6.2 Airport Facility Plan

Planning of the facilities of the new airport was made for the aforesaid two stages of development with the design years of 1995 and 2005 respectively, based on the planning parameters established in the preceding section 6.1.

6.2.1 Airport Facility Layout

Figs. 6-1 and 6-2 show the proposed airport facility layout plan for each stage.

The location of the runway which constitutes a basic element in airport layout planning has been shifted by 100 meters is parallel toward north from the position earlier considered in the site selection stage as presented in Chapter 5 hereinabove. This slight change has resulted from the detailed review of the entire situation based on the updated data and with due regards for such aspects as the amount of earthwork involved, existing water veins and creeks, and future extension possibility, etc. Along with the runway, the entire airport layout has been relocated as a whole, maintaining exactly the same configuration between one another of the facilities as that shown in Chapter 5, with apron and terminal facilities located on the south side of the runway in a place convenient for the surface approach to the airport from the existing national highway. As a result of this relocation, the total volume of earthwork involved in the new airport construction has been reduced by about 100,000 m^3 as shown in Table 6-4.

The orientation of the runway is set at N73°W of true north, and the wind coverage of more than 99 percent is expected as shown in Appendix 6B.

Since approach to the runway will be made principally from the west, calvert type approach lighting system is installed on the west end of the runway and simplified approach lighting system on the east end.

NOTE
— — GRADING AREA LINE
AIRPORT BOUNDARY & APPROACH ROAD RIGHT OF WAY

GRAPHIC SCALE
0 200 400 600 800 1000M
1 : 10,000

Fig. 6-1 AIRPORT LAYOUT PLAN(I)

REPUBLICA DE HONDURAS SECRETARIA DE COMUNICACIONES OBRAS PUBLICAS Y TRANSPORTE	
NEW TEGUCIGALPA AIRPORT DEVELOPMENT	
AIRPORT LAYOUT - I (AIRPORT AND APPROACH ROAD) FEASIBILITY STUDY	AUG 1979 2
JAPAN INTERNATIONAL COOPERATION AGENCY	

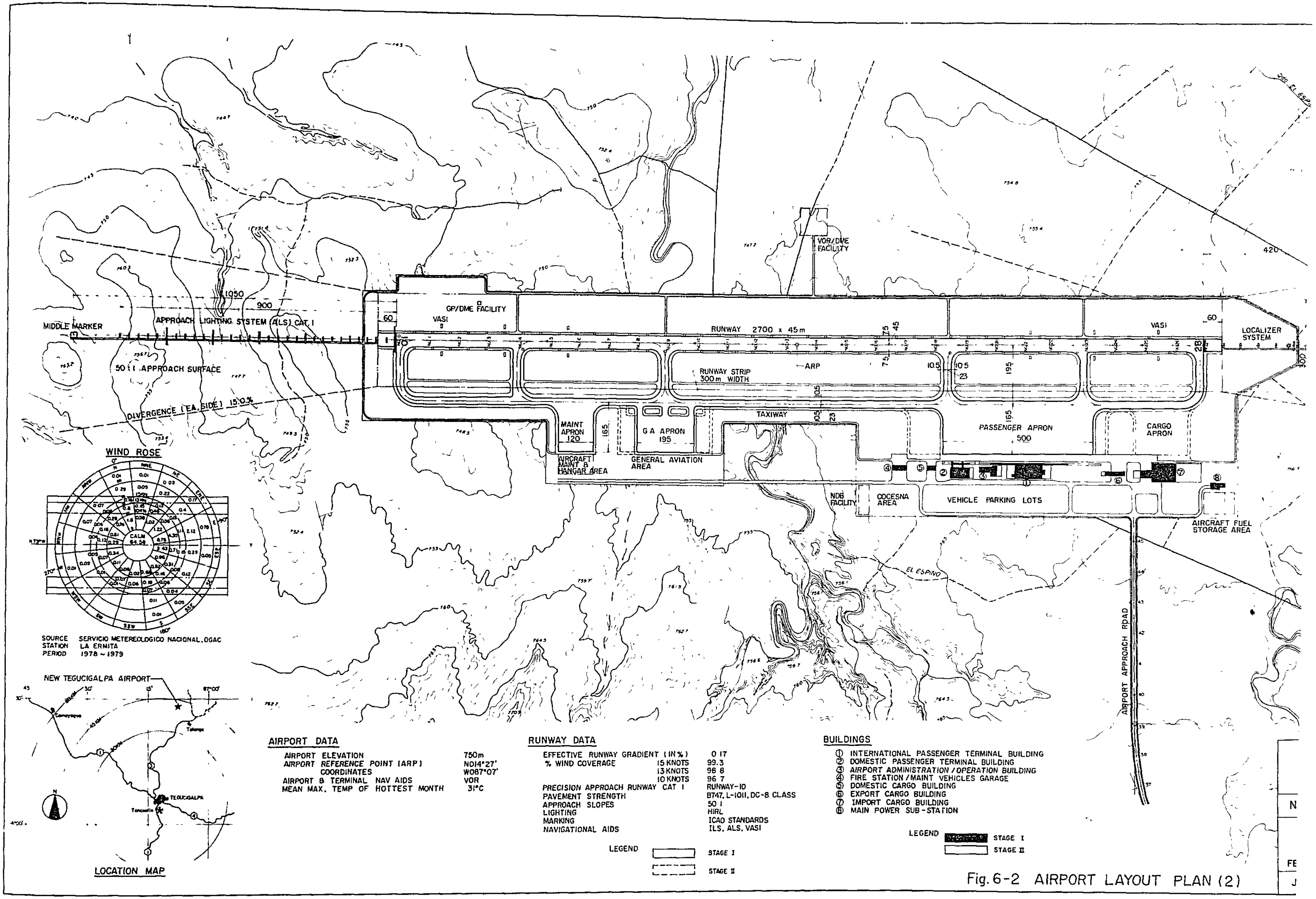
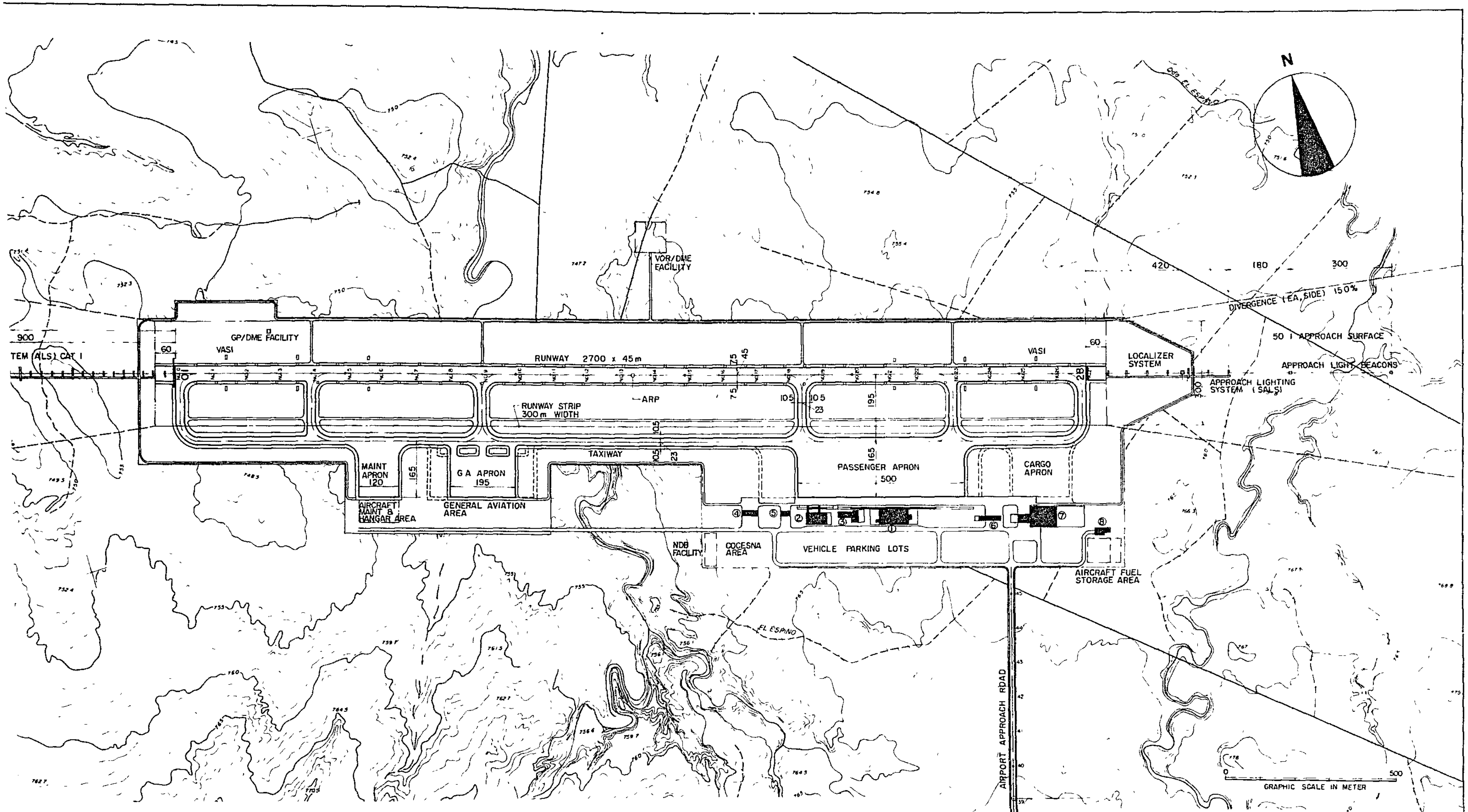


Fig. 6-2 AIRPORT LAYOUT PLAN (2)



AIRPORT DATA

AIRPORT ELEVATION	750m
AIRPORT REFERENCE POINT (ARP) COORDINATES	N014°27' W087°07'
AIRPORT & TERMINAL NAV AIDS	VOR
MEAN MAX. TEMP OF HOTTEST MONTH	31°C

RUNWAY DATA

EFFECTIVE RUNWAY GRADIENT (IN %)		0.17
% WIND COVERAGE	15 KNOTS	99.3
	13 KNOTS	98 8
	10 KNOTS	96.7
PRECISION APPROACH RUNWAY CAT I		RUNWAY-10
PAVEMENT STRENGTH		B747, L-1011, DC-8 CLASS
APPROACH SLOPES		50:1
LIGHTING		HIRL
MARKING		ICAO STANDARDS
NAVIGATIONAL AIDS		ILS, ALS, VASI

LEGEND
STAGE I
STAGE II

BUILDINGS

1. INTERNATIONAL PASSENGER TERMINAL BUILDING
2. DOMESTIC PASSENGER TERMINAL BUILDING
3. AIRPORT ADMINISTRATION / OPERATION BUILDING
4. FIRE STATION / MAINT. VEHICLES GARAGE
5. DOMESTIC CARGO BUILDING
6. EXPORT CARGO BUILDING
7. IMPORT CARGO BUILDING
8. MAIN POWER SUB-STATION

LEGEND
STAGE I
STAGE II

Fig. 6-2 AIRPORT LAYOUT PLAN (2)

REPUBLICA DE HONDURAS SECRETARIA DE COMUNICACIONES OBRAS PUBLICAS Y TRANSPORTE	
NEW TEGUCIGALPA AIRPORT DEVELOPMENT	
AIRPORT LAYOUT - 2	AUG. 1979
FEASIBILITY STUDY	3
JAPAN INTERNATIONAL COOPERATION AGENCY	

An approach feeder road to connect the new airport to the existing national highway has been planned so as to optimize smooth surface traffic movements and to minimize the amount of earthwork involved..

Table 6-4 TOTAL VOLUME OF EARTHWORK REQUIRED

Earthwork (m^3)	With Airport Layout Assumed in Site Selection Study	With Airport Layout Proposed in Final Report
Excavation	2,320,000	2,198,000
Embankment	2,100,000	2,123,000
Total	4,420,000	4,321,000

6.2.2 Runway, Taxiway and Apron

The runway, 2,700 meter long and 45 meter wide with 7.5 meter wide shoulder, is planned for construction in Stage I, and no addition or expansion is considered for Stage II.

All of 23 meter wide taxiways are to be proviced in Stage I and are expected to be adequately serviceable throughout Stage II. Parallel taxiway is provided along the entire runway length. Right angle exit taxiways comprise two connecting to the passenger loading apron and one to the general aviation apron, besides the one connecting between both ends of the runway.

All aprons except for the cargo apron are planned in two stages in accordance with the facility requirements as shown in Table 6-1 above. Passenger loading apron is to be sited away from and on the east side of the water vein that crosses under the middle part of the runway, and will extend to 165 meters from the centerline of the parallel taxiway so as to accommodate nose-in parking of B-747 class aircraft. Cargo loading apron as such is not to be provided in Stage I where freighters are expected to share the passenger apron as necessary. Separate cargo apron with 2 freighter parking positions will be provided to the east of the passenger apron for the convenience of belly cargo handling, taking into consideration the location of the cargo terminal building.

Aprons for aircraft maintenance and general aviation use are planned on the west of the above mentioned water vein. The general aviation apron is to have large enough area to accommodate 25 percent of the total number of registered small aircraft of Honduras forecast in Section 3.6 above.

6.2.3 Terminal Facilities

1) Facility Layout

The entire terminal facility layout plan is shown in Figs. 6-3 and 6-4 for Stage I and Stage II respectively.

a. Passenger Terminal Building

Passenger terminals for international and domestic services are planned each in a separate building taking into account the convenience of passengers of the respective services, the ratio of passengers transferring between international and domestic services, staged development of the terminal complex, etc. To minimize the passenger walking distance, the international passenger terminal building is placed right in front of the center of the international passenger aircraft parking aprons, and the domestic passenger terminal building is placed 120 m to the west of

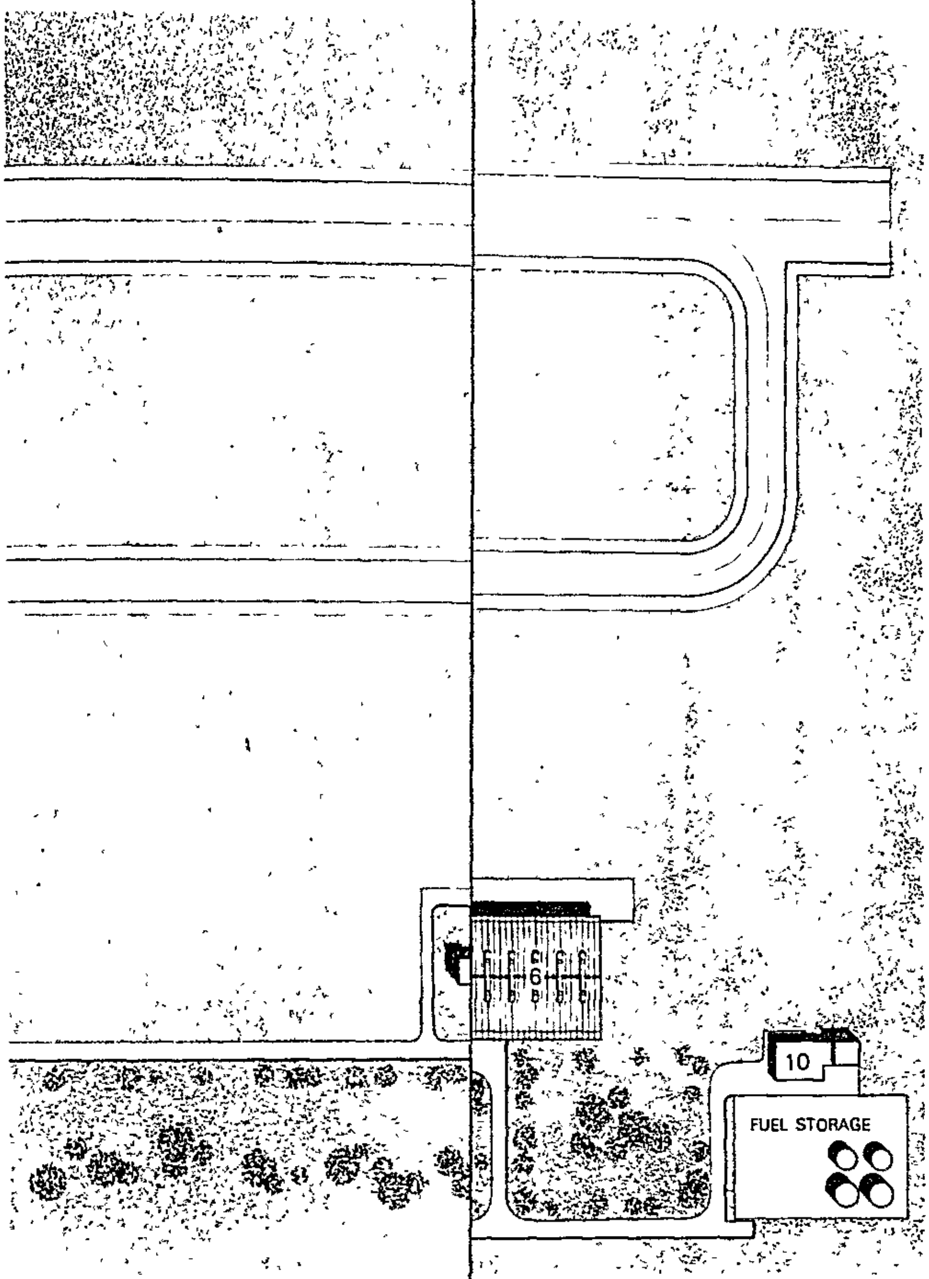


Fig.6-3 TERMINAL FACILITY LAYOUT PLAN (STAGE I)

REPUBLICA DE HONDURAS SECRETARIA DE COMUNICACIONES OBRAS PUBLICAS Y TRANSPORTE	
NEW TEGUCIGALPA AIRPORT DEVELOPMENT	
TERMINAL AREA LAYOUT PLAN STAGE 1	AUG 1979
FEASIBILITY STUDY	12
JAPAN INTERNATIONAL COOPERATION AGENCY	

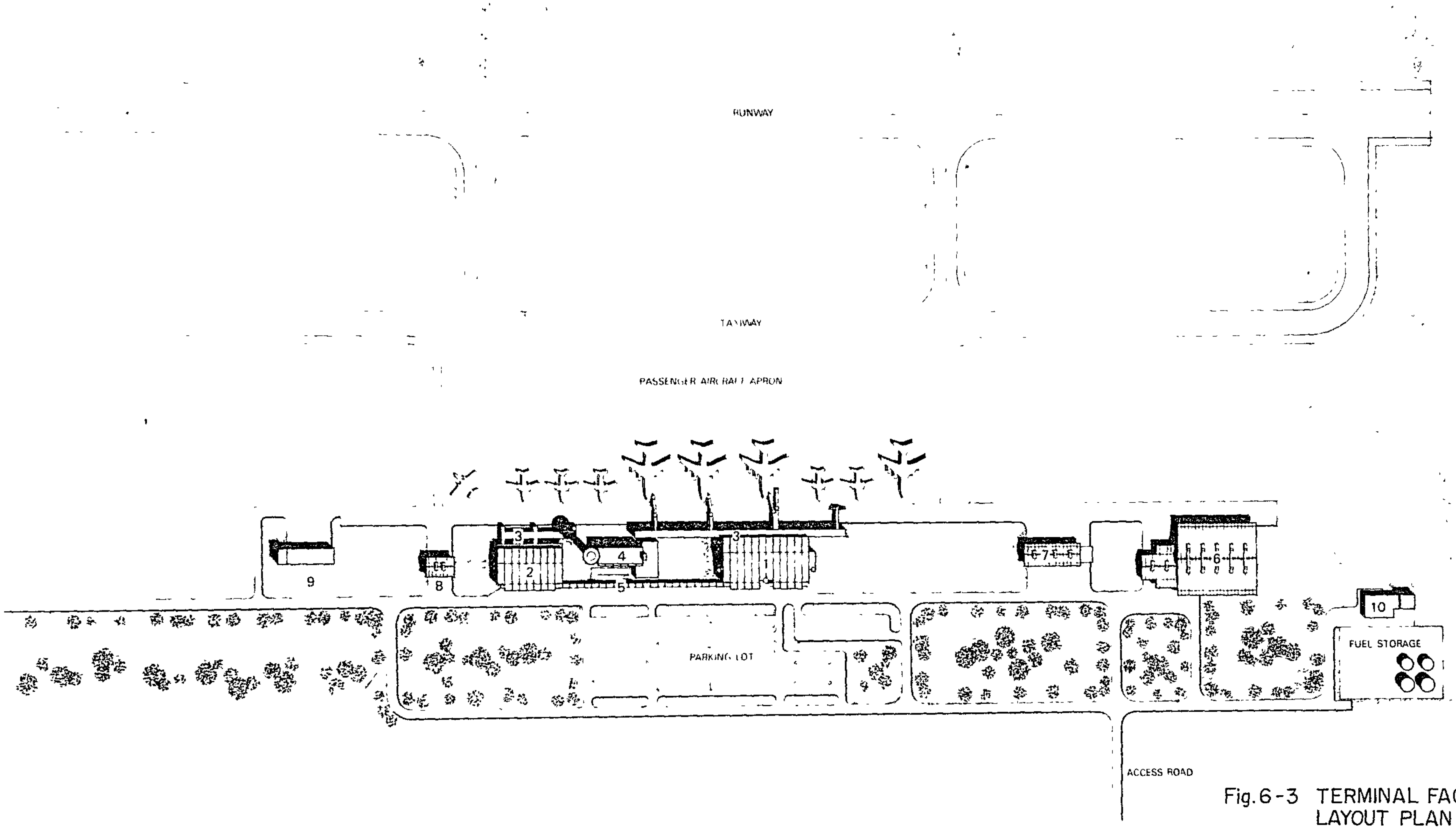


Fig.6-3 TERMINAL FACILITY LAYOUT PLAN (STAGE I)

1 INTERNATIONAL PASSENGER TERMINAL BUILDING
2 DOMESTIC PASSENGER TERMINAL BUILDING
3 FINGER CONCOURSE
4 AIRPORT ADMINISTRATION OPERATION BUILDING
5 COVERED WALK
6 IMPORT CARGO BUILDING
7 EXPORT CARGO BUILDING
8 DOMESTIC CARGO BUILDING
9 FIRE STATION MAINTENANCE VEHICLE GARAGE
10 MAIN SUB STATION

REPUBLICA DE HONDURAS
SECRETARIA DE COMUNICACIONES
OBRAS PUBLICAS Y TRANSPORTE

NEW TEGUCIGALPA AIRPORT DEVELOPMENT

TERMINAL AREA LAYOUT PLAN STAGE 1	AUG 1979
FEASIBILITY STUDY	12

JAPAN INTERNATIONAL COOPERATION AGENCY

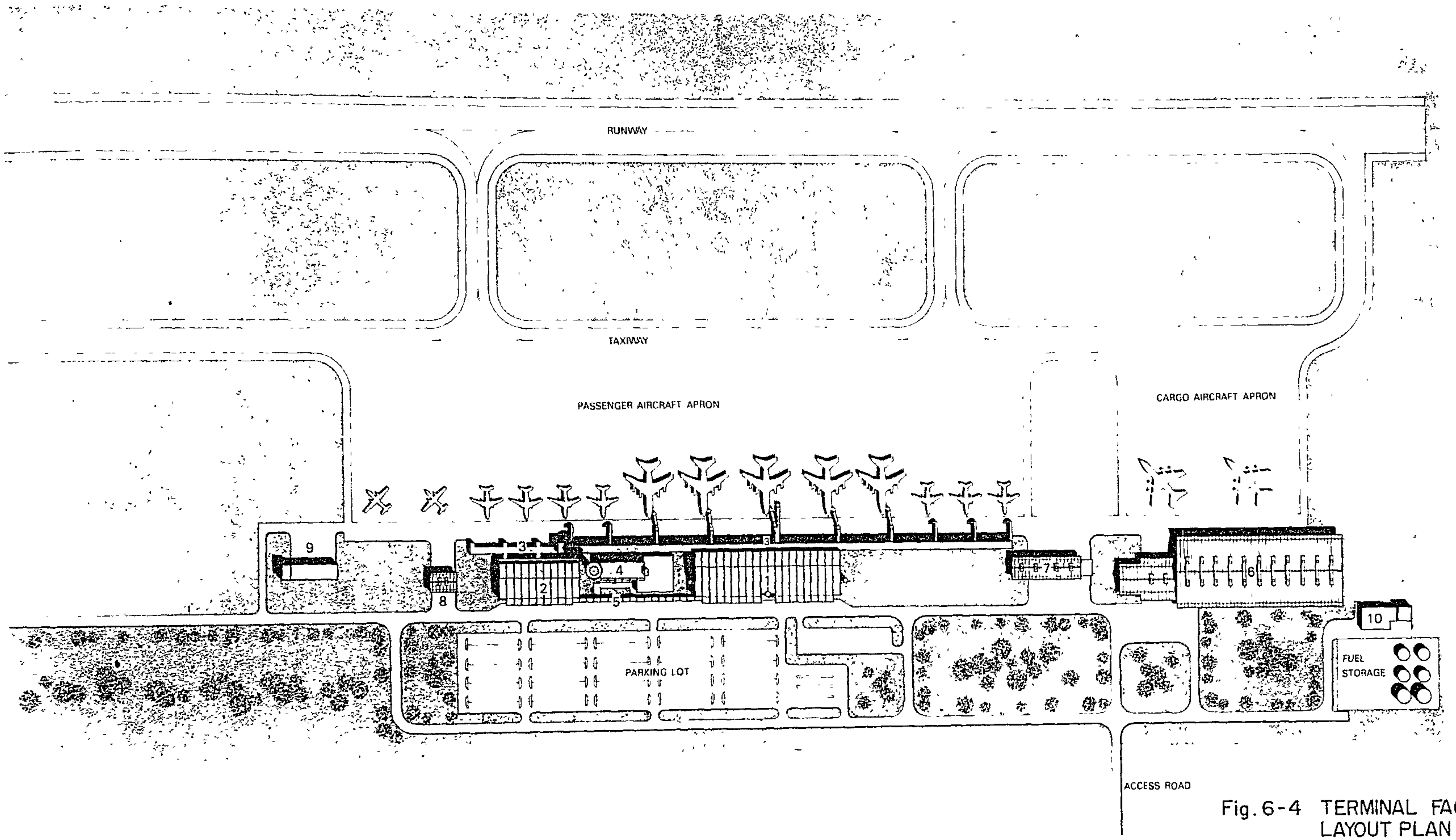


Fig. 6-4 TERMINAL FACILITY LAYOUT PLAN (STAGE II)

1 INTERNATIONAL PASSENGER TERMINAL BUILDING
2 DOMESTIC PASSENGER TERMINAL BUILDING
3 FINGER CONCOURSE
4 AIRPORT ADMINISTRATION OPERATION BUILDING
5 COVERED WALK
6 IMPORT CARGO BUILDING
7 EXPORT CARGO BUILDING
8 DOMESTIC CARGO BUILDING
9 FIRE STATION MAINTENANCE VEHICLE GARAGE
10 MAIN SUB STATION

REPUBLICA DE HONDURAS
SECRETARIA DE COMUNICACIONES
OBRAS PUBLICAS Y TRANSPORTE

NEW TEGUCIGALPA AIRPORT DEVELOPMENT

TERMINAL AREA
LAYOUT PLAN STAGE II

AUG 1979

FEASIBILITY STUDY

18

JAPAN INTERNATIONAL COOPERATION AGENCY

the international passenger terminal building close to the domestic parking positions.

b. Cargo Terminal Building

Cargo terminal is planned in 3 separate buildings, namely one for domestic cargo and two for international cargo comprising one each for export and import cargo to accommodate the particular requirements of the cargo handling system of the country. The international cargo buildings are located on the east side of the terminal area taking into account the position of the international passenger apron and international freighter apron, and also to avoid possible conflicts between cargo handling cars and general car traffic of the airport. The domestic cargo terminal building is located near the domestic passenger aircraft apron since domestic cargo is transported only in belly.

c. Airport Administration/Operation Building

An independent airport administration/operation building with control tower is planned from the viewpoint of security. It is placed in between the international passenger terminal building and the domestic terminal building, on account of its close functional relationship with the passenger terminal facilities.

d. Fire-fighting and Rescue Facilities

These facilities are planned on the west side of the domestic cargo terminal building where few obstacles exist at such a location as to facilitate speedy mobilization in case of emergency.

e. Main Substation

Main Substation is placed to the east of the terminal area for the sake of optimum layout of the electric power distribution system of the airport.

f. Fuel Storage Facility

Aviation fuel storage facilities are placed away from other facilities of the airport for reasons of safety and security, but not too far from the approach road so as to facilitate bulk delivery of fuel.

2) Facilities

a. Passenger Terminal Buildings

The one-and-half level international passenger terminal building is functionally divided into the departure block and the arrival block. In the departure block, the passenger check-in facilities are planned on the first floor, and the waiting lobby on the second floor. In the arrival block, Quarantine and Immigration facilities are planned on the second floor, and baggage claim and customs facilities are planned on the first floor. In the second stage of development, the terminal building is to be expanded on both sides by 4 seven-meter spans each in order to meet the increasing passenger handling requirements expected in international service. The conceptual plan of the passenger and baggage flow in the international passenger terminal building is shown in Fig. 6-5.

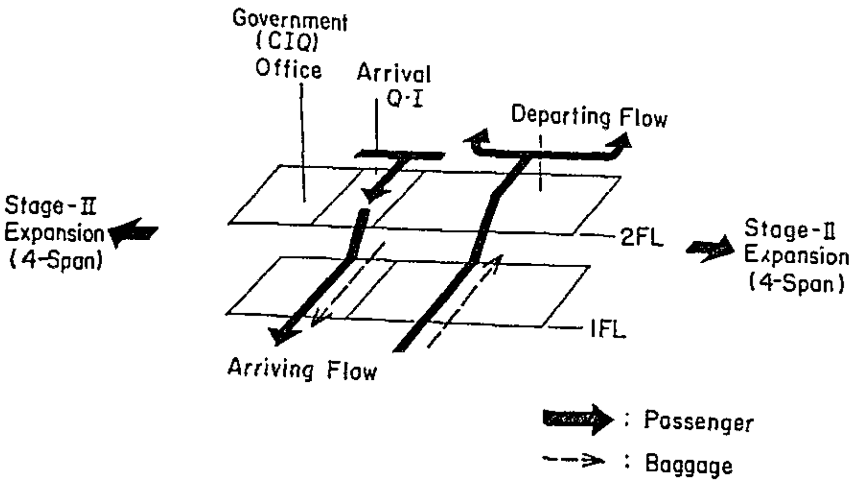


Fig. 6-5 CONCEPTUAL FLOW DIAGRAM OF INTERNATIONAL PASSENGER & BAGGAGE

Domestic passenger terminal building is planned with only one level judging from the domestic passenger traffic to be expected. It again consists of the departure block and the arrival block with a restaurant in between. In the second stage of development, departure block is to be expanded by two 12-meter spans.

The plans, sections and elevations of the passenger terminal buildings are shown in Appendix 6C.

b. Import Cargo Terminal Building

Import cargo terminal building is planned as shown in Appendix 6C with due regards for the functional coordination among the cargo storage area, cargo processing area, offices, transfer cargo handling area, and the cold storage area.

A basically manual cargo handling system supplemented by pallets and forklifts is planned for the import cargo building.

The cargo storage area is planned to have sufficient floor space to meet the cargo processing requirements with average staying period of import cargo of 15 days based on the present cargo handling performance at the existing Toncontín Airport. The cargo storage area will be expanded by twelve 7-meter spans on the east side, and the office space by three 7-meter spans on the west side.

c. Airport Administration/Operation Building

The three-level airport administration/ operation building with control tower is planned with four functional blocks as illustrated in Fig. 6-6.

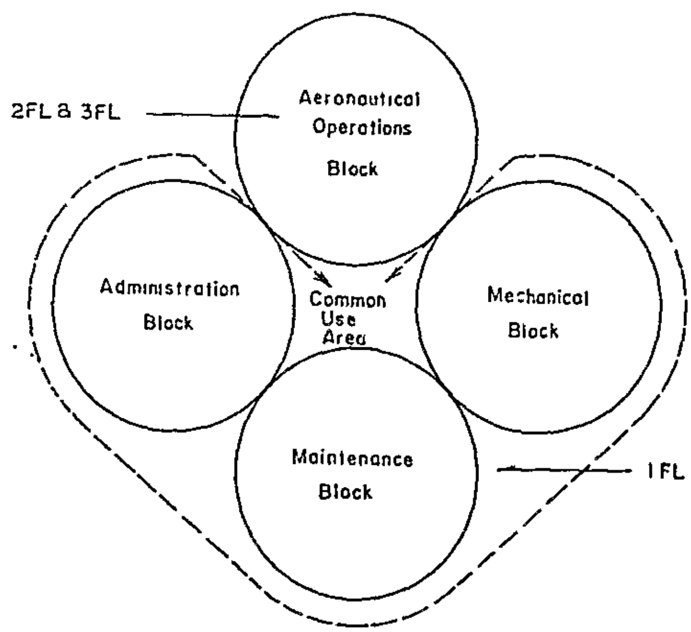


Fig. 6-6 ADMINISTRATION/OPERATION BUILDING PLANNING CONCEPT

In Stage II, the building will be slightly expanded except for the aeronautical operations block.

The floor plans, sections and elevations of the airport administration building are shown in Appendix 6C.

6.2.4 Airfield Lighting, Radio Nav-aids, Telecommunications and Meteorological Facilities

1) Airfield Lighting System

Airfield Lighting is planned as listed in Table 6-1 above for installation as illustrated in Appendix 6C in conformity with the standards and recommendations of the ICAO Annex 14 and Aerodrome Design Manual, Part 4.

Calvert formula (distance coded centerline) approach lighting system is planned for the precision approach runway, since this formula is economical and gives more information compared with the other alternative of ALPA formula (Barrette Centreline).

2) Radio Navigational Aids

The radio navigational aids of Instrument Landing System (ILS), VHF-Omni-directional Radio Range and Distance Measuring Equipment (VOR/DME), and Non-directional Radio Becon (NDB) are planned to be installed as shown in Appendix 6C in Stage I.

The ILS planned for Stage I for the precision approach runway 10 consists of the Localizer (LLZ), the Glide Path (GP) and the Middle Marker (MM), plus Distance Measuring Equipment (DME) installed near the Glide Path, a replacement for the standard ILS component of Compass Locater collocated with Outer

Marker (LOM), whose installation is not recommendable both from the topographical and economical points of view. Since Microwave Landing System (MLS) is expected to become the standard installation of landing aids in future, such a system is planned for Stage II to replace the Stage I ILS.

3) Telecommunications Facilities

The telecommunications facilities planned for the new airport consist of the two groups, the Aeronautical Mobile Service (AMS) and the Aeronautical Fixed Service (AFS) as shown in detail in Table 6-1.

All equipment for the AMS is provided in Stage I. As for the AFS, only teletypewriters are planned for installed in Stage I, all the rest of the installation required falling under the responsibility of COCESNA.

4) Meteorological Service Facilities

The meteorological service facilities are planned to be provided in Stage I as listed in Table 6-1 based on the requirements of the meteorological service standards specified in Annex 3, ICAO.

In addition, installation of the Automatic Picture Transmitter (APT) receiver station is also planned in Stage I in order to receive the meteorological information such as behaviour of cloud from the meteorological satellite.

6.2.5 Utilities

1) Electric Power Supply System

Power to be supplied to the new airport by ENEE (Empresa National de Energia Electrica) from the 34.5KV line built between Santa Fe and Talanga will be of the following characteristics:

Service Voltage	34.5 KV
System	3 phase 3-wire
Cycle	60 Hz

A main substation is planned on the airport premises to receive the ENEE-supplied power, and to supply the power at the voltage lowered to 4.16 KV for distribution through substations A through J to the airport facilities including the passenger terminal building, cargo terminal building, administration building and control tower, as well as the navigational aids, etc.

The electric power demand of these airport facilities is estimated as shown in Table 6-1.

Provision of stand-by engine generators with automatic on-off controls are planned for emergency power supply of navigational aids, building emergency lighting, and other essential facilities of the airport in case of commercial power failure.

Schematic diagram of the electric power distribution system is shown in Fig. 6-7.

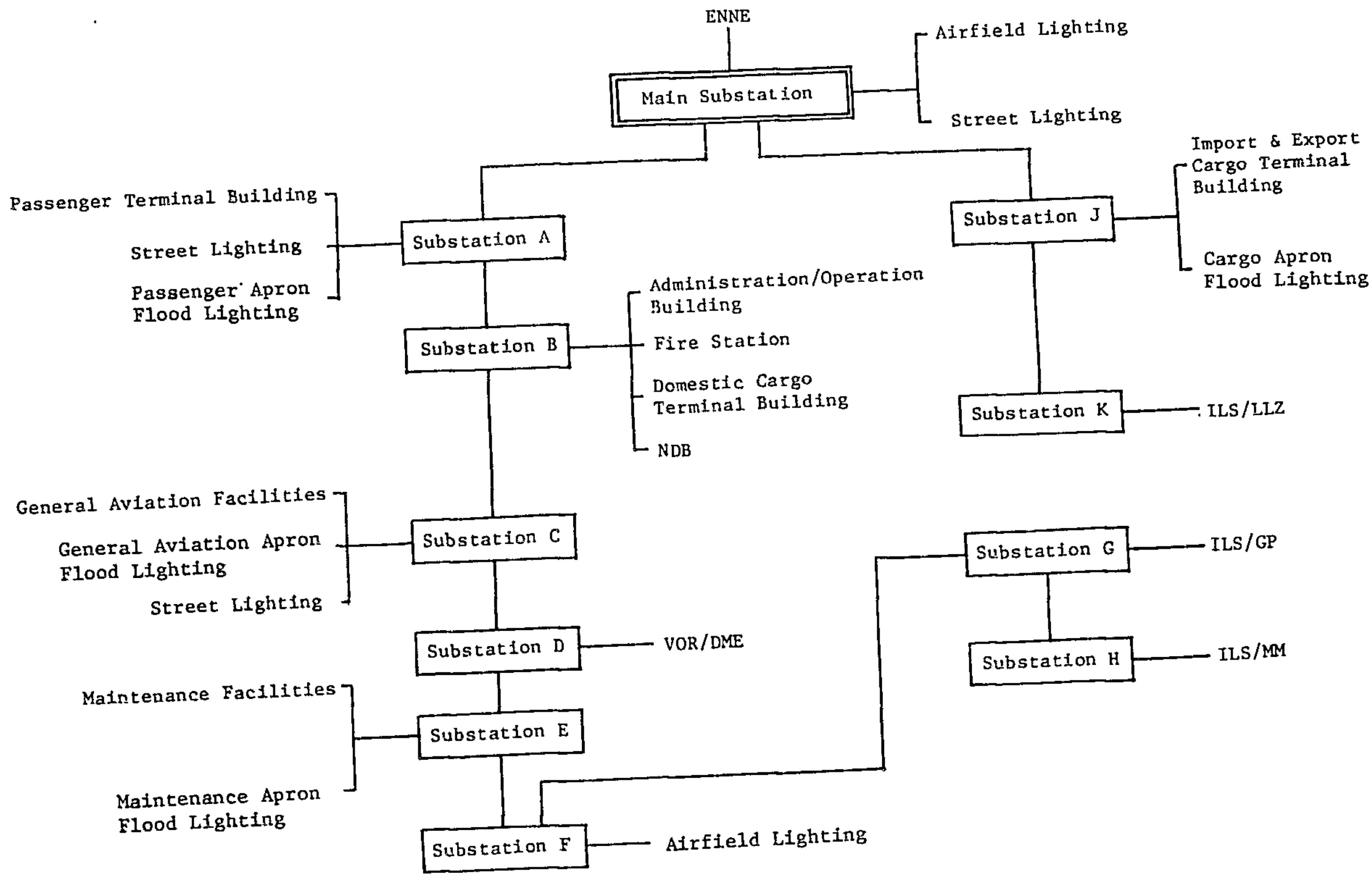


Fig. 6-7 ELECTRIC POWER DISTRIBUTION SYSTEM

2) Potable Water Supply Facilities

Although the construction of city water supply system is now under progress in Talanga, its planned capacity is not sufficient to meet the projected demand of the new airport as shown in Table 6-1, and, therefore, independent water supply system for exclusive use of the airport should definitely be provided. To this end construction of a deep well of 150 to 200 meters deep with 250 mm diameter is planned, since ground water at this site appears to have good enough potential as reliable source of potable water supply, judging from the results of test drilling made in 1978 for the sugar cane irrigation project in the Talanga Valley.

The water pumped up from the well will be purified through a siltation pond, a filter and a sterilizer, and will be distributed by gravity from an elevated storage tank to the various facilities of the airport, as illustrated in Fig. 6-8.

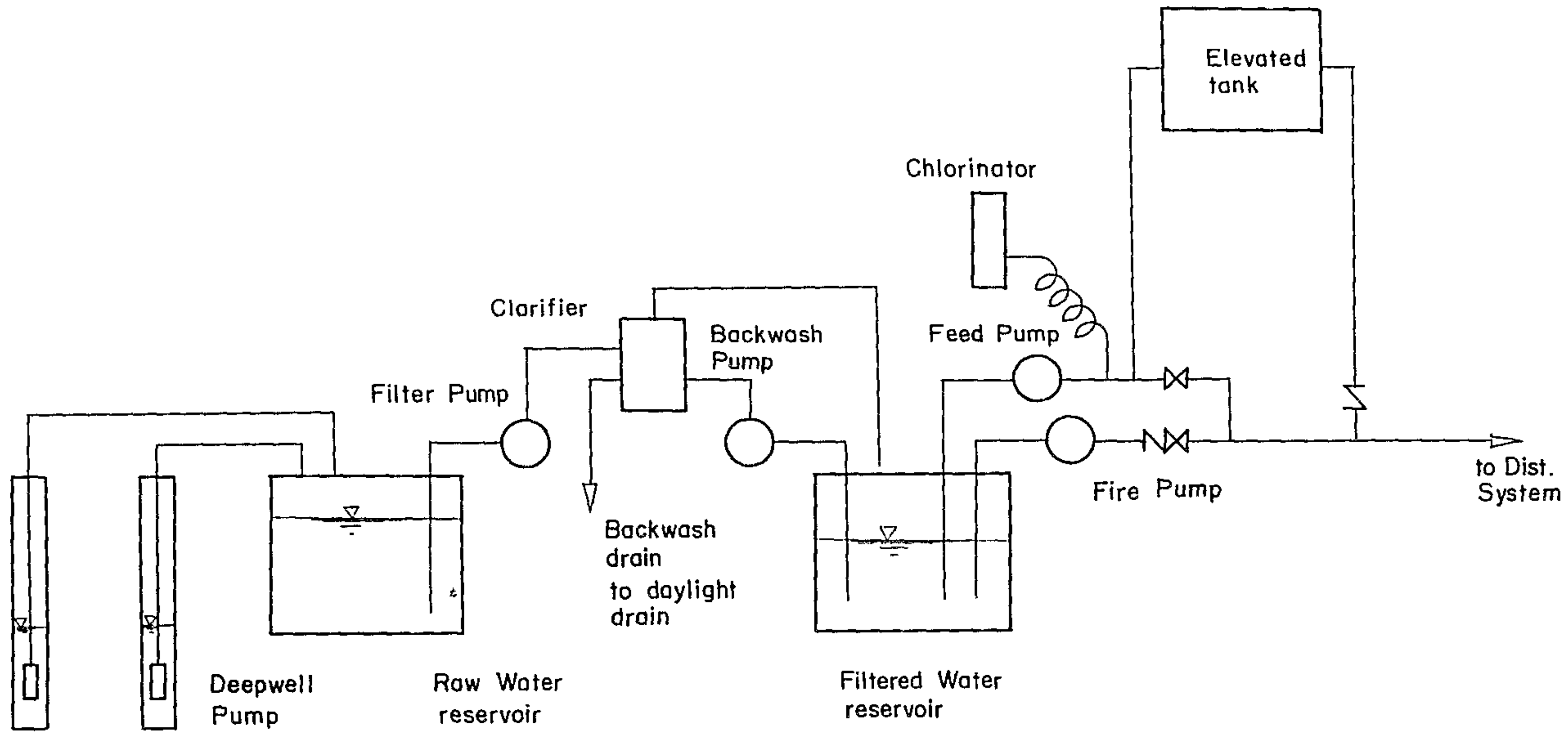


Fig. 6-8 POTABLE WATER SUPPLY SYSTEM

3) Sewage Treatment Facilities

No public sewage treatment facilities exist in Talanga, nor any regulations are in force with regard to the quality of discharged sewage. Nevertheless, provision of a preliminary treatment system at least is considered necessary for the new airport.

As shown in Table 6-1 in Subsection 6.1.2 hereinabove, daily treatment capacity of 350 Kl. and 500 Kl. respectively for the first and the second stages are estimated based on the potable water requirements. The facilities planned consist primarily of a septic tank and a filter bed as shown in Fig. 6-9, requiring an area of about 11,000 m^2 for the first stage and about 17,000 m^2 for the second stage. Biological Oxygen Demand (BOD) of the sewage purified by the planned system will be about 50 ppm.

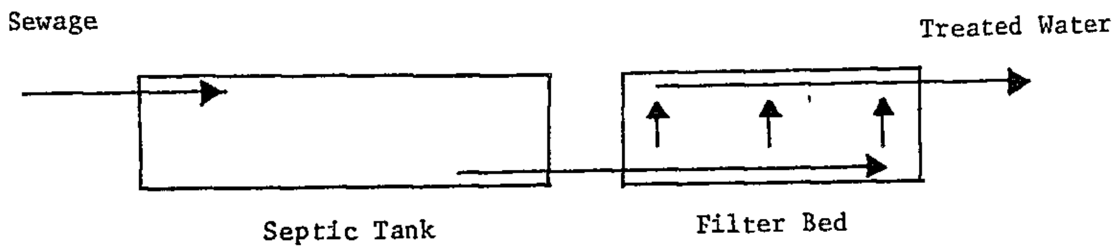


Fig. 6-9 SEWAGE TREATMENT FACILITIES

4) Telephone

HONDUTEL (Honduran Telecommunications) will supply the required telephone circuits as shown in Table 6-1 to the private branch exchange station to be housed in the international passenger terminal building.

6.2.6 Approach Road

An access feeder road to connect the new airport to the existing national highway which is about 5 kilometers away is planned as follows as shown in Appendix 6C.

1) Basic Planning Considerations

a. Number of Lanes

The peak hour one way road traffic volume is estimated at 406 cars in Stage I, and 524 cars in Stage II as shown in Table 6-1, and one lane for each direction enough to cater for the traffic volume is planned as illustrated in Fig. 6-10.

b. Design Criteria

Design velocity	60 Km/hour
Min. radius of curvature	150 m
Min. length of curvature	700 m/θ*
Max. longitudinal slope	5%

*θ : intersection angle of center line of road (degree)

2) Routing Alignment

Through paper location made on the topographic map of 1/5,000, a preliminary alignment was determined with due regards for minimizing the quantity of earthworks involved, avoiding the necessity of constructing sizable structures, providing smooth connection with the existing highway and for maximizing utilization of the existing roads. The preliminary alignment thus selected was examined through field reconnaissance and was adjusted where necessary. The resultant total length of the approach feeder road under plan amounts to about 4.5 kilometers.

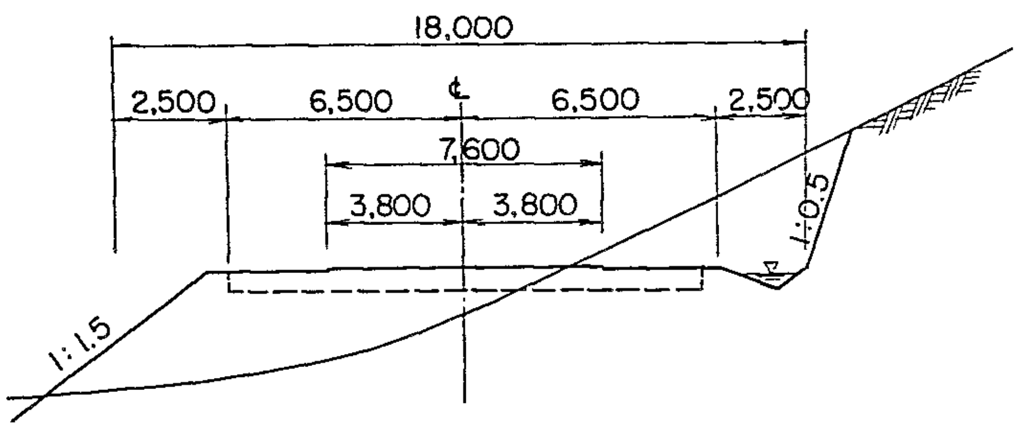


Fig. 6-10 STANDARD CROSS SECTION OF APPROACH FEEDER ROAD

3) Right-of-Way

In conformity with the standard Honduran practice, the right-of-way of the approach feeder road was planned to extend 30 meters across from the center to either side, totalling in a width of 60 meters. The entire area of the right-of-way is shown in Fig. 6-1.

6.2.7 Airport Premises

The airport premises was planned as delineated in Fig. 6-1 with a total area of 306 ha so as to be able to accommodatethe 2,700 meter runway and all the rest of the facilities planned in the foregoing, with due consideration for the necessary surface clearances, as well as for future terminal expansion.

6.2.8 City Air Terminal

In view of the fact that the new airport site is at 60 Km of road distance from the population centers of Tegucigalpa requiring 60 minutes by car, provision of a downtown city air terminal with airport limousine bus services would contribute greatly to the economy and convenience of airport users. It is recommended that planning of such a city terminal, if and when realized, be made as part of, or in conjunction with, the urban development plan of the metropolitan area.

6.3 Airspace Use Plan

6.3.1 Establishment of Instrument Approach and Departure Procedures

Instrument approach and departure procedure at the new airport was established in accordance with the criteria contained in ICAO PANSOPS Doc. 8168/611/3.

Wherever necessary planning was made by referring also to the FAA Terminal Instrument Procedures (TERPS), and the Criteria for Establishment of IFR Approach/Departure Procedures and Weather Minima established by the Civil Aviation Bureau of Japan.

Results of analysis of the wind data mentioned above in Subsection 6.1.3 indicate the percentage of easterly and westerly wind of 97 percent and 3 percent respectively as shown in Appendix 6B, and, therefore, precision approach to the runway is planned to be made from the west.

Basic factors on which the procedures were planned are shown in Table 6-5, and the procedures established for the new airport are illustrated in Appendix 6D,

6.3.2 Runway Usability

Runway usability of the new airport, calculated on the basis of the weather minima for each procedure as shown in Table 6-6, is 97 percent or more also as shown in the same table.

6.3.3 Aircraft Noise Contour

In order to forecast the impact of aircraft noise in the surrounding area of the new airport, WECPNL (weighted equivalent continuous perceived noise level) contour has been prepared. The WECPNL system takes into account not only the actual noise level but the "perceived noise level" wherein the noise levels in different frequency bands are weighted in accordance with the perception of the human ear, and account is taken of flights in various noise-generating categories, and of the proportion of flights within a day.

Contours of equal levels of annoyance are developed based on the noise levels of aircraft existing today, the planned method of aircraft operations, and the forecast number of flights by the types of aircraft expected to be in service at the new airport. The results of WECPNL noise contours on each design year of 1995 and 2005 are shown in Appendix 6E.

6.3.4 Noise-Related Land Use Plan

To prevent possible noise hazards expected in future, it is recommended that an effective land use plan be made at an early date by the competent authority of the Government through zoning the surrounding area of the new airport in accordance with the 1995 noise contours prepared in the foregoing. The area with the WECPNL of between 75 and 90 can be divided into several zoning categories according to the noise level, and appropriate land use restrictions should be established for each such category. The area having the WECPNL of 90 or more, on the other hand, is recommended to come under the direct jurisdiction of the new airport authority or of the national government.

Table 6-5 PLANNING FACTORS OF INSTRUMENT APPROACH AND DEPARTURE PROCEDURES

Elevation of Aerodrome Reference Point	2,480 ft (754 m)
Orientation of Runway	N73°W (true)
Runway Length and Width	2,700 m x 45 m
Designation of Runway	Runway 10 & 28
Precision Approach Runway	Runway 10
Elevation of Touchdown Zone	Runway 10 2,480 ft (753.0 m)
	Runway 28 2,470 ft (757.5 m)
Radio Nav-aids Installed	ILS, VOR/DME & NDB

Table 6-6 WEATHER MINIMA AND RUNWAY USABILITIES

Procedures			Weather Minima		Runway Usability (%)		
			Ceiling (Ft.)	Visibility (m)	Dry Season	Wet Season	Annual
Approach	ILS Approach Cat - I		300	800	98	98	98
	VOR/DME Circling Approach	Prop.	800	2,400	98	99	98
		Jet	800	3,200	97	98	98
	VOR Circling Approach	Prop.	1,200	2,400	98	99	98
		Jet	1,200	3,200	97	98	98
	NDB Circling Approach	Prop.	1,200	2,400	98	99	98
		Jet	1,200	3,200	97	98	98
Departure	Runway 10		300	800			
	Runway 28		300	800			

CHAPTER 7 CONSTRUCTION SCHEDULE AND COST ESTIMATE

7.1 Construction Conditions

7.1.1 Soil and Rainfall Intensity

1) Soil

The proposed airport site is covered by alluvial deposits more than 10 meters thick. The deposits, consisting of sand, silt and clay, are well consolidated having N-value of more than 40, and requires ripping work for excavation. Although the surface soil is hard in its naturally dry condition, it will easily turn muddy once disturbed and moistened, and therefore, special care will have to be taken in execution of earthworks in the wet season.

Appendix 7A shows the geological profiles of the proposed apron and runway center which have been prepared based on the results of soil investigations performed by the Government of Honduras in February 1979. The detailed results of field and laboratory soil tests are attached in Appendix 7B.

2) Rainfall Intensity

As is clearly seen in Table 7-1, the rainfall in the wet season accounts for more than 80 percent of the annual rainfall.

Table 7-1 MEAN MONTHLY RAINFALL AT TALANGA AND LA ERMITA

	(mm)
January	18
February	10
March	15
April	21
May	122
June	138
July	68
August	105
September	153
October	197
November	76
December	25
Annual	948

Note: Mean Values 1966 - 1976, including synthesised values 1966 - 1969.

Source: Cantarranas Suger Project Report, 1978

For assessment of workable days for civil works, the days of each month between March 1978 and February 1979 were classified by magnitude of rainfall based on the daily rainfall records of La Ermita. The results as summarized in Table 7-2 revealed that the total number of rainy days with rainfall of 5 mm and more during the rainy season corresponds to only about 35 percent of the total rainy days during the same period, indicating that sufficient workable days can be expected even in the rainy season.

The design rainfall intensity of 40 mm per hour for designing of the drainage system was calculated on the basis of the rainfall intensity records of Tegucigalpa as shown in Table 7-3, because such records of the Talanga area were not available.

Table 7-2 MONTHLY DAYS CLASSIFIED BY RAINFALL

		R = 0	$0 < R \leq 1$	$1 < R \leq 5$	$5 < R \leq 10$	$10 \leq R$
1978	Mar.	27	0	0	3	1
Dry Season	Apr.	22	2	2	0	4
	May	21	1	1	3	5
Wet Season	Jun.	15	5	3	3	4
	Jul.	12	5	8	6	0
	Aug.	16	6	5	3	1
	Sep.	14	4	7	1	4
	Oct.	19	2	4	4	2
	Nov.	15	5	6	3	1
	Dec.	19	4	5	2	1
1979	Jan.	25	3	3	0	0
Dry Season	Feb.	22	5	1	0	0

Source: Ermita Observation Station

Table 7-3 MAXIMUM RAINFALL INTENSITIES AT TEGUCIGALPA 1967 - 1971

Year	Rainfall Intensities (mm)								
	5 min	10 min	15 min	30 min	1 hr	2 hr	6 hr	12 hr	24 hr
1967	6.4	11.4	17.8	21.6	36.8	17.8	22.9	-	48.1
1968	7.6	12.7	15.2	20.3	36.8	53.3	-	-	69.8
1969	6.4	10.2	14.0	20.0	30.0	40.1	-	-	44.9
1970	-	-	10.0	20.0	33.0	44.0	64.1	-	50.5
1971	-	-	10.0	17.0	27.0	41.0	57.1	-	46.7
Average	6.8	11.4	13.4	19.8	32.7	39.2	48.0	-	52.0

Source: Cantarranas Suger Project Report, 1978

7.1.2 Construction Material

Possible sources and availability of principal construction materials such as sands, stones, cement, asphalt and steel required for the new airport construction are discussed hereunder.

1) Sand and Stone

Potential sources of sands and stones to be used for subbase, base course and concrete aggregate are described below and their locations are shown in Appendix 7C.

a. Deposits of Rio Talanguita

The river beds of Rio Talanguita running about 2 kilometers north from the proposed airport site have abundant deposits of sands and gravel, and these were used in construction of the existing national highway. The material appear to be suitable for use in subbase course and as concrete aggregate, but further tests are needed to ensure the suitability of the materials qualitywise. To transport the materials from this source, the existing jeepable way needs to be improved to a haul road.

b. Quarry Site

Limestone is exposed on the cut walls of the existing highway in the section between about 46 Km and 48 Km away from Tegucigalpa. Although the surface is rather weathered and cracky, the inner part of the limestone is expected to be hard enough and usable for the new airport construction. However, both its quality and quantity must be confirmed for detailed engineering purposes through seismic exploration and boring. The existing highway and the proposed airport approach feeder road will be used for hauling of this material.

2) Cement and Asphalt

The present portland cement production of Cementos de Honduras, S.A. in San Pedro Sula is 250,000 tons per year. A new cement factory under construction in Comayagua is expected to start operating in the middle of 1981, with a production of 1,200 tons per day. Therefore, local supply of cement material is considered sufficient for the new airport construction purposes.

Asphalt materials are not produced in Honduras and will need to be imported from the Republic of Venezuela, or other neighbouring countries.

3) Steel Material

Steel materials are not produced in Honduras, and must be imported from one of the countries presently supplying the material such as Brazil, Belgium, USA, Germany and Japan.

7.2 Civil Works

7.2.1 Grading

1) Determination of lormation Level

Search was made by electronic computer for an optimum formation level of the new airport that would give closest possible balance between cuts and fills, minimized total quantity of earthworks and best future runway extension possibilities. The calculation was made by unit area of 50-meter grids drawn throughout the entire area of the proposed airport premises.

The quantities of required earthwork resulting from the determined formation level are as shown in Table 7-4.

The longitudinal section and the standard cross section of the runway, complete with the formation level values are shown in Appendix 7D.

Table 7-4 EARTHWORK QUANTITIES

Excavation	
Stripping	300,000 m^3
Excavation	2,198,000 m^3
Embankment	2,123,000 m^3

2) Earthmoving Quantities by Hauling Distance

Excavation work is classified into the following three categories by type of construction equipment to be used depending on the hauling distance of earth as follows.

Table 7-5 CLASSIFICATION OF EXCAVATION WORK BY EQUIPMENT

	Work Categories	Hauling Distance	Equipment Used
Short Distance Work	(1)	Less than 50 m	Bulldozer
Medium Distance Work	(2)	50 m or more and less than 1,000 m	Motor Scraper
Long Distance Work	(3)	1,000 m or more	Shovel-Tipper

Using the electronic computer, the total earth-moving volume was classified by unit area of 50-meter grids into the above three categories so as to minimize the hauling distance, with the results as summarized in Table 7-6. The distribution diagram of earthworks is shown in Appendix 7E.

Table 7-6 EARTHMOVING QUANTITIES BY DISTANCE

Works	Quantity ('000 m^3)	Average Hauling Distance (m)
Stripping	300	1,500
Earthmoving (1)	211	40
Earthmoving (2)	1,445	600
Earthmoving (3)	467	3,500
Disposal	75	1,500

3) Method of Earthwork

As stated earlier, the earth of the site to be excavated consists mostly of well-consolidated alluvial deposits, and will require ripping work by 25 to 30 ton class bulldozer. As it will also easily turn muddy once wetted and disturbed, special care must be taken in actual execution of the earthwork during the wet season, and earthwork scheduling of different parts of the site must be made by duly taking this factor into account. Loose surface of the alluvium embankment work shall be compacted and smoothed without delay to prevent penetration of the rain water. Use of tamping roller and/or vibration roller is considered suitable for compaction of the alluvium embankment.

7.2.2 Pavement

1) Bearing Strength of Subgrade

As is shown in Appendix 7E, total quantities of excavation and embankment are distributed 50-50 within the new airport premises. In the pavement structural design, bearing strengths were calculated separately for the embanked subgrade and the excavated subgrade.

a. Embanked Subgrade

The results of the CBR test conducted in February 1979 revealed an extremely low value of 1 to 3 percent for the embanked subgrade to be expected at the new airport. These tests, however, were made in laboratory assuming on a worst conceivable condition which is quite unlikely to occur. In reality it is highly improbable that the subgrade and/or ground water once the pavement work is adequately completed. It is, therefore, considered unpractical to base the calculation of the subgrade bearing strength on the above mentioned low CBR values. On the other hand, the CBR value of this soil estimated with reference to the FAA's soil classification amounts to 7 to 9 percent, which is considered easily obtainable if and when the subgrade is embanked in a proper manner in dry condition. From the above considerations, the design CBR of the embanked subgrade is determined at 5 percent, allowing for variances in weather conditions and in quality of work performance.

b. Excavated Subgrade

N-value of the natural ground actually obtained by the standard penetration test is between 40 and 100, indicating that cementation of the alluvial deposits is well progressed. The design CBR of the excavated subgrade, therefore, is assumed at 10 percent, and, the K_{75} is estimated at 5.0 Kg/cm^3 based on this design CBR.

2) Pavement Surface Material

Comparative analyses were made of the characteristics of the two types of pavement presently being applied on airports, namely the asphalt concrete pavement and the cement concrete pavement, with the results as shown in Table 7-7.

As a result of this comparison, the asphalt concrete pavement has been adopted on account of economy and ease of construction, maintenance and repair, for all pavement surfaces of the proposed new airport, except for the passenger loading apron where cement concrete is preferred due to expected recessing, oil leakage and twisting force.

Table 7-7 COMPARISON BETWEEN ASPHALT CONCRETE PAVEMENT AND CEMENT CONCRETE PAVEMENT

	Asphalt	Cement
Thickness	Thick	Thin
Load Bearing Characteristics	Surface may be rutted depending on load	Can accommodate variety of loads without rutting
Joint	Not needed	Needed between panels to absorb effects of temperature variation
Weathering	Surface tends to harden and lose cohesion rather soon	Weathering does not much affect the bearing strength
Cost	About 45 Lps/m^2 (CBR = 10%)	About 70 Lps/m^2 (K_{75} = 5 kg/cm^3)
Construction Period	Rather short and suitable for surfacing of extensive area	Longer
Maintenance and Repair	Easier because spot repair is possible	Difficult, because it involves breaking up of concrete slabs, and long curing period

3) Pavement Thickness

The thickness of the pavement was determined based on the following design factors.

Design load (critical aircraft)	B-747
Repetition of design load	5,000 times
CBR of excavated subgrade	10%
CBR of embanked subgrade	5%
K_{75} of subgrade of the passenger loading apron	5 kg/cm^3

The standard structure of the proposed airport pavement is shown in Appendix 7F.

4) Pavement Construction Method

As already mentioned, care should be taken not to let the embanked subgrade work exposed to rain. Therefore, as soon as the subgrading work is completed, the subbase shall be laid without delay. If and when the pavement work takes place during the rainy season, a prime coating shall be applied on top of the subgrade. If, on the other hand, the circumstances should not permit such prompt execution of the subbase work, the formation level of the subgrade shall be finished slightly higher than the design level in order to allow for removal of the moistened surplus earth on the subgrade surface by grader just before the subbase work is actually executed.

Since the design CBR values of the subgrade, 5% for the embanked and 10% for the excavated subgrade, are based as aforesaid on the assumption that the subgrade be constructed under a dry condition, in the event of construction taking place during the rainy season, slopes of 2 - 4% shall be maintained on all grading surfaces together with temporary sumps to ensure quick surface drainage and possible subsequent pumping of the collected water as necessary.

7.2.3 Airport Drainage System

1) Basic Considerations

The proposed airport site is naturally drained by three small rivers running along the east end, the west end and through the central part across the proposed runway. The drainage system of the new airport is basically designed so as not to disturb this natural drainage after completion of the airport. The overall drainage system of the proposed new airport is shown in Fig. 7-1.

2) Estimated Discharge

The following rational formula was used to estimate the design discharge to be accommodated by the new airport drainage system.

$$Q = CiA/360$$

where,

Q : design discharge (m^3/sec.)

C : runoff coefficient by FAA criteria

for asphalt pavement	0.95
for concrete pavement	0.95
for sodding area	0.5
for other areas	0.3

i : rainfall intensity 40mm/hr.

A : drainage area (ha)

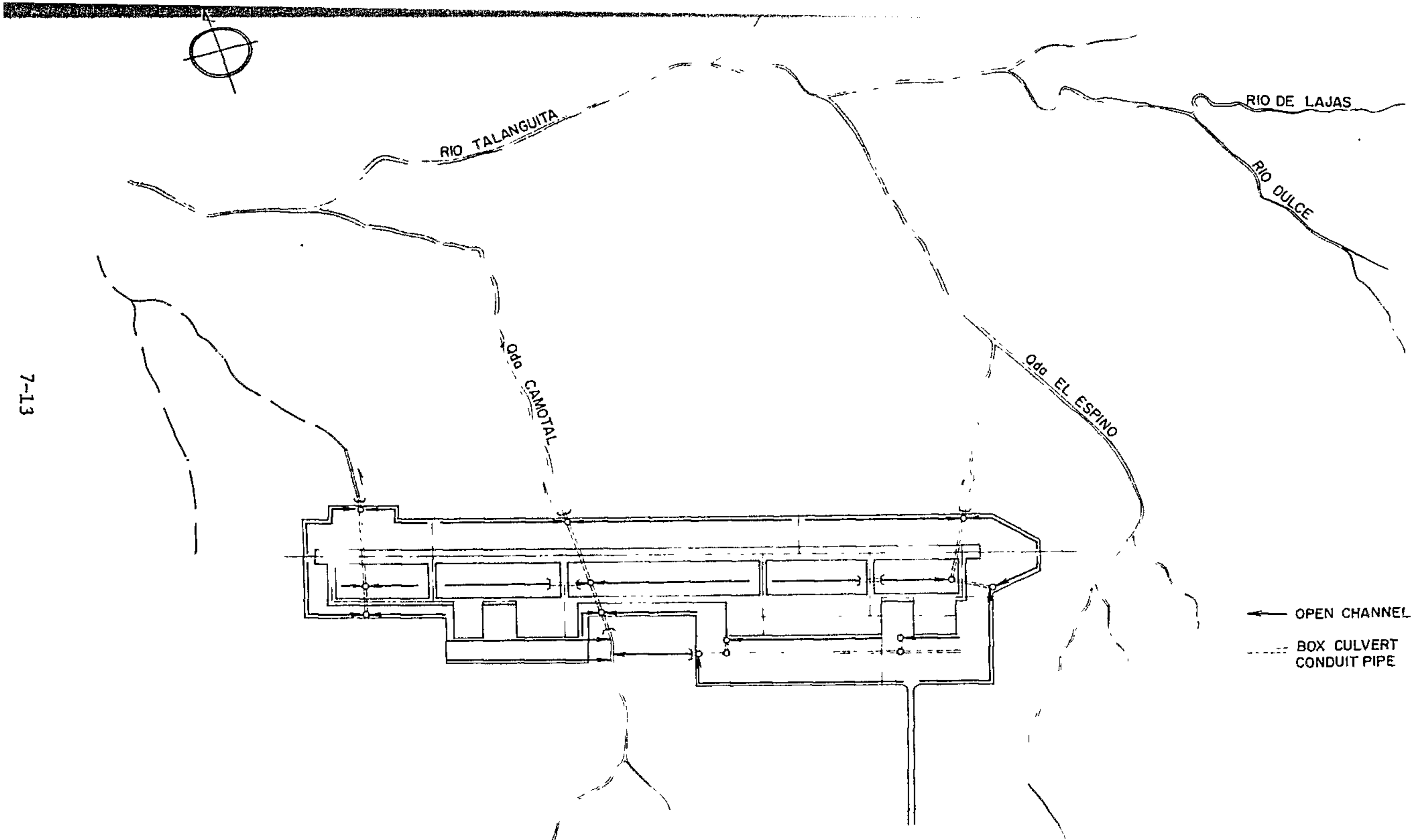


Fig. 7-1 DRAINAGE SYSTEM OF NEW TEGUCIGALPA AIRPORT

7.3 Building Works

7.3.1 Building Structure

All buildings of the new airport will be of reinforced concrete structure except for the passenger terminal finger and the import cargo building which will be of steel structure as shown in Table 7-8.

Table 7-8 TYPE OF BUILDING STRUCTURE

Buildings	Structure
International Passenger Terminal	Reinforced Concrete
Domestic Passenger Terminal	Reinforced Concrete
Finger	Steel
Import Cargo Bldg.	Steel
Administration/Operation Bldg.	Reinforced Concrete
Main Power Substation	Reinforced Concrete
Fire Station	Reinforced Concrete

7.3.2 Foundation of Buildings

Judging from the results of the standard penetration tests as shown in Appendix 7B, an isolated spread foundation is considered suitable for the airport buildings.

7.4 Construction Schedule

Construction schedule of the new airport is planned as shown in Table 7-9, based on an assumption that the detailed design and land acquisition will have been completed by June 1981.

As for the Stage I construction schedule, the period of construction is largely affected by the civil works of grading and pavement. Since it is desirable to execute the earthwork during the dry season to the maximum possible extent, two 8-hour shift system with 7 actual work hours per shift is considered. This will also contribute to making best possible use of the construction equipment. All other categories of the new airport construction work are planned with normal 8 work hours per day.

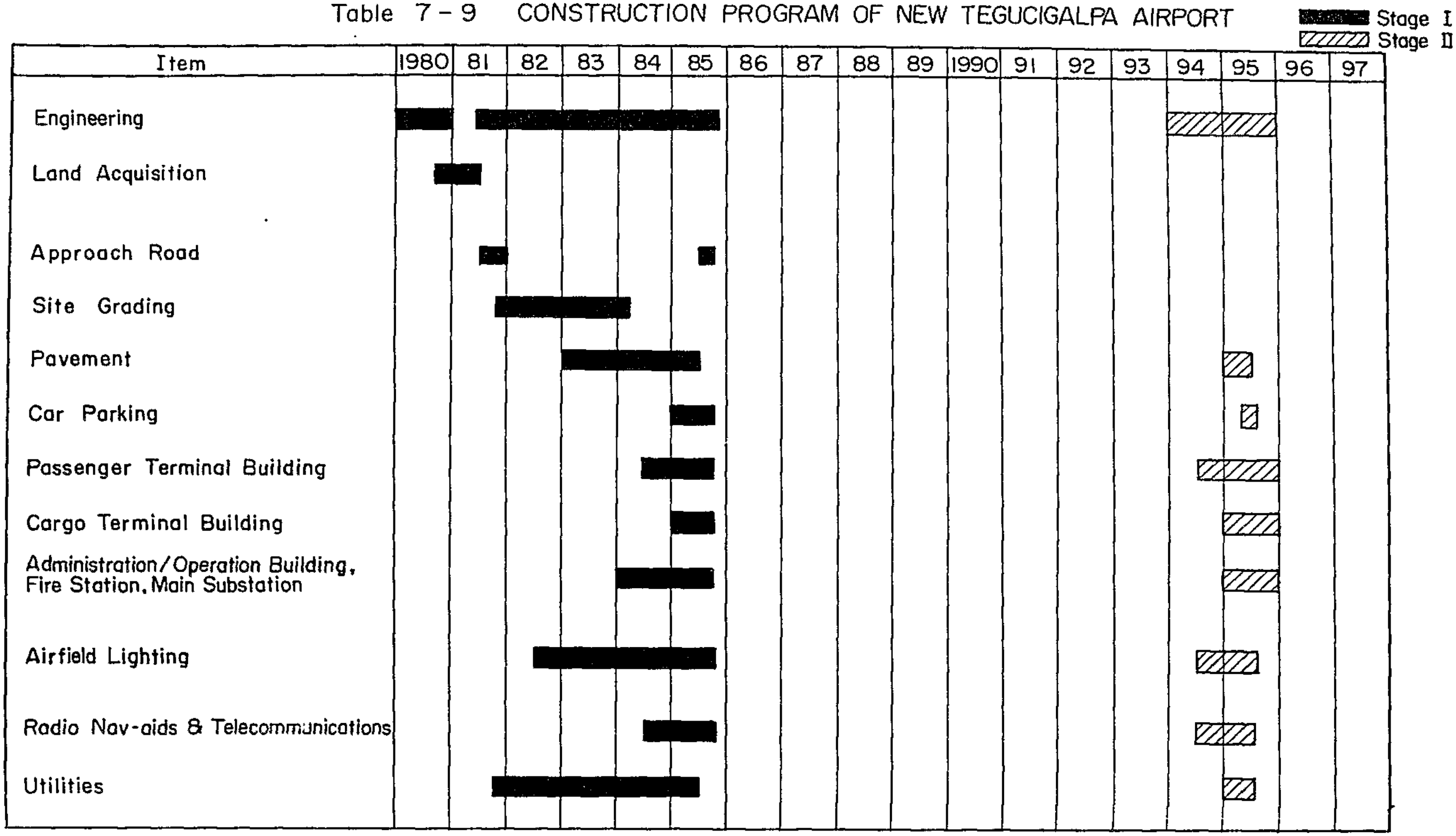
Based on the above factors, the period of the first stage construction of the proposed new airport is estimated to be 5 years from 1981 to 1985 inclusive. Construction period of Stage II development will be for the 2 years of 1994 to 1995 including the time required for the equipment manufacture at the factory.

7.5 Construction Cost Estimate

Construction cost of the new airport by development stage is estimated as tabulated in Table 7-10, and the breakdown by year of the construction cost based on the construction schedule as per Table 7-9 is shown in Table 7-11.

It should be noted that the construction cost of the international import and domestic cargo terminal buildings, aircraft maintenance hangar and fuel storage and distribution facilities are not included in the present cost estimation. The purchase and installation costs of the airport maintenance equipment and of the aircraft ground

Table 7 - 9 CONSTRUCTION PROGRAM OF NEW TEGUCIGALPA AIRPORT



service equipment are not estimated either. Besides, the construction and replacement cost of the electric power feeder line between the existing ENEE distribution line and the airport's main substation, as well as the cost of telephone connections to the new airport is not included in the project cost.

The present cost estimate is based on the following conditions.

1) Unit prices used in the cost estimate are based on the data collected by the JICA survey team in February 1979.

2) Foreign currency portion of the construction cost includes the following items:

a. Purchase cost of construction equipment including customs duty.

b. Cost of imported materials such as steel, asphalt and glass, with customs duty.

c. Foreign remittance portion of the overhead and profit of foreign contractor.

d. Wages of foreign labour.

e. Fuel and lubricant of the construction equipment.

3) Local currency portion of the cost includes t e following items:

a. Operation cost of the construction equipment other than fuel and lubricant.

b. Construction materials procured in Honduras such as cement, aggregate and wooden material.

c. Land transport cost of materials and labor.

d. Local portion of foreign and local contractors' overhead costs and profits.

e. Wages of local labour.

f. Land acquisition cost.

4) Engineering fee is estimated at 10% of the total cost of works as shown in Table 7-10.

5) Physical contingency to cover variance of quantity of construction is estimated at 10% of the sum of the total cost of works, engineering fee and the cost of land acquisition as shown in Table 7-10.

6) Price contingency to cover any upward change in the cost necessitated during the first three years of construction period is estimated at 7.1 percent and 7.4 percent per year respectively for the foreign and local currency portions of the the sum of the total cost of works, engineering fee, land acquisition and physical contingency. These percentages have been determined by referring to the price index changes of the past three years in Honduras.

7) Convension between US Dollar, Lempira and Yen is based on the exchange rates as of February 1979 of US$1.0 = L2.0 = ¥200.00.

Table 7-10 CONSTRUCTION COST ESTIMATE

(Unit: Thousand US$)

Cost Item	Stage I			Stage II		
	Foreign Portion	Local Portion	Total	Foreign Portion	Local Portion	Total
Civil Works	14,895	9,675	24,570	413	1,331	1,744
Building & Equipment	12,258	5,202	17,460	7,619	2,858	10,477
Airfield Lighting	3,739	478	4,217	543	54	597
Radio Nav-aid, Telecommunications & Meteorological Service Facilities	3,225	155	3,380	651	33	684
Utilities	5,090	1,254	6,344	121	251	372
TOTAL OF WORKS	39,207	16,764	55,971	9,347	4,527	13,874
Engineering	3,918	1,679	5,597	971	416	1,387
Land Acquisition	0	2,258	2,258	0	0	0
Physical Contingency	4,313	2,070	6,383	1,032	494	1,526
Price Contingency	1,214	839	2,053	0	0	0
GRAND TOTAL	48,652	23,610	72,262	11,350	5,437	16,787

Table 7-11 ANNUAL CONSTRUCTION COST ESTIMATE OF NEW AIRPORT

(Unit: Thousand US$)

Year	Foreign Portion	Local Portion	Total
1980	2,308	3,660	5,968
1981	1,483	708	2,191
1982	4,689	2,556	7,245
1983	9,689	4,380	14,069
1984	16,481	6,706	23,187
1985	14,002	5,600	19,602
1994	2,385	0	2,385
1995	8,965	5,437	14,402
Total	60,002	29,047	89,049

CHAPTER 8 FINANCIAL ANALYSIS

8.1 General

The purpose of the financial analysis is to examine the financial profitability of the New Tegucigalpa Airport Development Project based on the assumption that the new airport will be administered on a self-supporting accounting principle. The evaluation was made in terms of the financial internal rate of return derived from the financial cost-benefit analysis which was made with the cash flow of the financial costs and the financial benefits.

8.2 Estimate of Financial Costs

8.2.1 Construction Cost

The annual construction cost of the project shown in Table 7-11 of Chapter 7 is based on the market prices, and was, therefore, used as the financial cost of the construction in the present analysis.

8.2.2 Maintenance and Operation Cost

Estimates of the annual maintenance and operation costs of the proposed new airport are shown in Table 8-1. The calculation of these costs was made in the following manner.

1) Annual maintenance cost, including repair works and replacement cost, of runway, taxiway, aprons, approach road and car parking: -

   Estimated at 1% of their respective construction costs including the costs of pavement and drainage works but excluding the cost of grading works.

2) Maintenance cost of the buildings and of the airport utilities, including repair works and replacement cost: - Estimated at 1% of their respective construction costs.

3) Maintenance cost of the navigational aids, fire-fighting and rescue facilities and the special equipment, including repair works and replacement cost: - Estimated at 5% of their respective construction costs.

4) Personnel cost: - Estimated based on the present wage rates of SECOPT and on the recommended manning program of the New Tegucigalpa Airport Administration as shown in Table 10-4 of Chapter 10, with the results as shown in Table 8-2.

5) Other costs to be incurred in operation of the new airport: - Estimated in a lump sum at 5% of the sum of the estimated annual maintenance cost and the annual personnel cost of the new airport.

As a reference, the maintenance and operation cost of the eixsting Toncontín Airport in 1978 amounted to 291 thousand Lempiras (US$146,000), not including the personnel cost, which is estimated to be 783 thousand Lempiras (US$392,000) assuming that the number of persons concerned with the operation of the Toncontín Airport is 135 as shown in Subsection 10.1 of Chapter 10. The maintenance and operation cost of the Toncontín Airport including the personnel cost is, therefore, estimated to be at least 1,074 thousand Lempiras (US$537,000).

Table 8-1 ESTIMATE OF MAINTENANCE AND OPERATION COSTS OF NEW TEGUCIGALPA AIRPORT

(In 1979 thousand US$)

Year	Maintenance				Wages	Others	Total
	Civil Works	Building & Utilities	Nav-Aids & Other Equipment	Sub-Total			
1986	155	215	496	866	567	72	1,505
1987	155	215	496	866	572	72	1,510
1988	155	215	496	866	577	72	1,515
1989	155	215	496	866	583	72	1,521
1990	155	215	496	866	588	73	1,527
1991	155	215	496	866	594	73	1,533
1992	155	215	496	866	600	73	1,539
1993	155	215	496	866	606	74	1,546
1994	155	215	496	866	612	74	1,552
1995	155	215	496	866	618	74	1,558
1996	157	300	678	1,135	625	88	1,848
1997	157	300	678	1,135	631	88	1,854
1998	157	300	678	1,135	638	89	1,862
1999	157	300	678	1,135	645	89	1,869
2000	157	300	678	1,135	652	89	1,876
2001	157	300	678	1,135	660	90	1,885
2002	157	300	678	1,135	667	90	1,892
2003	157	300	678	1,135	675	91	1,901
2004	157	300	678	1,135	683	91	1,909
2005	157	300	678	1,135	691	91	1,917

Table 8-2 ESTIMATE OF ANNUAL WAGES OF THE NEW TEGUCIGALPA AIRPORT ADMINISTRATION

(In 1979 thousand lempiras)

	1986	1990	1995	2000	2005
Airport Director	28.0	28.0	28.0	28.0	28.0
Secretary	5.6	5.6	5.6	5.6	5.6
Chief of Operation Div.	17.8	17.8	17.8	17.8	17.8
Secretary	5.6	5.6	5.6	5.6	5.6
Air Traffic Control Sec.	232.5	232.5	232.5	232.5	232.5
Flight Operations Sec.	87.6	98.6	114.3	132.5	153.6
Meteorological Service Sec.	62.4	62.4	62.4	62.4	62.4
Fire-Fighting & Rescue Sec.	238.8	238.8	238.8	238.8	238.8
Chief of Maintenance Div.	17.8	17.8	17.8	17.8	17.8
Secretary	5.6	5.6	5.6	5.6	5.6
Air field Maintenance Sec.	48.7	48.7	48.7	48.7	48.7
Terminal Maintenance Sec.	105.1	118.3	137.1	159.0	184.3
Electrical & Mechanical Maintenance Sec.	119.6	119.6	119.6	119.6	119.6
Procurement Sec.	30.9	34.8	40.3	46.8	54.2
Chief of Administration Div.	17.8	17.8	17.8	17.8	17.8
Secretary	5.6	5.6	5.6	5.6	5.6
Accounting Section	43.5	49.0	56.8	65.9	76.3
Personnel Section	37.2	41.9	48.6	56.3	65.2
Statistics Section	24.6	27.7	32.1	37.2	43.2
Total	1,134.7	1,176.1	1,235.0	1,303.5	1,382.6
(In thousand US$)	(567)	(588)	(618)	(652)	(691)

8.3 Estimate of Financial Benefits

8.3.1 Current Airport Tariff Structure

The financial benefits of the New Tegucigalpa Airport Development Project comprise the airport revenues to be collected based on the current airport tariff structure of the Republic of Honduras. The airport tariff structure effective as of February 1979 was established in August 1962, but a new, revised airport tariff is scheduled to become effective in the near future to meet the increase in the costs of improvement and maintenance of the airports in the country. The revised airport tariff structure comprises the following items.

a. Landing Charges
b. Parking Charges
c. Lighting Charges
d. Land Rental
e. Terminal Rental
f. Car Parking Charges
g. Aircraft Fuel Tax
h. Cargo Tax

No charges such as departure tax or airport user charges are levied on passengers in the revised airport tariff structure. However, the Tourism Bureau of Honduras is charging a departure tax of 5 Lempiras (2.5 U.S. dollars) per departing foreign passenger in international service.

8.3.2 Estimate of Airport Revenues

Details of the new tariff to become effective shortly structure by item of charges, and the method and results of calculation of the expected airport revenues of the new airport based on such new airport tariff structure, are presented hereunder. Table 8-3 shows the forecast of annual aircraft movements at the new airport for the years 1985, 1990, 1995, 2000 and 2005.

Table 8-3 FORECAST OF AIRCRAFT MOVEMENTS AT THE NEW TEGUCIGALPA AIRPORT

ITEM	1985	1990	1995	2000	2005
Commercial Aviation	7,748	11,731	16,575	22,753	31,399
International Passenger Flight	4,898	7,474	10,762	15,213	21,593
200-Seater Jet (B-707 Class)	2,201	3,484	5,134	7,335	10,494
120-Seater Jet (B-737 Class)	2,967	3,990	5,628	7,878	11,099
Domestic Passenger Flight	2,478	3,680	4,967	6,311	8,025
120-Seater Jet (B-737 Class)	1,513	2,179	2,930	3,846	4,953
40-Seater Non-Jet (F-27 Class)	965	1,501	2,037	2,465	3,072
International Freighter	372	577	846	1,229	1,781
B-707 Class	252	389	573	837	1,216
B-737 Class	120	188	273	392	565
General Aviation	3,920	5,440	6,960	8,880	11,120
International Operation	980	1,360	1,740	2,220	2,780
Domestic Operation	2,940	4,080	5,220	6,660	8,340
Total	11,668	17,171	23,535	31,633	42,519

1) Landing Charges

Landing charges are levied on aircraft according to the respective maximum weight, including the parking rights for a period of 12 hours. Landing charges applicable to the types of aircraft expected to serve the new airport are as follows:

	Maximum Weight	Landing Charge
(International Service)		
B-707 Class	112.1 ton	L300 (US$150)
B-737 Class	47.7	L150 (US$75)
Small aircraft (average)	2.5	L10 (US$5)
(Domestic Service)		
B-737 Class	47.7	L120 (US$60)
F-27 Class	20.0	L40 (US$20)
Small aircraft (average)	2.5	L8 (US$4)

Expected revenues from landing charges at the new airport calculated based on the above landing charges are shown in Table 8-4.

Table 8-4 ESTIMATE OF LANDING CHARGES AT THE NEW TEGUCIGALPA AIRPORT

(In 1979 thousand US$)

Item	1986	1990	1995	2000	2005
Total International Service	327.2	450.8	653.9	928.7	1,322.7
B-707 Class	201.6	290.7	428.1	612.9	878.3
	(1,344)	(1,938)	(2,854)	(4,086)	(5,855)
B-737 Class	123.0	156.7	221.4	310.2	437.4
	(1,640)	(2,089)	(2,951)	(4,135)	(5,822)
Small Aircraft	2.6	3.4	4.4	5.6	7.0
	(523)	(680)	(870)	(1,110)	(1,390)
Total Domestic Service	65.9	88.7	118.8	153.4	196.0
B-737 Class	49.0	65.5	87.9	115.4	148.6
	(814)	(1,096)	(1,465)	(1,923)	(2,477)
F-27 Class	10.6	15.0	20.4	24.7	30.7
	(527)	(751)	(1,019)	(1,233)	(1,536)
Small Aircraft	6.3	8.2	10.5	13.3	16.7
	(1,570)	(2,040)	(2,610)	(3,330)	(4,170)
Total	393.1	539.5	772.7	1,082.1	1,518.7

(Note: Figures in parenthesis indicate the number of landings)

2) Parking Charges

Parking charges are levied according to the maximum weight of aircraft remaining parked beyond an initial period of 12 hours, based on the following rates.

B-707 Class	(112.1 t)	L15 (US$7.5)
B-737 Class	(47.7 t)	L8 (US$4.0)
F-27 Class	(20.0 t)	L5 (US$2.5)
Small aircraft (average 2.5 t)		L1.5 (US$0.75)

Estimated parking charges expected at the new airport are as shown in Table 8-5. The number of aircraft staying beyond the initial 12-hour period were calculated from the assumed flight schedule presented in Chapter 4.

Table 8-5 ESTIMATE OF PARKING CHARGES AT THE NEW TEGUCIGALPA AIRPORT

(In 1979 thousand US$)

Aircraft Type	1986	1990	1995	2000	2005
B-707 Class	5.4	6.5	8.1	9.4	10.8
	(720)	(860)	(1,080)	(1,250)	(1,440)
B-737 Class	2.9	3.9	5.8	6.4	7.2
	(720)	(980)	(1,440)	(1,600)	(1,800)
F-27 Class	0.9	0.9	0.9	1.3	1.8
	(360)	(360)	(360)	(510)	(720)
Small Aircraft	6.8	8.7	10.2	12.9	17.2
	(9,070)	(11,600)	(13,600)	(17,200)	(22,930)
Total	16.0	20.0	25.0	30.0	37.0

(Note: Figures in parenthesis indicate the number of parked aircraft.)

3) Lighting Charges

Lighting charges are levied for the lighting services to aircraft for a period of 80 minutes between landing and take-off, based on the following rates.

5:00 p.m. - 9:00 p.m.	L30 (US$15)
9:00 p.m. -12:00 p.m.	L55 (US$27.5)
12:00 p.m. - 6:00 a.m.	L80 (US$40)

Lighting charges expected at the new airport was calculated based on the assumed flight schedule presented in Chapter 4, with the results as shown in Table 8-6.

Table 8-6 ESTIMATE OF LIGHTING CHARGES AT THE NEW TEGUCIGALPA AIRPORT

(In 1979 thousand US$)

Time Period	1986	1990	1995	2000	2005
5:00 p.m. - 9:00 p.m.	22.7	26.6	32.4	39.8	48.6
	(1,510)	(1,770)	(2,160)	(2,650)	(3,240)
9:00 p.m. - 12:00 p.m.	-	-	-	5.0	9.9
	(-)	(-)	(-)	(180)	(360)
12:00 p.m. - 6:00 a.m.	-	-	-	-	-
	(-)	(-)	(-)	(-)	(-)
Total	22.7	26.6	32.4	44.8	58.5

(Note: Figures in parenthesis indicate the number of aircraft operations.)

4) Land Rental

Land rental at the unit price of 0.08 Lempira (0.04 U.S. dollar) per square meter per month is levied on the land area used for airlines' hangars, general aviation hangars, aircraft fuel supplying facilities, and for other purposes authorized by the DGAC. Calculation of this revenue expected at the new airport was based on the respective area requirements identified in Chapter 6, with the results as shown in Table 8-7.

Table 8-7 ESTIMTE OF LAND RENTAL AT THE NEW TEGUCIGALPA AIRPORT

(In 1979 thousand US$)

Item	1986	1990	1995	2000	2005
Aircraft Maintenance Hangar Area	9.6	9.6	9.6	9.6	9.6
	(20,000)	(20,000)	(20,000)	(20,000)	(20,000)
General Aviation Hangar Area	9.6	9.6	9.6	16.8	16.8
	(20,000)	(20,000)	(20,000)	(35,000)	(35,000)
Fuel Storage Area	3.8	3.8	3.8	3.8	3.8
	(8,000)	(8,000)	(8,000)	(8,000)	(8,000)
International Export Cargo Building Area	1.6	1.6	1.6	3.5	3.5
	(3,400)	(3,400)	(3,400)	(7,200)	(7,200)
Domestic Cargo Building Area	1.0	1.0	1.0	1.5	1.5
	(2,000)	(2,000)	(2,000)	(3,000)	(3,000)
Total	25.6	25.6	25.6	35.2	35.2

(Note: Figures in parenthesis indicate the chargeable land area in m^2.)

5) Terminal Rental

Terminal rental levied on the office space, bar-restaurant, shops and on the use of interior wall spaces for commercial advertisements in the terminal buildings are as follows:

Airlines office	L5 (US$2.5)/m^2/month
Bar-restaurant	Lump sum of L400 (US$200)/month (only for Toncontfon Airport)
Shops and Coffee shops	L25 (US$12.5)/m^2/month
Space for advertisements	L15 (US$7.5)/m^2/month

Calculation was made on the terminal rental at the new airport based on the respective floor areas planned in Chapter 6, with the results as shown in Table 8-8.

Table 8-8 ESTIMATE OF TERMINAL CHARGES AT THE NEW TEGUCIGALPA AIRPORT

(In 1979 thousand US$)

	1986	1990	1995	2000	2005
Office Space	33.9	33.9	33.9	57.9	57.9
	(1,130)	(1,130)	(1,130)	(1,930)	(1,930)
Restaurant Space	7.2	7.2	7.2	9.5	9.5
	(640)	(640)	(640)	(840)	(840)
Shop Space	42.0	4.2	4.2	55.5	55.5
	(280)	(280)	(280)	(370)	(370)
Advertising Space	15.3	15.3	15.3	23.4	23.4
	(170)	(170)	(170)	(260)	(260)
Total	98.4	93.4	98.4	146.3	146.3

(Note: Figures in parenthesis indicate the chargeable floor areas.)

6) Car Parking Charges

Car parking charges are levied on monthly contracted cars at the unit price of 30 Lempiras (15 U.S. dollars) per month, and on other cars at the unit price of 0.5 Lempiras (0.25 U.S. dollars) per hour. The expected revenues accruing from car parking charges at the new airport were calculated based on the above rates with the results as shown in Table 8-9.

Table 8-9 ESTIMATE OF CAR PARKING CHARGES AT THE NEW TEGUCIGALPA AIRPORT

(In 1979 thousand US$)

	1986	1990	1995	2000	2005
Charges by Month	19.6	27.0	37.8	51.8	63.0
	(109)	(150)	(210)	(288)	(350)
Charges by Hour	128.9	177.4	249.6	341.4	406.2
	(1,413)	(1,944)	(2,735)	(3,741)	(4,452)
Total	148.5	204.4	287.4	393.2	469.2

(Note: Figures in parenthesis indicate the number of cars parked.)

7) Aviation Fuel Tax

Aviation fuel tax is levied on fuel supply companies at the unit price of 0.02 Lempira (0.01 U.S. dollars) for each gallon supplied. Assuming that all departing aircraft will be supplied with fuel at the new airport enough for one way trip to their immediate destination, expected total revenue accruing from aircraft fuel tax will be as shown in Table 8-10.

Table 8-10 ESTIMATE OF AVIATION FUEL TAX AT THE NEW TEGUCIGALPA AIRPORT

(In 1979 thousand US$)

Item	1986	1990	1995	2000	2005
Commercial Aircraft	174.2	218.8	291.0	386.9	514.5
	(17,420)	(21,880)	(29,100)	(38,690)	(51,450)
General Aviation Aircraft	2.5	3.0	3.9	5.0	6.3
	(250)	(300)	(390)	(500)	(630)
Total	176.7	221.8	294.9	391.9	520.8

(Note: Figures in parenthesis indicate amount of fuel supplied in thousand gallons.)

8) Cargo Tax

Cargo tax is levied on cargo handling companies at the unit price of 0.01 Lempira (0.005 U.S. dollars) per kilogram of weight of cargo handled.
Calculation was made of the revenues from cargo tax at the new airport based on the cargo traffic forecast presented in Chapter 3, with the results as shown in Table 8-11.

Table 8-11 ESTIMATE OF CARGO TAX AT THE NEW TEGUCIGALPA AIRPORT

(In 1979 thousand US$)

	1986	1990	1995	2000	2005
International Cargo	67.5	96.3	141.8	206.5	299.0
	(13,500)	(19,250)	(28,350)	(41,290)	(59,800)
Domestic Cargo	6.6	7.3	8.5	9.8	11.1
	(1,320)	(1,450)	(1,700)	(1,960)	(2,220)
Total	74.1	103.6	150.3	216.3	310.1

(Note: Figures in parenthesis cargo tonnage handled.)

8.4 Results of Financial Cost-Benefit Analysis

The financial internal rate of return (FIRR) of the New Tegucigalpa Airport Development Project which has resulted from the financial cost-benefit analysis based on the cash flow of the financial costs and the financial benefits shows a negative value as shown in Table 8-13. Furthermore, a negative FIRR value has also resulted from the analysis based on the cash flow wherein the US$2.5 per head departure passenger tax presently being collected by the Tourism Bureau of Honduras is assumed to be collected by the DGAC. Consequently, it is concluded that the New Airport Development Project under the new airport tariff structure is not financially feasible.

In the event that the New Airport Development Project is financed by foreign loans, it will be necessary to take some effective measures to increase the airport revenues, either by raising the level of the airport tariffs, or by creating a system of government subsidy on the airport, or combination of both. Calculation was made on the FIRR of the various possible cases wherein an increase of the airport revenues is assumed to be realized through one or the other of the above mentioned measures. Calculation was also made on the weighted average interest rates of composite foreign loans comprising soft loan with the interest rate of 3% and hard loan with the interest rate of 8% on several cases of assumed shares. The results of these calculations are shown together in Table 8-12, indicating that if the airport revenues are increased four times as much as that of the present level, an FIRR of 4.6% can theoretically be expected. The most appropriate of the foreign loan composition in that case will be 70% of soft loan and 30% of hard loan.

A more practical measure, on the other hand, would be the one in which airport tariffs are raised twice as much as the present level, and any resultant deficits made up by some government subsidy in order to achieve a reasonable balance of accounts at the new airport as a financially independent entity.

Table 8-12 FINANCIAL INTERNAL RATE OF RETURN AND WEIGHTED AVERAGE OF INTEREST RATE

Increased Airport Revenue			350%	400%	450%	500%	550%
Financial Internal Rate of Return			3.1%	4.6%	5.9%	7.1%	8.1%
Combination of Loans	Soft Loan	3%	100%	70%	50%	20%	0%
	Hard Loan	8%	0%	30%	50%	80%	100%
Weighted Average of Loan Interest			3.0%	4.5%	5.5%	7.0%	8.0%

Table 8-13 CASH FLOW OF FINANCIAL COSTS AND REVENUES OF NEW TEGUCIGALPA AIRPORT DEVELOPMENT PROJECT [BASED ON REVISED AIRPORT TARIFF STRUCTURE]

(In 1979 thousand US$)

Year	Costs			Revenues									Operating Surplus	Cumulative Balance
	Construction Cost	Maintenance & Operation Cost	Total Cost	Landing Charges	Parking Charges	Lighting Charges	Land Rental	Terminal Rental	Car Parking Chnrges	Fuel Tax	Cargo Tax	Total Revenues		
1980	5,968	0	5,968	0	0	0	0	0	0	0	0	0	0	-5,968
1981	2,191	0	2,191	0	0	0	0	0	0	0	0	0	0	-8,159
1982	7,245	0	7,245	0	0	0	0	0	0	0	0	0	0	-15,404
1983	14,069	0	14,069	0	0	0	0	0	0	0	0	0	0	-29,473
1984	23,187	0	23,187	0	0	0	0	0	0	0	0	0	0	-52,660
1985	19,602	0	19,602	0	0	0	0	0	0	0	0	0	0	-72,262
1986	0	1,505	1,505	393	16	23	26	98	149	177	74	956	-549	-72,811
1987	0	1,505	1,505	425	17	24	26	98	161	187	81	1,019	-491	-73,302
1988	0	1,515	1,515	461	18	25	26	98	174	198	88	1,088	-427	-73,729
1989	0	1,521	1,521	499	19	26	26	98	189	210	96	1,163	-358	-74,087
1990	0	1,527	1,527	540	20	27	26	98	204	222	104	1,241	-286	-74,373
1991	0	1,533	1,533	580	21	28	26	98	218	235	112	1,318	-215	-74,588
1992	0	1,539	1,539	623	22	29	26	98	234	249	120	1,401	-138	-74,726
1993	0	1,546	1,546	670	23	30	26	98	250	263	130	1,490	-56	-74,782
1994	2,385	1,552	3,937	719	24	31	26	98	268	279	139	1,584	32	-77,135
1995	14,402	1, [illegible]8	15,960	773	25	32	26	98	287	295	150	1,686	128	-91,409
1996	0	1,848	1,848	827	26	34	35	146	306	312	161	1,847	-1	-91,410
1997	0	1,854	1,854	884	27	36	35	146	325	331	174	1,958	104	-91,306
1998	0	1,862	1,862	946	28	38	35	146	347	350	187	2,077	215	-91,091
1999	0	1,869	1,869	1,012	29	42	35	146	369	370	201	2,204	335	-90,756
2000	0	1,876	1,876	1,082	30	45	35	146	393	392	216	2,339	463	-90,293
2001	0	1,885	1,885	1,158	31	48	35	146	407	415	232	2,472	587	-89,706
2002	0	1,892	1,892	1,239	32	50	35	146	422	439	250	2,613	721	-88,985
2003	0	1,901	1,901	1,326	33	53	35	146	436	465	268	2,762	861	-88,124
2004	0	1,909	1,909	1,419	35	56	35	146	453	492	288	2,924	1,015	-87,109
2005	0	1,917	1,917	1,519	37	59	35	146	469	521	310	3,096	1,179	-85,930
Total	89,049	34,119	123,168	17,095	513	736	610	2,440	6,061	6,402	5,381	37,238	3,119	-85,930

CHAPTER 9 ECONOMIC ANALYSIS

9.1 General

The purpose of the economic analysis is to make a comprehensive evaluation of the economic worth brought about in the Republic of Honduras by the New Tegucigalpa Airport Development Project at Talanga site selected by the Government of Honduras as a result of the site selection study presented in Chapter 6. The economic evaluation was made in terms of the economic internal rate of return (EIRR) identified through an economic cost-benefit analysis made from the viewpoint of the national economy. It is a general practice to make cost-benefit analysis on a principle of "with and without test", that is to say, comparing the case where the project is implemented with the case where the project is not to be implemented. In such an analysis, whatever positive values identified through said comparison as being saved or gained on account of the implementation of the project on a comparative basis are defined as the benefits of the project, whereas any negative values attributable to the implementation of the project, again on a comparative basis, are defined as the costs of the project.

In the present study, the case "without project" is defined as the Base Case in which utilization of the existing Toncontín Airport is continued at the present facility level without any new investment made thereon as described in Subsection 2.3.3 of Chapter 2. The costs and benefits of the project as defined above were calculated in U.S. dollars on the basis of the actual prices prevailing in 1979 for the assumed project life of 20 years following the inauguration of the new airport.

9.2 The Base Case

9.2.1 Basic Thinking

The Base Case, as defined above, constitutes the case of continued utilization of the existing Toncontín Airport at the present facility level. It is anticipated that, in accordance with the air traffic forecast made in Chapter 3 above, the existing Toncontin Airport facilities will reach their physical capacity limits at a certain point in time, and that thereafter the potential traffic will have to overflow theoretically. Projection of such a year, or so-called saturation point, for each category of airport facilities, as well as estimates of the respective overflowing traffic, are made in the following subsections.

9.3.2 Timing of Traffic Saturation

1) Passenger Loading Apron

The passenger loading apron at the existing Toncontín Airport measures 50 m x 210 m, and is capable of accommodating two B-737s and one L-188 to park simultaneously. Daily aircraft movements calculated on the basis of the traffic forecast made in Chapter 3 are shown in Table 9-1.

In order to calculate the maximum possible daily handling capacity of the passenger apron, theoretically optimum peak day flight schedules were prepared based on the passenger traffic forecasts. In the flight schedule aircraft movements are spread over as many hours of operation as is feasible, taking into account such matters as the time of departure/arrival at origin/destination, etc., so that the existing parking positions may be utilized with maximum efficiency. On the basis of such flight schedules, and also assuming that the smaller one of the parking positions is primarily used for domestic flights and the larger two for international flights, the passenger apron is found to be capable of accommodating up to 22 domestic and 41 international flight a day. This means that the passenger loading apron at the existing Toncontín Airport will reach its physical handling capacity limit in 1987, and the aircraft movements after that year will overflow as Fig. 9-1 illustrates.

Table 9-1 DAILY PASSENGER FLIGHT MOVEMENTS AT TONCONTIN

Origin	Via	Destination	Movements			
			1980	1985	1990	1995
TGU	-	BZE	1	1	1	1
	BZE	MIA	4	6	9	13
"	"	MSY	3	5	7	11
"	"	IAH	3	4	5	7
			11	16	22	32
TGU	-	GUA	1	2	2	3
"	GUA	MEX	1	2	2	3
			2	4	4	6
TGU	-	SAL	2	3	4	6
"	SAL	GUA	2	2	2	2
			4	5	6	8
TGU	-	MGA	2	2	3	4
"	MGA	SJO	3	3	5	7
"	"	PTY	2	3	4	6
			7	8	12	17
TGU	-	ADZ	1	1	3	4
	Sub Total		25	34	47	67
TGU	-	SAP	4	5	8	10
"	-	LCE	3	5	7	9
"	-	OAN	2	4	5	7
"	-	PLP	1	1	2	2
	Sub Total		10	15	22	28
	Total		35	49	69	95

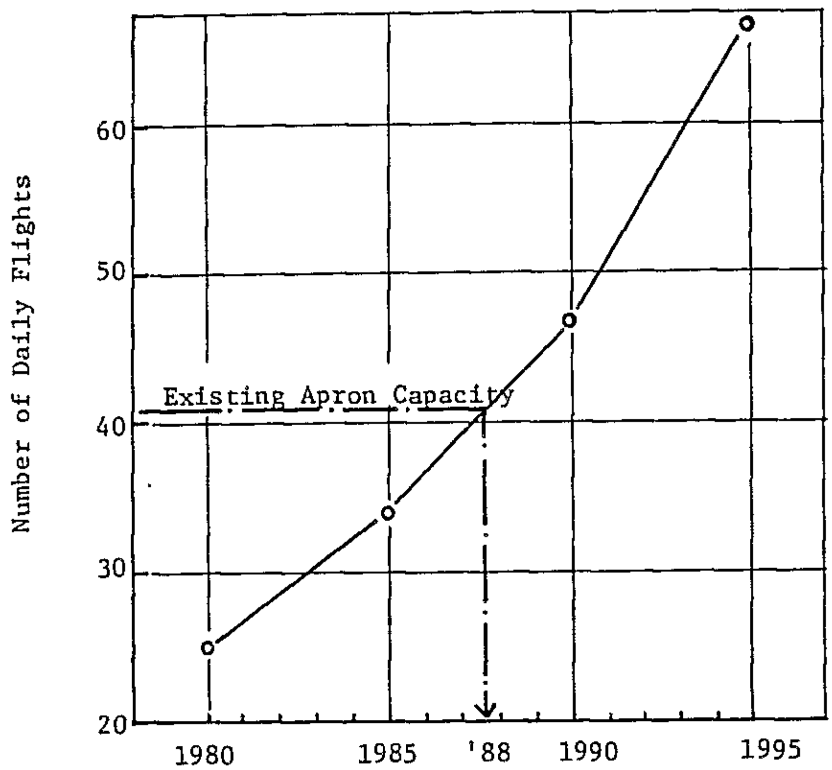


Fig. 9-1 PROJECTED DAILY INTERNATIONAL PASSENGER FLIGHT MOVEMENTS AT TONCONTIN AIRPORT

2) Passenger and Cargo Terminal Buildings

Hourly capacity of the existing passenger terminal building is assessed at 230 passengers as shown in Table 9-2. By the time the passenger loading apron is assumingly utilized to its capacity in each and every hour of operation in 1987 as discussed in paragraph 1) above, the passenger terminal building is also expected to reach its physical capacity limits.

Capacity of the international cargo handling facilities, including the new cargo terminal presently under construction, is assessed at 7,800 tons per annum as shown in Table 9-3, and, therefore, from the year 1980 on, the international cargo traffic is expected to overflow. As for the domestic cargo, however, the existing facilities can accommodate the projected cargo traffic up to the year 2005 as shown in Table 9-3.

Table 9-2 HOURLY HANDLING CAPACITY OF EXISTING PASSENGER TERMINAL BUILDING

Facility	Area (m^2)	Handling Capacity (persons/hour)
Departure Facility	820	130
Arrival Facility	325	100
Total	1,125	230

Table 9-3 ANNUAL HANDLING CAPACITY OF EXISTING CARGO TERMINAL BUILDINGS

Facility	Area (m^2)	Handling Capacity (tons/year)
International Cargo	2,800	7,800
Domestic Cargo	924	4,800
Total	3,724	12,600

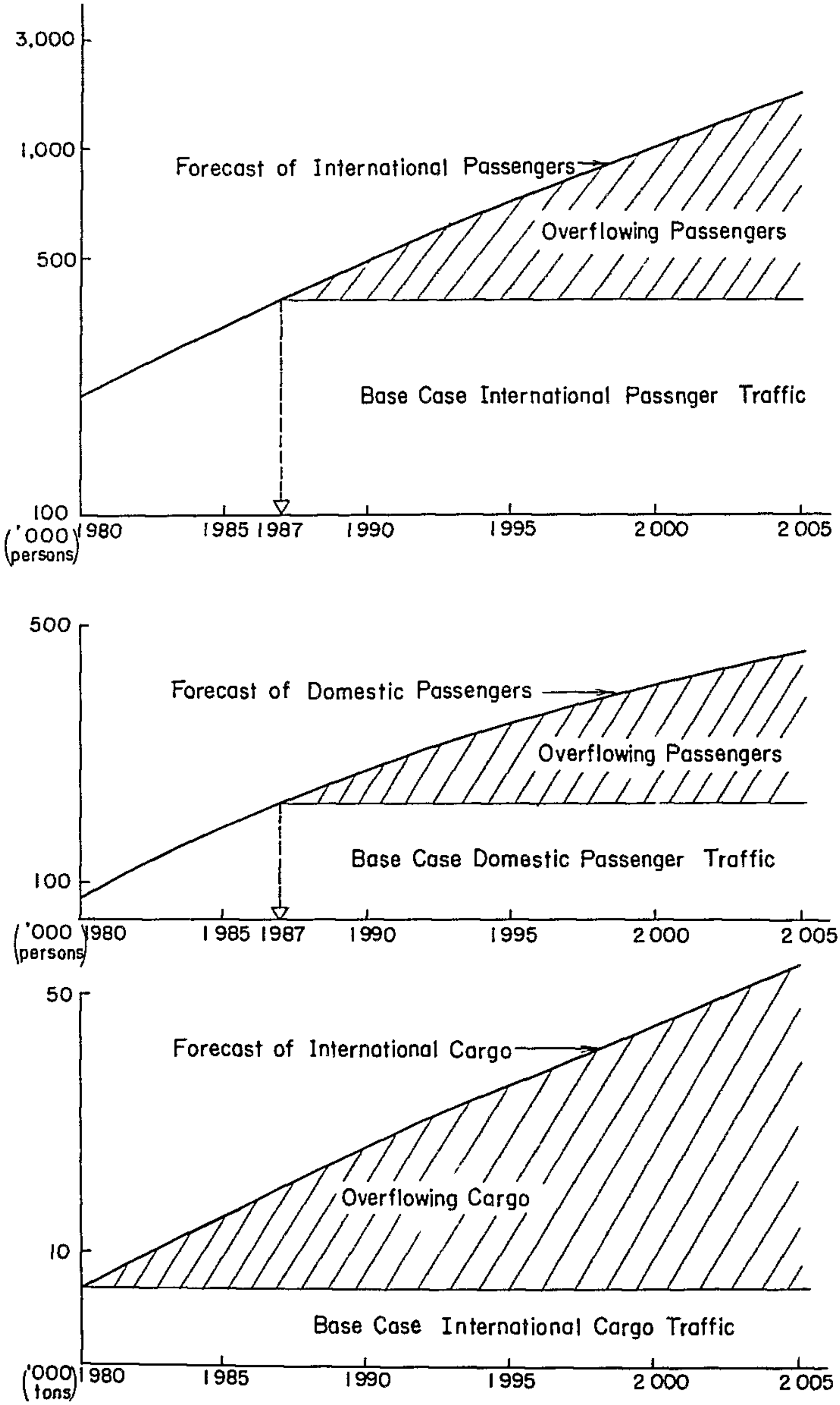


Fig. 9-2 BASE CASE DEMAND AND OVERFLOWING TRAFFIC AT TONCONTIN AIRPORT

9.2.3 Estimate of Overflowing Traffic

According to the study results of Section 9.2.2 above, the air passenger traffic at Toncontín Airport is expected to overflow starting from 1988, and the international cargo traffic from 1980 on, as shown in Fig. 9-2. Therefore, the Base Case transport demand and the overflowing traffic to be accommodated at the new airport are shown in Tables 9-4 and 9-5 respectively for the passenger and the international cargo traffic respectively.

Table 9-4 FORECASTS OF BASE CASE DEMAND AND OVERFLOWING PASSENGER TRAFFIC ACCOMMODATED AT NEW TEGUCIGALPA AIRPORT

(In thousand persons)

Year	Base Case Passenger Traffic			Overflowing Passengers Handled at New Tegucigalpa Airport		
	International Passenger	Domestic Passenger	Total	International Passenger	Domestic Passenger	Total
1985	325	147	472	0	0	0
1986	353	157	510	0	0	0
1987	383	169	552	0	0	0
1988	383	169	552	18	0	18
1989	383	169	552	53	0	53
1990	383	169	552	91	5	96
1991	383	169	552	126	15	141
1992	383	169	552	164	26	190
1993	383	169	552	204	37	241
1994	383	169	552	247	49	296
1995	383	169	552	294	61	355
1996	383	169	552	343	71	414
1997	383	169	552	396	82	478
1998	383	169	552	452	94	546
1999	383	169	552	512	106	618
2000	383	169	552	577	118	695
2001	383	169	552	646	130	776
2002	383	169	552	719	142	861
2003	383	169	552	798	155	953
2004	383	169	552	882	168	1,050
2005	383	169	552	973	182	1,155

Table 9-5 FORECASTS OF BASE CASE DEMAND AND OVERFLOWING CARGO TRAFFIC ACCOMMODATED AT NEW TEGUCIGALPA AIRPORT

(In tons)

Year	Base Case Cargo Traffic	Overflowing Cargo Handled at New Tegucigalpa Airport
1986	8,100	5,400
1987	8,100	6,650
1988	8,100	8,020
1989	8,100	9,510
1990	8,100	11,150
1991	8,100	12,700
1992	8,100	14,370
1993	8,100	16,180
1994	8,100	18,140
1995	8,100	20,250
1996	8,100	22,460
1997	8,100	24,850
1998	8,100	27,420
1999	8,100	30,200
2000	8,100	33,190
2001	8,100	36,360
2002	8,100	39,780
2003	8,100	43,460
2004	8,100	47,430
2005	8,100	51,700

9.3 Estimate of Economic Costs

The construction cost of the proposed new airport calculated in Chapter 7 and the maintenance and operation cost calculated in Chapter 8 are both based on the market prices and comprise the financial costs of the Project. The economic costs to be used in the economic analysis are obtained by deducting the custom duties and indirect taxes from the financial costs, and by applying the shadow prices.

9.3.1 Construction Cost

The method used in obtaining the economic construction cost of the new airport is outlined hereunder.

- Divide the foreign portion of each construction cost items into two groups of 1) imported goods and services, and 2) labor, which happens to comprise skilled labor only.

- Divide the local portion into three groups of 1) domestic goods and services, 2) skilled labor and 3) unskilled labor.

- Deduct the custom duty of 5% to 10% from the imported goods and services of the foreign portion.

- Deduct the indirect taxes of an average 3% from the domestic goods and services of the local portion, and apply the shadow wage rate of 2 Lempiras (US$1.0) a day (CONSUPLAN estimate for Tegucigalpa and environs) to the unskilled labor cost, as the Honduran labor market suffers from chronic under-employment.

The shadow exchange rate is not applied in this study, because the exchange rate has remained constant for the past 10 years in Honduras at 1 Lempira = 0.5 US Dollar. The economic costs of the construction thus calculated are shown in Tables 9-6 and 9-7 for Stage I and Stage II respectively. The annual breakdown of the economic construction cost is shown in Table 9-8.

9.3.2 Maintenance and Operation Cost

The economic cost of maintenance and operation of the proposed new airport calculated on the basis of the economic cost of the construction in an identical manner to that mentioned in Section 8.2 of Chapter 8 are shown in Table 9-9.

Table 9-6 GROUPING OF ESTIMATED CONSTRUCTION COST IN ECONOMIC COST CALCULATION

\- STAGE I -

(In 1979 thousand US$)

Item	Foreign Portion				Local Portion				Grand Total
	Foreign Goods & Services	Labor		Total	Domestic Goods & Services	Labor		Total	
		Skilled	Unskilled			Skilled	Unskilled		
(1) Civil Works	13,358	980	0	14,338	7,580	983	445	9,008	23,346
(2) Building & Equipment	11,488	541	0	12,029	3,195	1,184	290	4,669	16,698
(3) Airfield Lighting	3,153	345	0	3,498	281	11	71	363	3,861
(4) Radio Nav-aids, Tele-communications & Meteorological Facilities	2,640	321	0	2,961	12	114	12	138	3,099
(5) Utilities	4,295	470	0	4,765	747	129	142	1,018	5,783
Sub-total	4,934	2,657	0	37,591	11,815	2,421	960	15,196	52,787
(6) Engineering	-	-	-	3,759	-	-	-	1,520	5,279
(7) Land Acquisition	0	0	0	0	2,190	0	0	2,190	2,190
(8) Physical Contingency	-	-	-	4,135	-	-	-	1,892	6,027
(9) Price Contingency	-	-	-	1,229	-	-	-	741	1,970
Grand Total	(4,934)	(2,657)	(0)	46,714	(11,815)	(2,421)	(960)	21,539	68,253

\- : Inseparable

Table 9-7 GROUPING OF ESTIMATED CONSTRUCTION COST IN ECONOMIC COST CALCULATION

- STAGE II -

(In 1979 thousand US$)

Item	Foreign Portion				Local Portion				Grand Total
	Foreign Goods & Services	Labor		Total	Domestic Goods & Services	Labor		Total	
		Skilled	Unskilled			Skilled	Unskilled		
(1) Civil Works	357	46	0	403	1,184	33	31	1,248	1,651
(2) Building & Equipment	6,970	503	0	7,473	1,572	780	183	2,535	10,008
(3) Airfield Lighting	444	65	0	509	30	22	0.4	52	561
(4) Radio Nav-aids, Tele-communications & Meteorological Facilities	510	90	0	600	3	24	2.4	29	629
(5) Utilities	114	0	0	114	189	39	6.7	235	349
Sub-total	8,395	704	0	9,099	2,978	898	223	4,099	13,198
(6) Engineering	-	-	-	910	-	-	-	410	1,320
(7) Land Acquisition	-	-	-	0	-	-	-	0	0
(8) Physical Contingency	-	-	-	1,001	-	-	-	451	1,452
(9) Price Contingency	-	-	-	0	-	-	-	0	0
Grand Total	(8,395)	(704)	(0)	11,010	(2,978)	(898)	(223)	4,960	15,970

- : Inseparable

Table 9-8 ANNUAL BREAKDOWN OF ESTIMATED ECONOMIC COST OF CONSTRUCTION OF THE NEW TEGUCIGALPA AIRPORT

(In 1979 thousand US$)

Year	Foreign Portion	Local Portion	Total
1980	2,215	3,484	5,699
1981	1,493	608	2,101
1982	4,798	2,176	6,974
1983	9,118	4,037	13,155
1984	15,630	6,144	21,774
1985	13,460	5,090	18,550
1994	2,202	0	2,202
1995	8,808	4,960	13,768
Total	57,724	26,499	84,223

Table 9-9 ESTIMATED ECONOMIC COST OF MAINTENANCE AND OPERATION OF NEW TEGUCIGALPA AIRPORT

(In 1979 thousand US$)

Year	Maintenance				Wages	Others	Total
	Civil Works	Building & Utilities	Nav-Aids & Other Equipment	Sub-Total			
1986	146	202	461	809	567	69	1,445
1987	146	202	461	809	572	69	1,450
1988	146	202	461	809	577	69	1,455
1989	146	202	461	809	583	70	1,462
1990	146	202	461	809	588	70	1,467
1991	146	202	461	809	594	70	1,473
1992	146	202	461	809	600	70	1,479
1993	146	202	461	809	606	71	1,486
1994	146	202	461	809	612	71	1,492
1995	146	202	461	809	618	71	1,498
1996	148	283	635	1,066	625	85	1,776
1997	148	283	635	1,066	631	85	1,782
1998	148	283	635	1,066	638	85	1,789
1999	148	283	635	1,066	645	86	1,797
2000	148	283	635	1,066	652	86	1,804
2001	148	283	635	1,066	660	86	1,812
2002	148	283	635	1,066	667	87	1,820
2003	148	283	635	1,066	675	87	1,828
2004	148	283	635	1,066	683	87	1,836
2005	148	283	635	1,066	691	88	1,845

9.4 Estimate of Economic Benefits

9.4.1 Classification of Economic Benefits

The economic benefits considered attributable to the New Tegucigalpa Airport Development Project from the point of view of the national economy are identified through comparative analysis of the relevant elements in the Base Case and the project case. These benefits comprise the direct benefits and the indirect benefits, each of which consisting of the tangible benefits and the intangible benefits as shown below:

- Economic Benefits
  - Direct
    - Tangible
      - a. Satisfied trip demand of overflowing passengers
      - b. Satisfied transport demand of overflowing international cargo
      - c. Net increase of tourism income from foreign passengers
      - d. Airport revenue increment from foreign aircraft
      - e. Saving in aircraft fuel consumption
      - f. Benefits derived from improved airport facilities
      - g. Benefits of saved cost of aircraft noise countermeasures
      - h. Benefits of saved cost of maintenance and operation
      - i. Disbenefits of additional access time and cost (negative value)
    - Intangible
      - a. Improved air safety
      - b. Increased comfort and convenience
  - Indirect
    - Tangible
      - a. Employment effect
      - b. Multiplier economic effect
    - Intangible
      - a. Enhancement of national prestige
      - b. Development of information and cultural exchange
      - c. Role as nucleus of national economic development

9.4.2 Direct Benefits

1) Direct Tangible Benefits

a. Benefits of Satisfied Trip Demand of Overflowing Passengers

As discussed in Section 9.2 the air passenger traffic is expected to overflow in the Base Case starting from 1988 after the facilities at Toncontín Airport reach their physical capacity limits. In that case the overflowing passenger would either be forced to give up their trips, or would continue their trips by using the alternate airport of San Pedro Sula. In the present analysis, the ratio of occurrence of the above two cases is assumed to be 50-50. The cost of congestion expected to occur at Toncontín Airport before it reaches its physical capacity limit is not accounted for in the present study.

(1) Benefits of overflowing passengers forced to give up their trips

Generally speaking, air passengers are considered to be individuals having a high enough time value to justify the cost of air transport, namely the air fare, which they willingly pay in exchange for such utilities of air transport as time saving, comfort and safety. The overflowing passengers forced to give up their trips at the oversaturated Toncontín Airport will be able to make their intended trips if and when the new airport is constructed. The benefit of such passengers whose trip demand is satisfied by the new airport are considered to equal, at least, to a value that represents their "willingness to pay", which is considered quantifiable in terms of the air fares involved. If the consumer's surplus were also taken into account, the total benefit would be even greater. Assuming that the shares of the overflowing passengers by route are equal to those shown in Table 3-4, the weighted average air fares are calculated to be 100 US Dollars and 20 US Dollars respectively for international and domestic services based on the current air fares listed in Table 9-10. In the present study the benefits of the overflowing air passengers are calculated only of resident passengers based on an assumed ratio of 1:1 between the resident and the non-resident passengers in international service, and 9:1 in domestic service. The results are shown in Table 9-12.

(2) Benefits of overflowing passengers who continue their trips by Alternate Airport

As stated above 50% of the passengers overflowing at Toncontín Airport are assumed to continue their trips through San Pedro Sula Airport. In so doing they will necessarily have to use road transport between Tegucigalpa and San Pedro Sula, and, therefore, they can be said to enjoy the benefits of saved time and cost of the road transport after the inauguration of the new airport.

Table 9-10 CURRENT INTERNATIONAL & DOMESTIC AIR FARE BY ROUTE

(In US$)

Route	Fare
International Route	
Tegúcigalpa - Miami	125.0
Tegucigalpa - Mexico	125.0
Tegucigalpa - Panama	120.0
Tegucigalpa - San Andres	66.0
Tegucigalpa - San José	72.0
Tegucigalpa - Managua	38.0
Tegucigalpa - Guatemala	50.0
Tegucigalpa - Belize	55.0
Tegucigalpa - New Orleans	125.0
Tegucigalpa - Houston	125.0
Tegucigalpa - San Salvador	38.0
Domestic Route	
Tegucigalpa - San Pedro Sula	15.0
Tegucigalpa - La Ceiba	20.0
Tegucigalpa - Roatán	27.5
Tegucigalpa - Trujillo	27.5
Tegucigalpa - Olanchito	17.5
Tegucigalpa - Puerto Lempira	30.0

Source: TAN & SAHSA (As of February 1979)

Such benefits were calculated by the following formula, with the results as shown in Table 9-12.

$$Bi = (ViTr + Cr)Ni$$

where, Bi = Benefits of time and cost saved in the year i

Vi = Time value of resident passengers in the year i

Tr = Travel time by bus between Tegucigalpa and San Pedro Sula

Cr = Travel cost by bus between Tegucigalpa and San Pedro Sula

Ni = 50% of the total number of resident passengers in the year i

The actual calculation was made with an assumed travel time of 4 hours, and an average travel cost of 3 US Dollars. The time value of resident air passengers are as described below.

Per capita value-added of the workers in the industrial and the service sectors of Honduras in 1976 was 2,418 US Dollars in market price according to the World Bank statistics. Based on an assumed nominal increase rate of GDP of 15% per year, the per capita value added in 1979 would amount to 3,680 US Dollars. With the annual working hours assumed at 2,000, the time value per worker in the industrial and the service sectors in 1979 was estimated to be 1.8 US Dollars. As air passengers in general are considered to be of medium to high income classes, time value of air passengers on business trip was assumed to be 3.6 US Dollars, two times that of average workers, and that of tourists and other air passengers at 1.8 US Dollars, half that of air passengers on business or equal to that of average Honduran workers. According to the ECAT (Estudio Centro Americano Transporte) report of 1976 the breakdown of air passengers at Toncontín Airport by purpose of trip comprises 51% for business and 49% for leisure and others, and, therefore, average time value of air passengers was estimated to be 2.7 US Dollars. Since the time value increases commensurate with the increase in real income, the expected time value of resident air passengers through the year 2005 were calculated as shown in Table 9-11 with the increase rate equal to the real increase rate of GDP.

Table 9-11 ESTIMATE OF TIME VALUE OF RESIDENT AIR PASSENGER

Year	US$
1980	2.8
1985	3.5
1990	4.5
1995	5.5
2000	6.5
2005	8.0

Table 9-12 ESTIMATE OF BENEFITS OF SATISFIED TRIP DEMAND OF OVERFLOWING PASSENGERS

(In 1979 thousand US$)

Year	Benefits of Passengers who would have given up their trips			Time & Cost Saved on Road Transport to and from Alternate Airport	Total
	International	Domestic	Sub-Total		
1986	0	0	0	0	0
1987	0	0	0	0	0
1988	450	0	450	87	537
1989	1,330	0	1,330	269	1,599
1990	2,280	46	2,326	527	2,853
1995	7,350	275	7,625	2,525	10,150
2000	14,430	531	14,961	5,725	20,686
2005	24,330	819	25,149	11,382	36,531

b. Benefits of Satisfied Transport Demand of Overflowing International Cargo

As discussed in Section 9.2, the international cargo is expected to overflow after 1980 in the Base Case. The overflowing cargo would either be not transported at all by air, or would be transported through the alternate airport of San Pedro Sula. In the present analysis, the ratio of cargo traffic falling in such two cases is assumed to be 50-50.

(1) Benefits of overflowing international cargo not transported

Airlifted goods usually are valuables or perishables having high freight bearing capacity or requiring safe, speedy or careful handling. Consignors or consignees of such commodities use air transport by paying, in the form of air freight charges, the extra cost for such utilities as time-saving, emergency response and safety, etc. that air transport can provide. Therefore, when the transport demand of the overflowing international cargo is satisfied at the new airport, the consignors or consignees of such cargo are considered to get the benefits equal at least to what represents their "willingness to pay" which is considered quantifiable in terms of the air freight charges involved. If the consumer's surplus were also taken into account, the total benefits would be even greater.

Air cargo rates are primarily based on weights, but the charges structure, comprising general cargo rates, commodity classification rates, and specific commodity rates, etc., is more complicated than that of passenger fares. Actual calculation, therefore, was made by using the minimum charge by route as shown in Table 9-13, based on an assumed average cargo unit weight of 45 Kg. Assuming on the same shares by route of the overflowing cargo traffic as that shown in Table 3-12, the weighted average unit cargo rate is estimated at US$25. Table 9-14 shows the results of the calculation of the total benefits derived from the overflowing international cargo demand unfulfilled in the Base Case and satisfied by the new airport.

Table 9-13 MINIMUM CHARGES PER UNIT OF INTERNATIONAL AIR CARGO BY ROUTE

(US$)

Route	Minimum Charge
Tegucigalpa - Miami	26
Tegucigalpa - Mexico	23
Tegucigalpa - Panama	23
Tegucigalpa - San Andres	23
Tegucigalpa - San José	23
Tegucigalpa - Managua	23
Tegucigalpa - Guatemala	23
Tegucigalpa - Belize	23
Tegucigalpa - New Orleans	26
Tegucigalpa - Houston	26
Tegucigalpa - San Salvador	23

(2) Benefits of overflowing international cargo transported through San Pedro Sula Airport

The overflowing international cargo at Toncontín Airport which would be transported through the alternate airport of San Pedro Sula will have to use road transport between Tegucigalpa and San Pedro Sula. The consignors or consignees of such international cargo can be said to enjoy the benefits of saved time and cost of the said road transport after opening of the new airport, and such benefits were calculated with the actual transport cost of US$12.5 per ton by truck between Tegucigalpa and San Pedro Sula, with the results as shown in Table 9-14. Time value of cargo, however, was not calculated due to its difficulty of quantification.

Table 9-14 ESTIMATE OF BENEFITS OF SATISFIED TRANSPORT DEMAND OF OVERFLOWING INTERNATIONAL CARGO

(In 1979 thousand US$)

Year	Benefits Related to Transport Demand that would have been lost	Saved Cost of Road Transport to and from Alternate Airport	Total
1986	1,500	34	1,534
1990	3,097	70	3,167
1995	5,625	127	5,752
2000	9,219	207	9,426
2005	14,361	323	14,684

c. Net Increase in Tourism Income

As stated above, the new airport constructed at TALANGA is able to accommodate international passengers expected to overflow the existing Toncontín Airport. About one half of such passengers being assumed to be non-residents, the tourism income of Honduras is expected to increase significantly if and when the new airport is constructed on account of the new greatly improved access means of direct air connection to and from Tegucigalpa. Such increase in tourism-related spendings by non-resident brings increased foreign exchange earnings.

The nominal value consumed per tourist in Honduras has grown during the 4-year period of 1972 - 1976 as shown in Table 9-15. Assuming that the same tendency will continue through the year 2005, the nominal value consumed per tourist is expected to be 150 US Dollars in market price in 1979. According to the National Tourism Development Plan of Honduras, average length of stay in Honduras per tourist in 1974 was 4.2 days, and with the development of the tourism infrastructure, it is expected to increase by 0.5 day each year and, therefore, the average real value consumed per tourist is estimated to increase at an average annual growth rate of 5% through the year 2005. Assuming on the value-added ratio of Honduran tourism industry at 50%, which is equal to the average of that of all the industries of the country estimated by the World Bank, calculation was made of the net increase in the Honduran tourism income brought about by the increase in arriving non-resident air passengers, with the results as shown in Table 9-16.

Table 9-15 VALUE CONSUMED PER TOURIST

Year	Number of Visitors	Total Tourism Income (thousand US$)	Value Consumed Per Tourist (US$)
1972	61,923	4,921	80
1973	74,857	7,333	98
1974	90,815	8,169	90
1975	80,850	8,828	109
1976	98,906	11,600	117

Source: INSTITUTO HONDUREÑO DE TURISMO

Table 9-16 ESTIMATE OF NET INCREASE IN TOURISM INCOME

Year	Number of Increased Arriving Non-resident Passengers (A)	Value Consumed Per Passenger [US$] (B)	Net Increase in Tourism Income [thousand US$] (AB/2)
1986	0	211.0	0
1987	0	221.0	0
1988	4,500	232.0	522
1989	13,250	243.5	1,613
1990	22,750	256.0	2,912
1995	73,500	326.5	11,999
2000	144,250	417.0	30,076
2005	243,250	532.0	64,704

d. Airport Revenue Increment by Foreign Aircraft

Foreign airlines have not been serving the existing Toncontín Airport on account of the fact that the airport does not measure up to the internationally accepted standard of operational safety. On the other hand, introduction of international service by foreign airlines can well be expected at the new, modern airport of Tegucigalpa. In fact about 6 such foreign airlines are already anticipated by the DGAC to date.

In the present analysis, it is assumed that about 50% of the total international movements expected at the new airport will be those of aircraft belonging to foreign airlines or of other foreign ownership. The expected increase in the airport revenue attributable to such foreign aircraft was calculated based on the expected landing charges, parking charges and lighting charges estimated in Chapter 8, with the result as shown in Table 9-17. This increment in airport revenue also brings with it an increase in foreign exchange to Honduras, which may be termed as the economic benefit of the New Airport Development Project from the viewpoint of national economy.

Table 9-17 AIRPORT REVENUE INCREMENT BY FOREIGN AIRCRAFT

(In 1979 thousand US$)

Year	Landing Fees	Parking Fees	Lighting Fees	Total
1986	164	5	6	175
1990	226	6	7	239
1995	327	7	9	343
2000	465	9	13	487
2005	662	11	18	691

e. Saving in Aircraft Fuel Consumption

Since New Tegucigalpa Airport is designed to accommodate jet aircraft such as B-707 capable of serving in direct medium haul international routes of Tegucigalpa - Miami and Tegucigalpa - New Orleans. As to the route between Tegucigalpa and Mexico, considerable payload restriction is being imposed on B-737 direct flights now in operation at Toncontin Airport, whereas at the new airport B-707 class aircraft can easily be accommodated on direct flights without any restrictions whatsoever. The resultant increase in payload will reduce the number of aircraft operations on the above mentioned three routes, and consequently, will help save the overall aviation fuel consumption significantly, notwithstanding the fact that fuel consumption of B-707 is no less than that of B-737. Because Honduras depends on imports for all petroleum requirements of the country including that of aviation fuel, the saving in fuel consumption at the same time means the saving in the country's foreign exchange, thus contributing to the national economy. Fuel consumption of B-737 and B-707 for one way direct flight on the said routes are as shown in Table 9-18. Aviation fuel costs 0.8 US Dollar per gallon in Tegucigalpa city. Assuming that Honduran airlines account for 50% of the total international aircraft movements at the new airport, calculation was made of the total annual aviation fuel consumption expected at the new airport, and of such part of the saving as are expected to be accruing to Honduran airlines in case both B-737 and B-707 are operated on the said routes as assumed above, with the results as shown in Table 9-19.

Table 9-18 FUEL CONSUMPTION PER FLIGHT FROM TEGUCIGALPA

(In pounds)

	To Miami	To New Orleans	To Mexico
B-737	16,610	18,260	14,400
B-707	24,200	29,000	23,000

f. Benefits Derived from the Improved Airport Facilities

The New Tegucigalpa Airport is expected to be equipped with up-to-date facilities which will bring about significant improvement in the service level as compared with the existing Toncontín Airport. In particular, the Instrument Landing System will be installed at the new airport, resulting in an improved runway usability as estimated below, as compared with that of the existing Toncontín Airport.

Existing Toncontín Airport : 80% (Record)
New Tegucigalpa Airport : 95% (Estimate)

The above figures indicate that at the new airport runway inoperability due to bad weather conditions is reduced by 15% as compared with the existing airport, meaning that the passengers whose destination is Tegucigalpa can be said to enjoy the benefits of saved time and cost of road transport all the way from the alternate airport of San Pedro Sula for they are no longer forced to land there once the new airport is

Table 9-19 SAVING IN AIRCRAFT FUEL CONSUMPTION

Route	Aircraft Type	1986		1990		1995		2000		2005	
		Number of Flights ('000)	Fuel Consumption ('000 pounds)	Number of Flights ('000)	Fuel Consumption ('000 pounds)	Number of Flights ('000)	Fuel Consumption ('000 pounds)	Number of Flights ('000)	Fuel Consumption ('000 pounds)	Number of Flights ('000)	Fuel Consumption ('000 pounds)
TGU-MIA	B-737	(306)	5,083	(448)	7,441	(663)	11,012	(955)	15,863	(1,372)	22,789
	B-707	(184)	4,453	(269)	6,510	(398)	9,632	(573)	13,867	(823)	19,917
	Saving		630		931		1,380		1,996		2,872
TGU-MEX	B-737	(86)	1,238	(115)	1,656	(163)	2,347	(222)	3,197	(316)	4,550
	B-707	(52)	1,196	(69)	1,587	(98)	2,254	(134)	3,082	(190)	4,370
	Saving		42		69		93		115		180
TGU-MSY	B-737	(254)	4,638	(382)	6,975	(573)	10,463	(834)	15,229	(1,202)	21,949
	B-707	(153)	4,437	(230)	6,670	(344)	9,976	(500)	14,500	(721)	20,909
	Saving		201		305		487		729		1,040
Total Fuel Saving			873		1,305		1,960		2,840		4,092
Total Cost Saving in thousand US Dollars			106		158		238		344		496

constructed. The benefit derived from the improved runway usability was calculated in a similar manner as that of Subsection 9.4.2-1)-a)-(2), and the result is shown in Table 9-20.

The number of passengers benefited in this way is assumed at 15% of the total arriving resident air passengers of the Base Case demand.

Table 9-20 ESTIMATE OF BENEFITS DERIVED FROM IMPROVED RUNWAY USABILITY

Year	Number of Passengers Benefited ('000)	Benefit (In thousand US$)
1986	23.9	419
1987	25.8	477
1988	25.8	503
1989	25.8	516
1990	25.8	542
1995	25.8	645
2000	25.8	748
2005	25.8	903

g. Benefits of Saved Cost of Aircraft Noise Countermeasures

As stated in Subsection 2.3.5 of Chapter 2, residential area of Tegucigalpa city is located directly below the departure path of the airport. In the case of the continued use of the existing Toncontín Airport, the people living in the surrounding area of the airport are expected to suffer physically and mentally from aircraft noise increasingly as aircraft operations increase in future, and aircraft noise countermeasures will become necessary. If and when the new airport is constructed, such aircraft noise hazard can be alleviated, and consequently, the cost of noise countermeasure will be saved.

In accordance with the recommendations of ICAO Annex 16, the expected aircraft noise was calculated in terms of the WECPNL based on the aircraft movements forecast for 1987, when the existing Toncontín Airport is expected to reach its physical capacity limits. Fig. 9-3 shows the WECPNL contours expected in the year 1987.

In the absence of any established standards for aircraft noise-related compensation in Honduras, the following standard was set for the purpose of this study by referring to the statutory standards of compensation for damages caused by aircraft noise presently in effect in Japan and similar standards of other countries.

WECPNL 80 - 90	Compensation of the costs of noise insulation work
WECPNL 90 and above	Compensation of the costs of house relocation

Area of the noise-affected zones according to the 1987 noise contours was calculated using the city map in scale of 1:10,000, and the number of households assumed to be existing in such zones in 1979 was projected based on the 1974 census. Compensation for the households that may move into the noise effected zones after the year 1979 was not taken into account in the calculation.

Table 9-21 shows the estimated cost of aircraft noise countermeasures required for the existing Toncontín Airport in 1987 calculated on the above basis. Since the Base Case is unable to accommodate flight movement increases beyond the year 1987 as mentioned earlier, counter-noise costs will not be incurred beyond that year.

Table 9-21 ESTIMATE OF COUNTER-NOISE COST

	Number of Households Affected	Unit Cost (In 1979 US$)	Total Cost (In 1979 US$)
Cost of Noise Insulation Work	1,601	2,000	3,202,000
Cost of House Relocation	141	17,500	2,467,500
Total	1,742		5,669,500

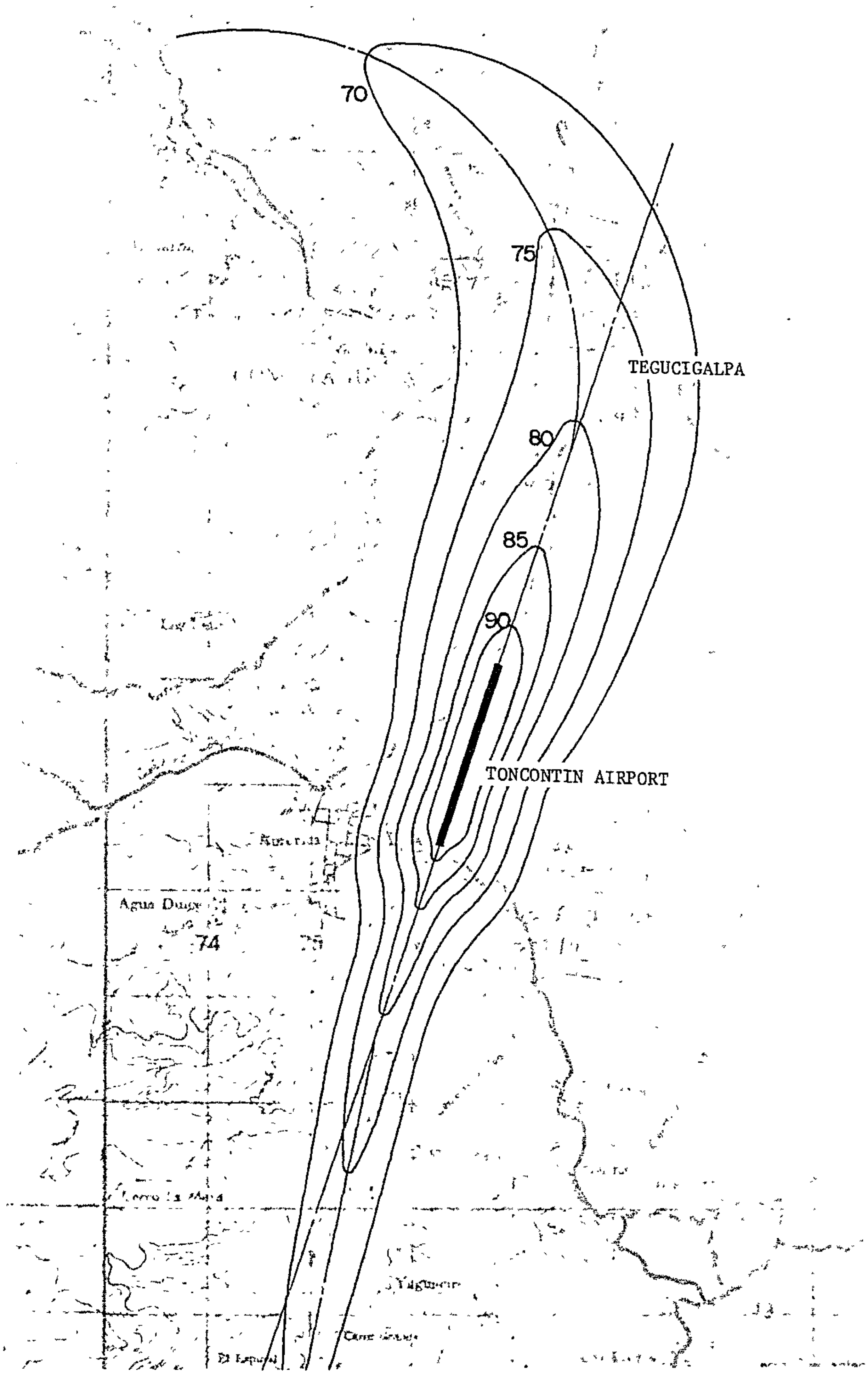


Fig. 9-3 FUTURE WECONL NOISE CONTOURS OF TONCONTIN AIRPORT (YEAR 1987)

h. Benefits of Saved Cost of Maintenance and Operation

When the new airport at Talanga is opened to traffic, the existing Toncontín Airport will be used only for general aviation. As stated in Chapter 8, the annual maintenance and operation cost of the existing Toncontín Airport including personnel costs is estimated to be US$537,000 in fiscal 1978. Assuming that the cost of maintenance and operation of the Toncontín Airport used only for general aviation will be about 50% of that of the existing airport, the remaining 50% of the cost will constitute a saving, and this saving, amounting to US$269,000 per year, is considered to be the benefits attributable to the construction of the new airport.

i. Disbenefits of Additional Access Time and Cost

Since the new airport to be constructed at Talanga site is 60 km away from the center of Tegucigalpa City, additional access time and costs will be imposed on the users of the new airport as compared with the Base Case, and such increments were calculated by the following formula:

$$A = (Cm-Cn) + v\ (Tm-Tn)$$

where,

A = Additional access time and costs incurred

Cm = Access cost between the center of Tegucigalpa and the new airport at Talanga

Cn = Access cost between the center of Tegucigalpa and Toncontín Airport

Tm = Access time between the center of Tegucigalpa and the new airport at Talanga

Tn = Access time between the center of Tegucigalpa and Toncontín Airport

v = Time value of users

The users of the new airport considered in the calculation comprised the resident international and domestic air passengers and airport employees, and the ratio of such access traffic by mode of transport was based on the figures found in Subsection 4.4 of Chapter 4. As for the air cargo, calculation was made on the difference in the cost of access transport by truck between the cases of the existing and the new airport. Table 9-22 shows the additional access time and costs per year calculated as mentioned above based on the access conditions presented in Table 5-15 of Chapter 5. The capacity of the existing national road between Tegucigalpa and Talanga is expected to be capable of accommodating the combined transport demand of the airport access and general traffic up to 1998, and thereafter congestion of the road may have to be expected. This question is further dealt with in the sensitivity test under Subsection 9.5.2 in Chapter 9.

Table 9-22 DISBENEFITS OF ADDITIONAL ACCESS TIME AND COST INCURRED

(Thousand US$)

Year	Resident Passengers			Cargo	Employee	Total
	International	Domestic	Sub-total			
1986	946	572	1,518	67	1,875	3,460
1990	1,466	860	2,326	93	2,719	5,138
1995	2,348	1,308	3,656	135	4,401	8,192
2000	3,689	1,845	5,534	195	6,168	11,897
2005	5,973	2,647	8,620	279	9,181	18,080

2) Direct Intangible Benefits

a. Improvement of Air Safety

As stated in Subsection 2.3.5 of Chapter 2, safety of aircraft operation is not secured at the existing Toncontín Airport. Furthermore, once aircraft crashes into downtown Tegucigalpa which happens to lie directly below the departure path of the existing airport, it may well prove to be a disaster. At the new airport, however, safety of aircraft operation will be significantly improved, and furthermore, possibility of aircraft crashing on the Tegucigalpa City can be almost entirely avoided. This actually constitutes one of the key factors in the planning of the present airport development project. This benefit, however, is not easily quantifiable, and is hence taken into account as intagibles in the present analysis.

b. Improvement of Comfort and Convenience

The service level of the facilities of the new airport will be much improved as compared with that of the existing Toncontín Airport. Air passengers will derive increased comfort and convenience from the new modern facilities installed in the passenger terminal building on the new airport. For example, waiting time of passengers will be largely reduced in the Customs, Immigration and Quarantine procedures, as well as at the check-in counters, and also the average handling time of air cargo will be reduced, at the same time reducing possible occurrence of damage or decay of air cargo. These advantages may well be termed direct benefits enjoyed by the airport users, but have not been identified as such in the present analysis due to lack of reliable data needed for their quantification.

9.4.3 Indirect Benefits

1) Indirect Tangible Benefits

a. Employment Effect

The New Tegucigalpa Airport Development Project is expected to contribute to increasing the national income by providing increased employment opportunities both during and after its construction. These benefits are quantifiable, but have been treated as indirect benefits as is generally practiced, and consequently no calculation thereof have been made in this analysis.

b. Multiplier Effect

The Project will cause multiplier effects through increased employment in construction and in airport operation and management as discussed above, and also through increased procurement of goods and services required for or related to the construction and operation of the new airport. These can be quantitatively identified through the input-output analysis, which however, was considered outside the scope of the present study.

2) Indirect Intangible Benefits

a. Enhancement of National Prestige

The existing Toncontín Airport is the only airport not served by foreign airlines within the Central American region. The national prestige of the Republic of Honduras will be enhanced when the new airport to serve the national capital is constructed with modern facilities measuring up to the international standards, and when subsequently foreign airlines start serving the airport.

b. Development of Information and Cultural Exchange

By virtue of the direct international service established at the new airport, exchange of up-to-date information with the international community will be greatly facilitated, hence contributing to the cultural development of Honduras.

c. Role as Nucleus of National Economic Development

The new airport is expected to play a key role in the development of the Honduran economy, by virtue of the geological advantage of its being situated in the heart of Central America.

9.5 Results of Economic Cost-Benefit Analysis

9.5.1 Economic Evaluation

The cost-benefit analysis based on the cashflow of the economic costs and the direct tangibles of the economic benefits indicates an economic internal rate of return of 13.8% for the Project as shown in Table 9-23. It is concluded, therefore, that the New Tegucigalpa Airport Development Project is economically feasible from the viewpoint of the national economy of Honduras, since the social discount rate of the country is understood to be 12%. If the direct intangible and the indirect benefits were taken into account, the economic worth brought about in Honduras by the Project would be even greater.

9.5.2 Sensitivity Analysis

Sensitivity analysis was made on the value of the EIRR for certain fluctuations of the key factors of the economic costs and the direct tangible benefits, with the results as shown below.

1)	+20% of estimated construction cost	EIRR 12.3%
2)	-20% of estimated construction cost	EIRR 15.7%
3)	+20% of air traffic forecast	EIRR 15.4%
4)	-20% of air traffic forecast	EIRR 12.0%
5)	+20% each of both estimated cost and air traffic forecast	EIRR 13.8%
6)	+20% of estimated cost and -20% of air traffic forecast	EIRR 10.5%

7)	-20% of estimated cost and +20% of air traffic forecast	EIRR 17.5%
8)	-20% each of both estimated cost and air traffic forecast	EIRR 13.8%
9)	The case of the assumed value added of tourism of 30%	EIRR 11.6%
10)	Eliminated airport revenue increment by foreign aircraft	EIRR 13.7%
11)	Eliminated saving an aircraft fuel consumption	EIRR 13.7%
12)	Eliminated aircraft noise countermeasure cost saving	EIRR 13.5%
13)	The case with (10), (11) & (12) occurring simultaneously	EIRR 13.2%
14)	Access congestion accounted	EIRR 13.7%

Table 9-23 CASH FLOW OF ECONOMIC COSTS AND BENEFITS OF NEW TEGUCIGALPA AIRPORT DEVELOPMENT PROJECT

(In 1979 thousand US$)

Year	Costs			Benefits										Discounted Cash Flow at 12%	
	Construction Cost	Maintenance & Operation Cost	Total Costs	Accommodated Overflowing Passengers	Accommodated Overflowing Cargo	Net Increase in Tourism Income	Airport Revenue Increment	Saving in Aircraft Fuel Consumption	Improved Runway Usability	Counter Noise Cost Saved	Maintenance & Operation Cost Saved	Increase in Access Time & Cost	Total Benefits	Total Costs	Total Benefits
1980	5,699	0	5,699	0	0	0	0	0	0	0	0	0	0	5,088	0
1981	2,101	0	2,101	0	0	0	0	0	0	0	0	0	0	1,675	0
1982	6,974	0	6,974	0	0	0	0	0	0	0	0	0	0	4,964	0
1983	13,155	0	13,155	0	0	0	0	0	0	0	0	0	0	8,360	0
1984	21,774	0	21,774	0	0	0	0	0	0	0	0	0	0	12,355	0
1985	18,550	0	18,550	0	0	0	0	0	0	0	0	0	0	9,398	0
1986	0	1,445	1,445	0	1,534	0	175	106	419	0	269	-3,460	-957	654	-433
1987	0	1,450	1,450	0	1,839	0	189	117	477	5,670	269	-3,820	4,741	586	1,915
1988	0	1,455	1,455	537	2,204	522	205	129	503	0	269	-4,216	153	525	55
1989	0	1,462	1,462	1,599	2,642	1,613	221	143	516	0	269	-4,655	2,348	471	756
1990	0	1,467	1,467	2,853	3,167	2,912	239	158	542	0	269	-5,138	5,002	422	1,438
1991	0	1,473	1,473	3,677	3,568	4,229	257	171	561	0	269	-5,640	7,092	378	1,820
1992	0	1,479	1,479	4,740	4,021	5,781	276	186	581	0	269	-6,192	9,662	339	2,214
1993	0	1,486	1,486	6,109	4,531	7,548	297	202	602	0	269	-6,798	12,760	304	2,611
1994	2,202	1,492	3,694	7,875	5,105	9,602	319	219	623	0	269	-7,463	16,549	675	3,023
1995	13,768	1,498	15,266	10,150	5,752	11,999	343	238	645	0	269	-8,192	21,204	2,490	3,459
1996	0	1,776	1,776	11,703	6,349	14,706	368	256	664	0	269	-8,825	25,490	259	3,712
1997	0	1,782	1,782	13,494	7,008	17,820	395	276	685	0	269	-9,507	30,440	232	3,958
1998	0	1,789	1,789	15,559	7,736	21,357	423	297	705	0	269	-10,244	36,102	208	4,192
1999	0	1,797	1,797	17,940	8,539	25,408	454	320	726	0	269	-11,038	42,618	186	4,418
2000	0	1,804	1,804	20,686	9,426	30,076	487	344	748	0	269	-11,897	50,139	167	4,641
2001	0	1,812	1,812	23,178	10,300	35,328	522	370	776	0	269	-12,933	57,810	150	4,778
2002	0	1,820	1,820	25,970	11,255	41,298	560	398	807	0	269	-14,061	66,496	134	4,907
2003	0	1,828	1,828	29,098	12,298	48,129	601	428	837	0	269	-15,289	76,371	120	5,031
2004	0	1,836	1,836	32,604	13,438	55,842	644	461	870	0	269	-16,626	87,502	108	5,147
2005	0	1,845	1,845	36,531	14,684	64,704	691	496	903	0	269	-18,080	100,198	97	5,262
Total	84,223	32,796	117,019	264,303	135,396	398,874	7,666	5,315	13,190	5,670	5,380	-184,074	651,720	50,344	62,906

Economic Internal Rate of Return = 13.8%

Net Present Value = 12,562

Benefit - Cost Ratio = 1.25

CHAPTER 10 PROJECT IMPLEMENTATION ORGANIZATION AND NEW TEGUCIGALPA AIRPORT ADMINISTRATION

10.1 Existing Toncontín Airport Administration

All civil aviation airports in Honduras including the existing Toncontín Airport are under the direct control of the Directorate General of Civil Aviation (DGAC) whose organization chart is shown in Fig. 10-3, which is under the Ministry of Communications, Public Works and Transport (SECOPT) organized as shown in Fig. 10-2. However, planning and construction of airports fall under the jurisdiction of the Directorate General of Civil Works (DGOC) with its organization as shown in Fig. 10-4.

Independent organization of Toncontín Airport administration has not been established to date partly because the DGAC office is located right on the existing Toncontín Airport. The function of the administration of Toncontín Airport is integrated in the organization of the DGAC, whose deputy director concurrently serves as the director of the Toncontín Airport.

Number of DGAC personnel concerned with the Toncontín Airport administration roughly counts 135 as shown in Table 10-1.

The executing agencies responsible for the design, construction, operation, and maintenance of the airport, however, vary by facility, and the DGAC actually is not fully in charge of the administration of the Toncontín Airport. The design and construction of runway, taxiway and apron are executed by the DGOC, and the operation of these facilities by the DGAC, and their maintenance by the Directorate General of Maintenance of Highways and Airports (DGM), of which the organization chart is shown in Fig. 10-5. As to the passenger terminal building, the Directorate General of Urbanism (DGU) with the organization as shown in Fig. 10-6 is in charge of the design and construction, and the DGAC in charge of the operation and maintenance. The DGU is in charge of the design and construction of the international import cargo building, while its operation and maintenance is the responsibility of the Directorate General of Customs which is under the Ministry of Finance. On the other hand, the international export cargo building and the domestic cargo building are designed, constructed, operated and maintained by the airlines. The aeronautical information service and radio navigational aids facilities are designed, constructed, operated, and maintained by the DGAC except for the enroute NDB and VOR/DME, which are maintained by COCESNA, who is also in charge of the design, construction, operation and maintenance of AFTN aeronautical fixed service installations except for the facilities installed within the airport which are operated and maintained by DGAC.

Airfield lighting facilities are designed and constructed by DGOC and operated and maintained by DGAC. DGAC is also in charge of the design, construction, operation and maintenance of the meteorological facilities, terminal air traffic control facilities and the fire fighting and rescue facilities. Car parking is designed, constructed and maintained by DGM, and operated by DGAC.

Aircraft refueling facilities are designed, constructed, operated and maintained by the fuel supply company. All the foregoing is summarized in Table 10-2.

Table 10-1 PRESENT PERSONNEL OF DGAC CONCERNED WITH OPERATION & MAINTENANCE OF THE EXISTING TONCONTIN AIRPORT (as of 1979)

Airport Director (Sub-Director of DGAC)	1
Air Traffic Control	22
Flight Operation	4
Aeronautical Information Service	16
Meteorological Service	8
Fire-fighting & Rescue	15
Electrical and Mechanical Servie	15
Terminal Maintenance	36*1
Procurement	2
Accounting	6
Personnel	4
Statistics	6
Total	135

Source: Dirección General De Aeronáutica Civil

*1	Chief	1
	Carpenters	2
	Masons	2
	Janitors	13
	Guardsmen	18
	(Total	36)

Note: Maintenance of runway, taxiway, apron and car parking is done by District No 1 of Maintenance Department, DGM with 1 engineer and 10 labors.

Table 10-2 ORGANIZATIONS RESPONSIBLE FOR DESIGN, CONSTRUCTION, OPERATION AND MAINTENANCE OF EXISTING TONCONTIN AIRPORT FACILITIES

Facility \ Responsibility	Design and Construction	Operation	Maintenance
1. Runway, Taxiway and Apron	Airport Department, DGOC	Operations Department, DGAC	Maintenance Department, DGM
2. Passenger Terminal Building	Public Building Department, DGU	Airport Department, DGAC	Airport Department, DGAC
3. Cargo Buildings — International Import	Public Building Department, DGU	Directorate General of Customs, MOF	Directorate General of Customs, MOF
3. Cargo Buildings — International Export and Domestic	Airlines	Airlines	Airlines
4. Aeronautical Information Service Facilities	Operations Department, DGAC	Operations Department, DGAC	Operations Department, DGAC
5. AFTN-Aeronautical Service Instllation	COCESNA	COCESNA	COCESNA
6. Radio Nav-aids — En Route NDB, VOR/DME	Operations Department, DGAC	Operations Department, DGAC	COCESNA
6. Radio Nav-aids — Terminal NDB	Operations Department, DGAC	Operations Department. DGAC	Operations Department, DGAC
7. Lighting Facility	Airport Department, DGOC	Operations Department, DGAC	Operations Department, DGAC
8. Meteorological Facility	Meteorological Department, DGAC	Meteorological Department, DGAC	Meteorological Department, DGAC
9. Air Traffic Control	Operations Department, DGAC	Operations Department, DGAC	Operations Department, DGAC
10. Car Parking	Maintenance Department, DGM	Maintenance Department, DGAC	Maintenance Department, DGM
11. Fire-fighting and Rescue	Airport Department, DGAC	Airport Department, DGAC	Airport Department, DGAC
12. Aircraft Refueling	Fuel Supply Company	Fuel Supply Company	Fuel Supply Company

Fig. 10-1 ORGANIZATION CHART OF THE GOVERNMENT OF THE REPUBLIC OF HONDURAS

Central Government

Superior Council of Defense

Superior Council of Economic Planning

Controller General's Office of the Republic

- Directorate General of Civil Service
- Honduran Institute of Tourism

Superior Court of Justice

- Courts of Appeal
- Courts of Letters, Peace and Minors

Attorney General's Office of the Republic

Ministry of Home Affiars & Justice

- National Police
- Directorate General of Population
- Directorate of Technical Advice & Assistance to Municipality
- Fire Defence Board
- National Printing Office
- Penitentiary

Ministry of Foreign Affairs

- Diplomatic Body
- Consular Body

Ministry of Defence & Public Security

- Armed Forces of Honduras
- Special Security Corps

Ministry of Economy & Commerce

- Directorate General of Centroamerican Economic Integration
- Directorate General of Foreign Trade
- Directorate General of Statistics and Census
- Directorate General of Industry
- Directorate General of Internal Commerce

Ministry of Finance

- Directorate General of Budgets
- Audit Office of the Republic
- Treasury General of the Republic
- Directorate General of Tax
- Directorate General of Customs
- Purveyor's Office of the Republic
- Public Credit Office
- Typolithographic Office

Ministry of Public Education

- Directorate General of Primary Education
- Directorate General of Normal & Secondary Education
- Directorate General of Vocational Education
- Superior School of Teachers
- Directorate General of School Maintenance & Construction
- Department of Artistic Education & Cultural Development
- Department of Literacy & Adult Education

Ministry of Public Health & Social Care

- Directorate General of Health

Ministry of Labor & Social Security

- Directorate General of Labor
- Directorate General of Social Security
- General Inspection of Labor

Ministry of Communications, Public Works & Transport

- Directorate General of Maintenance of Highways & Airports
- Directorate General of Civil Aviation
- Directorate General of Transport
- Directorate General of Mail
- Directorate General of Telecommunications
- Directorate General of Highways
- Directorate General of Urbanism
- Directorate General of Civil Works
- National Institute of Geography

Ministry of Natural Resources

- Directorate of Sector Planning
- Directorate of Administrative Services
- Directorate of Mines & Hydrocarbon
- Directorate General of Agricultural Operation

Governmental Agencies and Public Corporations

- Central Bank of Honduras
- National Development Bank
- Autonomous Municipal Bank
- Honduran Corporation of Forestry Development
- People's Credit Fund
- Cooperative Center of Industrial Technique
- National Corporation of Investment
- Honduran Olympic Committee
- Directorate General of Cooperative Development
- National Enterprise of Electric Energy
- National Railway of Honduras
- National Federation of Off-campus Sports
- Scholarship Funds for Students
- National Agricultural Institute
- Housing Institute
- National Institute of Professional Education
- National Institute of Retirement & Pension of Teachers
- Honduran Instititue of Coffee
- National Institute of History & Anthropology
- Honduran Institute of Social Security
- National Council of Social Welfare
- National Board for Children
- National Board for Rehabilitation of Invalids
- National Autonomous Service of Aquaduct & Sewer
- National Autonomous University of Honduras

Fig. 10-2 ORGANIZATION CHART OF MINISTRY OF COMMUNICATIONS, PUBLIC WORKS AND TRANSPORT (SECOPT)

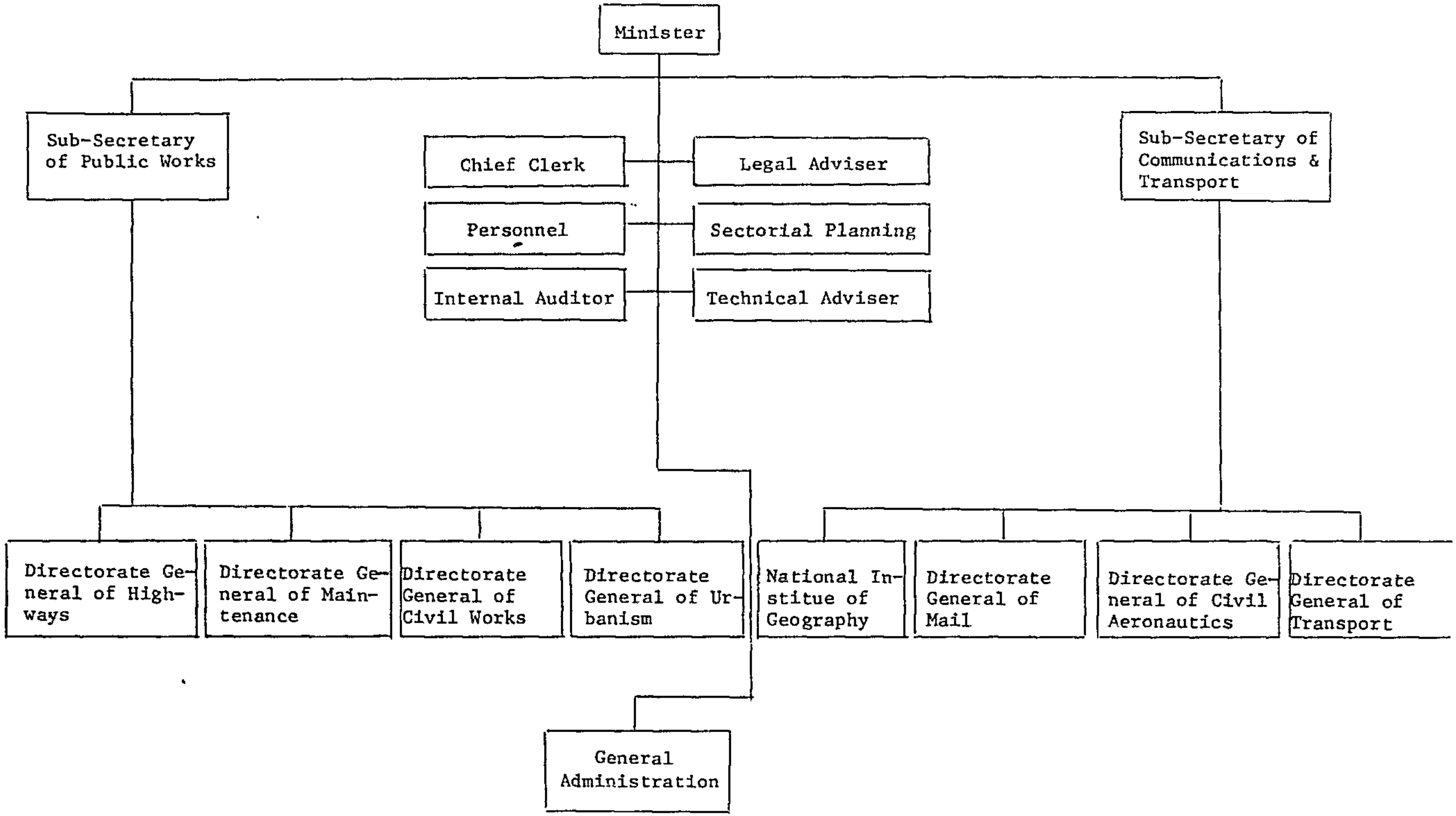
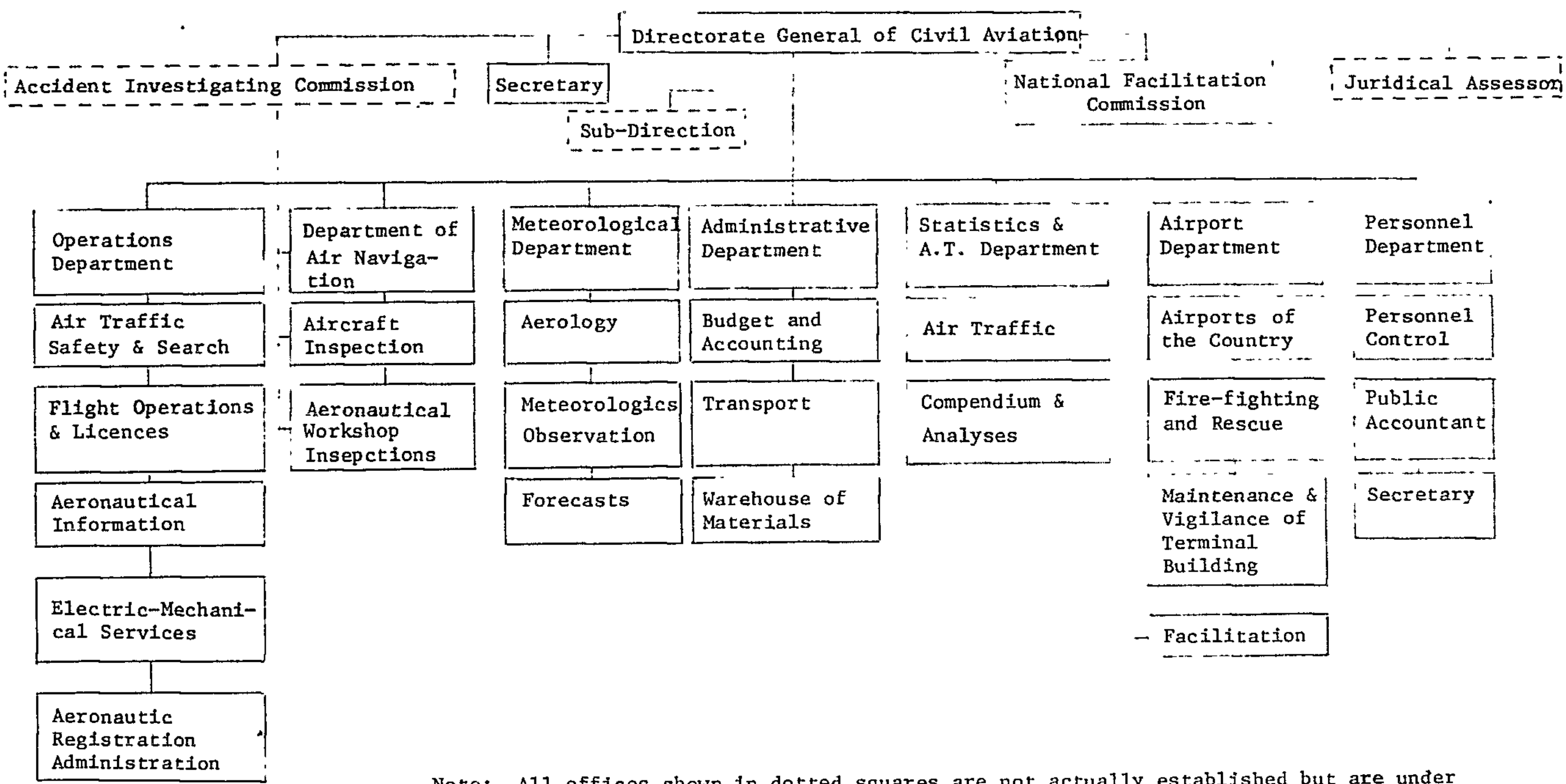


Fig. 10-3 ORGANIZATION CHART OF DIRECTORATE GENERAL OF CIVIL AVIATION (DGAC)



Note: All offices shown in dotted squares are not actually established but are under petition for establishment in the near future to accommodate the DGAC's requirements.

Fig. 10-4 ORGANIZATION CHART OF DIRECTORATE GENERAL OF CIVIL WORKS (DGOC)

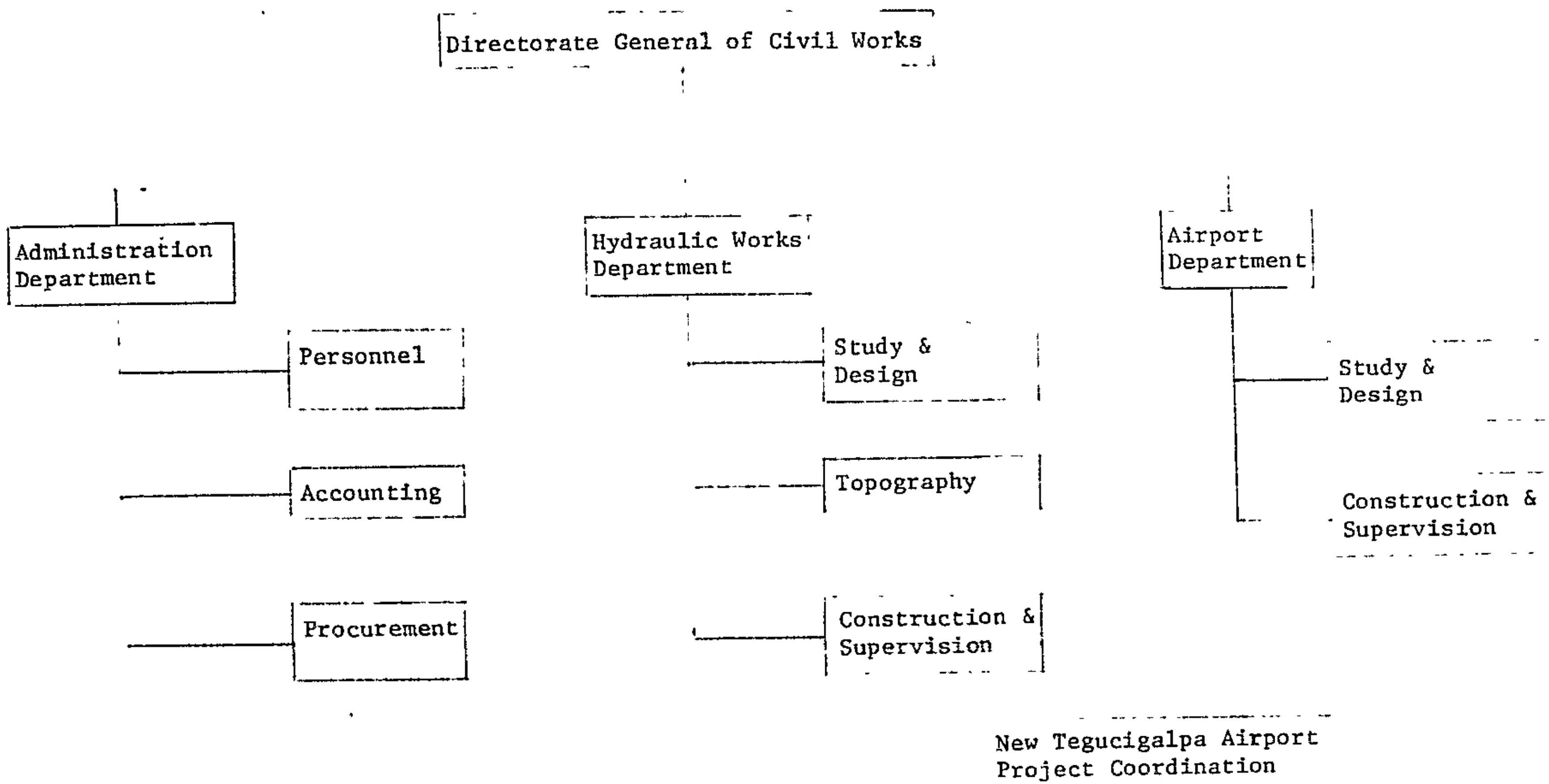


Fig. 10-5 ORGANIZATION CHART OF DIRECTORATE GENERAL OF MAINTENANCE OF HIGHWAYS AND AIRPORTS

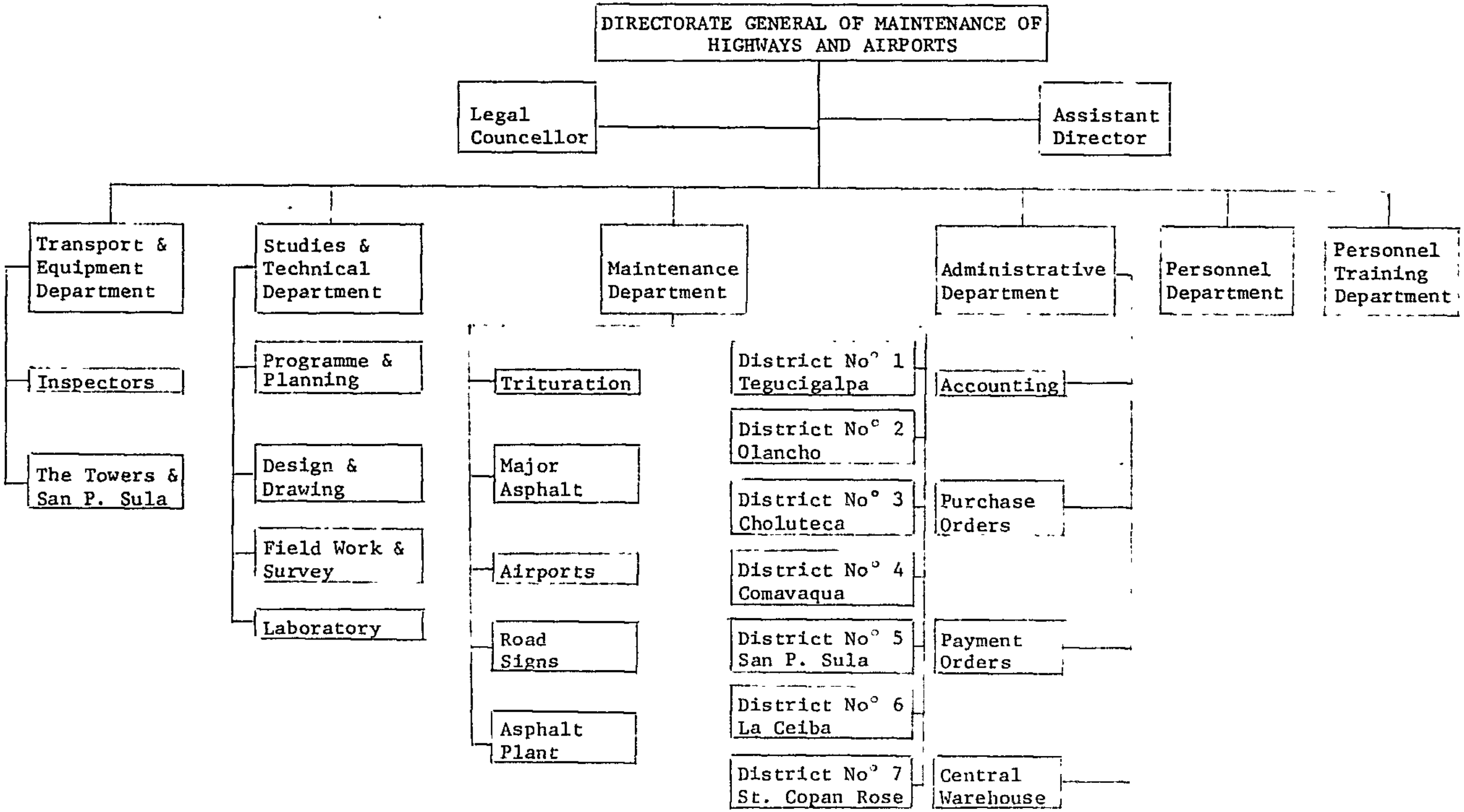
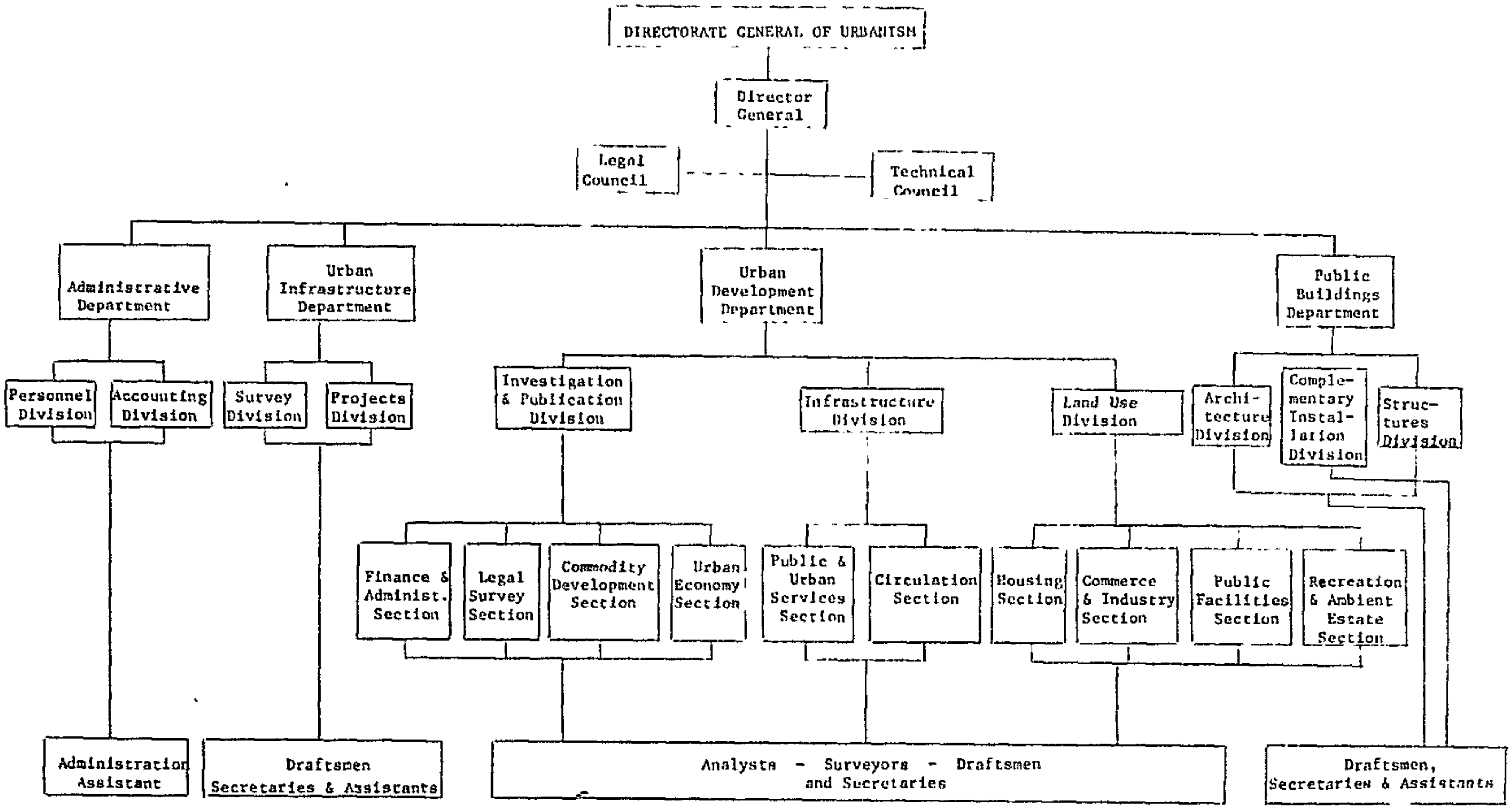


Fig. 10-6 ORGANIZATION CHART OF DIRECTORATE GENERAL OF URBANISM



10.2 Project Implementation Organization

In order to promote implementation of the new Tegucigalpa Airport Development Project, the Project office is established within the DGOC with 5 staff members as shown in Fig. 10-7. It will, however, be necessary to reinforce the staff of the Project office in order to be able to cope with the various matters involved such as the bidding and management of the detailed engineering and construction works, the training of the airport administration staff, etc. that are anticipated in the next few years until the inauguration of the new airport.

In this connection it is considered highly desirable to have an organization established as shown in Fig. 10-8. The technical adviser in the recommended organization, whose major role is to give appropriate advice to the chief of the project office on all technical matters of the Project, will need to be well versed in the planning, engineering and supervisory works of airport construction.

The role of the comptroller is to conduct audit of the Project accounts from the design stage through the completion of the construction work, and to advise the chief of the Project office on financial matters as appropriate. It is naturally expected that the members of the Project office staff will constitute the key personnel in the organization of the new airport administration except for the technical adviser and the comptroller.

As to the training of the new airport personnel no special training program will be necessary except for air traffic controllers because most of the new airport administration staff are expected to come from the existing Toncontín Airport, and the familiarization program to be conducted during the three-month orientation period preceding the inauguration of the new airport is considered sufficient for the purpose. In respect of the ATC personnel, however, at least 10 controllers will be required to remain at the existing

Toncontín Airport to handle the general aviation traffic there, and assuming that the remaining 12 will all be reassigned to the new airport, training of 23 new air traffic controllers will be required, the program of which is shown in Table 10-3.

Fig. 10-7 EXISTING PROJECT IMPLEMENTATION ORGANIZATION

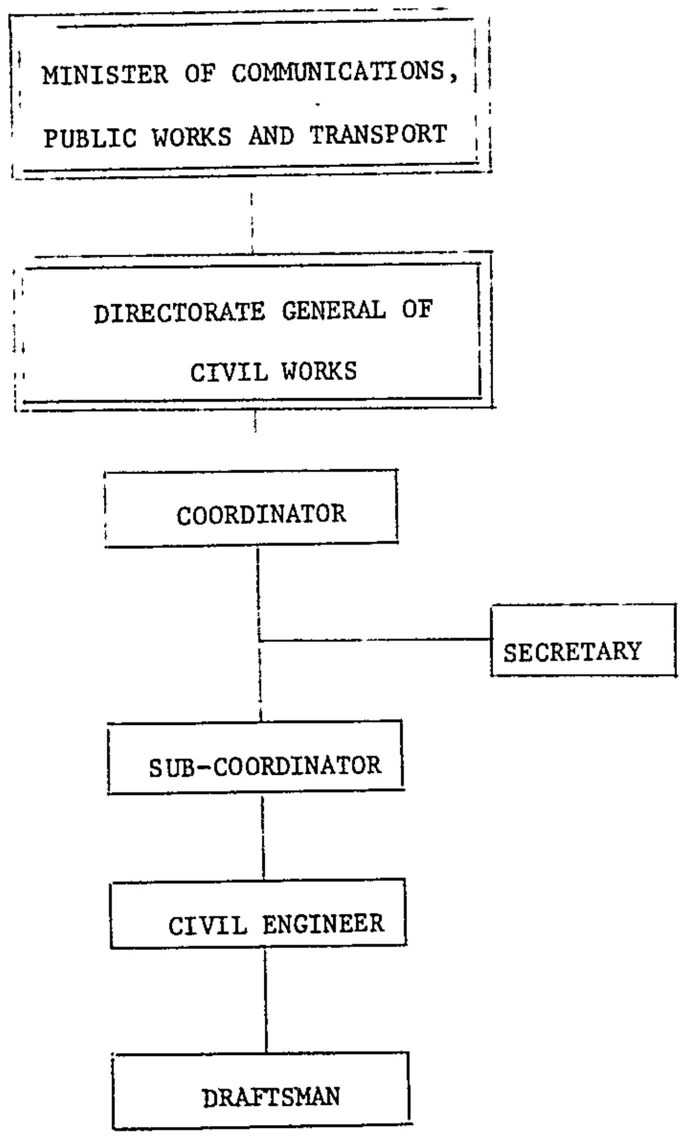
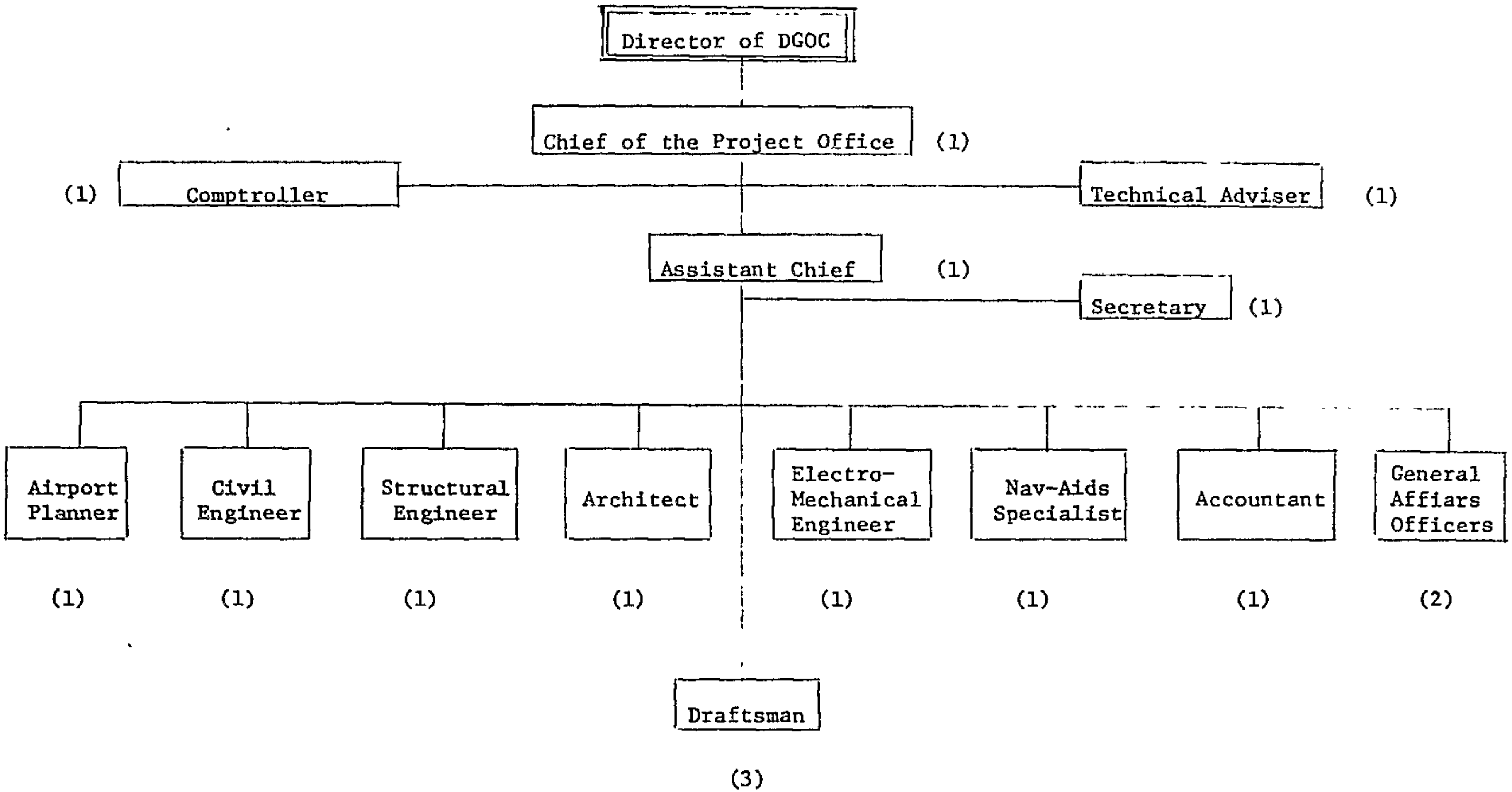
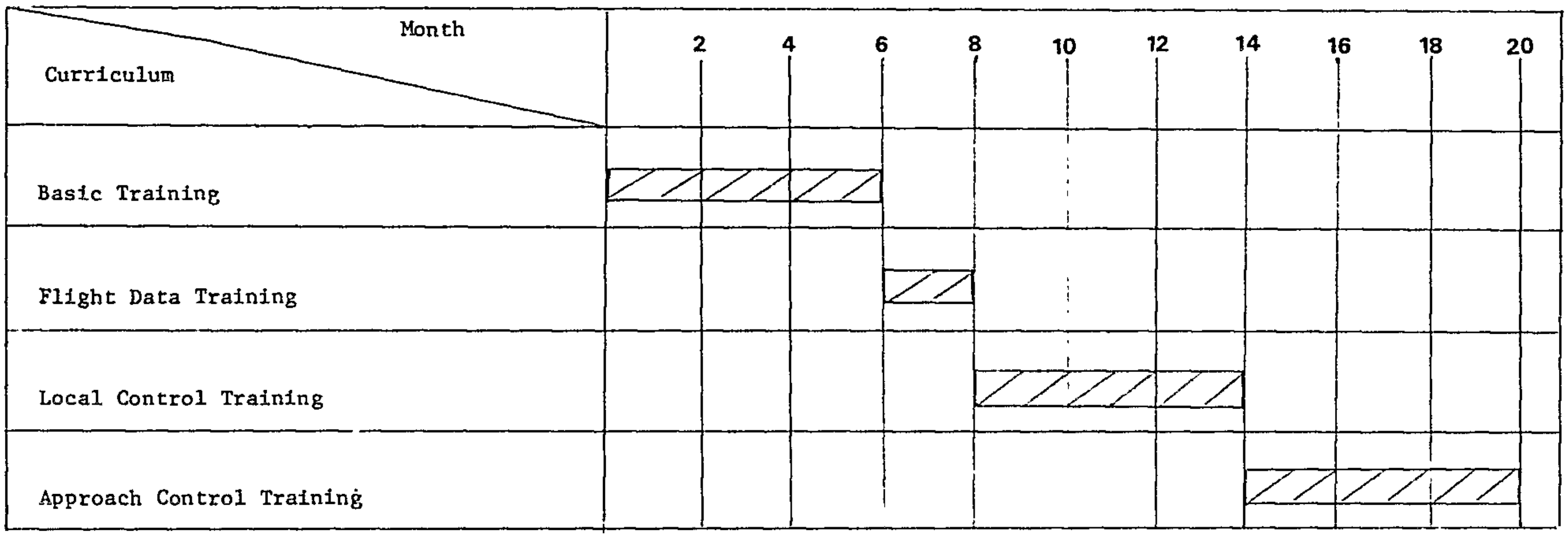


Fig. 10-8 PROPOSED PROJECT IMPLEMENTATION ORGANIZATION



Notes: Figures in parentheses indicate the number of personnel assigned.

Table 10-3 AIR TRAFFIC CONTROLLER TRAINING SCHEDULE



10.3 New Airport Administration Organization

As mentioned in Section 10.1 above, no separate organization exists for the administration of the present Toncontín Airport. It will, however, be absolutely necessary to have an independent administrative organization established for the new airport for the sake of its effective management and operation. Fig. 10-9 shows a recommended plan of such administrative organization.

The new airport's administrative organization is envisaged to belong to the DGAC, and to be composed of Operations Division, Maintenance Division and Administration Division under the control of the airport director. However, the planning and construction of the expansion or improvement work of the new airport will fall under the jurisdiction of the DGOC as it is today. The overlay and repair works of runway, taxiway, aprons and car parking will be the responsibility of the DGM, and COCESNA will operate and maintain ILS/DME, VOR/DME and AFTN aeronautical fixed service facilities as it does at present. The responsibility of the new airport administration organization will, therefore, sum up to the following.

The operations division will be responsible for the effective and efficient operation of the new airport, and be composed of the air traffic control section, the flight operation section, the meteorological service section and the fire-fighting and rescue section.

The air traffic control section will be in charge of the control of the aircraft landing and take-off at the new airport, or flying over and around the new airport, while the enroute air traffic control will continue to be made by COCESNA as hitherto. The number of controllers required in the initial year of operation will be one chief of the ATC section and 35 air traffic controllers grouped in 5 teams of 7 persons each, working on a 6-hour shift a day, and the increase of the ATC personnel is not expected to be necessary throughout the project life.

The flight operation section will be in charge of approving flight plans, and providing aeronautical information and telecommunication services. The number of persons required in the first year will be one chief of the section and 12 operators grouped into 4 teams of 3 persons working on a 8-hour shift a day. It will be necessary to increase the number of the staff at the rate of 3% a year to cope with the future increase of the traffic.

The meteorological service section will be in charge of meteorological observation and weather forecast, and the staff will comprise one chief of the section and 8 operators working in four 8-hour shifts a day with 2 persons in one team. No increase in the staff is anticipated throughout the project life.

The fire-fighting and rescue service section will comprise 1 section chief and 36 firemen grouped into 3 teams of 12 persons each working on a 12-hour shift a day, with no increase in the staff being necessary during the project life.

Each section of this division is expected to be self-sufficient as regards the maintenance of the facilities belonging to each. Should the Government so desire, however, a separate section specializing in maintenance of equipment and installations of the operations division could be established within the framework of the total manning envisaged for the division in the present recommendation.

The maintenance division will be responsible for the maintenance and operation of airport facilities, and will be composed of the airfield maintenance section, the terminal maintenance section, the electrical and mechanical maintenance section and the procurement section.

The airfield maintenance section of the Maintenance Division will be in charge of daily maintenance including upkeep of the runway, taxiway, apron and drainage, as well as of the turfing in the landing area. The section will require 1 chief of the section, 1 civil engineer and 15 workers to start with, and no particular increase is envisaged throughout the period of the project life.

The terminal maintenance section will be in charge of maintenance of the passenger terminal buildings, including the normal upkeep and security services. The international cargo building will be operated and maintained by the Customs, and the domestic cargo building by the airlines. The staff of this section required initially will comprise 1 chief of the section, 1 architect, 2 carpenters, 2 painters, 15 janitors and 20 guardsmen, and this will need to be increased by about 3% each year in order to cope with the expected increase in the activities of the airport.

The electrical and mechanical maintenance section will be responsible for the maintenance of the airfield lighting facilities and of the electrical and mechanical facilities of the terminal buildings. The section will require a staff of 17 engineers including a section chief, 10 electromechanics for the lighting facilities, 2 each working in 4 shifts plus 2 on normal day duty, and 6 electromechanics for the buildings, one each working in 4 shifts and 2 on normal day duty. No increase in the staff requirements of this section is anticipated for the project life.

The procurement section will be in charge of procurement and inventory of the materials and equipment necessary for the operation and maintenance of the entire airport facilities and will initially comprise a staff of 3 clerks and a section chief, which will be increased by about 3% a year to cope with the increasing work load in future.

The administration division will be composed of the accounting section, the personnel section and the statistics section, all of which is expected to require an increase in staff of about 3% per annum through the Project life. The accounting section will be responsible for control of budgets and expenditures as well as collection of airport revenues. The initial staff will comprise a section chief and 5 clerks. The personnel section will be in charge of the personnel management and general affairs, and will initially require a section chief and 4 clerks. The statistics section comprising a section chief and 2 statisticians will be in charge of collection and analysis of the statistical data relating to air traffic and administration of the airport. The manning program of the new airport administration in stages of every 5 years during the project life is summarized in Table 10-4.

Fig. 10-9 PROPOSED ORGANIZATION CHART FOR NEW TEGUCIGALPA INTERNATIONAL AIRPORT

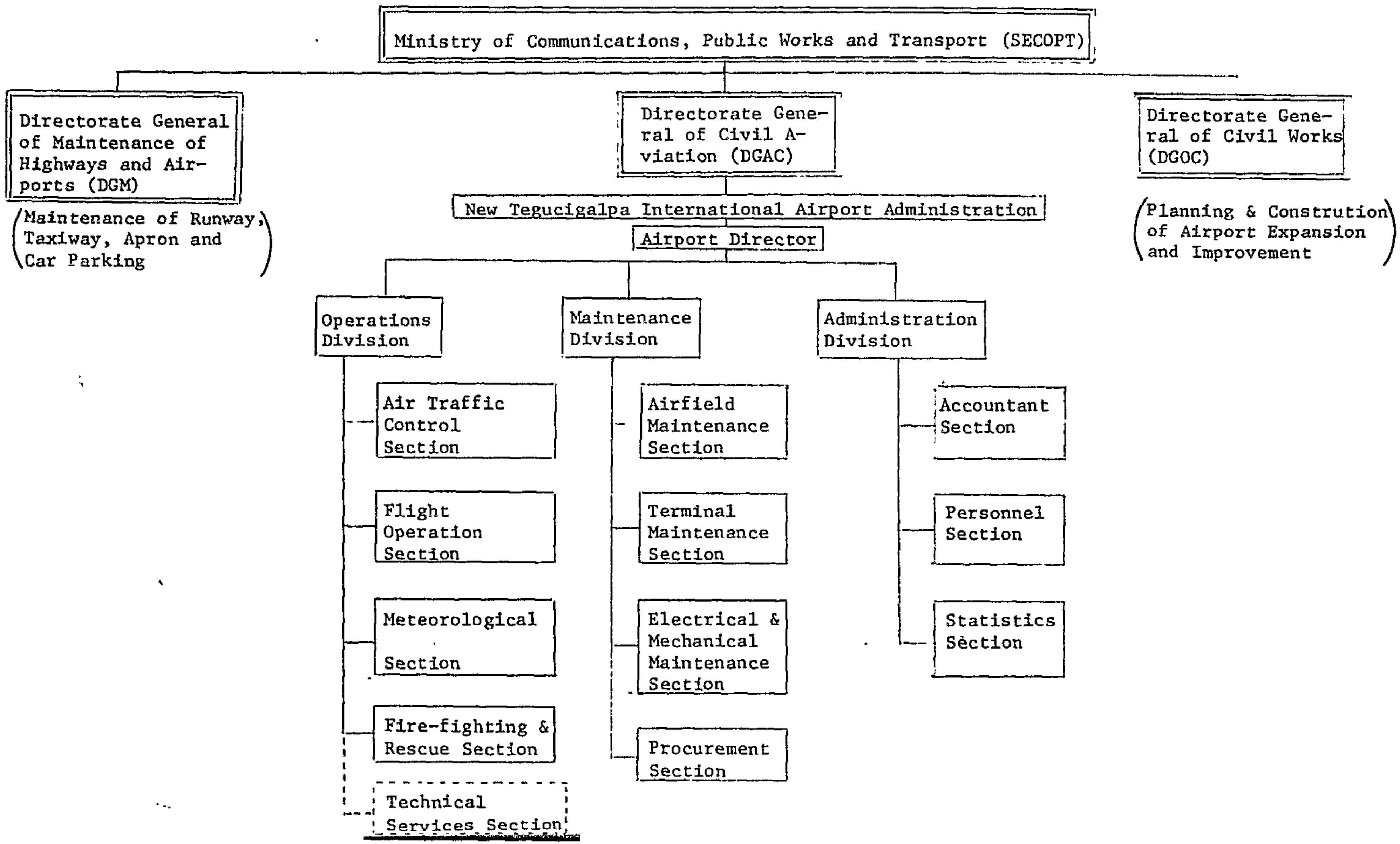


Table 10-4 RECOMMENDED MANNING PROGRAM OF NEW TEGUCIGALPA AIRPORT ADMINISTRATION

Classification	1986	1990	1995	2000	2005
<u>Airport Director</u>	1	1	1	1	1
Secretary	1	1	1	1	1
<u>Chief of Operations Division</u>	1	1	1	1	1
Secretary	1	1	1	1	1
Air Traffic Control Section	36	36	36	36	36
Flight Operation Section	13	15	17	20	24
Meteorological Service Section	9	9	9	9	9
Fire-fighting & Rescue Section	37	37	37	37	37
<u>Chief of Maintenance Division</u>	1	1	1	1	1
Secretary	1	1	1	1	1
Airfield Maintenance Section	17	17	17	17	17
Terminal Maintenance Section	41	46	53	62	72
Electrical & Mechanical Maintenance Section	17	17	17	17	17
Procurement Section	4	5	6	7	8
<u>Chief of Administration Division</u>	1	1	1	1	1
Secretary	1	1	1	1	1
Accounting Section	6	7	8	9	10
Personnel Section	5	6	7	8	9
Statistics Section	3	4	5	6	7
Total	196	207	220	236	254