVIEW OF NATIONAL AIR TRAFFIC

The following sections discuss the historical air traffic trends at Juan Santamariá International Airport.

5.1 International Passenger Traffic

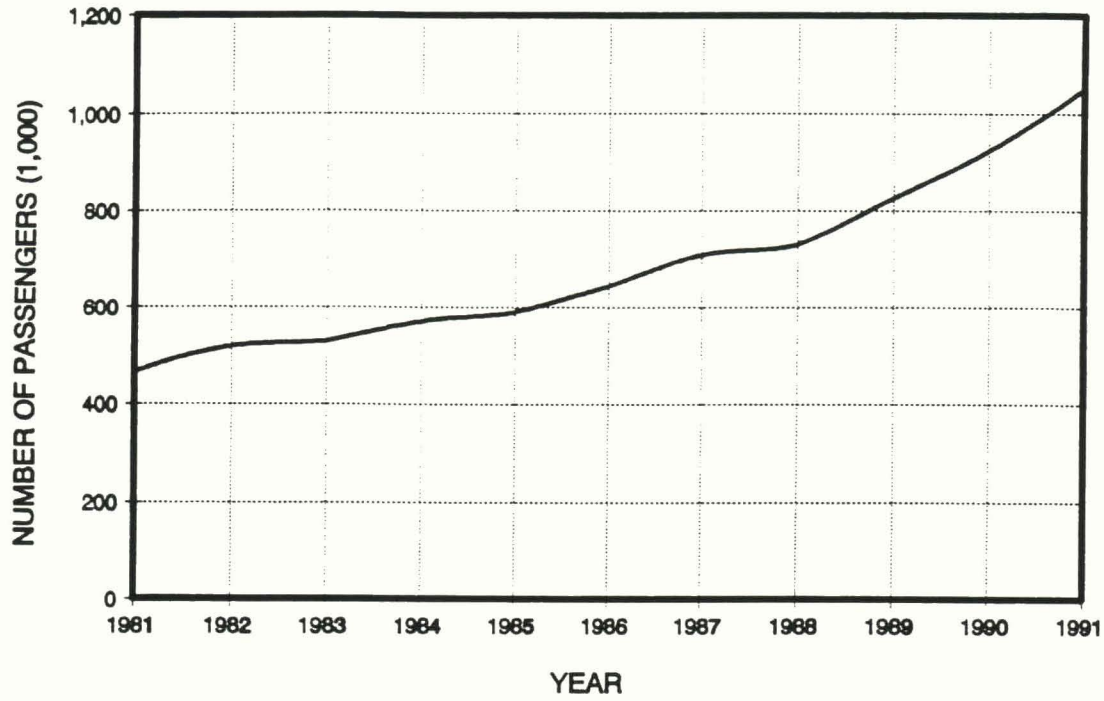
The following five sections discuss international passenger growth, the seasonality of the traffic, international scheduled and charter services and the origin of international traffic demand.

5.1.1 International Passenger Traffic Growth, 1981-1991

The growth in international passenger travel for 1981 to 1991 is shown in Figure 5.1. The average annual growth rate from 1981 to 1988 was 6.7%. This growth almost doubled in the period from 1988 to 1991, rising to an average of 12.9% per annum. The average annual growth rate for the entire period 1981 to 1991 was 8.5%.

During the first six months of 1992, total international passenger numbered 31% more than the same period in 1991. The average seat factor was 45% in 1991. The number of international considering origin and destination passengers surpassed one million for the first year in 1991.

FIGURE 5.1
Annual International Passengers at SJO



Average Annual Growth Rates		Year	International Passengers
1981-1988	6.7%	1981	464,061
1988-1991	12.9%	1982	517,653
1981-1991	8.5%	1983	529,947
		1984	570,690
		1985	590,302
		1986	643,879
		1987	707,910
		1988	730,090
		1989	825,623
		1990	922,969
		1991	1,050,890

REP_INFGRAPHFIG5_1

Source: DGAC

5.1.2 Peak Month Passenger Volumes

The peak international air passenger arrival months are provided in Table 5.1 for 1990 and 1991. The heaviest air passenger arrival months are typically, in order, December, July, March, January and February, with the lightest months being May, September and October. The largest difference between any two months was approximately 18,000 arrivals in 1991, which represents less than 5% of total international arrivals. Thus, although SJO does have recognizable peak arrival months, these months are not substantially greater than the low periods.

TABLE 5.1

International Air Passenger Tourist Arrivals By Month 1990-1991

	Total Tourist Arrivals By Air			
Month	1990	Monthly % of 1990	1991	Monthly % of 1991
January	29,417	9.3%	33,312	9.4%
February	29,264	9.3%	31,383	8.9%
March	28,924	9.2%	34,737	9.8%
April	22,670	7.2%	27,146	7.7%
May	20,710	6.6%	22,116	6.2%
June	23,523	7.5%	25,992	7.3%
July	29,249	9.3%	34,553	9.8%
August	28,346	9.0%	30,822	8.7%
September	18,551	5.9%	21,586	6.1%
October	25,225	8.0%	25,067	7.1%
November	26,998	8.6%	30,549	8.6%
December	32,725	10.4%	36,729	10.4%
Total	315,602	100.0%	353,992	100.0%

Denotes one of four highest months for annual international passenger arrivals.

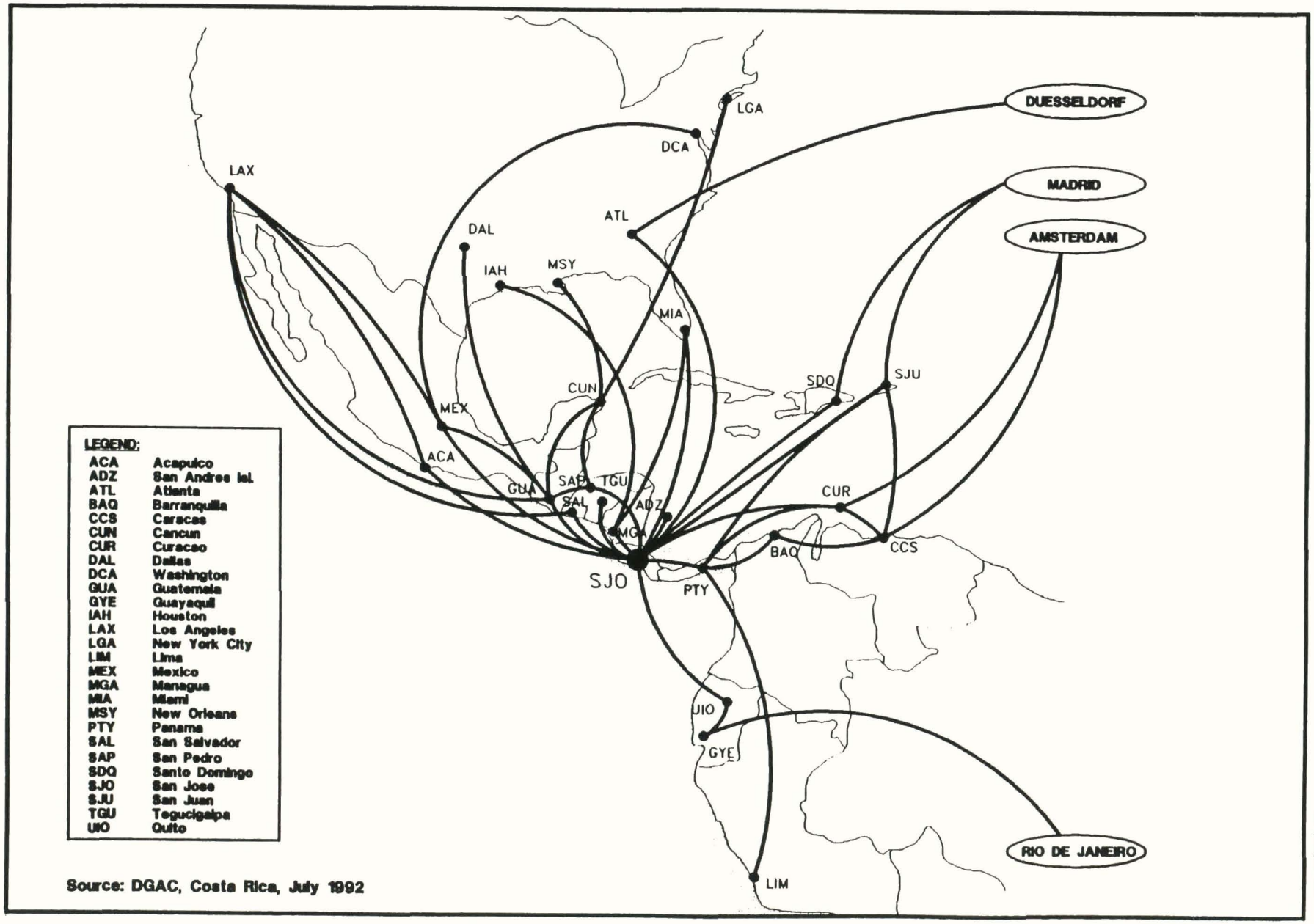
Source: ICT

5.1.3 Airline Schedules

Currently, thirteen international airlines provide scheduled services to Juan Santamariá International Airport (January 1992). The majority of flights offered by these carriers to SJO stop at several points, most in Central America and the Caribbean. Figure 5.2 presents the international scheduled flight services from San José as at July 1992. The itineraries and equipment of each of these flights is provided in Table 5.2. Due to airport constraints, the carriers are not able to use widebody aircraft to any large degree. However, January 1992 SJO Tower data indicates that several carriers, including LACSA and TACA, have recently initiated long-range wide-body jet services. LACSA provides Boeing 747 service and American Airlines is using A300 service, a widebody aircraft, on its SJO-MIA route.

Based on the actual movements and usage of gates in 1992, Figure 5.3 shows the number of movements per hour involving gate usage for a typical Thursday in July 1992, a peak month. The peak movement hour occurred between 1000 and 1100 hours with eight movements, which included five departures and three arrivals. Figure 5.4 shows the actual duration of the aircrafts' stay at the individual gates.

FIGURE 5.2
International Scheduled Routes, July 1992



Source: DGAC, Costa Rica, July 1992

TABLE 5.2
International Passenger Flight Schedule
SJO - July 1992

Note	Airline	Aircraft Type	Flight No.	Itinerary	Day of Week*	Flights Per Week	Arrival	Departure
	AMERICAN	B-727	973/972	MIA-SJO-MIA	D	7	22:15	1:15
	AMERICAN	B-757	981/984	MIA-SJO-MIA	D	7	17:50	7:00
	AMERICAN	B-727	983/982	MIA-SJO-MIA	D	7	15:02	16:15
	AMERICAN	B-727	989/988	MIA-SJO-MIA	D	7	11:49	12:49
	AMERICAN	B-757	990/991	DFW-GUA-SJO-GUA-DFW	D	7	22:13	8:00
	ACRA	B-727	211/210	MIA-SJO-MIA	D	7	15:15	9:00
	COPA	B-737	310/310	PTY-SJO-GUA	D	7	10:10	10:30
	COPA	B-737	311/311	GUA-SJO-PTY	D	7	16:15	16:35
	COPA	B-737	317/317	GUA-SAL-MGA-SJO-PTY	D	7	9:35	10:00
	COPA	B-737	318/318	PTY-SJO-MGA-SAL-GUA	D	7	17:00	17:20
a	CONTINENTAL	B-727	774/775	HOU-MGA-SJO-MGA-HOU	D	7	18:30	6:55
	AVIATECA	B-737	901/900	SJO-MGA-GUA-MGA-SJO	D	7	19:10	6:00
	AVIATECA	B737	960	PTY-SJO-MGA-SAL-GUA	D	7	14:10	14:30
	AVIATECA	B-737	961	GUA-SAL-MGA-SJO-PTY	D	7	10:10	10:30
	IBERIA	DC9	6301/6300	MAD-SJU-SJO-SJU-MAD	2-4-6	3	17:30	10:15
	IBERIA	DC9	6531/6501	MAD-SDQ-SJO	1-3-5-7	4	20:00	
	IBERIA	B-747	6530/6500	SJO-SQD-MAD	2-3-5	3		12:25
b	KLM	D10	753	AMS-CCS-CUR-SJO	7	1	21:40	
	KLM	D10	754	SJO-PTY-CUR-AMS	1	1		8:30
c	KLM	D10	745/746	AMS-CUR-GUA-SJO-CUR-AMS	4	1	8:55	10:20
	LACSA	B-727	610	SJO-PTY-BAQ-CCS	3-6-7	3	11:30	
	LACSA	B-727	611	CCS-BAQ-PTY-SJO	2-5-6	3		13:45
	LACSA	A-320	620/621	MIA-SJO-MIA	D	7	14:45	8:00
	LACSA	A-320	622/623	MIA-SJO-MIA	6	1	23:45	17:00
	LACSA	A-320	628	MIA-MGA-SJO	1-2-4-6	4	11:00	
	LACSA	A-320	629	SJO-MGA-MIA	1-3-5-7	4		17:00
	LACSA	A-320	631	LIM-PTY-SJO	2-4-6-7	4	6:45	
	LACSA	A-320	630	SJO-PTY-LIM	1-3-5-6	4		17:00
	LACSA	A-320	644	LAX-MEX-GUA-SAP-SJO	1-2-4-6	4	12:25	
	LACSA	A-320	645	SJO-SAP-GUA-MEX-LAX	1-3-5-7	4		13:30
d	LACSA	A-320	646	LAX-ACA-SAL-SJO	3-5-7	3	10:55	
	LACSA	A-320	647	SJO-SAL-ACA-LAX	2-4-6	3		13:30
	LACSA	A-320	648	LAX-ACA-SJO	3-7	2	10:25	
	LACSA	A-320	649	SJO-ACA-LAX	2-6	2		13:00
	LACSA	B-727	652	SJU-CCS-PTY-SJO	1-2-4-5	4	11:30	
	LACSA	B-727	653	SJO-PTY-CCS-SJU	1-3-4-7	4		13:45
	LACSA	B-727	670	MSY-CUN-SAP-SJO	2-5	2	12:40	
	LACSA	B-727	671	SJO-SAP-CUN-MSY	1-4	2		13:45
	LACSA	A-320	680	NYC-CUN-GUA-SAP-SJO	1-3-4-5-6	5	16:00	
	LACSA	A-320	681	SJO-SAP-GUA-CUN-NYC	2-3-4-5-7	5		12:30
e	LTU INT'L	B-767	462/463	DUS-ATL-SJO-ATL-DUS	3	1	15:15	16:55
	SAM	72M	502/503	GUA-SJO-ADZ	D	7	8:20	9:00
	SAM	72M	502/502	ADZ-SJO-ADZ	D	7	17:20	18:00
	SAM	72M	504/505	ADZ-SJO-ADZ	1-3-5	3	10:35	12:35
	MEXICANA	DC10	111/908	MEX-GUA-SJO-GUA-MEX	D	7	10:45	11:35
f	VARIG	B-767	876	RIO-GYE-UIO-SJO	6	1	18:30	
	VARIG	B-767	877	SJO-GYE-UIO-RIO	7	1		15:00
	RL	Not Operating	524/525	PTY-SJO-MGA		0	7:30	8:00
	RL	Not Operating	525/525	MGA-SJO-PTY		0	18:20	18:50
g	SAHSA	B-737	415	TGU-SJO	1-2-3-5-7	5	18:30	
	SAHSA	B-737	416	SJO-TGU	1-2-3-4-6	5		6:00
	TACA INT'L	B-737	410/410	PTY-SJO-SAL	D	7	6:30	7:00
	TACA INT'L	B-737	411/411	SAL-SJO-PTY	D	7	18:50	19:10
	UNITED	B-737	835/898	MIA-SJO-MIA	D	7	22:00	7:00
	UNITED	B-757	889/888	LAX-GUA-SJO-GUA-LAX	D	7	8:30	9:30
	UNITED	B-737	885/896	MIA-SJO-MIA	2-4-6-7	4	13:40	14:50
	UNITED	B-737	1003/1002	IAD-MEX-SJO-MEX-IAD	D	7	23:30	6:20

* 1 = MONDAY, 2= TUESDAY, 3 = WEDNESDAY, 4 = THURSDAY, 5 = FRIDAY, 6 = SATURDAY, 7 = SUNDAY AND D = DAILY.

Source: DGAC and Air Carriers

Note: Nica, a new carrier formed from the bankrupt carrier Aeronica, is expected to provide 737-200 service on routes from Managua to Miami, Guatemala City, Mexico City, San Jose and Panama City.

TABLE 5.2
International Passenger Flight Schedule
SJO - July 1992

Explanation of notes:

a HOU-MGA-SJC-MGA-HOU
Continental 771/775
IAH-MGA-SJC. Pax may disembark but not embark at MGA.
SJO-MGA-IAH: Pax may not disembark but may embark at MGA.

b AMS-CCS-CUR-SJO-PTY-CUR-AMS
KLM 753/754
AMS-CCS-CUR-SJO-:Note in OAG says KL753 conditional stopover traffic.
CCS-SJO not listed

c AMS-CUR-GUA-SJO-CUR-AMS
KLM 745/746
AMS-CUR-GUA-SJO: GUA-SJO not listed in OAG. Pax may disembark at GUA but not embark.

d LAX-ACA-SAL-SJO-SAL-ACA-LAX
LACSA 646/647
ACA-SJO: No flight listed.
ACA-SAL: No flight listed.
Conclusion: Pax may disembark at ACA but not embark.

e DUS-ATL-SJO-ATL-DUS
LTU 462/463
No flights listed for ATL-SJO-ATL.
ATL-SJO: Pax may disembark but not embark.
SJO-ATL: No pax may disembark in Atlanta - all bound for DUS.

f RIO-GYE-UIO-SJO-GYE-UIO-RIO
Varig 876/877
Actually RIO-GRU-GYE...
However, this info only listed in itinerary and not in flight listings.

g TGU-SJO-TGU
SAHSA 415/416
This route in OAG under flight numbers 413 and 419 - no Flight #415/416.
Also, route is TGU-MGA-SJO-MGA-TGU
Full rights at all stops.

Source: OAG August 1992.

FIGURE 5.3

SJO, Costa Rica - Sample International Passenger Aircraft Movements

(Typical Thursday, July 1992)

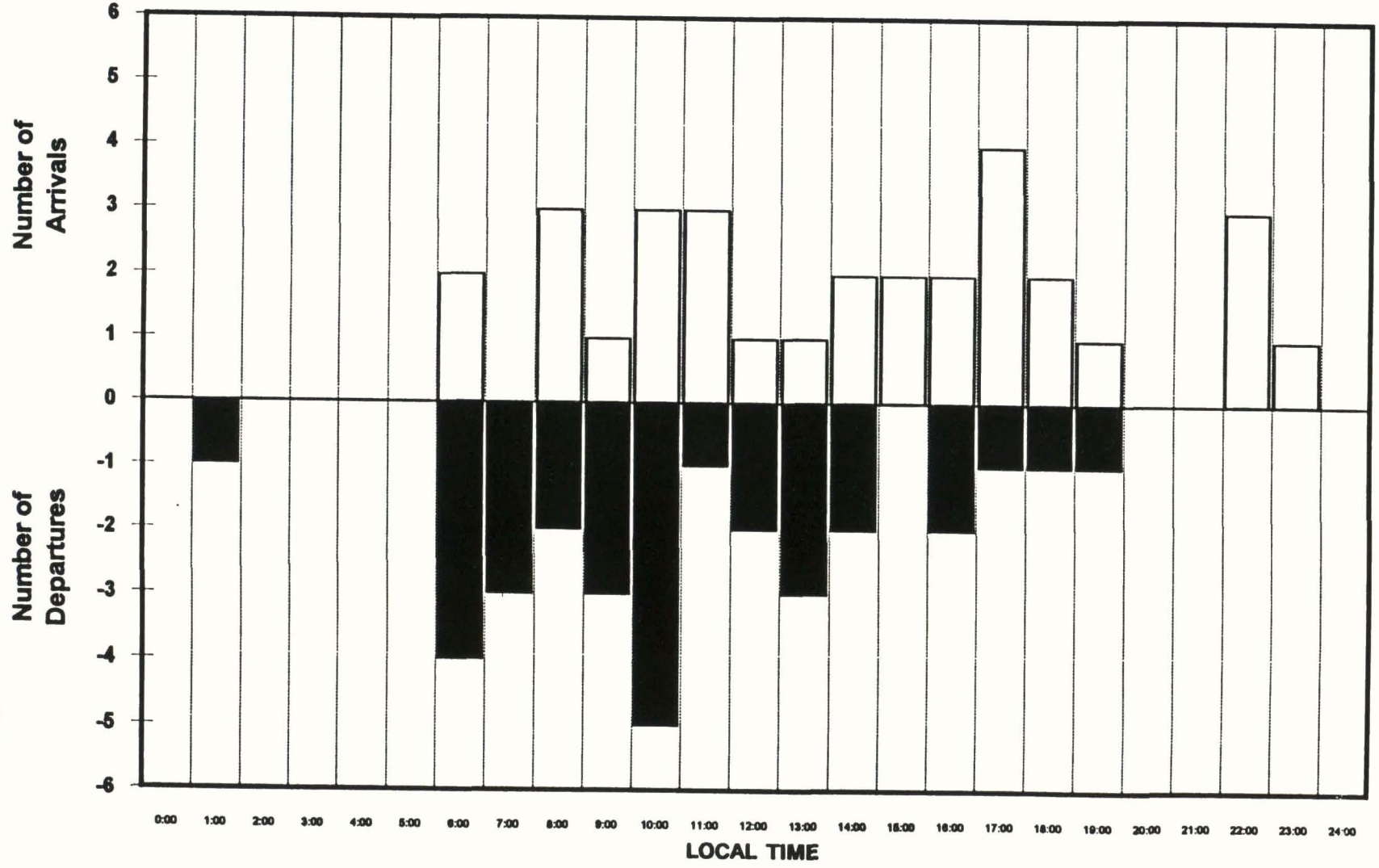
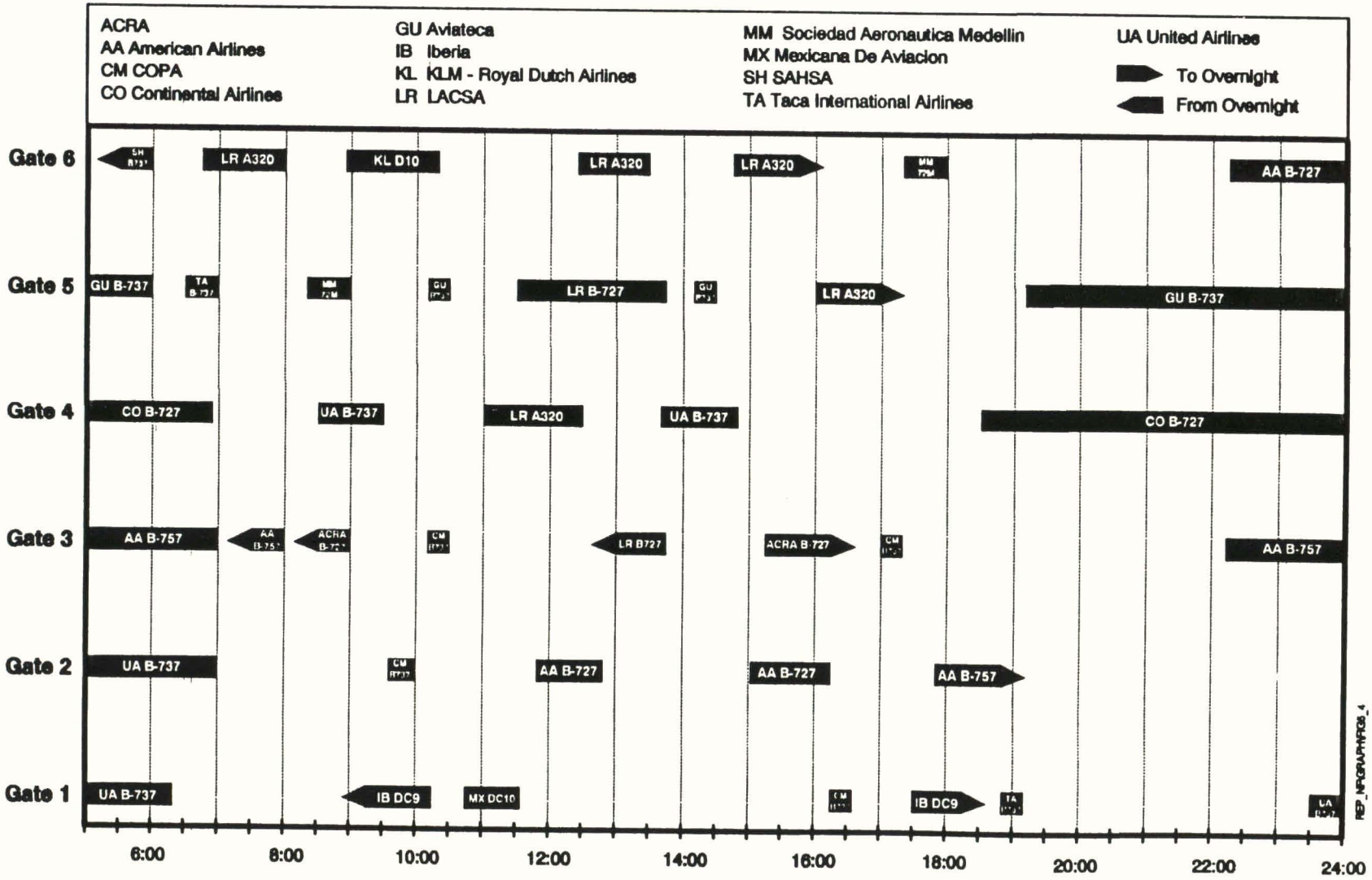


FIGURE 5.4
Airport Operations - San Jose (SJO)
(Typical Thursday, July 1992)



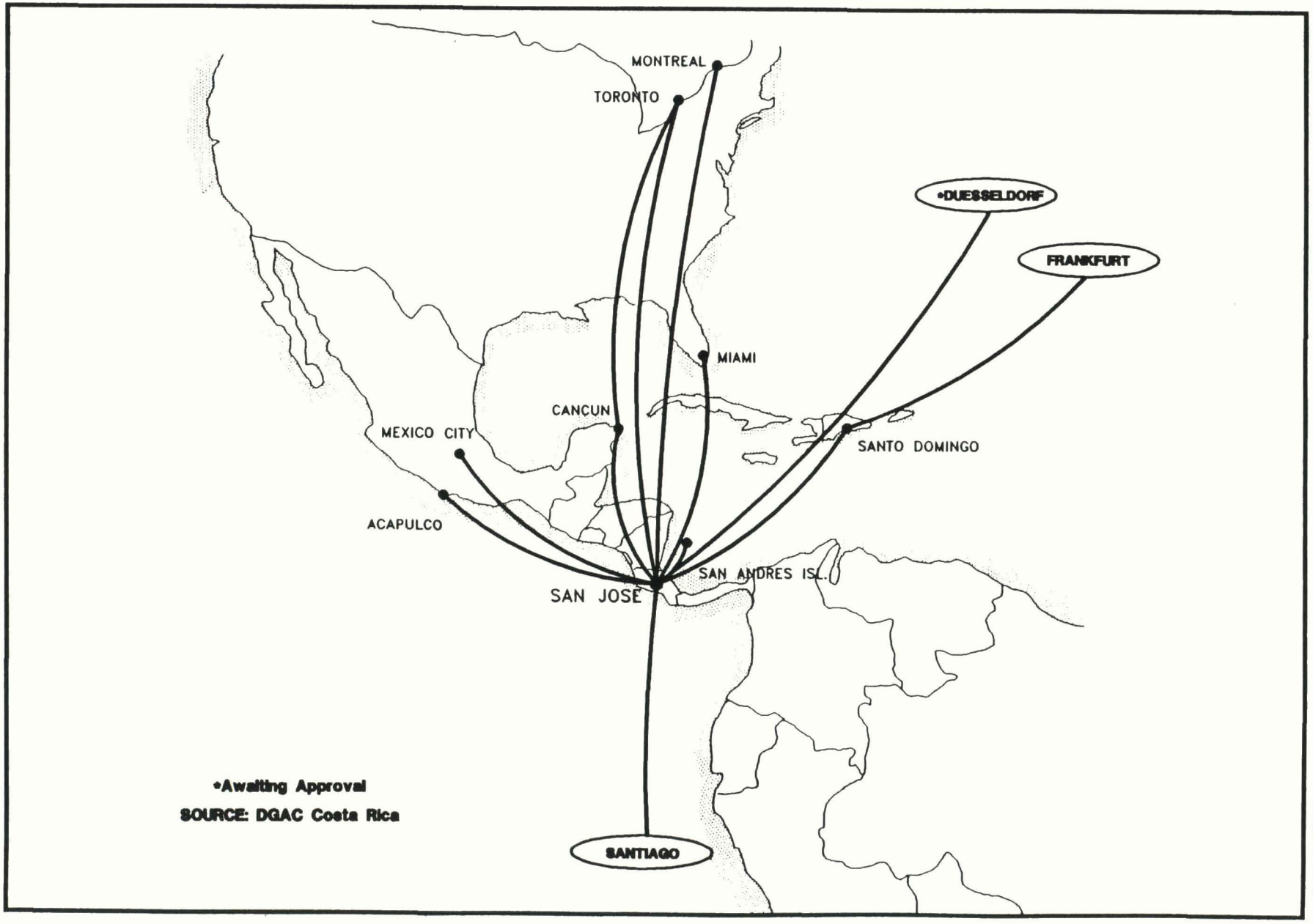
Source: DGAC, APS Analysis

5.1.4 Charter Services

The number of charter flights are slowly growing; however, they continue to represent less than two percent of the total international flights for San José. As of January 1992, the charter flights noted in Figure 5.5 were in operation. Current plans call for some charter traffic to be handled by the Liberia International Airport, Tomas Guardia, beginning during the 1992/1993 high season.

It is doubtful that the number of charter flights will increase to any large degree for a number of reasons. The low hotel capacity in the tourist regions outside San José creates problems for tour operators planning for planeload charters. The small size of the hotels make it impossible to place the entire group in one hotel and creates severe problems in the peak season. The average annual hotel occupancy rate was 66.35% in 1991, which given the seasonal nature of tourism, creates shortages in the peak season. Only one or two hotel projects currently registered with the ICT will have more than 500 to 600 rooms. Moreover, it is not in keeping with the style of Costa Rica to build large hotel complexes, a style that reflects a culture and style of living that Costa Rica wants to retain.

FIGURE 5.5
Charter Routes - January 1992



5.1.5 Passenger Origin

Table 5.3 outlines the international passenger traffic levels at Juan Santamariá International Airport by country of origin. North and Central America represent the largest volumes of international air traffic demand, while the largest growth rate of passenger demand is occurring in North America and Europe.

Almost 31% of the international passengers were carried by the Costa Rican carrier, LACSA, in 1991, as compared to approximately 41% in 1986. Carriers from the United States have been increasing their share of the international traffic to San José over the past decade due to an increase in demand from US passengers.

In terms of North American traffic to and from SJO, historically the most popular destination is Miami. Table 5.4 shows that over 60% of international passengers travelling to/from North America are on the SJO-MIA route, with Dallas as a distant second. European traffic flies to Madrid, Amsterdam and, as of 1991, Duesseldorf and Frankfurt.

TABLE 5.3

Total International Air Passengers (Arr & Dep) at Juan Santamaria International Airport

(Units: 1,000 passengers)

YEAR	1985	1986	1987	1988	1989	1990	1991	Avg Annual Growth Rate 1985-1991
North America	308	337	385	416	461	530	582	11.2%
Central America	199	206	215	211	245	258	287	6.3%
South America	28	29	31	36	39	44	48	9.4%
Caribbean	34	48	53	43	53	60	56	8.7%
Europe	22	23	24	24	28	31	36	8.6%
Charter							42	
Total	591	643	708	730	826	923	1,051	10.1%

Source: DGAC

TABLE 5.4
Origin/Destination Passengers at SJO
Scheduled & Charter Air Traffic
1986-1991

Year	1986	1987	1988	1989	1990	1991	Origin/ Dest. as % of 1991 Total
Total Int'l Passengers	643,879	707,910	730,090	825,623	922,969	1,050,926	100%
ORIGIN/DESTINATION:							
NORTH AMERICA	337,405	384,985	415,674	460,666	529,644	624,587	59.4%
SJO Arrivals	163,048	188,977	201,713	227,269	264,357	330,227	31.4%
Miami	110,996	120,374	136,264	152,477	174,000	175,040	16.7%
Dallas					7,948	28,300	2.7%
Mexico	30,439	38,047	31,161	25,252	26,596	26,310	2.5%
Houston	3,226	3,453	5,232	837	12,369	22,682	2.2%
Los Angeles	10,602	14,073	13,995	22,393	22,145	17,927	1.7%
New York		4,750	7,604	8,633	9,957	7,335	0.7%
New Orleans	5,743	5,534	6,044	5,320	5,125	5,268	0.5%
Cancun	1,574	1,586	1,359	1,617	3,271	3,939	0.4%
Acapulco						720	0.1%
San Francisco	51	1,007	54				0.0%
Other Routes*	417	153		10,740	2,946	42,706	4.06%
SJO Departures	174,357	196,008	213,961	233,397	265,287	294,360	28.0%
Miami	116,000	125,248	142,223	153,922	175,595	176,193	16.8%
Cancun	34,880	40,981	36,380	27,782	27,844	29,186	2.8%
Dallas					7,852	27,226	2.6%
Houston	3,331	3,928	5,700	1,770	10,070	24,331	2.3%
Los Angeles	10,252	12,870	13,009	21,798	21,589	18,738	1.8%
New York		3,862	7,654	8,689	10,269	8,182	0.8%
New Orleans	6,057	5,849	6,444	5,956	5,151	4,803	0.5%
Mexico	2,935	2,075	2,325	2,134	3,743	4,506	0.4%
Acapulco						965	0.1%
San Francisco	37	891	60	8			0.0%
Other Routes*	865	304	166	11,338	3,174	230	0.02%
EUROPE	23,174	23,617	24,200	27,595	31,241	36,092	3.4%
SJO Arrivals	11,192	11,050	11,684	13,811	15,562	18,576	1.8%
Madrid	6,903	5,981	5,960	6,635	8,176	9,516	0.9%
Amsterdam	4,289	5,069	5,724	7,176	7,386	7,261	0.7%
Duesseldorf						1,799	0.2%
SJO Departures	11,982	12,567	12,516	13,784	15,679	17,516	1.7%
Madrid	7,255	6,742	5,986	6,740	8,109	9,140	0.9%
Amsterdam	4,727	5,825	6,530	7,044	7,570	7,234	0.7%
Duesseldorf						1,142	0.1%
CENTR. AMERICA	206,267	215,488	210,602	245,064	257,509	286,828	27.3%
SJO Arrivals	101,949	108,015	104,496	121,846	124,760	140,558	13.4%
SJO Departures	104,318	107,473	106,106	123,218	132,749	146,270	13.9%
CARIBBEAN	48,068	52,751	43,496	52,923	60,446	55,796	5.3%
SJO Arrivals	23,364	26,612	21,616	26,126	30,392	27,048	2.6%
SJO Departures	24,704	26,139	21,880	26,797	30,054	28,748	2.7%
SOUTH AMERICA	28,965	31,059	36,118	39,375	44,129	47,623	4.5%
SJO Arrivals	15,005	16,435	18,937	21,526	23,601	24,596	2.3%
SJO Departures	13,960	14,624	17,181	17,849	20,528	23,027	2.2%

*Other Routes include Tampa, Guadalajara, Acapulco, Orlando, San Luis and Canada, Tapachula.

Source: DGAC

5.2 Domestic Passenger Traffic

SANSA (Servicios Aereos Nacionales SA), owned by LACSA, and Travelair (operating out of Tobias Bolaños) are Costa Rica's two domestic carriers. As of July 1992, SANSA is operating CASA C-212 (25 seats) and Travelair is using Britten Norman Islander-2A/B (9 seats). Table 5.5 lists the domestic services provided by SANSA and Travelair. These routes are also depicted geographically in Figure 5.6.

Operations to Limón Airport were suspended in 1987 following a drastic drop in air traffic demand due to a preference for road travel on the newly completed highway. Liberia Airport reopened in June 1992; however, scheduled domestic operations had not recommenced by July 1992.

Domestic traffic is less than 10% of the total passenger traffic for Juan Santamariá. Figure 5.7, which lists the number of domestic passengers from 1981 to 1991, shows just how drastically the traffic dropped during the early 1980s, primarily due to the improvement of the roads and a preference for road travel. The average annual growth rate in domestic passengers from 1981 to 1991 was actually a decreasing rate of -5.7%. From 1982 to 1983 alone, domestic traffic decreased by approximately 59% and by 1985, domestic traffic had dropped 78% since 1982. The volume of domestic traffic in 1991 was just over half of the 1981 volume.

The completion of 42 kilometres of highway between Colon and Orotina will provide a fast road link from San José to the Pacific Coast. This highway and the completion of any additional thoroughfares will tend to keep scheduled domestic traffic at a low percentage of total scheduled passenger traffic.

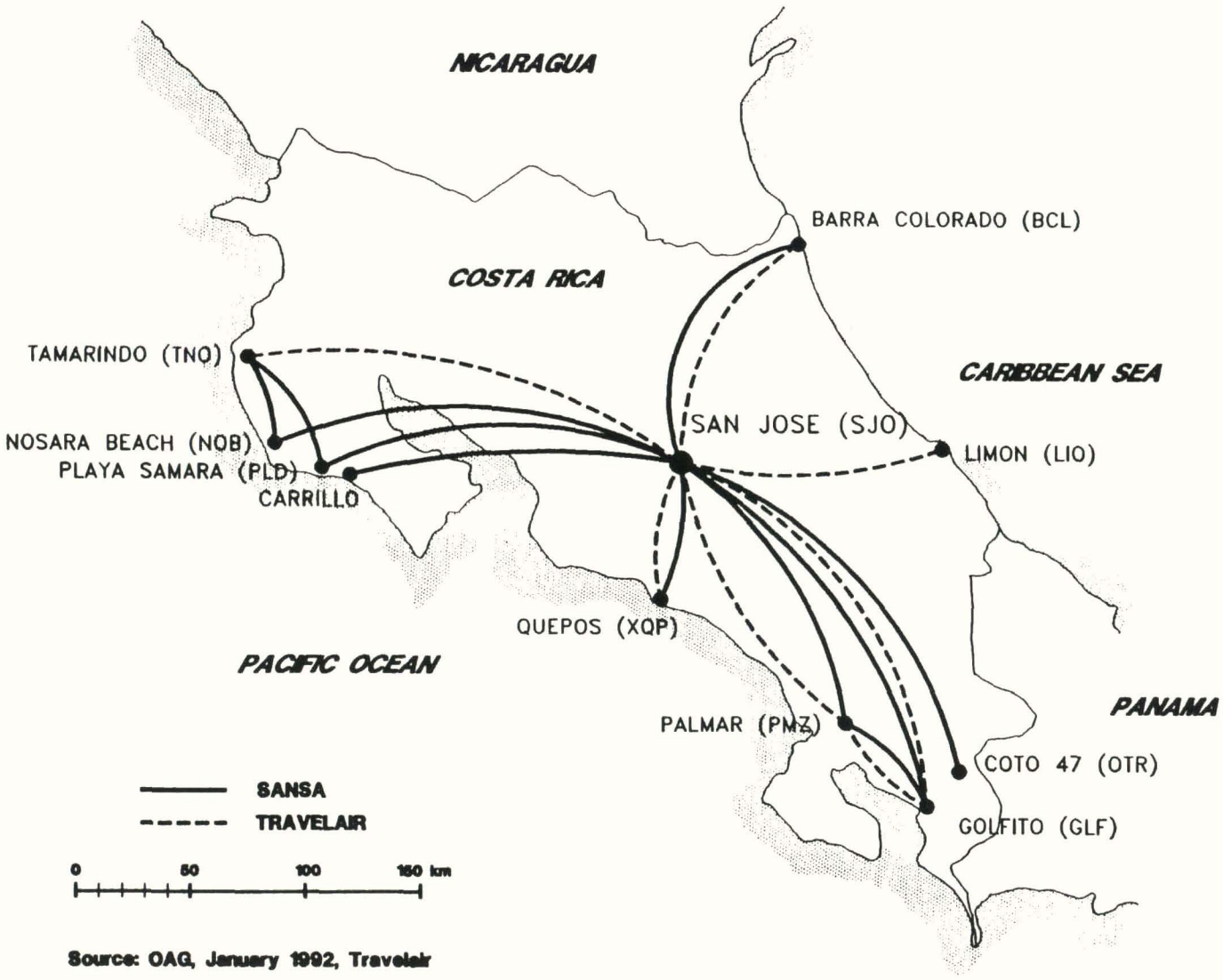
TABLE 5.5

Domestic Flight Services
January 1992

Airline	Route	Aircraft	Flights per Week
SJO:			
SANSA	SJO-Golfito-SJO	Aviocar (C-212)	6
SANSA	SJO-Quepos-SJO	Aviocar (C-212)	12
SANSA	SJO-Samara-Tamarindo-Nosara-Tamarindo-Samara-SJO	Aviocar (C-212)	3
SANSA	SJO-Coto 47-SJO	Aviocar (C-212)	6
SANSA	SJO-Palmar Sur-Golfito-Palmar Sur-Golfito	Aviocar (C-212)	3
SANSA	SJO-Barra Colorado-SJO	Aviocar (C-212)	3
Total			33
Tobias Bolaños:			
Travelair	SJO-Barra Colorado-SJO	BN-2A/B	6
Travelair	SJO-Quepos-SJO	BN-2A/B	14
Travelair	SJO-Golfito-Palmar Sur-SJO	BN-2A/B	7
Travelair	SJO-Limón-SJO	BN-2A/B	3
Travelair	SJO-Tamarindo-SJO	BN-2A/B	7
Total			37

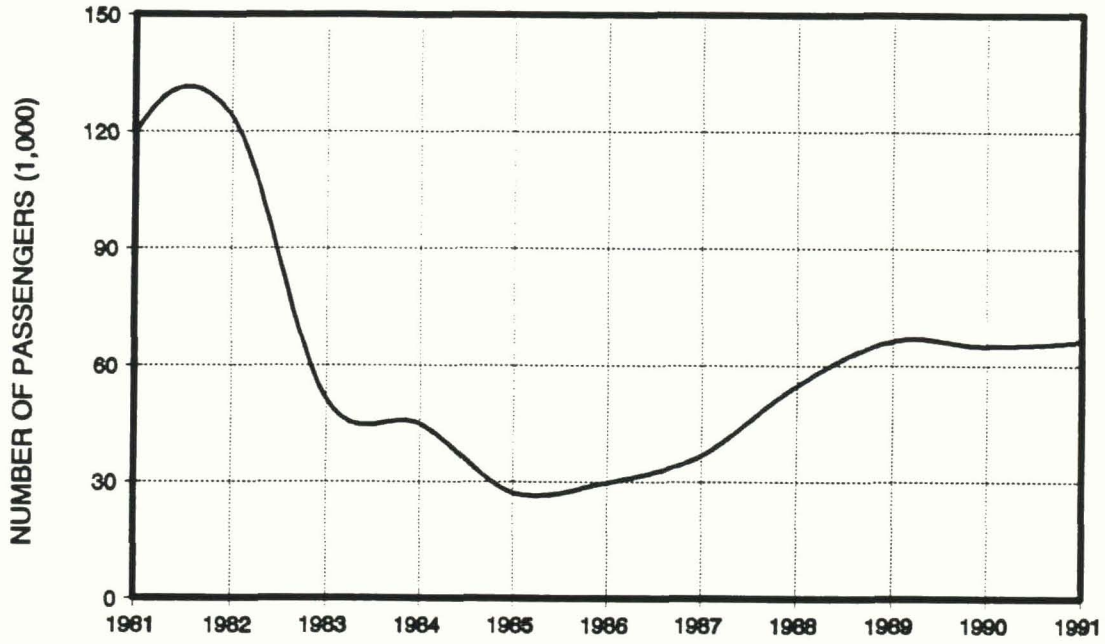
Sources: OAG January 1992 & August 1992, Travelair Schedule

FIGURE 5.6
Domestic Scheduled Routes - SANSA & Travelair, July 1992



Source: OAG, January 1992, Travelair

FIGURE 5.7
Annual Domestic Passengers at SJO



Average Annual Growth Rates	
1981-1985:	-30.9%
1985-1991:	16.0%
1981-1991:	-5.7%

Year	Domestic Passengers
1981	119,249
1982	123,892
1983	51,190
1984	44,774
1985	27,172
1986	29,712
1987	36,558
1988	54,620
1989	66,223
1990	64,901
1991	66,283

Source: DGAC

5.3 Cargo Traffic

The history of international cargo volume is shown in Tables 5.6, 5.7 and Figure 5.8. The average growth rates of export, import and total cargo volume from 1985 to 1991 are 16.4%, 12.9% and 15.0% respectively. The January 1992 cargo flight schedule is included as Table 5.8 and Figure 5.9 shows the routes on a map.

The following characteristics were found in an examination of cargo traffic:

- In 1991, air cargo exports from SJO represented 62% of the cargo volume while imports were just 38%. The total value of imports is greater than the value of exports for two reasons:
  1) imports are largely higher value industrial products;
  2) southbound cargo is more expensive than northbound, mostly due to imports being valued CIF.
- The volume handled by LACSA in 1991 was 35% of the imported cargo and 3.4% of the exported cargo.
- The major area to/from export and import is North America with 86.4% of the total volume in 1991. Approximately 80% of this is currently carried by dedicated freighter aircrafts. The final destination of a significant volume of this cargo is actually Europe.
- The breakdown of 1991 exports and imports by origin and destination areas and the growth rates with respect to each region during the period 1985 to 1991 are indicated in Figure 5.10.

TABLE 5.6

Air Cargo Exported from SJO
1985-1991
(Unit: Tons)

Year	North America	Central America	South America	Caribbean	Europe	Total
1985	11,531	1,891	162	1,209	802	15,595
1986	15,045	1,516	245	1,539	1,281	19,626
1987	17,600	1,554	152	1,767	2,004	23,077
1988	21,325	1,376	103	2,132	2,559	27,495
1989	29,112	1,507	92	1,604	2,910	35,225
1990	36,194	1,843	131	1,282	2,333	41,783
1991	34,004	1,764	202	1,390	1,373	38,733
Average Annual Growth Rate 1985-1991:	19.8%	-1.2%	3.7%	2.4%	9.4%	16.4%

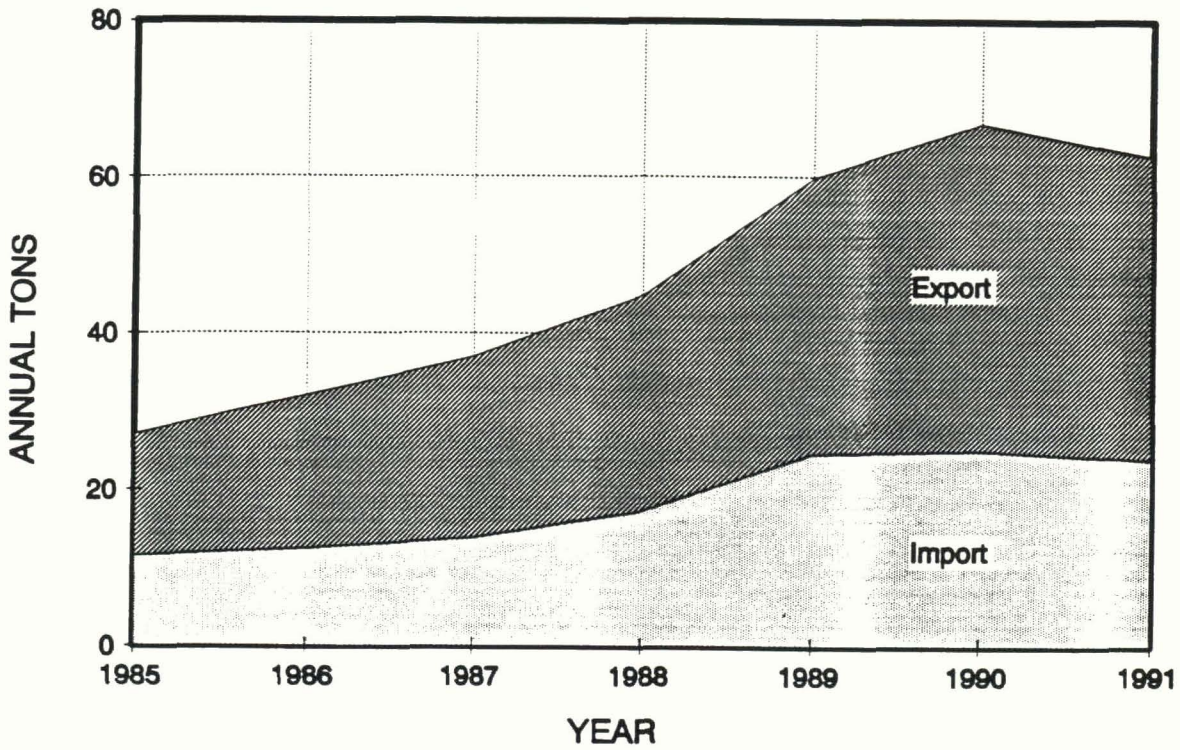
TABLE 5.7

Air Cargo Imported to SJO
1985-1991
(Unit: Tons)

Year	North America	Central America	South America	Caribbean	Europe	Total
1985	8,025	1,988	448	295	794	11,550
1986	8,886	2,111	368	369	785	12,519
1987	10,185	2,286	264	546	603	13,884
1988	13,916	2,065	171	638	541	17,331
1989	18,994	3,920	185	800	807	24,706
1990	21,072	2,121	368	855	704	25,120
1991	20,174	1,923	293	1,104	449	23,943
Average Annual Growth Rate 1985-1991:	16.6%	-0.6%	-6.8%	24.6%	-9.1%	12.9%

Source: DGAC, JICA Study, APS Analysis

FIGURE 5.8
Annual Air Cargo Import/Export - SJO



Year	Air Cargo Volume Exports & Imports (tons)
1985	27,145
1986	32,145
1987	36,962
1988	44,826
1989	59,931
1990	66,903
1991	62,676

Source: DGAC, JICA Study, APS Analysis

TABLE 5.8

Cargo Flight Schedule
SJO - January 1992

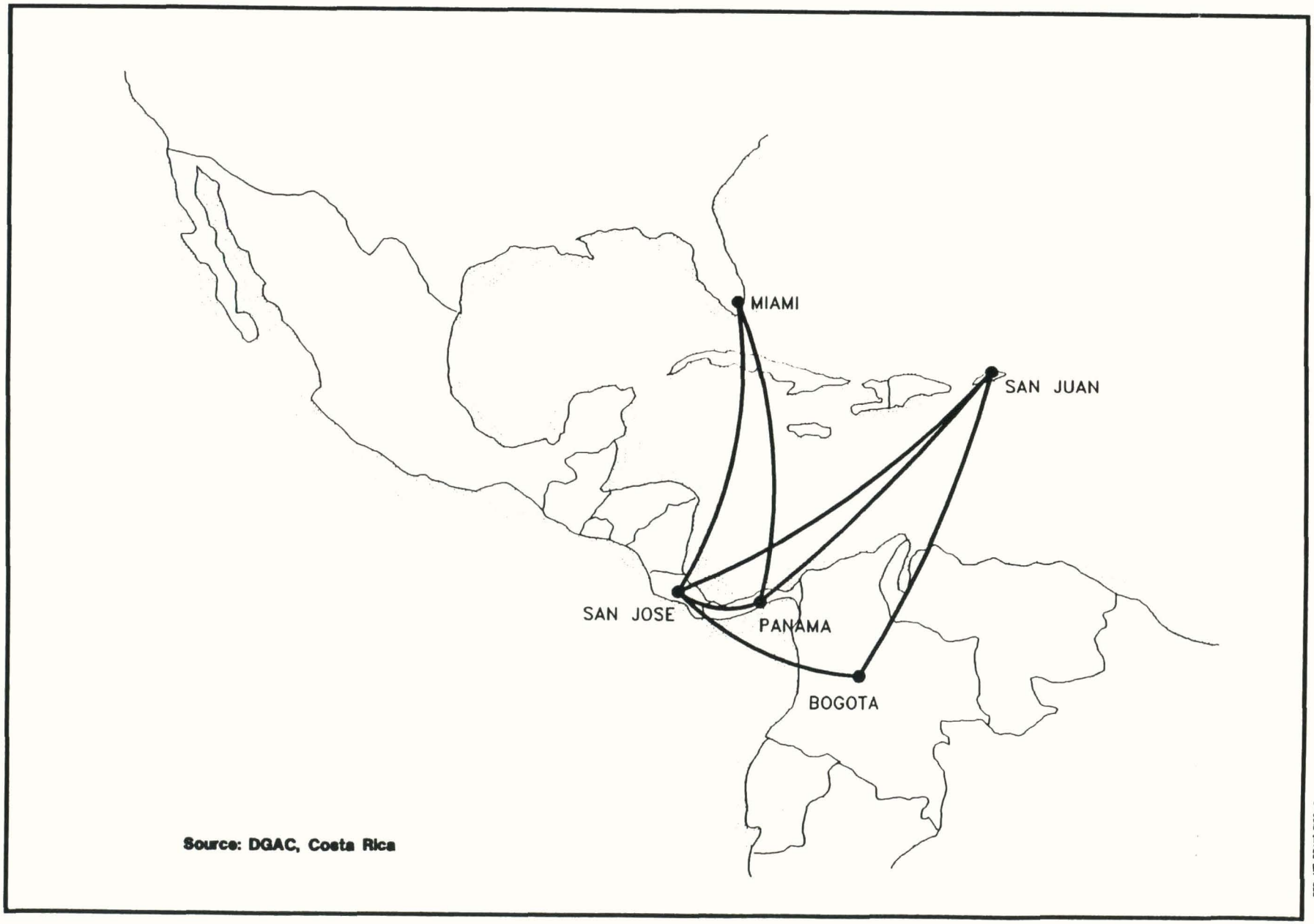
Airline	Flight No.	Itinerary	Day of Week*	Total Flights Per Week	Arrival	Departure
ARROW (1)	616/616	MIA-PTY-SJO-MIA	3-4-6-5	4	21:00	23:00
CHALLENGE (2)	045/046	MIA-PTY-SJO	1-2	2	20:45	22:15
CHALLENGE (2)	043/044	MIA-SJO-MIA	3-4	2	19:15	20:45
CHALLENGE (2)	043/044	MIA-SJO-MIA	5	1	21:15	22:45
CHALLENGE (2)	045/046	MIA-PTY-SJO	6	1	2:15	3:45
CHALLENGE (2)	043/044	MIA-SJO-MIA	6	1	20:15	22:15
CHALLENGE (2)	045/046	MIA-PTY-SJO	7	1	20:15	21:45
LACSA	700/701	SJO-MIA-SJO	D	7	20:00	1:30
IBERIA (QUINCENAL)	9259/9256	MAD-LPA-SJU-SJO-BOG-SJU-MAD	5	1	12:50	14:20
IBERIA (QUINCENAL)	9367/9256	MAD-LPA-SJU-SJO-PTY-SJU-MAD	6	1	18:59	20:30
TRANSCARGO	501/500	MIA-SJO-MIA	4	1	2:00	4:30
TRANSCARGO	501/500	MIA-SJO-MIA	6	1	11:30	14:00
FLORIDA WEST (3)		MIA-SJO-MIA	Not Regular	5	22:15	23:45

* 1 = MONDAY, 2 = TUESDAY, 3 = WEDNESDAY, 4 = THURSDAY, 5 = FRIDAY, 6 = SATURDAY, 7 = SUNDAY, D= DAILY

Notes:
(1) DAILY OPERATIONS ON FRIDAYS IS PENDING APPROVAL.
(2) ITINERARY FOR THE 24TH OF NOVEMBER UNTIL THE 19TH OF JANUARY 1992.
(3) FLORIDA WEST OPERATES 5 TIMES PER WEEK.

Source: DGAC

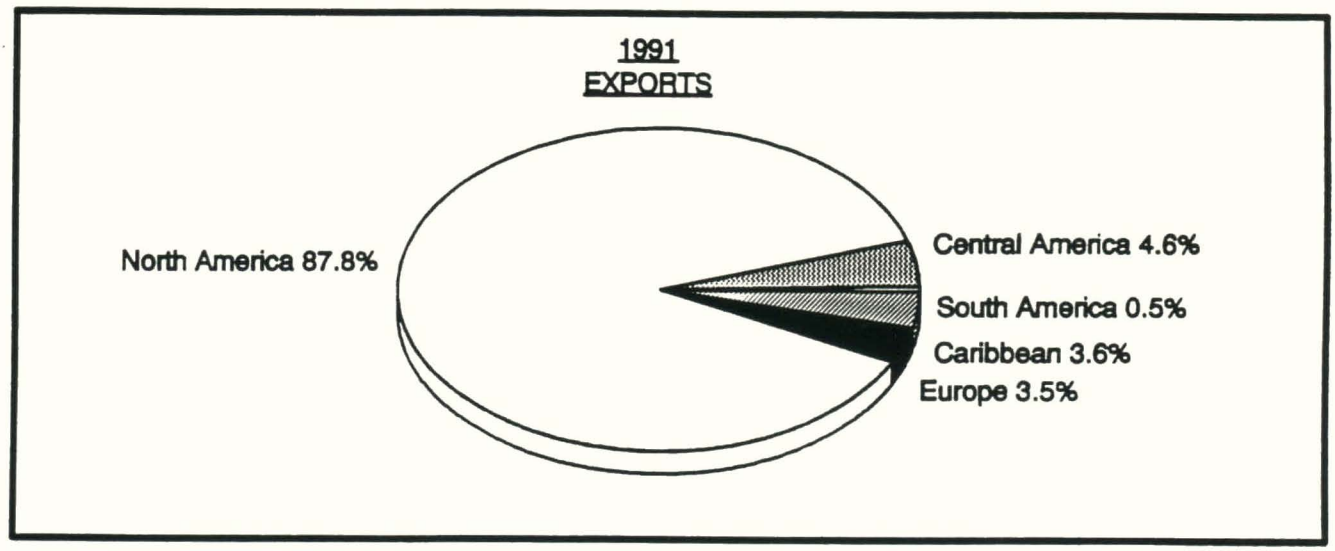
FIGURE 5.9
Cargo Route Schedule, January 1992

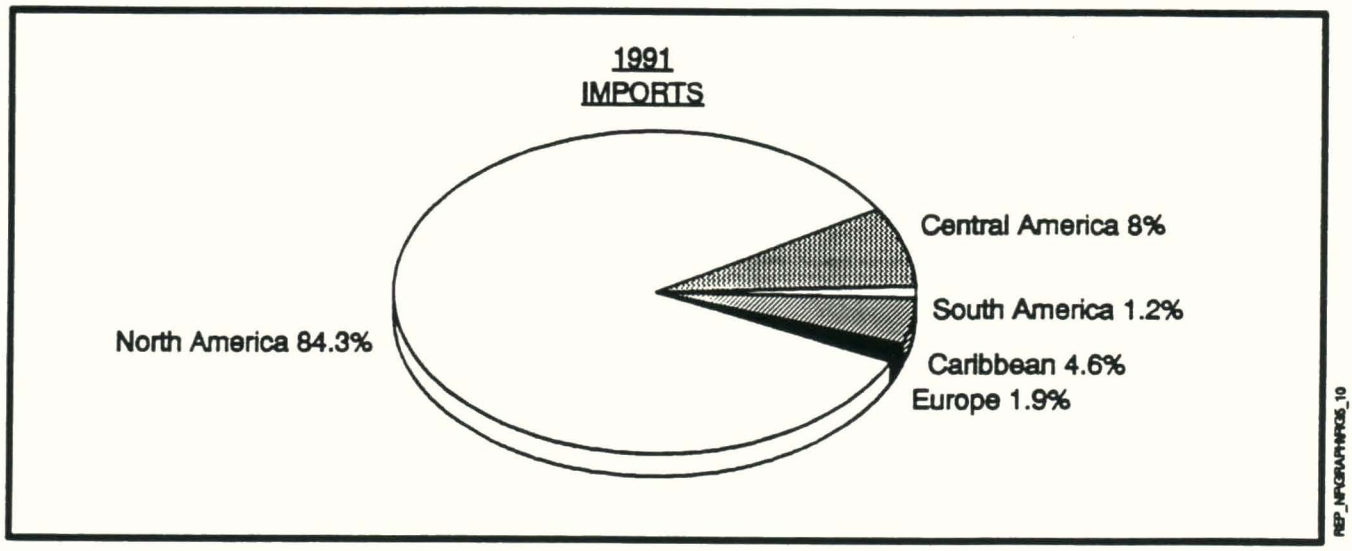


Source: DGAC, Costa Rica

FIGURE 5.10

International Cargo Volume
Exports & Imports by Destination & Origin





		North America	Central America	South America	Caribbean	Europe	Total
Share of 1991	Exports	87.8%	4.6%	0.5%	3.6%	3.5%	100%
	Imports	84.3%	8.0%	1.2%	4.6%	1.9%	100%
Annual Growth Rate of Exports & Imports 1965-1991		18.5%	-0.8%	-3.4%	8.8%	2.2%	15.0%

Source: DGAC, JICA Study, APS Analysis

5.4 Transit Passengers

Transit passengers typically average 30% on multi-stop international scheduled flights at SJO (source: JICA report). Approximately 25% of the scheduled weekly international flights have several scheduled stops in Central America and the Caribbean, where these transit passengers are destined.

5.5 Aircraft Movements at SJO

Aircraft movements, 1982-1991, at SJO are categorized by type of service in Table 5.9. The average annual growth of international scheduled passenger aircraft movements for 1986-1991 was 7.1%, which was lower than the average annual growth in international passengers for the same period at 10.3%.

Figure 5.11 provides a pictorial breakdown of 1991 SJO aircraft movements by type of service. General Aviation (GA) movements exceeded international passenger aircraft movements by almost 5% in 1991. GA and international passenger traffic accounted for over 86% of SJO's total annual aircraft movements in 1991, while domestic passenger aircraft movements and charter movements together accounted for less than 14%. The following sections describe the historical traffic trends.

In terms of weekly movements, Table 5.10 provides a weekly average of international and domestic movements (arrivals only) for the month of January 1992, based on SJO tower records. The average aircraft size is an estimate based on statistics published by the Official Airline Guide.

Table 5.11 lists weekly international movements (arrivals) for the month of January in the years 1981, 1985 and 1991, to show the progressive increase in daily aircraft movements. Sunday and Tuesday arrival movements doubled over the 1981-1991 period and Saturday aircraft arrivals increased by over

70%.

The aircraft currently employed on scheduled and charter passenger and cargo flights include the following (source January 1992 SJO cargo schedule, January 1992 SJO tower data, July 1992 SJO international passenger aircraft schedule and July 1992 OAG):

Airbus A300
Airbus A310
Airbus A320
Boeing 707
Boeing 727
Boeing 737
Boeing 747
Boeing 757
Boeing 767
Britten Norman Islander 2A/B
CASA 212
Lockheed L1011
McDonnell Douglas DC3
McDonnell Douglas DC8
McDonnell Douglas DC9
McDonnell Douglas DC10
PA-34 (Piper)
Tupolev 154.

TABLE 5.9

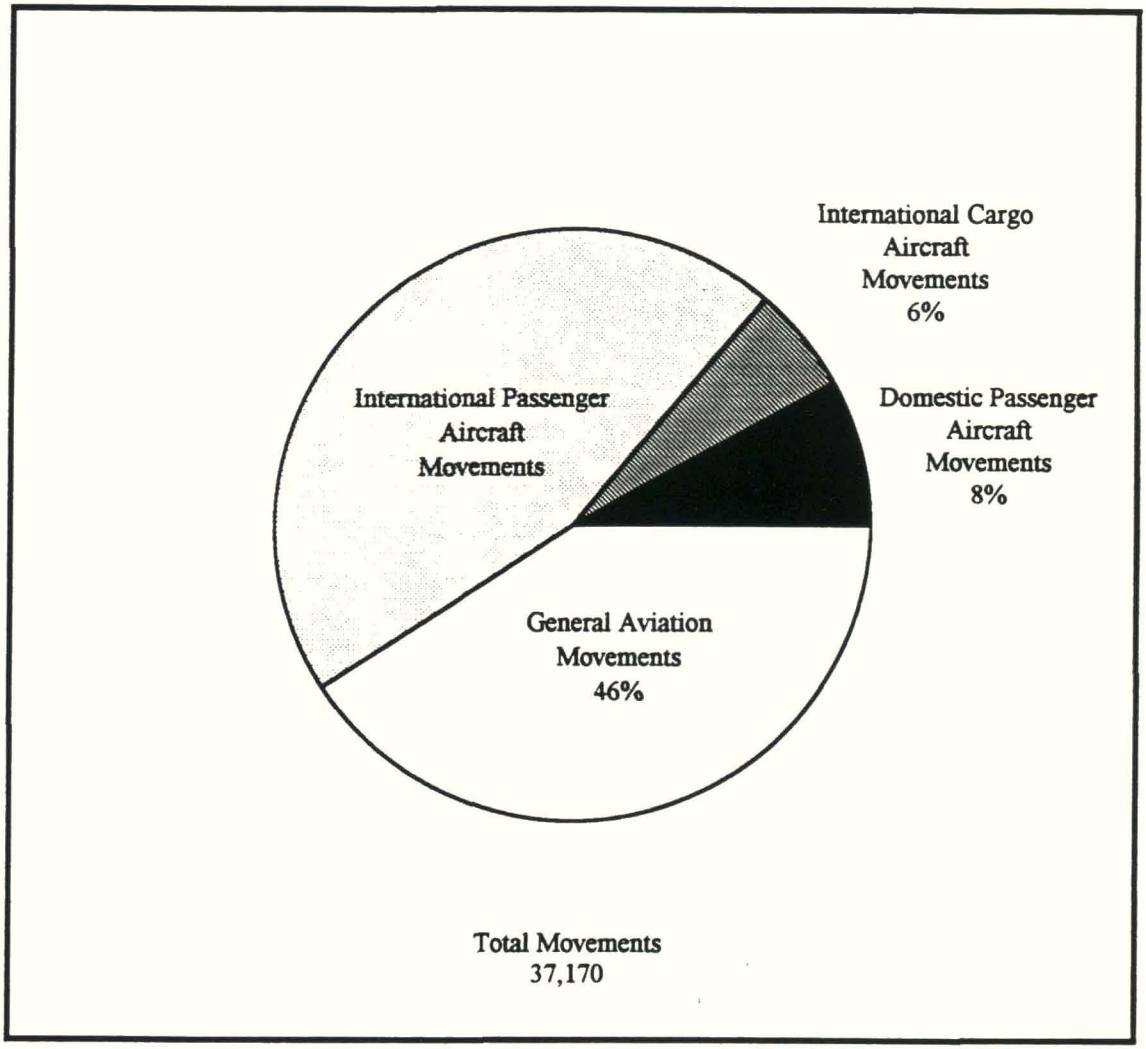
Annual Aircraft Movements at Juan Santamariá International Airport 1982-1991

Year	Passenger Aircraft Movements		International Cargo Aircraft Movements	General Aviation Movements	Total Annual Movements
	International Scheduled*	Domestic Scheduled			
1982	8,972	11,302	**	7,772	28,046
1983	8,256	7,092	**	9,206	24,554
1984	9,881	7,803	**	7,400	25,084
1985	9,990	6,855	**	7,997	24,842
1986	10,777	6,714	**	8,414	25,905
1987	11,795	2,006	**	12,937	26,738
1988	11,990	2,872	1,442	13,279	29,583
1989	11,836	3,076	1,917	13,641	30,470
1990	14,532	3,190	2,198	15,647	35,567
1991	15,180	2,931	2,130	16,929	37,170
Average Annual Growth Rates:					
1982-1991:	6.0%	-13.9%	13.9%	9.0%	3.2%

*Including charter flights
**Cargo movement data not collected until 1988.

Source: DGAC

FIGURE 5.11
Breakdown of Annual Aircraft Movements at SJO, 1991



Source: DGAC

TABLE 5.10

Daily Aircraft Scheduled Movements (Arrivals) -January 1992

	JAN 1992			
Day of Week	International Arrivals	Average Number of Seats	Domestic Arrivals	Average Number of Seats
Monday	20	136	7	26
Tuesday	20	141	6	26
Wednesday	20	141	6	26
Thursday	22	151	6	26
Friday	21	137	8	24
Saturday	23	141	6	27
Sunday	23	145	1	28
Total Weighted Average	142	142	38	26

Source: SJO Tower Data-Jan 1992

TABLE 5.11

Daily Aircraft Scheduled Movements (Arrivals) 1981, 1985 and 1991

	1991	1985	1981
Day of Week	No. of Int'l Pax Flight Arrivals	No. of Int'l Pax Flight Arrivals	No. of Int'l Pax Flight Arrivals
Monday	21	17	16
Tuesday	22	13	11
Wednesday	20	16	15
Thursday	22	19	13
Friday	22	16	17
Saturday	24	19	14
Sunday	22	17	11
Total Week	153	117	97

Sources: OAG Jan 1991, Jan 1985 & Jan 1981; GUIA Centroamericana January 1991

6 AIR PASSENGER FORECAST

6.1 Introduction

The Terms of Reference for this project specify a review of previous forecasts for SJO in order to corroborate and update the results. The three forecasts, listed in Section 2.1, were provided by the MOPT and the methodology, assumptions and results were subsequently analyzed by APS. As explained in Section 2.1, only the results of the most recent forecast were updated and are discussed herein.

6.2 Review of Comparative Forecast Assumptions

The following section describes the updated, underlying assumptions for the air traffic forecasts. Additional, updated assumptions, particular to the type of traffic being forecasted, appear in the relevant sections along with the rationale for questioning and amending the JICA figures and methodology.

The JICA study relied on the historical relationships between air traffic demand with the Gross Domestic Products (GDP) of Costa Rica and several world regions, in order to forecast the different types of traffic. The GDP forecasts were based on JICA's internally estimated rates of future growth. In order to bring some independent assessment of economic growth into a forecast exercise, it is customary to incorporate data from econometric models prepared by leading organisations in the field. Hence, for the current study, a number of major international economic forecast models were consulted. These include those of the World Bank, and consensus data derived from models of organisations such as Data Resources Inc., Wharton Econometric Forecasting Associates, Evans Econometrics and the U.S. Office of Management and Budget.

Assumption1 The four main regions of tourist origins and destinations present different patterns of growth over the last few years. Each region has been assessed for potential demand for air services into and out of Costa Rica. A summary of forecasted GDP growth rates is outlined in Table 6.1, with explanations below.

TABLE 6.1

Average Annual GDP Growth Rates for International Passenger Forecast
APS vs JICA Rates (%)
1991-2030

Period	North America		Europe		Central America		Other	
	APS	JICA	APS	JICA	APS	JICA	APS	JICA
1992-1995	2.9	3.15	2.5	3.00	3.0	1.32	4.5	2.34
1996-2003	3.5	3.15	3.0	3.00	4.5	1.32	4.0	2.34
2003-2010	3.3	3.15	3.3	3.00	4.0	1.32	4.2	2.34
2010-2030	3.3	3.15	3.3	3.00	4.0	1.32	4.2	2.34

Sources: APS Analysis, WEFA, Evans Econometrics, DRI, OMB-USA, IMF, Royal Bank of Canada.

North America

The largest portion of tourism demand in Costa Rica is generated in North America (Canada, the United States and Mexico). While the U.S. supplies the greatest share of tourists at present, the U.S. economy is not expected to grow at more than an average rate of 2.5% to 2.7% in the next two decades. Canada's growth rate has, on average, been higher than that in the U.S. and is expected to remain in the 3.0% to 3.2% range until the year 2010. It is the Mexican economy, now growing at a healthy rate after years of economic difficulty, that will supply a growing proportion of tourists, especially in the first decade of the next century.

As a result, North America's overall average annual GDP growth is projected to be in the 2.9% to 3.3% range over the next 20 years, with the lower rate experienced during the early years, to 1995, and the higher rate following.

Europe

Growth patterns in Europe are much harder to assess, now that the Eastern European countries are being brought into the greater European economy. However, the consensus seems to be that, after an adjustment period lasting from several years for Germany to perhaps a couple of decades for the less developed economies such as Romania and Bulgaria, GDP growth rates will be higher than in the past decade as pent-up demand in Eastern Europe is satisfied.

Lead by the reunited Germany, the European economy could see GDP rise annually at a rate of about 3.0% to the year 2010, with a lower growth rate of 2.5% in the next couple of years as the region adjusts to new conditions and a substantially higher rate in the later years, as the Czech, Polish and Hungarian economies are rebuilt in the first decade of the next century. It is estimated that rebuilding in other East European countries will be delayed until well after the turn of the century.

Central America

The economies of Central America have also experienced the general economic slowdown. In Costa Rica, real GDP is likely to average only about 2% for the period 1990-1992, according to a confidential bank report. Other countries in the region have also suffered the effects of the recession, aside from the results of civil strife some of them have yet to overcome. Once

these major problems are resolved, pent-up demand is expected to raise the real GDP growth rate to around 4.0% per annum to the year 2010.

Other Countries

While the economies of Other countries, including those in South America, exhibit a wide variety of growth rates, no individual country is likely to generate a significant number of tourists for Costa Rica in the near future. The assumptions are that countries reasonably close (Northern South America and the Caribbean) have similar physical attractions closer to home, whereas those which have the potential to generate large numbers of tourists (Japan, for example) are very far away. However, on average, a combination long-term GDP growth rate for all these countries is anticipated to be at least 4.2% in the next two decades, after a period of recovery from the current downturn.

In the two decades following 2010, an overall straightline projection methodology is employed, based on GDP growth rates for each region, to forecast tourism growth rates and the resulting passenger growth. This is predicated on the assumption that the market for the type of tourist attractions supplied by Costa Rica will have matured by the beginning of the second decade of the next century. The resulting effect is a gradually flattening out curve in the overall growth rate, which is likely to coincide with the physical limits to tourist facilities available in a small country like Costa Rica.

Assumption2 In the JICA study a regression analysis of actual results of traffic and past GDP was performed; however, the time series employed was only five years of traffic data. With the benefit of an additional year of traffic and the utilization of GDP growth rates developed in this study, APS analyzed the JICA forecast and found the results to be largely similar in the longer term.

Assumption3 The JICA study developed two sets of traffic figures: one without the use of Liberia Airport and one considering the use of Liberia and the induced traffic for SJO by virtue of Liberia operations. During its discussions with transportation officials and tourism groups, the Consultants were given the strong impression that Liberia would not receive a substantial portion of the country's international traffic but would serve some of the charter market and would also be an alternate to SJO. By July 1992, only one international carrier had applied to land at Liberia. Operations are expected to commence at the end of 1993. APS has corroborated the international passenger traffic forecast for 1991-2010, which does not include induced traffic from Liberia operations.

The international passenger demand from 2010 to 2030 is a straight line projection of the average long-term growth patterns appropriate to the economic development status of each region.

6.3 International Passenger Demand Forecast

As stated earlier, the forecast results of this study are similar to the JICA study despite the fact that APS Consultants employed a different methodology and different underlying assumptions. Section 6.2, above, discussed the various assumptions made by APS. The Consultants used a Delphi estimate for its forecasting method, which is a method of forecasting based on comparisons of historical traffic and GDP growth rates. A measure of judgemental analysis was also used to due to a lack of readily available data for particular countries such as the East European countries. Hence, the international passenger demand forecast by region appears in Table 6.2, is graphed in Figure 6.1 and is described as follows:

i) **North America's** economic growth has been negative in the past couple of years and is unlikely to increase much in 1992. Yet, in the past several years, it appears passenger growth and GDP rates during the same period have had an inverse relationship, leading to conclude that Costa Rica is considered to offer inexpensive holidays. Moreover, anecdotal data indicate that this air traffic demand will again rise in 1992 despite very low economic growth. A growth rate of 9% similar to that in 1991, was used for the full year 1992, and the next 2 years as the economy picks up.

Beginning in 1995, the air traffic demand growth rate is expected to decline to an average 6.5% as the economy in North America undertakes the rebuilding of its infrastructure and takes advantage of trade opportunities between new trading blocks. From 2000 to 2010, the demand for air services to/from North American points will reflect a maturing in the demand for tourism attractions in Costa Rica and will grow more slowly

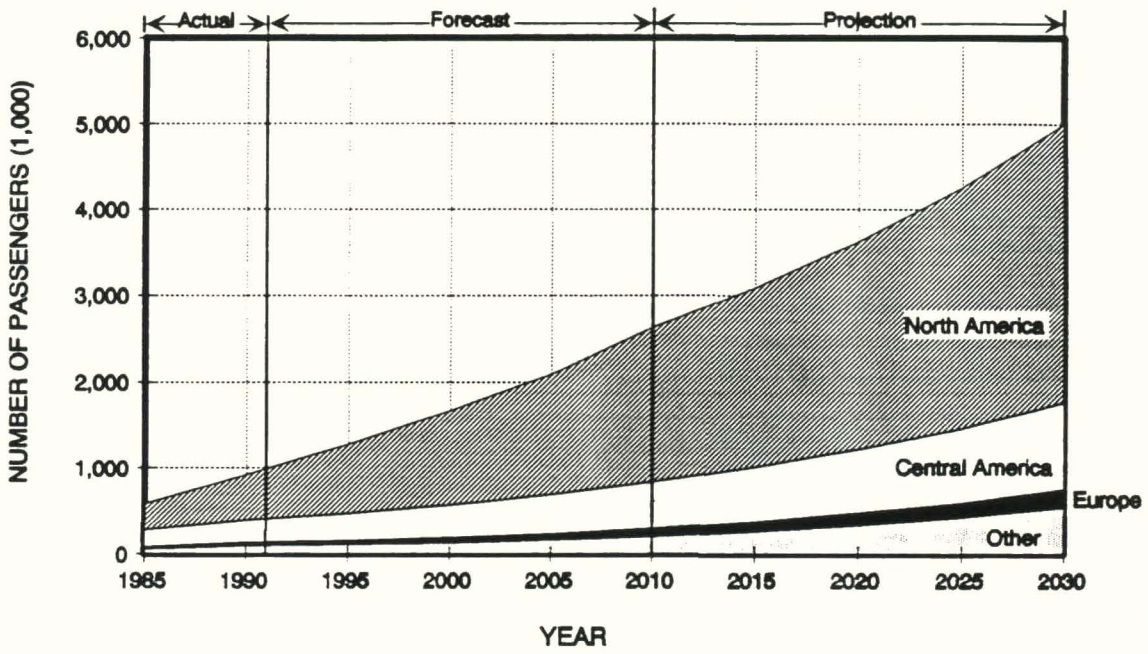
TABLE 6.2

International Air Passenger Forecast By Passenger Origin
(1,000)
1991-2030

Year	North America	Europe	Central America	Other	Total
1991	625	36	287	103	1,051
1995	804	48	316	110	1,278
2000	1,100	62	377	131	1,670
2010	1,792	100	537	204	2,633
2020	2,408	148	736	333	3,625
2030	3,236	220	1,008	542	5,006
Average Annual Growth Rates:					
1991-2000	6.5%	6.2%	3.1%	2.8%	5.3%
2000-2010	5.0%	4.9%	3.6%	4.4%	4.7%
2010-2030	3.0%	4.0%	3.2%	5.0%	3.3%

Source: APS Analysis

FIGURE 6.1
Breakdown of Annual International Passenger Forecast
1991 - 2030



APS Passenger Demand Forecast & Projections (1,000)

Year	International Passengers
1991 (Actual)	1,051
1995	1,278
2000	1,670
2010	2,633
2020	3,625
2030	5,006

Average Annual Growth Rates

Period	International Passengers
1981-1991	8.5%
1991-2000	5.3%
2000-2010	4.7%
2010-2030	3.3%

Source: APS Analysis

than in the past, with the Mexican tourists being substituted for levelling off demand in the Canadian and U.S markets.

After 2010, overall demand from North America is expected to grow at an annual rate very similar to that of the region's collective GDP rate of 3%.

ii) Although the total number of air passengers from **Europe** has been relatively small, recent growth rates have been substantial and are likely to remain so to the end of the century. After the year 2000, the rate is likely to decline as demand for Costa Rica's ecology-type vacations reaches maturity. Again, after 2010, growth rates are likely to match GDP growth rates.

iii) Generally, the demand for air services from points in **Central America** will be dependent on the conditions of competing modes of transport in the region (mostly road conditions). However, preference for road transport is expected to keep this traffic growing at only modest rates. Substantial growth rates were recorded only in the past three years, after a period of very modest growth. The consensus seems to indicate that over the longer-term, low growth is more likely to resume.

iv) Finally, demand for air services from **Other** regions has been growing fairly steadily, despite the erratic number of O/D Caribbean passengers. Demand from South America has largely compensated for this irregular pattern. For 1992, the rate employed is 1%, the same as for 1991. As the economies of countries where this traffic originates improve, demand will also rise so that, after the year 2000, it is forecast to increase at a 4.5% annual rate. Here too, the growth rates for the second

and third decades are likely to be about the average GDP growth rate for the regions.

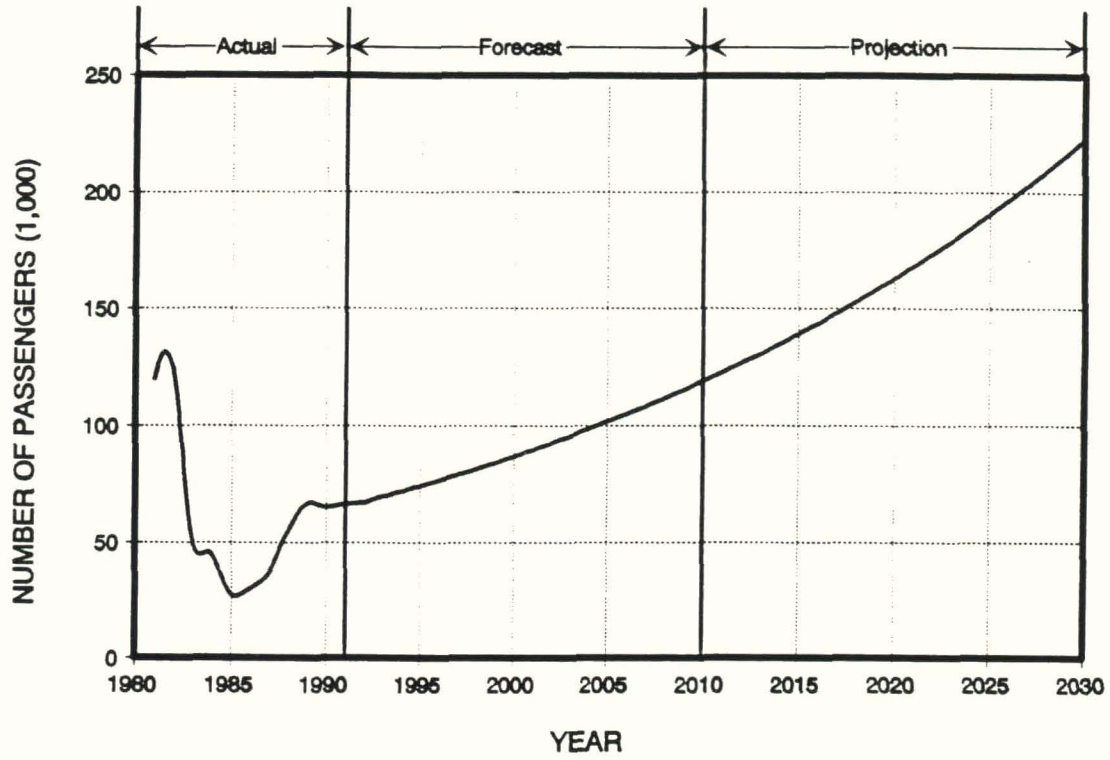
6.4 Domestic Passenger Demand Forecast

With regard to the domestic demand for air transport, past estimates match current economic forecast rates. However, as mentioned in subsection c) above, Costa Rica's GDP is likely to record healthier rates than anticipated in the JICA study in the coming decades as the economies of the region rebuild. Growth rates are expected to be in the 4% range over the next two decades. The only factor able to affect substantially the projected rates of growth in domestic air passenger demand is unanticipated plans to improve the road system within the country in the next 20 years. Past road improvement programs halved the demand for domestic air transport; the potential for a similar situation remains for the future.

However, the discontinuity in the trend line for domestic growth in the past 10 years makes any econometric forecasting equations unreliable. The propensity to travel ratio, developed in the JICA study, is therefore retained for this analysis, although it is applied to updated GDP forecast growth rates.

Figure 6.2 graphs the forecast for annual domestic passengers at SJO, resulting from the Delphi method, which are the JICA figures less the induced traffic from Liberia operations. The domestic passenger demand for the years 2010 to 2030 is a straight line projection based on updated anticipated long-term growth rates.

FIGURE 6.2
Domestic Passenger Demand Forecast
1991 - 2030



APS Passenger Demand Forecast
(1,000)

Year	Domestic Passengers
1991 (Actual)	66.3
1995	74.0
2000	86.6
2010	118.7
2020	162.6
2030	222.8

Average Annual Growth Rates

Period	Domestic Passengers
1981-1991	-5.7%
1991-2000	2.9%
2000-2010	3.2%
2010-2030	3.2%

REP_MPGRAPHPF06_2

Source: DGAC, APS Analysis

6.5 Charter Passenger Demand Forecast

Charter traffic may increase from origins such as Duesseldorf once the foreign demand warrants such a move. This demand, however has been included in the international passenger demand forecast and, therefore, does not represent a net increase in the demand forecast for total international passengers. Should additional charters frequent Costa Rica, the aircraft size would likely increase over the scheduled aircraft size while the frequency of scheduled flights, and perhaps the aircraft size, to the same destination would decrease.

6.6 Transit Passenger Demand Forecast

Transit passengers are expected to continue to account for 30% of total passengers on multi-stop international arrivals at SJO, where SJO is not the final stop on the route, at least until the end of the century. This assumption is taken from the JICA study. Should the demand for any one of the destinations on an international route rise significantly, that destination will likely receive a direct flight, thereby reducing the proportion of transit passengers at SJO.

7 AIR CARGO FORECAST

The following sections describe the methodology employed for forecasting air cargo and the forecast for air cargo exports and imports.

7.1 Forecast Assumptions

Two principal factors have influenced the modification of cargo forecasts from the JICA study:

i) The conceptual problem associated with the use of Costa Rica GDP to forecast exports. Exports in fact reflect the demand generated in the principal country of destination, the U.S. If U.S. GDP alone is used as independent variable in a multiple regression equation, more than 70% change in the demand for Costa Rica exports is explained.

The forecasts of imports is more difficult because part of those imports are re-exported after a certain value has been added to the products in question. Imports are also subject to foreign currency availability and other conditions of the local economy. Given the limited time available to the Consultants for this study, not all of these factors could readily be identified and quantified.

ii) Although the JICA study (Draft Final Report) was published in August, 1992, at the time the analysis took place ,the authors had no indication that both LACSA and TACA intended to operate jumbo jets in the current winter season. In fact, the JICA study predicts the use of jumbos only in 2005. The result is a serious underestimation of available cargo capacity during normal operation hours.

Moreover, according to an investment advisory firm, there are indications that the World Bank will shortly allocate a large loan to

]Costa Rica to enable the country to improve its transportation infrastructure, including roads and ports, both of which could syphon off some of the demand for air cargo.

The review of these two factors regarding the JICA forecast has required a completely new estimation of the potential growth of exports and imports, and the resulting forecasts of demand for air cargo.

7.2 Forecast of Air Cargo Exports and Imports

Using the U.S. GDP growth rates described in Section 6.2 as a basis to forecast exports and imports from Costa Rica, the following tonnage, in Table 7.1, is calculated for selected years:

TABLE 7.1
International Air Cargo Operations Forecast (Tons)
1991-2030

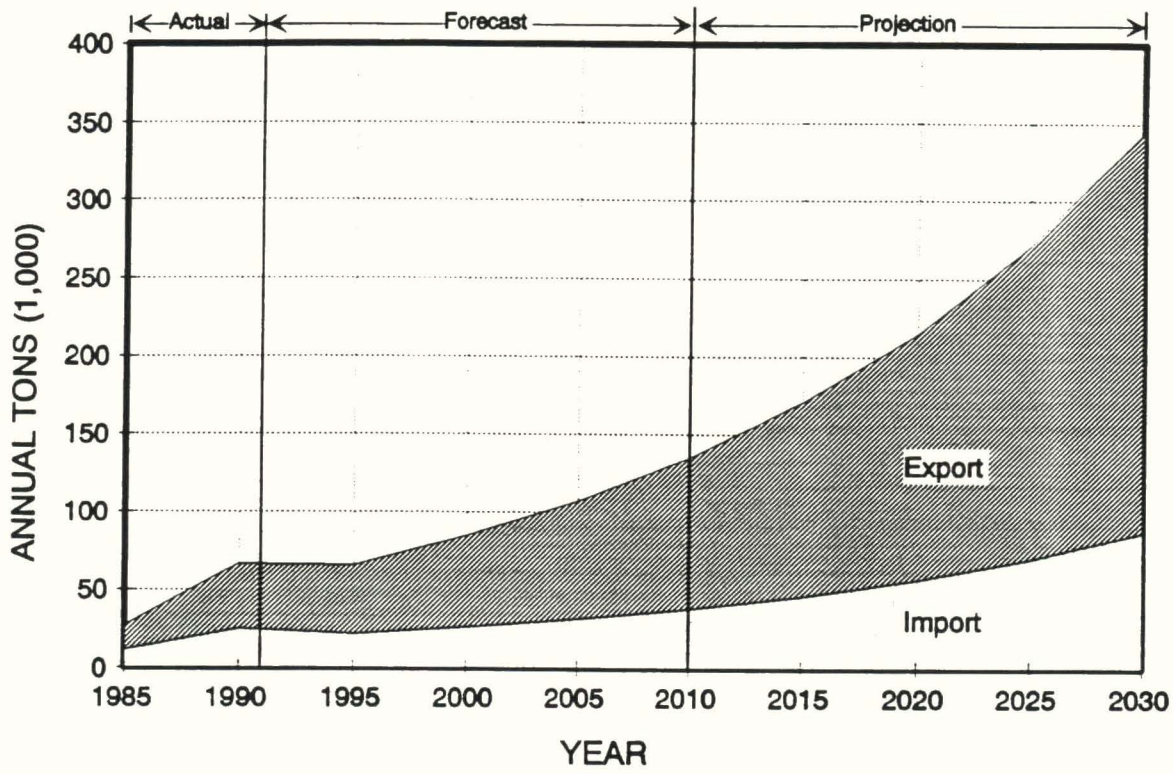
Year	Exports	Imports
1991pr.	38,733	23,943
1992	38,000	19,750
1995	44,070	21,820
2000	58,970	26,410
2005	75,980	31,650
2010	96,970	38,114
2020	157,960	56,900
2030	257,300	87,500

pr. - Preliminary figures

Average Annual Growth Rates:	
1991-2000:	3.6%
2000-2010:	4.7%
2010-2030:	4.8%

Source: APS Analysis

FIGURE 7.1
Air Cargo Forecast
1991 - 2030



APS Cargo Forecast

Year	Exports	Imports	Total
1991	38,733	23,943	62,676
2000	58,970	26,410	85,380
2010	96,970	38,114	135,084
2020	157,960	56,900	214,860
2030	257,300	87,500	344,800

Average Annual Growth Rates

1991-2000	3.6%
2000-2010	4.7%
2010-2030	4.8%

REP_NPGRAPHFIG8_7

Source: DGAC, APS Analysis

Figure 7.1 graphs the historical and forecasted export and import growth for air cargo operations. It is worth noting that, from 1985 to 1990, the average annual growth rate of air cargo exports was almost 26%, at a time when the U.S. and Canadian economies were booming. However, preliminary figures for 1991 show a marked decline in exports to the North American markets, reflecting the general economic downturn. The current year (1992) is expected to produce a further marginal decline over 1991, in view of the weak economic recovery in North America, stagnant growth in its other markets and the effects of specific trade disputes with some countries in Europe.

Forecasts of air cargo exports were arrived at by assuming that, over the long-term, growth would average twice the rate of U.S. GDP during the same period, since the proportion of total exports destined for the North American countries has been gradually increasing from 74% in 1985 to 88% in 1991. Given the current establishment of large trading blocks and the trend in economic progress in the regions identified in this study, substantial changes in these proportions before 2010 are not anticipated.

A combination of the U.S. GDP and the exchange rate of the Costa Rican colone show strong correlation with the annual changes in exports passing through Juan Santamariá airport. However, the small number of historic years available to the Consultants do not provide sufficient data on which to develop a meaningful regression equation. Judgement, based both on historic patterns and on trends in total export values, was used to establish the growth rate.

To develop an air cargo import forecast, the fact that a significant proportion of high value imports are shipped by air to Costa Rica for processing before being re-exported presented an assumed testable correlation between air cargo exports and air cargo imports. Regression analysis does indicate a fairly close relationship (r^2 of 76.3, with other test statistics in the significant range),

so that the resulting equation, using air cargo exports only as the independent variable, was employed to forecast the volume of air cargo imports. The equation is as follows (units = tons):

Air Cargo Import Volume = 8248 + (0.308)(*Air Cargo Export Volume*)

How these forecasts translate into aircraft movements is discussed in the following section.

8 AIRCRAFT MOVEMENTS FORECAST

The following sections present the movement forecasts for international and domestic aircraft, General Aviation and international cargo aircraft.

8.1 Methodology

In order to determine the breakdown of international and domestic, scheduled and non-scheduled movements, a number of sources were evaluated. The primary resources utilized for determining the current numbers of movements were: Juan Santamariá tower records for the month of January 1992; air traffic data for 1991, which was not available when the JICA study was completed; the results of the JICA study; and schedules published in various issues of the Official Airlines Guide. Schedules published by various carriers and regional travel authorities were also consulted. Forecast methodology for movements was largely based on passenger forecast results, assumptions about aircraft in use and assumed average load and seat factors.

A summary of the total movement forecasts is outlined in Table 8.1 and depicted graphically in Figures 8.1 and 8.2.

8.2 International Aircraft Movements

An examination of the OAG for January 1985 found that, the average number of seats per aircraft on international flights serving Costa Rica was estimated at 137 for 1985. An analysis of 1991 flights, published in the OAG, by aircraft type indicated that average seating per aircraft had increased to 144. This trend towards larger aircraft is also anticipated to continue in the coming years. Contrary to assumptions developed in the JICA study of Costa Rican airports in which long-range, widebody jets would enter service only in the year 2005, two carriers, LACSA and TACA, began operating four such weekly

TABLE 8.1

Annual Movement Forecast
1991-2030

Year	Passenger Aircraft Movements		General Aviation Movements	Cargo Aircraft Movements	Total Aircraft Movements
	International	Domestic			
1991a	15,180	2,931	16,929	2,130	37,170
1995	18,007	3,700	17,900	2,190	41,797
2000	21,976	4,331	20,400	1,745	48,452
2005	25,882	4,056	23,300	2,172	55,410
2010	30,622	4,565	26,700	2,826	64,713
2020	40,280	5,421	34,200	4,216	84,117
2030	53,833	6,367	41,700	7,385	109,285

a: actual data
Source: DGAC (1991 data), APS Analysis, JICA Study

FIGURE 8.1

Annual Movements Forecast

Passenger Aircraft Movements

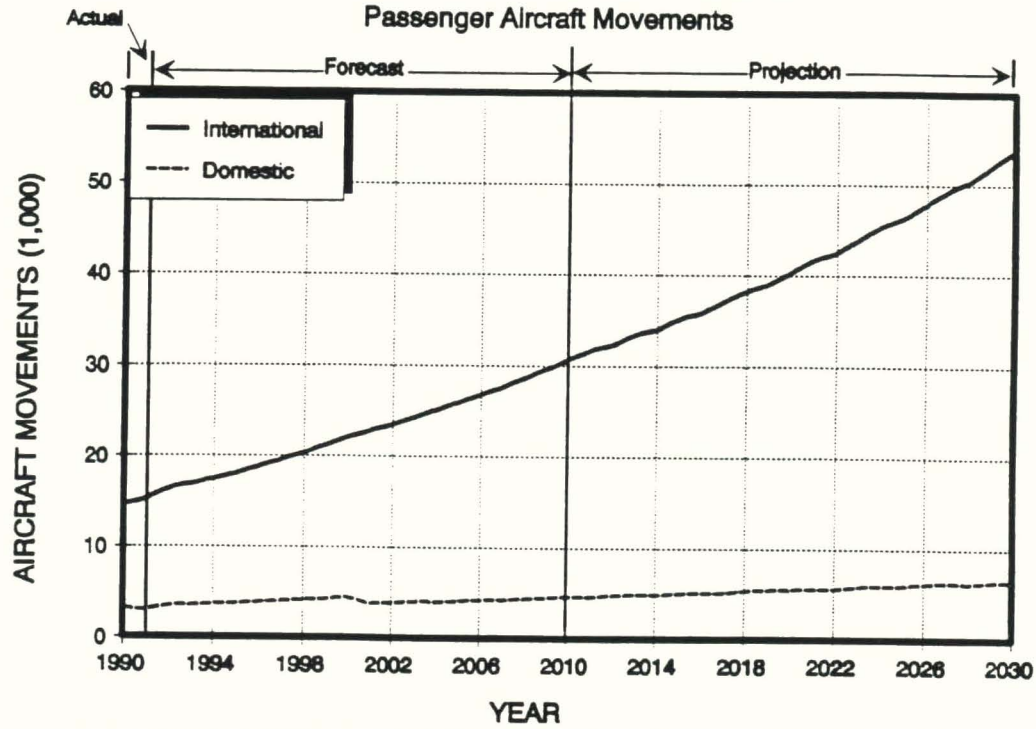
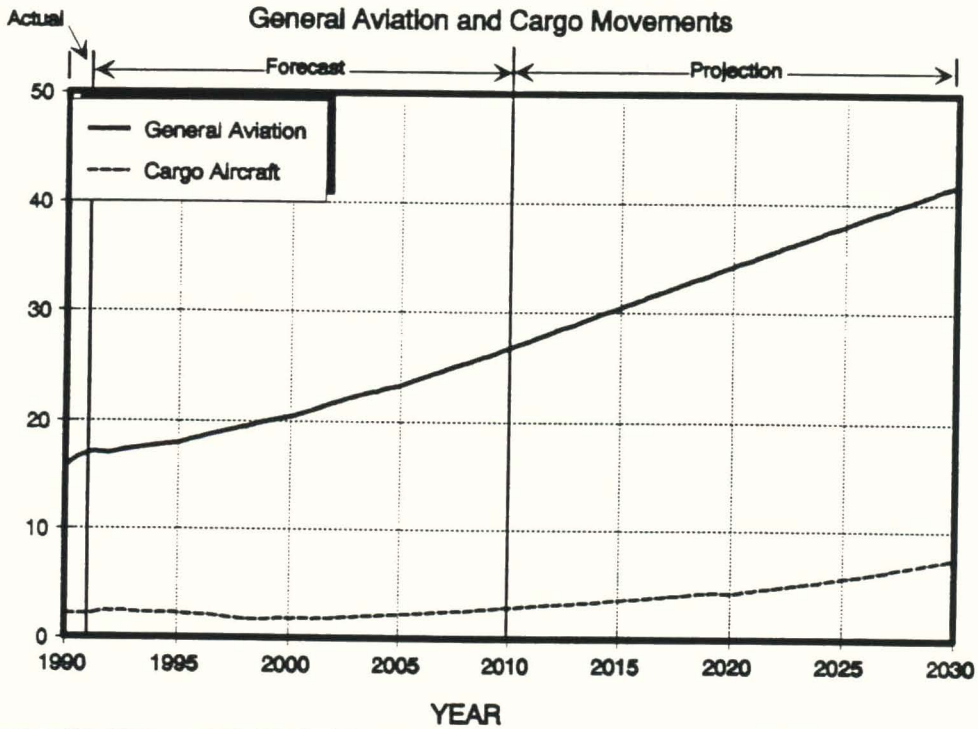


FIGURE 8.2

Annual Movements Forecast

General Aviation and Cargo Movements



flights through Juan Santamariá in January 1992. This has necessitated a substantial re-evaluation of the JICA international aircraft movement forecasts. The ratios used to develop seating capacity and numbers of movements are, respectively, average seats of commercial flights through Juan Santamariá for January 1992, as indicated in tower records and various issues of the Official Airline Guide and, secondly, the load factor developed in the JICA study. The use of long-range widebody aircraft is anticipated especially on the charter and heavy scheduled routes during high season.

Since little current interest in operating between Liberia and foreign points is evident from carriers presently serving Costa Rica, the effects of traffic through Liberia on Juan Santamariá have been disregarded in the forecasts which follow.

Seat factors currently average around 45%. Other than direct flights to Miami and charter flights to Canada and Europe, international flights make several stops before reaching their final destinations. Also, approximately forty percent of the international flights at SJO have final destinations which are other than SJO. The rather low seat factor is partly due to passengers having disembarked at earlier stops in the flight, and to the additional transit passengers at SJO, which account for approximately 30% of capacity, as discussed in an earlier section. It is expected that average seat factors will rise to around 52% by the end of the forecast period, as heavier traffic demand encourages the carriers to eliminate intermediate stops between points of origin and destination and Costa Rica.

Table 8.2 provides the assumptions discussed in this section, regarding capacity available, aircraft size and seat factors for various years of the forecast period. Once the relevant assumptions were determined, the forecasted number of international passengers was divided by the product of average seats per aircraft and average annual seat factors to arrive at the

TABLE 8.2

Forecast of International Passenger Aircraft Movements
1991-2030

Year	International Passengers (1,000)	Average Seats Per Aircraft	Average Annual Seat Factor	International Aircraft Movements
1991a	1,051	144	45%	15,180
1995	1,278	153	46%	18,007
2000	1,670	157	48%	21,976
2010	2,633	167	51%	30,622
2020	3,625	176	51%	40,280
2030	5,006	180	52%	53,833
Average Annual Change:				
1991-1995	5.0%	1.5%	0.5%	4.4%
1995-2000	5.5%	0.5%	0.9%	4.1%
2000-2010	4.7%	0.6%	0.6%	3.4%
2010-2030	3.3%	0.4%	0.1%	2.9%

a: actual data
Source: APS Analysis

TABLE 8.3

Breakdown of International Passenger Aircraft Movements
by Aircraft Type
SJO, 1990-2030

Year	Aircraft Type			Total Movements
	L-WB	WB	NB	
1990	0	582	13,950	14,532
1991	0	1,017	14,163	15,180
1992*	228	1,139	14,836	16,203
1995	427	1,217	16,363	18,007
2000	526	1,560	19,890	21,976
2010	729	2,101	27,792	30,622
2020	1,458	3,649	35,173	40,280
2030	2,191	4,377	47,265	53,833

L-WB: Long range-Wide body
Typical aircraft include:
Boeing 747 (288-624 pax)
Boeing 777 (305-440 pax)

WB: Widebody
Typical aircraft include:
Airbus 300 (267-375 pax)
Airbus 310 (210-280 pax)
Boeing 767 (216-312 pax)
McDonnell Douglas DC 10 (270-345 pax)
Lockheed L1011 (256-330 pax)

NB: Narrow body
Typical aircraft include:
Airbus 320 (164-179 pax)
Boeing 727 (134-163 pax)
Boeing 737 (86-149 pax)
Boeing 757 (178-217 pax)
McDonnell Douglas DC 8 (189-259 pax)
McDonnell Douglas DC 9 (115-130 pax)
Tupolev 154 (128-158 pax)

Note*: Estimated

Source: APS Analysis, Jane's "All The World's Aircraft" (seat ranges).

forecasted number of movements. Table 8.3 lists a breakdown of international passenger aircraft movements by general aircraft type. This breakdown was made on the basis of current aircraft fleets, new aircraft types anticipated, traffic volumes on the individual routes and the demand anticipated on these routes from the passenger forecast developed earlier. Table 8.1 and Figure 8.1 provide the actual numbers and a graph of this international passenger aircraft movement forecast.

8.3 Domestic Aircraft Movements

The elimination of Liberia Airport traffic effects has also required major changes to the estimation of domestic movements for the forecast period. The ratios for average aircraft size (25 seats) and average annual load factor (80%), both from the JICA study were retained in the forecast calculations to the year 2000 (forecasted passengers divided by the product of average number of seats and the average load factor equal total forecasted movements). SANSA operates out of SJO while Travelair operates from Tobias Bolaños.

Following the construction of the new airport, estimated for the year 2000, the average size of the aircraft is expected to increase. It is uncertain at this point in time whether or not the current airport will remain open; however, assuming it is still in operation, there will most likely be an induced growth of traffic beyond that which is forecast, making the need for larger aircraft even greater. Additionally, new, modern aircraft would be required to offer the traveller a comparable level of service to that experienced on the international flight.

Table 8.1 and Figure 8.1 provide the actual numbers and a graph of this domestic passenger aircraft movement forecast.

8.4 General Aviation Movements

Numbers and ratios were retained unchanged from the JICA study, aside from updating for 1991 and 1992. The GA movements for flying schools, agricultural spraying, government and private use, are expected to grow at 2.7%, close to the forecasted GDP for Costa Rica. It would seem reasonable to assume that a large portion of these movements will continue to operate from the San José area, the centre of Costa Rican business and population.

8.5 Cargo Aircraft Movements

The issue of cargo flights present some difficulties when setting assumptions on which forecasts are developed, as discussed in Section 7. Currently, the cargo operators are using Boeing 707s, Boeing 757s and DC8s in full freighter service. Table 8.4 lists the freighter fleets serving SJO as at March 1992. As the Boeing 707s and DC8s age, they are likely to be replaced by the Boeing 757F since it has comparative capacity and range capability. The greatest drawback to the Boeing 757 is its acquisition cost, despite a significant improvement in fuel efficiency, two-person crew and lower maintenance costs. When contacted (October 1992), Challenge Air Cargo, Arrow Air Inc. and Florida West Airlines did not have any near term plans for changes in their fleets.

Belly (underfloor) capacity is already being offered in widebody aircraft at heavily discounted rates as airlines seek to attract additional revenues and this capacity is expected to be increasingly used in the future. The average cargo capacities for narrowbody, widebody and long range-widebody aircraft are 3, 15 and 20 tons respectively. Assuming an 80% load factor, the cargo volumes may be allocated to the forecasted passenger aircraft movements, while at the same time ensuring that the desired destination is considered.

TABLE 8.4

Cargo Airline Fleets Serving SJO
March 1992

Cargo Airline	Aircraft Type	Number of Fleet
Arrow Air Inc.	DC-8-63F	4
	DC-8-62F	6
Challenge Air Cargo	B707-330C	1
	B757-23AF	2
Florida West Airlines	B707-320C	8

Source: "Fleet International", March 1992.

Over 86% of cargo is flown to North America, over 80% of which moves on all cargo services. Ninety percent of all North American cargo traffic is flown to Miami on three daily cargo services and on additional cargo flights that are operated from time to time by other cargo airlines. Narrowbody passenger service, which is the most prevalent on the MIA-SJO routes, does not offer a significant amount of cargo capacity hence, these aircraft are assumed to have a cargo load factor of 30%. Widebody aircraft have already been introduced on the MIA-SJO-MIA route, and the use of these aircraft is expected to increase, thereby reducing the need for dedicated freighter service. The cargo aircraft are assumed to have a 50 ton capacity with a 60% load factor. This load factor is low due to the light weight nature of the air cargo, largely flowers, fruits and vegetables.

By the end of the 1990s, however, the need for freighters is expected to increase again because the cargo capacity on passenger aircraft destined for Miami will not keep pace with the growing cargo volume. The cargo is expected to continue to be destined for Miami as opposed to other destinations such as Mexico, Los Angeles or Dallas, for example, due to the fact that the final destination of a significant volume of this cargo is actually Europe.

9. PLANNING PEAK HOUR PASSENGER FORECAST

The following sections provide the peak hour passenger forecast for terminal planning purposes.

9.1 Methodology

The planning peak hour passenger forecast for international traffic was calculated using the following formula:

$$International\ PPHP = (PPHP\ Ratio)(Annual\ Number\ of\ Seats)$$

where:

PPHP represents Planning Peak Hour Passengers.

This equation can be broken down further as:

$$PPHP = (Planning\ Peak\ Seat\ Ratio)(80\%)(Average\ Aircraft\ Size)(Annual\ Movements)$$

$$PPHP = \frac{Planning\ Peak\ Hour\ Seats}{(Average\ Aircraft\ Size)(Annual\ Movements)}(80\%)$$
$$(Average\ Aircraft\ Size)(Annual\ Movements)$$

Peak hour seats were examined for 1991, enabling the calculation of the planning ratios, which were then used for estimating future ratios and planning peak passengers.

The domestic planning peak hour passengers were calculated by the same method. Table 9.1 shows the relevant variables for the international

passenger calculation and summary variables for the domestic peak hour passenger forecast.

9.2 Planning Peak Hour Passenger Forecast

9.2.1 International

The forecast and projections for planning peak hour international and domestic passengers appear in Table 9.1. Despite the spreading of the peak over the years, the anticipated move to larger aircraft on the heaviest international routes will likely continue to push the number of passengers up during the planning peak from 683 international in 1991 to over 1,700 international passengers by the year 2010 and over 3,100 by the year 2030.

The APS forecast, in terms of the forecasted number of planning peak hour international passengers, is 27% higher than the JICA estimates for 1995, 42% higher for the year 2000 and 14% higher for the year 2010. The difference in forecasts results from a number of different assumptions regarding aircraft mix, average aircraft size, seat and load factor and the number of aircraft movements, as discussed in previous sections.

9.2.2 Domestic

The number of domestic planning peak hour passengers is not very significant in either 1991 or 2030, at 62 and 134 respectively. Once again, the APS forecast differs from the JICA estimates due to differing assumptions regarding average aircraft size and the number of annual movements. These assumptions have been discussed in previous sections.

TABLE 9.1

Planning Peak Hour Passenger Forecast and Projections

(a) International

Year	APS					JICA
	International Planning Peak Hour Pax Ratio	Peak Hour Seats	Aircraft Size	Annual Movements	International Planning Peak Passengers	International Planning Peak Passengers
1991	0.000313	854	144	15,180	683	-
1995	0.000350	1,207	153	18,007	965	760
2000	0.000346	1,494	157	21,976	1,195	840
2010	0.000338	2,163	167	30,622	1,731	1,520
2020	0.000330	2,928	176	40,280	2,342	-
2030	0.000322	3,905	180	53,833	3,124	-

(b) Domestic

Year	APS			JICA
	Domestic Planning Peak Hour Pax Ratio	Number of Annual Passengers	Domestic Planning Peak Passengers	Domestic Planning Peak Passengers
1991	0.000940	66,263	62	-
1995	0.000900	73,995	67	80
2000	0.000800	86,617	69	80
2010	0.000650	118,686	77	100
2020	0.000600	162,628	98	-
2030	0.000600	222,840	134	-

Source: APS Analysis

10. PLANNING PEAK HOUR MOVEMENT FORECAST

The following sections provide the peak movement forecast for the various types of services for airport planning purposes.

10.1 Methodology

Two methods of peak calculations were employed: planning peak factors to develop total peak movements and passengers; and, a set of standard formulae to determine the range of high and low peak arrivals, as a check on the former method. The methodology was formulated on the assumptions or observations that:

i) Present peak patterns in the domestic market are more amenable to control by relevant airport and airline authorities, whereas international peaks depend to a considerable extent on network schedules of all airlines serving SJO, local capacity of infrastructure and passenger demand.

ii) Historic peak hour traffic levels, as a percent of total annual movements have a general tendency to decline over time, as airlines and airports seek to spread peak hour demand.

10.2 Peak Hour Movement Trends

Establishing the operational peak for any airport depends on the specific traffic patterns at the airport under study. For Juan Santamariá, it is international movements which tax airport facilities to their greatest use. A review of tower records reveals that, despite schedules indicating as many as ten international movements an hour, operational conditions are such that only six movements are handled within a sixty-minute time span on a regular basis.

With regard to domestic traffic, the heaviest airport use occurs at a time period somewhat earlier than those for international traffic. Also the ground facilities used by domestic aircraft are different than those for international traffic, raising the possibility that these movement patterns could coincide in future, as domestic services try to feed international flights. Domestic traffic does not currently use gates and, therefore, could come in during peaks without causing operational area bottlenecks. Terminal facilities would then have to cope with both domestic and international passenger flows at the same time. At present, no more than three domestic movements operate within any sixty-minute period, according to tower record data, and this period precedes that for international traffic, as might be expected.

The heaviest use of airport facilities by general aviation aircraft currently occurs in early morning, at a time when there are few international or domestic flights. However, in the event some of these flights are timed to connect with international scheduled traffic, nominally they could be moved into a period where other services are already taxing airport facilities. These flights must also be taken into account when establishing the overall peak operating ratios at an airport.

Cargo flights tend to operate late at night or in the very early hours of the morning when few other aircraft movements occur. At most, three movements per hour would likely occur to the year 2010. After the year 2010, four or five movements in the peak hour could occur.

Therefore, as in the JICA study, peak ratios indicate traffic concentration on an average day of the peak month against the annual traffic. Calculations are also made to determine the breakdown between arrivals and departures, each of which makes similar demands on some airport facilities and different demands on others.

10.3 Planning Peak Hour Aircraft Movements

The formula used for estimating peak arrivals is as follows:

For high peak hour arrivals: .000282D + 1.04

For low peak hour arrivals: .000240D + 0.73

where D is the total number of annual aircraft movements. This formula is used by Transport Canada for estimating peak arrivals.

Peak hour ratios are listed in Table 10.1 for international, domestic and general aviation activities, which are applied to the movement forecast to forecast the peak movements. These ratios were developed based on the trends discussed above. A summary table of planning peak hour values follows in Table 10.2

Peak hour international arrival traffic generally occurs between 1845 hours and 1945 hours, whereas, peak hour departure traffic occurs between 0745 and 0845 hours.

Thursday is the peak international arrival day, while Wednesday has peak departures. In terms of total international passenger aircraft movements, Thursday has the busiest hour, which occurs between 0930 and 1030 hours with 2 arrivals and 4 departures (also one arrival at 0925 hours). Figure 5.3 graphed actual movements, which showed 5 departures and 3 arrivals between 1000 and 1100 hours on a Thursday in July - the busiest day of the week, the busiest month of the year, hence, not a planning peak.

As noted earlier in the forecast, the month of July has typically the highest traffic levels with December, January, February and March also experiencing higher traffic than the remaining months of the year.

TABLE 10.1

(a) International Planning Peak Hour Ratios*
(Number of movements as a percent of total annual international movements)
SJO, 1991-2030

Year	Movements	Seats	Passengers
1991a	0.003750	0.000441	0.000313
1995	0.003750	0.000438	0.000350
2000	0.003750	0.000433	0.000346
2010	0.003750	0.000423	0.000338
2020	0.003750	0.000413	0.000330
2030	0.003750	0.000403	0.000322

(b) Domestic Planning Peak Hour Ratios

Year	Movements	Passengers
1995	0.000800	0.000900
2000	0.000750	0.000800
2010	0.000675	0.000650
2020	0.000650	0.000600
2030	0.000625	0.000600

(c) General Aviation Planning Peak Hour Ratios

Year	Movements
1995	0.000447
2000	0.000439
2010	0.000416
2020	0.000406
2030	0.000400

* Formulas used to calculate these ratios are outlined in Section 10.3.
Source: APS Analysis

TABLE 10.2

Planning Peak Hour Movement Forecast
1991-2030

PLANNING PEAK HOUR AIRCRAFT MOVEMENTS

	International			Domestic			General Aviation			Cargo	Total Movements			
Year	Total Peak	High Arr	Low Arr	Total Peak	High Arr	Low Arr	Total Peak	High Arr	Low Arr	Total Peak	Total Peak	High Arr	Low Arr	Peak Dep
1991	6	5	4	3	2	1	7	5	4	3	16	11	9	5
1995	7	6	5	3	2	2	8	6	5	3	18	13	11	6
2000	8	7	6	3	2	2	9	7	6	3	20	15	12	6
2005	10	8	7	3	2	2	10	8	6	3	23	17	14	7
2010	11	10	8	3	2	2	11	9	7	3	25	19	16	8
2020	15	12	10	4	3	2	14	11	9	4	33	25	21	13
2030	20	16	14	4	3	2	17	13	11	5	41	32	27	19

Note: Numbers rounded to next highest integer.
Source: APS Analysis

11. SUMMARY

Table 11.1, also appearing in the Executive Summary, provides a summary of the forecast results to the year 2010 with projections to the year 2030.