491-1023

VOLUME IV OF IV

ECONOMIC FEASIBILITY FOR THE RELOCATION OF JUAN SANTAMARIA INTERNATIONAL AIRPORT, SAN JOSE, COSTA RICA

FOR

THE MINISTRY OF PUBLIC WORKS AND TRANSPORTATION

REPUBLIC OF COSTA RICA

BY

AVIATION PLANNING SERVICES LTD.

MAY 1993

1. INTRODUCTION

This four volume 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.

Volume IV is presented here and is part of the following set:

- 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 study was to develop air traffic demand forecasts, evaluate alternative airport sites, recommend the most suitable, carry out a technical and economic feasibility study, conduct an environmental impact study, and prepare conceptual airport drawings. This study is intended to assist the Government in its evaluations as to the extent of upgrade of the present airport, in the short term, while developing a new unrestricted site, capable of handling future traffic well into the 21st century.

1.1 Objective

The material contained in this volume provides the financial and economic analysis of the airport, an environmental impact study for the chosen site and conceptual drawings for the new airport. The financial analysis includes an estimate of costs (capital costs and annual operating and maintenance costs),

revenue projections, cash flow statements, and calculation of the and net present value (NPV) for the project. The economic analysis also considers the benefits, advantages and disadvantages of the new airport to the Costa Rican economy.

The report is organized in six major sections as shown in the table of contents.

1.2 Terms of Reference

The specific requirements of the financial, economic and environmental impact analyses and conceptual drawings for the new international airport study 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 this part of the study require APS to:

A. Conduct an economic analysis of the selected site, with respect to the development costs and costs of road transportation, which supports the site selected in the technical analysis.

B. Establish level of investment costs, which are to be separated between infrastructure, navigational aids and equipment, and annual operation and maintenance costs.

C. Prepare revenue and profit projections, financial statements, internal rate of return and net present value for the project.

D. Conduct an environmental impact study of the airport on the recommended site.

E. Analyze the effect of the project on the national economy.

F. Prepare conceptual drawings for the selected site.

2. COST ANALYSIS

The objective of this volume is to provide the economic feasibility of the proposed airport project such that discussions with financial institutions and development groups can be commenced. Before developing revenue projections, the capital and operating costs for the new airport project need to be forecasted. This section will provide a broad order-of-magnitude of the capital costs estimated for land acquisition, construction and operating costs at the Tarcoles site.

Since the intent of the MOPT is to have the new airport funded and operated under the public concession law, it is not feasibile, at this time, to develop detailed cost-benefit scenarios, since they are very dependent upon the agreements reached between the government and the developers. However, the projected spread between revenue and cost can be seen and this will provide a useful tool for further detailed discussions.

2.1 Capital Costs

In order to achieve suitable returns from the investment necessary for their construction, airports should be located so as to minimize the cost of development. Therefore, topography, soil conditions, construction material availability, access costs, as well as services and land values, are of particular importance.

Preliminary airport capital costs were computed at each of the three sites identified in Volume III. For the comparative analysis of the sites, only the difference in capital costs were considered significant. This section will focus on the estimated costs of the following elements for the selected airport at Tarcoles:

- Land Acquisition
- Runway, Taxiway and Apron
- Earth Moving
- Car Park
- Access Roads
- Lighting Systems
- Terminal & Cargo Facilities
- Rescue and Fire Fighting
- Air Traffic Control
- Navigational Aids
- Buildings
- Other Airport Facilities

It should be noted that the estimates in this section are order of magnitude costs. The detailed cost estimates will be left for the preliminary design phase when it is decided to proceed with the new airport development.

2.1.1 Land Acquisition

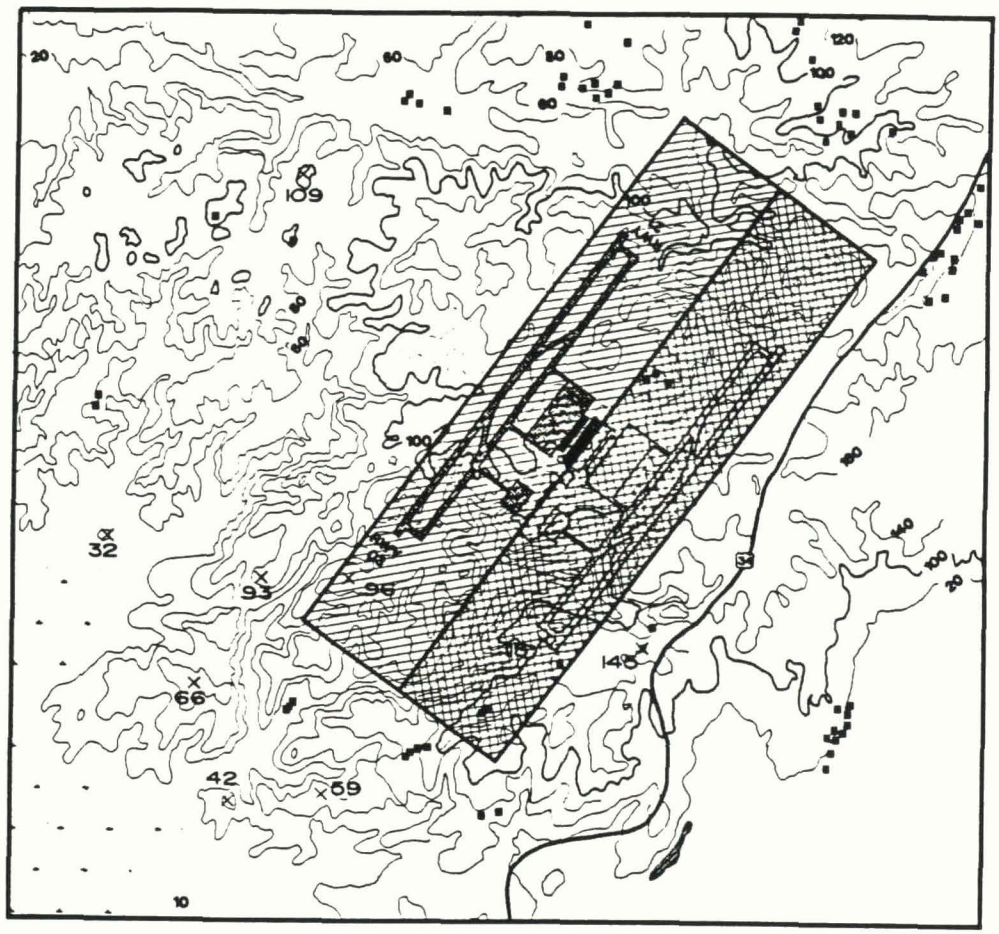
As noted earlier, airports require adequate space for present and future development and the value of land is a factor to be considered. Figure 2.1 shows the proposed airport locations, together with the area of land required, both for the present and future facilities.

Based on the areas in Figure 2.1, and an expropriation cost of 400,000 colones per hectare in the Pitahaya area (provided by the DGAC), land acquisition costs can be estimated. It should be noted that this land value is based on rural lots in the 100 to 200 hectare range, and for land values in the Pitahaya area. It was indicated that the value in the Tarcoles area would be equivalent. Therefore, for this study, the land value at Tarcoles was considered to be 400,000 colones per hectare.

As a result, anticipated expropriation costs (in 1992 colones) are as computed below.

FIGURE 2.1
LAND AREA REQUIRED
ECONOMIC FEASIBILITY STUDY - COSTA RICA

TARCOLES SITE



Initial Land Area Required (ha): 457
Future Land Area Required (ha): 457
Total Land Area Required (ha): 914

LEGEND:
- Village (housing)
- Peak Heights
- Initial Runway
- Future Runway
- Land Area Required

All contours are in metres

SCALE 1 : 60 000

0 2,000 m

VOL_IV\FIG\FIG2-1

	Tarcoles
Initial land area required (ha)	457
Future land area required (ha)[1]	457[2]
Total land area required (ha)	914
Land acquisition cost (M. Col)	366

[1]Additional land reserved for an additional independent parallel runway, if required in the future.
[2]An option or right of first refusal might be used here.

When the suitability of a site is being considered, the land required for future development of the airport site must be controlled. Initial acquisition of this land safeguards the possibility of future expansion and may also prove to be the cheapest course of action. For this study, land for future expansion was considered to be acquired in the initial procurement program, however, it can be leased back to any tenants for continued acceptable uses.

In addition, it is expected that compensation will be required for the homes (See Volume III), where the airport would be located. Based on a visual inspection of the maps and aerial photographs of the area, it is expected that compensation for homes would amount to approximately 35 M. Col at Tarcoles.

Therefore, the anticipated land acquisition cost at Tarcoles would amount to 401 M. Col.

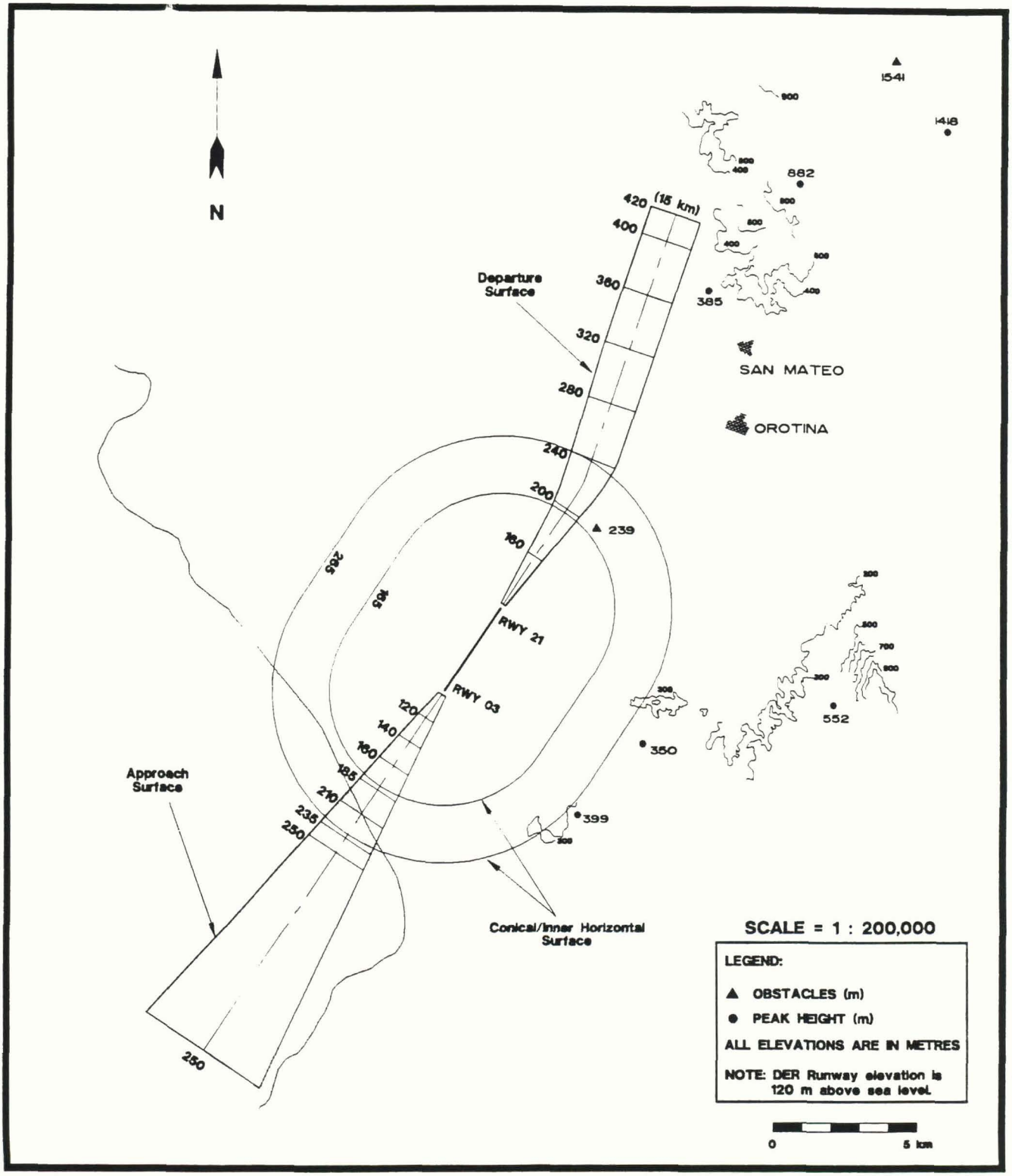
2.1.1.1 Land Use Planning

This section of the report will provide a brief discussion of the obstacle limitation surfaces which can affect land uses outside the airport property boundary.

Obstacle limitation surfaces, required to ensure a satisfactory level of safety, extend beyond the boundary of the airport and therefore require protection by the enactment of zoning regulations, which will prohibit the erection of structures violating any of the defined plane surfaces. These surfaces, for example, include takeoff, approach, transitional, inner horizontal and conical surfaces, and are shown in Figures 2.2 and 2.3 for the airport at Tarcoles. These obstacle limitation surface requirements are based on recommendations set forth in ICAO Annex 14. In addition, any future development of residential or industrial areas around the airport should consider the noise resulting from aircraft operations. Noise exposure is discussed in detail in Section 5.1.

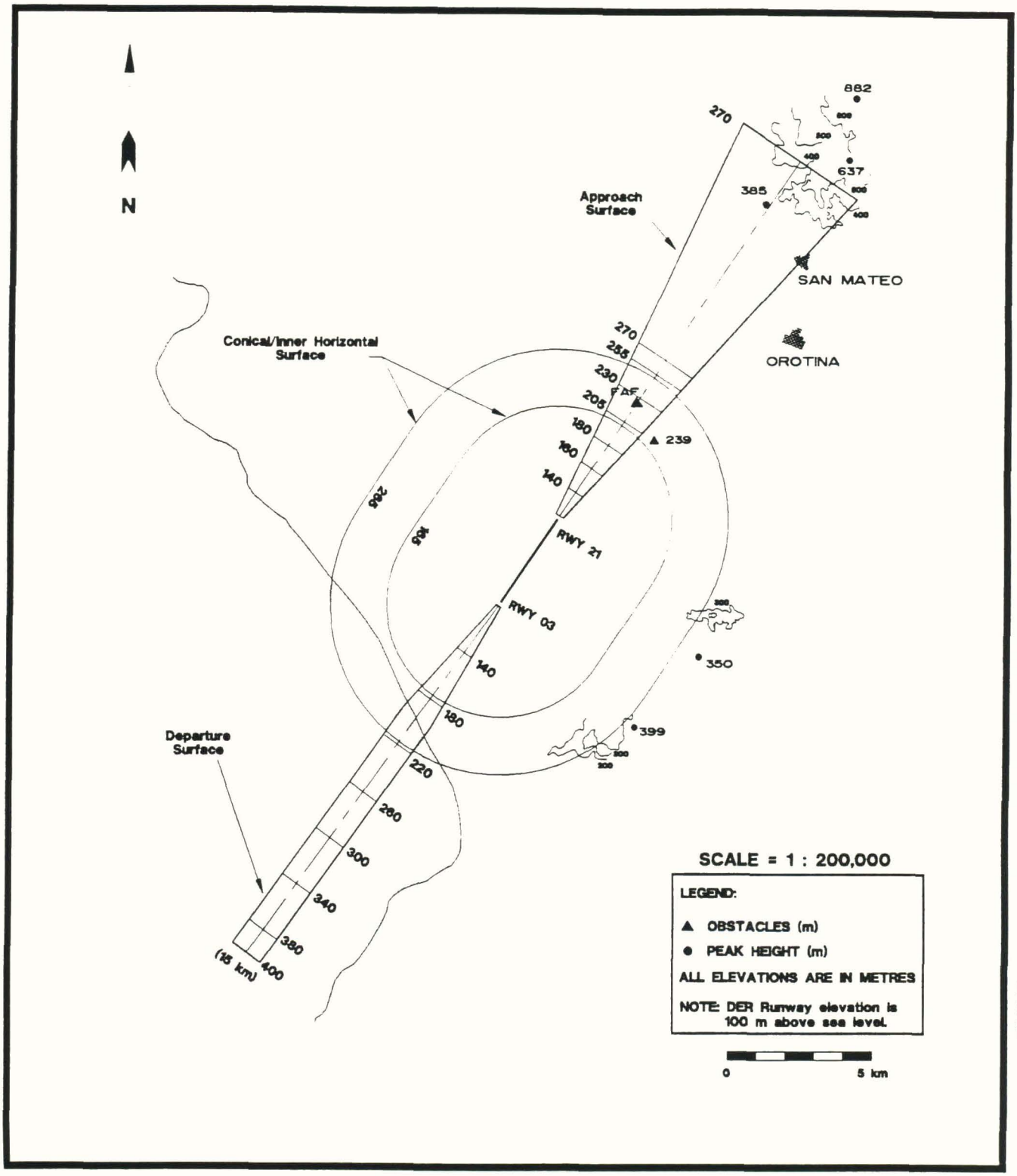
Zoning regulations apply to all the lands, including public road allowances adjacent to or in the vicinity of an airport. Lands within an airport boundary are therefore not included in a zoning regulation: however, all structures within an airport boundary must nevertheless comply with obstacle limitation surface requirements unless such structures (e.g. light masts) are essential for aircraft operations.

FIGURE 2.2
ANNEX 14 OBSTACLE LIMITATION SURFACES - RWY 03
ECONOMIC FEASIBILITY STUDY - COSTA RICA



VOL_IV\FIG\FIG2-2

FIGURE 2.3
ANNEX 14 OBSTACLE LIMITATION SURFACES - RWY 21
ECONOMIC FEASIBILITY STUDY - COSTA RICA



REP\FIG\FIG2-3

2.1.2 Runway, Taxiway and Apron System

Geometric standards for airport runways and taxiways depend upon the characteristics of the aircraft utilizing the facility. The reference code of a runway is identified by the combination of a code number and letter. Based on a Code 4E airport for a precision runway, suitable for heavy, long-range aircraft, costs were provided by Transport Canada as shown below.

Runway - flexible pavement: $3,052 (412,000 Col.) per lineal metre; The runway cost is based on a 45 metre width and 7.5 metre paved shoulders on each side.

Taxiway - flexible pavement: $1,163 (157,000 Col.) per lineal metre; The taxiway cost is based on a 23 metre width and 10.5 metre paved shoulders on each side.

The length of runway and taxiway systems are shown below, and are based on the layout from Volume III.

	Tarcoles
Runway (lineal m)	3,000
Taxiways (lineal m)	4,150

The cost estimate for the runway and taxiway pavement system at Tarcoles is as follows:

	Tarcoles
Runways (M. Col.)	1,236
Taxiways (M. Col.)	649
TOTAL (M. Col)	1,885

For the year 2010, the apron area required would amount to approximately 170,000 m^2. Based on an apron unit cost of \$82.76/m^2 (in concrete) the cost of the apron would amount to \$14.1 M US or 1829 M.Col.

2.1.3 Earth Moving and Drainage

An estimate of the earth moving requirements was made using maps with a scale of 1:50,000 and contour intervals of 20 metres, in the absence of more accurate and detailed topographic data. In view of the level of accuracy of this map, the simplifying assumption was made that runway and taxiway (and strips) would not have significant transverse slopes. The runway and taxiway longitudinal profile is based on maximum slopes according to ICAO Annex 14.

Although aerial photographs are available for this area, which can provide more detailed contour intervals, the cost for this more detailed analysis was prohibitive at this stage of the analysis.

Requirements for cut in the terrain adjacent to the runway strip (ie. 14.3% transitional surface slope and inner horizontal surface) were considered in this analysis. Similarly, requirements for fill on the terrain adjacent to the airside surfaces were also considered. This requirement

is to have a maximum downward slope of approximately 1:1.5 in order to provide for adequate soil stability.

It should be noted that the level of the taxiway and runway (at a typical cross-section) is not necessarily the same, but a function of the slope of crossing taxiways. Furthermore, the lateral position of the apron was such that earthwork was minimized. On an aircraft stand, the maximum slope should not exceed 1%.

A cost of 280 colones/cubic metre was provided by the DGAC for earth moving. Visual inspection of the sites has indicated that blasting, which would cost approximately 20 times the cost of earth moving, would not likely be required.

Orientation, slope, elevation and position of the surfaces have been taken so as to yield a 10 per cent greater cut than fill. More precise positioning would be possible with more detailed topographic data.

Drainage cost for the site was estimated using a cost of 6000 colones/lineal metre, provided by DGAC. With a lineal requirement of 13,000 meters, the estimated cost is 78 million Colones for Tarcoles.

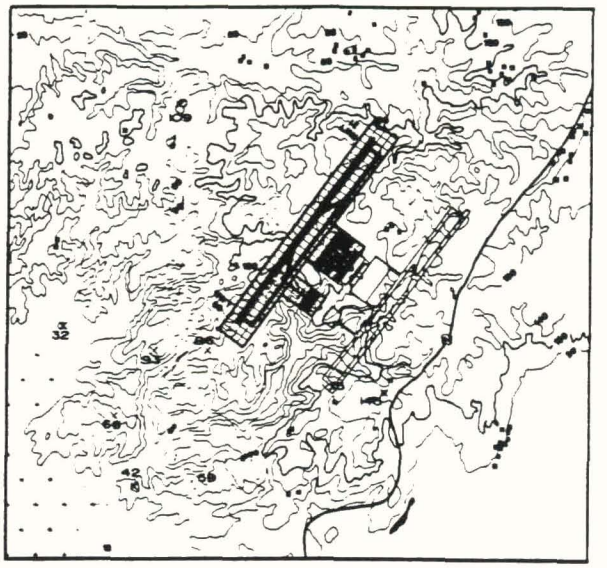
The following sub-section provides a description of the earthwork cost computations for Tarcoles.

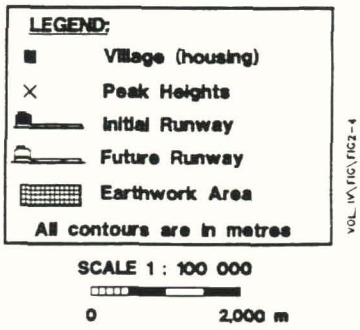
2.1.3.1 **Cost**

The location of the airside surfaces assumed for the computations are shown in Figure 2.4. Runway 03-21 at Tarcoles would slope upwards towards the NE with an overall slope of 1%. The runway profile is also shown in Figure 2.4, together with a typical cross-section along the runway.

FIGURE 2.4
EARTHWORK REQUIREMENTS - TARCOLES
ECONOMIC FEASIBILITY STUDY - COSTA RICA

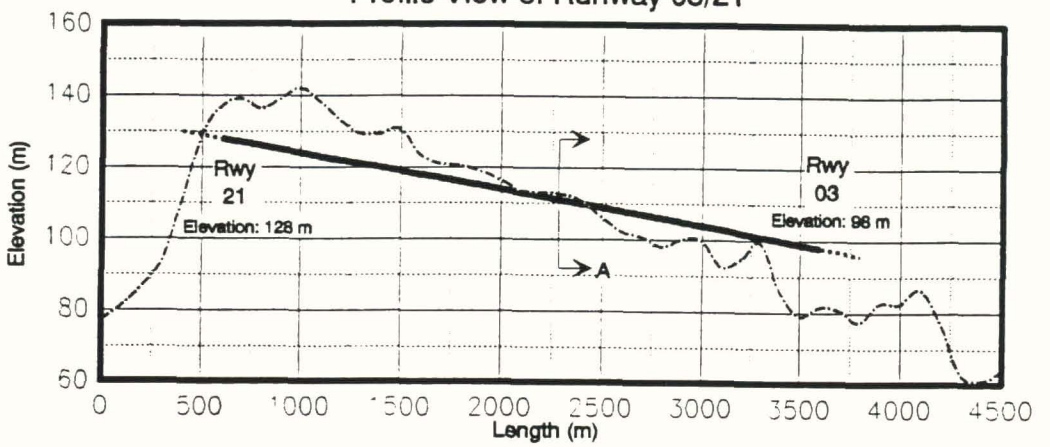
Plan View of Tarcoles Site



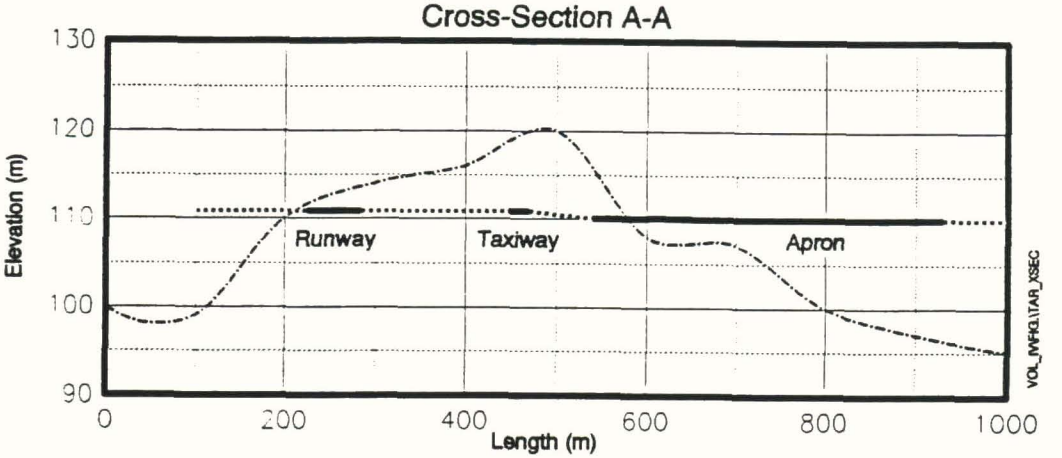


VOL_IV\FIG\FIG2-4

Profile View of Runway 03/21



Cross-Section A-A



VOL_IV\FIG\TAR_XSEC

The results of the preliminary optimized computations show that at the Tarcoles site, the earth moving would amount to the following quantities and costs:

	Cut (Million m^3)	Fill (Million m^3)	Cost (Million Col)
Apron	2.1	1.7	1,055
Runway 03-21/Taxiway	8.2	7.8	4,465
Additional Earth Moving		0.3	93
TOTAL	10.3	9.7	5,613

2.1.4 Car Park

The required car park area is estimated based on the number of peak hour passengers, a parking ratio of 60% obtained from a traffic survey for trends at Juan Santamariá airport, and a unit space requirement of 35 m^2 for a parking slot which includes internal parking lot roads and green areas. Based on 1,808 peak hour passengers forecasted for the year 2010, and a cost of 2,500 colones/m^2 provided by DGAC for a ground-level exterior car park, the resulting car park cost is estimated to be 95 million Colones.

2.1.5 Access Roads

Fast and convenient access facilities for passengers and freight are essential for an airport to provide efficient service. Of major importance for the site being considered is the completion of the road from Colon to Orotina. It was assumed for this study that this road will be completed prior to completion of the airport.

The access roads (from the present roadway system to the terminal) at Tarcoles is shown in Figure 2.5, and the approximate road distance is 13 km. This distance includes an additional 5 km allowance for internal airport roads and circulation (curbside) roads around the terminal complex.

To determine the required width of the roads, the number of vehicles expected in the critical direction in the peak hour was estimated. From the passenger movement forecast, the numbers of arriving and departing passengers were taken to determine the number of people on a busy day for the years 2010 and 2030. The average number of well-wishers and greeters was as described in Volume III.

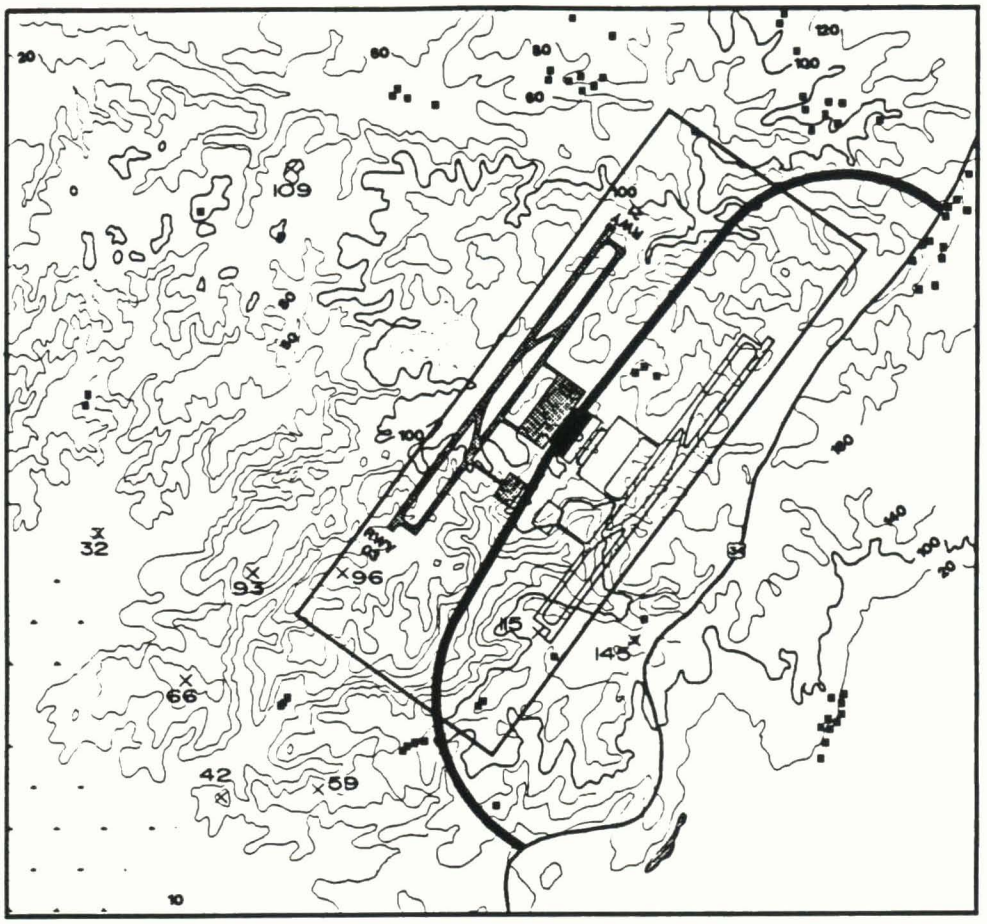
The peak hour flow was obtained from summing the flows of passengers and greeters/well-wishers for both arrivals and departures. Using the breakdown in mode of ground transportation and the average vehicle occupancy as provided in Volume III, the number of vehicles on the road can be estimated.

The number of lanes required is based on a lane capacity of 2,000 vehicles per hour. The unit cost to build a 7.5 metre wide two lane road (one lane each way), obtained from MOPT, is 20 M. Col per kilometre.

Based on the peak hour traffic, the greeters/well-wishers and the mode of transport, it is expected that a two lane road (one lane each way) would be sufficient until the year 2020. However, this does not include any allowance for airport personnel or local traffic and, as a result, it is recommended that a four lane road be built during the initial construction of the airport. Therefore, the cost of access road construction at Tarcoles is 520 M. Col.

FIGURE 2.5
ACCESS ROADS
ECONOMIC FEASIBILITY STUDY - COSTA RICA

TARCOLES SITE



In addition, in the costing of access roads, it is considered important that a four lane road be available to Tarcoles from San José. As previously mentioned, it was assumed that the road from Colon to Orotina would be completed prior to airport construction. Also, since the present road system from Orotina to Tarcoles is two lanes, construction of two additional lanes would be recommended, however this was not included in the cost.

These costs do not include excavation or earthwork for the access roads. Routing of roads is more flexible than for runways, so that more opportunity exists to select the most favourable location.

2.1.6 Lighting Systems and Visual Aids

While lighting systems and visual aid requirements for a new airport normally include runway end indicators, pavement markings and signs, this section will focus only on lighting systems.

Requirements for lighting systems are determined from the recommendations set forth in ICAO Annex 14 and the Aerodrome Design Manual, Part 4.

The airport lighting systems would include runway edge, runway centreline, runway threshold/end, stopway, approach, VASI/PAPI, taxiway and apron flood lights.

Cost estimates for lighting system aids at Tarcoles is $U.S. 2.4 million (324 M. Col.) and this includes allowances for packing, shipping, insurance, installation, contractor costs, custom fees and design.

2.1.7 Terminal Facilities

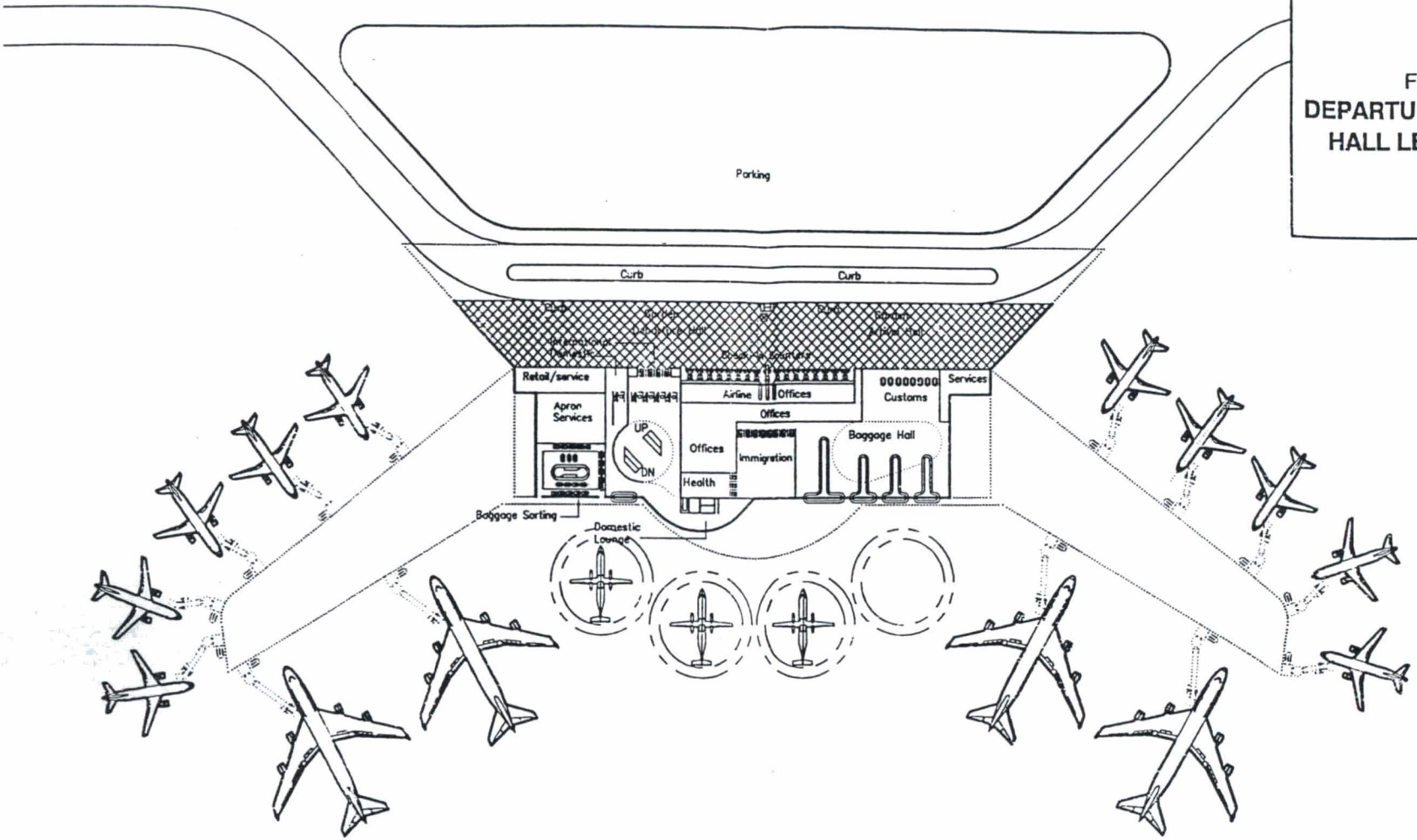
The development of a new international airport in Costa Rica will necessitate the construction of a minimum number of buildings to serve passengers and airport operational requirements. No estimate has been made for any buildings for the exclusive use of LACSA, other airlines or any third parties.

The area requirements for the facilities were developed on the basis of forecast passenger flows and internationally accepted space standards in the case of the PTB.

The design of the terminal is conceived as part of a two stage concept. The total complex will create the primary gateway to Costa Rica in both the symbolic and functional sense. The first stage will be targeted for the year 2010 with the latter for the year 2030. For the arriving tourist, it is the portal leading to Costa Rica and its image as an ecologically conscious country.

The proposed facility provides approximately 24,000 m^2 in the first phase and 45,000 m^2 in the latter phase. The design integrates this future expansion and at each stage retains a functional and passenger-friendly facility. A proposed layout of the terminal facility is provided in Figures 2.6 and 2.7 for the first phase. Figure 2.8 provides a view of a typical section of the terminal. Figures 2.9 and 2.10 provide the proposed layout of the terminal system for Phase II, and this would be sufficient to accomodate the future passenger needs.

FIGURE 2.6
DEPARTURE AND ARRIVAL HALL LEVEL - PHASE 1



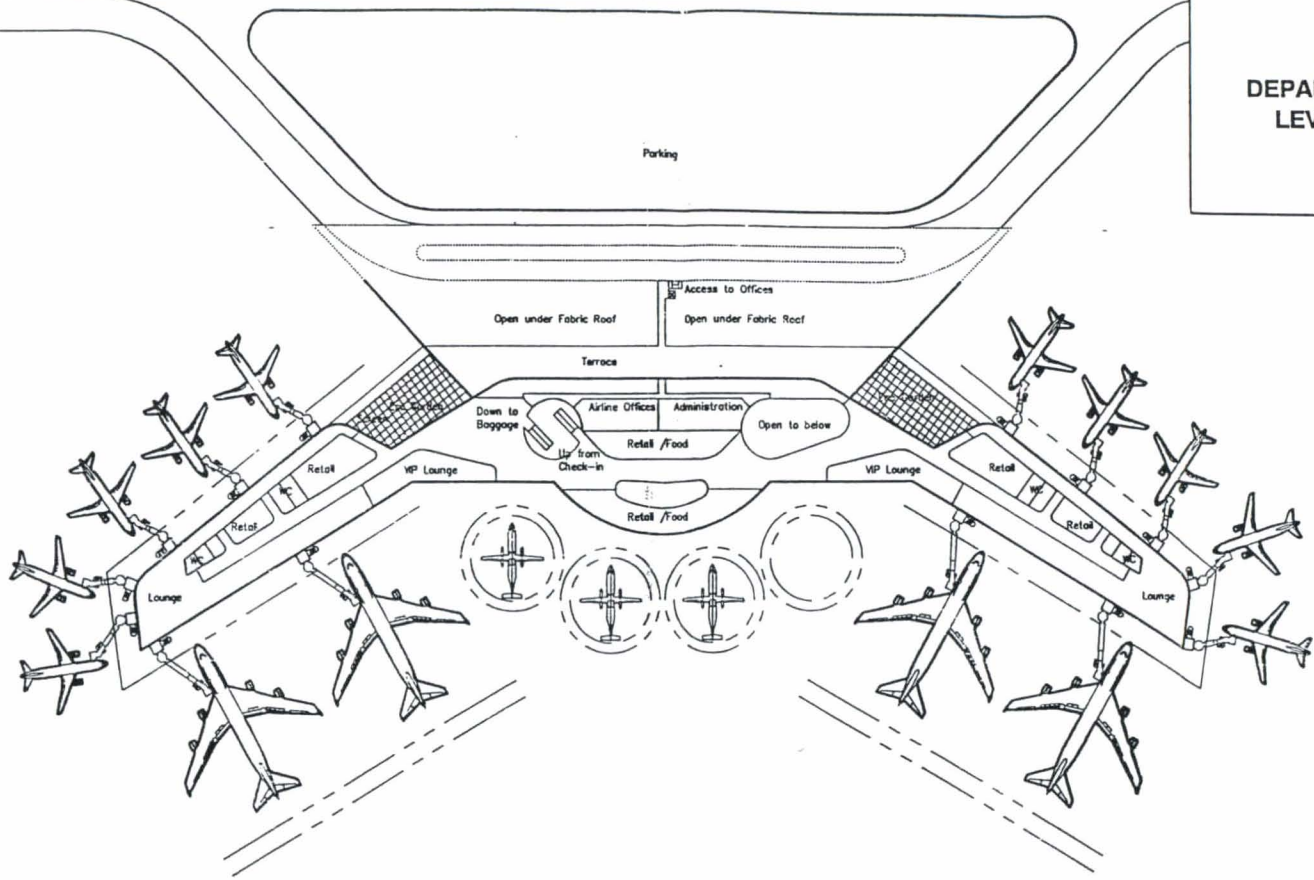
COSTA RICA AIRPORT PROPOSAL

DEPARTURE AND ARRIVAL HALL LEVEL -PHASE1

0 10m 50m 100m 150m

ZEIDLER ROBERTS PARTNERSHIP ARCHITECTS

FIGURE 2.7
DEPARTURE LOUNGE LEVEL - PHASE 1



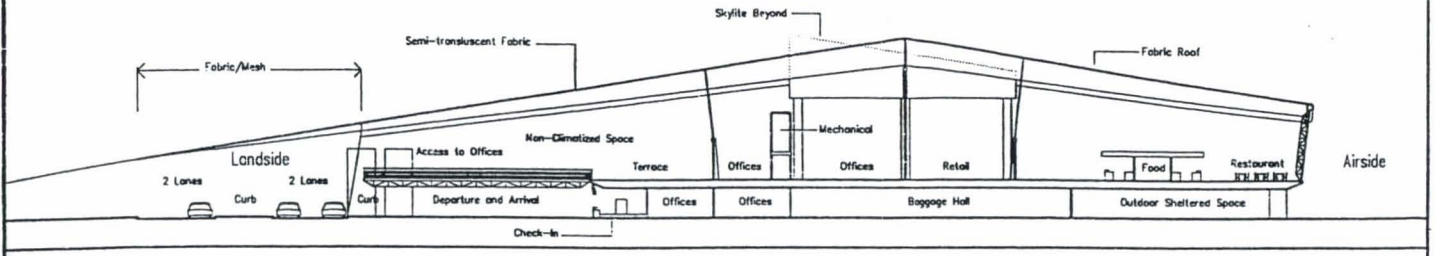
COSTA RICA AIRPORT PROPOSAL

DEPARTURE LOUNGE LEVEL / PHASE1

0 10m 50m 100m 150m

ZEIDLER ROBERTS PARTNERSHIP ARCHITECTS

FIGURE 2.8
TYPICAL SECTION



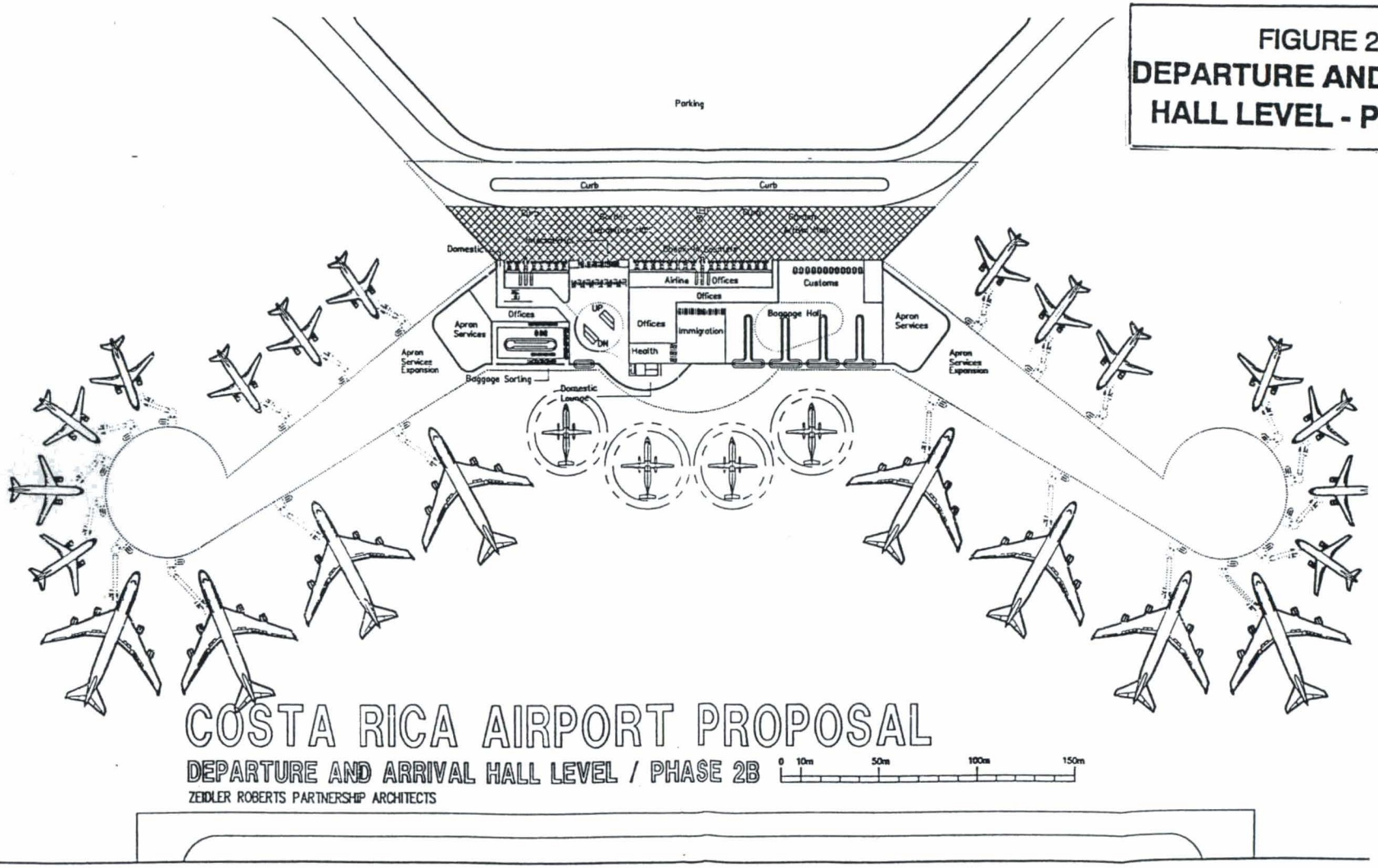
COSTA RICA AIRPORT PROPOSAL

TYPICAL SECTION

0 10m 50m

ZEIDLER ROBERTS PARTNERSHIP ARCHITECTS

FIGURE 2.9
DEPARTURE AND ARRIVAL HALL LEVEL - PHASE 2B



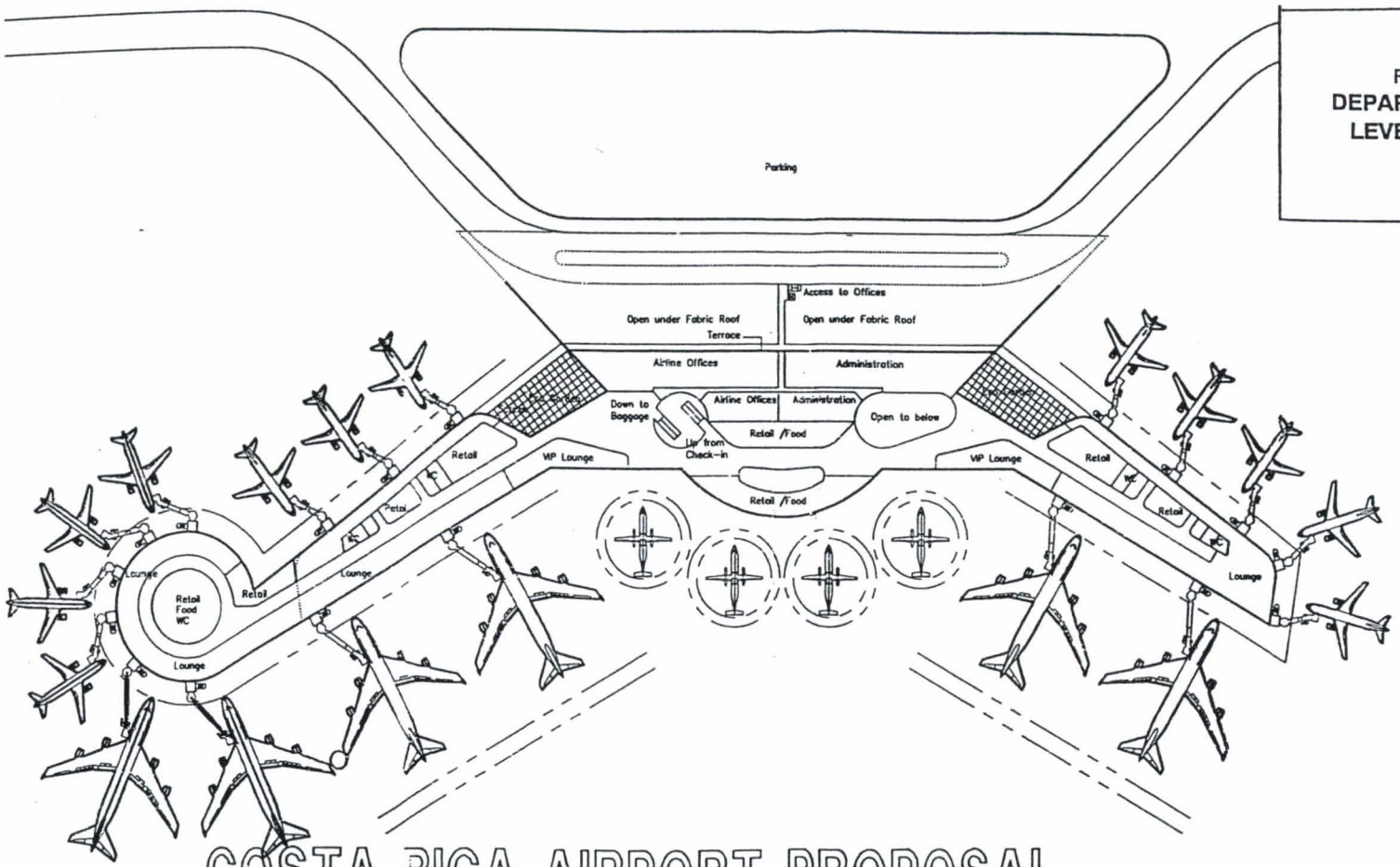


FIGURE 2.10
DEPARTURE LOUNGE LEVEL - PHASE 2A

COSTA RICA AIRPORT PROPOSAL

DEPARTURE LOUNGE LEVEL / PHASE 2A

0 10m 50m 100m 150m

ZEIDLER ROBERTS PARTNERSHIP ARCHITECTS

2.1.7.1 Terminal Site

The new terminal responds to the need to accommodate the future anticipated international traffic. The design takes careful cognizance of the airport site as a whole integrating the new terminal with the surroundings. The landside interface with the terminal is handled by a curb and a median for unloading and loading passengers. A ring road surrounding the parking lot will link the airport with existing roadways.

2.1.7.2 Terminal

The terminal design process first considered the optimum shape of the overall terminal complex considering the airside function. Whether seen from the air or from street level, the design will be powerful and memorable. The building will incorporate the most advanced technology in balance with nature. The focus of the terminal will be a fibreglass reinforced, teflon-tension roof over the reception hall. The hall will be open to the atmosphere, animated with plants and kiosks. The sheltering roof will be designed with modern computer technology. Yet as it unfolds it conveys the very idea of flight. The roof will be aerodynamically designed to create a cooling action inside the open space. A conceptua drawing of the terminal is shown in Figure 2.11.

2.1.7.3 Terminal Design

The most successful air facility is one that processes passengers swiftly and efficiently. Functionality is the corner stone of our design concept, but this functionality is enlivened with a pleasant spatial experience. The design includes efficient passenger processing through modern ticketing and baggage handling facilities. Once the departing passenger leaves the ground-meeters and greeters hall-he rises through a series of excalators

APPENDIX A

TABLE 3.1

MOPT Fee Schedule
(No. 20656-MOPT & DGAC Information, October 1992)
SJO, October 1992

1 Landing Fees

Based on maximum aircraft weight as in column (a) below.

2 Approach Fees

Fee for approach as in column (b) below.
For exclusively cargo flights, and a/c > =90,000kg, pay 18% of tariff.

3 Lighting Fees

If landing/taking off when lights are required, add column (c) below.

For Landing, Aproach and Lighting Fees:
Transit flights > = 90,000 kg pay ¢ 299.84/metric ton.
Source: articles 1-5.

Maximum Weight (kg)	Fee per metric ton (¢)					
	(a)		(b)		(c)	
	Local¢	Int'l$	Local¢	Int'l$	Local¢	Int'l$
0 to 7,500	7.00	0.07	11.00	0.11	0.30	0.01
7,501 to 15,000	11.00	0.11	14.00	0.14	1.05	0.01
15,001 to 38,000	12.00	0.12	20.00	0.21	2.40	0.02
38,001 to 60,000	93.00	0.97	121.00	1.24	4.35	0.05
60,001 to 90,000	93.00	0.97	242.00	2.52	6.65	0.07
90,001 plus	93.00	0.97	506.00	5.25	12.25	0.12

4 Boarding Bridge Fees - SJO only

Based on maximum aircraft weight.
For the first 90 minutes or part thereof, see table.
After 90 minutes, 60% of tariff for each half hour or part thereof.
Can add a surcharge.
Source: article 6.

BOARDING BRIDGE FEE

Maximum Weight (kg)	Fee per metric ton	
	Local¢	Int'l$
38,001 to 60,000	35.00	0.36
60,001 to 90,000	57.00	0.60
90,001 plus	103.00	1.07

5 Aircraft Towing Fees - SJO only

Based on maximum aircraft weight.
$0.24/metric ton if for purpose of takeoff.
50% surcharge, that is $0.36/metric ton, if for another reason.
Source: article7.

6 Aircraft Parking Fees

Cargo aircraft has 3 hours to unload and load.
Passenger aircraft has 90 minutes to unload and load.
For each 30 minutes beyond:
Domestic: ¢9.50/metric ton of maximum weight.
Int'l: $0.10/metric ton
Scheduled services between 1800h and 0600 hours receive 50% reduction in tariff.
Source: article 8.

7 Exemptions From Fees

Aircraft in government service
International/humanitarian missions
Emergency
Technical & meteorological flights
Source: article 9.

No article 9 in update.

8 Terminal Use by Pax Fee

Pax using services and installations of airport:

Int'l pax - tourists	¢780.00
Int'l pax - residents	¢5990 (USD 44.50)
Domestic pax	0
Transit pax	¢180 (USD 1.50)

Source: article 10.

9 Safety/Security Fee

Services ensuring safety and security of passengers:

International passengers:	¢6.00/pax
Domestic passengers:	¢5.00/pax

Source: article 11.

10 Concession Fees

Concessions at SJO are charged a monthly fee based on:
i) location
ii) type of activity.
Source: article 12.

CONCESSION FEES

Location	Monthly Fee (¢/sq metre)
a) Terminal Bldg	
Basement	
- Concession/Commercial	428.00
- Airlines & related activities	321.00
First Floor	
- Concession/Commercial	474.00
- Airlines & related activities	354.00
Second, Third & Fourth Floors	
- Concession/Commercial	379.00
- Airlines & related activities	283.00
b) Connecting Bldgs (including hangars)	
- Concession/Commercial	405.00
- Airlines & related activities	305.00
c) Land Tenants	
- Concession/Commercial	85.00
- Airlines & related activities	63.00
d) Land Tenants for Cultivation	2.50
e) Car Park	
- Concession/Commercial	63.00
f) Utilization of ramp area for supply of food & bev	23,220/month

11 Registration Fees

Various charges for registration of aircraft, flight crew, ground crew, etc.
Grace period of 30 days for payment then interest accrues at 2.5%.
Source: article 13.

End.

up to the departure lounge level. An appropriate mix of retail, food outlets and two magnificent eco-gardens will be provided there. Care has been taken to take advantage of the different views - land as well as air side. Walking distances have been kept to a minimum and animated spatially through with various events. The magnificent eco-gardens located at the beginning of the two piers will provide the departing passengers with a memorable image.

The arriving passenger is taken through the departure lounge level down to immigration then through to the baggage hall. A vertical well visually connects the lounge level with the baggage hall providing natural light and a spatial experience. The traveller then enters the main hall after customs. Domestic passengers are processed at the arrival level through to a lounge overlooking the airfield. Arriving domestic passengers follow the same route after claiming their baggage from a claim device conveniently placed next to the domestic lounge.

The grand hall combines all meeters and greeters creating an energy that will leave a lasting impression on those travelling through the terminal.

2.1.7.4 Terminal Costs

A cost estimate for the terminal facility is derived using area requirements shown in Figures 2.6 and 2.7 for the year 2010 and unit cost estimates provided by Transport Canada for the construction of Terminal 3 in Toronto. Based on a terminal area of 2400 m^2 and a unit cost of \$1667/m^2, the cost of the terminal facility would amount to \$40 M US (5400 M.Col.). The total number of gates (aircraft stands) required during the peak hour is based on estimates from the forecast for the year 2010. Based on the schematics from Figures 2.6 and 2.7, the cost for the loading bridges (gates) would amount to \$ 24 M US (3240

M.Col.). The total cost for the PTB would therefore be approximately $64M US (8640 M.Col.).

2.1.8 Cargo Facilities

The area required for cargo facilities was estimated based on the forecast of cargo tonnage for the year 2010, which results in a 13,000 m^2 cargo facility. Based on a cost of $1000/$m^2$ for this type of facility, the cost of the cargo facility would amount to $13 M US (1755 M.Col.).

2.1.9 Rescue and Fire Fighting Services

The facilities and equipment for RFF services will vary depending on:

- type of aircraft, and
- the number of movements by each aircraft type.

It is likely that the Airport Category for RFF services in the long term would be 9, for which ICAO recommends a minimum of three RFF vehicles. Based on the minimum required amounts of extinguishing agents from ICAO Annex 14, the cost for the vehicles, including a 500 m^2 tire station, would be approximately $2 M US (267 M. Col.).

2.1.10 Air Traffic Control

The objective of this section is to provide an estimate of the ATC equipment costs.

a) Air Traffic Control Tower and Cab

Based on the current operational staffing at the Juan Santamariá

airport, the cab should allow for the unrestricted operation of three control personnel, i.e., a supervisor, an air controller, and a ground controller. In addition, allowance should be made for a fourth, or a trainee, position.

For the tower cab it is recommended that the initial controller/pilot communication facilities consist of the following Very High Frequency (VHF) capabilities:

- 1 air control frequency
- 1 ground control/clearance delivery frequency
- 1 emergency frequency
- appropriate communications consoles, preferably modular, to permit rapid replacement in the event of failure
- ATC communications recorders
- Automated Terminal Information System (ATIS)

With the exception of the ATIS, the foregoing constitutes the minimum necessary for the safe operation of an airside/airspace control facility.

In addition to the VHF communication capabilities, there will exist a requirement for additional capabilities such as inter-unit data transference (hot lines), telephones, crash/fire/rescue alarms, etc. These items cannot be finalized until later in the detailed planning phase.

b) Terminal Control Unit (TCU)

The location of a TCU is flexible, although close proximity to the control cab is desirable from both an operational and cost

standpoint.

The radar currently in use at the present airport is due for replacement shortly.

As the current airport now has the control methodologies and communications capabilities that enable it to effectively co-ordinate operations with the ATC Centre in Honduras, it could serve as a "Costa Rican Centre" with the new airport TCU consisting of:

i) Communications including 2 VHF control frequencies, appropriate direct communication lines to the ATC Centre and the control tower cab, and telephones.

ii) Radar

It is recommended that the new airport be provided with:

- medium range (80 NM) Airport Surveillance Radar (ASR)
- Secondary Surveillance Radar (SSR)
- 2 enhanced radar consoles
- 2 basic radar consoles

The following is a rough order of magnitude costing for the ATC equipment.

- Control Tower Cab $200,000 US

  The cost is for a prefabricated cab of suitable size with console and air conditioning and includes shipping, insurance, customs, etc. The cab could possibly be constructed in Costa Rica for

less.

- Radar $3,840,000 US
  - ASR (medium range 80 NM)
  - SSR
  - i) Display consoles (2 basic)
    ii) Display consoles (2 enhanced)

- ATC Communications - VHF $135,000 US
  - 1 air control
  - 1 ground control/clearance delivery
  - 1 emergency
  - 2 terminal control

All (radio) navaids and communications pricing includes "basic" No Break Power Supplies with Battery back-up and navaid remote displays.

- Recorders $40,000 US
- ATIS $120,000 US

TOTAL ATC EQUIP. COST EST. $4,335,000 US (or 585 M. Col.)

2.1.11 Navigational Aids

This section provides a description and the costing of navigational aids requirements at Tarcoles. It should be noted that recommendations for navaids was discussed in Volume III.

A Category I ILS is considered necessary for two reasons:

- The use of a CAT I ILS, with the corresponding approach and runway lighting would lessen the probability of missed approaches and increase the useability of the airport. It would also allow the use of coupled approaches for aircraft equipped for this feature.

- The airport site could be subject to ocean generated fog conditions. Surface elevations increase very gradually from the shore to where the mountainous terrain introduces a sharp increase in the elevation. This terrain can cause on-shore fog conditions under certain conditions.

The rough order of magnitude costs for navaids are provided below:

■ ILS (CAT I)	$600,000 US
■ VOR	$480,000 US
■ DME	$160,000 US
■ MLS	$400,000 US
■ NDB	$120,000 US

Therefore, based on the requirements for navaids from Table 5.2 in Volume III, a cost estimate for Tarcoles, including $500,000 US for additional site preparation for each localizer and glide path installation, is $3.2 M US (432 M. Col.).

2.1.12 Additional Airport Requirements

A number of other airport requirements must be met in the new airport and could include:

- curbs and sidewalks;

- curbs and sidewalks;
- electric power and auxiliary back-up power supply;
- water supply;
- mobile communications;
- fuel farm and supply route;
- meteorological equipment;
- sewage and solid waste disposal;
- administration/operations building;
- waste water treatment.

A $20 million US (2,700 M. Colones) estimate for these sub-systems has been added to the overall cost of the airport.

2.1.13 Summary of Capital Cost

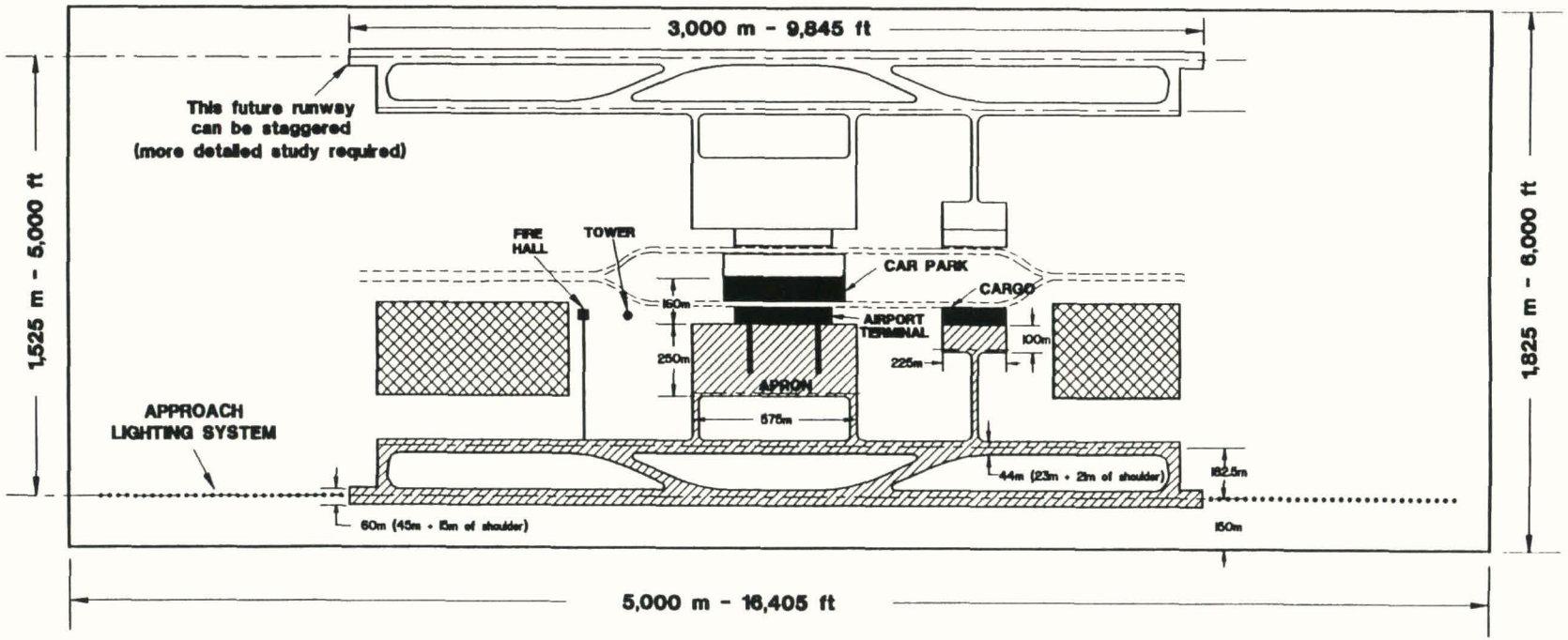
The total cost for construction of the new airport is arrived at by summing the above estimates, adding 7% for design and construction supervision, and an additional 10% for contingency. These estimates are provided in Table 2.1. A layout of these airport systems is shown in Figure 2.12.

TABLE 2.1
PRELIMINARY AIRPORT CAPITAL COST ESTIMATE

	TARCOLES
	Estimated Cost 1992 currency (Million Colones)
1 Land Acquisition	401
2 Site Preparation	5,613
3 Drainage	78
4 Runway System	1,236
5 Taxiway System	649
6 Apron	1,829
7 Car Park	95
8 Lighting	324
9 ATC Equipment	585
10 Terminal Facility & Gates	8,640
11 Cargo Facility	1,755
12 Fire Station & Equipment	267
13 Navigational Aids	432
14 Road Access	720
15 Other (eg. Fuel, Auxil. Power, Comm., Sewage, etc.)	2,700
16 Engineering Services & Contingency	4,305

Total (in Million Colones)	29,629
Total (in Million USD)	219

FIGURE 2.12
PRELIMINARY AIRPORT LAYOUT
ECONOMIC FEASIBILITY STUDY - COSTA RICA



SCALE
1 : 25,000

500 0 250 500 m

LEGEND:

First Stage

Later Addition

Area can be used to provide the following:

- Power Station
- Water Supply
- Fuel Farm
- Admin./Ops Building
- Meteo. Equipment
- etc.

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2.2 Annual Operating & Maintenance Costs

The following sub-sections will provide a discussion of the annual operating and maintenance costs at SJO, followed by a 30 year projection of the expenses for the new airport.

2.2.1 SJO Annual O&M Cost Analysis

The annual operating costs of the (Department of Civil Aviation) DGAC include Juan Santamariá airport and are shown in Table 2.2 for the years 1990 and 1991. The relatively low costs are largely responsible for a significant annual surplus since 1988 (shown in Figure 2.13), despite the low revenue level. Personnel services accounted for over half of the annual expenses in 1991. The 48% increase in personnel expenses from 1990 to 1991 is partly attributable to cost-of-living adjustments.

The purchase of other services declined substantially between 1990 and 1991 and represented 18% of 1991 operating expenses. The "other services" category includes such services as equipment rental, information and publicity, printing, telecommunication, electricity, water service, travel, insurance, maintenance of office equipment and buildings, etc.

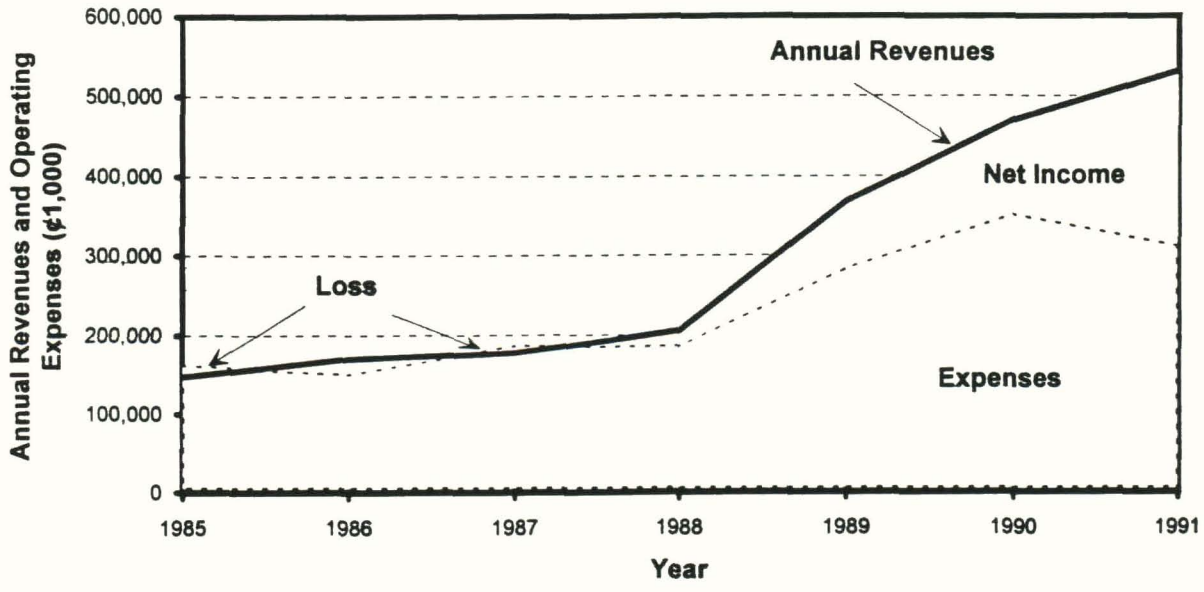
The depreciation expense accounts for only 2% of the annual O&M cost. This perhaps misleading percentage is because the DGAC carries only a limited number of the major airport assets on its books. In 1990, the DGAC's book value of its share of runway and buildings was under US $600,000 (employing exchange rate of 1990), with an annual depreciation of less than US $50,000. These numbers in no way approximate a realistic indication of the total airport assets. At the end of May 1991, the net worth of the DGAC totalled about US $9 million.

TABLE 2.2
DGAC
Operating Expenses, 1990 - 1991
(1,000 colones)

	1990	1991	Percent Increase	1991 Percent of Total
Personnel Services	110,947	163,968	48%	52%
Other Services	75,258	55,994	-26%	18%
Materials & Supplies	43,884	37,333	-15%	12%
Machines & Equipment	15,144	6,760	-55%	2%
Depreciation: Buildings, Runways, Other	5,623	5,710	2%	2%
Financial Disbursement	5,100	577	-89%	1%
Transfers to other Government Organizations	27,483	41,991	53%	13%
Construction	44,350	-	-100%	-
Global Allotment	3,353	-	-100%	-
TOTAL	331,142	312,333	-6%	100%

Sources: DGAC, IDB

FIGURE 2.13
DGAC
Annual Revenues and Operating Expenses
1985 - 1991



This cursory analysis of DGAC expenses shows clearly that the new airport's financial structure will have to be dramatically different than current practice if it is to operate efficiently and effectively. The following cost sections will establish a realistic O&M expense budget, which takes full account of all airport assets and operations.

2.2.2 Expense Projection

As was seen in the analysis of SJO's current expenses, the cost structure requires a complete overhaul, which is beyond the scope of this study. The capital costs were estimated for this new facility and interest costs can be estimated. The following steps were taken to estimate an appropriate relationship between the remaining expense items and traffic levels.

The ICAO publication "Airport and Route Facilities, Financial Data and Summary Traffic Data" for 1990, lists expense data for a number of airports around the world. Table 2.3 provides an excerpt from this publication for illustrative purposes. Airports with similar traffic volumes to Costa Rica were extracted from the ICAO publication.

Expense data was retrieved for the following airports:

STATE	IATA CODE	AIRPORT	FISCAL YEAR ENDED
Chile	SCL	Arturo Merino Benitez (Santiago)	31 Dec. 1990
Fiji	NAN	Nadi International (Nadi)	30 June 1990
Ghana	ACC	Kotoka International (Accra)	31 Dec. 1990
Mauritius	MRU	Sir S. Ramgoolam International (Mauritius)	30 June 1990
Mexico	ACA	General Juan N. Alvarez International (Acapulco)	31 Dec. 1990
Mexico	MTY	General Mariano Escobedo Int'l (Monterrey)	31 Dec. 1990
Mexico	MZT	General Rafael Buelna Int'l (Mazatlan)	31 Dec. 1990
Mexico	PVR	Lic. Gustavo Diaz Ordaz Int'l (Puerto Vallarta)	31 Dec. 1990
Sri Lanka	CMB	Katunayake (Colombo)	31 Dec. 1990

TABLE 2.3

AIRPORT FINANCIAL DATA

State: MEXICO Fiscal Year Ended: 31 DECEMBER 1990

Airport: JUAN N.ALVAREZ Rate of Exchange: US $ 00.000354 = 1 PESO

INCOME, EXPENSES AND INVESTMENTS

	DESCRIPTION	U. S. DOLLARS SUB-TOTAL	U. S. DOLLARS TOTAL	PESOS (MILL.) SUB-TOTAL	PESOS (MILL.) TOTAL
INCOME	1. AIR TRAFFIC OPERATIONS		9 585 612		27 078
	1.1 AIRCRAFT RELATED CHARGES	4 146 402		11 713	
	1.2 PASSENGER RELATED CHARGES	5 439 210		15 365	
	1.3 OTHER CHARGES ON AIR TRAFFIC OPERATIONS	-		-	
	2. GROUND HANDLING CHARGES		-		-
	3. CONCESSIONS		1 794 780		5 070
	OF WHICH, FUEL AND OIL	1 794 780		5 070	
	4. RENTALS		14 024 064		39 616
	5. OTHER REVENUES		41 064		116
	6. TOTAL REVENUES (SUM OF ITEMS 1 THROUGH 5)		25 445 520		71 880
	7. OPERATING SUBSIDIES		-		-
	8. TOTAL INCOME (SUM OF ITEMS 6 AND 7)		25 445 520		71 880
EXPENSES	9. OPERATION AND MAINTENANCE (INCLUDING LABOUR)		3 217 152		9 088
	9.1 PERSONNEL COSTS	2 064 528		5 832	
	9.2 SUPPLIES	1 152 624		3 256	
	9.3 SERVICES - CONTRACTED	-		-	
	10. ADMINISTRATIVE OVERHEADS		3 665 670		10 355
	11. OTHER NON-CAPITAL COSTS		14 160		40
	12. CAPITAL COSTS		118 236		334
	12.1 DEPRECIATION AND/OR AMORTIZATION	118 236		334	
	12.2 INTEREST	-		-	
	12.3 OTHER CAPITAL COSTS	-		-	
	13. TOTAL EXPENSES (SUM OF ITEMS 9 THROUGH 12)		7 015 218N		19 817N
INVESTMENTS	14. GROSS CAPITAL INVESTMENTS DURING THE YEAR		1 346 970		3 805
	14.1 AIRCRAFT MOVEMENT AREAS	132 042		373	
	14.2 TERMINAL BUILDINGS (OWNED BY AIRPORT)	928 542		2 623	
	14.3 EQUIPMENT AND VEHICLES	78 588		222	
	14.4 OTHER FACILITIES	200 364		566	
	14.5 LAND	7 434		21	

BASIS ON WHICH AIRPORT INCOME AND EXPENSE ACCOUNTS MAINTAINED: [x] ACCRUALS [ ] CASH [ ] OTHER

BASIS ON WHICH AIRPORT CAPITAL ASSETS VALUED: [ ] HISTORIC [x] CURRENT [ ] OTHER

AIRPORT TRAFFIC (FORM I)

DESCRIPTION	COMMERCIAL OPERATIONS MOVEMENTS	PASSENGERS	FREIGHT	MAIL	TRAFFIC UNITS
INTERNATIONAL	6 675	676 779	612	27	683
DOMESTIC	9 482	813 947	2 256	109	838
TOTAL	16 157	1 490 726	2 868	136	1 521

Source: ICAO, Airport and Route Facilities, Financial Data and Summary Traffic Data, No. 388, 1990.

Regression analyses were performed on a number of variables in order to determine, if possible, a relationship between expenses, exclusive of capital costs, and traffic volume. The expenses included:

a) operation and maintenance: personnel, supplies, contract services
b) administrative overhead
c) other non-capital costs

Table 2.4 lists these expenses for the noted airports.

The following relationships were examined for the above mentioned airports:

a) x_1: number of annual passengers (domestic and international)
   x_2: number of annual aircraft movements (domestic and international passenger aircraft)
   y: expenses less capital costs

b) x_1: number of annual passengers (domestic and international)
   y: expenses less capital costs

c) x_1: number of annual aircraft movements (domestic and international passenger aircraft)
   y: expenses less capital costs

Due to the lack of significant statistical results, no valid relationship between airport expenses and air traffic volume could be established for SJO.

Based on considerable evaluation of alternatives, the Consultants found the most feasible solution to be the utilization of the current SJO expense per passenger movement, exclusive of capital costs, which would be applied to the forecasted number.

TABLE 2.4
Expense Data for Selected International Airports, 1990
Unit = 1990 US$ (1,000)

AIRPORT	Chile SCL	Fiji NAN	Ghana ACC	Mauritius MRU	Mexico ACA	Mexico MTY	Mexico MZT	Mexico PVR	Sri Lanka CMB
TRAFFIC DATA									
Total Movements	26,152	23,556	7,227	10,619	16,157	20,561	16,536	17,550	11,663
Total Passengers	1,750,209	727,764	761,547	832,488	1,490,726	1,532,884	825,867	1,426,000	1,471,711
EXPENSE DATA (Excluding Capital Costs)									
Expense/Passenger	$1.68	$7.96	$1.37	$4.11	$4.63	$3.31	$4.85	$3.80	$4.44
Expense/Movement	$112.30	$245.90	$144.25	$322.60	$426.87	$246.53	$242.25	$308.88	$560.33
NET INCOME (Including Capital Costs)									
Net Income/Passenger	$10.65	$0.96	$64.46	$4.03	$12.36	$4.16	$5.37	$5.79	$3.64
1990 EXPENSES excluding Capital Costs (1,000)									
Operation & Maintenance	$1,608	$4,674	$1,042	$3,330	$3,217	$2,147	$990	$1,769	$4,080
Personnel	918	2,284	924	2,057	2,065	1,020	815	1,108	3,042
Supplies	690	1,910	114	1,273	1,153	1,127	175	661	1,038
Services-Contracted	0	480	4	0	0	0	0	0	0
Admin Overheads	1,329	731	1	96	3,666	2,918	3,013	3,652	2,454
Other Non-Capital Costs	0	387	0	0	14	4	3	0	1
Total Expenses	2,937	5,792	1,043	3,426	6,897	5,069	4,006	5,421	6,535

Source: ICAO "Airport and Route Facilities, Financial Data and Summary Traffic Data, 1990"

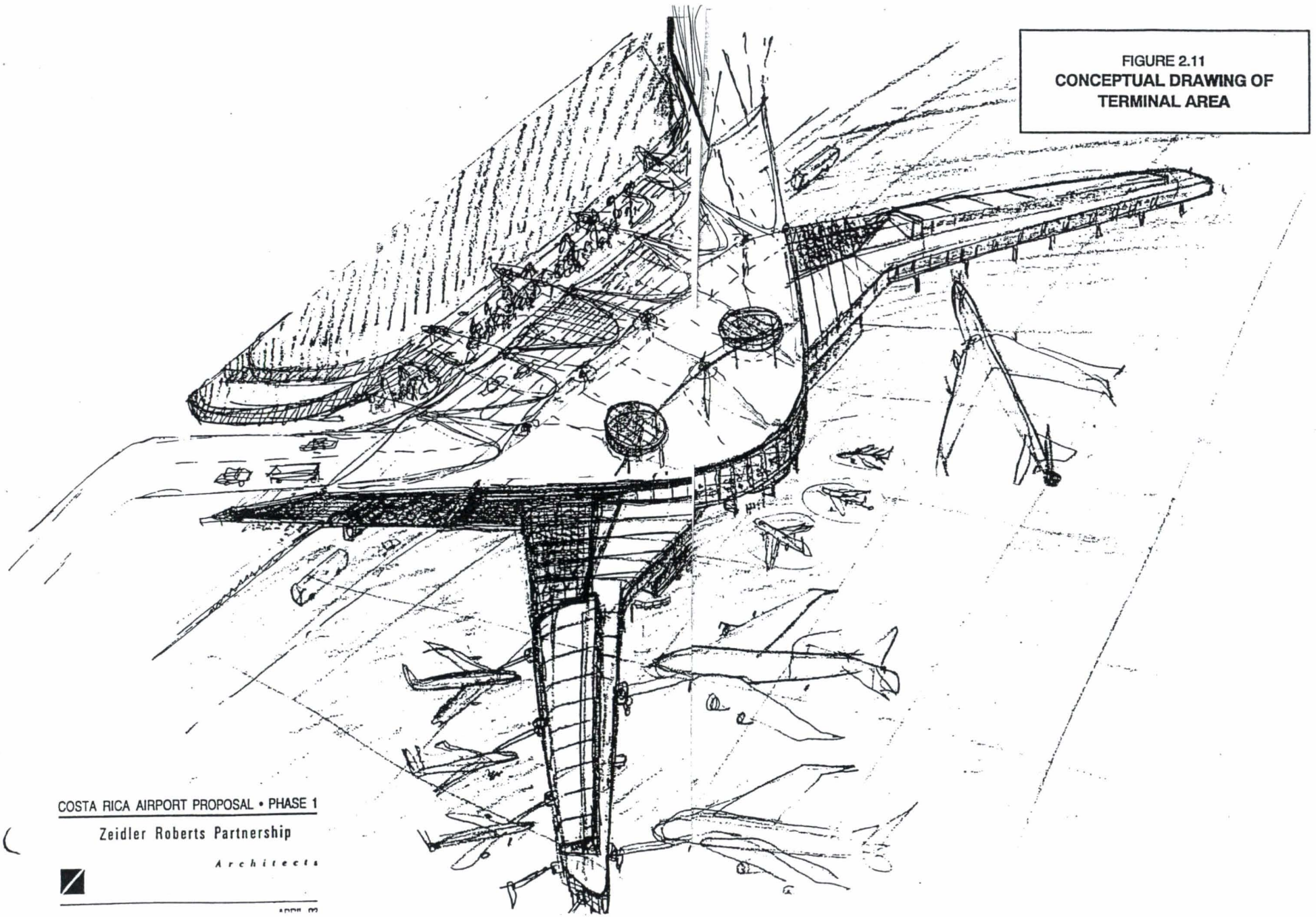


FIGURE 2.11
CONCEPTUAL DRAWING OF TERMINAL AREA

The following expenses were incurred at SJO in 1991:

(Unit = 1,000 Colones)	
Personnel Services	163,968
Non-personnel Services	55,994
Material and Supplies	37,333
Machines/Equipment	6,760
Financial Disbursement	577
Depreciation	5,710
Current Transfers	41,991
Total expenses	312,333
Annual 1991 expenses exclusive of depreciation	306,622

Source: DGAC

International and domestic aircraft movements at SJO totalled 18,111 in 1991. Thus, annual airport expense, exclusive of depreciation on a per movement basis were ¢16,930. At the exchange rate of ¢135 = $1US, this value is the equivalent of $US 125 per movement. On a per passenger basis, expenses are ¢275 or $US 2.03 per passenger. It is worth noting that these values are within the range of expenses carried by the airports examined.

3. REVENUE ANALYSIS

The following sections examine the current fee schedule charged by Juan Santamariá International Airport, compare the fee schedule with that of neighbouring countries, outline a more viable fee schedule and project revenues based on the suggested fee schedule and the forecasted air traffic from Volume II of this study.

3.1 SJO Revenues & Fee Schedule

Between 1990 and 1991 revenues increased by 64%, while passenger traffic increased by 14%, cargo volume decreased by 6% and aircraft movements increased by 5%. The change in revenue items is shown in Table 3.1, which lists SJO revenues for the DGAC for 1990 and 1991. Most of the revenues come from fees paid by the airlines and concessionaires, according to a tariff approved by the Technical Council (included at the end of Volume IV as Appendix A). Before 1991, the fees were expressed in colones; however, beginning in 1991, all charges relating to international flights have been expressed in U.S. dollars, although they may be settled in colones. Locally incurred charges, such as passenger tax and concession revenues, continue to be expressed in colones. All charges are indexed to changes in the official cost of living index and are adjusted every six months on that basis.

A number of fees are collected jointly with other organizations, which are shown in the accounts as transfers in and transfers out. In addition to the difficulties in dividing the revenues, it is not clear whether they appear in the DGAC accounts before or after redistribution.

The revenue items collected by the DGAC are discussed in the subsections following. Table 3.2 below shows the percentage breakdown of DGAC revenues from SJO operations for the year 1991.

TABLE 3.1

DGAC Revenues at Juan Santamariá International Airport
1990 - 1991
(Unit = 1,000 Colones)

	1990	1991	Percent Increase
Landing & Related Fees			
Landing	42,973	73,535	
Approach	110,616	187,818	
Lighting	4,424	6,232	
Subtotal	158,013	267,585	69%
Special Airport Services			
Loading Bridges	56,440	86,042	
Towing	6,417	14,236	
Parking	17,754	19,068	
Security	3,416	4,754	
Subtotal	84,027	124,100	48%
Passenger Tax	128,430	138,579	8%
Concessions & Transfers			
Rentals - Terminal Space	10,444	16,871	
Rentals - Land	5,105	12,332	
Fuel Fee	1,201	1,446	
Ramp Service Fee	513	979	
Auto Parking/Duty Free	23,950	89,978	
Other Commercial		1,522	
Subtotal	41,213	123,128	199%
Interest	57,195	99,224	73%
Other Revenue			
Registration Fees	1,074	1,181	
Other		14,825	
Subtotal	1,074	16,706	1455%
TOTAL	**469,952**	**769,322**	**64%**

Source: DGAC

TABLE 3.2
DGAC Revenue Breakdown
1991

	Percentage of DGAC's Revenues
Landing & Related Fees	35%
Loading Bridge, Towing, Parking, Security	16%
Passenger Tax	18%
Concessions Revenue (incl IMAS & Parking)	16%
Interest Income	13%
Other Revenue	2%
TOTAL	**100%**

Source: DGAC

3.1.1 Landing, Approach & Lighting Fees

Landing fees are charged based on the maximum take-off weight (MTOW) of the aircraft. The fee is determined on a per kilo basis with the charge per kilo applied to the maximum take-off weight of the aircraft. The Government Meteorological Office receives 25% of the landing fee. Presumably for this reason it is kept separate from the approach fee, which is approximately three times greater than the landing fee. A lighting fee is charged for both arrivals and departures at night.

Cargo aircraft are charged only 18% of the applicable landing and lighting charge, although the rationale for this continued practice is unknown.

3.1.2 Loading Bridges, Towing, Parking & Security

Loading bridge charges are a function of the MTOW of the aircraft and the time that the aircraft remains at the bridge. Aircraft towing fees are based on the MTOW of the aircraft and the purpose of the tow. Aircraft parking fees differ for passenger and cargo aircraft; each type is allotted a period of time for loading and unloading, beyond which a fee is levied. The security fee applies only to passenger aircraft, that is cargo aircraft are exempt, and is based on the number of passengers, domestic and international.

3.1.3 Passenger Tax

The passenger tax is applicable only to departing international and transit passengers, with a much higher charge for residents of Costa Rica. In 1986, the tax for tourists was quoted in U.S. currency at $10.00 per passenger. Currently, however, the tax is expressed in colones, although it may be paid in U.S. dollars at the current exchange rate. The charge has varied greatly over the last couple of years. In 1990, it was ¢400; in mid-1991, it was ¢517; in mid-1992, it was ¢400 again, then rising to ¢780 in October 1992. Table 3.3 lists the passenger taxes that were in effect in October 1992. Given the fluctuation of the colone, this revenue would be more reliable if quoted in U.S. dollars.

The method of tax collection and administration results in the DGAC receiving only 80% of the revenue collected from airport taxes.

TABLE 3.3
SJO Passenger Tax
October 1992

Tax Type	Tax Per Passenger	Approximate USD Equivalent
National	¢ 5,990	$ 44.50
Tourist	¢ 780	$ 6.00
Transit	¢ 180	$ 1.50

Source: DGAC

3.1.4 Concession Revenue

The revenue accounts include concession revenue under a number of titles including concessions, transfers from IMAS (revenue from duty-free shop operated by IMAS) and from the Municipality of Alajuela, who own and operate the parking lot.

The duty-free shop pays a percentage of its annual net income to the DGAC as does the Municipality of Alajuela for the revenue it collects. It is unclear if the charge for fuel delivery is based on the amount sold or if it is a fixed amount. In either case, the fee is considered to be paltry in comparison to other airports. The remainder of the concession revenues are based on space rentals, which are a function of location and floor area (square metres). These revenues are not related to the concession's volume of business, the latter being normal airport practice. COOPESA, an independent maintenance facility, the largest tenant at the airport, is believed to have a special arrangement regarding concession fees, which was not available.

3.1.5 Interest Income

In 1990, the DGAC received 13% of its overall revenues in the form of interest income. This percentage remained at the same level in 1991. The interest is from an accumulation of annual surplus invested in various forms of government and bank securities.

3.1.6 Other Revenue

In 1991, the DGAC received 2% of its overall revenue from other sources, and includes fees for the licensing of aircraft and pilots, quoted in colones.

3.2 Revenue Earning Efficiency

An examination of the revenue items and discussions with the DGAC result in a number of observations regarding the revenue earning efficiency of SJO:

- The level of charges at SJO is very low (e.g. passenger tax, fuel charge, landing fees).
- The reporting method of DGAC revenues collected jointly with other agencies masks the earning power of the airport.
- Concession fees are levied in disregard of their earning capability, in the case of rental car companies, for example, and only on the space they occupy.
- Not all occupants earning revenue actually pay the designated fee.

An IDB report compares SJO revenues and operations to those in Managua, Nicaragua for similar items for the year 1990. SJO revenues covered the entire year, while Managua revenues were for the first ten months. It was found that comparable revenues per enplaned passenger were 3½ times greater at Managua than at SJO. Table 3.4 shows the breakdown of these results by major revenue

category. This is not to say that Managua is the ideal situations, as relative cost levels and allocation of costs were not considered. What is evident in comparison to Managua, is that the overall level of charges at SJO is too low. Table 3.4 shows that:

- SJO landing fees and the passenger tax are approximately half those of Managua;
- the fuel charges at Managua are almost 200 times greater than those at SJO; and
- other concessions earn five times more revenue at Managua.

This comparison clearly indicates that SJO fees are not even close to approximating an adequate level. As was found with the cost analysis, it is necessary to revise the current practices.

3.3 Recommended Fee Schedule for New Airport

A more productive and logical structure of airport charges is required but is beyond the scope of this study. The collection and administration of revenues should be simplified such that they become the concern of the airport authority. It is through this method that the revenues may be employed in the most productive way and that the airport may be operated in a cost-efficent and commercial manner. There are a number of privatized airports in the world which can be used as models for a possible re-vamping of the current fee structure.

TABLE 3.4

Comparison of SJO & Managua, Nicaragua
Revenues, 1990

	SJO TOTAL ($1,000)	SJO Per Enplaned Passenger ($)	MANAGUA TOTAL ($1,000)	MANAGUA Per Enplaned Passenger ($)	Revenue Per Enplaned Passenger Managua/SJO Ratio
Landing & Other Airport Services	2,525	5.43	1,409	12.40	2.28
Passenger Tax	1,408	3.03	607	5.34	1.76
Fuel Concession	21	0.05	1,104	9.71	194.20
Other Concessions	647	1.39	756	6.65	4.78
Subtotal - Comparable Revenues	4,601	9.90	3,876	34.10	3.44
Other Revenues					
Ramp Servvice			530	4.66	
Interest	716	1.54			
Other	84	0.18	—	—	
TOTAL REVENUES	**5,401**	**11.62**	**4,406**	**38.76**	

Notes:

SJO revenues include some non-airport DGAC fees
SJO revenues in colones converted at $1US = 100 colones
Managua 1990 figures are for ten months
Enplaned international passengers:
SJO 464,297
Managua 113,675

Sources:

IDB (DGAC, Managua Airport Authority)

APS Note: The SJO figures for 1990 in this table were the values available to the IDB in 1991. Table 3.1, produced by APS includes updated 1990 figures, available in 1992.

3.4 New Airport Revenue Projections

As stated above, it will be necessary, in the future, to develop a new schedule of charges for the new airport, given the inadequacies of the current revenue charges at SJO. In order to project revenues for the current study it was decided to analyze the relationship between airport revenues and airport activity at other airports in Central and South America, to try to estimate a dollar revenue figure per passenger or per movement. The ICAO document "Airport and Route Facilities, Financial Data and Summary Traffic Data, 1990", Series AF-No 8, which lists revenues, expenses and traffic data for a number of airports throughout the world, was chosen as the source of financial data.

The first step in the analysis was to search for airports in the vicinity of Central and South America with traffic levels similar to Juan Santamariá International and where sufficient information was provided. The airports employed in the analysis were those listed previously in Section 2.2.2.

Table 3.5 lists general revenue items for 1990 for each of these airports and also two additional airports that will be considered later in this section.

As a second step, a series of regression analyses were carried out in order to determine a specific relationship between airport revenues and airport traffic levels. The following relationships were examined:

a) x_1: number of annual passengers (domestic and international)
   x_2: number of annual aircraft movements (domestic and international passenger aircraft)
   y: total annual revenues

TABLE 3.5
Revenue Data for Selected International Airports, 1990
Unit = 1990 US$ (1,000)

AIRPORT	Chile SCL	Fiji NAN	Ghana ACC	Mauritius MRU	Mexico ACA	Mexico MTY	Mexico MZT	Mexico PVR	Sri Lanka CMB
TRAFFIC DATA									
Total Movements	26,152	23,556	7,227	10,619	16,157	20,561	16,536	17,550	11,663
Total Passengers	1,750,209	727,764	761,547	832,488	1,490,726	1,532,884	825,867	1,426,000	1,471,711
REVENUE DATA									
Revenue/Passenger	$14.51	$11.17	$65.83	$8.15	$17.07	$7.59	$10.30	$9.74	$8.08
Revenue/Movement	$970.86	$345.00	$6,937.07	$638.87	$1,574.89	$566.18	$514.32	$791.37	$1,020.04
NET INCOME									
Net Income/Passenger	$10.65	$0.96	$64.46	$4.03	$12.36	$4.16	$5.37	$5.79	$3.64
1990 REVENUES									
Air Traffic Operations	$16,355	$3,292	$50,033	$4,326	$9,586	$8,591	$6,309	$10,892	$9,002
A/C Related Charges	6,811	2,831	48,919	2,093	4,146	4,173	3,236	4,813	3,370
Pax Related Charges	9,544	461	1,075	2,060	5,439	4,419	3,073	6,078	5,632
Other	0	0	39	173	0	0	0	0	0
Ground Handling Charg	0	0	78	0	0	0	0	0	0
Concessions	8,786	3,363	0	1,558	1,795	1,289	1,399	1,642	1,302
of which, fuel & oil	8,786	477	0	1,143	1,795	1,289	1,399	1,642	0
Rentals	0	390	22	458	14,024	1,735	747	1,340	1,592
Other Revenues	248	1,082	0	442	41	26	50	15	0
Total	25,390	8,127	50,134	6,784	25,446	11,641	8,505	13,888	11,897
Operating Subsidies	0	0	0	0	0	0	0	0	0
Total Revenue	25,390	8,127	50,134	6,784	25,446	11,641	8,505	13,888	11,897

Source: ICAO "Airport and Route Facilities, Financial Data and Summary Traffic Data, 1990"

b) x_1: number of annual aircraft movements (domestic and international passenger aircraft)

y: annual revenues from aircraft related charges + other air traffic operations + ground handling + fuel and oil portion of concession charges.

c) x_1: number of annual passengers (domestic and international)

y: annual revenues from passenger related charges

d) x_1: number of annual passengers (domestic and international)

y: total annual revenues

Each of the four regression analyses again failed to yield significant results and it was decided therefore, to base the new airport's revenues on a combination of revenue per passenger from selected airports, with a positive net income.

The air traffic structure in Costa Rica is heavily weighted with tourist/pleasure traffic at approximately 70 per cent of total annual international passengers. The remainder, 30 per cent, is business traffic. Cancun International Airport (CUN) in Mexico is largely pleasure/tourist traffic and is situated in the same general region as Costa Rica. The revenue per passenger experienced there was estimated to be sufficiently representative of an achievable revenue figure for the pleasure traffic at the new Costa Rican airport. Table 3.6 presents the revenue per pax figure for 1990. This figure is considered to be a conservative estimate for the Costa Rican pleasure traffic as the Costa Rican traffic has a substantially larger portion of scheduled flights as opposed to Cancun's heavily charter-based structure.

Benito Juarez International Airport (MEX) at Mexico City, handled over 11 million pax in 1990, with a substantial business portion. This airport is also in the same general regional area as Costa Rica and had a positive net income in 1990. Although the traffic is far greater than the level forecasted for Costa Rica, business travellers would likely expect similar charges to travel to Mexico as to Costa Rica. The revenue per pax figure for 1990 appears in Table 3.6.

TABLE 3.6

AIRPORT REVENUE PER PASSENGER

Type of Traffic	% of Annual Costa Rica Passenger Traffic	Airport Base	Revenue per Pax 1990	Weighted Portion for Costa Rica Airport
Pleasure	70%	CUN	$10.97	(0.7)(10.97) = $7.679
Business	30%	MEX	$10.06	(0.3)(10.06) = $3.018

Annual Traffic Weighted Revenue per Pax $10.70

Sources: ICAO, APS Analysis

Calculating a weighted average revenue per pax, based on CUN and MEX as representative of pleasure and business traffic respectively, yields (US 1990) $10.70 revenue per passenger. In 1991, the revenue per passenger figure at SJO was approximately $US 5.10, which, as discussed previously is well below the figures attainable at CUN and MEX. This figure will be escalated to the relevant years in the financial analysis following, for the new international airport.

4. FINANCIAL ANALYSIS

As discussed previously, it would be impractical to project financial results based on current rates and charges and current cost data. Moreover, there is no cost data that accurately separates Juan Santamariá International from the DGAC. It is beyond the scope of this study to develop detailed rates, charges and cost data, hence the following financial analysis will be based on approximate revenue and cost data developed in previous sections of this volume. Detailed financial projections would be very important to any future development of this project.

4.1 Methodology

It is recalled from previous sections that the following estimates were developed for revenues and costs:

- Estimated annual revenue/passenger: $US 10.70 (1990)
- Estimated annual cost/passenger excluding capital costs: $US 2.03 (1992)

These figures were escalated to the year 2000 and then applied to the annual passenger forecast to arrive at escalated revenue and expense figures. Discount factors were then applied to the net income figures in order to calculate the PV net income.

4.2 Net Income and Cash Flow

Table 4.1 lists the annual escalation factors applied to the revenue and expense per passenger figures. In reality, revenue increases will lag behind cost increases as revenue charges will have to be increased by the airport to reflect the changed economic condition. The revenue increases will lag behind the cost increases for several years until the revenues are increased at a greater rate. This scenario is reflected in the escalation rates listed in Table 4.1, which are a

TABLE 4.1
Escalation and Discount Rates
For Costa Rican Airport Revenues & Expenses, 1992 - 2030

YEAR	ANNUAL ESCALATION RATES		ANNUAL DISCOUNT RATES
	Expenses	Revenues	Expenses & Revenues
1992	0.160	0.160	0.200
1993	0.160	0.150	0.200
1994	0.160	0.150	0.200
1995	0.150	0.170	0.200
1996	0.140	0.140	0.190
1997	0.130	0.140	0.180
1998	0.120	0.110	0.170
1999	0.110	0.110	0.160
2000	0.100	0.098	0.150
2001	0.098	0.096	0.148
2002	0.096	0.094	0.146
2003	0.094	0.100	0.144
2004	0.092	0.090	0.142
2005	0.090	0.088	0.140
2006	0.088	0.092	0.138
2007	0.086	0.084	0.136
2008	0.084	0.082	0.134
2009	0.082	0.086	0.132
2010	0.080	0.078	0.130
2011	0.078	0.076	0.128
2012	0.076	0.080	0.126
2013	0.074	0.072	0.124
2014	0.072	0.070	0.122
2015	0.070	0.074	0.120
2016	0.068	0.066	0.118
2017	0.066	0.064	0.116
2018	0.064	0.068	0.114
2019	0.062	0.060	0.112
2020	0.060	0.058	0.110
2021	0.058	0.062	0.108
2022	0.056	0.054	0.106
2023	0.054	0.052	0.104
2024	0.052	0.056	0.102
2025	0.050	0.048	0.100
2026	0.048	0.046	0.098
2027	0.046	0.050	0.096
2028	0.044	0.042	0.094
2029	0.042	0.040	0.092
2030	0.040	0.044	0.090

NOTES:

1) Escalation Rates:

Costs: escalate at CPI til 1995, then decrease 1pt per yr til 2000, then .2 pts per yr

Revenues: escalate every 3 yrs close to actual CPI growth. After 9 years, bring in line with expense growth.

2) Discount Rates:

Rate is a function of long-term bond rate, systemic risk and long-term CPI.

Source: APS Analysis

function of the CPI (Consumer Price Index) and economic assumptions regarding the future.

The present value (1993) of the stream of revenues and expenses for the years 2000 to 2030 is $US 851M. This value does not include any earnings which may be derived from cargo operations. The present value figure represents the amount available for principal payments and interest on the capital cost, replacement of capital items and shareholder earnings. The annual payments to debt holders could be matched to the anticipated annual cash flows.

4.3 Financing

The amount to be financed may be reduced from the full capital cost by one or a combination of the following:

1) equity investment,
2) passenger facility charge for SJO operations up to the opening of the new airport.
3) sale of a portion of land currently occupied by Juan Santamariá International,
4) sale of land currently occupied by Tobias Bolaños airport.

The funds to be raised from the above sources could be a key factor on the development of a new facility under the public concessions law. In view of the combinations possible, all that can be said at this time is that the greater the contribution from these sources, the more readily the new facility financing can be arranged.

The proposed source of funds breakdown should form part of any development proposal put forth by private interests which will also consider the Government of Costa Rica inputs.

5. ENVIRONMENTAL IMPACT ASSESSMENT

Airport environmental planning has, with the growth of aviation in recent years, become an integral part of any airport development. There are basically three areas of concern in evaluating the impact of airport operations on the country and communities; these are noise, air and water pollution, and ecological effects. In addition, an evaluation must be carried out with respect to adverse social effects of such development. This section of the report will attempt to identify the areas of concern to the environment at Tarcoles. This assessment will indicate how these environmental concerns might be alleviated or reduced.

5.1 Noise

The noise exposure of the population due to aircraft operations can be estimated by the Noise Exposure Forecast (NEF) index, developed in the USA. The ICAO index referred to as Weighted Continuous Perceived Noise Level (WECPNL) differs only by a constant from the NEF index. A qualitative assessment of the noise was carried out at each of the sites in Volume III. The Noise Exposure Forecast at Tarcoles during the years 1991, 2010 and 2030 will be discussed below.

As mentioned above, the extent of aircraft noise exposure is expressed by the NEF index. Contours of equal NEF values in the vicinity of an airport are the accepted means of portraying the aircraft noise exposure. The shape and extent of these contours depend upon the types of aircraft involved, the flight paths which the aircraft follow, their proximity to the ground and the number of operations performed by each aircraft type. Once the aircraft operations data is obtained (forecast) it is submitted to the computer program which computes resulting NEF index values at predetermined locations around and on the airport.

The computation takes into account the number of flights in a 24 hour period of each type of aircraft as shown in Table 5.1 (year 1991) and Table 5.2 (years 2010 and 2030). The flight paths for operations out of Tarcoles were based on the recommended procedures set forth in Volume III. Direction of operation was taken as 57% of the time from Runway 03 and 43% on Runway 21, based on the windrose developed in Volume III.

The NEF contours were computed for the traffic in the years 1991, 2010 and 2030. The aircraft types and traffic was generated from the data developed in the forecasts to Volume II. The breakdown between night and day operations was determined based on current traffic patterns at SJO. NEF contours for the three periods are shown in Figures 5.1 through 5.3.

In the charts, the area under the NEF 30 contour was shaded. This noise level is normally considered the maximum tolerable for residential areas, as shown in Table 5.2. Hospitals and schools can tolerate less noise and should be outside the NEF 30 contour and also have appropriate noise control features in the building design. Patients' level of anxiety is increased due to association of danger with noise.

In comparing Figure 5.1 with Figures 5.2 and 5.3, it can be seen that there is a significant reduction of noise resulting from the future useage of more advanced and quieter stage 3 aircraft. Figure 5.3 shows that very few people will be affected by noise contours exceeding 30.

5.2 Air and Water Pollution

Airports are generally not considered great sources of air pollution. The pollutants emitted by aircraft and related sources tend, in most cases, to dissipate to low concentrations before reaching the airport boundaries and are thus noticeable mostly within the airport itself, mainly in the terminal area.

TABLE 5.1
Departures and Arrivals for 1991

Aircraft	Departures		Arrivals		Total Departures	Total Arrivals
	Day	Night	Day	Night		
A310	1	0	1	0	1	1
B707	1	0	1	0	1	1
B727	13	1	7	0	14	7
B737	5	1	5	0	6	5
B757	0	1	0	1	1	1
BN-2A/B	5	0	5	0	5	5
C-212	6	0	6	0	6	6
DC8	0	2	2	0	2	2
DC10	2	0	2	0	2	2
GA	27	0	28	0	27	28
Total	**60**	**5**	**57**	**1**	**65**	**58**

Note: Departures were broken down into ranges of 0-500 NM, 500-1000 NM and 1000-1500 NM for the analysis.

TABLE 5.2
Departures and Arrivals for 2010 and 2030

Aircraft	Departures (2010)		Arrivals (2010)		Total Departures	Total Arrivals
	Day	Night	Day	Night		
GA	48	0	48	0	48	48
Small Turbo Prop	9	0	9	0	9	9
Turbo Prop	11	0	11	0	11	11
Narrow Body	29	10	27	2	39	29
Wide Body	4	0	4	0	4	4
Large Wide Body	2	0	2	0	2	2
Total	**103**	**10**	**101**	**2**	**113**	**103**

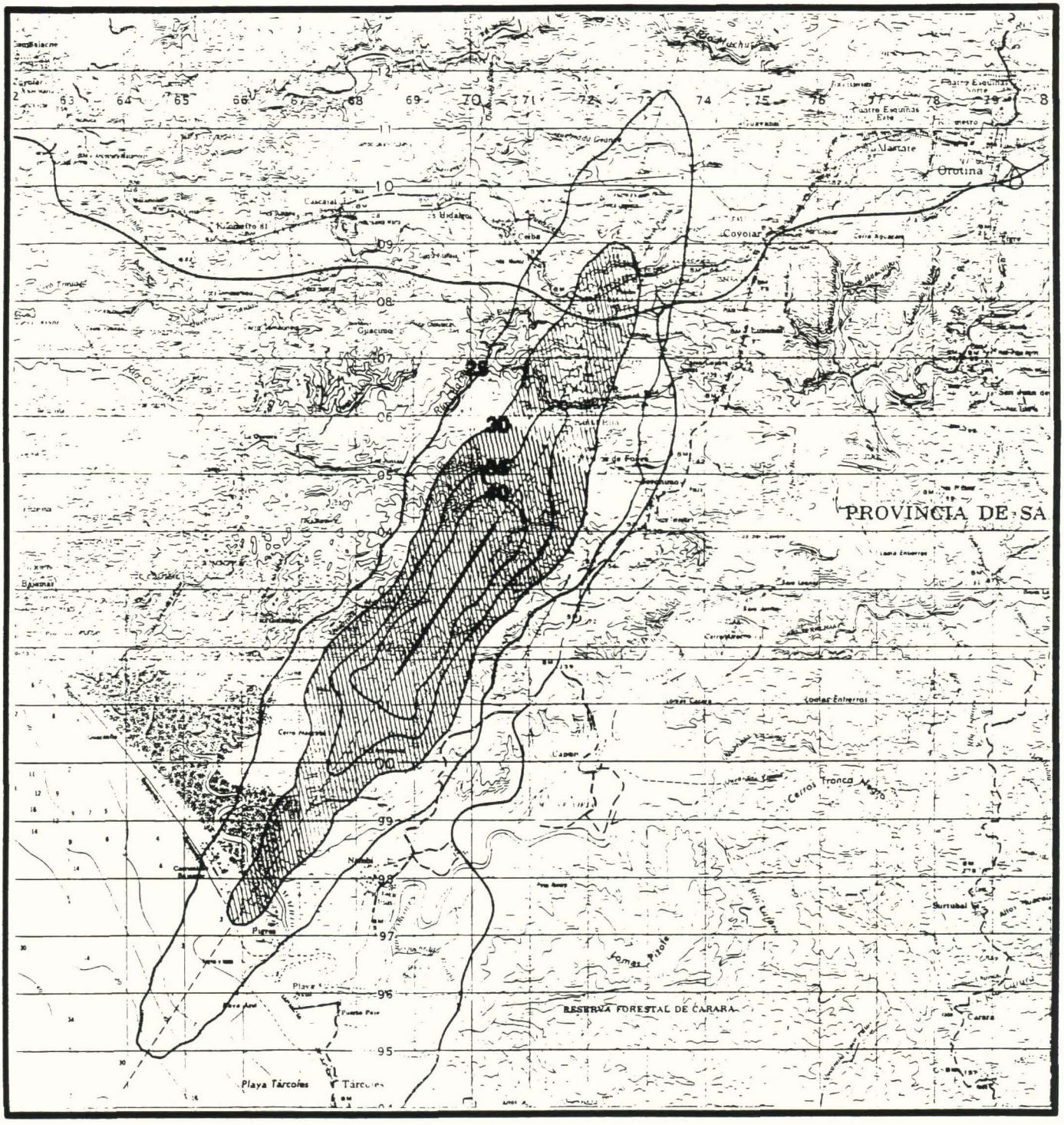
Aircraft	Departures (2030)		Arrivals (2030)		Total Departures	Total Arrivals
	Day	Night	Day	Night		
GA	63	0	64	0	63	64
Small Turbo Prop	11	0	11	0	11	11
Turbo Prop	13	0	13	0	13	13
Narrow Body	72	17	74	3	89	77
Wide Body	9	0	7	0	9	7
Large Wide Body	4	0	4	0	4	4
Total	**172**	**17**	**173**	**3**	**189**	**176**

Note: Departures were broken down into ranges of 0-500 NM, 500-1000 NM, 1000-1500 NM, 1500-2500 NM, 2500-3500 NM and 4500+ NM for the analysis.

FIGURE 5.1

NOISE CONTOURS FOR TARCOLES RUNWAY 03 - 1991

ECONOMIC FEASIBILITY STUDY - COSTA RICA

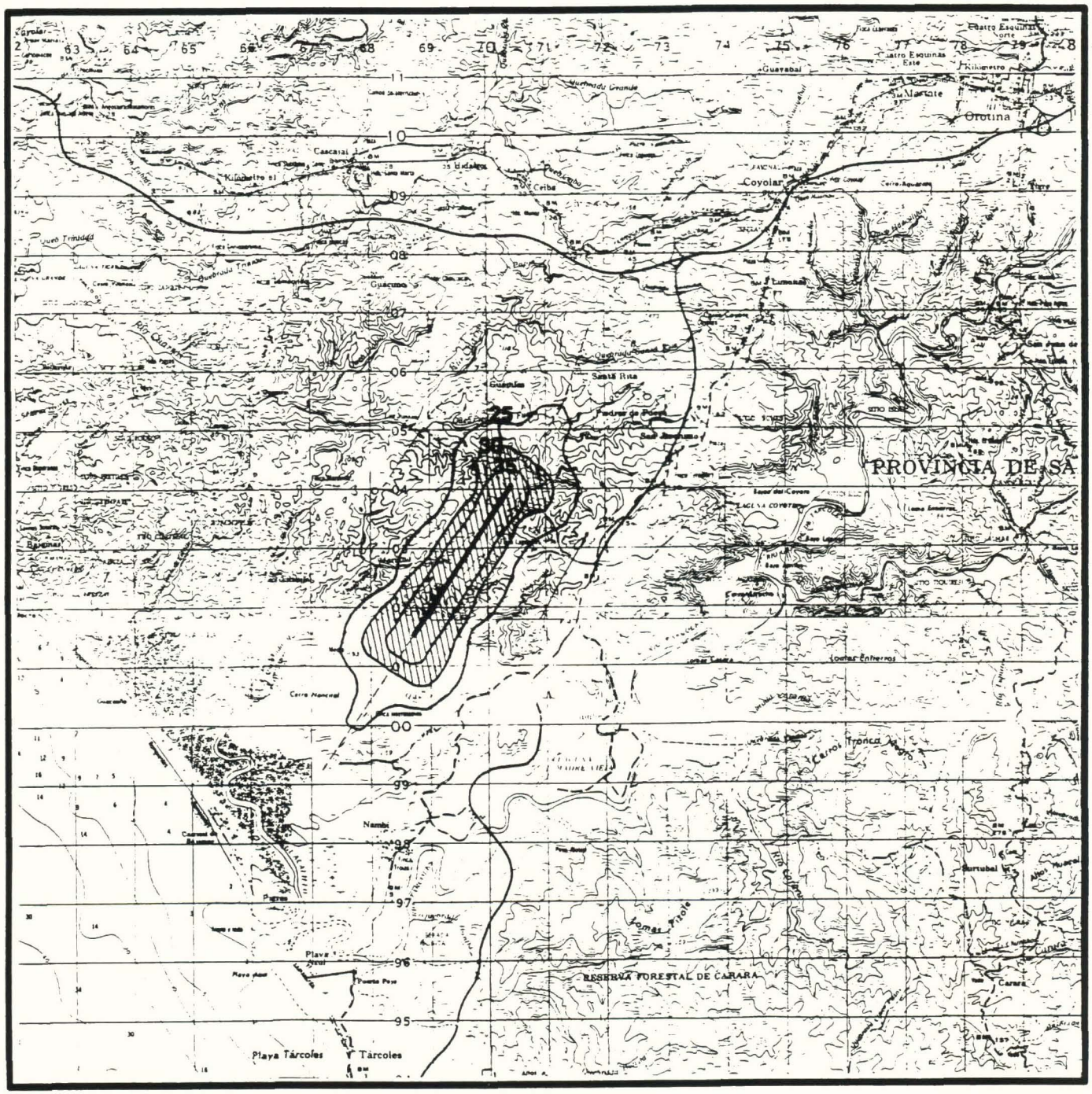


Scale
1 : 100,000

FIGURE 5.2

NOISE CONTOURS FOR TARCOLES RUNWAY 03 - 2010

ECONOMIC FEASIBILITY STUDY - COSTA RICA

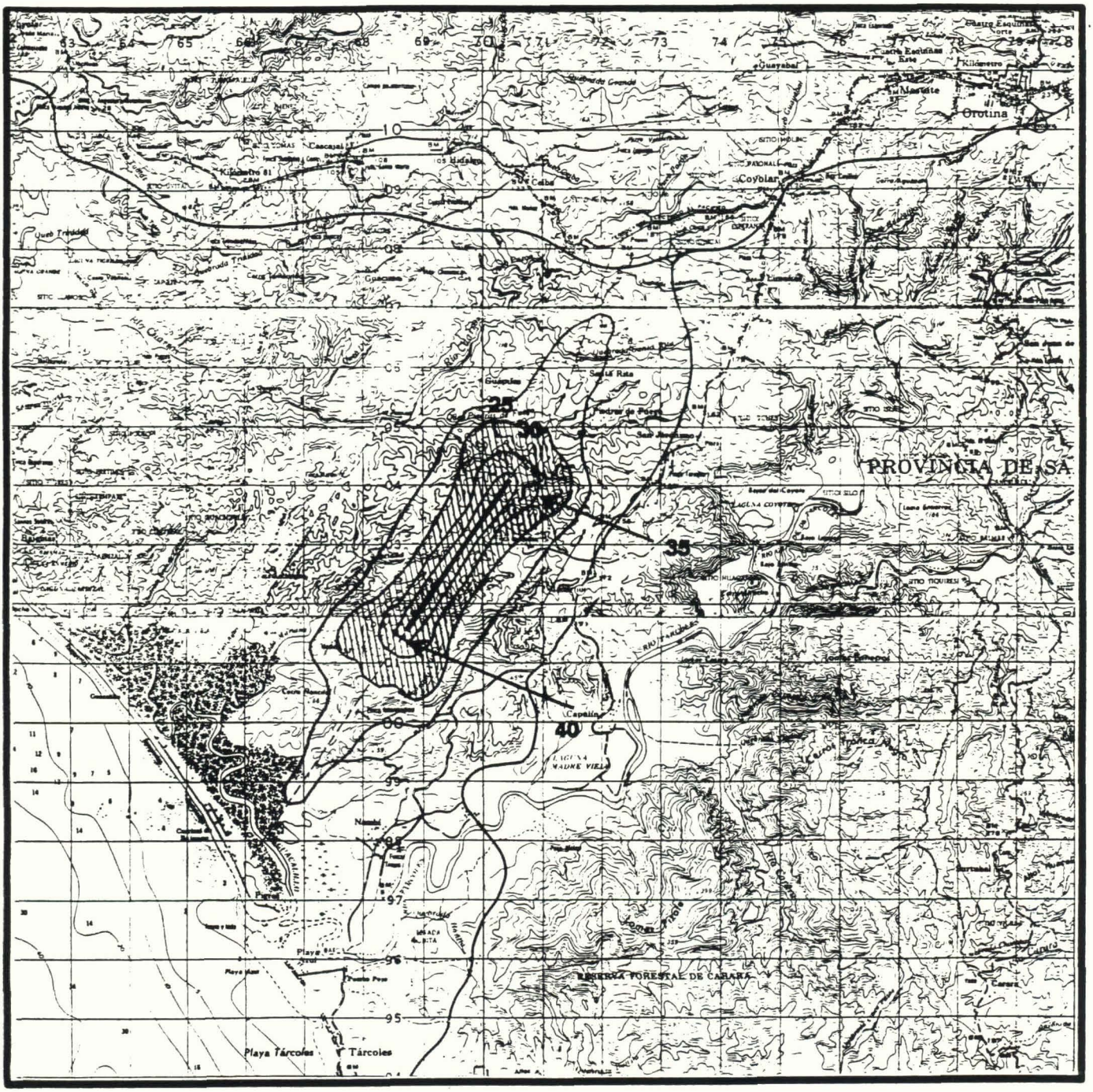


Scale
1 : 100,000

FIGURE 5.3

NOISE CONTOURS FOR TARCOLES RUNWAY 03 - 2030

ECONOMIC FEASIBILITY STUDY - COSTA RICA



Scale
1 : 100,000

The greatest problem occurs during idle power and apron manoeuvring, and thus exhaust products are very evident around terminals where there is a concentration of aircraft with engines idling. Ground operation procedures to restrict idling can basically control this problem.

With the Carara Biological Reserve nearby the proposed airport at Tarcoles, air pollution from aircraft operations could have some effect, and any holding patterns should be carried out to the west of the airport over the ocean.

An airport can be a major contributor to water pollution if suitable treatment facilities for airport wastes are not provided. As such, the environmental study in the detailed design phase must consider how various sources of water pollution can be treated since this could be a major concern at the Tarcoles site due to the proximity to the Tarcoles River.

5.3 Ecological Aspects

Apprehension has been expressed as to the possible effects of aircraft operating at Tarcoles on the Carara National Biological Reserve, located approximately four kilometres SE of the proposed airport on both the north and south sides of Rio Grande de Tarcoles. The tropical forest contains, among other things, amphibians, reptiles, aquatic birds and a diversity of flora. Arbofilia, a reforestation redevelopment endeavour, is a self-sustaining group located near the Carara Reserve. This project is carried out entirely by Costa Ricans with no international or government involvement. Adults and children work in the nurseries planting, caring for seedlings, pruning, grafting. Of five new plants produced, two are returned to the forest and three are sold. As a result, any effects from aircraft on the wildlife and farming would be considered undesirable.

Birds can pose a threat to aircraft and they are a major problem at many airports throughout the world. They can damage aircraft in flight and have been the cause of several fatal accidents. The main danger is through ingestion of birds into a turbojet engine during the critical phase of take-off.

To make the surrounding area compatible with the airport, care should therefore be taken in determining land-use of the region. However, to make it totally acceptable, care must be taken to prevent the planting and harvesting of crops from attracting birds to the departure and approach areas of the airport.

The Macaws which inhibit the reserve apparently fly across the Tarcoles River at sundown to nighttime resting places in mangroves along the ocean, particularly in June and July. It would therefore be advisable to track their movements on surveillance radar and caution pilots as to their presence.

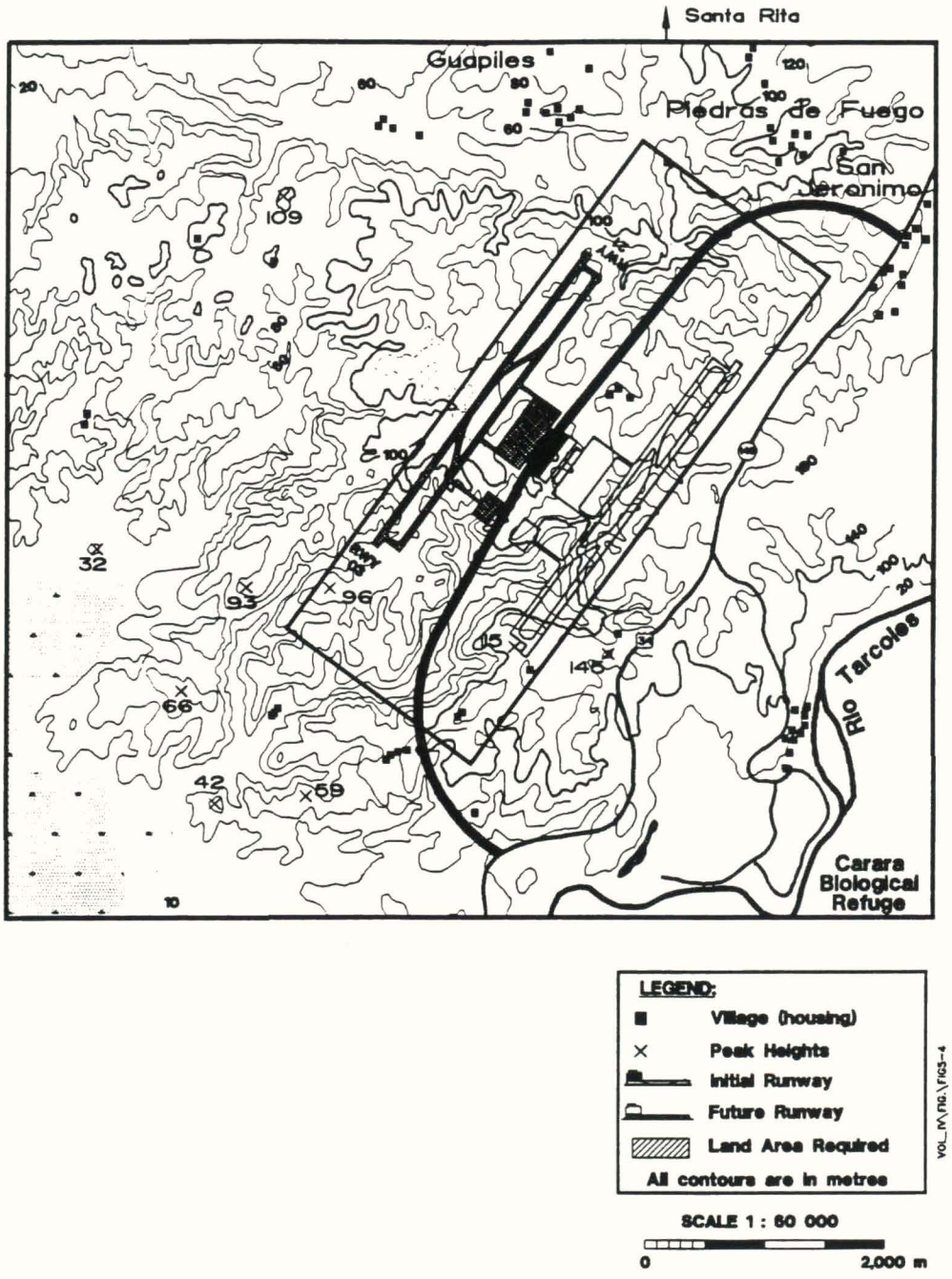
5.4 Adverse Effects to Social Development

The following is a preliminary overview of the impact of the airport sites on the development of the area, specifically the population and infrastructure in the area. The primary focus of this section is on the displacement of the population as this is believed to be the most intrusive element of airport construction. Figure 5.4 shows the location of the airport at Tarcoles, highlighting the populated areas and infrastructure elements that could be adversely effected by the airport.

From a review of the maps, there appear to be less than ten homes or structures of some type within the area required for the airport. The actual number would require investigation but it appears to be small. The closest towns to the site include San Jeronimo, Piedras de Fuego, Santa Rita and Guápiles, which would all be affected to some degree by the noise generated by airport operations. The next phase must include a more detailed environmental impact study of Tarcoles,

FIGURE 5.4
PHYSICAL INFRASTRUCTURE AFFECTING DEVELOPMENT OF AIRPORT
ECONOMIC FEASIBILITY STUDY - COSTA RICA

TARCOLES SITE



which must include, among other items, the examination of the location of the Arbofilia project at the Carara Reserve and the surrounding population, which may be effected by the airport construction and operation.

No major roads would be blocked by the construction and access to the site would appear to require only a link to Highway 143, which currently passes the site. As noted earlier, the access roads should be widened to four lanes.

In the case of this site, it is not assumed that workers residing in the area will have the necessary expertise to operate the airport. Some workers would have to be transported or relocated from the San José area and current residents in the area could presumably be retrained. The benefit this would bring to residents near the new site and the potential loss of jobs to some of the current workers at SJO is examined in the next section.

5.5 Summary

From an environmental standpoint, it is obvious that consideration must be given to study measures to alleviate noise, bird hazards, and wildlife disruptions. A detailed environmental impact study should be carried out at the proposed site of Tarcoles during the detailed design phase.

6. ECONOMIC IMPACT

In order for the new airport to be a viable project, the net effect of its operation should be an increase in economic activity within Costa Rica. This section identifies the economic impact, advantages and disadvantages, of the airport on the economy.

6.1 Benefits To Economy of Costa Rica

The following quantifiable and non-quantifiable, or tangible and intangible, benefits, should result from the development and operation of a replacement international airport.

6.1.1 Development Sustainability

An efficient transportation system is a pillar of development sustainability. Specifically, an airport provides access to other markets. The more efficient and effective the airport, the better the access obtained. Juan Santamariá International Airport (SJO), as it currently operates, is not an efficient operation and, even with the short-term strategies planned to upgrade the airport, is not anticipated to significantly remove the inefficiencies. As air traffic levels increase, SJO will not be able to keep pace with the rising demands and users of the airport, including airlines, passengers, cargo carriers, etc., may become dissatisfied to the extent that they take their business to other countries. The carriers providing service to Costa Rica could decline, decreasing the access of local businesses to existing and additional foreign markets. A new airport, with the level of service demanded by the users, will be better positioned to provide continued and increasing access to outside markets, thereby providing a foundation for the continuing development process.

6.1.2 Export Promotion

Costa Rica is in the process of developing a more efficient export sector capable of generating the foreign exchange required to expand the import capacity and meet the country's external financial obligations. Currently, the airport facilitates the export of tourism, plants, vegetables, fruits and value added products, among other items. In 1991, tourism ranked second to bananas in terms of export earnings, thereby validating the importance of this industry to the economy.

The growth of tourism that is projected to occur during the next 40 years will be constrained by the current airport and export earnings therefore curtailed. Indeed, SJO will not be able to meet the air traffic demands beyond the beginning of the twenty-first century. A new airport will not only permit but also promote the growth of tourism, providing Costa Rica with the benefits of tourism, including increased tourism receipts, an increase in investment in accommodation and entertainment facilities for the tourists, etc.

There is currently a substantial wastage of perishable export items, such as flowers, which could be avoided by a modern, efficient facility. The revenue from the sale of these goods would benefit the local industry as well as the government, in terms of export revenues. A new cargo facility associated with efficient airport operations will additionally promote the export of these items, thereby increasing export opportunities for local industry.

Another benefit of the new airport will be the airport concessions that will expand and increase. The additional sale of fuel and related services will also provide more revenue.

6.1.3 Job Creation

Job creation opportunities begin during construction and will continue to grow with airport and hotel staffing requirements and growth in airport-related businesses such as bus, taxi, car rental services, etc. Also, employees of airport-related activities will provide clientele for businesses that will emerge around the airport.

As a focal point for economic development, the airport will reduce the concentration of business and industry in SJO and provide new opportunities to residents in the Puntarenes area.

6.1.4 Foreign Exchange Generation

As discussed previously, tourism currently ranks second in foreign exchange earnings in Costa Rica. The ability of a new airport to meet forecasted tourism demands, which SJO will be unable to do, will enable the continued and growing inflow of tourism foreign exchange earnings, which are required to meet the country's external financial obligations.

6.1.5 Multiplier Effect

The multiplier effect explains why increased airport activity will lead to increased economic activity in other sectors of the economy. That is, the direct economic impact will be increased by indirect and induced economic effects of airport activities. There will be a positive impact on passenger and employee service industries and businesses that depend on the airport for their own growth.

6.1.6 Technology Transfer

The new airport will be able to incorporate new technologies to improve cargo storage facilities, ensuring less cargo wastage, and to offer improved services, maintenance, security and convenience for passengers.

6.1.7 Management Development

Local citizens will benefit from training in appropriate management techniques, which will be required in order to ensure the efficient, effective and profitable operation of the new airport. The training will also provide an improved opportunity for women to participate equally in the operation of the airport and, therefore, in the development process. It is CIDA's contention that this equal participation is fundamental to the achievement of sustainable development, "effective development requires the participation of women from developing countries as decision-makers"[1]. Costa Rica is a leader in this area in Central America.

6.1.8 Environmental Improvement

The removal of the international airport services from the metropolitan area of San José will substantially reduce the pollution from airport noise and emissions experienced by the surrounding residents. As 60% of the country's population resides in the metropolitan area, the removal of this pollution from their lives is significant. Also, the number of residents near the selected site is a minute fraction of the current situation.

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[1] "Women in Development and Gender Equity", Canadian International Development Agency, 1992.

6.2 Disadvantages to Economy of Costa Rica

The nature of an airport is such that a number of disadvantages to its construction and operation exist. However, the disadvantages listed below are not expected to represent a threat to the sustainable development of the country.

6.2.1 Demands on Infrastructure

The new airport will place greater demands on access roads, power, water and other public utilities, which will be in excess of their current capacity and will require expansion. It should be noted, however, that despite the cost incurred, the infrastructure in Costa Rica already requires improvements and the infrastructure amelioration will provide a more efficient service to the residents and industries surrounding the airport and to all airport users.

6.2.2 Relocation of Residents

The residents that are relocated will be reimbursed for their property; however, the personal inconvenience and emotional implications of having one's family uprooted is a disadvantage. However, the limited number involved at Tarcoles represents a much less disadvantage, than the advantage to the entire economy from the new airport.

6.2.3 Environmental and Ecological Considerations

The environmental impact analysis was discussed previously in Section 5 of this volume. The construction and operation of the airport will bring a level of noise, air and water pollution; however, in the detailed design phase, the latest techniques as will be implemented to alleviate this impact. Moreover, as was previously mentioned in the discussion

of benefits, the number of residents effected by the operation of the new airport is less than 1% of the number currently effected.

6.2.4 Business Displacement

Export and import industries dependent on rapid air transport services tend to be established around an airport. This has occurred at SJO with greenhouses and free zones scattered around the current airport and Central Valley area. In order for these businesses to continue effectively, a quick and direct access to the new airport must be provided as noted earlier.

6.3 Conclusion

The benefits from the responsible development of a new airport far outweigh the disadvantages. Economic benefits will be derived from improved passenger and cargo services, improved maintenance and security and increased food, fuel and other concessions. The newly developed area will benefit from the airport as most of the purchases by or for the airport will be made from suppliers, dealers, manufacturers and service organizations in the region. More than likely, the majority of these purchases will continue to be from the same businesses given the close proximity of the current airport to the new site and the anticipation of direct and fast road transport between the Central Valley and proposed site. However, there is an opportunity for increased economic activity around the airport site.

The entire country should benefit from the ability to handle the forecasted increase of tourists as the new airport will offer security for travellers, convenience and safety in the terminal building and an assured quality of service. The investment to accommodate the tourists, the substantial job creation, foreign exchange generation, technology transfer and development of

management directly attributable to the new airport, all constitute benefits to the country.

The disadvantages include increased infrastructure investment, relocation of residents, environmental and ecological considerations and increased transportation costs for businesses which require rapid air transport from their current location near SJO.

The net outcome, however, is a significant and substantial increase in economic activity within the country enabling the sustainable development of the country and the generation of foreign exchange required to meet external financial commitments.

APPENDIX A

TABLE 3.1

MOPT Fee Schedule
(No. 20656-MOPT & DGAC Information, October 1992)
SJO, October 1992

1 Landing Fees

Based on maximum aircraft weight as in column (a) below.

2 Approach Fees

Fee for approach as in column (b) below.
For exclusively cargo flights, and a/c > =90,000kg, pay 18% of tariff.

3 Lighting Fees

If landing/taking off when lights are required, add column (c) below.

For Landing, Aproach and Lighting Fees:
Transit flights > = 90,000 kg pay ¢ 299.84/metric ton.
Source: articles 1-5.

Maximum Weight (kg)	Fee per metric ton (¢)					
	(a)		(b)		(c)	
	Local¢	Int'l$	Local¢	Int'l$	Local¢	Int'l$
0 to 7,500	7.00	0.07	11.00	0.11	0.30	0.01
7,501 to 15,000	11.00	0.11	14.00	0.14	1.05	0.01
15,001 to 38,000	12.00	0.12	20.00	0.21	2.40	0.02
38,001 to 60,000	93.00	0.97	121.00	1.24	4.35	0.05
60,001 to 90,000	93.00	0.97	242.00	2.52	6.65	0.07
90,001 plus	93.00	0.97	506.00	5.25	12.25	0.12

4 Boarding Bridge Fees - SJO only

Based on maximum aircraft weight.
For the first 90 minutes or part thereof, see table.
After 90 minutes, 60% of tariff for each half hour or part thereof.
Can add a surcharge.
Source: article 6.

BOARDING BRIDGE FEE

Maximum Weight (kg)	Fee per metric ton	
	Local¢	Int'l$
38,001 to 60,000	35.00	0.36
60,001 to 90,000	57.00	0.60
90,001 plus	103.00	1.07

5 Aircraft Towing Fees - SJO only

Based on maximum aircraft weight.
$0.24/metric ton if for purpose of takeoff.
50% surcharge, that is $0.36/metric ton, if for another reason.
Source: article7.

6 Aircraft Parking Fees

Cargo aircraft has 3 hours to unload and load.
Passenger aircraft has 90 minutes to unload and load.
For each 30 minutes beyond:
Domestic: ¢9.50/metric ton of maximum weight.
Int'l: $0.10/metric ton
Scheduled services between 1800h and 0600 hours receive 50% reduction in tariff.
Source: article 8.

7 Exemptions From Fees

Aircraft in government service
International/humanitarian missions
Emergency
Technical & meteorological flights
Source: article 9.

No article 9 in update.

8 Terminal Use by Pax Fee

Pax using services and installations of airport:

Int'l pax - tourists	¢780.00
Int'l pax - residents	¢5990 (USD 44.50)
Domestic pax	0
Transit pax	¢180 (USD 1.50)

Source: article 10.

9 Safety/Security Fee

Services ensuring safety and security of passengers:

International passengers:	¢6.00/pax
Domestic passengers:	¢5.00/pax

Source: article 11.