

## 10.11 Airport Facilities for Nozha Airport

Required facility planning at Nozha airport for Phase I and Phase II are summarized as follows.

### 10.11.1 Airport and Terminal Area Layout of Nozha Airport

Figs. 10.11.1 and 2 show the airport and terminal area layout plan, respectively, of Nozha airport. Table 10.11.1 shows the summary of the airport facilities at Nozha airport. The major considerations for these plans are as follows:

#### (1) Passenger Terminal Building

The expansion of the passenger terminal building will not be required in Phase I for the following reasons:

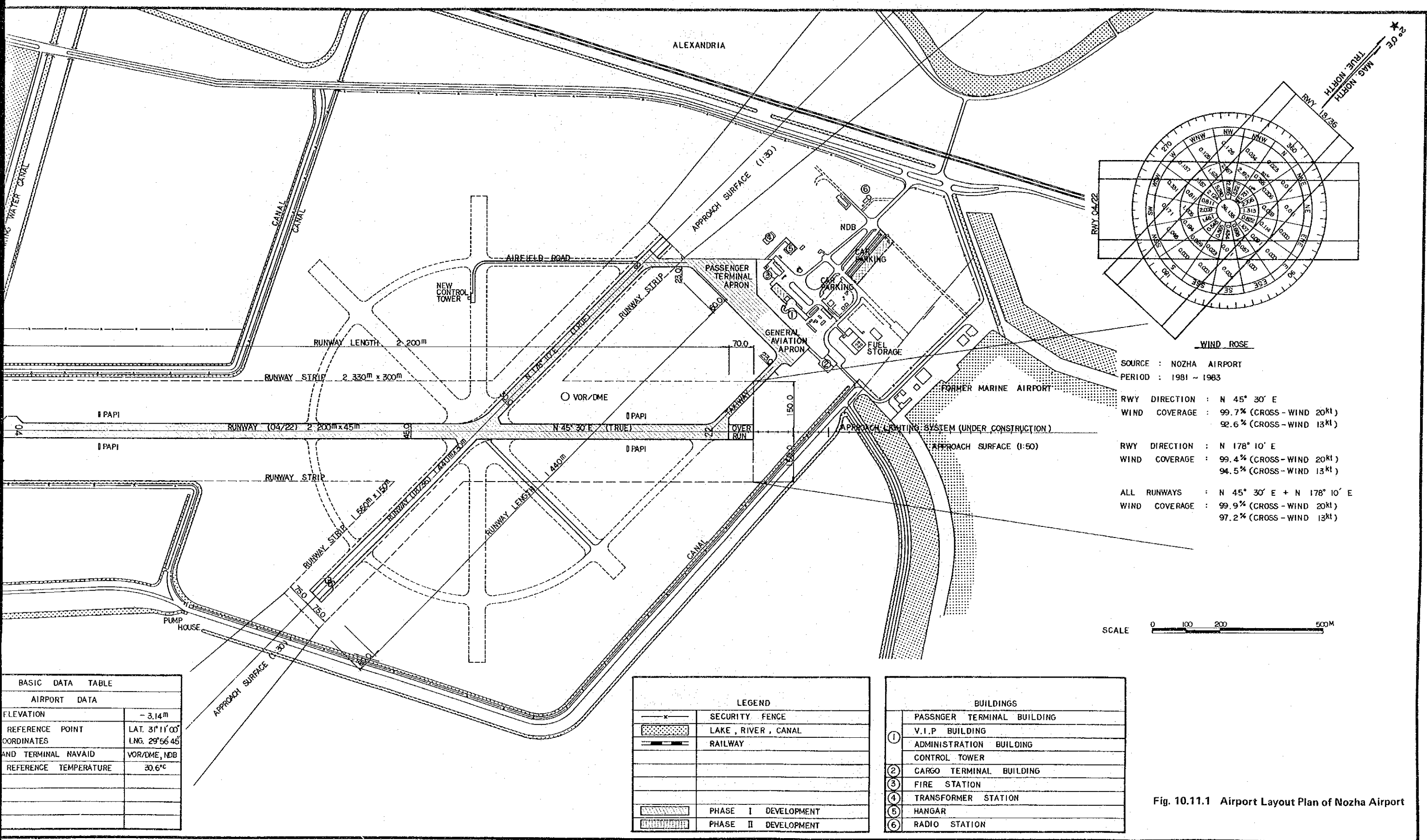
- The facility requirements indicate that the required floor area of the passenger terminal building will be 3,300 sq.m and 5,100 sq.m in Phases I and II, respectively.
- The immediate development (short term plan) is required for the existing passenger terminal building and thus the building will have been expanded to 3,000 sq.m before Phase I development (Refer to Section 5.9).
- Although the facility requirements indicate an expansion of more than 300 sq.m in floor area, this expansion will force a relocation of the existing VVIP building. Postponement of the expansion in Phase II will in no way influence services to passengers.

The passenger terminal building will be expanded toward the west in Phase II as shown in Fig. 10.11.2.

#### (2) Cargo Terminal Building

The cargo terminal building at Nozha airport which will have been constructed in the immediate development will meet the domestic cargo demand in Phases I and II. No expansion of the building will be necessary.





**WIND ROSE**  
 SOURCE : NOZHA AIRPORT  
 PERIOD : 1981 - 1983

RWY DIRECTION : N 45° 30' E  
 WIND COVERAGE : 99.7% (CROSS-WIND 20kt)  
 92.6% (CROSS-WIND 13kt)

RWY DIRECTION : N 178° 10' E  
 WIND COVERAGE : 99.4% (CROSS-WIND 20kt)  
 94.5% (CROSS-WIND 13kt)

ALL RUNWAYS : N 45° 30' E + N 178° 10' E  
 WIND COVERAGE : 99.9% (CROSS-WIND 20kt)  
 97.2% (CROSS-WIND 13kt)

SCALE 0 100 200 500M

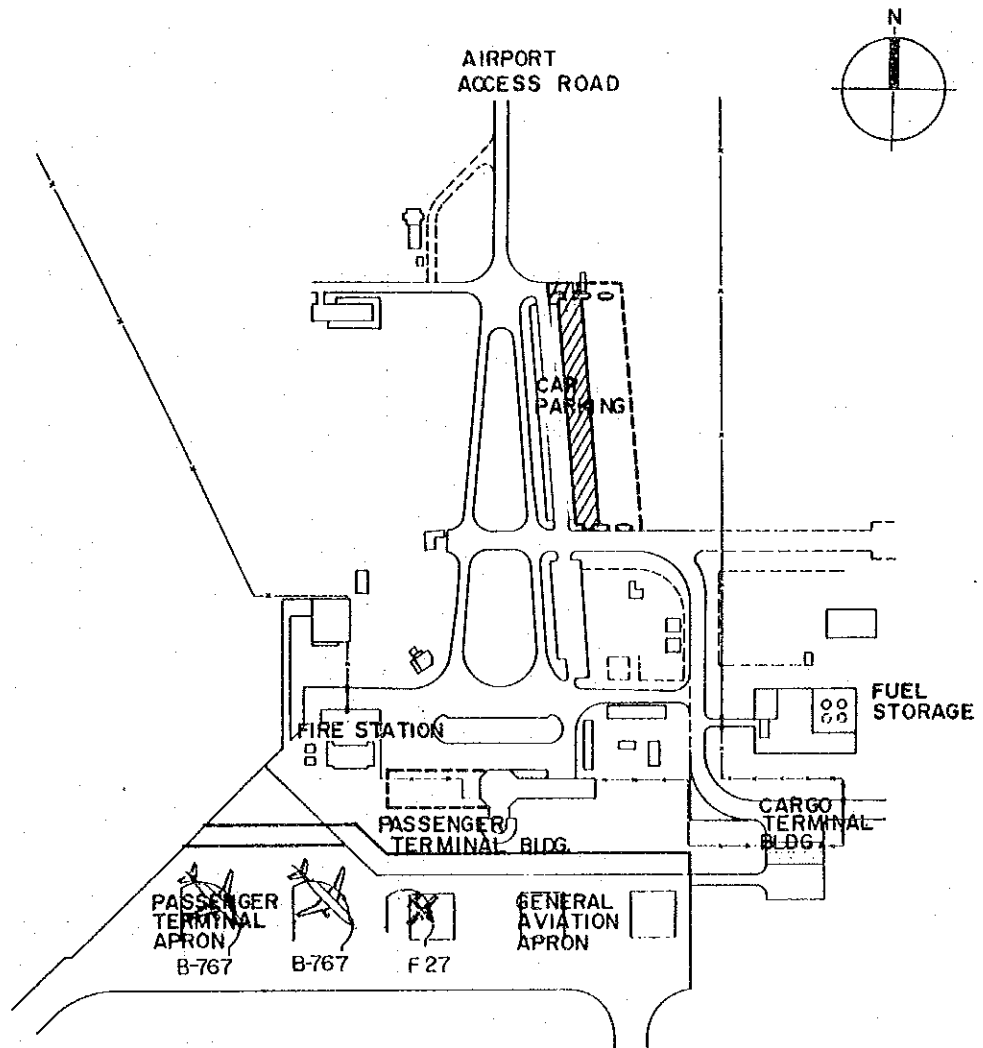
BASIC DATA TABLE	
AIRPORT DATA	
ELEVATION	- 3.14m
REFERENCE POINT COORDINATES	LAT. 31° 11' 00" LONG. 29° 56' 45"
LAND TERMINAL NAVAID	VOR/DME, NDB
REFERENCE TEMPERATURE	30.6°C

LEGEND	
	SECURITY FENCE
	LAKE, RIVER, CANAL
	RAILWAY
	PHASE I DEVELOPMENT
	PHASE II DEVELOPMENT

BUILDINGS	
	PASSNGER TERMINAL BUILDING
①	V.I.P. BUILDING
	ADMINISTRATION BUILDING
	CONTROL TOWER
②	CARGO TERMINAL BUILDING
③	FIRE STATION
④	TRANSFORMER STATION
⑤	HANGAR
⑥	RADIO STATION

Fig. 10.11.1 Airport Layout Plan of Nozha Airport








- LEGEND**
-  IMMEDIATE WORKS
  -  PHASE I
  -  PHASE II

Fig. 10.11.2 Terminal Area Layout Plan of Nozha Airport

Table 10.11.1 Outline of Nozha Airport in Phase 1

"X" indicates services available

Country	Name of Airport	INT./DOM.	ICAO CODE	Comencement of Services	Airport Total Area	Aerodrome Ref. Point	Airport Elevation	Runway Orientation	Aerodrome Ref. Temp.	Operation Hours	Seasonal Availability	Note:								
Arab Republic of Egypt	Alexandria (Nozha)	DOM.	4D	1945	554 ha	30° 11' 00" N 29° 56' 45" E	-3.35 m (-11 ft)	N43° 30' E(MN) N176° 10' E(MN)	30.6°C	-	All Seasons	Control Agency: Egyptian Civil Aviation Authority								
City/Town																				
Name	Population	Distance to Airport	Transportation		Bus	Operational Minimum						Note:								
Alexandria	2.6 Million (1982)	4 NM by Road	Railway	Taxi	Bus	Runway	Procedure	OCL				Approach Category: Instrument, Non precision								
Nav aids	NDB X	VOR X	DME X	TACAN X		LOCATOR	VHF D.F.													
ATC/COM	ASR	SSR	PAR	ASDE		VHF A/G	(VHF LINK, SSB) X	ITY	MICROWAVE	ATS										
Lights	ALS X	SFL X	SALS X	ALB X	CGL X	RWL X	RWCL X	RWTL X	ORL X	TDZL X	REIL X	DML X	PAPI X	TWL X	TWCL X	TG X	ABN X	IWDI X	AFL X	O.L. X
MET	RWY Surface Sensors		RVR	Cellometer		WX-FAX	APT-RX	Radioonde	WX Radar	WX-ITY										
Basic Facilities																				
Runway Strip	Size	Pavement		Note	Annual Passengers (x 1,000)								Note:							
	2,330 m x 150 m	-			800									Completion of Phase I development: End of 1991						
Runway	2,200 m x 45 m	Asphalt			600															
Taxiway	1,440 m x 30 m	Asphalt			400															
Apron	370 m x 23 m	Asphalt			200															
Design Aircraft	No. of Stands	Area		Parking Configuration	100															
B767 class	2	38,260 m <sup>2</sup>		Self-manuevering	80															
F27 class	1	Structure		Self-manuevering	1983	1985	1990	1995	2000	2005	2010									
Passenger Bldg.	3,000 m <sup>2</sup>	RC			80	80	100	150	200	250	300									
Cargo Bldg.	600 m <sup>2</sup>	S			1983	1985	1990	1995	2000	2005	2010									
Administration Bldg.	1,500 m <sup>2</sup>	RC			LDG and TOF															
Control Tower	Cab. 40 m <sup>2</sup>	RC		Height 18 m	5,526	2,900	3,450	3,730	4,590											
Fire Station	590 m <sup>2</sup>	2 Air Crash Tenders 2 Fire Engines			Annual Freight (ton)															
P.O.L.	(JET A1 150 kℓ)				81	380	600	900	1,300											
Hangar	31 m x 36 m			For Gliders	Annual Passengers															
Carparking Lot	260 cars				DOM.	81,436	290,000	380,000	500,000	660,000										
					INT.	1,705	-	-	-	-										
					Year	1983	1985	1995	2000	2005	2010									

(3) Control Tower

New control tower is located as shown in Fig. 10.11.1. This location meets the FAA siting criteria which requires clear and unobstructed view of the entire movement area of airport surfaces and approach/departure areas. Access from/to the existing administration building can be made crossing the non-instrument runway.

The elevation of the control tower is determined to be approx. 15 m above mean sea level, based on the aforementioned criteria. The control tower is planned to be a reinforced concrete structure.

(4) Runway, Taxiway and Apron

No extension of the runway and taxiway will be required in Phases I and II since the existing runway length suffices for the assumed longest route, Alexandria to Aswan. Only pavement overlay works will be required for the existing runways.

As for the apron, the aircraft stands are modified as shown in Fig. 10.11.2 in order to accommodate two B-767 class and one F27 aircraft.

(5) Car Parking

A car parking area which will have been expanded (not paved) in the immediate development will suffice for the space requirements in Phase I. The area will, however, be paved by asphalt concrete in Phase I.

### 10.11.2 Pavement

The pavement of the Nozha airport is planned as shown in Fig. 10.11.3 (Refer to Section 7.5.2 also).

(1) Runway, Taxiway and Apron

Overlay with 3 cm thickness is required for runway 04/22, runway 18/36 (only section used for connecting taxiway to apron), taxiway and apron. This required thickness of overlay has been calculated based on 400 respective loadings from B-767 class aircraft and subgrade CBR 3%.

(2) Car Parking

The paved carpark with asphalt concrete of approx. 260 lots including existing 170 lots is required in Phase I. Pavement thickness will consist of 5 cm surface, 15 cm base course and 20 cm subbase course. The thickness is designed based on the CBR design method, assuming less than 100 daily tracks with a 5 ton wheel load and CBR 3 percent for the subgrade.





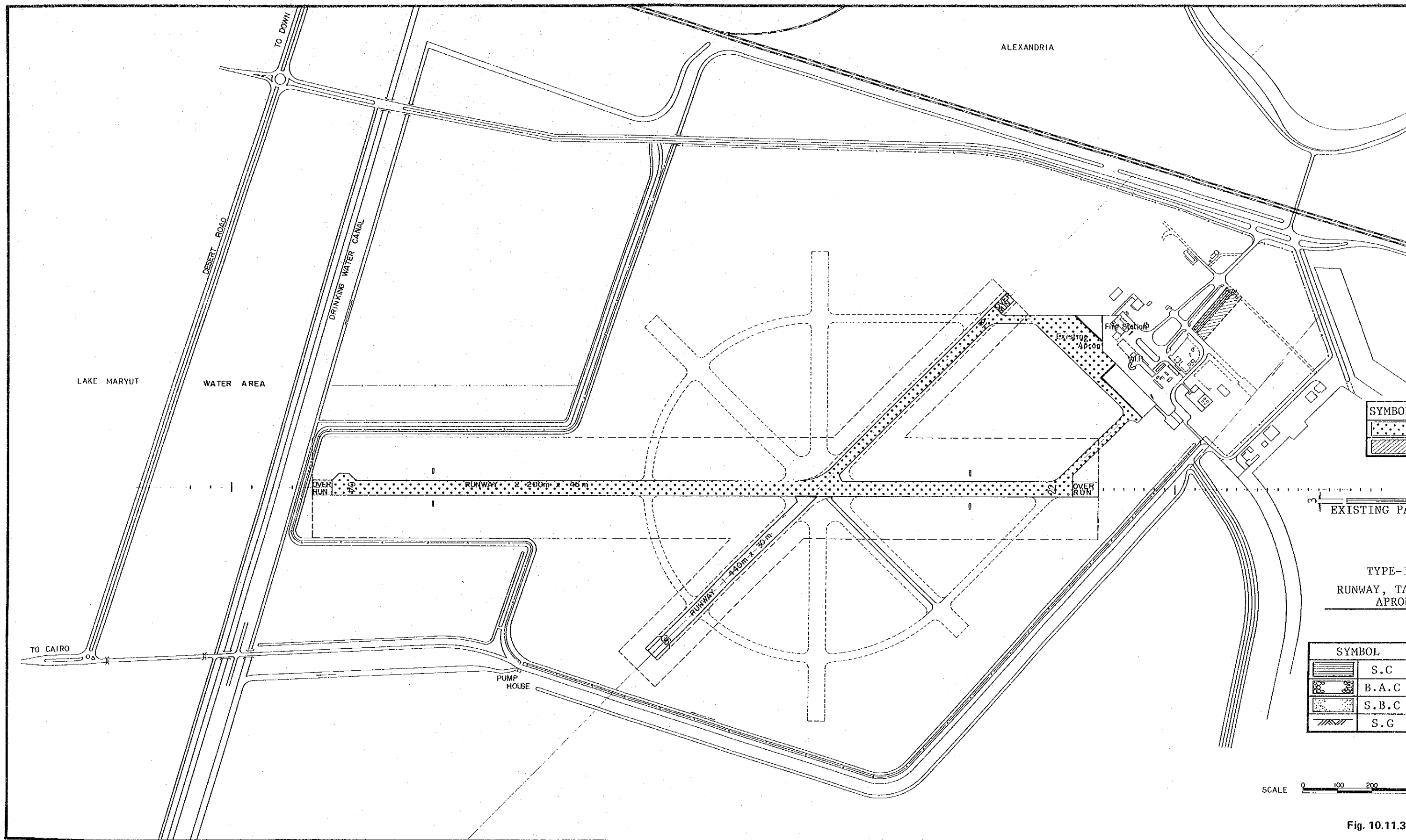
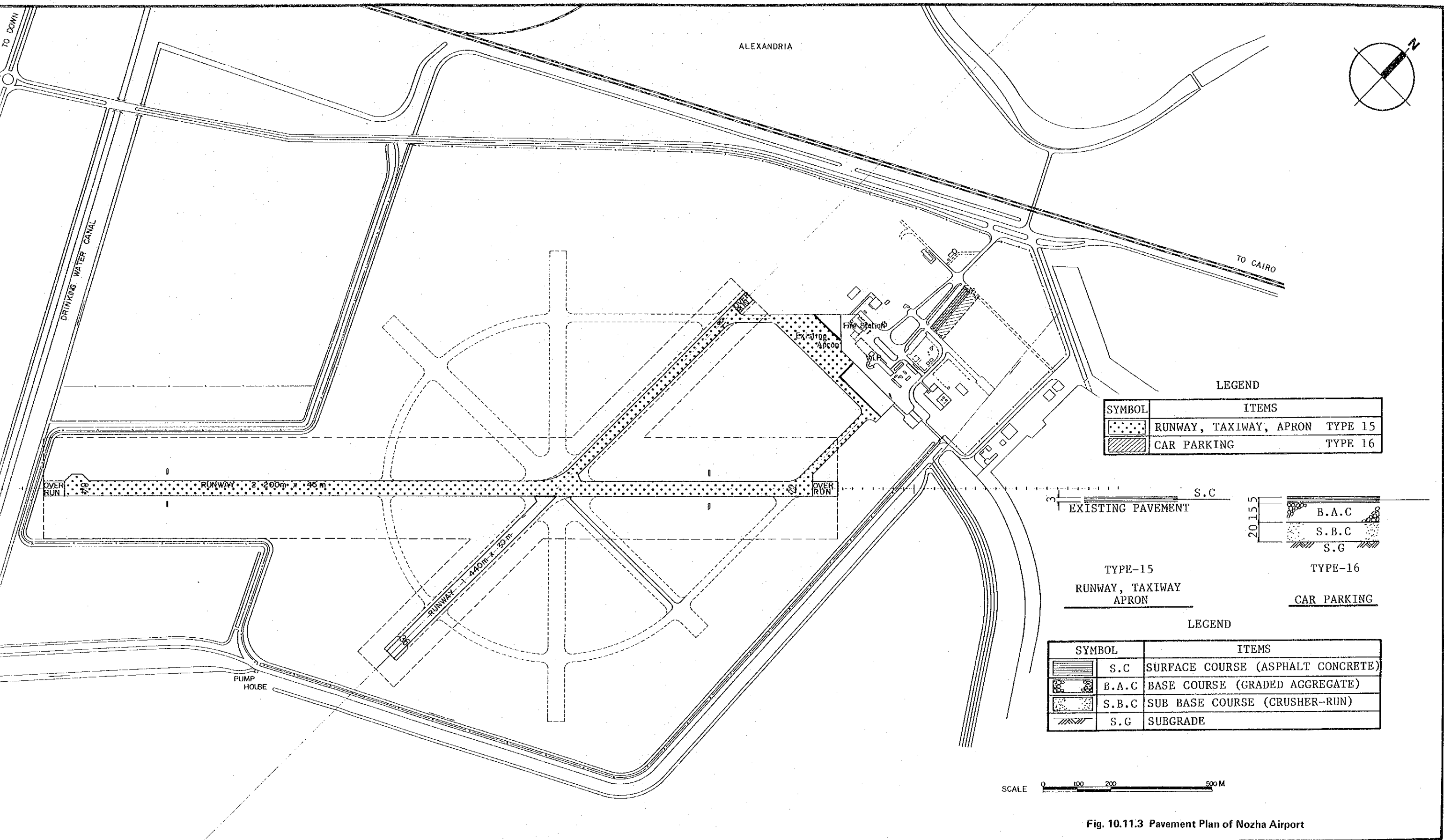
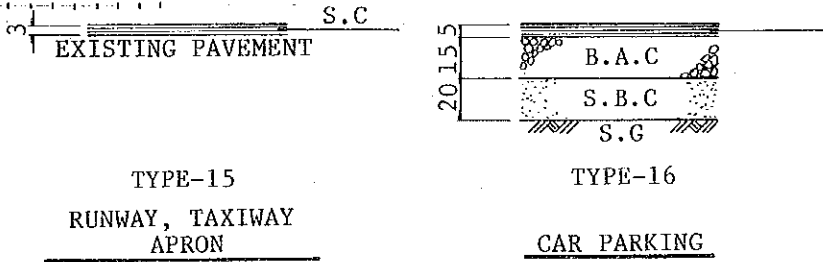


Fig. 10.11.3



LEGEND

SYMBOL	ITEMS
	RUNWAY, TAXIWAY, APRON TYPE 15
	CAR PARKING TYPE 16



LEGEND

SYMBOL	ITEMS
	S.C SURFACE COURSE (ASPHALT CONCRETE)
	B.A.C BASE COURSE (GRADED AGGREGATE)
	S.B.C SUB BASE COURSE (CRUSHER-RUN)
	S.G SUBGRADE

SCALE 0 100 200 500 M

Fig. 10.11.3 Pavement Plan of Nozha Airport



### 10.11.3 Air Navigation System

At Nozha airport, the existing aircraft operations category : non-precision and instrument approach, for runway 04/22 will continue and the minimum improvements for the existing air navigation systems are planned as listed in Table 10.11.2.

The existing air navigation systems which are operating at Nozha airport will be maintained as long as possible. Replacement of these equipment such as VOR/DME, NDB, VHF air-to-ground radio, etc., will, however, be required around 1994.

Since the existing operations category (non-precision and instrument approach) for runway 04/22 will continue at Nozha airport, no development of the air navigation systems will be required in Phase I except for control consoles, telecommunications cable link etc., related to the construction of a new control tower. No nav aids will be required for runway 18/36, since it is planned to be operated as non-instrument runway.

Table 10.11.2 Air Navigation Systems Plan (Nozha Airport)

Equipment	Nr.	Outline	Remarks
Control tower console	1 set	2 positions and light control desk	
Communications control equipment	1 set	For control of VHF	
Air traffic light gun	1 set		
Meteorological sensor	1 lot	Wind, temperature and air pressure	Conventional type
DC power supply equipment	1 set		
Telecommunications cable link	1 lot	Between the new tower and the existing equipment room	

#### 10.11.4 General Services

##### (1) Rescue and Fire Fighting

The existing rescue and fire fighting facility at Nozha airport meets the necessary requirements for category 7 and no upgrading will be required in Phases I and II.

##### (2) Fuel Supply

At Nozha airport, the required fuel storage area is estimated to be 2,800 sq.m and 3,200 sq.m in Phase I and II, respectively. An area of 3,200 sq.m which will cope with the demand in Phase II, is reserved in Phase I.

It is suggested that the necessary fuel yard requirement in the immediate development (short term development) which will require 7,000 sq.m in total area can be reduced to 3,200 sq.m by decreasing storage criteria from one-week-storage capacity to 3 days-storage capacity.

## CHAPTER 11 AIRSPACE USE





## CHAPTER 11 AIRSPACE USE

### 11.1 General

This chapter discusses airspace use and the possibility of establishing aircraft operations procedures for the new airport and Nozha airport.

There are no constraints in establishing free aircraft operations procedures for the new airport since the new airport is adequately located in the desert area. This makes it possible to conduct the optimum aircraft operations with the lowest obstacle clearance limit for the precision approach category I. The new airport can be linked with Cairo, Athens, etc., by new air routes, which can be established without any constraints.

Nozha airport will be used for domestic services after removal of the obstacles and establishment of a safer and more efficient VOR/DME straight-in approach procedure.

It is advised that close coordination by ECAA with the military should be made before the establishment of aircraft operations procedures for the new airport in order to ensure the maximum utilization of the airspace among the new airport and the adjacent military airport.

### 11.2 Basic Assumptions

Basic assumptions and conditions which are employed in this Chapter are summarized in Tables 11.2.1 and 2.

**Table 11.2.1 Basic Assumptions (New Airport)**

Item	Dimension
Runway Location (ARP)	N 30° 55' 15" E 29° 42' 55"
Runway Orientation	True North 142.0° East (RWY 14/32)
Magnetic Variation	2.0° East
Runway Elevation	
ARP	50.5 m
RWY 14 TDZ	61.5 m
RWY 32 TDZ	44.2 m
RWY 14 Threshold	61.5 m
RWY 32 Threshold	37.0 m
Runway Length	3,250 m
Runway Utilization Ratio	RWY14 90% RWY32 10%
Nav aids	ILS, VOR/DME, NDB, Locator

**Table 11.2.2 Basic Assumptions (Nozha Airport)**

Item	Dimension
Runway Location (ARP)	N 30° 11' 00" E 29° 56' 45"
Runway Orientation	True North 43°30' East (RWY 04/22)
Magnetic Variation	2.0° East
Runway Elevation	
ARP	3.25 m below sea level
RWY 04 Threshold	2.7 m (9 ft) below sea level
RWY 22 Threshold	3.4 m (11 ft) below sea level
Runway Length	2,200 m
Runway Utilization Ratio	RWY04 80% RWY22 20%
Nav aids	VOR/DME, NDB

### 11.3 Obstacle Limitation Surfaces

Figs. 11.3.1 and 2 show the obstacle limitation surfaces of the new airport and Nozha airport, respectively. The obstacle limitation surfaces are studied based on the ICAO requirements for precision approach category I (Code No. 4 E) for the new airport and non-precision approach (Code No. 4 D) for Nozha airport (Refer to Table 4.2.7 on page 4-12).

No obstruction which protrudes upon the obstacle limitation surfaces is found at the new airport. Thus, complete obstacle limitation surfaces can be established at the new airport.

Lamp posts and trees, however, protrude upon the approach surface and take-off climb surface of runway 04/22 at Nozha airport as explained in detail in Section 5.3.1 on page 5-11. Those should be removed as soon as possible in order to ensure safe aircraft operations now and in Phase I.

It is considered not feasible to remove many obstructions (houses, trees, mosque, etc.) which protrude upon the approach surface of runway 18 and take-off climb surface of runway 36, as reported on Section 5.3.1 on page 5-11. Runway 18/36 should, accordingly, be operated as non-instrument runway.



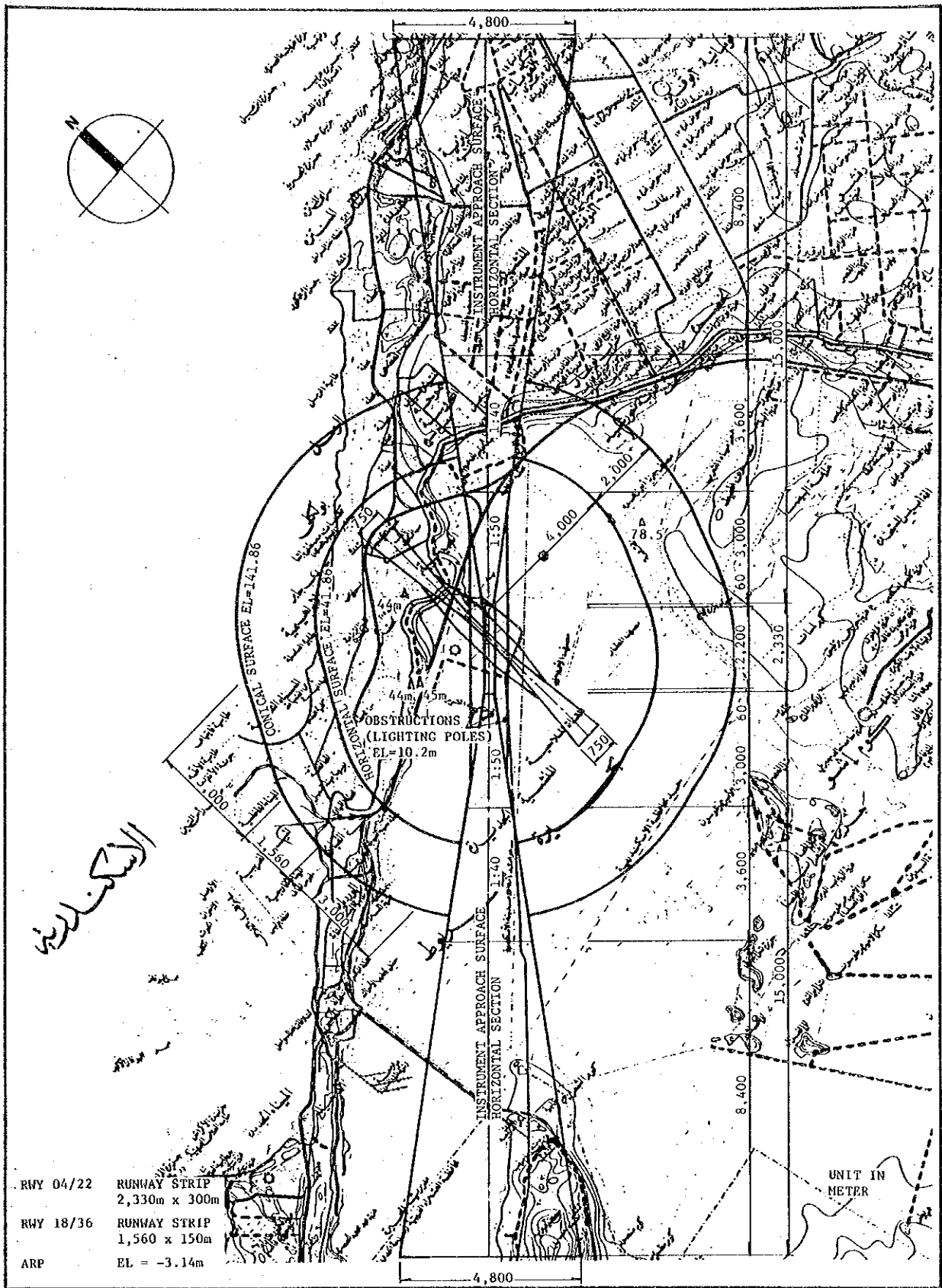


Fig. 11.3.2 Obstacle Limitation Surfaces for Nozha Airport

## 11.4 Aircraft Operations Procedures

### 11.4.1 Terminal Area

Fig. 11.4.1 shows a possible terminal area chart for both the new airport and Nozha airport. A new air route connecting Cairo airport and the new airport can be established without any constraints as shown in Fig. 11.4.1. The new air route will be established utilizing Cairo VOR and El Daba VOR avoiding the Prohibited Areas HE/P1 and P2, and the Danger Areas HE/DI3 and DI4.

The existing air route, A10, connecting Nozha airport and Cairo airport can be maintained as it is without any modification due to the establishment of the new air route.



#### 11.4.2 Approach and Departure Procedures for the New Airport

Figs. 11.4.2 through 5 show possible instrument approach and departure procedures for the new airport taking into consideration Nozha airport and the adjacent military airport. These charts were drawn in order to study the actual or possible existence of any constraints for the procedures establishment and should be considered for reference only.

As basic approach procedures, ILS approach for runway 32, and VOR approach for runways 14 and 32 were studied, whereas NDB approaches are considered mostly the same as VOR approaches. As shown in the figures, no problem is found and very practical approach procedures of low obstacle clearance limit (OCL) and free standard instrument departure (SID) procedures can be established for the new airport.

It is advised that an approach (radar) control services which utilize the planned ASR/SSR should be established at the new airport for both the new airport and Nozha airport, and that only aerodrome control services should be established at Nozha airport.



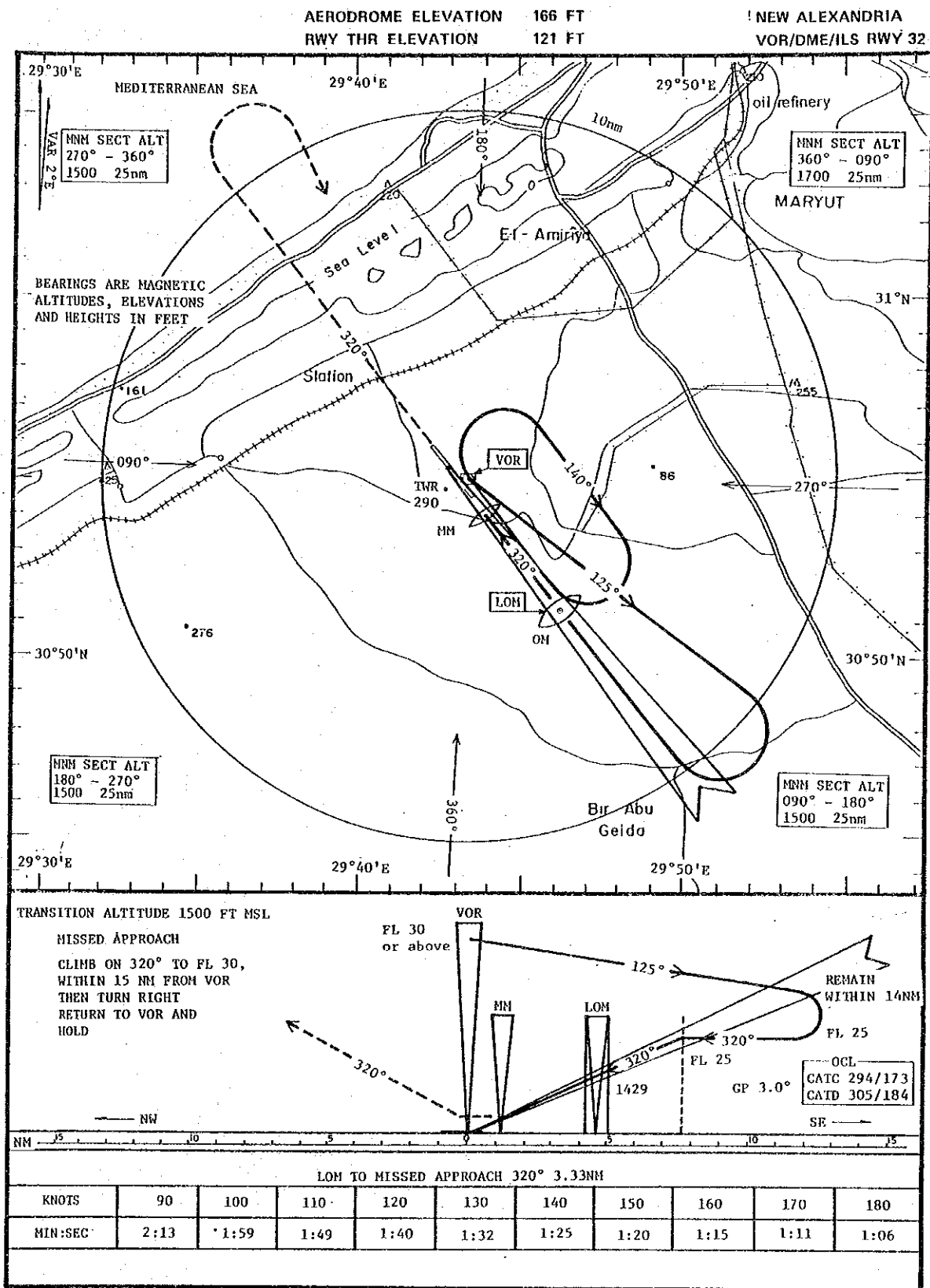


Fig. 11.4.2 ILS Approach Chart of New Airport

AERODROME ELEVATION 166 FT  
 RWY THR ELEVATION 121 FT

NEW ALEXANDRIA  
 VOR/DME RWY 32

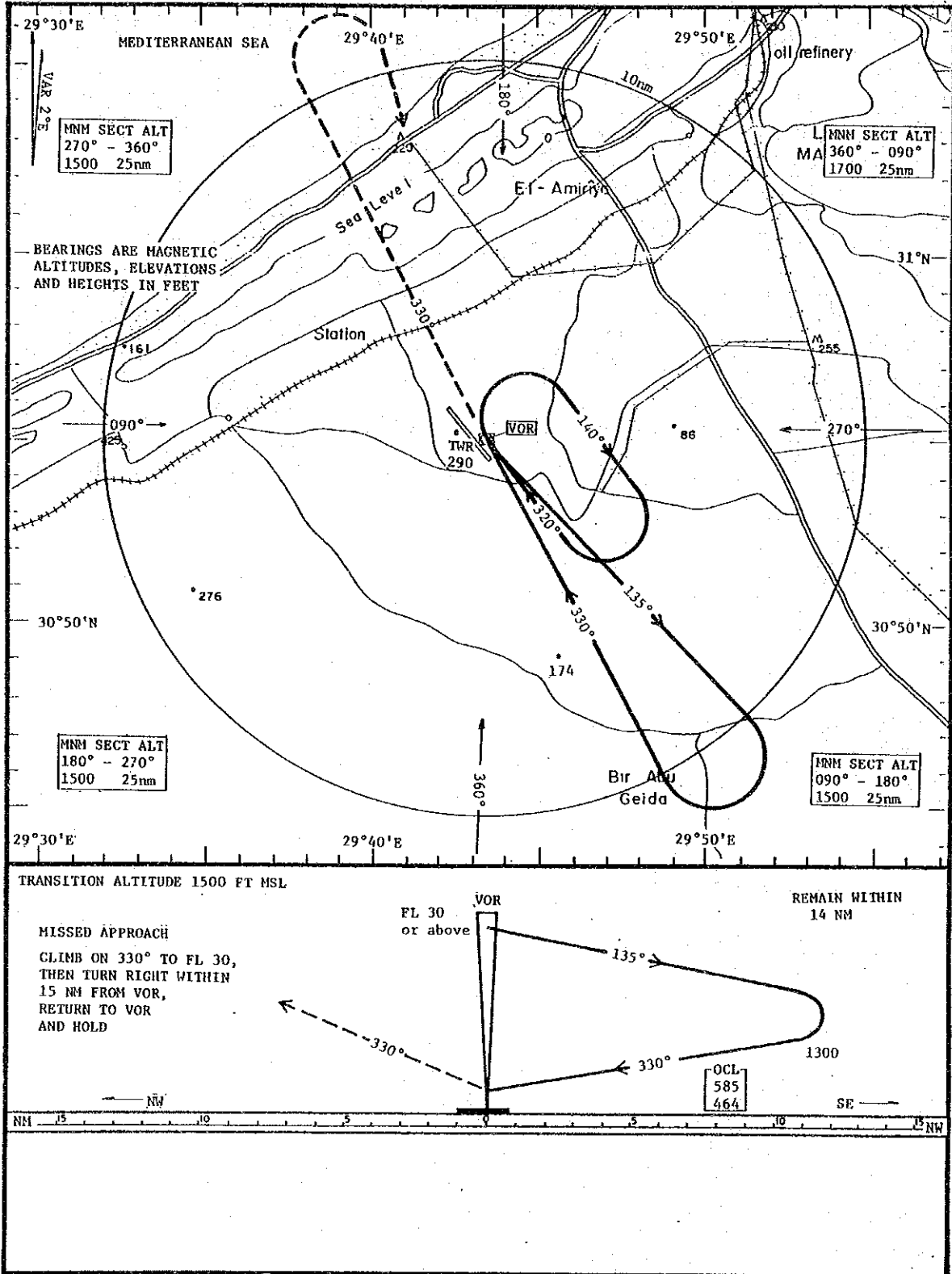


Fig. 11.4.3 VOR Approach Chart of New Airport (Runway 32)

AERODROME ELEVATION 166 FT  
 RWY THR ELEVATION 202 FT

NEW ALEXANDRIA  
 VOR/DME RWY 14

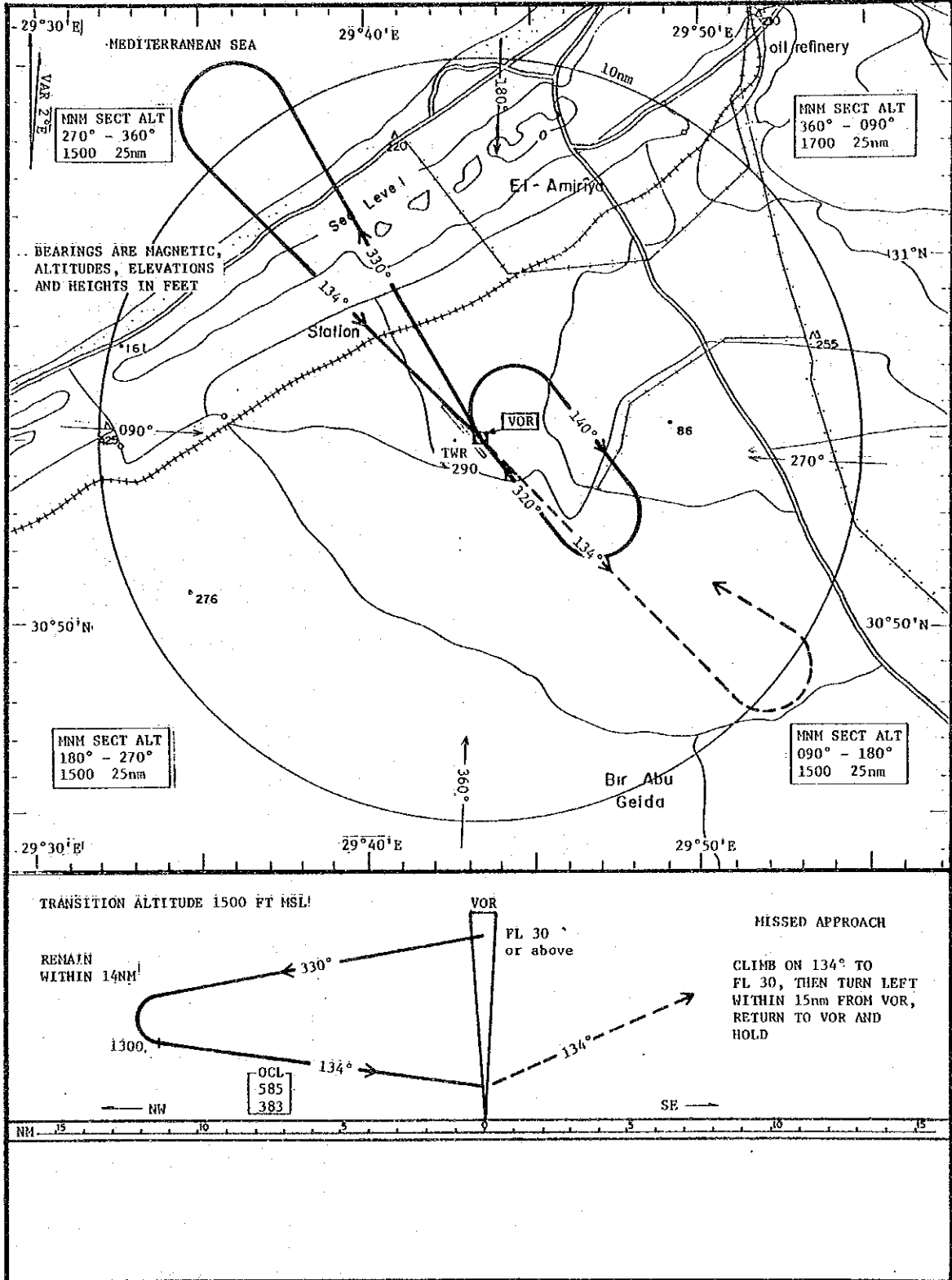


Fig. 11.4.4 VOR Approach Chart of New Airport (Runway 14)

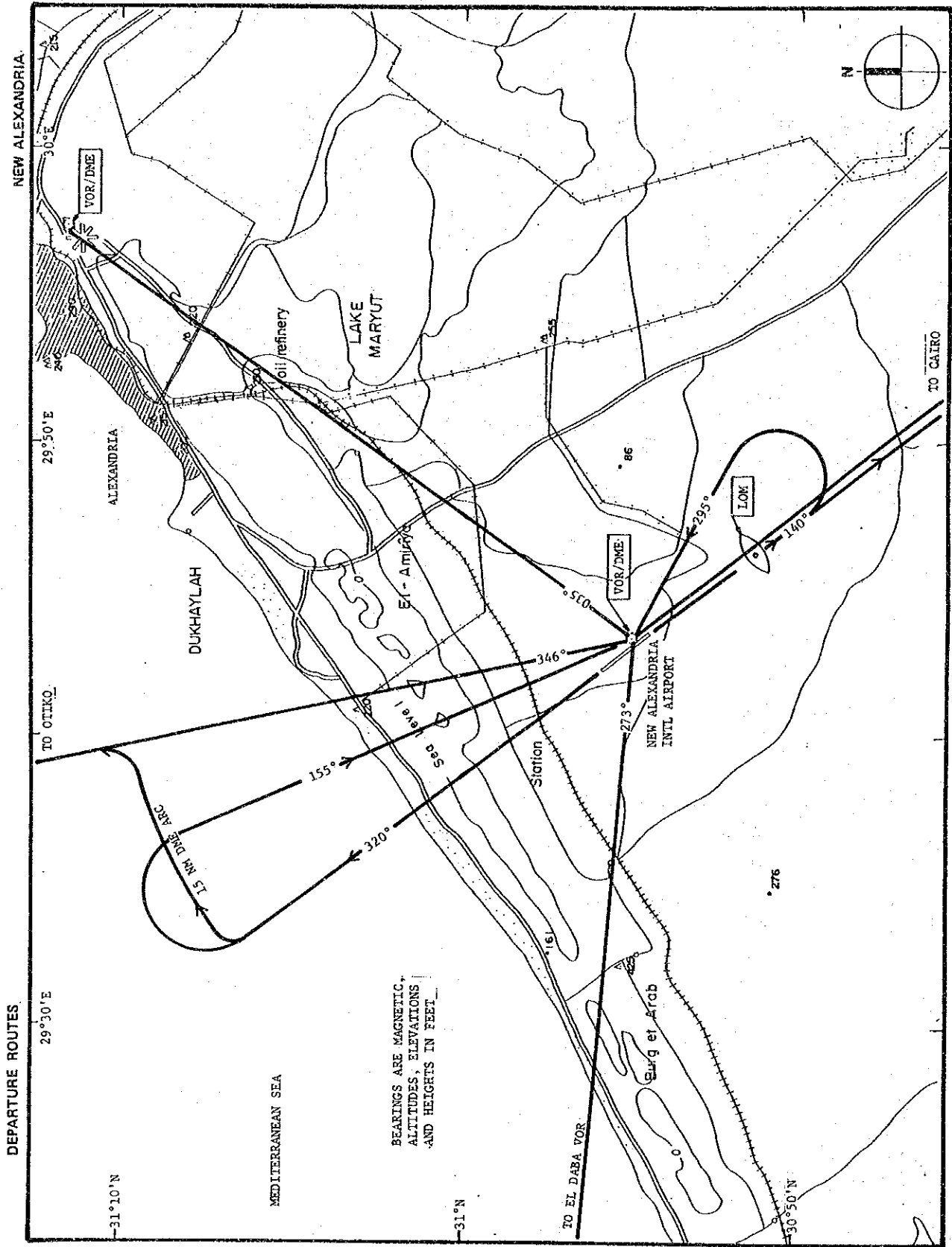


Fig. 11.4.5 SID at New Airport

### 11.4.3 Approach and Departure Procedures for Nozha Airport

Figs.11.4.6 and 7 show possible instrument approach and departure procedures for Nozha airport.

A VOR/DME straight-in approach procedure which is an instrument but non-precision approach can be established avoiding flying over the densely populated area of Alexandria city and the Danger Area HE/D12.

Instrument departure procedures also can be established, but limited to flight courses on the south east side of Nozha airport in order to avoid aircraft noise disturbance to the densely populated area.









## **CHAPTER 12 SUBSIDIARY CONSIDERATIONS**



## CHAPTER 12 · SUBSIDIARY CONSIDERATIONS

### 12.1 General

This chapter explains the study on aircraft noise influence, land use planning of the area surrounding the airport and airport organization.

Assessment based on aircraft noise contours indicates that the new airport can be developed compatible with the existing land use in the area surrounding the airport. Modifications of the land use plan will, however, be required in order to harmonize the new airport with the surrounding area within the framework of the regional development.

### 12.2 Aircraft Noise

Aircraft noise contours of the new airport are calculated for the year 2000 based on the conditions as tabulated in Table 12.2.1.

Fig. 12.2.1 shows the calculated aircraft noise contours in Weighted Equivalent Continuous Perceived Noise Level (WECPNL). (For details, refer to Attachment F to Annex 16, Environmental Protection, Vol. I Aircraft Noise, ICAO).

The contour of WECPNL70 extends approx. 5.5 km northwest of runway 14 threshold and approx. 6.5 km south east of runway 32 threshold. Within the area covered by the noise level of WECPNL70, there are a few dozen houses near Hawariyah railway station.

Table 12.2.1 Assumption on the Calculation of Aircraft Noise Contour

Item	Assumptions														
Target year	Phase I (year 2000)														
Traffic pattern	As stated in Chapter 11														
Ratio of Runway use	RWY14 : 90% RWY32 : 10%														
Runway length	3,250 m														
Glide slope angle	3.0 degree														
Number of daily flights	<table border="0"> <tr> <td>Jumbo jet:</td> <td>4 flights</td> </tr> <tr> <td>Large jet:</td> <td>14 flights</td> </tr> <tr> <td>Medium jet:</td> <td>4 flights</td> </tr> <tr> <td>Narrow jet:</td> <td>10 flights</td> </tr> <tr> <td>Propeller:</td> <td>2 flights</td> </tr> <tr> <td colspan="2"><hr/></td> </tr> <tr> <td>Total</td> <td>34 flights</td> </tr> </table>	Jumbo jet:	4 flights	Large jet:	14 flights	Medium jet:	4 flights	Narrow jet:	10 flights	Propeller:	2 flights	<hr/>		Total	34 flights
Jumbo jet:	4 flights														
Large jet:	14 flights														
Medium jet:	4 flights														
Narrow jet:	10 flights														
Propeller:	2 flights														
<hr/>															
Total	34 flights														
Distribution of flights	<table border="0"> <tr> <td>Day time flight</td> <td>: 65%</td> </tr> <tr> <td>Evening time flight</td> <td>: 15%</td> </tr> <tr> <td>Night time flight</td> <td>: 20%</td> </tr> </table>	Day time flight	: 65%	Evening time flight	: 15%	Night time flight	: 20%								
Day time flight	: 65%														
Evening time flight	: 15%														
Night time flight	: 20%														

A few small villages to the east of Hawariyah station are in the proximity, but beyond the contour line of WECPNL70. In the southern vicinity of the new airport, a small village is located, but far beyond the contour of WECPNL70. Most of the area covered by the contour of WECPNL70 is desert or agricultural area.

It is, therefore, judged that the new airport can be developed compatible with the existing land use in the area surrounding the airport.

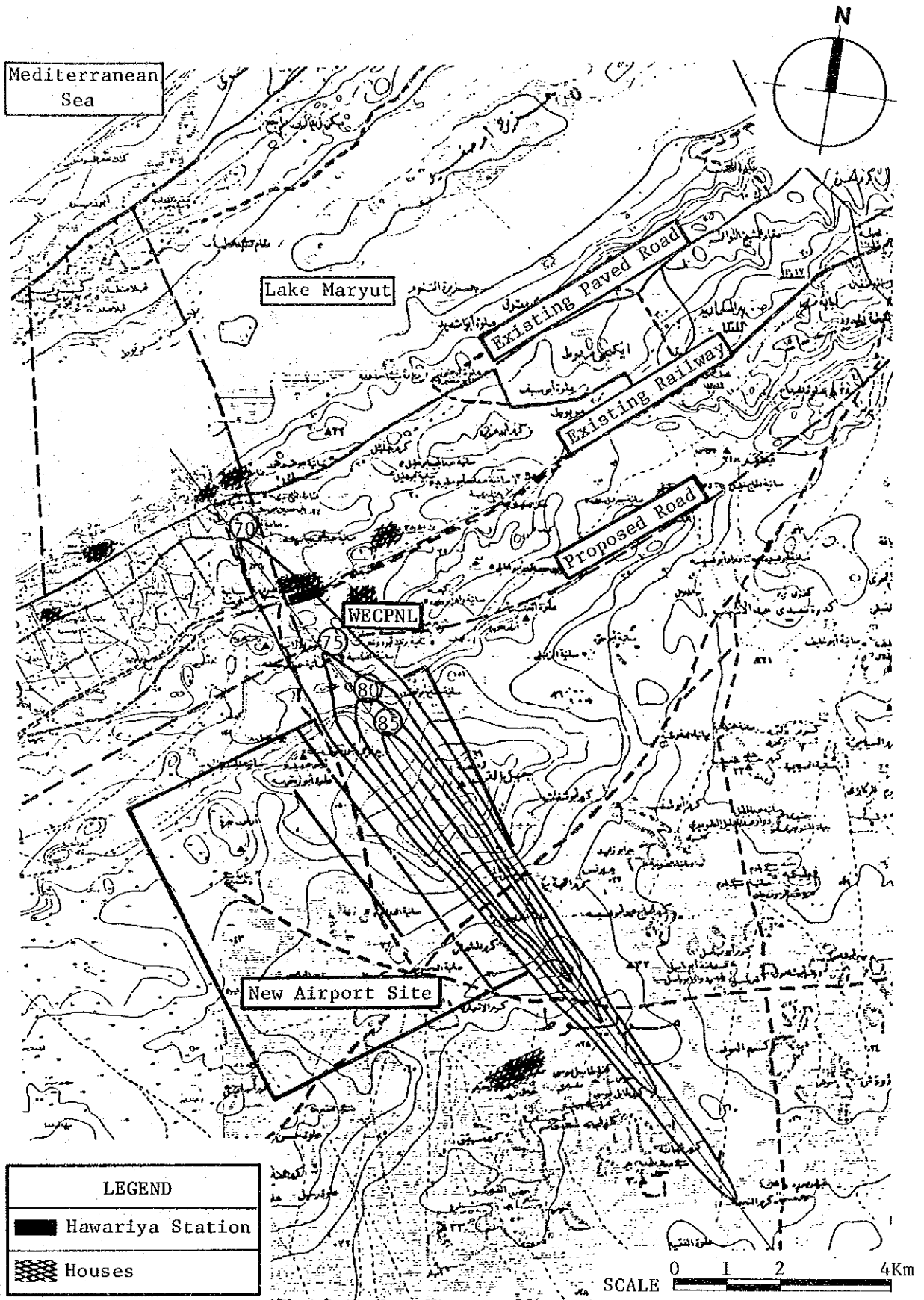


Fig. 12.2.1 Aircraft Noise Contours (Year 2000)

### 12.3 Land Use Planning of the Area Surrounding the Airport

Land use controls are classified broadly into the land use zoning regulations based on aircraft noise and height restrictions, etc. Each regulation or requirement is explained in detail hereinafter and necessary modifications to the already drawn up land use plan are proposed for the area surrounding the new airport.

#### (1) Considerations on Aircraft Noise

The land in the vicinity of the new airport is very sparsely inhabited and the land use consists of agricultural fields and waste land (desert). The agricultural use of this area can be positively encouraged by the implementation of irrigation works. Agricultural use except poultry is compatible with aircraft noise and will contribute economically to the Governorate using the land even close to the new airport which would otherwise be left as waste land because of the serious exposure to aircraft noise.

"The Comprehensive Plan Alexandria 2005" issued by the Alexandria Governorate, anticipates that the area between the national railway and Mediterranean sea will be developed as the residential area.

Based upon the following criteria which are proposed taking into account the current land use controls for aircraft noise in Japan, France, etc., Fig. 12.3.1 proposes the modification of the land use plan in order to harmonize the new airport with the surrounding area within the framework of the regional development.

#### - Proposed Criteria -

- WECPNL 70 = : No school, hospital, mosque, church etc., is permitted.
- 75 = : No new residence is basically permitted.  
Agricultural, commercial and industrial land use only is recommended.
- 85 = : Prohibited area for new residences.  
Agricultural, outdoor recreational, commercial and industrial land use are recommended.

The future land use will be classified in the following three categories:

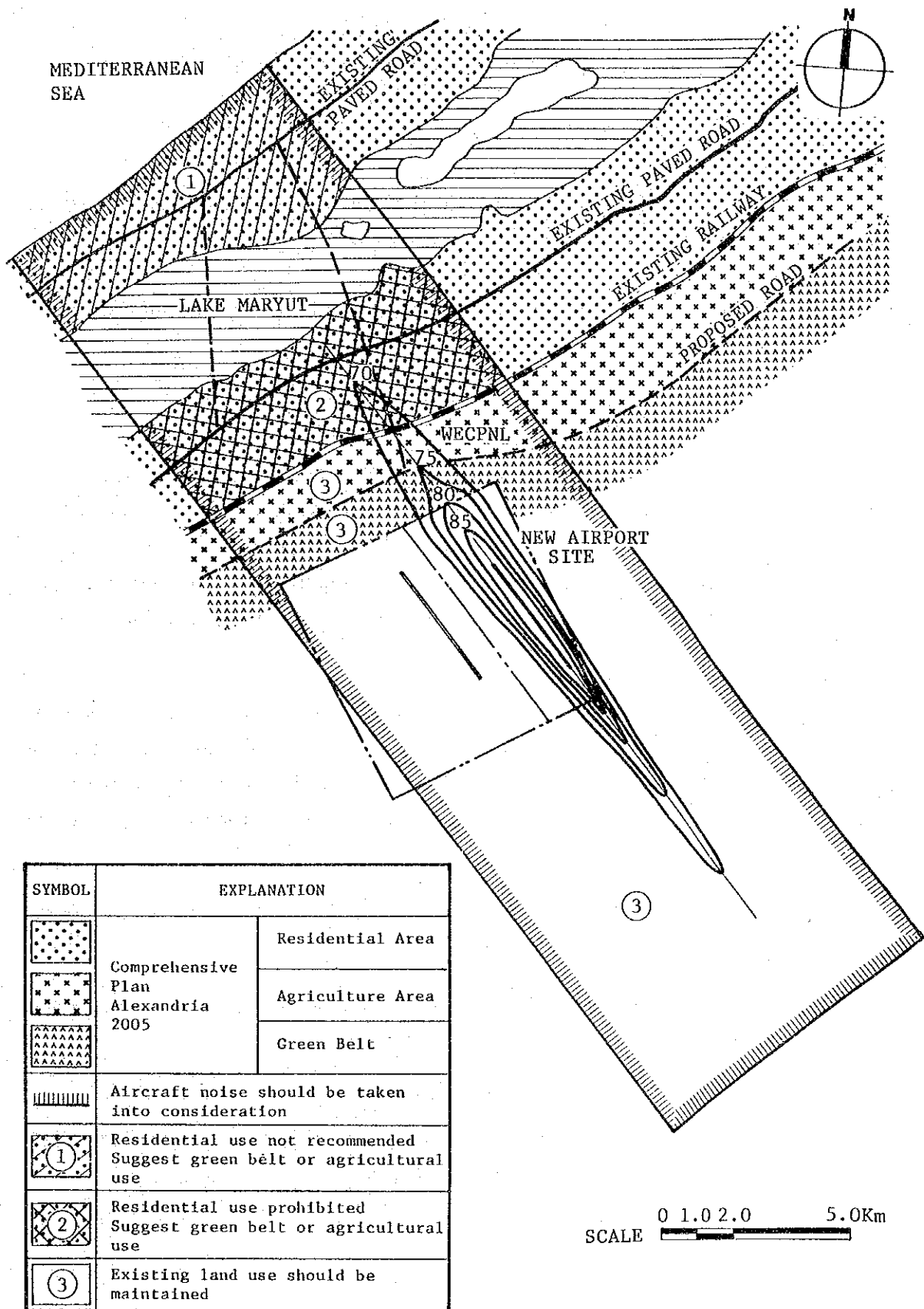


Fig. 12.3.1 Proposed Modification of Land Use Plan

- i) Residential use strictly prohibited.  
The residential area in the comprehensive plan should be converted to agricultural use or green belt.
- ii) Residential use not recommended.  
The residential area is recommended to be converted to industrial area or agricultural use or green belt where practical.
- iii) The future land use of agricultural and green belt should be maintained as planned.

(2) Considerations related to aircraft operations

The obstacle limitation surfaces consisting of approach surfaces, take off climb surfaces, inner horizontal surface, transitional surfaces, and conical surfaces, are established in accordance with ICAO Annex 14 for the precision approach runway. Height limitations for structures and trees are required for the above stated surfaces in order to keep any structures below the surface elevations and to maintain safe operations for aircraft.

An obstruction clearance zone, which is free of structures or trees, should be established around the air navigation facilities such as VOR/DME, GP, etc., for adequate and safe operations, and also clear and continuous visibility from the control tower to all the final approaches, traffic patterns, runway and taxiways should be maintained.

In addition to the above limitations, regulations on the following are considered necessary:

- Businesses and activities posing a potential fire hazard to the surrounding property of the airport,
- Signs, and lights likely to bring about hazards for aircraft,
- Smoke, electronic and radio interference, accumulation of refuse or trash, glare, heat emission, odorous matter, etc.



At Nozha airport, no positive control of the existing and future land use, which will require relocation of houses and soundproof construction, will be justified since Nozha airport is for domestic demand effectively utilizing the existing facilities without substantial development or large-scale investment. The environment impact by aircraft noise will be contemplated and Nozha airport will be replaced by the new airport if serious noise problems arise from the airport neighbourhood.

As a minimum countermeasure, the existing obstructions which protrude upon the obstacle limitation surfaces for runway 04/22 should be removed and strict control over future construction of buildings/structures should be enforced for aircraft safety.

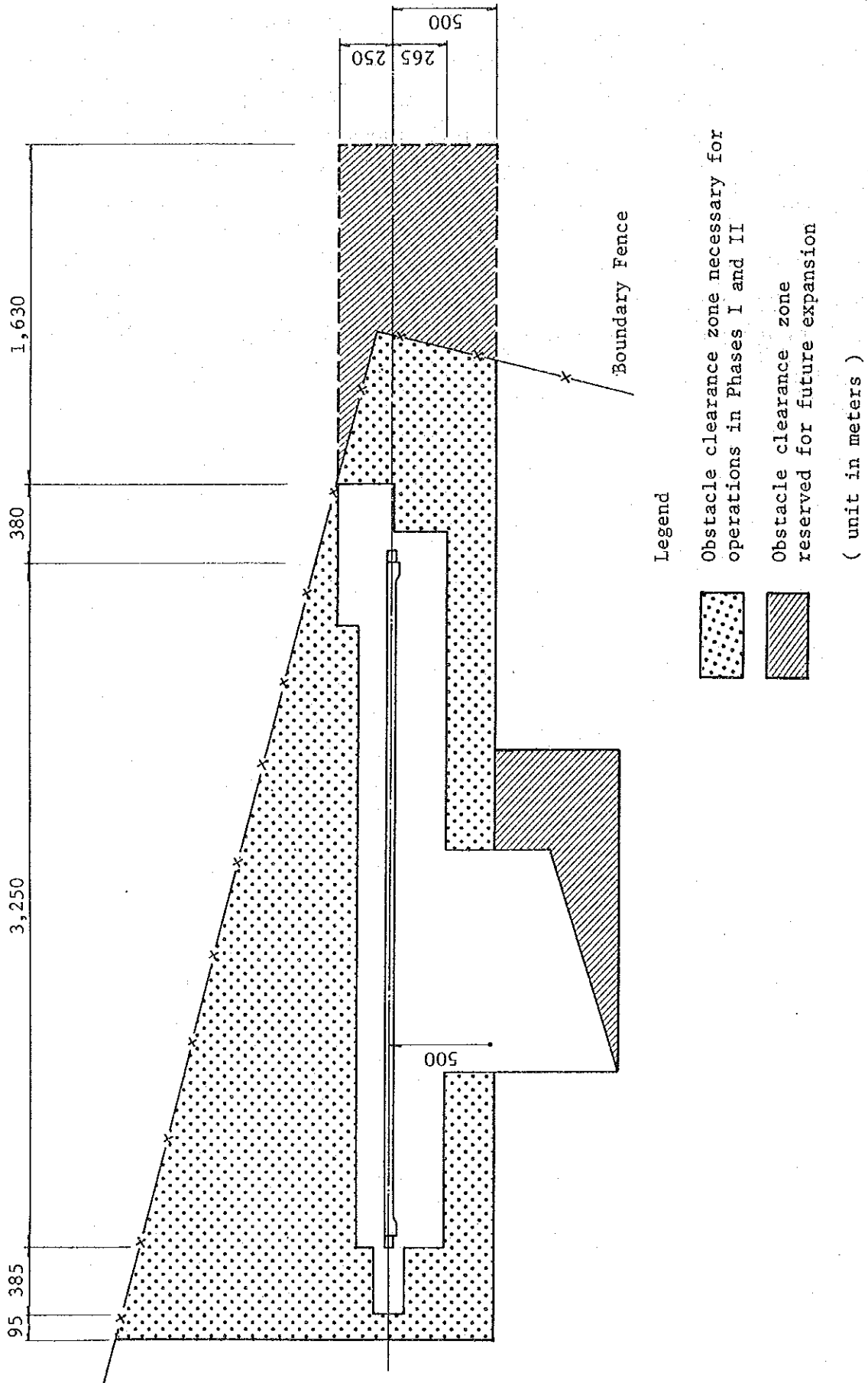


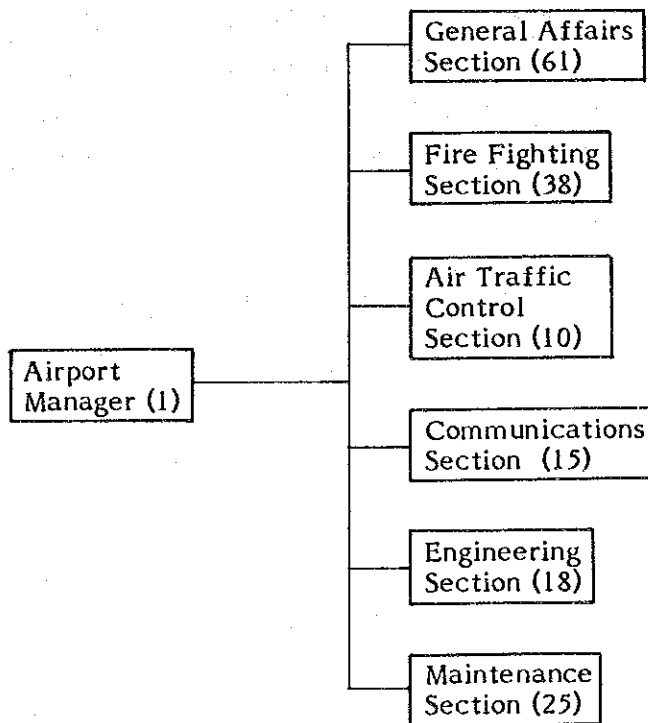
Fig. 12.3.2 Obstacle Clearance Zone

## 12.4 Airport Organization

The existing ECAA organization at Nozha airport which is shown in Fig. 12.4.1 comprises six sections under the direction of an airport manager, and the ECAA staff numbers 168 members.

The organization of the new airport and Nozha airport was studied and assumed based on the following factors:

- The existing organization of Nozha airport and other major airports in Egypt such as Cairo, Luxor, Aswan, etc.
- The forecast number of ECAA staff members in Phases I and II (Refer to Section 4.8 on page 4-30)



(TOTAL: 168)

Note: Figures in parentheses ( ) indicate number of ECAA members.

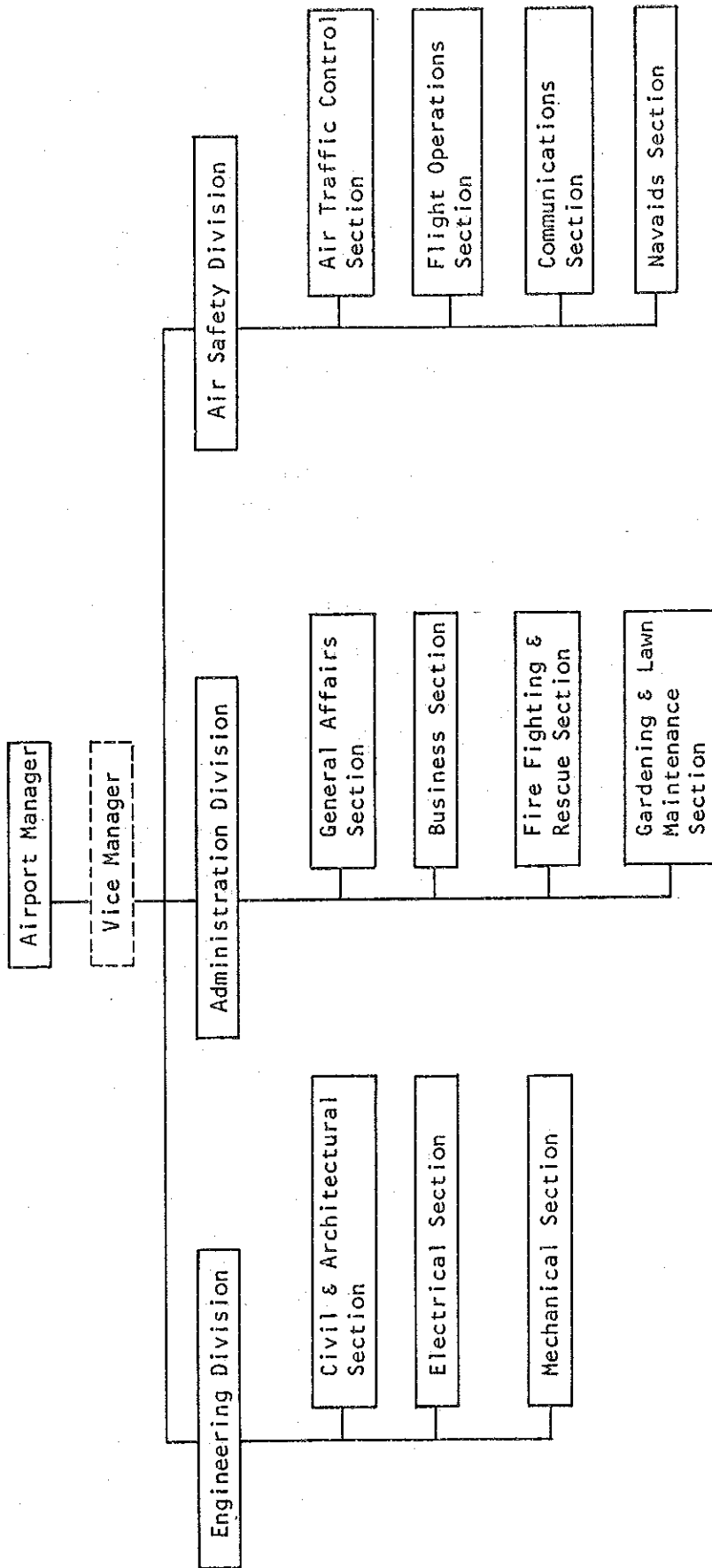
Fig. 12.4.1 Existing ECAA Organization Chart of Nozha Airport (Source: ECAA)

Figs. 12.4.2 and 3 show the assumed airport organization charts of ECAA for the new airport and Nozha airport, respectively. Tables 12.4.1 and 2 show the assumed number of ECAA staff members in Phases I and II for the new airport and Nozha airport, respectively.

The organization of the new airport will consist of eleven sections classified into three divisions under the direction of an airport manager. Herein, "Business Section" is assumed to be responsible for calculation/collection of landing charge, air passenger service charge, rent of concessions, etc., and "Gardening and Lawn Maintenance" is responsible for maintaining garden, lawn, trees in the airport area. The ECAA staff will number 230 and 300 members in Phase I and Phase II, respectively. The total number of airport employees including the above-mentioned ECAA staff will be 580 and 760 members in Phases I and II, respectively.

At Nozha airport, it is assumed that the existing six sections will increase to ten sections under the direct control of an airport manager, but the ECAA staff will, on the contrary, decrease to 100 members through greater efficiency and rationalization of the organization and increased use of outside sub-contractors for labour works.

The total number of airport employees including the 100 ECAA members will be 200 and 290 members in Phases I and II, respectively.



Note. [ ] Phase II

Fig. 12.4.2 Organizational Chart of New Airport (JICA Estimate)

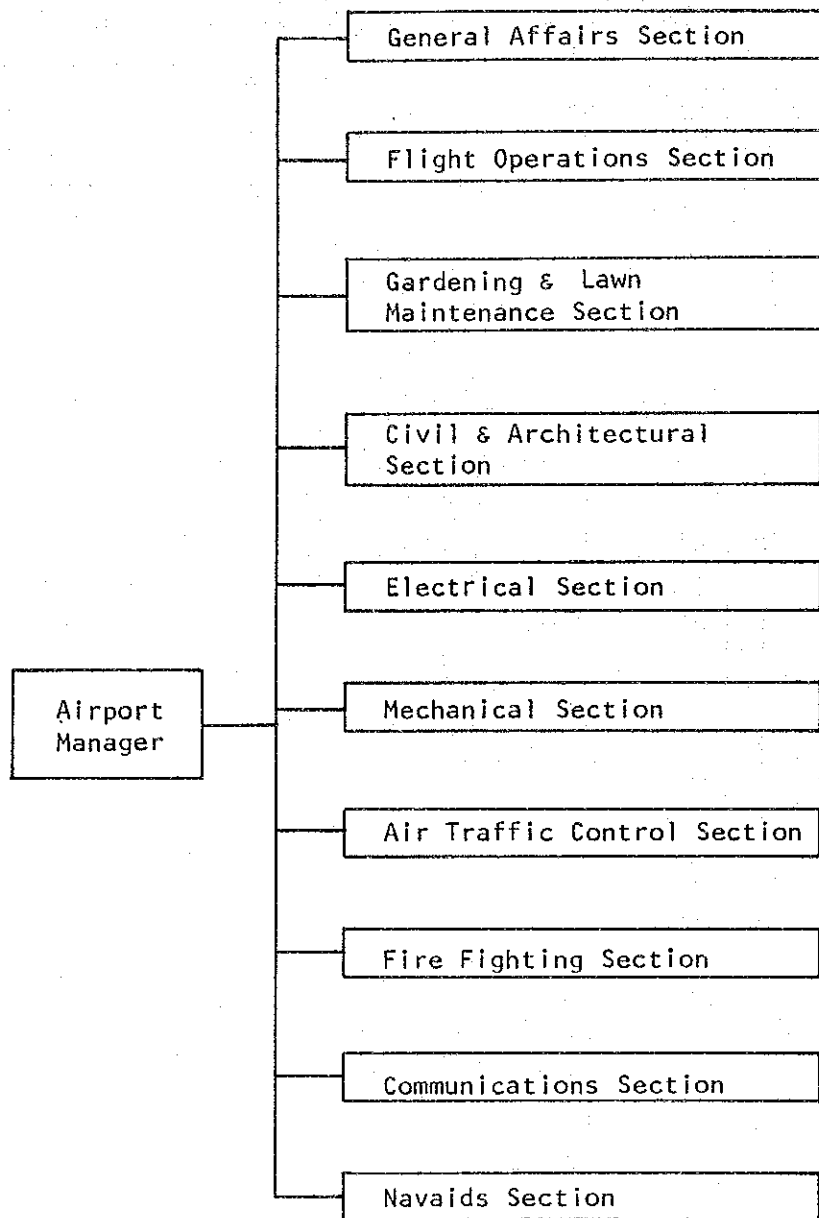


Fig. 12.4.3 Organization Chart of Nozha Airport (JICA Estimate)

Table 12.4.1 Estimated ECAA Staff Members of New Airport

	1992	1995	2000	2005	2010
Airport Manager	1	1	1	1	1
Vice Manager					1
Director of Administration Division			1	1	1
General Affairs Section	10	20	20	25	30
Business Section	5	10	10	10	15
Fire Fighting Section	40	40	40	40	40
Gardening and Lawn Maintenance Section	10	10	11	13	20
Director of Engineering Division			1	1	1
Civil & Architectural Section	15	15	20	25	25
Electrical Section	15	20	20	30	40
Mechanical Section	10	10	10	15	15
Director of Air Safety Division			1	1	1
Air Traffic Control Section	20	20	30	35	35
Flight Operations Section	17	17	17	18	20
Communications Section	12	12	15	15	15
Nav aids Section	25	25	33	40	40
	180	200	230	270	300

(JICA Estimate)

Table 12.4.2 Estimated ECAA Staff Members of Nozha Airport

	1992	1995	2000	2005	2010
Airport Manager	1	1	1	1	1
General Affairs Section	8	8	8	8	8
Flight Operations Section	10	10	10	10	10
Gardening and Lawn Maintenance Section	5	5	5	5	5
Civil & Architectural Section	12	12	12	12	12
Electrical Section	10	10	10	10	10
Mechanical Section	8	8	8	8	8
Air Traffic Control Section	12	12	12	12	12
Fire Fighting Section	16	16	16	16	16
Communications Section	8	8	8	8	8
Nav aids Section	10	10	10	10	10
	100	100	100	100	100

(JICA Estimate)



## **CHAPTER 13 CONSTRUCTION SCHEDULE AND COST ESTIMATES**



## CHAPTER 13 CONSTRUCTION SCHEDULE AND COST ESTIMATES

### 13.1 General

This chapter explains the construction schedule and cost estimates based on the airport master plan for both new airport and Nozha airport.

The construction costs necessary for the new airport and Nozha airport in Phase I are estimated at 65.2 million and 3.0 million Egyptian Pounds (1984 base price), respectively. And a total cost is 68.2 million Egyptian Pounds.

### 13.2 Construction Schedule

#### 13.2.1 Construction Conditions

##### (1) Site Conditions

The new airport site is located in the desert area, where no man-made structure nor vegetation other than small weeds are required to be removed for construction works. The site lies on undulating terrain with an average elevation of approx. 50 m above mean sea level at the centre of the proposed runway. As for the soil conditions, based on the results of the site survey and soil data analysis, the land surface of the new airport site is covered with fine silty clay and hard limestone and mudstone are evident in hills higher than about 50 m in elevation.

With regard to the rainfall conditions, the rainfall intensity in the area including both the new airport site and Nozha airport is expected to be less than 8 mm/hr according to the Meteorological authority in Cairo.

Nozha airport is located on land reclaimed from Lake Maryut by dredging soil. Based on the results of the soil investigation, very soft clay about 6 m thick lies below the ground and the ground water table is very high at about 0.5 m to 0.7 m below ground level.

##### (2) Construction Materials and Equipment

Most of the materials to be used for the construction work can easily be procured in Alexandria.

In particular, aggregate required for the new airport construction will be obtained at the new airport site. The quality and quantity should be studied in the detailed design stage.

### 13.2.2 Civil Works

#### (1) Temporary Works

Temporary construction roads are required for transporting the construction equipment and materials to the new airport site. At present, access to the new airport site is by vehicle along a single-lane road from Hawariya. An airport access road is, therefore, necessary to be constructed as soon as possible to be used for the construction road. However, the airport access road requires a culvert box across the irrigation canal and requires a longer construction period than a road on ground. Furthermore, the airport access road is planned to be linked with a proposed road between the Desert Road and New Ameriyah city as shown in Fig. 7.4.6.

Opening of the airport access road will depend on the completion of the proposed road. Until the opening of the airport access road, the existing road from Hawariya will be used for the temporary construction road. Necessity of widening and some structural improvement of the existing road to ensure transport of the construction equipment and materials should be checked with the timing of the completion of the proposed road before the start of the construction work.

The above-mentioned temporary work shall start as soon as possible after commencement of the construction work and should be completed within three months together with other temporary works including site offices and construction plants.

For the redevelopment of Nozha airport, extensive temporary works are not required.

#### (2) Site Preparation

Site preparation of the new airport should start immediately after completion of the aforementioned temporary work. The total earthwork volume for the entire new airport construction is estimated to be about 2,100,000 cu.m of cut volume as described in Section 10.3. Approx. 1 year will be required for completion of the site preparation.

### (3) Pavement Work

Pavement work of the new airport should start immediately after completion of the site preparation and will take approx. 18 months to complete.

As for the pavement work of Nozha airport, it will be completed before 1992. The time schedule and methodology of the pavement work including utilization of the runway, taxiways and apron should be carefully studied before its inauguration.

### 13.2.3 Building Works

Building works of the new airport, including the passenger terminal building, cargo terminal building and etc., should start immediately after completion of site preparation of the terminal area, and will take 2 years to complete.

New control tower of Nozha airport will be completed before 1992.

### 13.2.4 Other Works

Installation of the equipment of nav aids and airport utilities will start after site preparation and will take 18 months. Time schedule of construction work on utilities such as power supply and water supply should be adjusted with the related organizations.

As for the Nozha airport, improvement of the facilities of nav aids and utilities will be completed in 1991.

### 13.2.5 Construction Schedule

The construction schedule is summarized in Table 13.2.1. Concerning major construction works for Phase I development, 3 years for the new airport and 1 year for Nozha airport are required. After completion of the construction at the new airport, six months are required for flight check, test operation for various nav aids, maturity flights, etc.

Table 13.2.1 Construction Schedule

Work Items	Calendar Year																									
	1984	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	2000	1	2	3	4	5	6	7	8	9
Service Period	PHASE I																									
Feasibility Study and Engineering Services	PHASE II																									
Immediate Works																										
Land Acquisition and Compensation																										
Construction																										
1 Temporary Works																										
2 Site Preparation																										
3 Pavement Works																										
4 Miscellaneous Civil Works																										
5 Access Road																										
6 Passenger Terminal Building																										
7 Cargo Terminal Building																										
8 Administration and Other Buildings																										
9 Navajds Works																										
10 Utilities Works																										
11 Others																										
Management and Test Operation	AO TO																									
Required Completion Time of Related Projects by Others																										
1 Coastal Highway	▽																									
2 Connection Road with Coastal Highway and Airport Access Road	▽																									
3 Proposed Road between Desert Road and New Ameriyah City	▽																									
4 Transmission Lines of Power Supply	▽																									
5 Distribution Lines of Water Supply	▽																									

Legend

F/S : Feasibility Study  
 Topo : Topographical Survey  
 Soil : Soil Investigation

E/S : Detail Design and Preparation of Tender Document  
 T/E : Tender Evaluation  
 C/S : Construction Supervision

AO : Establishment of Airport Organization  
 TO : Test Operation, Various Flight Checks, etc.  
 Nozha New Airport

Moreover, about 3 years are required for topographic survey, soil investigation, detailed design and tender evaluation after completion of this Feasibility Study.

Therefore, start of construction will be set around July, 1988 and completion around June 1991. The opening of the new airport will be scheduled around January, 1992.

Construction for Phase II development of the new airport and Nozha airport requires 2 years and 1 year before 2001, respectively.

In addition to the aforementioned major construction works, replacement of nav aids equipment will be required in 1994 and 2005 for Nozha airport and in 2002 for the new airport. The replacement of airfield lighting equipment will be required in 2007 for the new airport.

The related project should be completed as shown in Table 13.2.1 by the authority concerned in order to implement the airport construction smoothly.

#### (1) Development of Related Road Network

The Coastal Highway linking Alexandria and Mersa Matruh is scheduled to be completed by the beginning of 1990. Completion of the connection road with the Coastal Highway and airport access road, or the completion of the proposed road between the Desert Road and New Ameriyah city is required by the commencement of service of the new airport, that is, the beginning of 1992.

Considering the temporary construction roads for the new airport site, the aforementioned roads are desirable to be completed before the starting of the construction work of the new airport, that is, the middle of 1988.

#### (2) Related Utilities Works

A transmission line for power supply and a distribution line for water supply, which will connect the airport to the regional network via interface point shall be completed by the beginning of 1990.

### 13.3 Construction Cost Estimates

The construction cost is estimated based on the airport master plan and is shown in Tables 13.3.1 through 4. Construction costs for Phase I and Phase II are estimated to be about 68.2 million and 34.5 million Egyptian Pounds, respectively.

And these construction costs are estimated primarily for the economic analysis which will be evaluated from the viewpoint of the national economy.

The estimated costs are based on the following assumptions:

- (1) Construction cost is estimated based on the unit construction prices in 1984.
- (2) Exchange rates are set at US\$1.00 = £E0.82 and £E1.00=¥300.
- (3) Engineering services cost is estimated at 9% and administration cost is estimated at 3% of the total cost of construction works.
- (4) Contingency is estimated at 10% of the sum of the total cost of construction works, engineering services cost and administration cost.
- (5) Construction cost of access road is estimated for the section from the terminal area of the new airport to the planned trunk road between New Ameriyah city and the Desert Road.
- (6) Construction cost of utilities is estimated as the required cost for introduction from northern boundary of new airport site within an area of 6 km x 6 km to the terminal area.
- (7) The following facilities which will be constructed and/or supplied by other related authorities are not included in this cost estimates.
  - Catering facilities
  - Fuel supply facilities
  - Vehicles for ground support services
- (8) Foreign currency portion of the construction cost includes the following items:
  - Procurement costs for the imported materials, equipment and building construction materials



- Procurement costs for the imported construction equipment
- The general expenses and the profit for the foreign contractors and engineering firms
- Wages for foreign laborers

(9) Local currency portion of the cost includes the following items:

- Operation cost of the construction equipment including fuel and lubricants
- Procurement costs of the construction materials which are available locally such as cement, aggregate and so on
- Transportation costs for materials and laborers
- The contractors' expenses and profits, for both foreign and local, for the amounts paid in local currency
- Wages for local laborers

**Table 13.3.1 Estimated Construction Cost for New Airport and Nozha Airport**  
(Note: This table is applicable for Economic Analysis)

Exchange Rate : US\$1.00 = fE0.82, fE1.00 = ¥300  
Cost estimate based on 1984 price

(Unit : fE1,000)

Phase of Construction Work Item		Phase I			Phase II			TOTAL		
		Local Portion	Foreign Portion	Total	Local Portion	Foreign Portion	Total	Local Portion	Foreign Portion	Total
Land Acquisition and Compensation		-	-	-	-	-	-	-	-	-
Civil Works	Site Preparation	1,800	6,780	8,580	10	20	30	1,810	6,800	8,610
	Pavement Works	5,300	4,880	10,180	4,720	4,350	9,070	10,020	9,230	19,250
	Miscellaneous	250	340	590	-	-	-	250	340	590
	Access Road	290	260	550	290	260	550	580	520	1,100
	Sub Total	7,640	12,260	19,900	5,020	4,630	9,650	12,660	16,890	29,550
Building and Equipment Works	Passenger Terminal Building	7,570	8,210	15,780	3,530	3,830	7,360	11,100	12,040	23,140
	Cargo Terminal Building	860	1,020	1,880	640	760	1,400	1,500	1,780	3,280
	Administration/Tower and Other Buildings	1,790	1,350	3,140	-	-	-	1,790	1,350	3,140
	Sub Total	10,220	10,580	20,800	4,170	4,590	8,760	14,390	15,170	29,560
Nav aids Works	Radio Nav aids, Tele-communications, Air traffic Control and Meteorological Systems	310	5,700	6,010	200	4,400	4,600	510	10,100	10,610
	Airfield Lighting	260	2,840	3,100	270	2,370	2,640	530	5,210	5,740
	Sub Total	570	8,540	9,110	470	6,770	7,240	1,040	15,310	16,350
Utilities Works	Power Supply	360	1,840	2,200	170	790	960	530	2,630	3,160
	Water Supply	290	130	420	220	50	270	510	180	690
	Sewage	230	170	400	90	70	160	320	240	560
	Incinerator	20	220	240	10	110	120	30	330	360
	Telecommunications	20	410	430	10	120	130	30	530	560
	Sub Total	920	2,770	3,690	500	1,140	1,640	1,420	3,910	5,330
Other Equipment	Boarding Bridge	40	1,010	1,050	30	670	700	70	1,680	1,750
	Vehicles for Administration, Fire Fighting and Rescue	30	800	830	-	-	-	30	800	830
	Sub Total	70	1,810	1,880	30	670	700	100	2,480	2,580
Total of Construction Works		19,420	35,960	55,380	10,190	17,800	27,990	29,610	53,760	83,370
Engineering Services Cost		440	4,660	5,100	190	2,360	2,550	630	7,020	7,650
Administration Cost		1,550	-	1,550	810	-	810	2,360	-	2,360
Sub Total		21,410	40,620	62,030	11,190	20,160	31,350	32,600	60,780	93,380
Contingency		2,140	4,060	6,200	1,120	2,020	3,140	3,260	6,080	9,340
GRAND TOTAL		23,550	44,680	68,230	12,310	22,180	34,490	35,860	66,860	102,720

**Table 13.3.2 Estimated Construction Cost for New Airport**  
(Note: This table is applicable for Economic Analysis)

Exchange Rate : US\$1.00 = E£0.82, £E1.00 = ¥300  
Cost estimate based on 1984 price

(Unit : £E1,000)

Phase of Construction Work Item		Phase I			Phase II			TOTAL		
		Local Portion	Foreign Portion	Total	Local Portion	Foreign Portion	Total	Local Portion	Foreign Portion	Total
Land Acquisition and Compensation		-	-	-	-	-	-	-	-	-
Civil Works	Site Preparation	1,800	6,780	8,580	10	20	30	1,810	6,800	8,610
	Pavement Works	5,030	4,630	9,660	3,820	3,520	7,340	8,850	8,150	17,000
	Miscellaneous	200	280	480	-	-	-	200	280	480
	Access Road	290	260	550	290	260	550	580	520	1,100
	Sub Total	7,320	11,950	19,270	4,120	3,800	7,920	11,440	15,750	27,190
Building and Equipment Works	Passenger Terminal Building	7,570	8,210	15,780	3,170	3,430	6,600	10,740	11,640	22,380
	Cargo Terminal Building	860	1,020	1,880	640	760	1,400	1,500	1,780	3,280
	Administration/Tower and Other Buildings	1,330	1,010	2,340	-	-	-	1,330	1,010	2,340
	Sub Total	9,760	10,240	20,000	3,810	4,190	8,000	13,570	14,430	28,000
Navais Works	Radio Navais, Telecommunications, Airtraffic Control and Meteorological Systems	280	5,050	5,330	180	4,020	4,200	460	9,070	9,530
	Airfield Lighting	250	2,800	3,050	190	1,620	1,810	440	4,420	4,860
	Sub Total	530	7,850	8,380	370	5,640	6,010	900	13,490	14,390
Utilities Works	Power Supply	310	1,760	2,070	120	710	830	430	2,470	2,900
	Water Supply	120	130	250	50	50	100	170	180	350
	Sewage	230	170	400	90	70	160	320	240	560
	Incinerator	20	220	240	10	110	120	30	330	360
	Telecommunications	20	410	430	10	120	130	30	530	560
	Sub Total	700	2,690	3,390	280	1,060	1,340	980	3,750	4,730
Other Equipment	Boarding Bridge	40	1,010	1,050	30	670	700	70	1,680	1,750
	Vehicles for Administration, Fire Fighting and Rescue	30	800	830	-	-	-	30	800	830
	Sub Total	70	1,810	1,880	30	670	700	100	2,480	2,580
Total of Construction Works		18,380	34,540	52,920	8,610	15,360	23,970	26,990	49,900	76,890
Engineering Services Cost		420	4,450	4,870	160	2,020	2,180	580	6,470	7,050
Administration Cost		1,480	-	1,480	700	-	700	2,180	-	2,180
Sub Total		20,280	38,990	59,270	9,470	17,380	26,850	29,750	56,370	86,120
Contingency		2,020	3,900	5,920	950	1,740	2,690	2,970	5,640	8,610
GRAND TOTAL		22,300	42,890	65,190	10,420	19,120	29,540	32,720	62,010	94,730

**Table 13.3.3 Estimated Construction Cost for Nozha Airport**  
(Note: This table is applicable for Economic Analysis)

Exchange Rate : US\$1.00 = £E0.82, £E1.00 = ¥300  
Cost estimate based on 1984 price

(Unit : £E1,000)

Phase of Construction Work Item		Phase I			Phase II			TOTAL		
		Local Portion	Foreign Portion	Total	Local Portion	Foreign Portion	Total	Local Portion	Foreign Portion	Total
Land Acquisition and Compensation		-	-	-	-	-	-	-	-	-
Civil Works	Site Preparation	-	-	-	-	-	-	-	-	-
	Pavement Works	270	250	520	990	830	1,730	1,170	1,080	2,250
	Miscellaneous	50	60	110	-	-	-	50	60	110
	Access Road	-	-	-	-	-	-	-	-	-
	Sub Total	320	310	630	900	830	1,730	1,220	1,140	2,360
Building and Equipment Works	Passenger Terminal Building	-	-	-	360	400	760	360	400	760
	Cargo Terminal Building	-	-	-	-	-	-	-	-	-
	Administration/Tower and Other Buildings	460	340	800	-	-	-	460	340	800
	Sub Total	460	340	800	360	400	760	820	740	1,560
Navaid Works	Radio Navaid, Telecommunications, Airtraffic Control and Meteorological Systems	30	650	680	20	380	400	50	1,030	1,080
	Airfield Lighting	10	40	50	80	750	830	90	790	880
	Sub Total	40	690	730	100	1,130	1,230	140	1,820	1,960
Utilities Works	Power Supply	50	80	130	50	80	130	100	160	260
	Water Supply	170	-	170	170	-	170	340	-	340
	Sewage	-	-	-	-	-	-	-	-	-
	Incinerator	-	-	-	-	-	-	-	-	-
	Telecommunications	-	-	-	-	-	-	-	-	-
	Sub Total	220	80	300	220	80	300	440	160	600
Other Equipment	Boarding Bridge	-	-	-	-	-	-	-	-	-
	Vehicles for Administration, Fire Fighting and Rescue	-	-	-	-	-	-	-	-	-
	Sub Total	-	-	-	-	-	-	-	-	-
Total of Construction Works		1,040	1,420	2,460	1,580	2,440	4,020	2,620	3,860	6,480
Engineering Services Cost		20	210	230	30	340	370	50	550	600
Administration Cost		70	-	70	110	-	110	180	-	180
Sub Total		1,130	1,630	2,760	1,720	2,780	4,500	2,850	4,410	7,260
Contingency		120	160	280	170	280	450	290	440	730
GRAND TOTAL		1,250	1,790	3,040	1,890	3,060	4,950	3,140	4,850	7,990

**Table 13.3.4 Estimated Annual Construction Cost**  
 (Note: This table is applicable for Economic Analysis)

Exchange Rate : US\$1.00 = E£0.82, £E1.00 = ¥300  
 Cost estimate based on 1984 price

(Unit : E£1,000)

Year	Item	New Airport			Nozha Airport			Total of New Airport & Nozha Airport		
		Local Portion	Foreign Portion	Total	Local Portion	Foreign Portion	Total	Local Portion	Foreign Portion	Total
Phase I Investment	1985									
	1986	340	800	1,140				340	800	1,140
	1987	680	1,640	2,320				680	1,640	2,320
	1988	890	3,130	4,020				890	3,130	4,020
	1989	3,660	7,860	11,520				3,660	7,860	11,520
	1990	10,440	15,880	26,320	50	120	170	10,490	16,000	26,490
	1991	6,290	13,580	19,870	1,180	1,250	2,430	7,470	14,830	22,300
	1992									
	1993									
	1994				20	420	440 <sup>*1</sup>	20	420	440
		Sub Total	22,300	42,890	65,190	1,250	1,790	3,040	23,550	44,680
Phase II Investment	1998	470	1,110	1,580	80	190	270	550	1,300	1,850
	1999	3,870	4,710	8,580	90	510	600	3,960	5,220	9,180
	2000	5,760	8,660	14,420	1,680	1,960	3,640	7,440	10,620	18,060
	2001									
	2002	150	3,130	3,280 <sup>*1</sup>				150	3,130	3,280
	2003									
	2004									
	2005				40	400	440 <sup>*1</sup>	40	400	440
	2006									
	2007	170	1,510	1,680 <sup>*2</sup>				170	1,510	1,680
	Sub Total	10,420	19,120	29,540	1,890	3,060	4,950	12,310	22,180	34,490
	GRAND TOTAL	32,720	62,010	94,730	3,140	4,850	7,990	35,860	66,860	102,720

Note : \*1 Replacement of navalds equipment

\*2 Replacement of airfield lighting equipment

Table 13.3.1' Estimated Construction Cost for New Airport and Nozha Airport

(Note: This table is applicable for the Budgetary Entity)

Exchange Rate : US\$1.00 = E£0.82, ££1.00 = ¥300  
Cost estimate based on 1984 price

(Unit : ££1,000)

Phase of Construction Work Item		Phase I			Phase II			TOTAL		
		Local Portion	Foreign Portion	Total	Local Portion	Foreign Portion	Total	Local Portion	Foreign Portion	Total
Land Acquisition and Compensation		-	-	-	-	-	-	-	-	-
Civil Works	Site Preparation	8,580	-	8,580	30	-	30	8,610	-	8,610
	Pavement Works	10,180	-	10,180	9,070	-	9,070	19,250	-	19,250
	Miscellaneous	590	-	590	-	-	-	590	-	590
	Access Road	550	-	550	550	-	550	1,100	-	1,100
	Sub Total	19,900	-	19,900	9,650	-	9,650	29,550	-	29,550
Building and Equipment Works	Passenger Terminal Building	7,570	8,210	15,780	3,530	3,830	7,360	11,100	12,040	23,140
	Cargo Terminal Building	860	1,020	1,880	640	760	1,400	1,500	1,780	3,280
	Administration/Tower and Other Buildings	1,790	1,350	3,140	-	-	-	1,790	1,350	3,140
	Sub Total	10,220	10,580	20,800	4,170	4,590	8,760	14,390	15,170	29,560
Nav aids Works	Radio Nav aids, Tele-communications, Air traffic Control and Meteorological Systems	310	5,700	6,010	200	4,400	4,600	510	10,100	10,610
	Airfield Lighting	260	2,840	3,100	270	2,370	2,640	530	5,210	5,740
	Sub Total	570	8,540	9,110	470	6,770	7,240	1,040	15,310	16,350
Utilities Works	Power Supply	360	1,840	2,200	170	790	960	530	2,630	3,160
	Water Supply	290	130	420	220	50	270	510	180	690
	Sewage	230	170	400	90	70	160	320	240	560
	Incinerator	20	220	240	10	110	120	30	330	360
	Telecommunications	20	410	430	10	120	130	30	530	560
	Sub Total	920	2,770	3,690	500	1,140	1,640	1,420	3,910	5,330
Other Equipment	Boarding Bridge	40	1,010	1,050	30	670	700	70	1,680	1,750
	Vehicles for Administration, Fire Fighting and Rescue	30	800	830	-	-	-	30	800	830
	Sub Total	70	1,810	1,880	30	670	700	100	2,480	2,580
Total of Construction Works		31,680	23,700	55,380	14,820	13,170	27,990	46,500	36,870	83,370
Engineering Services Cost		440	4,660	5,100	190	2,360	2,550	630	7,020	7,650
Administration Cost		1,550	-	1,550	810	-	810	2,360	-	2,360
Sub Total		33,670	28,360	62,030	15,820	15,530	31,350	49,490	43,890	93,380
Contingency		3,370	2,830	6,200	1,580	1,560	3,140	4,950	4,390	9,340
GRAND TOTAL		37,040	31,190	68,230	17,400	17,090	34,490	54,440	48,280	102,720

Note: Civil Works are allocated in Local Portion.

Table 13.3.2' Estimated Construction Cost for New Airport

(Note: This table is applicable for the Budgetary Entity)

Exchange Rate : US\$1.00 = £E0.82, £E1.00 = ¥300  
Cost estimate based on 1984 price

(Unit : £E1,000)

Phase of Construction Work Item		Phase I			Phase II			TOTAL		
		Local Portion	Foreign Portion	Total	Local Portion	Foreign Portion	Total	Local Portion	Foreign Portion	Total
Land Acquisition and Compensation		-	-	-	-	-	-	-	-	-
Civil Works	Site Preparation	8,580	-	8,580	30	-	30	-	-	8,610
	Pavement Works	9,660	-	9,660	7,340	-	7,340	17,000	-	17,000
	Miscellaneous	480	-	480	-	-	-	480	-	480
	Access Road	550	-	550	550	-	550	1,100	-	1,100
	Sub Total	19,270	-	19,270	7,920	-	7,920	27,190	-	27,190
Building and Equipment Works	Passenger Terminal Building	7,570	8,210	15,780	3,170	3,430	6,600	10,740	11,640	22,380
	Cargo Terminal Building	860	1,020	1,880	640	760	1,400	1,500	1,780	3,280
	Administration/Tower and Other Buildings	1,330	1,010	2,340	-	-	-	1,330	1,010	2,340
	Sub Total	9,760	10,240	20,000	3,810	4,190	8,000	13,570	14,430	28,000
Navaid Works	Radio Navaid, Telecommunications, Airtraffic Control and Meteorological Systems	280	5,050	5,330	180	4,020	4,200	460	9,070	9,530
	Airfield Lighting	250	2,800	3,050	190	1,620	1,810	440	4,420	4,860
	Sub Total	530	7,850	8,380	370	5,640	6,010	900	13,490	14,390
Utilities Works	Power Supply	310	1,760	2,070	120	710	830	430	2,470	2,900
	Water Supply	120	130	250	50	50	100	170	180	350
	Sewage	230	170	400	90	70	160	320	240	560
	Incinerator	20	220	240	10	110	120	30	330	360
	Telecommunications	20	410	430	10	120	130	30	530	560
	Sub Total	700	2,690	3,390	280	1,060	1,340	980	3,750	4,730
Other Equipment	Boarding Bridge	40	1,010	1,050	30	670	700	70	1,680	1,750
	Vehicles for Administration, Fire Fighting and Rescue	30	800	830	-	-	-	30	800	830
	Sub Total	70	1,810	1,880	30	670	700	100	2,480	2,580
Total of Construction Works		30,330	22,590	52,920	12,410	11,560	23,970	42,740	34,150	76,890
Engineering Services Cost		420	4,450	4,870	160	2,020	2,180	580	6,470	7,050
Administration Cost		1,480	-	1,480	700	-	700	2,180	-	2,180
Sub Total		32,230	27,040	59,270	13,270	13,580	26,850	45,500	40,620	86,120
Contingency		3,220	2,700	5,920	1,330	1,360	2,690	4,550	4,060	8,610
GRAND TOTAL		35,450	29,740	65,190	14,600	14,900	29,540	50,050	44,680	94,730

Note: Civil Works are allocated in Local Portion.

**Table 13.3.3' Estimated Construction Cost for Nozha Airport**  
 (Note: This table is applicable for the Budgetary Entity)

Exchange Rate : US\$1.00 = fE0.82, fE1.00 = ¥300  
 Cost estimate based on 1984 price

(Unit : fE1,000)

Phase of Construction Work Item		Phase I			Phase II			TOTAL		
		Local Portion	Foreign Portion	Total	Local Portion	Foreign Portion	Total	Local Portion	Foreign Portion	Total
Land Acquisition and Compensation		-	-	-	-	-	-	-	-	-
Civil Works	Site Preparation	-	-	-	-	-	-	-	-	-
	Pavement Works	520	-	520	1,730	-	1,730	2,250	-	2,250
	Miscellaneous	110	-	110	-	-	-	110	-	110
	Access Road	-	-	-	-	-	-	-	-	-
	Sub Total	630	-	630	1,730	-	1,730	2,360	-	2,360
Building and Equipment Works	Passenger Terminal Building	-	-	-	360	400	760	360	400	760
	Cargo Terminal Building	-	-	-	-	-	-	-	-	-
	Administration/Tower and Other Buildings	460	340	800	-	-	-	460	340	800
	Sub Total	460	340	800	360	400	760	820	740	1,560
Navaid Works	Radio Navaid, Telecommunications, Airtraffic Control and Meteorological Systems	30	650	680	20	380	400	50	1,030	1,080
	Airfield Lighting	10	40	50	80	750	830	90	790	880
	Sub Total	40	690	730	100	1,130	1,230	140	1,820	1,960
Utilities Works	Power Supply	50	80	130	50	80	130	100	160	260
	Water Supply	170	-	170	170	-	170	340	-	340
	Sewage	-	-	-	-	-	-	-	-	-
	Incinerator	-	-	-	-	-	-	-	-	-
	Telecommunications	-	-	-	-	-	-	-	-	-
	Sub Total	220	80	300	220	80	300	440	160	600
Other Equipment	Boarding Bridge	-	-	-	-	-	-	-	-	-
	Vehicles for Administration, Fire Fighting and Rescue	-	-	-	-	-	-	-	-	-
	Sub Total	-	-	-	-	-	-	-	-	-
<b>Total of Construction Works</b>		<b>1,350</b>	<b>1,110</b>	<b>2,460</b>	<b>2,410</b>	<b>1,610</b>	<b>4,020</b>	<b>3,760</b>	<b>2,720</b>	<b>6,480</b>
Engineering Services Cost		20	210	230	30	340	370	50	550	600
Administration Cost		70	-	70	110	-	110	180	-	180
Sub Total		1,440	1,320	2,760	2,550	1,950	4,500	3,990	3,270	7,260
Contingency		150	130	280	250	200	450	400	330	730
<b>GRAND TOTAL</b>		<b>1,590</b>	<b>1,450</b>	<b>3,040</b>	<b>2,800</b>	<b>2,150</b>	<b>4,950</b>	<b>4,390</b>	<b>3,600</b>	<b>7,990</b>

Note: Civil Works are allocated in Local Portion.



## CHAPTER 14 ECONOMIC AND FINANCIAL ANALYSES



## CHAPTER 14 ECONOMIC AND FINANCIAL ANALYSIS

### 14.1 General

Economic and financial analyses are carried out on the airport master plan. Economic price which seeks the optimal allocation of resources in the national economy is used in the economic analysis in order to assess the project more accurately. Project life is set at 25 years and salvage value is calculated for the facilities of Phase II development taking into account the life expectancy of the facilities.

Results of the analyses show that the project is feasible from the viewpoint of the national economy. A high economic return endorses the urgent implementation of the project with regard to the national and regional development. It is also proven that the project yields a sufficient economic return on investment even in the case of a substantial increase in the construction cost or reduction of traffic demand, and that Phase I development can stand on its own as an economically viable project.

Financial analysis shows that the revenues will be able to cover the operation and maintenance costs of the project, but it is considered that the current airport charges are insufficient to cover the total costs including the construction, operation and maintenance for the airport development.

Introduction of soft loan or government subsidies will be necessary in order to implement the project as a social infrastructure.

### 14.2 Economic Analysis

#### 14.2.1 Methodology

No change has been made on the cost and the benefit items which are described in Section 8.2. Following concepts are additionally introduced.

#### (1) Economic Price

Economic price is used to accurately evaluate the net contribution of the project to the national economy. The costs and benefits, therefore, shall be estimated at the economic price (international/border price).

When various kinds of local input (costs) and output (benefits) of a project at financial (market) price are converted into those at economic (international/border) price, it is most precise to use the conversion factors which correspond to the kinds of input and output. It is because that volume and kind of goods and services are different by the kind of the input and the output, and that, as a result of this, a degree of influence of price policy in the country concerned upon the value of input and output is also different each other. The introduction of a conversion factor aims to deduct the influence from the value.

(2) Project Life and Salvage Value

The project life is set at 25 years. The annual depreciation rate of 4% with straight line method which is now adopted for all kinds of facilities by ECAA corresponds to the project life of 25 years. As for air navigation systems, however, the annual depreciation rate is set as shown in Table 14.2.1 taking into account the faster deterioration.

Table 14.2.1 Annual Depreciation Rate

Facilities		Annual Depreciation Rate (%/year)	Life Expectancy (Year)
Civil Works, Buildings, Utilities		4.0	25
Air Navigation Systems	Nav aids	10.0	10
	Lights	6.7	15

Salvage value at the end of the project life is calculated for the facilities of the Phase II development in accordance with the annual depreciation rate.

14.2.2 Costs

(1) Construction Cost and Salvage Value

Table 14.2.2 summarizes the construction cost and the salvage value of the project.

Table 14.2.2 Construction Cost and Salvage Value

Unit: 1,000EE, 1984

Phase	Price		Financial	Economic
	Local/Foreign			
Phase I Investment	Local		23,550	21,190
	Foreign		44,680	44,680
	Sub-total		68,230	65,870
Phase II Investment	Local		12,310	11,080
	Foreign		22,180	22,180
	Sub-total		34,490	33,260
Total	Local		35,860	32,270
	Foreign		66,860	66,860
	Sub-total		102,720	99,130
Salvage Value			10,460	9,620

Local portion of the construction cost is converted from financial price base to economic price base by multiplying the Standard Conversion Factor (SCF) of 0.9. The total construction cost at economic price is valued at 99.1 million Egyptian Pounds and 96.5% of the total cost at financial price. Explanation and estimation of SCF is given in Appendix 14.1.

(2) Operation and Maintenance Costs

a) Personnel Cost

The personnel cost is divided into the following sub-cost items.

- i) Direct personnel cost
- ii) Distributed personnel cost  
(Compensation for services from the head office, etc.)

The direct personnel cost is calculated by multiplying the number of ECAA staff estimated in Section 12.4 by average annual personnel cost of 3,100 Egyptian Pounds. The personnel cost includes social welfare costs as well as salary and allowances.

The distributed personnel cost is calculated by multiplying the number of ECAA staff by 0.5 (estimated based on ECAA document) and the annual personnel cost per staff. Personnel cost is converted into economic price base by SCF.

b) Material and Utility Cost

Material and utility costs are set at 10% of the personnel cost referring to the estimation from the related data (ECAA: 4%, 1981/1982, CAA: 7.6%, 1983/1984). Taking into consideration that these costs have a tendency to be kept lower than the production costs from the view point of social welfare, the conversion factor of 1.3\* is adopted.

Source \*: Egypt National Transport Study

c) Maintenance and Repair Costs

Annual maintenance and repair costs are estimated as described in Section 8.2.4. Local portion of the financial costs is converted into economic price base by SCF.

(3) Construction, O&M Costs saved at Cairo Airport

Construction cost for the additional investment and its salvage value are estimated at economic price as shown in Table 14.2.3.

Table 14.2.3 Construction Cost Saved at Cairo Airport

Unit: Million£E, 1984 economic price

Phase Items	Phase I	Phase II
Construction Cost	6.9	11.1
Salvage Value	1.8	

The operation and maintenance costs are also calculated by the same method as the above-mentioned paragraph (2).

(4) Operation and Maintenance Costs Saved at Existing Nozha Airport

The annual costs are estimated to be 0.5 million Egyptian Pounds at economic price.

14.2.3 Benefits

Benefits are also converted from financial price base to economic price base. Detailed estimation method is described in Appendices 14.2 and 14.3.

(1) Benefit Due to Accommodation of Overflowing Egyptian International Passengers

(a) Saving on access cost to/from the airport

Benefits at economic price are tabulated in Tables 14.2.4 and 14.2.5.

Table 14.2.4 Travelling Cost Saved on Surface Transportation

Unit: £E/pax. 1984 economic price

Alexandria ↻ Cairo Airport	Alexandria ↻ New Airport	Total
8.5	-0.8	7.7

Table 14.2.5 Travelling Time Value Saved on Surface Transportation

Unit: £E/pax. 1984 economic price

Alexandria ↻ Cairo Airport	Alexandria ↻ New Airport	Total
2.0	-0.3	1.7

(b) Saving of air fares

Saving of air fares which will be paid to the foreign carriers in "WOP" case is the foreign portion of the benefit and the benefit at economic price equals the financial benefit.

(2) Benefit due to Accommodation of Overflowing Domestic Passengers

Benefit is converted into economic price base as shown in Table 14.2.6.

Table 14.2.6 Benefit due to Accommodation of Overflowing Domestic Passengers

Unit: £E/pax. 1984 economic price

Egyptian Passengers	11.7
Foreign Passengers	22.0

(3) Benefit due to Accommodation of Overflowing International Cargo

Saving on surface transportation cost between Alexandria and Cairo is estimated to be 16.5 Egyptian Pounds/ton at economic price.

Saving on cargo air fare is the foreign portion of the benefit and benefit at economic price equals the financial benefit.

(4) Benefit due to Reduction of Passenger Processing Time at the Airport

Economic time value per Egyptian passenger is estimated at 0.5 Egyptian Pounds.

(5) Benefit to Airline by Permitting Introduction of Larger Aircraft

Almost all the operation cost of the aircraft belongs to the foreign portion. Then, the benefit at economic price is expressed by financial price.

(6) Additional Access Cost in Case of the New Airport (Disbenefit)

Disbenefit is calculated based on the economic time value of 0.5 Egyptian pounds per Egyptian passenger and the average economic operation cost of the vehicles of 2.45 P.T. per passenger km.



(7) Other Direct and Tangible Benefits

Two other benefits, i.e., benefit to provide an alternate airport to Cairo and benefit due to accommodation of foreign international passengers are not included in the analysis because of lack of accurate data for the estimation. However, if these benefits are quantified, economic performance of the project will be improved somewhat.

(8) Indirect and/or Intangible Benefits

There are indirect and/or intangible benefits which will be generated by the airport development project. Such benefits will include promotion of the regional development, increase of employment opportunities, expansion of trade and business activities, improvement of air safety, alleviation of the congestion at Cairo airport, etc.

Among those, the airport development project will contribute greatly to the promotion and implementation of various regional development projects in Alexandria region by offering a rapid mass transportation system for close links with European countries and other countries in the Middle East.

14.2.4 Cash Flow

The costs and benefits over the entire project period are shown in Table 14.2.7.

Table 14.2.7 Cash Flow of Master Plan

Unit : 1,000EE, 1984 economic price

YEAR	Cost						Benefit						NET BENEFIT
	CONST. COST	0 & N COST	SAVE AT CAIRO	SAVE AT NOZHA	TOTAL COST	INT'L FAX	DOM. FAX	INT'L CARGO	TIME SAVE	AIRLINE BENEFIT	ADD. ACCESS	TOTAL BENEFIT	
1985	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1986	1110.0	0.0	0.0	0.0	1110.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-1110.0
1987	2250.0	0.0	0.0	0.0	2250.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-2250.0
1988	3930.0	0.0	0.0	0.0	3930.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-3930.0
1989	11150.0	0.0	0.0	0.0	11150.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-11150.0
1990	25440.0	0.0	-3460.0	0.0	21980.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-21980.0
1991	21550.0	0.0	-3460.0	0.0	18090.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-18090.0
1992	0.0	2600.0	-210.0	0.0	1890.0	4630.0	170.0	440.0	30.0	0.0	-370.0	4300.0	3010.0
1993	0.0	2630.0	-210.0	0.0	1920.0	5870.0	510.0	530.0	30.0	30.0	-370.0	5600.0	4680.0
1994	440.0	2670.0	-220.0	0.0	2390.0	7360.0	840.0	610.0	30.0	30.0	-370.0	8530.0	6140.0
1995	0.0	2690.0	-220.0	0.0	1970.0	8990.0	1130.0	660.0	30.0	30.0	-370.0	10580.0	8610.0
1996	0.0	2730.0	-230.0	0.0	2000.0	9490.0	1230.0	710.0	30.0	110.0	-370.0	11480.0	9480.0
1997	0.0	2760.0	-230.0	0.0	2020.0	10150.0	1350.0	760.0	30.0	130.0	-370.0	12550.0	10530.0
1998	1800.0	2780.0	-230.0	0.0	3830.0	10760.0	2190.0	800.0	30.0	150.0	-370.0	13560.0	9730.0
1999	8730.0	2810.0	-5830.0	0.0	5230.0	11390.0	2330.0	840.0	30.0	180.0	-370.0	14600.0	9340.0
2000	17320.0	2840.0	-5830.0	0.0	13830.0	12130.0	2360.0	910.0	30.0	200.0	-370.0	15760.0	1930.0
2001	0.0	3220.0	-330.0	0.0	3300.0	12820.0	3300.0	960.0	30.0	210.0	-370.0	16850.0	14510.0
2002	3260.0	3250.0	-330.0	0.0	5620.0	13440.0	3710.0	1020.0	30.0	230.0	-370.0	18060.0	12440.0
2003	0.0	3310.0	-400.0	0.0	2410.0	14200.0	4310.0	1090.0	30.0	240.0	-370.0	19400.0	16990.0
2004	0.0	3330.0	-410.0	0.0	2420.0	14830.0	4720.0	1160.0	30.0	250.0	-370.0	20620.0	18200.0
2005	440.0	3380.0	-410.0	0.0	2910.0	15570.0	5220.0	1230.0	30.0	280.0	-370.0	21960.0	19950.0
2006	0.0	3410.0	-420.0	0.0	2490.0	16340.0	5710.0	1310.0	30.0	290.0	-370.0	23310.0	20820.0
2007	1660.0	3420.0	-430.0	0.0	4150.0	17130.0	6230.0	1390.0	30.0	310.0	-370.0	24720.0	20570.0
2008	0.0	3450.0	-440.0	0.0	2510.0	17900.0	6910.0	1480.0	30.0	320.0	-370.0	26270.0	23760.0
2009	0.0	3490.0	-450.0	0.0	2540.0	18650.0	7410.0	1560.0	30.0	330.0	-370.0	27630.0	25990.0
2010	0.0	3520.0	-460.0	0.0	2560.0	19590.0	8090.0	1640.0	30.0	360.0	-370.0	29340.0	26780.0
2011	930.0	3520.0	-460.0	0.0	3490.0	19590.0	8090.0	1640.0	30.0	360.0	-370.0	29340.0	25850.0
2012	0.0	3520.0	-460.0	0.0	2560.0	19590.0	8090.0	1640.0	30.0	360.0	-370.0	29340.0	26780.0
2013	3260.0	3520.0	-460.0	0.0	5820.0	19590.0	8090.0	1640.0	30.0	360.0	-370.0	29340.0	23520.0
2014	0.0	3520.0	-460.0	0.0	2560.0	19590.0	8090.0	1640.0	30.0	360.0	-370.0	29340.0	26780.0
2015	0.0	3520.0	-460.0	0.0	2560.0	19590.0	8090.0	1640.0	30.0	360.0	-370.0	29340.0	26780.0
2016	-9620.0	3520.0	1360.0	-500.0	-5240.0	19590.0	8090.0	1640.0	30.0	360.0	-370.0	29340.0	34588.0

DISCOUNT RATE = 9. %      B/C RATIO = 1.5677      NPU = 29959.40

DISCOUNT RATE = 12. %      B/C RATIO = 1.2024      NPU = 8449.21

DISCOUNT RATE = 15. %      B/C RATIO = 0.9389      NPU = -2069.57

EIRR = 14.214 %

#### 14.2.5 Evaluation of the Project

The EIRR, B/C ratio and NPV of the project are calculated and summarized in Table 14.2.8.

Table 14.2.8 Economic Assessment

EIRR (%)	B/C Ratio*	NPV* (million£E, 1984)
14.2	1.2	8.4

Note\*: at discount rate of 12%

Economic analysis shows that the project is feasible because the EIRR of 14.2% is higher than 12% of the opportunity cost of capital in Egypt, thus proving the rationality of investment. A high economic return endorses the urgent implementation of the project.

#### 14.2.6 Sensitivity Analysis

Sensitivity analysis is also made to provide a basis for probabilistic judgement on the feasibility of the project. The EIRRs are calculated on the various projections and summarized in Table 14.2.9.

Table 14.2.9 Summary of Sensitivity Analysis

Projections		EIRR (%)
Base Case		14.2
Case 1	Construction Cost up by 10%	13.1
Case 2	Traffic Demand down by 10%	12.9
Case 3	Construction Cost up by 10% Traffic Demand down by 10% (Simultaneously)	11.9
Case 4	Phase I Development	13.0

The result of the sensitivity analysis shows that even in the worst projection of Case 3, the EIRR almost satisfies the opportunity cost of capital, and proves that the project yields a sufficient economic return on investment even in case of a substantial increase in the construction cost or reduction of traffic demand.

Case 4 is the case where only the Phase I development will be implemented. The annual amount of the operation and maintenance cost and all benefits after Phase I development are kept at the same level as those in 2000. Case 4 proves that the investment program throughout the entire project period is quite appropriate in scale and allocation, because the Phase I development on its own is justified by its relatively high EIRR of 13.0% as well as Base Case. It also provides the essential data to potential financial institutions which may consider the Phase I development independent of Phase II.

### **14.3 Financial Analysis**

#### **14.3.1 Methodology**

Financial analysis is carried out in order to study the financial viability of the project. The pricing policy of airport charges as well as the borrowing policy are discussed.

#### **14.3.2 Expenditures**

The construction cost, salvage value and the operation and maintenance costs have been described in 14.2.2. Unit prices of the personnel, utility and material costs are assumed to increase at the rate of 3.5% per annum, taking into account the relative increase against the level of consumer prices.

#### **14.3.3 Revenues**

Revenues from the airport charges are described in Section 8.3.4. Air passenger charge and rent on concessions in the terminal building are updated in this chapter.

##### **(1) Air Passenger Service Charge (Departure Tax)**

The revenue from the air passenger service charge to the airports is calculated by multiplying the number of international air passengers leaving Egypt by 5 Egyptian Pounds.

Although the charge is stipulated to be 10 Egyptian Pounds/pax., 5 Egyptian Pounds/pax. is paid to the National Treasury. The remaining 5 Egyptian Pounds/pax. is assumed to be the airport's revenue.

##### **(3) Rent on Concessions in Terminal Building**

The rental revenue from airlines, agencies, shops, restaurants and cafeterias are calculated based on the airport master plan and unit fees in Table 14.3.1.

**Table 14.3.1 Annual Rental for Terminal Building Space**

Unit: £E/sq.m

New International Airport	Nozha Airport
81	18

Source: Document from ECAA

**14.3.4 Projection of Revenue and Expenditure**

Table 14.3.2 shows the projected revenue and expenditure of the entity.

Table 14.3.2 Projected Revenue and Expenditure

Unit : 1,000EE, 1984 financial price

YEAR	Expenditure			Revenue							NET REVENUE
	CONST. COST	O & M COST	TOTAL EXP.	LANDING CHARGE	PAX. SUC CHARGE	RENTAL FEE	CAR PARKING	ADMISSION FEE	TOTAL REV.		
1985	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1986	1140.0	0.0	1140.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-1140.0
1987	2320.0	0.0	2320.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-2320.0
1988	4020.0	0.0	4020.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-4020.0
1989	11520.0	0.0	11520.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-11520.0
1990	26490.0	0.0	26490.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-26490.0
1991	22300.0	0.0	22300.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-22300.0
1992	0.0	2730.0	2730.0	750.0	2100.0	300.0	0.0	0.0	0.0	3150.0	420.0
1993	0.0	2820.0	2820.0	830.0	2400.0	300.0	150.0	110.0	0.0	3790.0	970.0
1994	440.0	2910.0	3350.0	980.0	2750.0	300.0	170.0	120.0	0.0	4300.0	950.0
1995	0.0	3010.0	3010.0	1170.0	3150.0	300.0	180.0	140.0	0.0	4940.0	1930.0
1996	0.0	3090.0	3090.0	1230.0	3300.0	300.0	210.0	160.0	0.0	5200.0	2110.0
1997	0.0	3190.0	3190.0	1290.0	3450.0	300.0	220.0	170.0	0.0	5430.0	2240.0
1998	1800.0	3300.0	5100.0	1360.0	3600.0	300.0	240.0	170.0	0.0	5860.0	560.0
1999	3100.0	3400.0	6500.0	1440.0	3750.0	300.0	240.0	180.0	0.0	5910.0	-690.0
2000	18060.0	3520.0	21580.0	1530.0	3930.0	300.0	250.0	180.0	0.0	6200.0	-15380.0
2001	0.0	4000.0	4000.0	1580.0	4000.0	300.0	270.0	200.0	0.0	6430.0	2430.0
2002	3200.0	4150.0	7430.0	1630.0	4230.0	300.0	270.0	200.0	0.0	6630.0	-800.0
2003	0.0	4300.0	4300.0	1680.0	4400.0	300.0	280.0	210.0	0.0	6870.0	2570.0
2004	0.0	4440.0	4440.0	1750.0	4500.0	300.0	290.0	220.0	0.0	7150.0	2710.0
2005	440.0	4610.0	5050.0	1830.0	4750.0	300.0	310.0	230.0	0.0	7420.0	2370.0
2006	0.0	4720.0	4720.0	1920.0	4930.0	300.0	320.0	240.0	0.0	7710.0	2950.0
2007	1680.0	4920.0	6600.0	2000.0	5100.0	300.0	340.0	250.0	0.0	7990.0	1390.0
2008	0.0	5030.0	5030.0	2090.0	5280.0	300.0	350.0	260.0	0.0	8280.0	3190.0
2009	0.0	5270.0	5270.0	2200.0	5480.0	300.0	370.0	260.0	0.0	8610.0	3340.0
2010	0.0	5460.0	5460.0	2310.0	5680.0	300.0	380.0	270.0	0.0	8940.0	3490.0
2011	940.0	5460.0	6400.0	2310.0	5680.0	300.0	400.0	280.0	0.0	8970.0	2570.0
2012	0.0	5460.0	5460.0	2310.0	5680.0	300.0	400.0	280.0	0.0	8970.0	3510.0
2013	3280.0	5460.0	8740.0	2310.0	5680.0	300.0	400.0	280.0	0.0	8970.0	230.0
2014	0.0	5460.0	5460.0	2310.0	5680.0	300.0	400.0	280.0	0.0	8970.0	3510.0
2015	0.0	5460.0	5460.0	2310.0	5680.0	300.0	400.0	280.0	0.0	8970.0	3510.0
2016	-10460.0	5460.0	-5000.0	2310.0	5680.0	300.0	400.0	280.0	0.0	8970.0	13970.0

INTEREST RATE = 10. % REV./EXP. RATIO = 0.4269 NPU = -36384.00

INTEREST RATE = 13. % REV./EXP. RATIO = 0.3593 NPU = -32048.80

INTEREST RATE = 16. % REV./EXP. RATIO = 0.2904 NPU = -27982.90

#### 14.3.5 Evaluation of the Project

Projected revenue and expenditure show that the revenues will be able to cover about 150% of the operation and maintenance costs based on the present charging system. However, it is also clarified that the revenues should be increased to a level of 2.9 times the present level to cover the necessary expenditures including the construction, operation and maintenance costs, when the necessary expenditure requirements are funded with interest rate of 13%, i.e., present prime rate in Egypt. The pricing policy of airport charges and funding source with lower interest are required to achieve a financial balance.

#### 14.3.6 Pricing and Borrowing Policy

In order to assess the possibility of increasing the airport charges, the passenger service charge and the aircraft landing charge which constitute a large part of the total revenues are analyzed.

The passenger service charge per international passenger leaving Egypt is 10 Egyptian Pounds at present. It is one of the most expensive service charges in the world. Thus a raise of the charge is considered to be difficult.

The aircraft landing charge of B747 is compared with that of several airports around the world. As a result, present charge of about 1,650 US dollars is in the average range as shown in Table 14.3.3.



Table 14.3.3 Comparison of Aircraft Landing Charge of B-747

Unit: US\$

Country	City	Airport	Landing Charge
Egypt	Cairo	Cairo	1,650
Japan	Tokyo	Narita	3,420
United States	Los Angeles	Los Angeles	500
France	Paris	CH. De Gaulle	1,930
W. Germany	Frankfurt	Frankfurt	2,170
United Kingdom	London	Heathrow	1,410
Australia	Sydney	Kingsford	4,620
Thailand	Bangkok	Bangkok	1,330

Note: B-747 with Maximum take-off weight of 352 tons  
as of November, 1983

Assuming that the landing charge is raised to a level of 2.5 times the present level, the charge will become one of the highest in the world.

In order to analyze the pricing policy, various funding sources are projected and the required level of revenues is calculated as shown in Table 14.3.4.

**Table 14.3.4 Funding Source and Required Level of Revenues**

Projections	Interest Rate	Fund Composition	Required Revenue Level (times)
Base Case	Fund with 13%	All Portion	2.9
Case 1	Fund with 13%	Local Portion	1.9
	Fund with 4%	Foreign Portion	
Case 2	Government Fund	Local Portion	1.4
	Fund with 4%	Foreign Portion	
Case 3	Government Fund	All Portion	1.2

In Base Case and Case 1, required level of revenues will not be achieved even if the landing charge is raised to a level of 2.5 times the present level. Case 2 and Case 3 require a level of landing charge of 2.5 and 1.7 times the present level respectively, in order to achieve the financial balance.

Projection of the landing charge, however, needs to be determined on the basis of policy from the viewpoint of the national economy e.g., the role of Egypt as a traffic junction in this region.

As is well known, airport management is generally difficult in terms of the financial operation. Hence, the introduction of soft loan or government subsidies will be necessary in order to implement the project as a social infrastructure.

## CONCLUSION



## CONCLUSION

Based on the airport development concept which is to continue using Nozha airport for domestic service by maintaining its serviceability through short-term development works and to construct a new airport for international service including a limited domestic service for New Ameriyah city and the North west coast regional development area, the airport master plan is prepared for the target years 2000 (Phase I) and 2010 (Phase II).

The feasibility of the project based on the airport master plan is studied and assessed. As a result, the cost necessary for the project is estimated to be 68.2 million and 34.5 million Egyptian Pounds in Phases I and II, respectively, and the economic internal rate of return (EIRR) is 14.2 percent in Phases I and II, and 13.0 percent in Phase I. Hence, the project is feasible from the viewpoint of the optimum allocation of resources in the national economy.

It is, accordingly, recommended that a new airport for international service including a limited domestic service should be constructed at the reserved site approx. 45 km south west of Alexandria city, and Nozha airport should be operated for domestic service after the necessary but minimum short-term and Phase I development.

The implementation of the project shall have impact on:

- Contribution to the national economy and achievement of the priority themes of the "Five Year Plan for Economic and Social Development",
- Contribution to the increase of opportunity of trade and business as a basic infrastructure through the promotion and implementation of the various regional development projects such as North west coast development, New Ameriyah city development, free economic zone, etc.,
- Contribution to the increase of employment opportunities,
- Stimulation of tourism development,
- Contribution to the safety of air transport,

- Convenience for both Alexandria and New Ameriyah city,
- Flexibility in an emergency, maintenance work, etc., which require closure of one airport,
- Alleviation of the congestion at Cairo airport especially for international services,
- Provision of better alternate to Cairo airport,
- Contribution to the airlines' profitability by means of introduction of wide bodied jet aircraft.

It is advised to organize the necessary committee and start on the following preparatory and necessary coordination works:

- The preparations including request for financial assistance, topographic survey, soil investigation, etc., should be initiated at the earliest possible date so that the engineering services including basic design, detailed design, preparation of tender documents, assistance in evaluation of the tenders, etc., can be carried out and completed by mid. 1988 at the latest.
- The first phase construction work should be started in mid. 1988 so that the airport can become operational in early 1992.
- The new airport facilities in Phase I are to be so designed as to cope with the demand up to year 2000, by which time Phase II construction which is to cope with the demand up to year 2010 will be completed.
- In parallel with the engineering services for the new airport construction, the necessary but minimum immediate improvement works at Nozha airport will be required in order to cope with the increasing demand up to the time of new airport inauguration.
- Coordination works to change the current land use plan at the north of the new airport from residential use to agricultural or green belt will be required.

- Coordination works to efficiently utilize the airspace for both the new airport and the adjacent military airport will be required before the establishment of the aircraft operations procedures.









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