ARAB REPUBLIC OF EGYPT

FEASIBILITY STUDY
FOR
NEW ALEXANDRIA INTERNATIONAL AIRPORT
CONSTRUCTION PROJECT

PROGRESS REPORT

OCTOBER 1984

JAPAN INTERNATIONAL COOPERATION AGENCY

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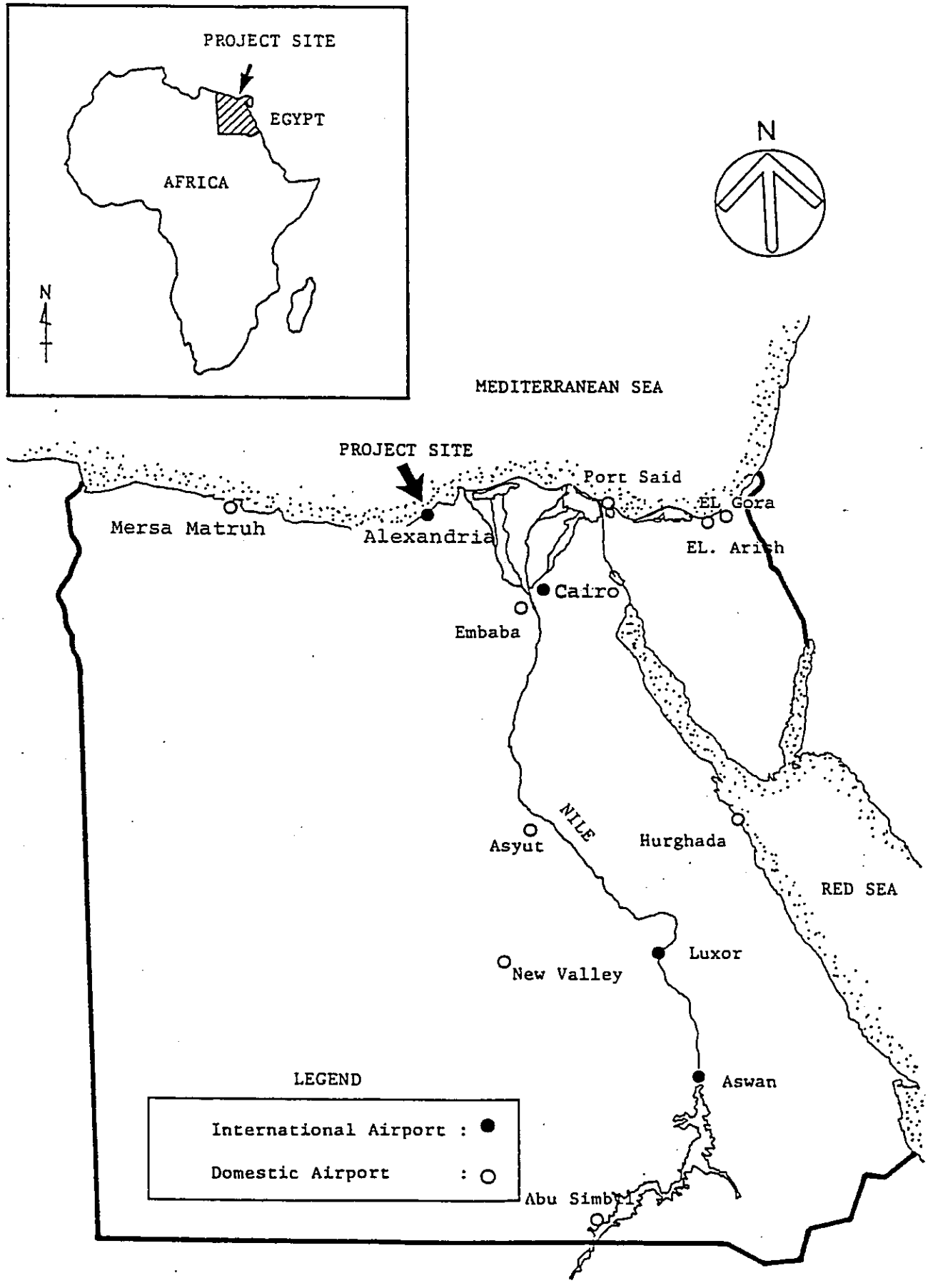
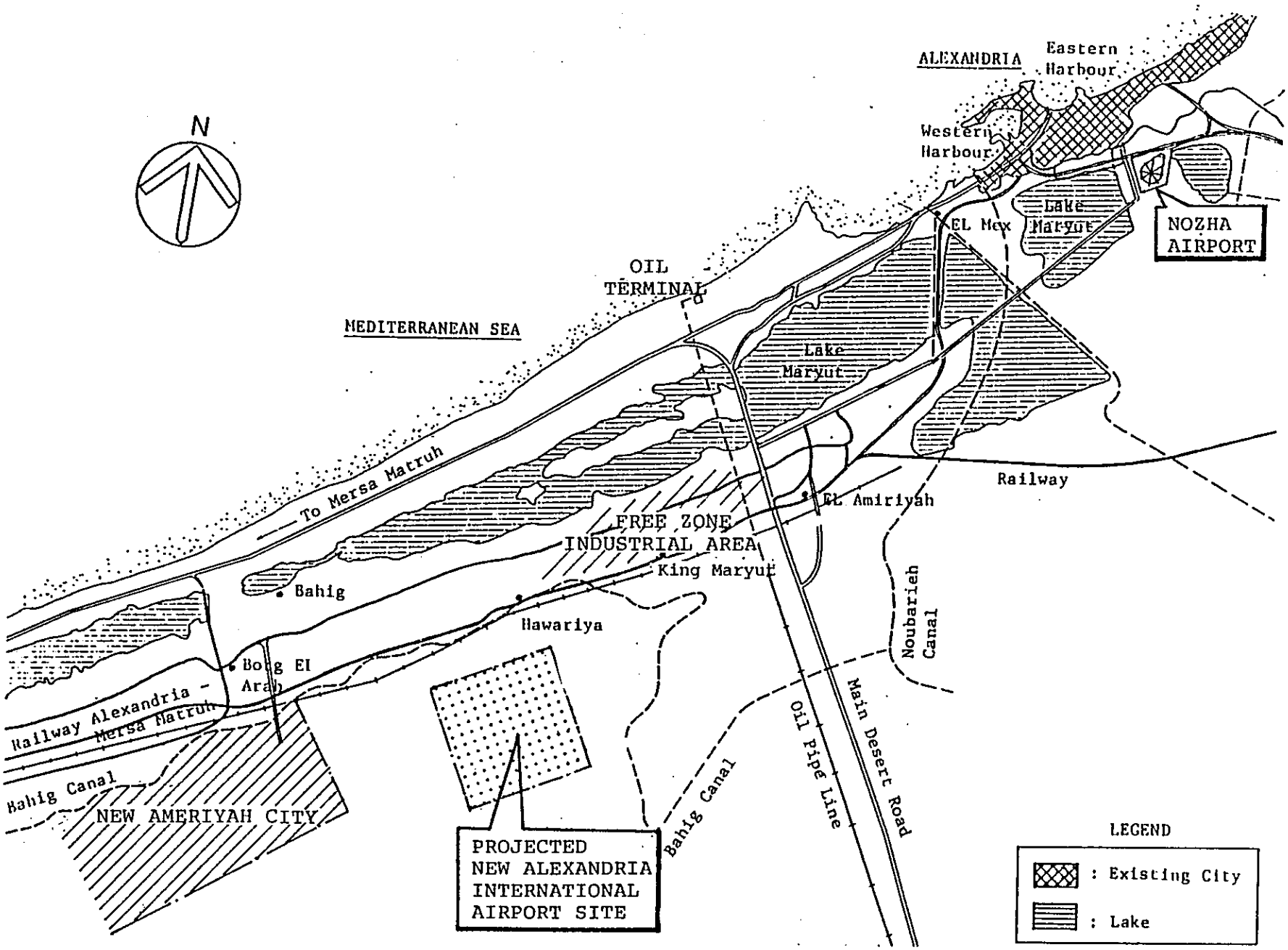


PROJECT LOCATION MAP - 1



PROJECT LOCATION MAP - 2

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INTRODUCTION

According to the work schedule agreed upon the Inception Report, the study team has carried out the following studies for three months since July 11, 1984.

1) Meteorological observations at the new airport site
2) Topographic survey of the new airport site
3) Soil investigations in both Nozha airport and the new airport site
4) Air traffic analysis and demand forecast
5) Airport requirements analysis
6) Redevelopment plan for the existing airport
7) Development plan for a new airport
8) Comparative evaluation of the redevelopment of the existing airport and the construction of a new airport.

Although it was basically scheduled in the Inception Report that the Progress Report summarizes a selection of the most feasible airport development scheme for the Alexandria region between the redevelopment of Nozha airport and the development of a new airport, this Progress Report refrains from the establishment of the target traffic demand and consequently a selection of the most suitable airport development scheme in the Alexandria region in view of the magnitude of traffic demand forecast in the feasibility study because air traffic demand forecast will need more time to be finalized due to a delay of data collection and the subsequent analysis.

Therefore, this Progress Report contains the general condition of socio-economy and air transportation in Egypt and Alexandria, the evaluation of the existing airport facilities, discussions on the future development policies for both Nozha airport and a new airport, and the characteristics and qualitative comparison on several important issues of both schemes.

In the Interim Report, the study items 5) through 8) will be further studied and finalized based on the target demand prudentially established by the demand forecast under item 4).

CAHPTER 1.SOCIO-ECONOMIC CONDITION OF EGYPT

1-1 Socio-Economic condition of Egypt

Sited at the cross roads of the three continents of the old world, Egypt has been naturally the main path of transportation either on land, by sea or by air. Located at the North East of Africa and at the heart of the Middle East, Egypt has served as the master link connecting three worlds, the African world with more than 55 countries and more than 500 Million population, the Arab world of 24 Countries and more than 150 Million population, though some of them are doubling as African countries too, and the Islamic world of more than 40 Countries, though here again some of them are doubling as African and/or Arab Countries also.

The African link is not only a mere geographical one as most of the Egyptian land lies in Africa (Sinai Peninsula is part of Asia), but it goes deep to the extent that the live blood running through the Egyptian Heart, viz, the water of the River Nile is shared with other African Countries. On the political front, Egypt has been the main driving force behind almost all the liberation movements in all Africa and has served as a development example and as an educational center for the population of the newly liberated countries throughout the continent.

In between the Arab Countries, Egypt has been the central stage for all the political, cultural, social and religious activities. The population of Egypt constitute almost one third of the total population of the Arab World. It has served as the cradle of Arab culture and preserved the Arab heritage through the ages. In short, Egypt has always been setting the tone of all the arab movements and activities.

Withen the Islamic World, the oldest islamic university (AL Azhar) in Cairo has served as the main source of Islamic education for more than thousand years. The Egyptian moderate interpretation of Islam has been always the main stream.

Out of these three domains, Egypt has its links which extends in its historical roll in Judaism and Christianity and its continous give and take with its neighbours across the Mediterranean Sea, viz, the Europian Countries.

This unique geographical site together with such strong links with almost all of the world has made Egypt the crossing point as well as the meeting point of many political, religious, and business activities withen the Middle East.

The Country has two sea fronts at the Mediterranean Sea and at the Red Sea with length of about 1000 Km. on each, thus forms a near perfect square of about one million sq.km area. Although the total area is relatively vast for the current population of about 45 Million inhabitant, the settled land is not more than 36,000 Sq.Km., thus the average density in the inhabited zones is over 1,100 person per Sq. Km., one of the highest in the World. This population is even more concentrated in the urban areas of Cairo and Alexandria with staggering housing and transportation problems.

Being in the climatic dry zone, more than 95% of the country is barren deserts with negligible rain fall except for the Northen coastal strip which has an annual avarage of about 200 mm. The Country depends solely on the River Nile as its main source of water and thus life has been naturally concentrated in the Delta and the Nile Valley. In research for new areas to settle part of the increasing population (rate of increase 2.28 % annually), the Egyptian Government has started an ambitious program for the development of new communities in desert regions to halt the urban expansion at the cost of the limited fertile land. One of the promising regions for absorbing a share of future increase in population is the North West Coast mainly because of its proximity to the sea and thus has natural preference for human settlement when compared with other inland sites of the desert. This preference is due to the possibilities of recreation facilities along the coast and the relatively mild weather.

The revolution of 1952, though has brought radical changes in the structure of the Egyptian society and economy, has been burdened by the continous preparations for wars and the continous high rate of population growth. The full dependence on the government and the public sector has led to severe shortage of private saving and finance which resulted in an economic stagnation in the begining of 1970s. The open door policy introduced by the late President "Sadat" has restored some of the balance and had put Egypt on the path of a high growth rate of more than 8% per annum in the late 1970s and the begining of the 1980s. This growth rate has been also attributed to the increase in petroleum production, the Suez Canal revenue and the remittances of the Egyptians abroad. These last three main sources of foreign currency which are expected to continue in good shape for at least the intermediate future, together with the current healthy flow of investment into new industrial projects makes the future look of the Egyptian economy on the bright side in spite of the current level of international debt. This argument is supported by the assessment of the world financial centers which consider Egypt between the credit worthy countries.

A direct result of the increase of the Egyptians abroad is the continuous rise in the air traffic demand between Egypt and the Arab Countries by two digit rates annually.

The current five year plan 1982/83 - 1986/87 has the target of increasing the annual economic growth at the rate of 8 per cent in real terms so that the standard of living can be increased by rates at least twice the rate of population growth. The framework for the five year plan is based on the following development strategy:

1- Continued achievement of accelerated rates of growth to maintain higher living standards for the rapidly growing population.
2- Maintenance of high priority to agriculture and industrial sectors.

3- Expansion of the construction capacity and basic services.
4- Increase of manpower productivity through programmes of training.
5- Allocation of adequate funds for housing.
6- Reform of the basic desequilibrium in the balance of payments.

As for transportation in Egypt, the concentration of the population withen the Delta and the Nile Valley has lead to the development of fairly good and extensive railways and road network within these regions. This high concentration of population in a relatively limited land has been the main reason for the limited demand for air transportation. This situation is in direct contrast with the case of neighbouring desert countries of Libya and Saudi Arabia where the vastness of the desert and the far distances between the scattered settlements has made air transportation more competitive than other means of transportation. The new emphasis in Egypt to go out of the Delta and the Nile Valley and to develop new communities in Sinai Peninsula, along the Red Sea, around the High Dam Lake, in the New Valley and along the North West Coast is bound to change the picture dramatically withen the next two or three decades to the benifit of air transportation. This is clear in the trend followed by the Egyptian Civil Aviation Organization in constructing and developing airports around the Country.

Table 1-1 Development of Gross National Income
(At Current Prices - L.E.million)

Year	Gross National Income		Saving	Disversment / Consumption		
	G.D.P.	Net income Revenue from the rest of the year		Individual	Collective	Total
1976	6,704.6	133.0	1,301.1	3,965.1	1,571.4	5,536.5
1977	8,209.9	433.2	2,029.4	4,916.9	1,696.8	6,613.7
1978	9,787.5	990.0	2,673.4	6,263.5	1,840.6	8,104.1
1979	12,610.2	1,303.7	3,531.6	8,338.2	2,044.1	10,382.3
80/81	18.041.2	1,312.8	5,333.6	11,080.0	2,940.4	14,020.4
81/82*	20,726.8	2,604.4	5,150.0	14,550.7	3,630.5	18,181.2
Annual Growth Rate (%) 1976-81/82	22.8			26.7	16.4	24.1
Saving Ratio(%)			'76 19.0 81/82 22.1			

Source: Statistical Yearbook, Central Agency for Public Mobilisation and Statistics

Table 1-2 Gross Domestic Product by Sector
= Five Year Plan =

Sector \ Fiscal Year	Amount 1/ (million)		Annual Growth Rate (%)	Constituent ratio (%)	
	1981/1982	1986/1987	1981/82-1986/87	1981/82	1986/87
Agriculture	3,891.5	4,660.0	3.7	19.8	16.1
Industry / Mining/Petroleum	5,610.4	9,598.3	11.3	28.6	33.2
Electricity	117.3	194.6	10.7	0.6	0.7
Construction	930.2	1,384.0	8.3	4.7	4.8
Service	9,089.4	13,083.1	7.6	46.3	45.2
(Total) GDP at Factor Cost	19,638.8	28,920.0	8.0	100.0	100.0
GDP at Market Cost	20,726.8	31,305.0	8.6		

Source: The Detailed of the Five Year Plan for Economic and Social Development 1982/83 - 1986/87,Ministry of Planning, December 1982

Note 1/ 1981/82 Constant price

Table 1-3 Development of Production

(At Current Price - L.E. Million)

Sector	1976	1977	1978	1979	1980/81	1981/82*	Rate 1/
Agriculture	2,407.2	2,840.6	3,472.8	3,726.0	4,822.5	5,465.5	16.1
Industry	3,773.1	4,248.6	4,929.1	6,163.5	7,937.2	9,494.0	18.3
Petroleum	574.8	696.1	854.8	2,476.0	3,899.1	3,753.7	40.7
Electricity	94.8	109.7	132.0	136.7	197.9	202.3	14.8
Construction	662.0	843.1	1,218.0	1,694.0	1,885.0	2,160.0	24.0
Commodity Sectors	7,511.9	8,738.1	10,606.7	14,196.2	18,741.7	21,075.5	20.6
Transportation and Means of Comunication	554.8	673.2	904.4	1,241.0	1,879.1	2,177.6	28.2
Finance and Trade	1,568.0	1,932.4	2,482.6	3,307.0	4,648.9	5,295.0	24.8
Housing	230.0	252.0	271.0	297.0	330.7	396.3	10.4
Public Utilities	31.1	35.0	40.0	47.0	60.5	66.0	14.7
Other Services	2,138.7	2,418.8	2,699.4	3,041.7	4,138.3	5,251.2	17.6
Services Sectors	4,522.6	5,314.4	6,397.5	7,934.0	11,057.5	13,150.1	21.4
Grand Total	12,034.5	14,049.5	17,004.2	22,130.2	29,799.2	34,225.6	20.9

Source: Statistical Yearbook

Note 1/: Annual increasing rate (%) 1976 - 1981/82

Table 1-4 The Balance of Trade between Egypt and Foreign Countries (Unit LE.1000)

Year	Export	Import	Difference + or -
1952	150,172	227,698	-77,526
1977	668,478	1,884,278	-1,215,800
1978	679,754	2,632,180	-1,952,426
1979	1,287,813	2,686,212	-1,398,399
1980	2,132,178	3,401,999	-1,269,821
1981	2,262,982	6,187,486	-3,924,504
1982*	2,184,122	6,354,517	-4,170,395

Source: Statistical Yearbook

Table 1-5 Manufacturing and Mining Industry Production and their Employees in Alexandria, 1976

Sector	Industry Production (million L.E)	Employee
Quarry/Mining	1.665	1,091
Food Industry	155.409	27,378
Textiles/Clothes	136.462	79,287
Wood/Wood Product	1.951	1,108
Paper/Printing	45.488	10,950
Chemicals	95.702	19,268
Mineral Product (excl.Petroproduct)	9.782	3,927
Basic Metal	34.756	9,135
Metal Product	32.402	16,459
Other transportation Industry	0.243	58
Repair and Service	1.310	799
Total	515.170	169,460

Source: Comprehensive Plan Alexandria 2005

Table 1-6 1976 Population and Housing Census

Area	Population			Inhabited Area (km²)	Density of Population (person/km²)
		Urban	Rural		
Whole Egypt	36,626,204	16,036,403	20,589,801	827,491	44
Alexandria	2,317,705	2,317,705	-	314.4	7,372
Airport 1/ service area	7,066, 270	3,510,944	3,555,326	221,100.4	32

Table 1-7 Population Estimates 1977 - 1982
(unit: 1000 persons)

Area / Year	Whole Egypt	Alexandria	Airport Service Area 1/	Population abroad
1976 census	38,198	2,318	7,066	1,425
1977	38,794	2,352	7,220	1,444
1978	39,767			
1979	40,889			
1980	42,126	2,512	7,814	1,578
1981	43,465	2,576	8,020	1,621
1982	44,673	2,635	8,237	1,667
Annual Growth Rate (%) 82/76	2.6	2.2	2.6	2.6

Source: Statistical Yearbook; Central Agency for Public Mobilisation and Statistics

Note 1/ : All population in Alexandria, Beheria, Matruh, Kafr-el-Sheikh Governorates and 1/3 in Gharbya Governorate are estimated.
(Approx. 100 km radius area from Alexandria are considered as a service area.)

Table 1-8 Wage Rate

(L.E/Labour-Annum)

Year	Average	Comodity Sectors	Service Sectors
1976	268	189	386
1977	316	225	449
1978	347	249	485
1979	380	271	526
1980/81	533	354	759
1981/82	635	407	915
Rate*	17.0	15.0	17.0

Source: Statistical Yearbook

Note* : Annual increasing rate (%) 1976 - 1981/82

Table 1-9 Price Indices

(1965/66 = 100)

Year	Whole sales Price	Consumer Price (Urban)	Consumer Price (Rural)
1976	170.7	164.2	187.8
1977	186.6	185.1	206.7
1978	214.1	205.6	234.2
1979	234.6	226.0	248.7
1980	285.2	272.7	311.0
1981	308.9	301.2	353.4
1982	337.7	345.8	402.8
Rate*	12.0	13.2	13.6

Source: Statistical Yearbook

Note* : Annual increasing rate (%) 1976 - 1981/82

Table 1-10 Foreign Tourists to Egypt by Main Group

(Unit: 1000 tourist)

From / Year	Total	Arab Countries	OECD Countries	Socialist Countries	Others
1971	428.1	260.2	101.3	34.0	32.6
1972	540.9	314.0	143.2	49.4	34.3
1973	534.8	333.1	148.8	31.1	21.8
1974	679.5	411.1	197.9	35.4	34.0
1975	793.1	437.5	278.4	34.4	42.8
1976	984.0	534.5	368.0	35.5	45.9
1977	1,003.9	474.9	437.8	30.7	60.4
1978	1,051.8	455.4	495.8	25.3	75.3
1979	1,064.1	396.9	574.9	31.4	60.9
1980	1,253.1	479.4	663.8	23.6	86.3
1981	1,376.0	578.8	664.7	22.3	110.2
1982	1,423.3	618.3	679.9	23.0	105.0
1983	1,497.9	598.7	751.6	25.6	122.0

Source: Statistical Bulletin, Ministry of Tourism

Table 1-11 Foreign Tourist by Transportation Means in percent <1981>

Main Group	By Air	By Sea	By Road	Total
Arab Countries	32.6 (77.4)	0.9	8.6 (20.5)	42.1 (100.0)
OECD Countries	37.9 (78.4)	7.3 (15.2)	3.1	48.3 (100.0)
Socialist Countries	1.2 (71.7)	0.4	0.0	1.6 (100.0)
Others	5.3 (66.8)	0.9	1.7	8.0 (100.0)
Total	76.9	9.6	13.5	100.0

Table 1-12 Hotels (Public + Private) in Egypt

Year	Hotels	Rooms	Beds
1976	903	21,769	44,153
1977	911	22,423	45,401
1978	943	24,309	49,172
1979	1,066	28,428	57,202
1980	1,096	30,005	61,886
1981	1,105	32,327	62,355
1982	1,101	32,275	64,599
Rate 1/	3.4	6.8	6.5

Source: Statistical Yearbook

Note 1/: Annual increasing rate (%) 1976 - 1982

Table 1-13 Public Hotels in Alexandria

Class	Hotels	Rooms	Beds
5-stars	2	584	1,144
4-stars	7	501	1,124
3-stars	6	425	972
2-stars	11	428	856
1-stars	10	532	1,000
Total	36	2,470	5,109

Source: Comprehensive Plan Alexandria 2005

Table 1-14 Egyptian University Graduates

(Person)

Year	Whole Egypt (a)	Alexandria (b)	(b)/(a) (%)
1976/77	65,567	9,896	15
1977/78	68,983	11,100	16
1978/79	75,695	11,750	16
1979/80	77,075	12,690	16
1980/81	81,863	12,335	15
1981/82	82,673	12,602	15
Rate 1/	4.7	5.0	

Source: Statistical Yearbook

Note 1/: Annual increasing rate (%) 1976/77 - 1981/82

Table 1-15 Railway Transport in Egypt

Year	Total Passenger-km (million)	Average Occupancy (%)	Freight Ton-km (million)
1976	8,747	59	2,018
1977	9,298	61	2,425
1978	9,490	61	2,297
1979	10,941	63	2,448
1980	14,160	62	2,480
1980/81	11,000	51	2,170
1981/82	12,479	52	2,295
Rate*	6.7		2.4

Source: Statistical Yearbook, Central Agency for Public Mobilisation and Statistics

Note * : Average annual increasing rate (%), 1976 - 1981/82

Table 1-16 Average Daily Traffic Volumes 1/ 1979 <Highways>

Whole Egypt (a)	252,142
From/to Alexandria (b)	30,437
(b) / (a) (%)	12.1

Source: Egypt National Transport Study, Phase II - 1981

Note 1/: Moterized vehicles, 2 directs, 24 hours.

Table 1-17 Activities[1/] of Seaports of Egypt

Year	Whole Egypt			Alexandria		
	Vessels (No.)	Cargo (1000 tons)	Passengers (1000)	Vessels (No.)	Cargo (1000 tons)	Passengers (1000)
1975	6,932	15,103	326	6,134	13,943	
1976	7,583	14,137	365	5,909	11,959	212
1977	8,573	15,974	499	5,987	12,108	279
1978	8,400	15,901	464	5,667	12,005	238
1979	9,504	16,073	487	6,197	12,740	228
1980	9,632	19,393	540	6,764	15,035	247
1981	10,500	23,390	573	7,483	19,097	199
Rate [2/]	7.2	7.6	9.9	3.4	5.4	-2.5
% of Alexandria in Whole Egypt			1975	88	92	71
			1978	67	75	51
			1981	71	82	35

Source : Statistical Yearbook

Note 1/: Total of incoming and outgoing

Note 2/: Annual increasing rate (%) 1976 - 1981

Table 1-18 Total Air Traffic Demands of Egypt 1/

Year	Air Traffic of Passengers (1000 air passengers)						Air Cargo at Cairo Airport (tons)					
	Internationanl	*	Domestic 1/	*	Total 1/	*	International	*	Domestic 1/	*	Total 1/	*
1975	2,360	-	577	-	2,877	-	24,781	-	411	-	25,192	-
1976	2,960	125	649	112	3,609	125	29,274	118	540	131	29,754	118
1977	3,332	113	746	115	4,078	113	38,263	131	848	157	39,111	131
1978	3,603	108	983	132	4,586	112	36,067	94	966	114	37,033	95
1979	4,040	112	1,120	114	5,160	113	42,040	117	1,267	131	43,307	117
1980	4,313	107	1,584	141	5,897	114	44,361	106	1,129	89	45,440	105
1981	4,839	112	1,943	123	6,782	115	59,623	134	1,408	125	61,031	134
1982	5,593	116	2,013	104	7,606	112	85,402	143	3,951	281	89,353	146
1983	6,071	109	2,205	110	8,276	109	123,229	144	1,960	50	125,189	140
	Average Annual Increasing Rate (% per annum)											
1975-1983	12.5		18.2		14.1		22.2		21.6		22.2	
1975-1979	14.4		18.0		15.7		14.1		32.5		14.5	
1979-1983	10.7		18.5		12.2		30.8		11.5		30.4	

Note 1/ excluding Pyramid Air Line.

Note * changing rate to previous year (%).

Source: Annual Statistical Report,
Egyptian Civil Aviation Authority

CHAPTER 2 AIR TRANSPORTATION IN EGYPT AND ALEXANDRIA

2-1 Airport and Air Route in Egypt

2-1-1 Airport in Egypt

There are 18 airports in Egypt which include 17 airports operated by Egyptian Civil Aviation Authority (ECAA), and Cairo International Airport by Cairo Airport Authority (CAA). A half of them, i.e. 9 airports, provide the scheduled flight services and are further divided into 4 international airports including Cairo, Luxor, Aswan and Alexandria, and 5 domestic airports including the airports with scheduled/non-scheduled services and airports for small aircraft.

There are 11 airports with a runway of more than 2,500m in length as shown in Fig.2-1-1. However, only three airports out of the above airports, i.e. Cairo, Luxor and Aswan, are capable of accommodating large jet aircraft including A300 due to an insufficient pavement strength in other airports.

According to the Five Year Plan for Economic and Social Development (1982/83 -1986/87) issued in December 1982 by the Government of Egypt, 116 million Egyptian Pounds and 104 million Egyptian Pounds are appropriated in the budget for the development the airports and the related facilities controlled under ECAA,and the facilities under CAA respectively. In the budget for CAA, 77 million Egyptian Pounds is included for the implementation of the second passenger terminal building under construction at Cairo airport as a project with high priority. The project is scheduled to be completed in the Five Year Plan period.

For the existing airports other than Cairo airport, 14 million and 10 million Egyptian Pounds are budgeted for Luxor airport and Aswan airport respectively. For new airport projects, 15 million and 12 million Egyptian Pounds are included in the budget for new airports in Sinai Peninsula and Ameriyah region (Alexandria) respectively.

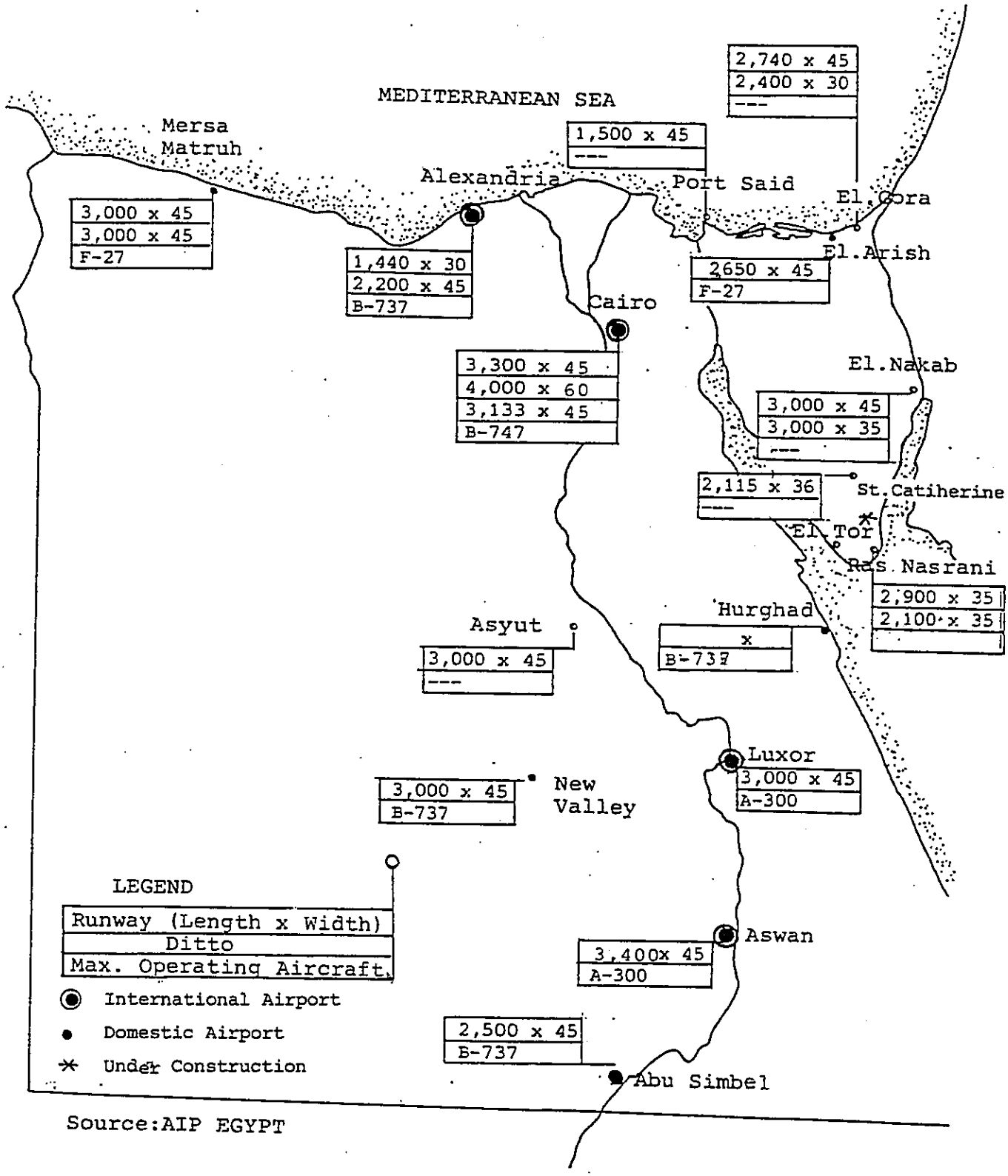


Fig.2-1-1 AIRPORT LAYOUT OF EGYPT

For Nozha airport, 3 million Egyptian Pounds will be spent for the improvement during the Five Year Plan period.

2-1-2 Air Route

(1) International

At Cairo international airport as of 1983, there are 55 airline companies in service. Egypt is connected with 57 countries by the international scheduled routes. According to the traffic record of 1983 at Cairo airport, the international scheduled and non-scheduled flights are 47,831 flights per year (at an average of 131 flights daily) and 5,261 flights (14 flights daily) respectively.
Fig.2-1-2 indicate the international routes served by Egypt Air.

The following routes are the international routes connected with the airports other than Cairo airport.

Alexandria --- Jeddah (by Egypt Air, 5 flights weekly)
Luxor -------- Jeddah (by Egypt Air, 2 flights weekliy)
Aswan ----- Khartoum (by Sudan Airways, 1 flight weekly)

The total passengers handled by the above routes are 52 thousand in 1983.

(2) Domestic

The domestic scheduled air service in Egypt is performed by Egypt Air and Air Sinai. Air Sinai is a subsidiary organization of Egypt Air established mainly for the air services in Sinai Peninsula.
According to the time table of Egypt Air (as of summer 1984), there are 10 air routes for scheduled flights as shown in Fig.2-1-3 and 95 flights are operated weekly (an average

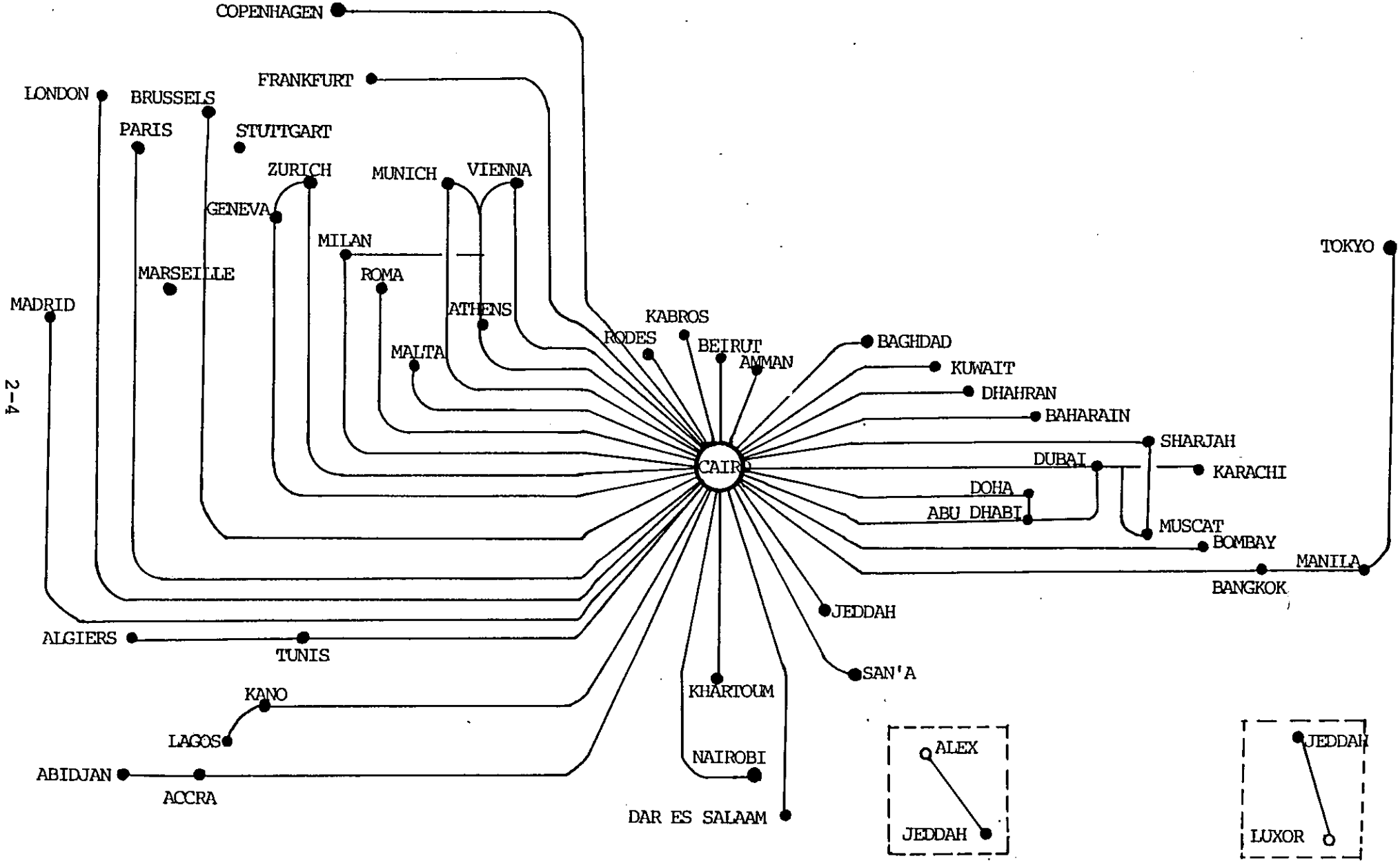
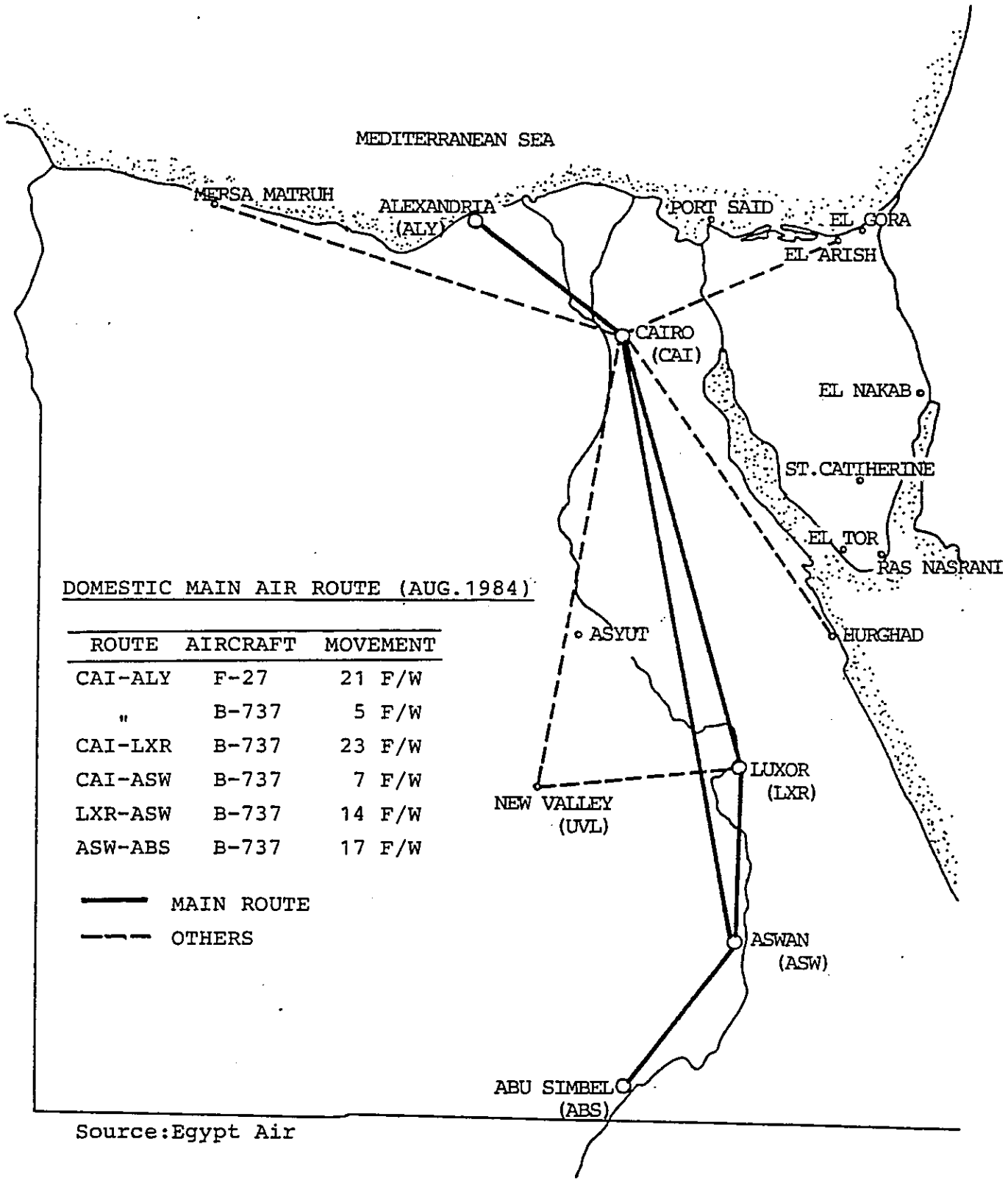


Fig.2-1-2 International Route Served by Egypt Air



DOMESTIC MAIN AIR ROUTE (AUG.1984)

ROUTE	AIRCRAFT	MOVEMENT
CAI-ALY	F-27	21 F/W
"	B-737	5 F/W
CAI-LXR	B-737	23 F/W
CAI-ASW	B-737	7 F/W
LXR-ASW	B-737	14 F/W
ASW-ABS	B-737	17 F/W

Source:Egypt Air

Fig. 2-1-3 Present Air Route Structure of Egypt

of 14 flights daily). The major aircraft is B-737 with a share of 73 per cent (69 flights weekly) and the other is F-27.
However, in a winter season as the peak season of the upper Egypt, 9 flights of A-300 were operated weekly between Cairo, Luxor and Aswan in 1983 and 1984.

2-2 Airline Companies

There are at present the following airline companies in Egypt.

Egypt Air (including Air Sinai)	: A department of Ministry of Civil Aviation.
Egypt Air Cargo	: A subsidiary organization of Egypt Air specialized in air cargo transportation.
ZAS Air	: Private airline company specialized in air cargo transportation.
MISR Overseas	: Private airline company for non-scheduled flight service.
Pyramid Air Line	: Ditto

As the airline companies other than Egypt Air are very small in their fleet size, they transport only a small percentage of traffic as compared to Egypt Air.

The number and type of aircraft owned by Egypt Air and the future fleet plan are shown in Table 2-2-1.

In addition to the above, Egypt Air leases about 5 aircraft every year during the last 4 to 5 years in order to cope with the excess demand during peak season. Number of the scheduled flights operated by Egypt Air in 1983 are 18,000 international flights and 7,000 domestic flights. These flights account for one fourth of the total flights in Egypt. The passenger load factor for international services has been in a range from 55 to 59 percent since 1980. The load factor for domestic service increased to 73 percent in 1983 from 67 percent in 1980.

Table 2-2-1 Fleet Plan of Egypt Air

year / aircraft	1984	1985	Remarks
B-747	(1)	2	( ) leased
A-300	8	8	
B-767	3	5	
B-707	7	6	
B-737	8	8	1 aircraft for Air Sinai
F-27	3	3	all aircraft for Air Sinai
Total	29 (30)	32	

2-3 Air Transport Trend

2-3-1 International Passenger

The actual international passenger traffic from 1975 to 1983 in Egypt is as shown in Table 2-3-1. The annual increase rate of passenger in Cairo during the above 8 years was an average of 11.8 percent for the scheduled flights at Cairo airport, 12.4 percent for the total Cairo airport, and 12.5 percent for the total Egypt. The international sevices are mostly operated at Cairo airport as indicated in Table 2-3-1.

An openning of new international route between Luxor and Kuwait is scheduled and Hurghada airport is planned to be international airport in future. Therefore, it is likely that the international passenger will gradually be dispersed to other airport in future. Figs.2-3-1 and 2 show the trend of international passengers in the major cities near Egypt for a comparison with Cairo.

2-3-2 Domestic Passenger

The trend of domestic passengers in Egypt is shown in Table 1-18 , in Chapter - 1. The total domestic passengers are 2,205 thousand in 1983. The passengers were increased at a relatively high rate of 18 percent during 8 years from 1975 to 1983. Especially at Luxor, Aswan and Abu Simbel airport in the upper Egypt region, the annual increase rate was recorded to be 20 percent during the above period. The domestic passengers at the above three airports were about 1,400 thousand in 1983 which was about 63 percent of all the domestic passengers in Egypt. Domestic airports in other area handle annual passengers of less than 100 thousand According to the data by Egypt Air, the passenger load factor for domestic service is in the increasing trend from 66.9 percent in 1980 to 73.2 percent in 1983.

Table 2-3-1 International Passenger in Egypt

(x 1,000)

item / year	Cairo Airport			other airport	total
	scheduled	non-scheduled	total		
1975	2,209	151	2,360	-	2,360
1976	2,732	228	2,960	-	2,960
1977	3,065	267	3,332	-	3,332
1978	3,242	361	3,603	-	3,603
1979	3,527	513	4,040	-	4,040
1980	3,953	355	4,308	5	4,313
1981	4,386	438	4,824	15	4,839
1982	4,795	798	5,593	N.A	5,593
1983	5,398	621	6,019	52	6,071

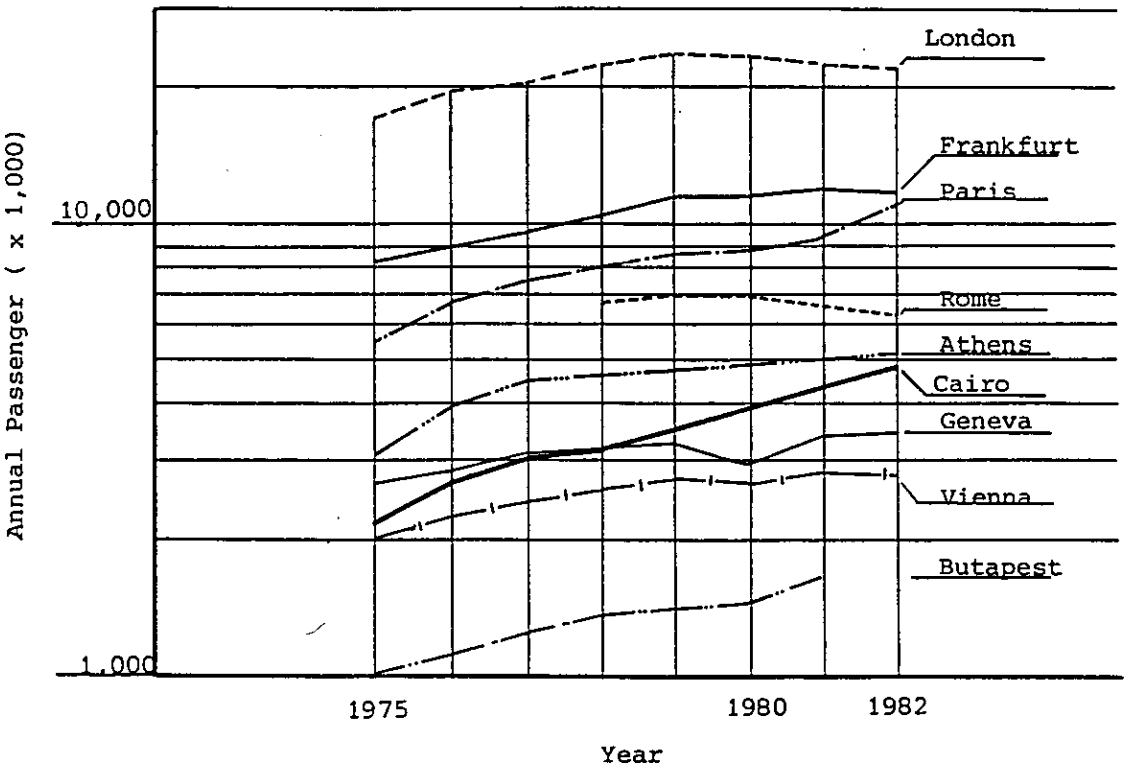


Fig.2-3-1 Trend of International Passenger
(European region)

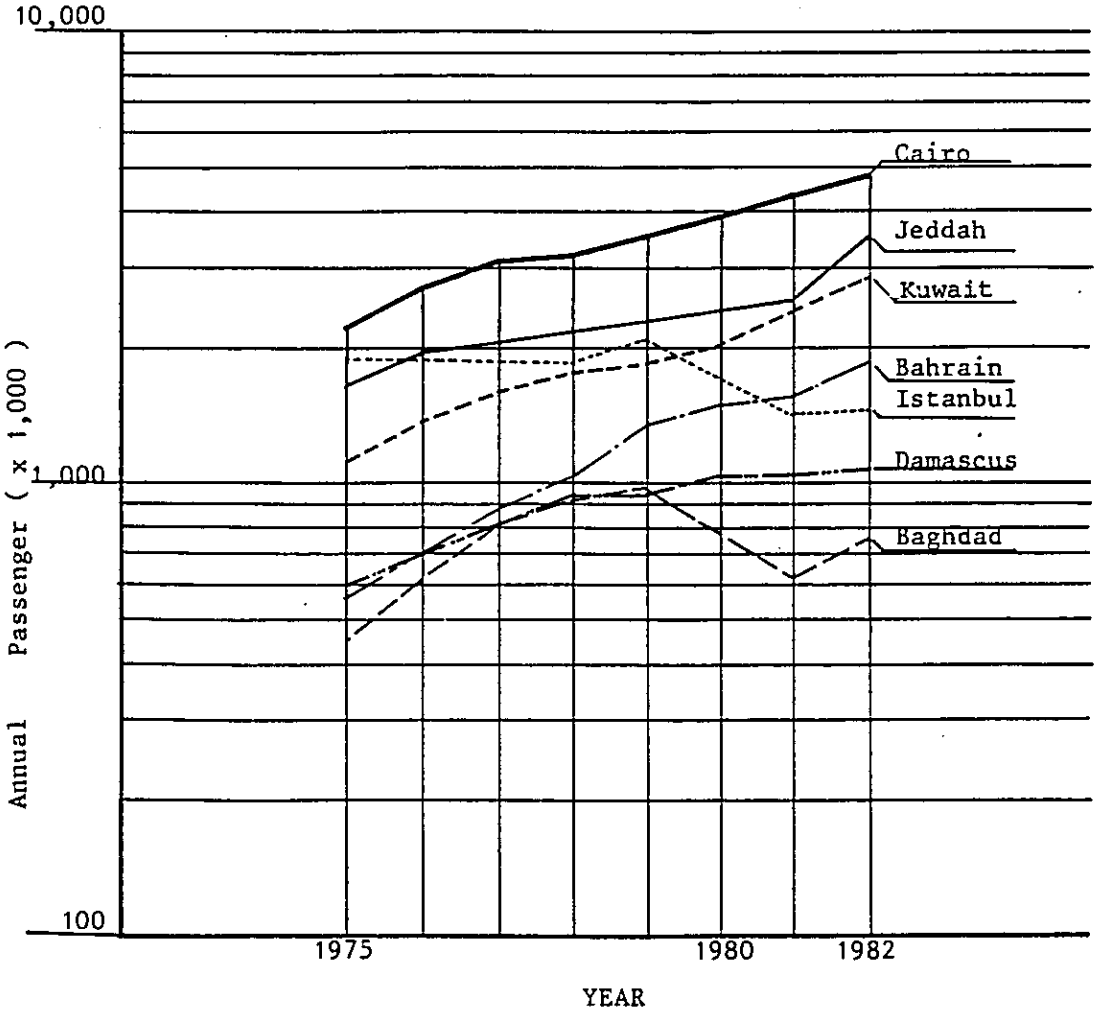


Fig.2-3-2 Trend of International Passenger
(Middle East region)

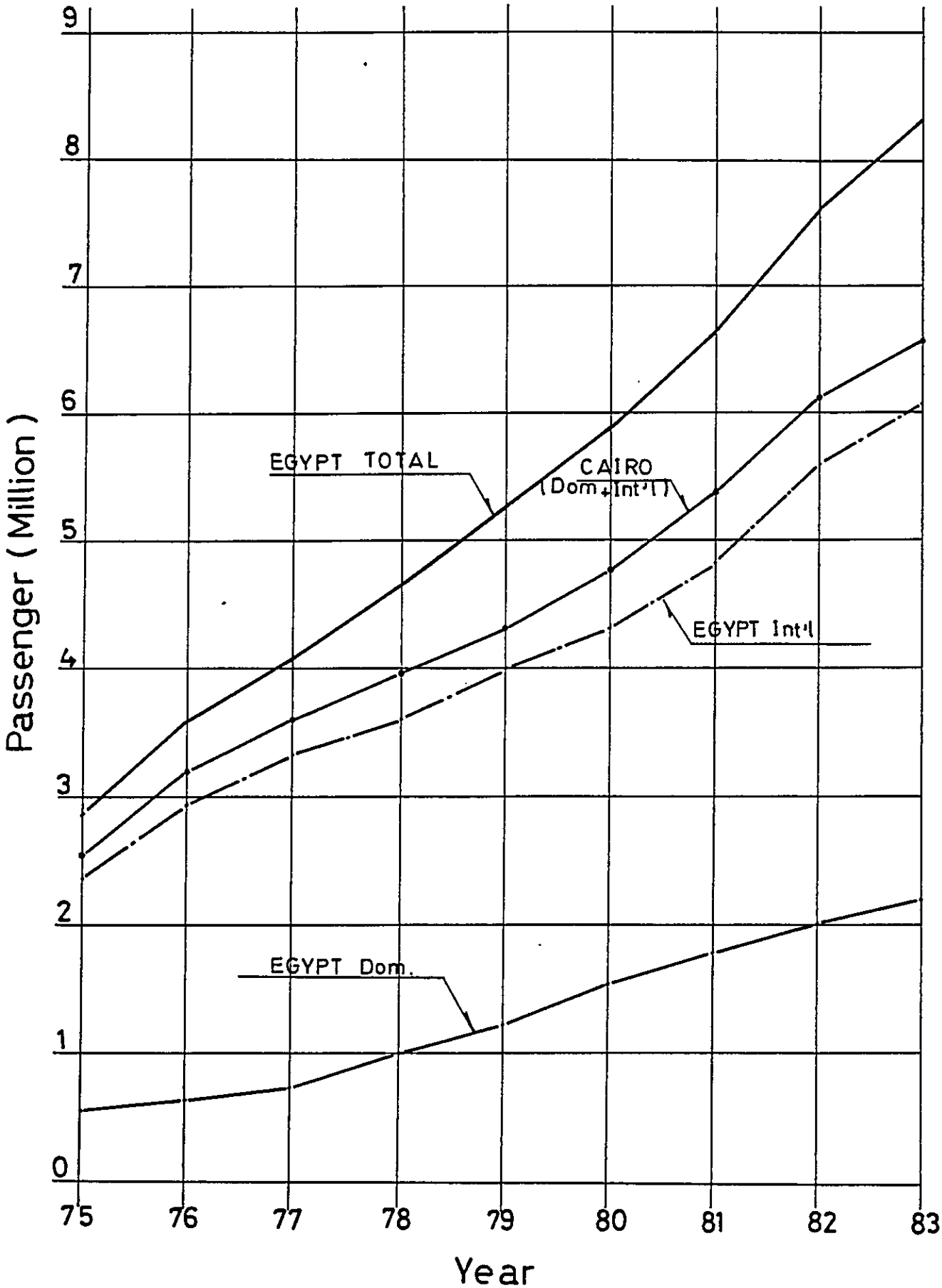


Fig.2-3-3 Annual Passenger Movement

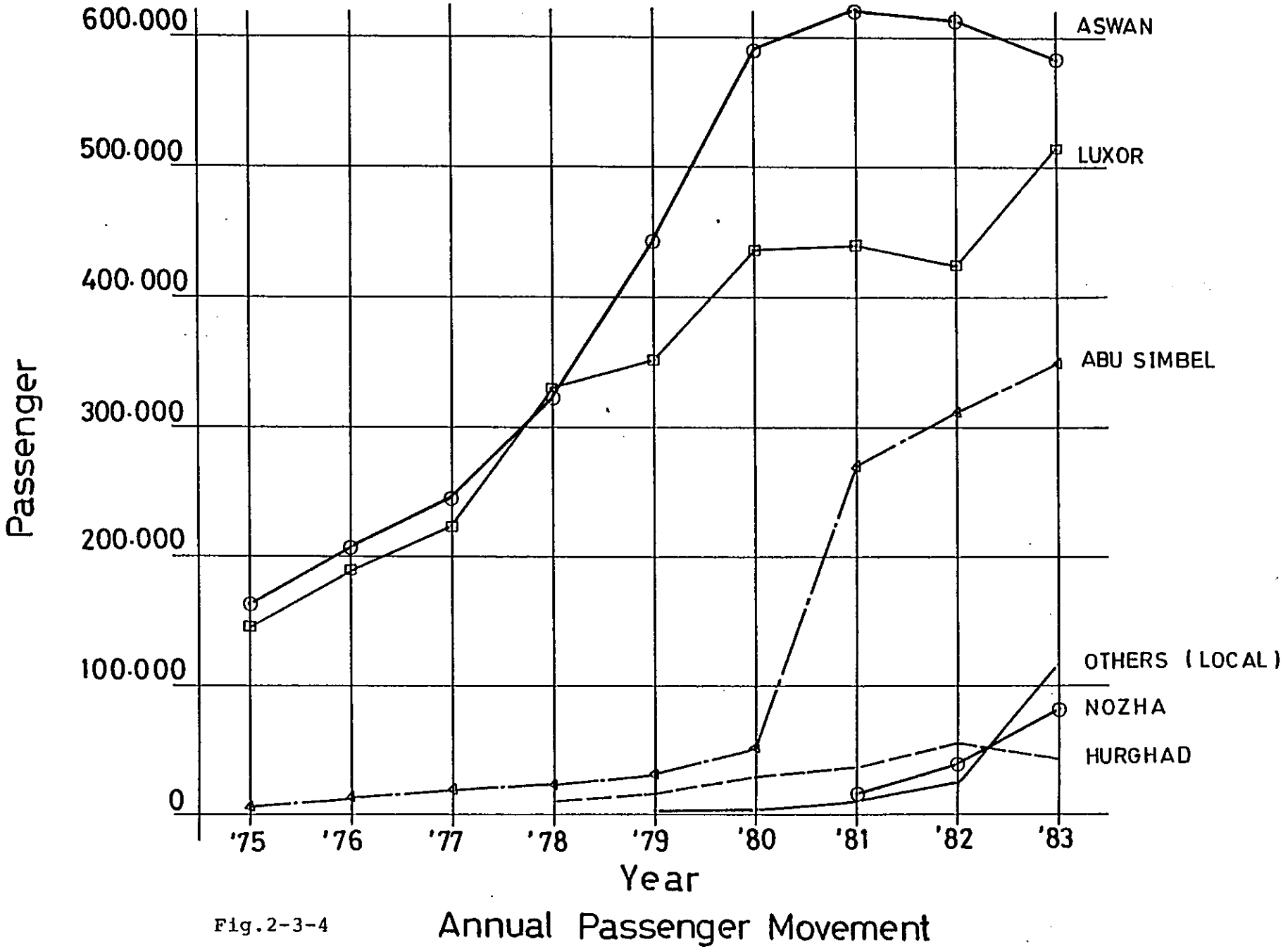


Fig.2-3-4 Annual Passenger Movement

2-3-3 Air Traffic at Nozha (Alexandria) Airport

Nozha airport operated both domestic and regional international flights up to April 1970 when the airport was closed due to the insufficiency of the facilities for jet aircraft. In 1981, the scheduled flight service between Alexandria and Cairo was restarted by F-27 aircraft after the completion of the redevelopment work. International flight between Alexandria and Jeddah was inaugurated after the extension work of the runway in december 1982. In 1969, the annual international and domestic passengers were 6 thousand and 60 thousand respectively. After three years from its re-openning, the annual international and domestic passengers reached 2 thousand and 81 thousand in 1983 respectively, and 83 thousand passengers in total. The annual passenger increase rate was recorded to be an extremely high rate and about 200 percent for 2 years from 1981 to 1983.

The annual average load factor of passengers is 80 percent and this figure shows that the demands and the seat-served are not in balance.

On the other hand, inaugurations of flight services to Athens and Kuwait in addition to Jeddah have been pending question at Nozha airport.

In the light of these conditions, it is considered that the passenger traffic at Nozha airport will enjoy a high increase rate for a while.

2-4 Peaking Characteristics in Alexandria

2-4-1 Peak Month and Design Day

Monthly variations of air passengers and aircraft movements for the three year period from 1981 to 1983 are indicated in Tables 2-4-1 and 2. However, it is not reasonable to estimate the future peaking characteristics based on the above data at Nozha airport with a small size of traffic. According to Egypt Air, they handled 19.2 percent of annual passengers in the peak month of August 1981, 14.5 percent in September 1982 and 10.7 percent in August 1983. This data indicate that as air passengers increase, peak coefficients decrease. When Cairo airport was similar to the future Alexandria airport in the size of traffic, it recorded peak month coefficients to annual passengers as follows:

Year	Annual passengers	Peak Month Coefficient
1970	1.03 million	10.6 percent (August)
1975	2.56 million	10.4 percent (August)
1980	5.24 million	10.1 percent (October)

Based on the above coefficients, peak month coefficient as an planning value will be about 10.5 percent or 1/9.5. In this case, design day coefficient is set at 1/290 as a quotient of peak month ratio divided by number of days in an average month.

2-4-2 Peak Hour coefficient

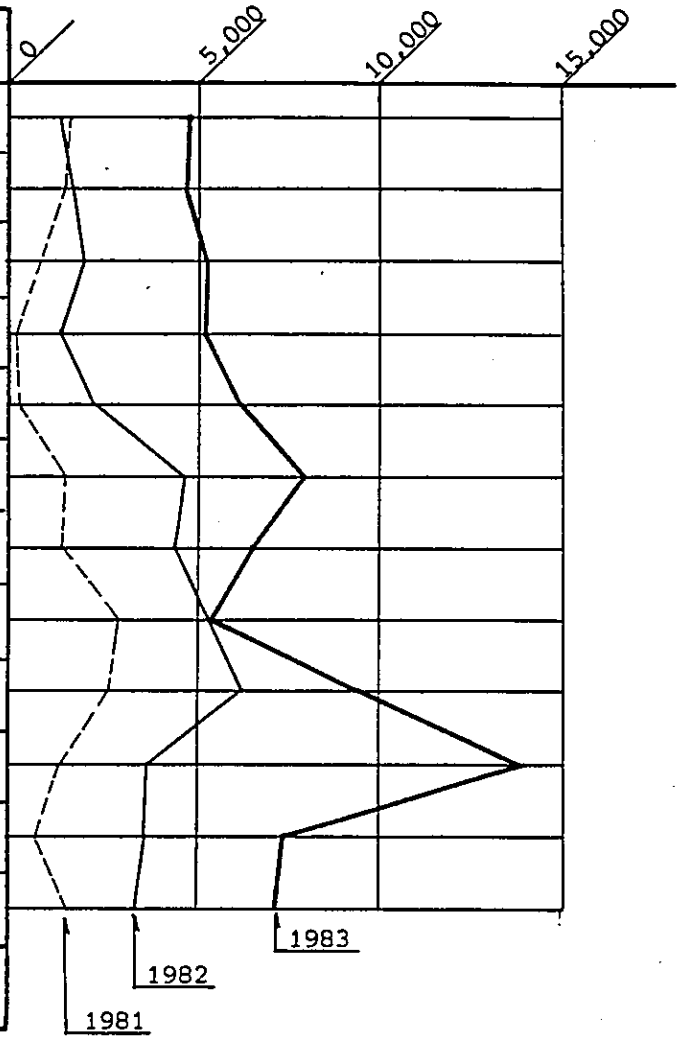
Based on the flight schedules at five major airports in Egypt, the range of the relation between daily aircraft movements and peak hour coefficient (peak hour movements divided by daily aircraft movements) is plotted together with the average characteristic of Japanese airports in Fig. 2-4-1. Among 5 selected airports, Cairo and Luxor airports operate 24 hours daily. In this study, the curve indicated in Fig. 2-4-1 is utilized to obtain a peak hour coefficient.

2-4-3 Load Factor

According to Yearly Report of Working Activity, 1983, issued by Egypt Air, the annual average load factors for domestic services in 1982 and 1983 were 70.3 percent and 73.2 percent respectively.

Table 2-4-1 Monthly Variation of Air Passengers at Nozha Airport

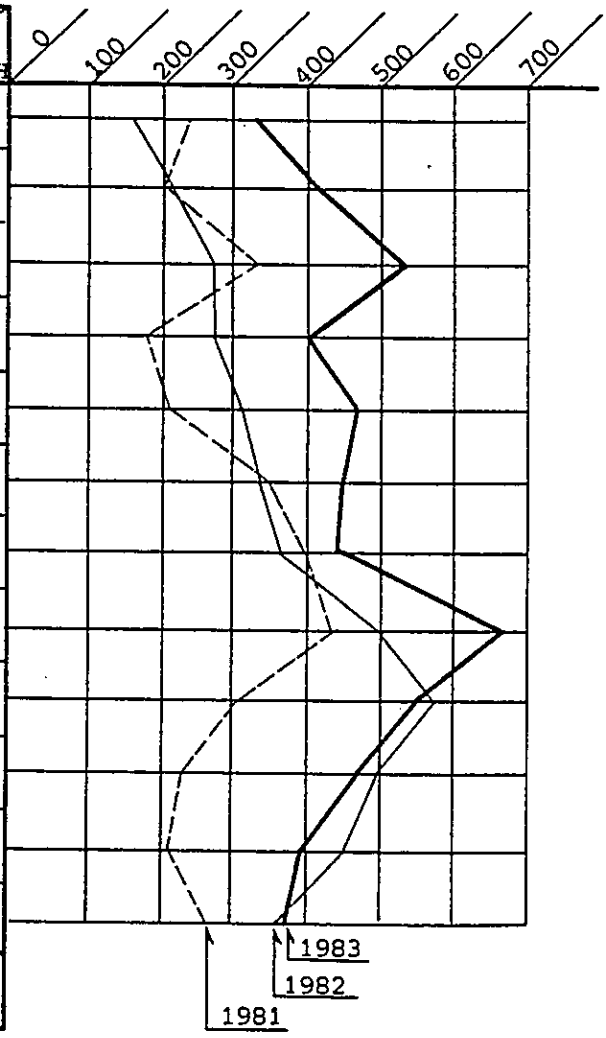
YEAR / MONTH	1981	1982	1983
JAN	1,536	1,437	4,697
FEB	1,459	1,526	4,688
MAR	837	1,954	5,184
APR	210	1,290	5,085
MAY	224	2,232	6,164
JUN	1,439	4,374	7,862
JUL	1,419	4,391	6,426
AUG	2,865	5,363	5,133
SEP	2,613	6,204	9,438
OCT	1,274	3,627	13,998
NOV	690	3,600	7,334
DEC	1,554	3,285	7,132
TOTAL	16,120	39,283	83,141



SOURCE: ANNUAL STATISTICAL REPORT (1981 - 1983) ; ECAA

Table 2-4-2 Monthly Variation of Aircraft Movements at Nozha Airport

1981	1982	1983	YEAR / MONTH
238	166	342	JAN
208	212	422	FEB
338	276	540	MAR
182	278	402	APR
219	316	468	MAY
354	340	452	JUN
400	368	446	JUL
438	502	674	AUG
306	578	550	SEP
227	500	470	OCT
208	454	394	NOV
260	358	366	DEC
3,378	4,348	5,526	TOTAL



SOURCE: ANNUAL STATISTICAL REPORT (1981 - 1983) ; ECAA

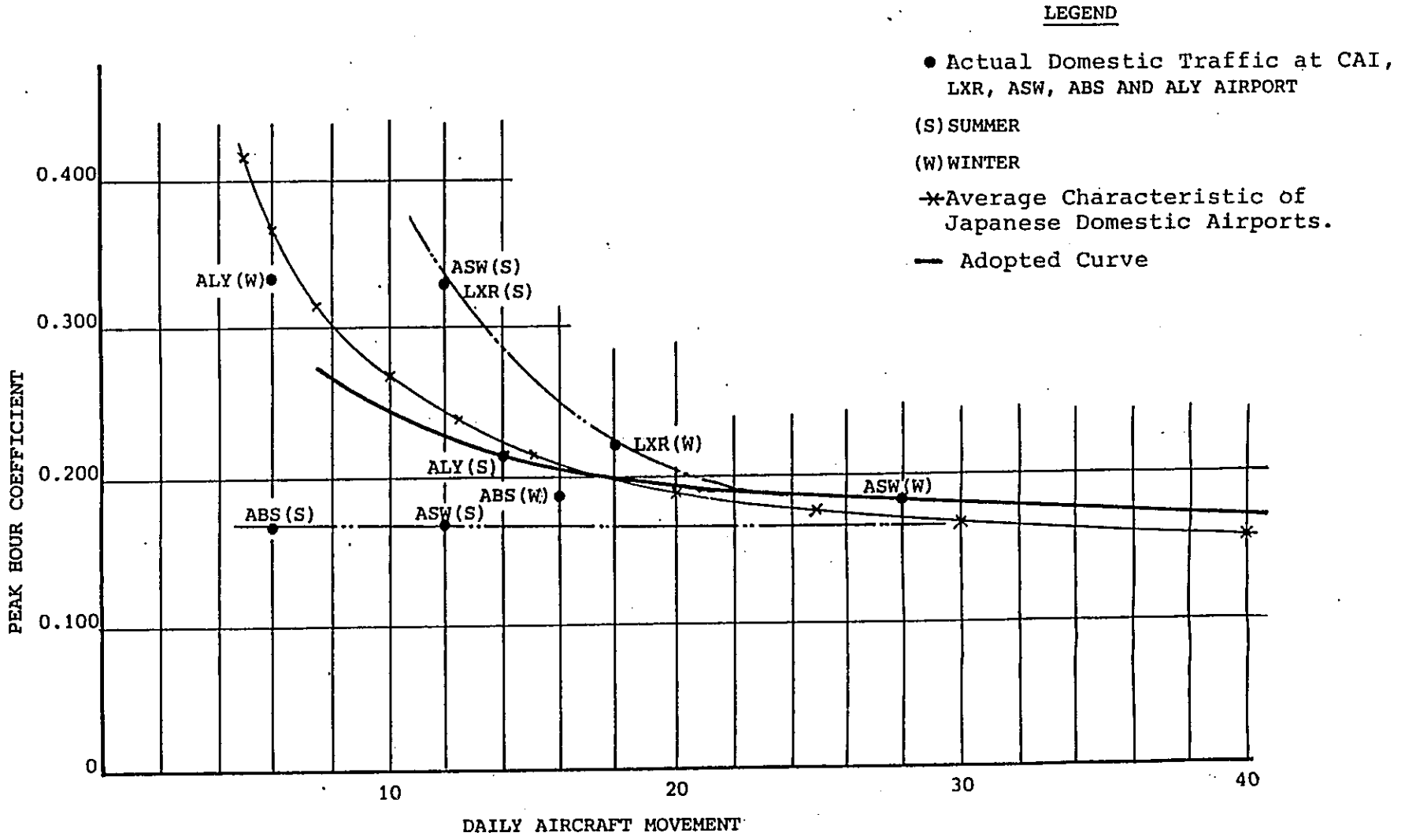


Fig. 2-4-1 Peak Hour Coefficient

The load factor for Cairo-Alexandria route was 77.6 percent in 1983. Taking into account the decrease of load factor by the increase of the flight service in the future, annual average load factor as a planning value is set at 70 percent. The annual average load factor for the international service is assumed to be 60 percent based on the average load factor of IATA international scheduled services, i.e. 61.7 percent in 1981 and 60.5 percent in 1982.
During the peak month, the above load factors for the planning are estimated to be increased to 80 percent and 70 percent for domestic and international services respectively based on the Egypt Airs' past record of the load factor during the peak month, i.e. August or September, in comparison of annual average load factor.

2-4-4 Heavy Direction Ratio during Peak Hour

Heavy direction ratio is defined as the ratio of the aircraft movements of the heavier direction (arrival or departure) divided by total peak hour movements. It is estimated to be about 0.65 based on time tables at several airport in Egypt.

2-5 Aircraft Size and Mix

2-5-1 Aircraft Classification

Aircraft owned by Egypt Air are classified by type and size in relation to other classification systems as shown in Table 2-5-1. Among them, B-737 and F-27 are operated at Nozha airport at present. For the planning of the airport in Alexandria, the aircraft is classified by size as indicated in Table 2-5-2 based on the following assumptions:

(1) B-707 of Egypt Air for medium and long haul services will gradually be retired and replaced by B-747 and B-767 as is practiced by many other airlines in the world.

(2) Economical and efficient services coping with demand will require the uses of wide bodies jet with 300 seats and small jet of 150 seater class.

Table 2-5-1 Comparison of Aircraft Classification

No. of Seat	Present Fleet of Egypt Air as of Aug.1984	FAA	NACO	Japanese C.A.B Design Basis for 1990
500				JUMBO (525) B-747
400	B-747 (440)	Special B-747 (421 - 500)		
300		B-747 (341 - 420)	JUMBO (300)	AIRBUS (370) DC-10/L-1011
200	A-300 (255 - 260) B-767 (206 - 222)	Special DC-10 (281 - 340) DC-10/L-1011/ A-300 (211 - 280)	DC-10/L-1011/ B-747	MEDIUM JET (230) B-767/A-300
100	B-707 (156 - 184) B-737 (99 - 121)	DC-8-61/NSA (161 - 210) DC-8/B-707/ B-727/DC-9 (111 - 160) B-737/B-727/ DC-9 (81 - 110)	LARGE (150) VC-10/DC-8/B-707 MEDIUM (90)	SMALL JET (165) DC-9
0	F-27 (57)	DC-9/BAC-111 (61 - 80) CV-580/YS-11 (40 - 60)	BAC-111/B-727/ B-737 SMALL (60) F-27/F-28	PROPELLER (64) YS-11 STOL (19) DHC-6

Table 2-5-2 Aircraft Classification and Seat Capacity

Category	Year / Type of Aircraft	Up to 1990	Up to 2000	Up to 2010	REMARKS
JUMBO	B-747 Class	500	500	500	B-747-300 to be introduced in 1985 by Egypt Air, is assumed to have 500 seats based on the present B-747-200 with 440 seats of Egypt Air.
LJ	A-300, L-1011 DC-10, class	260	290	320	A-300 class aircraft is assumed to be enlarged in future.
MJ	A-310, B-767 class	220	260	280	B-767 will be stretched after 2000.
NJ	A-320, MD 80 B-757 class	160	190	220	Seating capacity is assumed to increase B-757 class from A320 class at the present.
SJ	B-737-200 DC-9-40 class	110	135	160	Present B-737-200 will be gradually replaced by the larger class including B-737-300.
P	F-27 YS-11	57	60	60	Seating capacity will remain the same for Turbo prop.

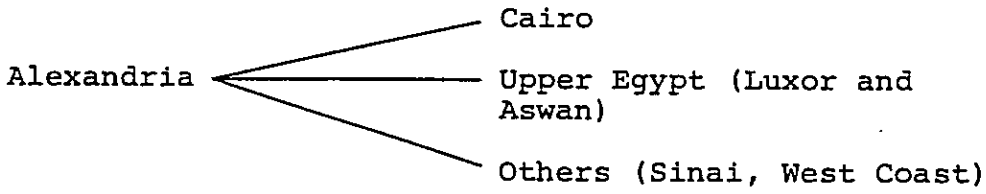
2-5-2 Aircraft Mix in Alexandria

Aircraft mix expected in Alexandria is projected based on the present utilization of Egypt Airs' fleet by routes and the present aircraft mix at Cairo International Airport.

(1) Domestic routes

i) Route structure

The present route structure is formed from north to south along Nile river as shown in Fig. 2-1-3. The route connecting Alexandria with Abu Simbel via Cairo, Luxor and Aswan is the present trunk line of Egypt. This structure will basically be maintained for the future. Therefore, the future domestic routes from/to Alexandria are assumed to be changed as shown in Fig. 2-5-2 according to the increase of the traffic.



ii) Present aircraft mix by route

a. The present aircraft mix for the domestic service by Egypt Air is as shown in Table 2-5-3.

Table 2-5-3 The Present Aircraft Mix for Domestic Service

(%)

Year \ Aircraft	A300	B-737	F-27
1983 Winter (Peak season of Luxor and Aswan)	12	78	10
1984 Summer (Peak season of Alexandria)	0	77	23

The aircraft mix in the summer of 1984 is considered as the base for the future projection.

(2) International Routes

i) Route Structure

Although there is at present no international service other than Jeddah route,other international routes to Europe including Athens,Rome, etc. and Middle East including Kuwait, Baghdad, etc. are assumed to be established according to the increase of the demand.

ii) Present aircraft mix

The aircraft mix for international flight was investigated at Cairo airport in July 1984 and is summarized as shown Table 2-5-4.

Table 2-5-4 The Present Aircraft Mix for International Services at Cairo

Aircraft Type	J	L	M	N	S	P
	B-747	A-300 L1011 DC-10	A-310 B-767	B-757 DC-9 B-727	B-737	F-27
Share (%)	10	36	3	34	16	1

The above share will be used as the base for the projection of the aircraft mix in Alexandria.

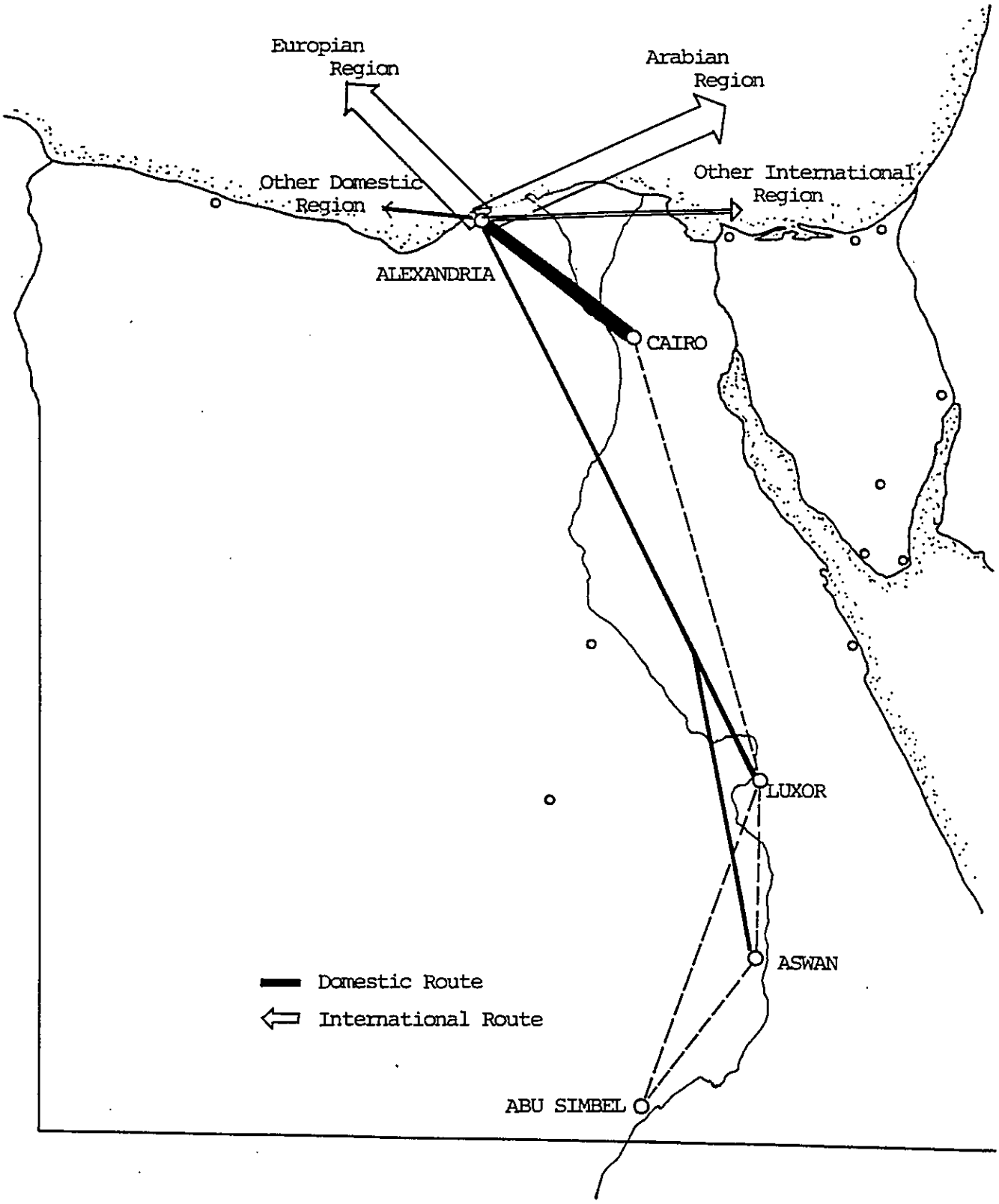


Fig. 2-5-2 Future Air Routes from/to Alexandria

CHAPTER 3 AIRPORT REQUIREMENTS ANALYSIS

3-1 General

The air traffic demand forecast is in progress and is to be finalized in the Interim Report. In the meantime, Airport facility requirements are tentatively estimated for the several cases of annual passenger traffic, i.e. 1 million, 1.5 million, 2 million and 3 million, as indicated in Table 3-1-1 in order to carry out the preliminary study on the redevelopment of Nozha airport and the development of New Airport and to visualize merits and demerits of conceivable alternatives for the future airport development in Alexandria.

3-2 Airside Facilities and Obstacle Limitation Requirements

3-2-1 Aerodrome Reference Code and Operational Requirements

An aerodeome reference code -code number and code letter- will be as shown in Table 3-2-1 in accordance with the maximum aircraft anticipated. (Refer to the subsection 1,3 "Reference code" in Annex 14, Aerodrome, ICAO).

Table 3-2-1 Aerodrome Reference Code

Annual Passenger (million)	1	1.5	2	3
Code number	4	4	4	4
Code letter	D	D	D	E

An operational category of the runway should be precision approach runway category-I.

3-2-2 Runway Length and Width

The runway length has been calculated for the longest route i.e. Alexandria to Heathrow/London which is expected in future. This route was also considered in the previous study by NACO in 1974.

Table 3-1-1 Airport Facility Requirements

	Item		Present Conditions as of 1984	CASE-1	CASE-2	CASE-3	CASE-4	
Assumed Air Traffic Characteristics	1.Total Annual Passenger (million)	Dom.	81,436 (1983)					
		Int'l	1,705 (1983)					
		Total	83,141 (1983)	1	1.5	2	3	
	2.Annual Cargo Volume (thousand ton)		68 ton	10	15	20	30	
	3.Annual Aircraft Movement (Operation)		5,526 (1983)	7,290	9,710	11,950	15,800	
	4.Peak Hour Passenger		(200)	600	900	1,200	1,700	()Estimated
	5.Peak Hour Aircraft Movement		(4)	5	6.5	7	8	()Estimated
	6.Largest Aircraft		B737-ADV	A300-B4 class	A300-B4 class	A300-B4 class	B747	
Facility Requirements	7.Runway (m x m)		2,200m x 45m 1,440m x 35m	2,200 x45	3,000x45 (3,250x45)	3,000x45 (3,250x45)	3,000x45 (3,250x45)	()New Site
	8.Runway Strip(m x m)		2,320m x 150m 1,560m x 150m	2320 x150	3,120x300 (3,370x300)	3,120x300 (3,370x300)	3,120x300 (3,370x300)	()New Site
	9.Taxiway (m x m)		370m x 23m			Paralell T/W justified		
	10.Passenger Terminal Apron (gate position)		3 gates for B737	B727 class 5*	B757 class 6*	A300 & B757 class 6*	B747 & A300 class 8*	*rough estimate
	11.Passenger Terminal Building (s q.meter)	Total	3,904	12,000	18,000	24,000	34,000	
	12.Cargo Terminal Building (s q. meter)		No Facility	3,000	4,500	6,000	9,000	
	13.Administration Building (s q. meter)		1,233	2,400	2,400	2,400	2,400	
	14.Air Navigation Systems		Instrument Non Precision	Precision Approach Category - I				
	15.Car Parks (Car) (s q. meter)		170 cars	500 16,500	700 23,000	1,000 33,000	1,400 46,000	
	16.Access Road (lane)		1 lanes for each direction	1 lane for each direction			2 lanes for each direction	
	17.Fuel Supply (Kl) (sq.meter)		JET A1 51 Kl AVGAS 17.6Kl	2,000 7,000	3,000 8,500	3,500 8,500	5,500 10,500	
	18.Rescue and Fire-fighting (s q. meter)		2 Air Crash Tenders 2 Fire Engines	5 cars 400	5 cars 400	5 cars 400	6 cars 500	
	19.Utilities	Electricity (KVA)	400	2,500	3,000	3,500	5,000	
		Water(ton/month)	5,000 (As of July, 1984)	10,000	13,000	16,000	23,000	
		Waste Deposit (ton/month)	N.A.	50	50	70	100	

The assumptions for the calculation are as follows;

Assumptions

(1) Longest design route

Take-off : Alexandria ——> London ---> Paris (Alternate)
1870NM 240NM

Landing : London ——> Alexandria ---> Cairo
1960NM 102NM

Table 3-2-2 lists 2 non-stop flight sectors from Cairo in order of distance together with respective stage distances and annual passengers. It is observed from this table that London is the furthest European city from Cairo and the second largest market in Europe routes next to Athens. Hence, it is assumed that Alexandria will connect Middle East and Europe in which London will be the furthest destination.

(2) Airport OAT : 30.6°c

(3) Payload: Maximum payload

(4) Elevation : Sea Level

(5) Runway slope = Zero percent.

The result of the runway length calculation is summarized in Table 3-2-3, and for the detailed calculations, refer to the calculation sheet after Table 3-2-2.

Table 3-2-3 Runway Length Requirements by Aircraft

Aircraft	Runway Field Length		
	Take-off	Landing	
		Dry	Wet
B747-300	2,430 meter	2,030 meter	2,320 meter
DC-10-30	2,420	1,890	2,160
A 300-B4	3,000	1,940	2,720

Table 3-2-2 Stage Distances and Annual Passengers of Non-Stop Flight Sector from Cairo

Destination	Distance (NM)	Aircraft used by Egypt Air	Annual PAX in 1983
1) New York	4,845		101,087
2) Bangkok	4,204	MS 747	22,597
3) Accra	3,085	MS 707	3,838
4) Kano	2,407	MS 707	12,190
5) Bombay	2,344	MS 707	14,333
6) Dar Es Salam	2,334	MS 707	10,537
7) Copenhagen	2,016	MS AB3	15,722
8) Nairobi	1,973	MS 707	27,014
9) London	1,972	MS AB3	209,354
10) Madrid	1,905	MS 707	28,952
11) Brussels	1,847	MS 707	32,863
12) Paris	1,792	MS AB3	197,124
13) Frankfurt	1,634	MS AB3	128,513
14) Geneva	1,582	MS AB3	38,283
15) Milan	1,542	MS AB3	27,302
16) Sharjah	1,524	MS 737	7,328
17) Dubai	1,517	MS AB3	67,304
18) Munich	1,503	MS 707	47,027
19) Doha	1,325	MS 707	78,383
20) Dhahran	1,245	MS AB3	N.A.
21) Sanna	1,229	MS 707	75,268
Kuwait*	1,158	MS AB3	478,085
Jeddah*	700	MS AB3	745,845
Athens*	668	MS 737	303,582

Note: * Distinations are listed in order of distance. After 21), destinations with relatively large amount of traffic are indicated for reference.

In Europe routes, more than 50 percent of all flights are presently operated by A-300 which is a major aircraft of Egypt Air fleet for international service and by which Egypt Air operates Cairo-London sector. This tendency is considered to remain in the future.

3000 meter long runway will therefore be required in Alexandria to accommodate the above condition when Alexandria-London flight service will be started to cope with air passenger demands.

It should be noted that the 3,000 m long runway be corrected to 3,250 m long for the new airport site, because of the corrections by runway slope (about 0.8 percent) and altitude (about 40 m).

The width of the runway should be 45m whereas the code letter of the runway is 4.
(Refer to the section 3-2-1).

3-2-3 Runway Strip

The runway strip should be 3,120m x 300m, (3,370m x 300m for new airport site) for the code number 4.

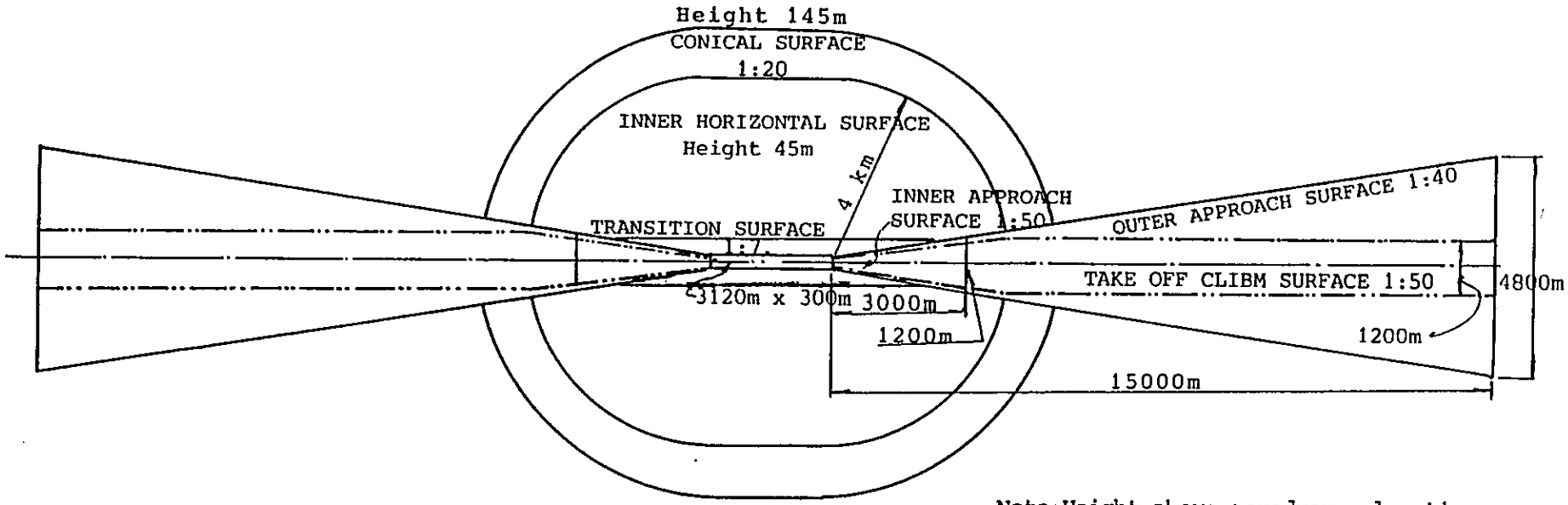
3-2-4 Obstacle Limitation Requirements

The operational category of the runway has been established "Precision approach runway, Category-I". The aerodrome reference code is "4.".

The dimensions and slopes of the obstacle limitation surfaces are shown in Figs. 3-2-1 and 2, and Tables 3-2-4 and 5.

3-2-5 Taxiway

A complete parallel taxway with perpendicular exit taxiways will be necessary when number of instrument approaches exceed four flights during the peak hour and the operation of wide bodied jet aircraft will become more frequent.



Note:Height above aerodrome elevation.

Fig. 3-2-1 Obstacle Limitation Surfaces (1)

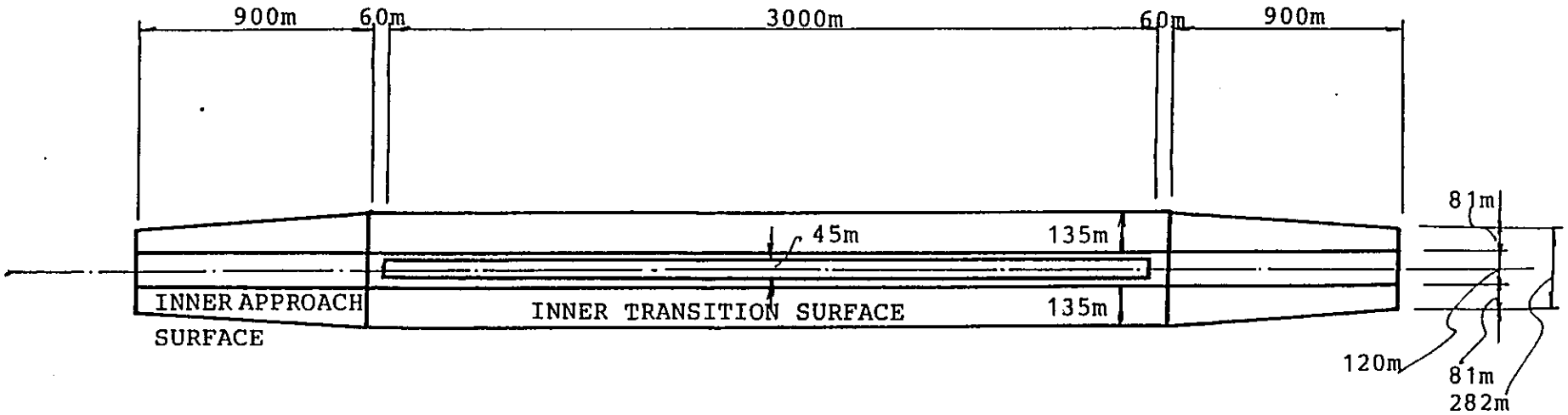


Fig. 3-2-2 Obstacle Limitation Surfaces (2)

Table 3-2-4 Dimensions and Slopes of Obstacle Limitation Surfaces

APPROACH RUNWAYS

Surface and dimensions[a]	Runway classification									
	Non-instrument				Non-precision approach			Precision approach category I		Precision approach category II or III
	Code number				Code number			Code number		Code number
	1	2	3	4	1,2	3	4	1,2	3,4	3,4
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
CONICAL										
Slope	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%
Height	35 m	55 m	75 m	100 m	60 m	75 m	100 m	60 m	100 m	100 m
INNER HORIZONTAL										
Height	45 m	45 m	45 m	45 m	45 m	45 m	45 m	45 m	45 m	45 m
Radius	2 000 m	2 500 m	4 000 m	4 000 m	3 500 m	4 000 m	4 000 m	3 500 m	4 000 m	4 000 m
INNER APPROACH										
Width	-	-	-	-	-	-	-	90 m	120 m	120 m
Distance from threshold	-	-	-	-	-	-	-	60 m	60 m	60 m
Length	-	-	-	-	-	-	-	900 m	900 m	900 m
Slope								2.5%	2%	2%
APPROACH										
Length of inner edge	60 m	80 m	150 m	150 m	150 m	300 m	300 m	150 m	300 m	300 m
Distance from threshold	30 m	60 m	60 m	60 m	60 m	60 m	60 m	60 m	60 m	60 m
Divergence (each side)	10%	10%	10%	10%	15%	15%	15%	15%	15%	15%
First section										
Length	1 600 m	2 500 m	3 000 m	3 000 m	2 500 m	3 000 m	3 000 m	3 000 m	3 000 m	3 000 m
Slope	5%	4%	3.33%	2.5%	3.33%	2%	2%	2.5%	2%	2%
Second section										
Length	-	-	-	-	-	3 600 m[b]	3 600 m[b]	12 000 m	3 600 m[b]	3 600 m[b]
Slope	-	-	-	-	-	2.5%	2.5%	3%	2.5%	2.5%
Horizontal section										
Length	-	-	-	-	-	8 400 m[b]	8 400 m[b]	-	8 400 m[b]	8 400 m[b]
Total length	-	-	-	-	-	15 000 m	15 000 m	15 000 m	15 000 m	15 000 m
TRANSITIONAL										
Slope	20%	20%	14.3%	14.3%	20%	14.3%	14.3%	14.3%	14.3%	14.3%
INNER TRANSITIONAL										
Slope	-	-	-	-	-	-	-	40%	33.3%	33.3%
BALKED LANDING SURFACE										
Length of inner edge	-	-	-	-	-	-	-	90 m	120 m	120 m
Distance from threshold	-	-	-	-	-	-	-	[d]	1 800 m[c]	1 800 m[c]
Divergence (each side)	-	-	-	-	-	-	-	10%	10%	10%
Slope	-	-	-	-	-	-	-	4%	3.33%	3.33%

a. All dimensions are measured horizontally unless specified otherwise.
b. Variable length (see 4.2.9 or 4.2.17).
c. Or end of runway whichever is less.
d. Distance to the end of strip.

For Runway 3,000m

(Source Annex14- Aerodromes)

Table 3-2-5 Take-Off Runways

Surface and dimensions[a]	Code number		
	1	2	3 or 4
(1)	(2)	(3)	(4)
TAKE-OFF CLIMB			
Length of inner edge	60 m	80 m	180 m
Distance from runway end[b]	30 m	60 m	60 m
Divergence (each side)	10%	10%	12.5%
Final width	380 m	580 m	1 200 m 1 800 m[c]
Length	1 600 m	2 500 m	15 000 m
Slope	5%	4%	2%[d]

a. All dimensions are measured horizontally unless specified otherwise.
b. The take-off climb surface starts at the end of the clearway if the clearway length exceeds the specified distance.
c. 1 800 m when the intended track includes changes of heading greater than 15° for operations conducted in IMC, VMC by night.
d. See 4.2.24 and 4.2.26.

For Runway 3,000m

(Source Annex 14- Aerodromes)

3-2-6 Apron

(1) Calculation Method for Required Number of Aircraft Stand.

The following formula is used to obtain the required aircraft stands.

$$S = \sum_{i}^{n} \left(\frac{Ti}{60} \times Ni \right) + \alpha$$

Where S : Required number of aircraft stands

Ti: Gate occupancy time of aircraft of Category (i) in minutes

Ni: Number of arriving aircraft of Category(i) during the peak hour

α : One extra stand for the largest aircraft of the planning year for unexpected peaking occasion. (1 extra for each 10 stands)

(2) Classification of Aircraft

Apart from the aircraft classification by seating capacity, the classifications as shown in Table 3-2-6 is made for the planning of aircraft parking area taking into account wing span, overall length, etc. of aircraft dimensions (Table 3-2-7).

Not only Egypt Air fleet but also foreign fleet are taken into consideration for the classifications for apron.

Table 3-2-6 Aircraft Classifications for Apron

(meter)

Category	Classification	Wing Span	Overall Length
JUMBO	B-747	60	70
LJ MJ	DC-10,L-1011,A-300 B-767,A-310	50	56
NJ SJ	B-757,MD80 B-727,B-737	38	47
P	F-27	29	25

(3) Gate Occupancy Time

Table 3-2-8 shows the gate occupancy time by aircraft, which is estimated by the actual parking time of aircraft in Egypt.

Table 3-2-7 Size of Aircraft

(meter)

AIRCRAFT MODEL	WING SPAN	OVERALL LENGTH	HEIGHT
B-747	59.6	70.5	19.3
DC-10	50.4	55.5	17.4
L-1011	47.4	54.2	16.9
A-300	44.8	53.6	16.5
B-767-200	47.2	48.5	15.9
B-707-320	44.4	46.6	12.9
A-310-200	43.9	46.7	15.8
B-757	38.0	47.3	13.6
B-727-200	32.9	46.7	10.5
B-737-300	28.9	33.4	11.1
A-320	34.5	37.4	11.8
B-737-200	28.4	30.5	11.3
F-27	29.0	25.1	8.7

The gate occupancy time for planning includes a margin for delay.

Table 3-2-8 Gate Occupancy Time

Item / Aircraft and Category	Route	Actual Gate Occupancy Time 1/		Gate Occupancy Time for Planning	
		INT'L	DOM	INT'L	DOM
JUMBO	B-747	90	--	100	55
L J	A-300	90	45		
M J	B-767	90	--		
N J		--	--	50	35
S J	B-737	40	15		
P	F 27	--	15	--	

1/ Based on the time table of Egypt Air.
Except Cairo International Airport.

(4) Clearance between Aircraft

The interval between aircraft wing tips will be set at 7.5m for a wing span of more than 30m and 4.5m for that of 15-23m based on ICAO recommendations.

(5) Required Number of Aircraft Stands

The number of stands has been estimated based on the following assumptions and is summarized in Table 3-2-9.

Assumptions:

i) Shares of international and domestic services are assumed to be the same.

ii) The representative aircraft in the cases of 1, 1.5, 2 and 3 million annual passengers are assumed to be B727, B757, A300 and B757, and B747 and A300 class respectively for estimating size of apron at the progress report level.

Table 3-2-9 Required Number of Aircraft Stands

Assumed Annual PAX. (million)	JUMBO	LJ/MJ	NJ/SJ
1			5
1.5			6
2		6	
3	8		

3-3 Landside Facilities

3-3-1 Car Parking

The following formula is used to estimate the required number of parking spaces.

$$V = P \times C$$

Where, V: Required number of parking spaces

P: Number of peak hour passengers

C: Number of parking spaces per peak hour passenger (0.7 by survey)

The required number of parking spaces is calculated based upon the result of the site survey at Nozha, which resulted in C = 0.7 (79parked cars per 114 passengers) for cars and C=0.1 for taxies. Table 3-3-1 shows the requirements for car parking space.

Table 3-3-1 Parking Lot Requirements

Annual PAX. (Million)	1	1.5	2	3
Number of Lots	500	700	1,000	1,400
Required Space (m^2)	16,500	23,000	33,000	46,000

3-3-2 Access Road

The generated car traffic of an access road will accordingly be 1,200 incoming and outgoing cars/hour for annual passengers of 2 million and 1,700 cars/hour for 3 million passengers. Thus, an access road of 2 lanes for both way and 4 lanes for both way will be required for 2 and 3 million annual passengers respectively.

3-4 Buildings

3-4-1 Passenger Terminal Building

(1) Domestic Passenger Terminal Building

The floor area required for the passenger terminal building has been calculated by multiplying the number of the hourly peak passengers by the unit floor area.

The unit floor area is 14m² per peak hour passenger by FAA standards, and 15m² per passenger, i.e. a plannig value mainly used in Japan, (well-wisher ratio to a passenger is 0.5 person/passenger). The site survey at Nozha Airport shows the well-wisher ratio is about 0.6 person/passenger. Accordingly, the unit floor area of 15m² per passenger is applied for the comestic passenger terminal building.

(2) International Passenger Terminal Building

An international passenger terminal requires C.I.Q. (Customs, Immigration and quarantine) facilities and large passenger amenities compared to a domestic passenger terminal.

An additional floor area of 10m² per passenger is usually added to the unit floor area of domestic passenger terminal, thus the unit floor atea of 25m² is applied for the international passenger terminal building.
Table 3-4-1 shows the required floor atea for the passenger terminal building.

Table 3-4-1 Floor Area Requirements for Passenger Terminal Building

Annual Passengers (million)	1	1.5	2	3
Peak Hour Passenger (persons)	600	900	1,200	1,700
Required Floor Area (sq.meter)	12,000	18,000	24,000	34,000

3-4-2 Cargo Terminal Building

The required floor area for a cargo terminal building has been calculated on the assumption that manual handling will be applied. The cargo handling capacity is generally considered to be 5 annual tons/sq.m. in case of manual handling. Accordingly, 0.2 sq.m./annual ton of cargo handling area is necessary.

The floor area of the cargo terminal building is usually required to be 1.5 times that of the cargo handling area, in order to accomodate the office area of airlines, cargo agents, etc. Table 3-4-2 shows the requirements for the cargo terminal building.

Table 3-4-2 Cargo Terminal Building Requirements

Annual Cargo Volume (ton/year)	10,000	15,000	20,000	30,000
Cargo Handling Area (sq.meter)	2,000	3,000	4,000	6,000
Cargo Terminal Bldg. (sq.meter)	3,000	4,500	6,000	9,000

3-4-3 Administration Building and Control Tower

An independent administration building with a control tower is required for the airport administration, operation and maintenance.

The required floor area will be 2,400m² for offices and equipment rooms in the light of the planning value mostly used in Japan.

A control tower cab with a floor area of about 60m² will be necessary for air traffic controllers and control consoles. The height of hte tower cab will be set at 20m to 25m (depending on the tower location) based on FAA standard.

3-4-4 Rescue and Fire-Fighting Station

The facility requirements for the rescue and fire-fighting services are estimated in compliance with the ICAO AIRPORT SERVICE MANUAL, Part I.

The facilities are calculated and tabulated in Table 3-4-3. Airport category is determined by the largest aircraft movements for the busiest consecutive 3 months.

Table 3-4-3 Required Fire-Fighting Facilities

Annual Passenger(million)	1	1.5	2	3
Airport Category	7	8	8	9
Extinguishing Agents				
Water for Aqueous Film Forming Foam (ℓ)	12,100	18,200	18,200	24,300
Dry Chemical Powder (kg)	225	450	450	450
CO_2 (kg)	450	900	900	900
vehicles				
Rapid Intervention Vehicle	1	1	1	1
Major vehicle	2	2	2	
Ambulance	1	1	1	1
Command Car	1	1	1	1
Floor Space(m^2)	400	400	400	500

3-5 Air Navigation Systems

Air navigation systems include, (1) Radio navigation aids, (2) Air traffic control system (3) Aeronautical telecommunications system, (4) Visual aids and (5) Meteorological system.

Air navigation systems will be designed to meet the operational requirements, precision approach category-I, and to be sufficient to handle aircraft in safe and effective manner.

3-6 Others

3-6-1 Public Utilities

The airport utilities requirements are estimated based on the unit demand established here as shown in Table 3-6-1.

Table 3-6-1 Unit Demand

Utilities	Unit demand/m^2	
Electricity	passenger Terminal Building	: 100 VA / m^2
	Cargo Terminal Building	: 60 VA / m^2
	Administration Building	: 80 VA / m^2
	Equipment	: Calculated by Equipment
Water	Passenger Terminal Building	: 0.023 ton/m^2/day
	Cargo Terminal Building	: 0.003 ton/m^2/day
	Administration Building and others	: 0.01 ton/m^2/day
Waste	Passenger Terminal Building	: 0.072 Kg/m^2/day
	Cargo Terminal Building	: 0.144 Kg/m^2/day
	Administration Building and others	: 0.024 Kg/m^2/day

(Source: average unit demand of several airport in Japan.

Table 3-6-2 shows the demands of public utilities.

Table 3-6-2 Airport Utilities Demands

Annual Passengers	1 mill.	1.5	2	3
Electricity (KVA) Demand	2,500	3,000	3,500	5,000
Water (ton/month) Demand	10,000	13,000	17,000	24,000
Waste (ton/month) Deposit	50	50	70	100

3-6-2 Aviation Fuel

The daily fuel consumption is accumulated by multiplying the trip fuel including that for an alternate airport, by the number of departing aircraft in respective type. The required fuel storage capacity is estimated as tabulated in Table 3-6-3 on the condition that the airport is provided with a 7 days storage capacity.

Table 3-6-3 Aviation Fuel Storage Requirement

Annual Passenger	1 mill.	1.5	2	3
Daily Fuel Consumption (kl)	260	460	480	630
7 days storage capacity (kl)	1,800	3,200	3,400	4,400
Area required	7,000m^2	8,500m^2	8,500m^2	10,500m^2

CHAPTER 4 EVALUATION AND REDEVELOPMENT CONCEPT OF NOZHA AIRPORT

4-1 Existing Capacity and Anticipated Time of Saturation

4-1-1 Outline of Nozha Airport

Nozha Airport is located about 7.5 km southeast of Alexandria city center, which is the second most populated city of Egypt with 2.5 million.
Figs. 4-1-1 and Table 4-1-1 outline the present conditions at the existing Nozha Airport as of August 1984.

The existing Nozha Airport provides at present 5 international flights (B737) to Jeddah/ Saudi Arabia weekly, 3 domestic flights (F-27) daily and 5 domestic flights (B737) to Cairo weekly.

The passenger traffic handled in 1983 is 81,436 domestic passengers, 1,705 international passengers, and 83,144 passengers in total.
The current air traffic increased to about 5 times as much as that of 1981 when the regular civil air transport services were re-started.

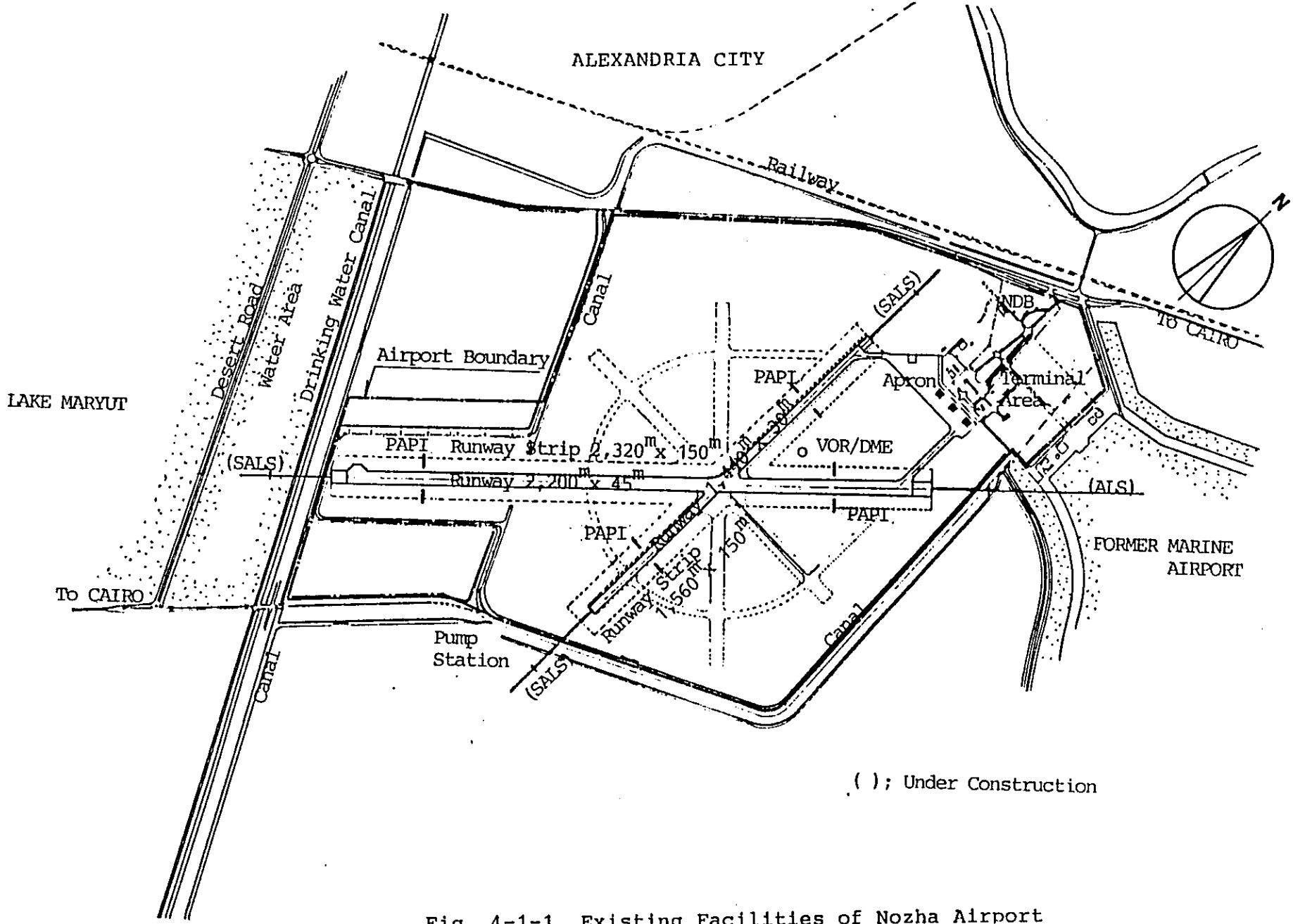


Fig. 4-1-1 Existing Facilities of Nozha Airport

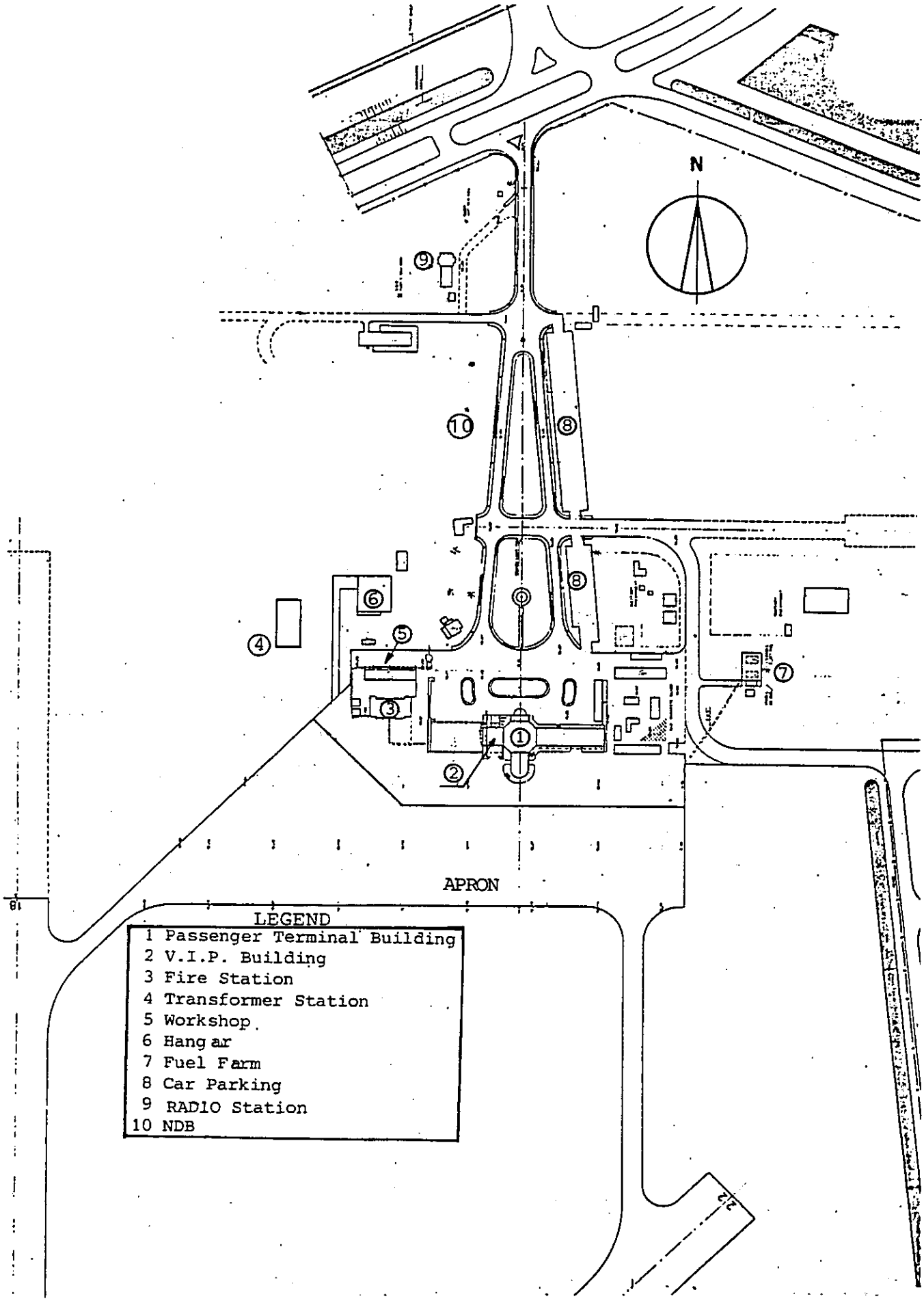


Fig. 4-1-2 Layout of Existing Facilities

Table 4-1-1 OUTLINE OF THE EXISTING ALEXANDRIA AIRPORT

"O" indicates "Plan or under construction"
"X" indicates "Implemented or services provided"

Country	Name of Airport	INT./DOM. / ICAO CODE	Commencement 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)	INT./DOM. / 4C	1945	354 ha.	31°11'00"N / 29°56'45"E	-3.35 m (-11 ft)	N43°30'E(MH) N176°10'E(MH)	30.6° C	0500(GMT)~ Sunset	All Seasons	Control Agency: Egyptian Civil Aviation Authority

City/Town			Transportation			Wind Coverage
Name	Population	Distance to Airport	Railway	Taxi	Bus	
Alexandria	2,500(1980) thousand	4 NM by Road	N.A.	X	Airline X Transport	RWY 04/22 92.6% (13kt) 99.7% (20kt)

Operational Minimum					Note:
Runway	Procedure	DH/MDA	Vis	RVR	* OCL not established. Egypt Air Operator's minimum.
04/22	NDB Circling*	600 ft	2,400 m	-	
	-	-	-	-	
18/36	-	-	-	-	
	-	-	-	-	

Air Navigation

																					Note:
NAV.	NDB		VOR		DME		TACAN		ILS		LOCATOR		VHF D.F.								
	X		X		X		-		-		-										
ATC/COM	ASR		SSR		PAR		ASDE		ARTS		VHF A/G		AFS		TTY		MICROWAVE		ATIS		
											4 freq.		(VHF LINK, SSB) X		X		O				
LIGHT	ALS	SSL	SALS	ALB	CGL	RWY	RWCL	RWTL	ORL	TDZL	REIL	DME	PAPI	TWL	TWCL	TGL	ABN	WIND	APT	O.L.	
	RWY 22 O		RWY15 RWY04			RWY16 RWY04/22		X					X	X			X	X	X	X	
MET	RWY Surface Sensors				RVR		Ceilometer		WX-FAX		APT-RX		Radiosonde		WX Radar						
	X								X												

Basic Facilities

	Size	Pavement	Note
Runway Strip	150m x 2,320m	-	-
Runway	2,200m x 45m 1,430m x 30m	Asphalt	LCN 49 LCN 29
Taxiway	370m x 23m	"	

Apron	Design Aircraft	No. of Stand	Pavement	Area (m²)	Parking Configuration
	B737 class	3	Concrete	38,260	Angle-out

Flight Services

INT/DOM	Major Air Route	Airline	Aircraft	Flight/week	Remarks
INT'L	Alexandria-Jeddah	Egypt Air	B737-200	5-Flts/week	As of Aug., 1984.
DOM	Alexandria-Cairo	"	F-27	21 "	
"	"	"	B737-200	5 "	

Other Facilities

	Size	Structure	
Passenger Bldg.	3,004 m²		
Cargo Building	N.A.		
Administration Bldg.	1,233 m²		
Control Tower	Cab. 37 m²		Height 14m
Fire Station	547 m²	2Air Crush Tenders 2 Fire Engines	
P.O.L	JET A1 51,000 ℓ AVGAS 100/130 17,600 ℓ		
Hangar	31m x 36m		For Gliders
Carparking Lot	170 cars		No bus space

Traffic Statistics

Year	1979	1980	1981	1982	1983
LDG and TOF		-	3,378	4,348	5,526
Annual Freight (ton)					
Annual Passengers DOM		-	16,120	39,283	61,435
Annual Passengers INT		-	-	-	1,705

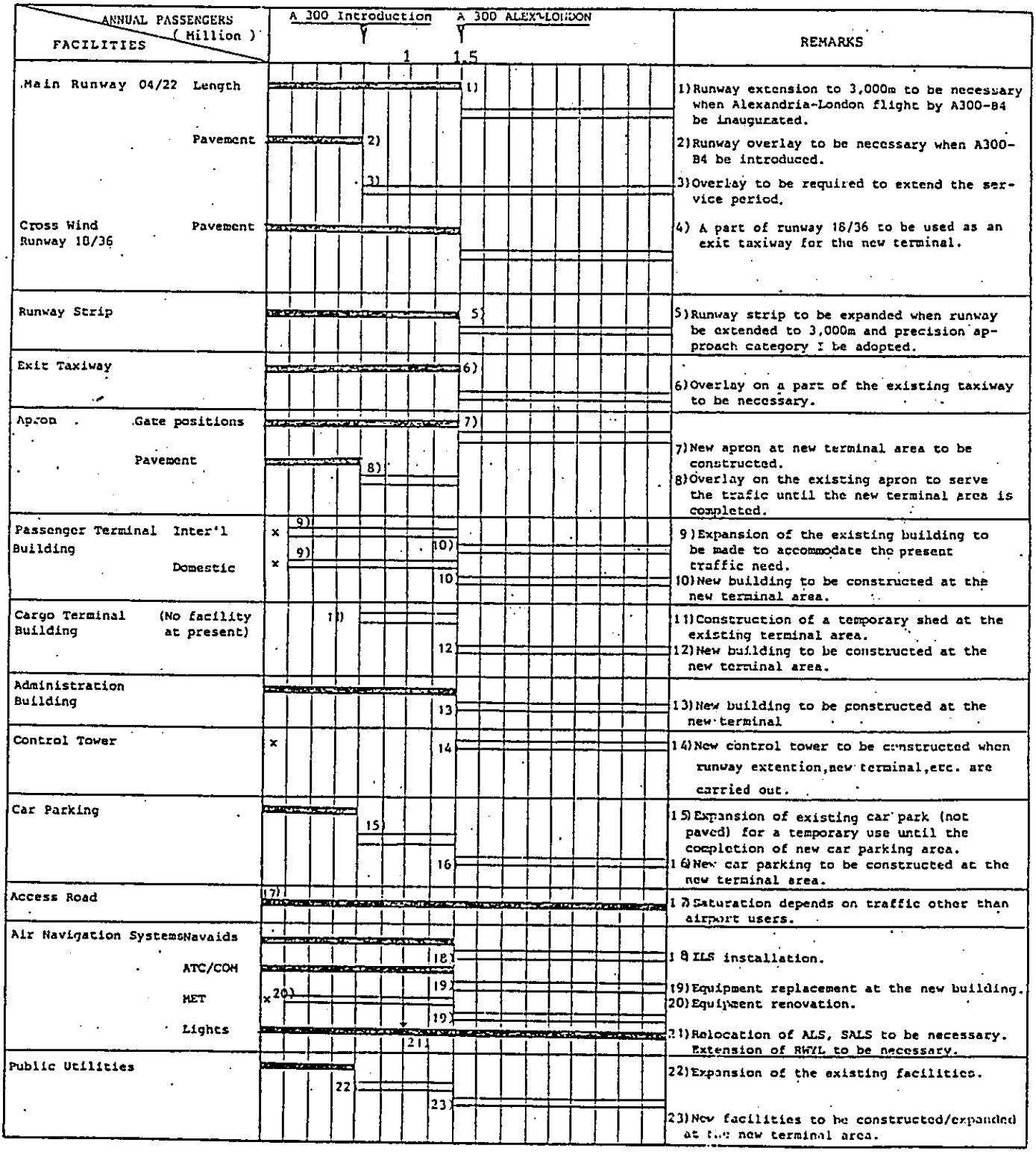
4-1-2 Evaluation of the Existing Facilities

(1) General

The capacity of the existing facilities have been evaluated in terms of capacity in relation to type of aircraft, air route, number of passengers, etc. Results of the evaluations of major facilities are summarized together with necessary improvement in Table 4-1-2. Most of pavement will require overlay when A-300 flights are accommodated. It is estimated from the present upsurging trend of air traffic demand at Nozha airport that Cairo-Alexandria route will not take long to handle more than a half million and thus, may introduce A-300. The existing passenger terminal building is saturated by the present passenger traffic and requires an improvement necessary for the present and short term demands. The existing runway of 2,200 meter long is required to be extended to 3,000 m for A-300 flights between Alexandria and London. This service, expected in the previous study by NACO, 1974, may be started when annual passengers reach a range of 1.5 to 2 million. At Cairo airport, passengers on Cairo-London route accounted for about 4 percent of total annual passengers in 1982. If this share can be applied for Alexandria, about two A-300 flights weekly will be operated when international passengers of more than 0.8 million is handled at Nozha airport. The airport will reach its capacity and call for substantial redevelopment work when the runway extension is required.

Table 4-1-2 Capacity of the Existing Facilities VS Annual Passengers

x Already out of capacity
Existing capacity
Expanded Capacity



(2) Runways

Nozha Airport now has two intersecting runways. The extension of the main runway to 2,200m was completed in 1983. The dimensions of the existing runways are as follows:

RUNWAY	RUNWAY DESIGNATION	TRUE BEARING	DIMENSIONS	PAVEMENT STRENGTH
Main Runway	04/22	045°/225°	2,200m x 45m	LCN49
Cross-wind Runway	18/36	178°/358°	1,440m x 30m	LCN29

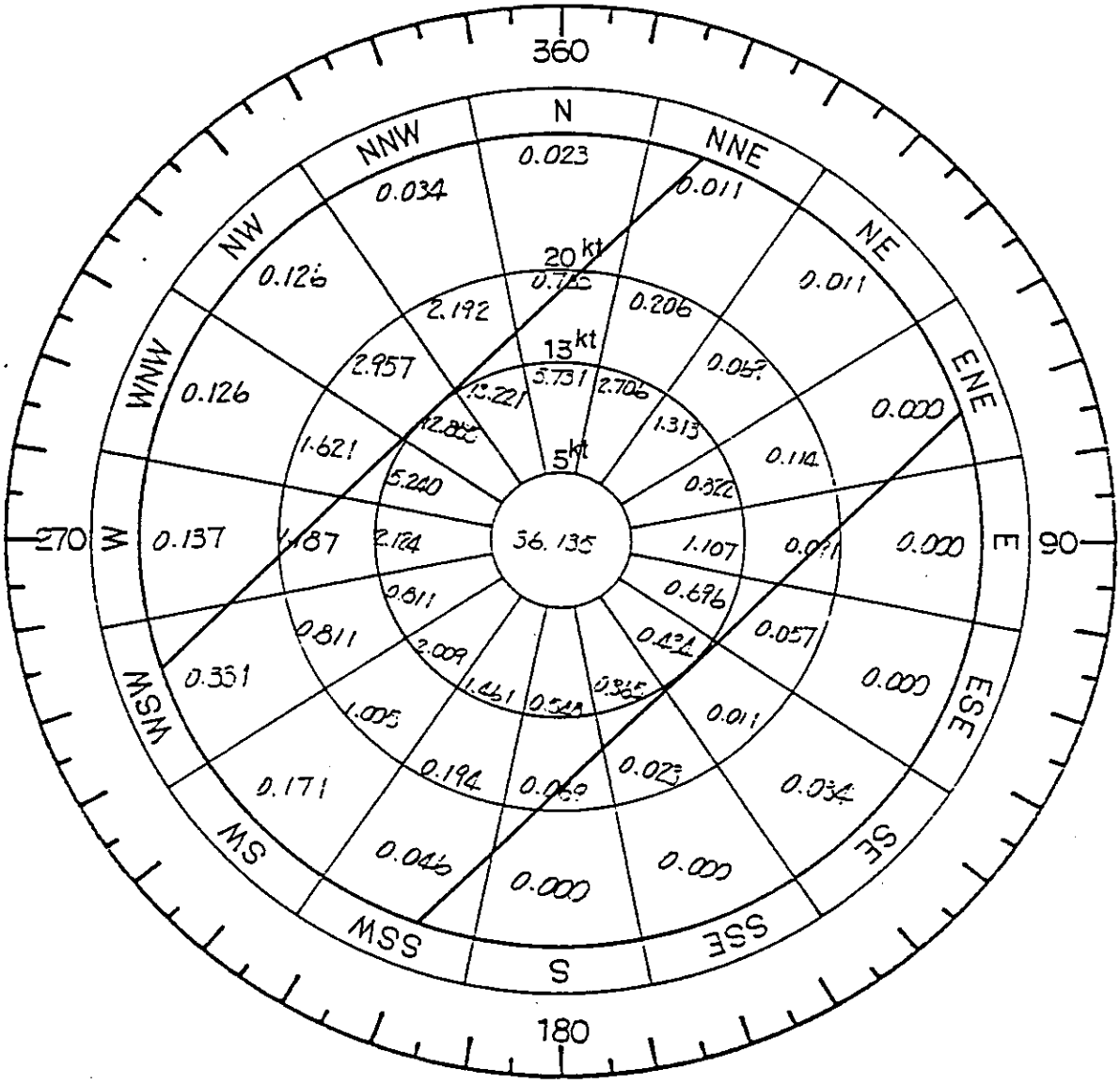
The largest aircraft operated at Nozha Airport is at present B-737-200 Advanced (RWY 04/22).

The existing cross-wind coverages have been analized based on the 3 years data (1981-1983) observed at Nozha Airport, and the result is shown in Table 4-1-3. The cross-wind coverage maps are shown in Figs. 4-1-3 through 8.

Table 4-1-3 Cross-wind Coverage of the Existing Runways

RUNWAY	Cross- wind Coverage	
	Cross-wind Component less than 13kt.	Cross-wind Component less than 20kt
Runway 04/22	92.6 %	99.7 %
Runway 18/36	94.5 %	99.4 %
Runway 04/22 and Runway 18/36	97.2 %	99.9 %

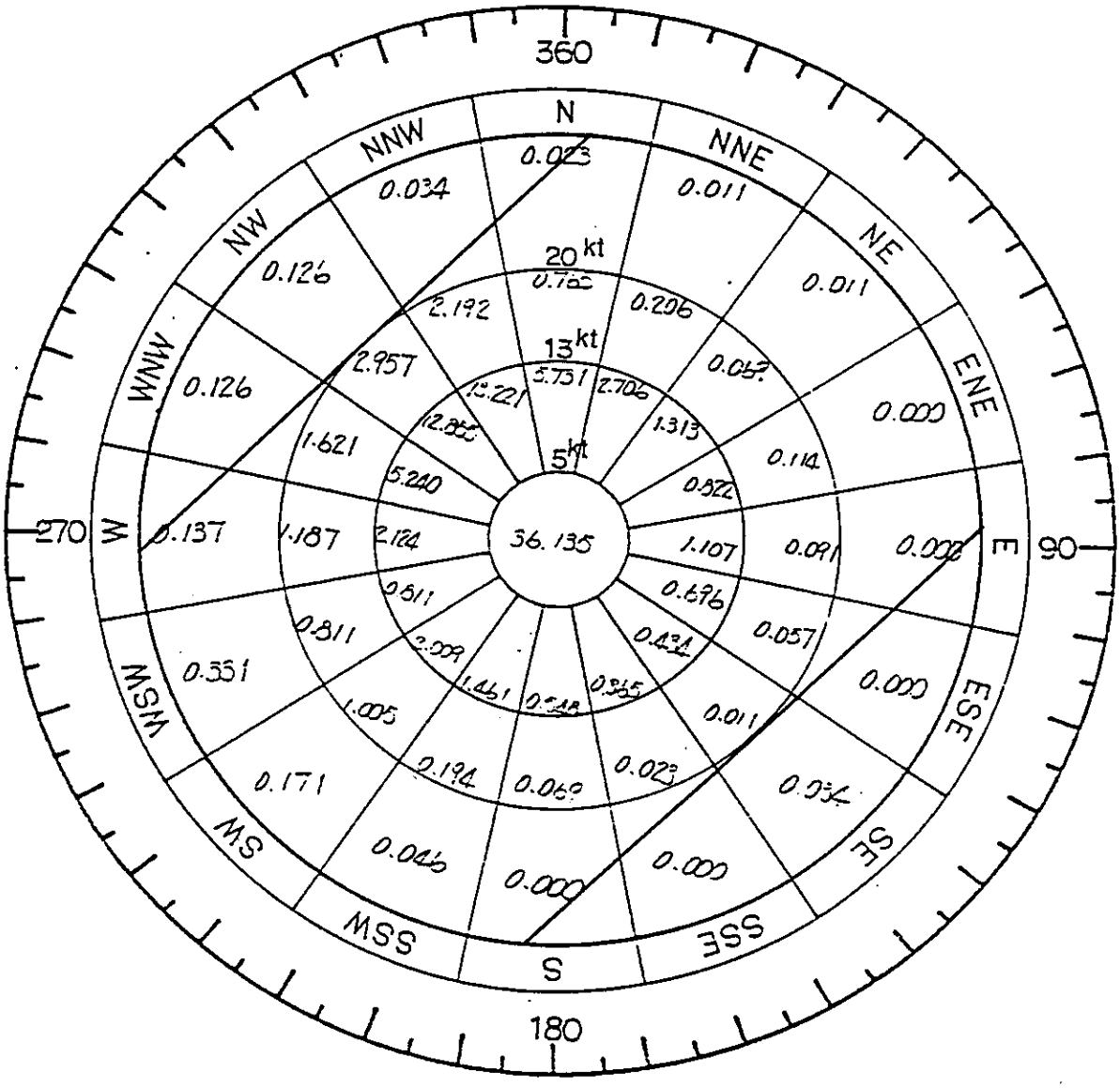
(JICA Analysis)



LOCATION : NOZHA AIRPORT
PERIOD : 1981-1983 (3YEARS)
R/W DIRECTION : N 45°30' E
WIND COVERAGE : 92.6% (CROSS WIND 13Kt)

Fig. 4-1-3 Wind Coverage Map of RWY 04/22

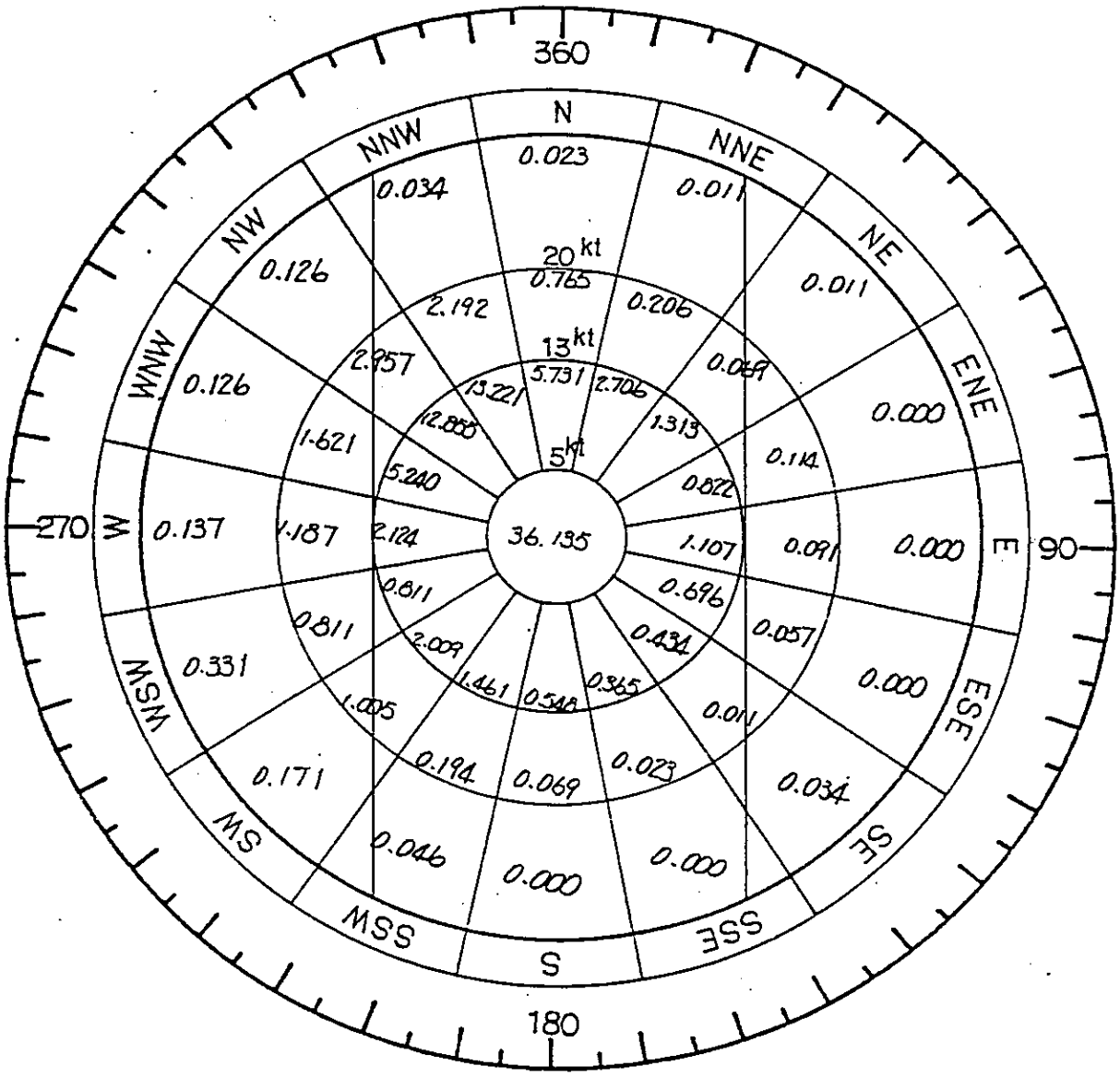
(Cross-wind component less than 13kt)



LOCATION : NOZHA AIRPORT
PERIOD : 1981-1983 (3YEARS)
R/W DIRECTION : N45°30' E
WIND COVERAGE : 99.7% (CROSS WIND 20Kt)

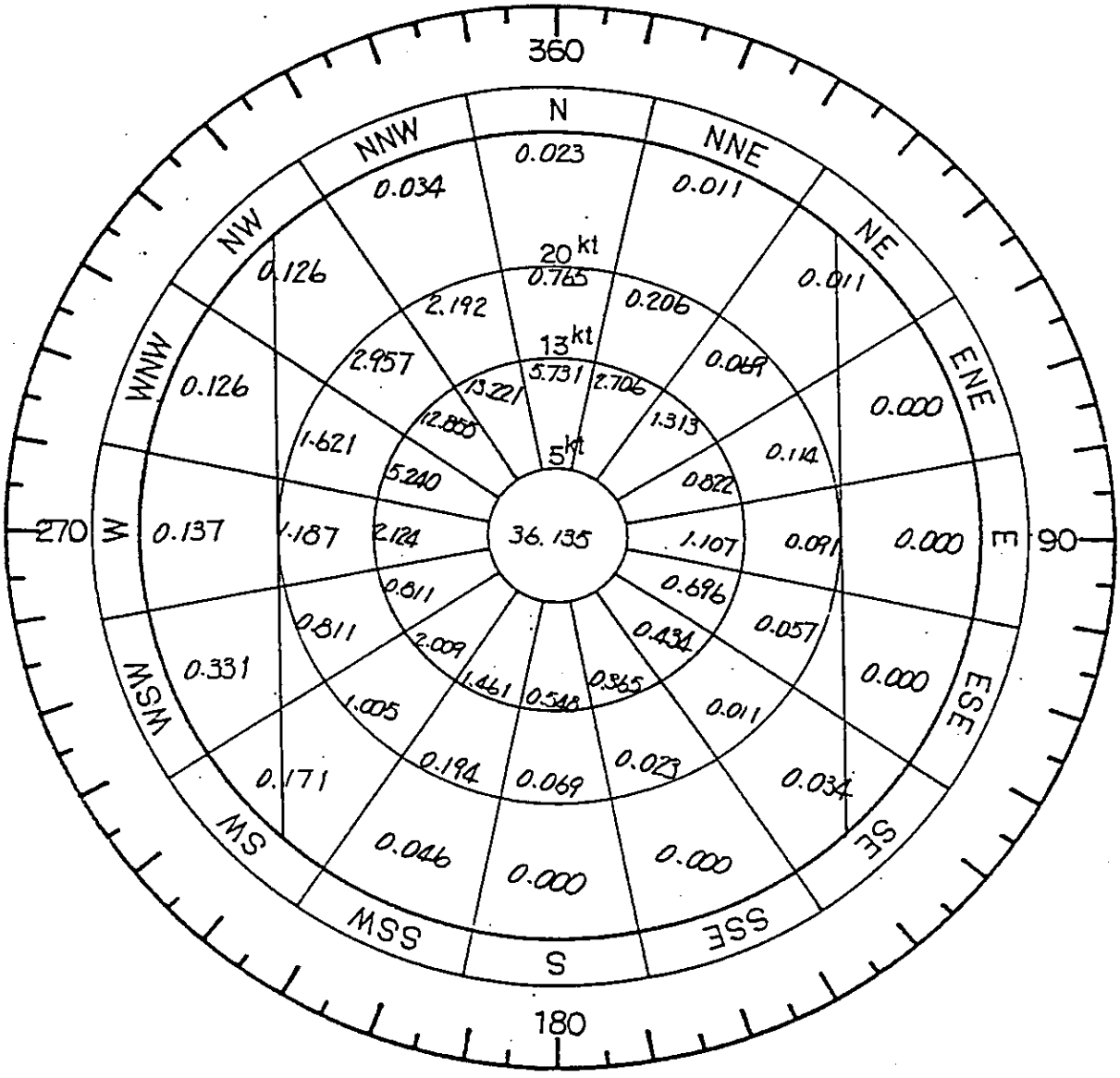
Fig. 4-1-4 Wind Coverage Map of RWY 04/22

(Cross-wind component less than 20kt)



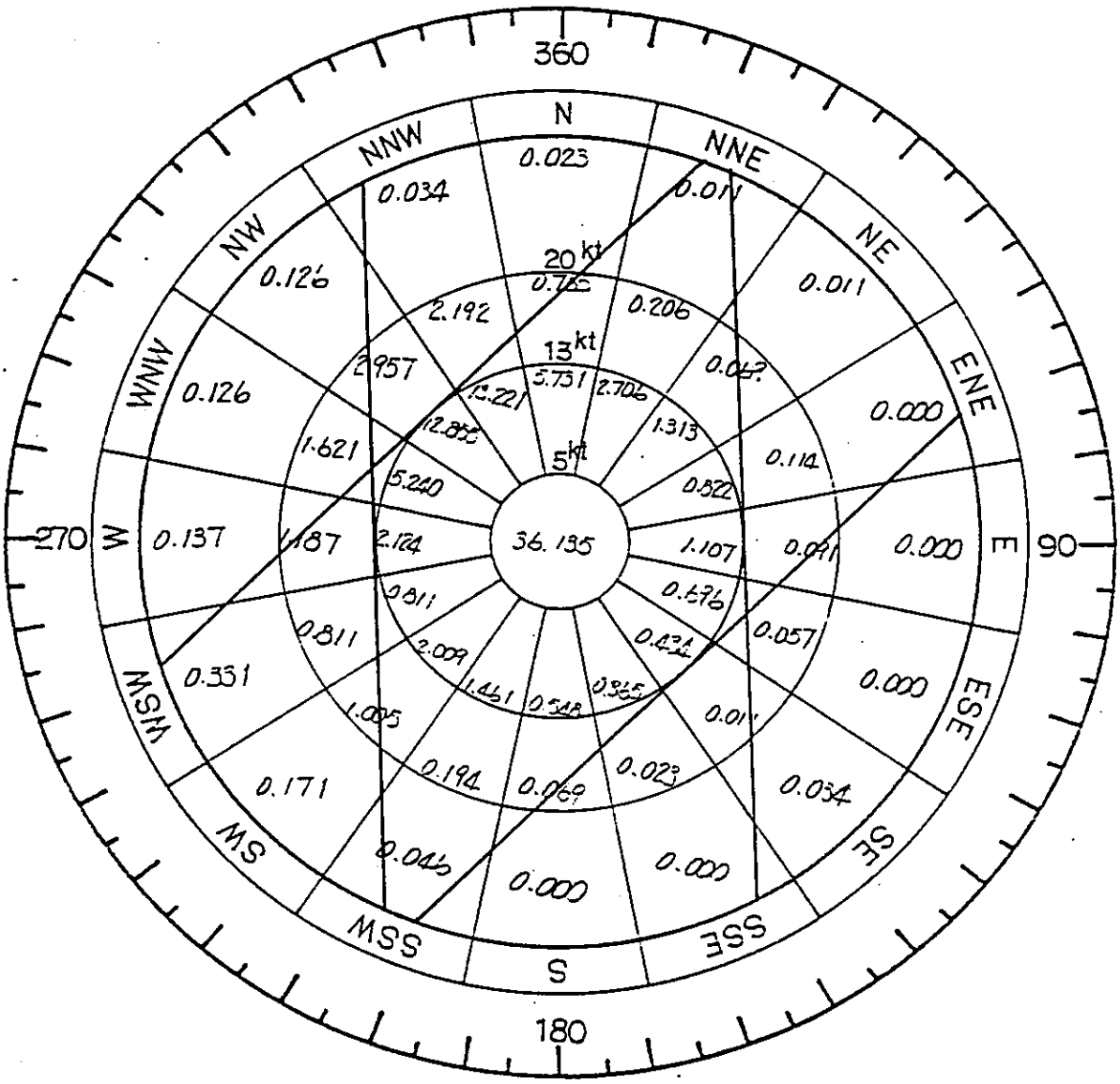
LOCATION : NOZHA AIRPORT
PERIOD : 1981-1983 (3YEARS)
R/W DIRECTION: N178° 10' E
WIND COVERAGE+ 94.5% (cross-wind 13KT)

Fig. 4-1-5 Wind Coverage Map of RWY 18/36
(Cross-wind component less than 13kt)



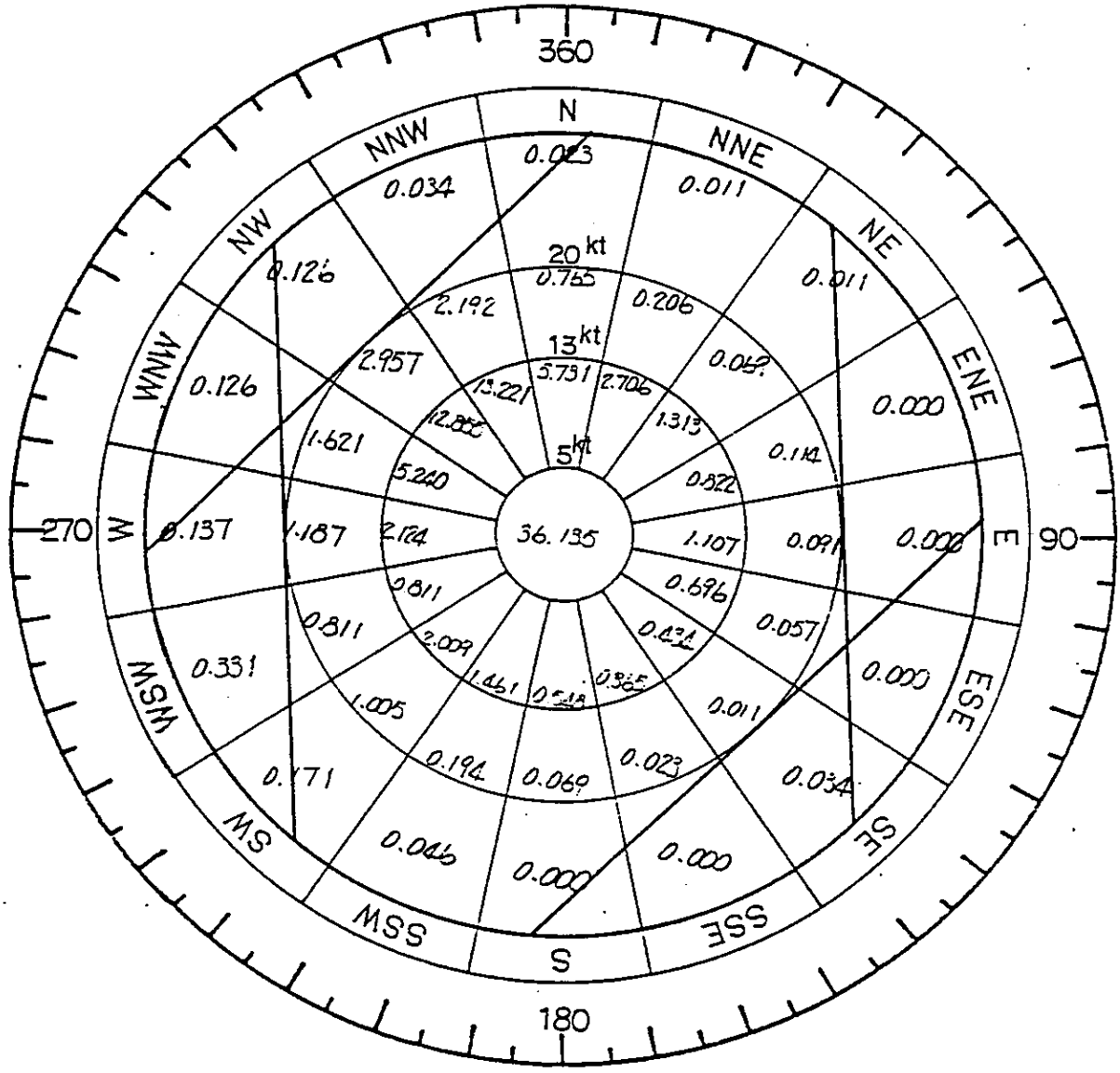
LOCATION : NOZHA AIRPORT
PERIOD : 1981-1983 (3YEARS)
R/W DIRECTION: N178° 10' E
WIND COVERAGE: 99.4% (cross-wind 20KT)

Fig. 4-1-6 Wind Coverage Map of RWY 18/36
(Cross-wind component less than 20kt)



LOCATION : NOZHA AIRPORT
PERIOD : 1981-1983 (3YEARS)
R/W DIRECTION : N 45°30' E + N 178°10' E
WIND COVERAGE : 97.2% (CROSS WIND 13Kt)

Fig. 4-1-7 Wind Coverage Map of RWY 04/22 and RWY 18/36
(Cross-wind component less than 13kt)



LOCATION : NOZHA AIRPORT
PERIOD : 1981-1983 (3YEARS)
R/W DIRECTION : N 45°30' E + N 178°10' E
WIND COVERAGE : 99.9% (CROSS WIND 20Kt)

Fig. 4-1-8 Wind Coverage Map of RWY 04/22 and RWY 18/36 (Cross-wind component less than 20kt)

ICAO recommends that "the number and orientation of runways at an aerodrome should be such that the usability factor of the aerodrome is not less than 95 percent for the aeroplanes that the aerodrome is intended to serve." (Aerodromes, Annex-14). The cross-wind coverage of the runway 04/22 meets the operational requirements for B-737 and the larger jet aircraft (in the viewpoint of coverage.) The wind coverage of the runway 04/22 and runway 18/36 is respectively less than 95 percent for a cross-wind component not exceeding 13kt. Therfore, both runways are essentiao for accommodation of F-27 class and the smaller aircraft.

The length of the existing main runway 04/22 will suffice the operational field length requirements for non-stop flights of A300-B4 to Cairo, Amman, Jeddah, Baghdad, Athens, etc.

Note: Landing phase is critical for A300-B4 from the above origines.
Landing with flap 25 degrees (15 degrees is more economical) will be necessary for a wet surface condition.

The pavement strength is, however, not sufficient for A300-B4 operations. Thus, an introduction of A300-B4 to Nozha Airport calls for overlay works of at least 23cm thick for the main runway. The existing main runway should be extended to 3,000m when flight service by A300-B4 between Alexandria and London is inaugurated.

The cross-wind runway 18/36 can be used only for non-instrument runway, and no take-off procedures by the aircraft larger than DHC-5D and F-27 are permitted for the runway 36, because many obstructions which can not be removed easily protrude upon the approach surface of instrument approach runway.

Note: A site survey by a theodolite indicates that obstacles of many buildings, mosque , trees, etc. do not permit any instrument approach of F-27 class on the above. Therefore, the runway 18/36 accommodates non instrument approach of only F-27 class aircraft or the smaller.
2 percent of take-off climb surface also can not be established for the runway 36 for the same reasons. Accordingly, take-off operation from runway 36 is limited to the aircraft smaller than but not including F-27 class aircraft.
The runway 18 threshold should be displaced 600m toward the south if F-27 or the above instrument approach and take-off is accommodated.

(3) Runway Strip

The existing runway strip is established for non-instrument runway and has a width of 75m on each side of the runway center line. The width of the runway strip should be extended to a distance of 150m on each side of the runway center line when the runway is extended to 3,000m and the precision approach category-I operation is performed . Although the existing terrain mostly meets the grading requirements of the strip for precision approach category-I, fill of ditches, removal of obstructions, etc. will be necessary.

(4) Obstacle Limitation Surfaces and Aircraft Operations

The existing obstacle limitation surfaces at Alexandria Airport are as follows:

i) Approach surface

a. Runway 04

The lighting poles (10.2 meters AGL,8.7meters AMSL) along the desert road approximately 550 meters south east of Runway 04 threshold protrude upon both the approach surface of 1:50 slope and the take off climb surface for Runway 22 (Refer to Fig. 4-1-9)

b. Runway 22

Trees of 4 to 5 meter high along the road approximately 250 meter north east of Runway 22 threshold protrude upon both the approach surface of 1:50 slope for Runway 22 and the take off climb surface for Runway 04(Refer to Fig. 4-1-10)

c. Runway 18

The mosque (23.5 meters AMSL) and the trees in palace (34.2 meters AMSL) located approximately 950 meters and 1,250 meters from Runway 18 threshold protrude upon the approach surface of 1:40 slope for Runway 18. Furthermore, the most of houses and buildings in densely populated are shaded by obligue lines in Fig. 4-1-11 protrude upon the approach surface of 1:40 slope for Runway 18.

d. Runway 36

There is no obstacle protrude upon the approach surface of 1:50 slope for Runway 36.

ii) Transitional Surfaces

There is no obstacle other than houses and buildings located near the end of the approach area for Runway 18 which protrude upon the transitional surface for Runway 18.

iii) Inner Horizontal Surface and Conical Surface

Obstacles protruding upon the inner horizontal surface and concial surface are as shown in Fig. 4-1-12.

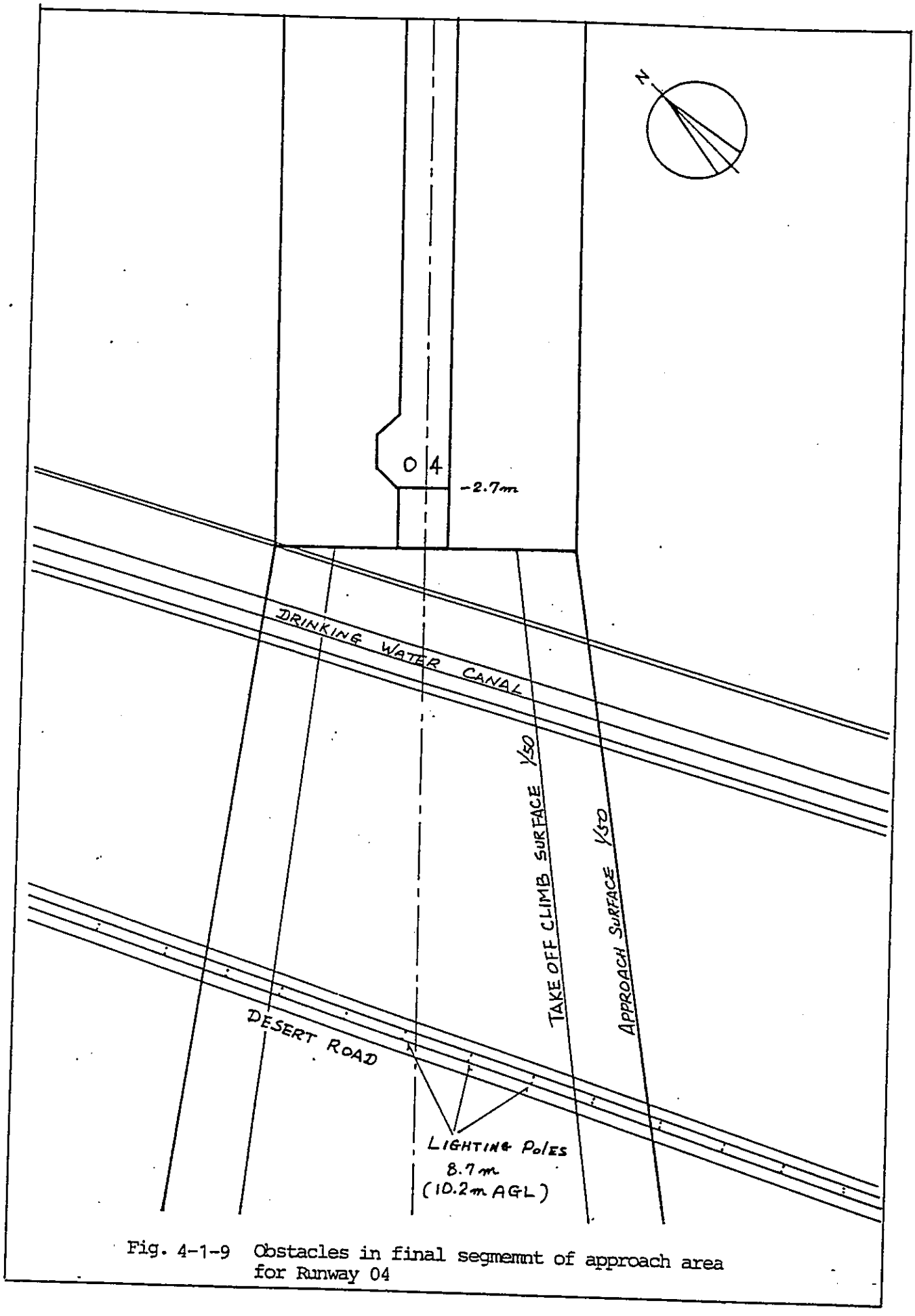


Fig. 4-1-9 Obstacles in final segmemnt of approach area for Runway 04

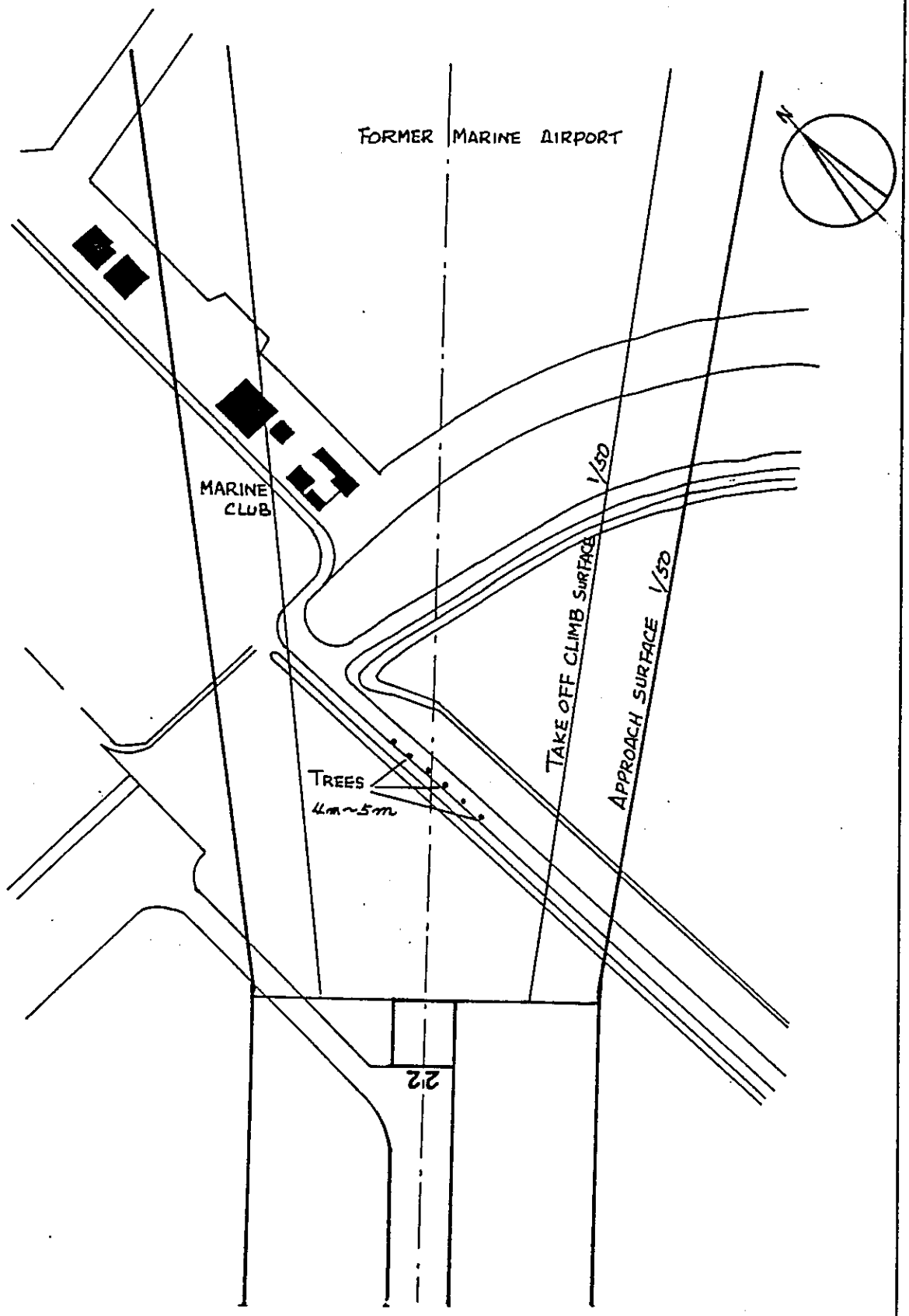


Fig. 4-1-10 Obstacles in final segment of approach area for Runway 22

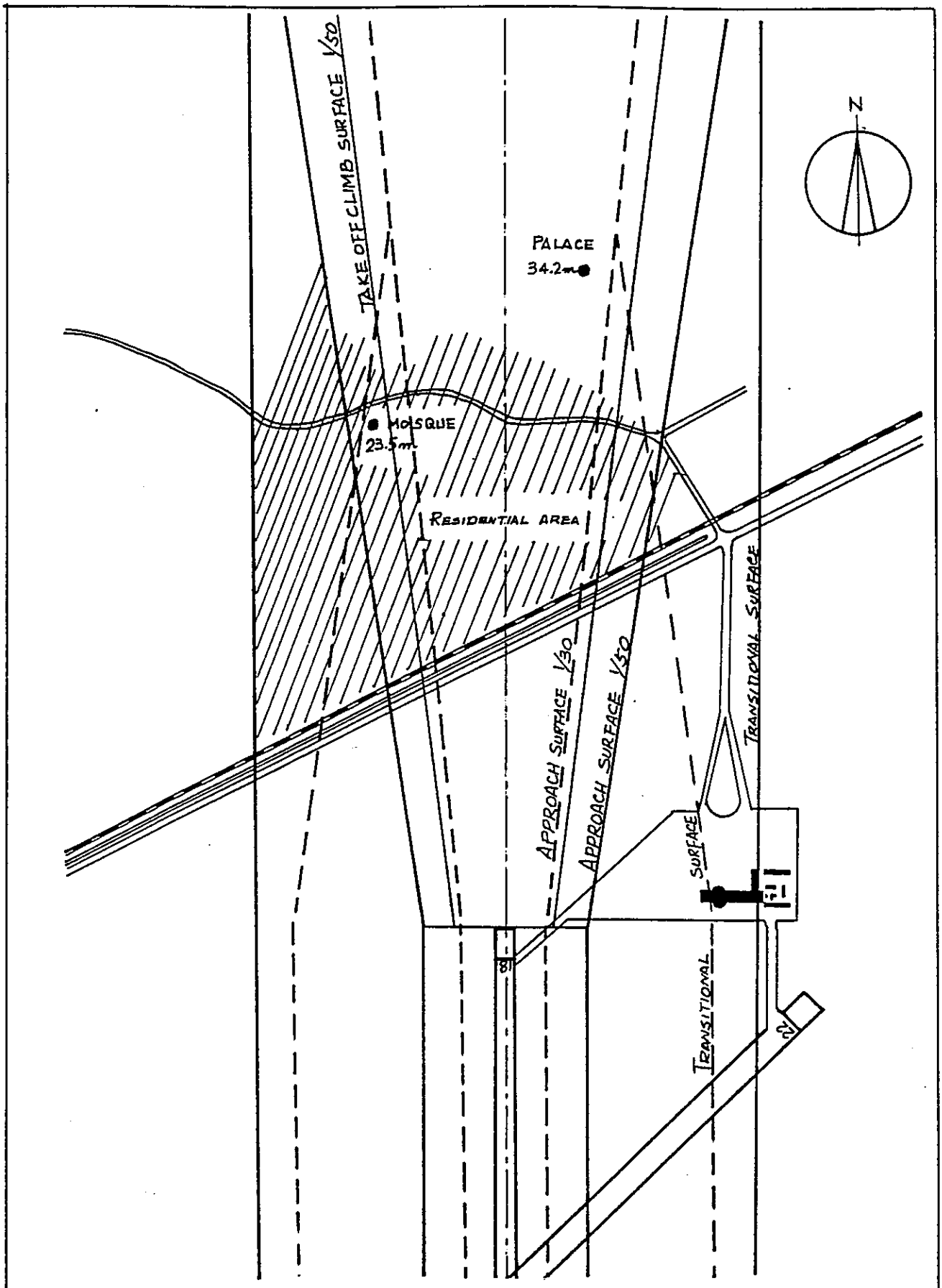


Fig. 4-1-11 Obstacles in final segment of approach area for Runway 18

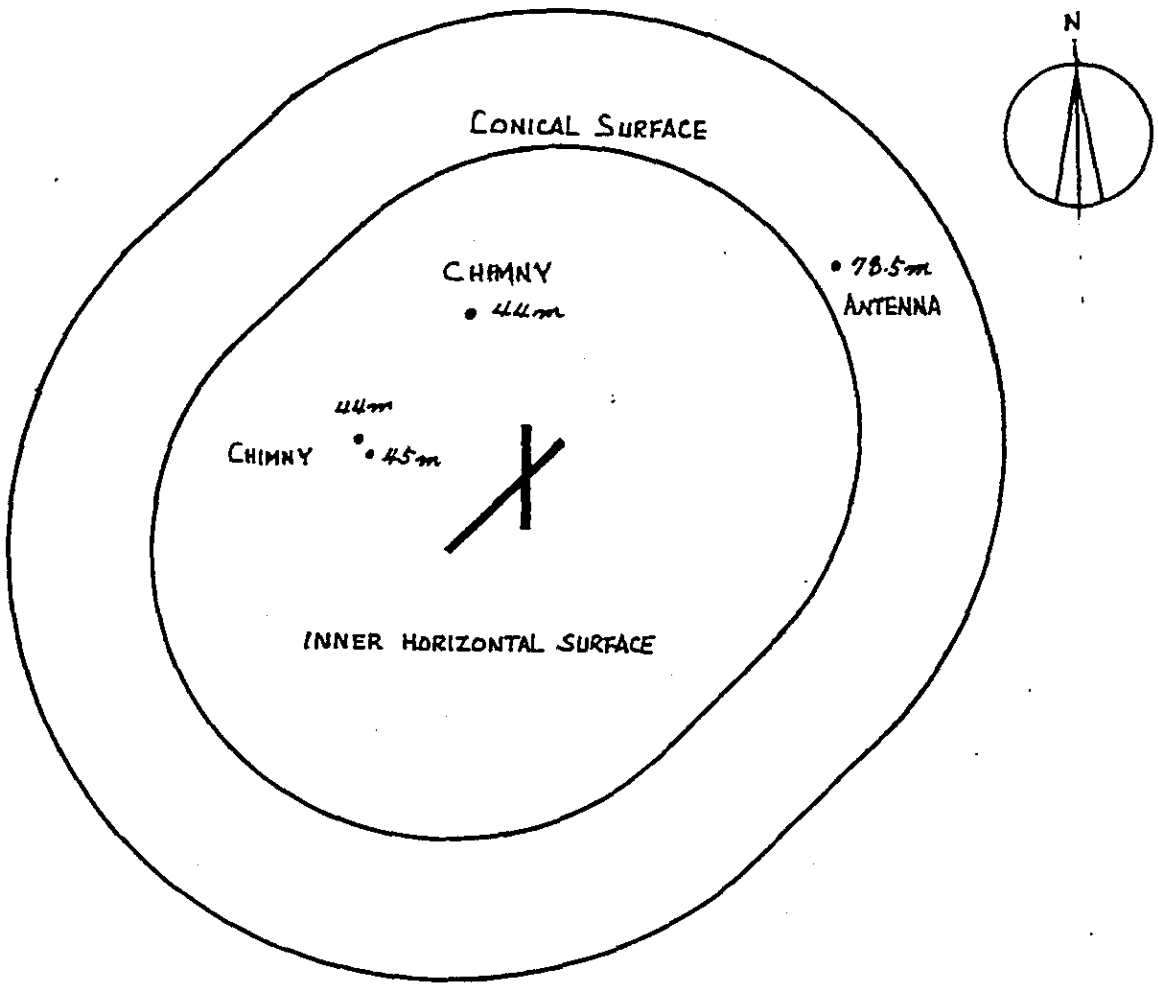


Fig. 4-1-12 Obstacles in inner horizontal and conical surfaces

Approach/Departure procedures at Nozha Airport are as follows:

iv) Instrument Approach Procedure

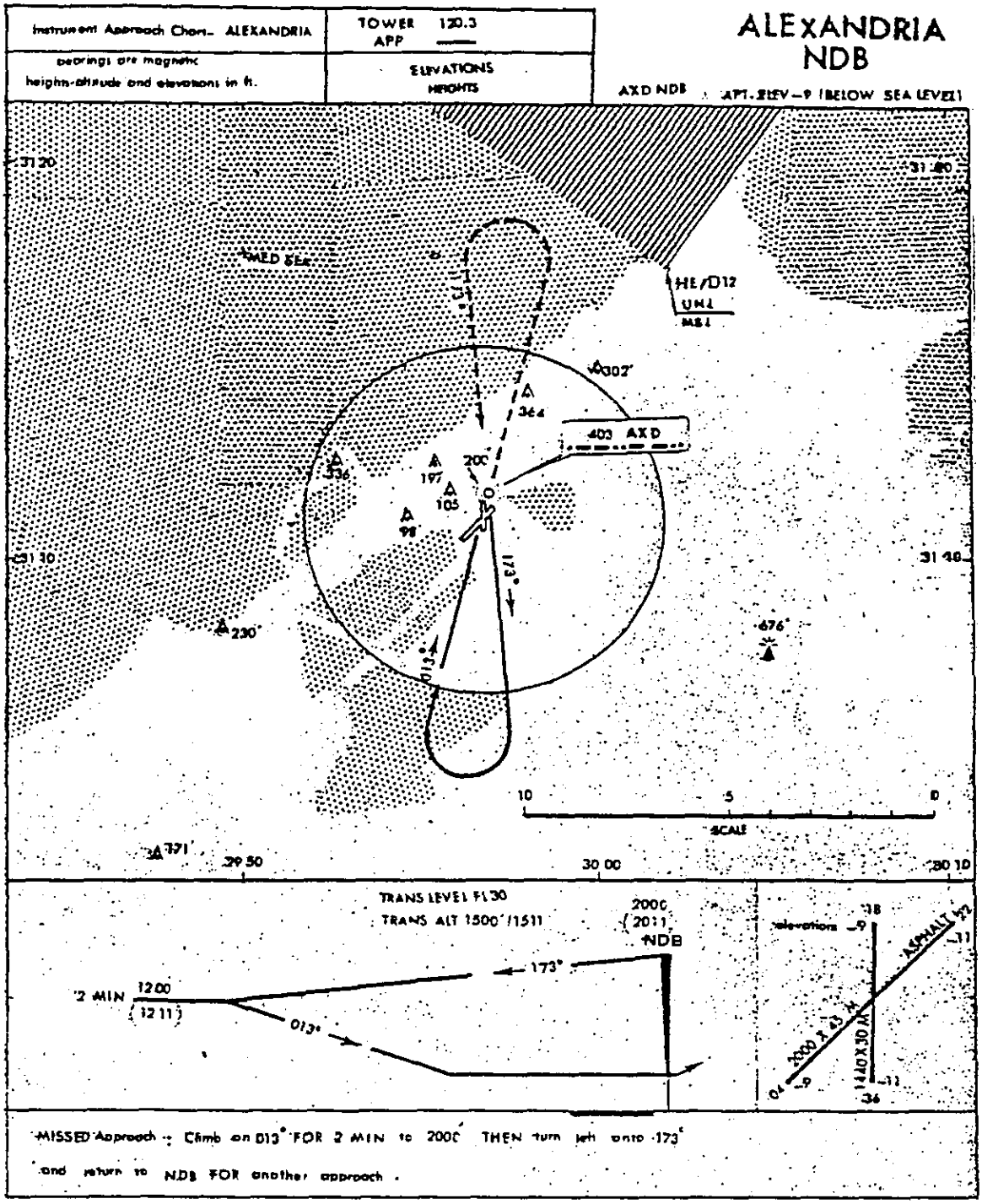
At present, instrument approach with circling approach as shown in Fig. 4-1-13 is established at Nozha airport. As a result of site investigation, it is judged that straight-in approach to Runway 04 using Alexandria NDB can be established in accordance with ICAO PANS/OPS DOC 8168/OPS/611. It is considered important to establish the minimum sector altitude and OCL (Obstacle Clearance Limit) in order to ensure the safety of aircraft operations while the present instrument approach chart does not indicate them.

It is recommended to alter the present missed approach course so that an adequate separation between the protected area for missed approach course and the danger area, HE/D12 can be maintained for the safety.

v) Standard Instrument Departure (SID)

Standard instrument departure route is not presently established at Nozha airport.

The establishment of SID in Aeronautical Information Publications is desirable in order to increase the safety and efficiency of the aircraft operations.



Source: Egyptian Civil Aviation Authority

Fig. 4-1-13 Existing Instrument Approach Procedure

(5) Taxiways

Nozha Airport has two exit taxiways which connect RWY22 and RWY18 thresholds to the apron. The width of taxiways is 23m and the pavement strength is LCN49. There is no parallel taxiway at present. Therefore, aircraft turns around using the turn-pad at the end of the runway. It is evaluated that the existing pavement will require an overlay after receiving about 7,000 repetitions of B-737 or when A-300 is put in service.

(6) Apron

The existing apron has a total area of 38,260m². Three angle-out parking positions for B737 and one heliport with a dimension of 30m by 30m are provided in the apron. However, one of the above three B737 positions at the east end is usually used by helicopter and the smaller aircraft. Thus, the existing heliport is not used at present. The capacity of the existing apron can be increased as planned in fig. 4-1-14 in order to accommodate one A300 class aircraft and four B-737. This layout can hadle the traffic up to 1 to 1.5 million annual passengers under the efficient apron utilization. However, the existing terminal facilities including apron, passenger terminal building, control tower, etc. are not considered suitable forthe expansion to cope with the future traffic demands because of their limited size and system. Therefore, new terminal facilities should be developed for the replacement as explained in the subsection 4-2-2.

The capacity of the existing pavement will require an overlay after about 1,800 repetitions of B-737 or when A-300 is introduced to the airport.

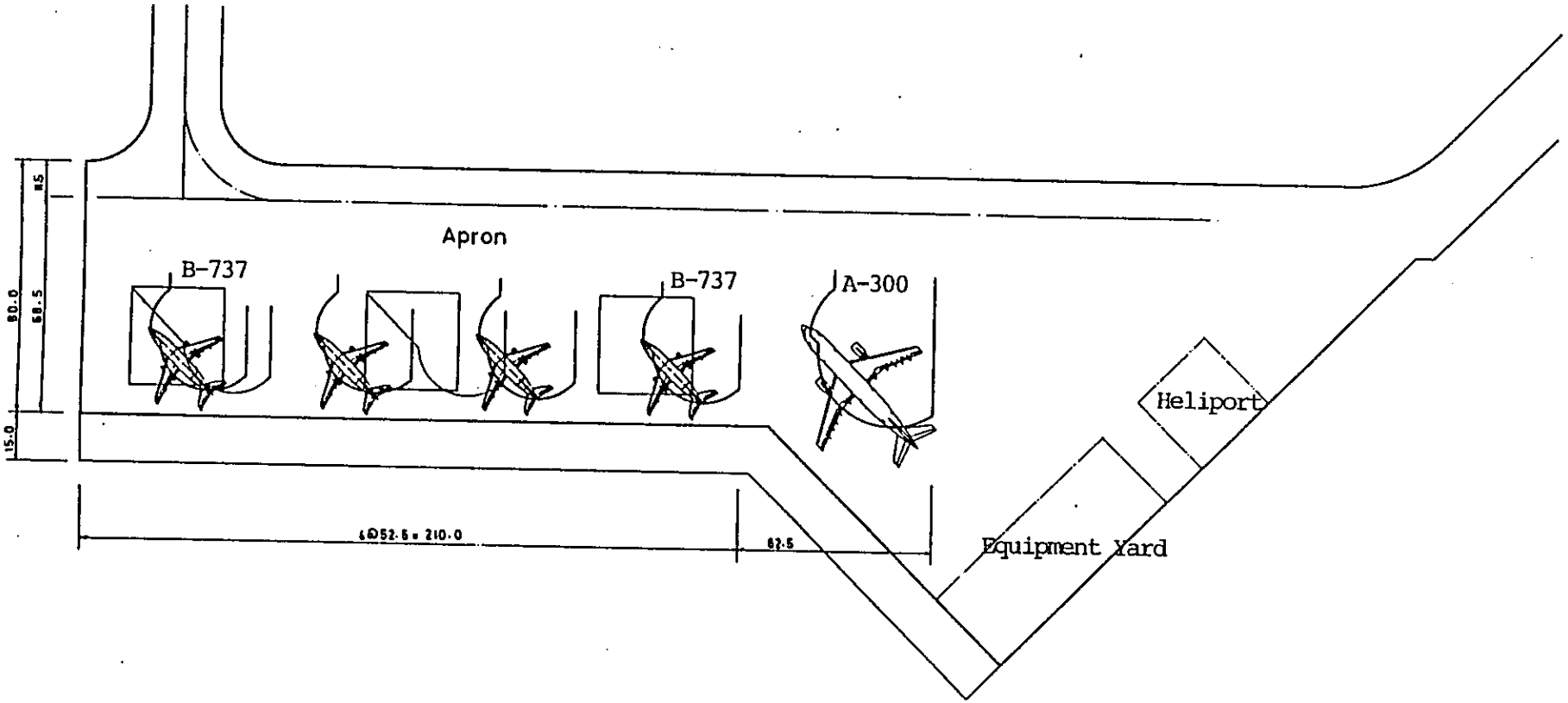


Fig. 4-1- 14 Maximum Utilization of the Existing Apron

(7) Passenger Terminal Building

The existing passenger terminal building is three story high and is made of reinforced concrete. The total floor area is 3,900m² excluding VIP room. The building accommodates the airport administrative offices and meteorological offices. Fig. 4-1-15 shows the existing layout of the ground floor. The departure hall and domestic gate lounge was constructed in 1940's and the building for international facilities was expanded in 1950's.
The existing passenger terminal building is considered to have already been saturated by the present passenger traffic demand for the following reasons:

a. The existing terminal building can handle passengers of only one departure and one arrival of B737 aircraft at the same time.
   - Only 1 check-in counter is provided,
   - The check-in lobby (44m²) and departure hall (247m²) is too small.

b. The floor space of the domestic gate lounge is 78m² and this is about 65 percent of the required space for one B737 passengers.

c. Only one baggage conveyer is provided and it can not serve simultaneous arrivals of domestic and international flights.

(8) Road and Car Parking

The existing road in the airport property area which is connected to desert road with 2 lanes for each direction, is 1 lane for each direction divided by green belt. The road in the airport with a capacity of 1,000 cars/hour /one direction can be used until the completion of the new terminal. The traffic survey indicates that the car parking area can accommodate 174 cars and the parking rate is 0.7 cars/passenger during a peal hour. The car parking are will be saturated when about 250 peak hour paaengers are hundled.

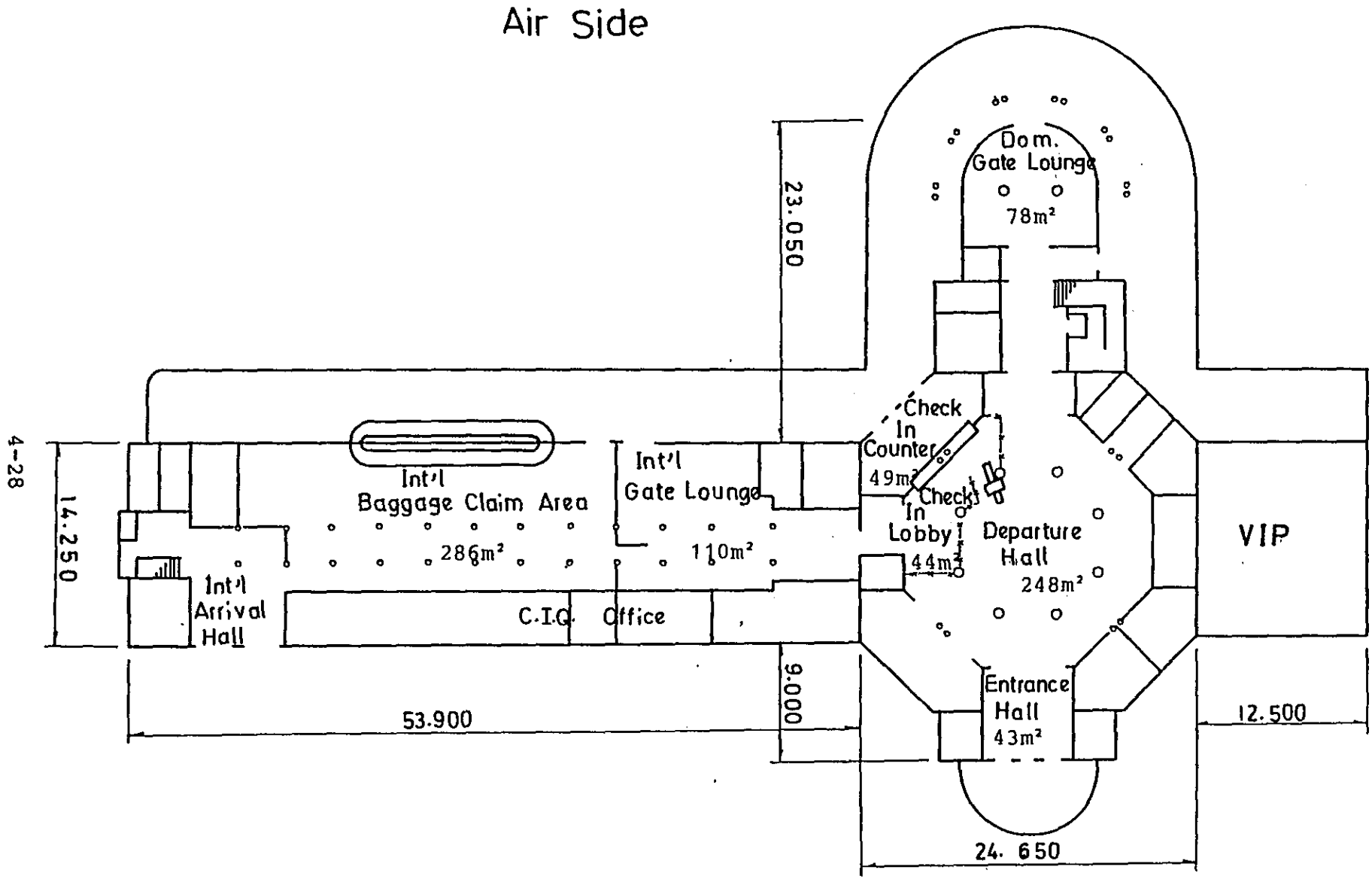


Fig.4-1-15 Existing Terminal Building

(9) Air Navigation Systems

An outline of the existing air navigation system is summarized in Table 4-1-4. The existing air navigation systems are composed of the minimum equipment necessary for air traffic services.

The existing control tower does not meet the mandatory requirements including location, height, etc.

A new control tower is required as soon as possible to overcome the present problem.

The complete replacement of the existing meteorological equipment and renovation of the telecommunications lines will immediately be required.

The radio navigation aids (VOR/DME, NDB) are new ones and could continue to operate up to around 1993 with a good maintenance.

An installation of new lighting system was recently implemented (approach lighting system is under construction) and it could be usable for about 15 years from now. A relocation of the existing approach lighting system, runway end lights, runway threshold lights, etc. and an extension of the runway edge lights, however, be necessary in order to cope with category-I operations.

Table 4-1-4 Outline of the existing air navigation system

Equipment	Outline	Remarks
NAVAIDS		
NDB	"AXD" 403KHz	Terminal-use
VOR/DME	Conventional VOR and colocated DME	Airport and en-route use
ATC/COM		
ATC console	1 position	
VHF A/G	4 frequencies; 119.8MHz, 120.3MHz 121.9MHz, 121.5MHz	
Radio teletype	SSB between Cairo	
Radio telephony	VHF Link between Cairo	to be replaced by a micro-wave Link by the end of 1984
Magnetic tape recorder	ATC-use	
VISUAL AIDS		
Approach lighting system	RWY 22	Under construction
Simple approach lighting system	RWY 04/18/36	Ditto
Runway edge lights	RWY 04/22, RWY 18/36	
Runway threshold lights	ditto	Semi . flush type
Runway end lights	ditto	Ditto
Runway threshold wing bar lights		
Precision approach path indicator (PAPI)	RWY 04/22 RWY 18/36	
Taxiway lights		
Illuminated wind direction indicator	near cross-point of 2 runways	
Apron flood lights	on the building edge	
Aerodrome beacon	on the tower-top	

Table 4-1-4 Cont'd

Obstruction lights	on the tope of the passenger terminal building	
MET. Wind vane, Barometer Thermometer/ Radio Teletypewriter Facsimile	Wind-vane on the tower top.	 TTY: out of order
Others Transformer station Emergency generator Tower	 400KVA x 2 for navaids and building use 250KVA x 2 sets Cab= 37m^2, Height (eye level) : 14m	

4-2 Future Airport Layout Plan

In order to study about the redevelopment of Nozha airport compared with a new airport development in terms of aircraft operation, airport operation, construction, noise influence, expansibility, etc. Case-3 traffic in Table 3-1-3 (2million annual passengers) is tentatively targetted in this Progress Report.

4-2-1 Alternatives for Runway Extension

The most important factor to be considered for the extension of the runway to 3,000m is that airspace should be completely free from obstacles in order to ensure safe aircraft operations.

As a result of a precise site survey, it is judged that 2 percent of approach surface required for precision approach category-I operations can not be established for RWY18 due to the existence of obstacles. Therefore, the threshold of RWY18 should be displaced 600m toward south as shown in Fig. 4-2-1 in case that this runway is used for precision approach. No significant obstacle which protrude upon approach surfaces, take-off climb surfaces, transitional surface, etc., is found for other runways. The main approach runway is considered to be RWY04 for runway 04/22 and RWY36 for runway 18/36 based on the wind analysis.

OBJECT	HEIGHT (MSL)	1/50 SURFACE (MSL)	1/40 SURFACE (MSL)
PALACE	34.2m	22.3	28.6
MOSQUE	23,5m	6.3	21.1

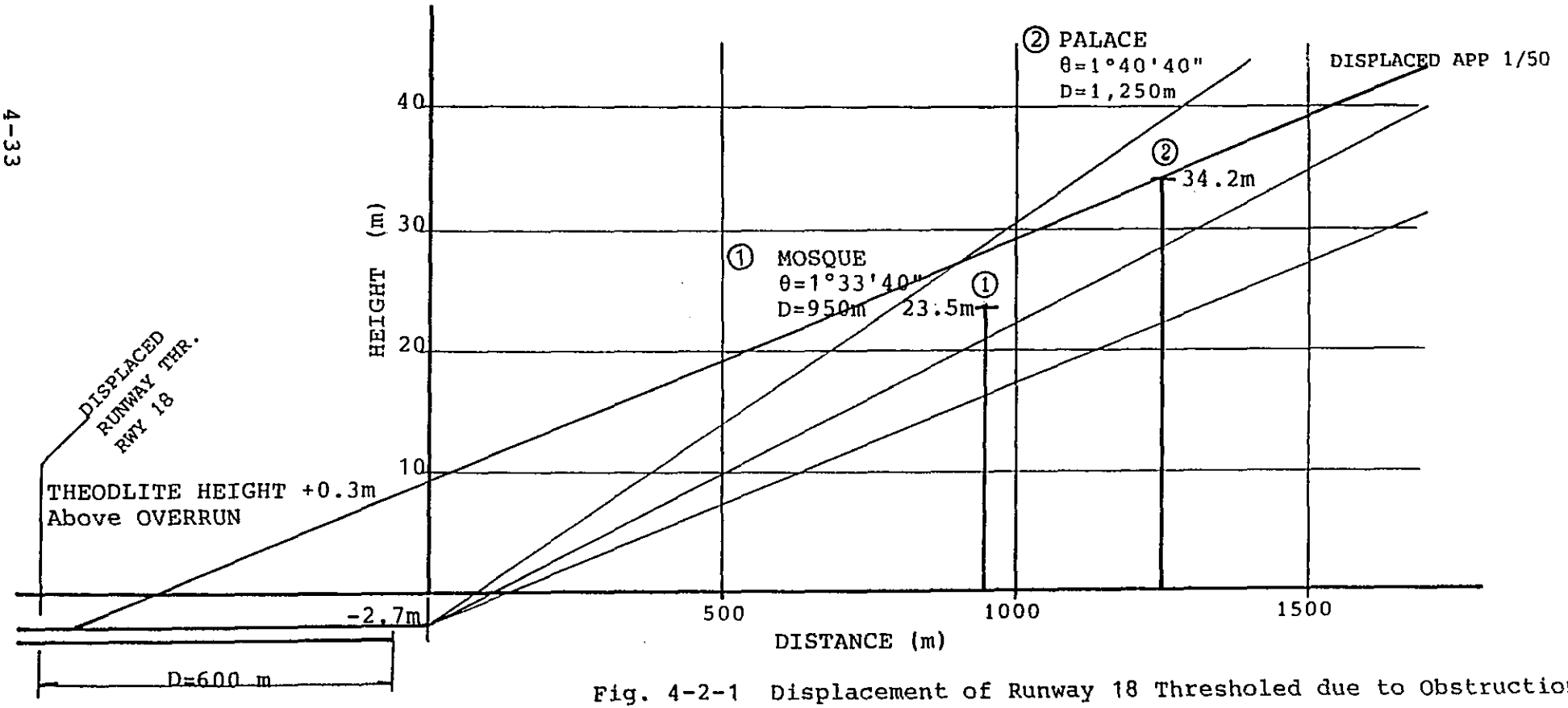


Fig. 4-2-1 Displacement of Runway 18 Thresholed due to Obstructions

The following three alternatives are finally selected and compared with each other for the redevelopment plan of Nozha airport.

Alt.-A : Extension of RWY04 threshold to the south west

Alt.-B : Extension of RWY22 threshold to the north east

Alt.-C : Extension of RWY36 threshold to the south.

Although an extension of the old runway 13/31 is also conceivable, this scheme has been precluded for the following reasons:

- Many obstacles protrude upon the approach surface (RWY13) and take-off climb surface (RWY32) as same as RWY18.
- More serious aircraft noise polution than Alternative-c is foreseen because the flight path will more widely cover the densety populated residential area as shown in Fig. 4-4-1 and 2.
- It is obvious that this scheme will require the higher construction cost than that for the extension of RWY 36 because the runway does not substantially exist, and thus, more construction work is necessary.

(1) Alt.-A : Extension of RWY04 Threshold to South West

Alternative-A is a scheme to reclaim from Lake Maryut, and to extend the existing runway toward south west and across the drinking water canal. The existing desert road to Cairo will be relocated. The reclamation is about 39 ha. in area, and requires an earth work volume of about 1.8 million cu.m. Two existing canals (drinking water and drainage) will be replaced with box calvert in order for them to cross under the extended runway. The desert road will be relocated outside the expanded airport area so that any vehicle traffic and lighting pole along the road will not infringe the obstacle limitation surfaces. The reclamation area in Lake Maryut is 1.5m in depth of water on the bottom which is generally formed by two strata, i.e. the upper stratum of about 6m thick is of silty clay (N = 0 to 3) and the lower stratum of stiff clay silt with N value of 14 to 26. Since reclamation on the weak foundation will cause an adverse residual settlement, the counter measures should be required for the subgrade of runway and taxiway in order to minimize pavement overlay work after the completion of the construction. Replacement of weak soil by sand will be required under the pavement area taking into consideration the allowable residual settlement after the reclamation, cost-effectiveness of the construction and necessary period for the construction. The replacement will be carried out by filling sand after dredging out the weak soil under the pavement area as shown in Fig. 4-3-2.
The required volume of sand is estimated to be 1.1 million cu.m in total.

For the bank around the extended area on which airport perimeter road is planned, the reclamation will be started from the shore by filling up sand as is commonly practiced in Lake Maryut .

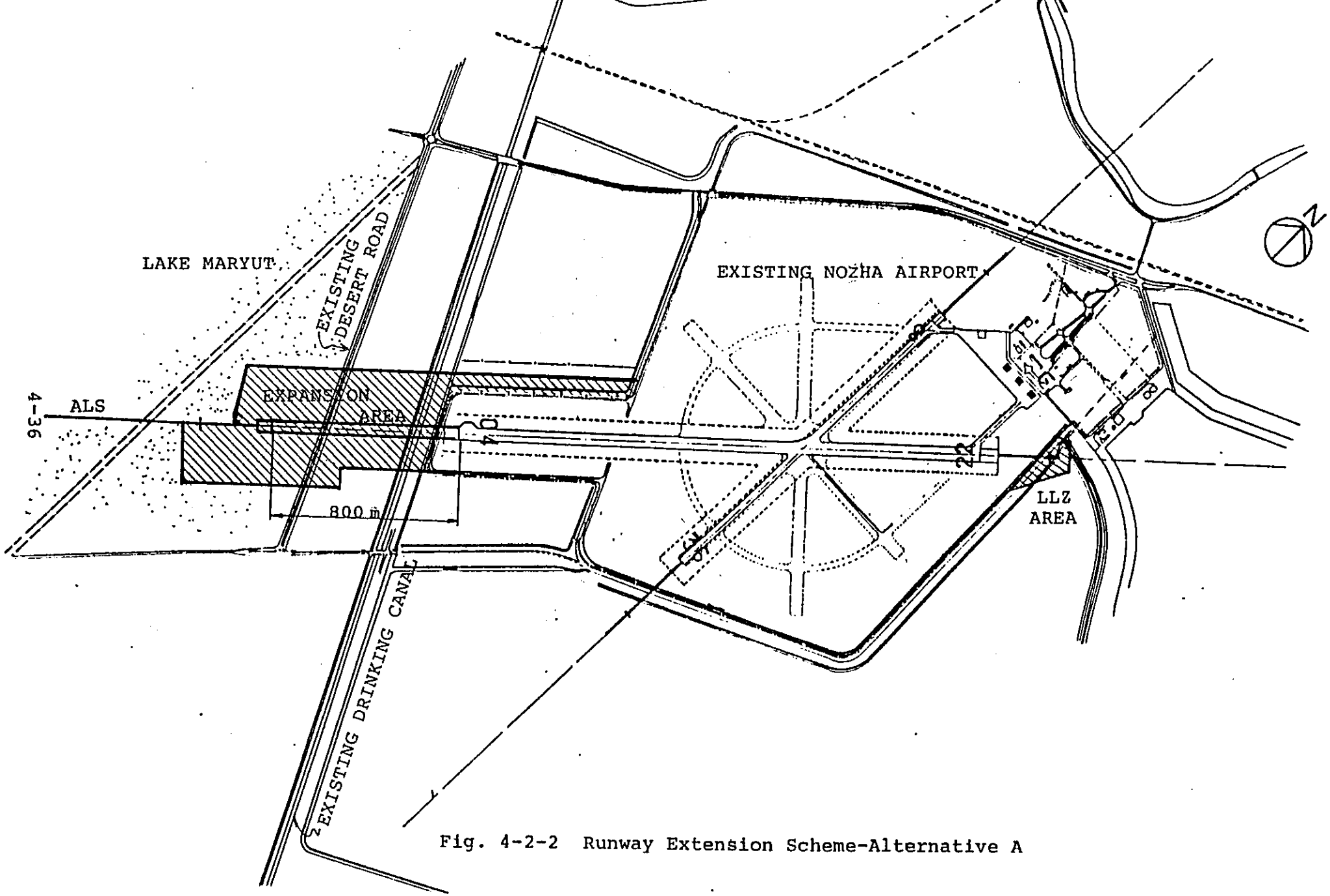


Fig. 4-2-2 Runway Extension Scheme-Alternative A

For the area other than the pavement, the dredged soil will be used for reclamation.

The relocation of the desert road will extend for about 2.4km and require 670 thousand cu.m of borrow sand for its reclamation.

Box culvert as pressure conduit will be necessary for the drinking water canal to cross the restricted area of the airport because the planned elevation of the runway is about the same as the water level.

(2) Alt.-B : Extension of RWY 22 Threshold to North East

Alternative-B is a scheme to reclaim from the former marine airport and to extend the existing runway by 500m toward the northeast.
A part of Lake Maryut will also be reclaimed in order to secure the critical area of ILS glide slope facility.

The reclamation area is about 24 ha in total and about 60 percent of Alternative-A. The earth volume necessary for the reclamation is about 1.2 million cu.m.

The reclamation method will be as same as Alternative-A and the necessary sand volume will amount to 540 thousand cu. m. The marine club, fish pond and houses in the RWY 22 extension area should be removed.

The existing drinking water canal near RWY 04 threshold will be relocated outside ILS glide slope area.

It should be noted that strict control of obstacles (height restriction) should be necessary in the area marked ① in Fig. 4-2-3, because the approach surface (1/50) and transitional surface (1/7) are only about 7m away from the ground level. This area should be acquired to be included in the airport property area if it is difficult to control the height of buildings. Alternative-B will cause larger aircraft noise pollution to the township than Alternative-A, because the runway becomes consequently 800m closer to the community.

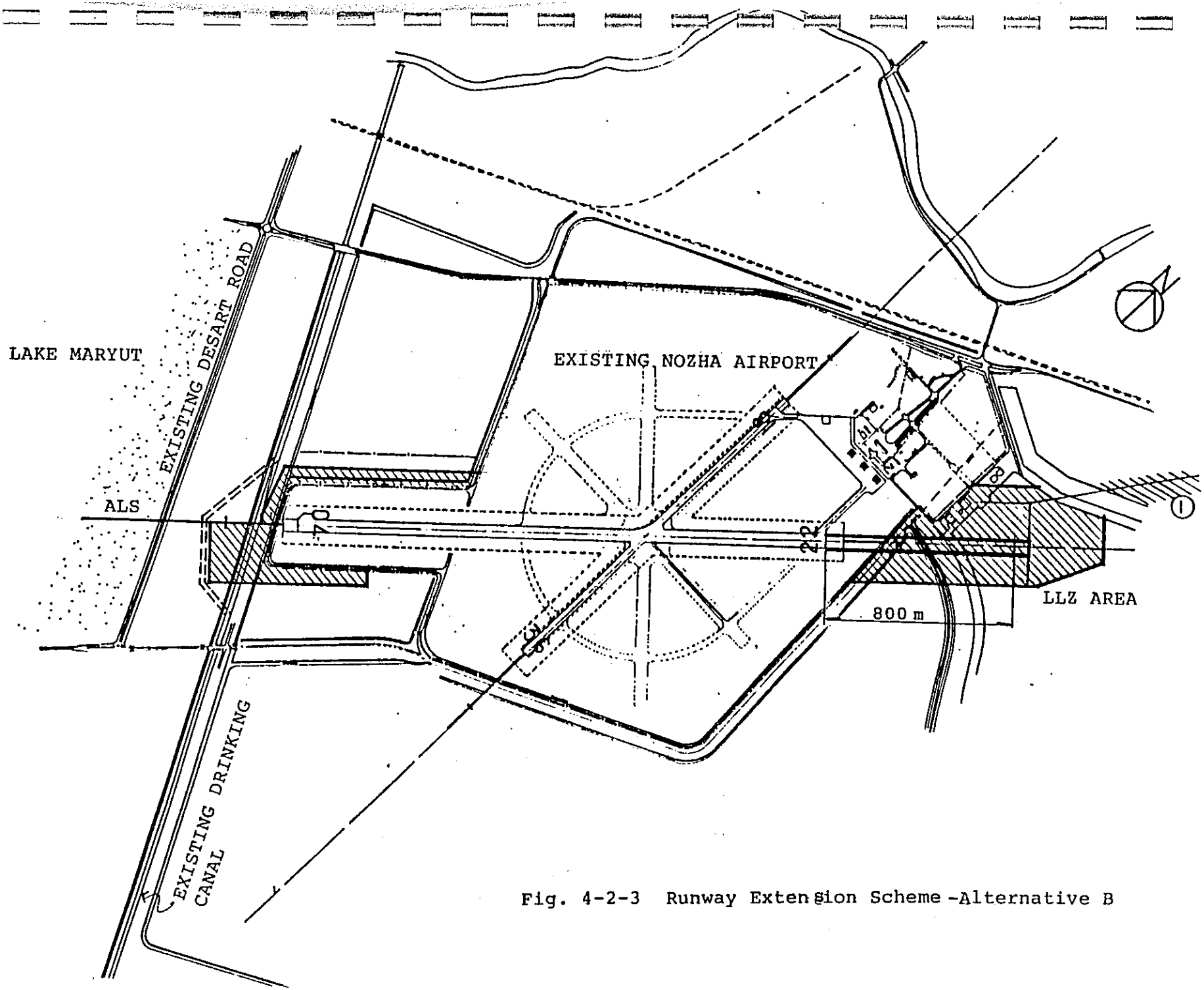


Fig. 4-2-3 Runway Extension Scheme -Alternative B

(3) Alt.-C : Extension of RWY 36 Threshold to South

Alternative-C is a scheme to extend the runway 18/36 to south. The threshold of the runway 18 will be displaced 600m to the south. Thus, more than the half of the runway length is projected outside the existing airport property area, as shown in Fig. 4-2-4. An area of about 92 ha, which is a paddy field at present, will be acquired for the extension. This area is also reclaimed land on Lake Maryut, thus the soil condition is judged to be very poor. The most adverse factor in Alternative-C is aircraft noise pollution to the densely populated residential area along the extended center line of runway. (refer to Fig. 4-4-2).

Although there is a great potential of aircraft noise problem irrespective of concept of development as long as Nozha airport is considered to be further developed for the future traffic need, Alternative-C will suffer from the most serious noise problem among other.

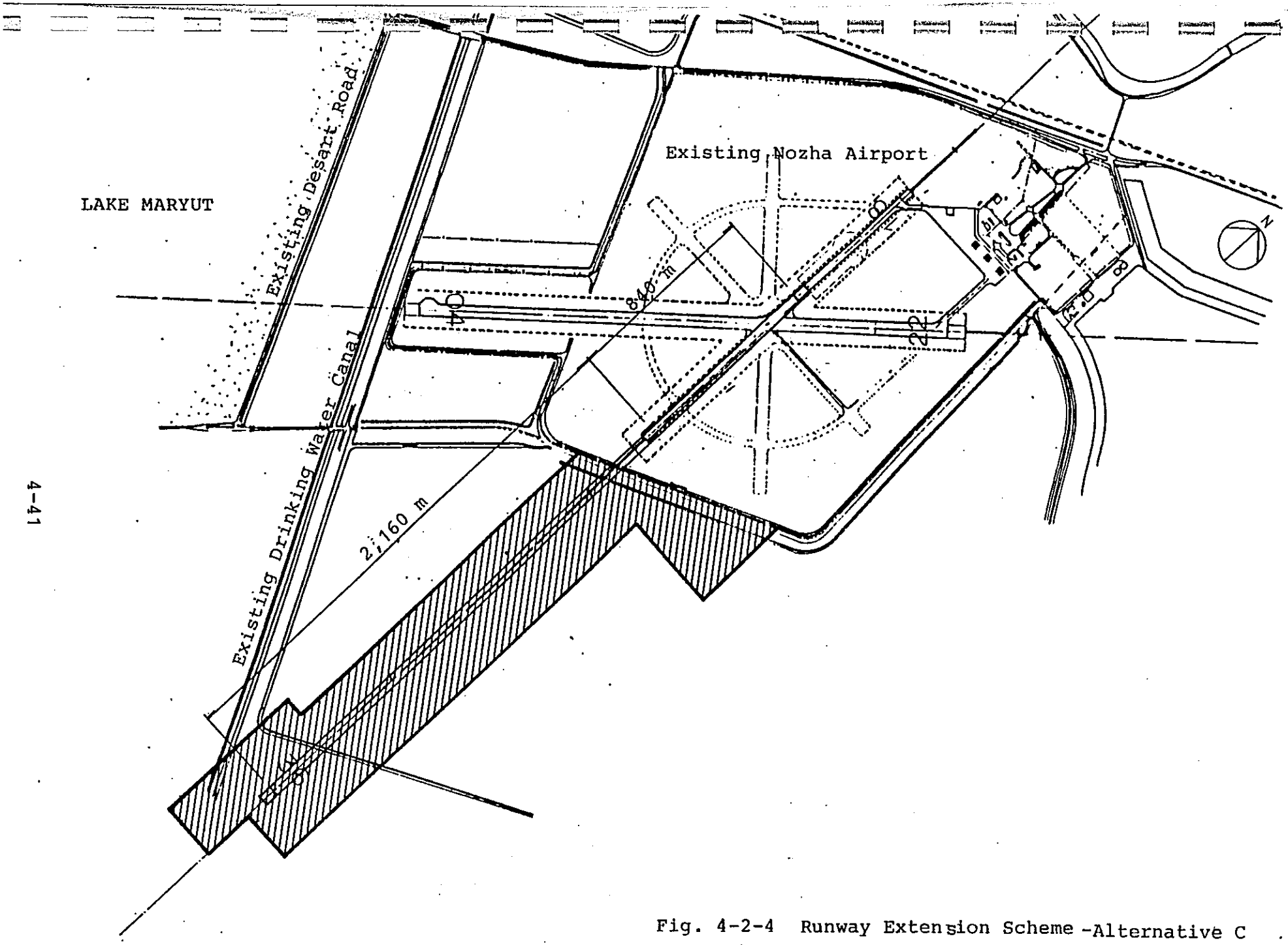


Fig. 4-2-4 Runway Extension Scheme -Alternative C

(4) Comparative Evaluation of Alternatives

Table 4-2-1 shows the comparative evaluation of three alternatives.
The preliminary cost estimate for civil works indicate that Alternative-A (extension of RWY 04 threshold to the south west) requires the highest cost (about 41 million Egyptian Pounds) while Alternative-C (extension of RWY 36 threshold to the south)requires the lowest cost (about 30 million Egyptian Pounds).
However, Alternative-C will influence the township of Alexandria by much greater aircraft noise. The influenced area (more than WECPNL70, refer to the subsection 4-4-1) by aircraft noise will greatly spread to 850 ha.

The most essential things for location of a new runway are the safety of aircraft operations and compatibility with airport surrounding area. Among others, it is the prerequisite in today's airport planning to minimize an aircraft noise influence to the airport vicinity and a cause of social movement to raise a noise problem.
The airport in Alexandria will play an important role as the gateway to both Egypt and Alexandria, and an alternative airport for Cairo as well. Nozha airport will be required to operate for 24 hours daily if this airport is selected for future use. It is therefore, recommended that Alternative-C with greater potential to cause noise problems in future should not be selected.
Although Alternative-C is 5 to 11 million Egyptian Pounds cheaper than the other alternatives, this difference will be set off and even reversed by a possible noise compensation in future. The extension of the runway 18/36 will furthermore, require a land acquisition of a vast agricultural land (paddy field). The demolition of the agricultural land is not recommeded for airport-use where other alternatives are possible.

Alternative-B is 6 million Pounds cheaper than Alternative-A. Therefore, Alternative-B, extension of Runway 22, is selected as the most suitable scheme for the redevelopment of Nozha airport in order to compare with the development scheme for a new airport. However, it is noted that any substantial development of Nozha airport has a great potential to cause aircraft noise problem in future.

Table 4-2-1 Comparative Table for the Extension of Runway

Item \ Alternative	Alternative-A RWY 04 Extension	Alternative-B RWY 22 Extension	Alternative-C RWY 36 Extension	Remarks
1. Runway to be extended	800m toward the south west.	800m toward north east.	2,160m toward south *	* The Threshold of RWY 18 is displaced to the south by 600m
2. Pavement Overlay Length Required for the Existing Runway.	2,200m	2,200m	70m	
3. Necessary Land Acquisition	Approximaterly 1 ha.	Approximately 5 ha.	Approximately 105 ha.	
4. Reclaimed Area	39 ha.	24 ha.	0	
5. Earth Work Volume Cut Fill (Including reclamation and sand mat)	---- 2,400 thousand cu. m	100 thousand cu. m 1,200 thousand cu. m.	---- 1,100 thousand cu. m.	
6. Other Major Works	Relocation of the desert road to Cairo (about2.4km) and drinking water canal	Relocation of drinking water canal	Relocation of drinking water canal.	
7. Social Considerations	Larger noise pollution to the township on the north east of airport	Larger noise pollution to the township on the north east of airport. Height restriction in the industrial zone below RWY 22 approach surface to be strictly necessary	Largest noise pollution to the township on the north of airport. Land acquisistion of paddy field to be newly necessary.	
8. Preliminary Cost Estimate for comparison,incl. land acquisition removal and Civil works.	41 million Egyptian Pounds	35 million Egyptian Pounds	30 million Egyptian Pounds	

4-2-2 Airport Layout Plan

Fig. 4-2-5 shows the airport layout plan for the redevelopment of the existing Nozha airport, and the concept for layout is explained hereinafter.

(1) Runway

Runway 22 is planned to extend by 800m toward the north east on the former marine airport. This extension will require a land acquisition of about 5.2 ha and a reclamation from the former marine airport which is estimated to be an area of about 21 ha. and an earth volume of about 1 million cu. m. Fish pond, marine club, buildings, etc. should be removed for the extension of the runway.

(2) Obstacle Limitation Surfaces and Aircraft Operations Considerations

i) Obstacle limitation surfaces

An obstacle survey work was carried out to confirm existence of obstacles approach area for Runway 22 of Nozha airport. As a result of obstruction survey work, it was confirmed that nothing protrude upon the 1:50 slope of approach surface for Runway 22 even if Runway 04/22 is extended by 800 meters toward the north east. However, an adjustment of the future land use for the north side of the former marine airport is considered necessary in order to ensure the safety for aircraft operations in the final approach segment for Runway 22 as shown in Fig. 4-2-6.

According to "Comprehensive Plan Alexandria 2005" issued by Governorate of Alexandria,1984, this area is included in the proposed industrial area.

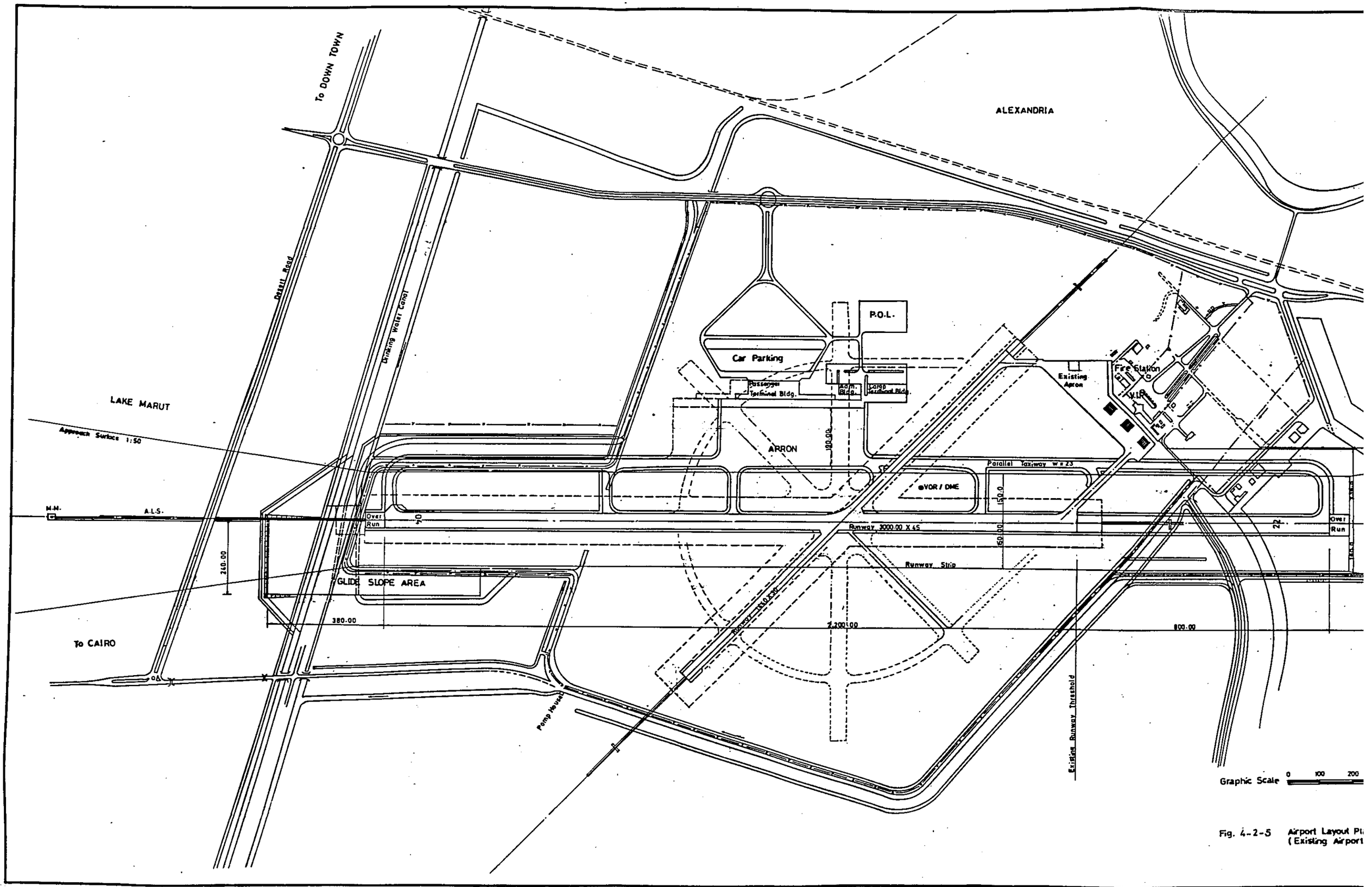


Fig. 4-2-5 Airport Layout Pl
(Existing Airport

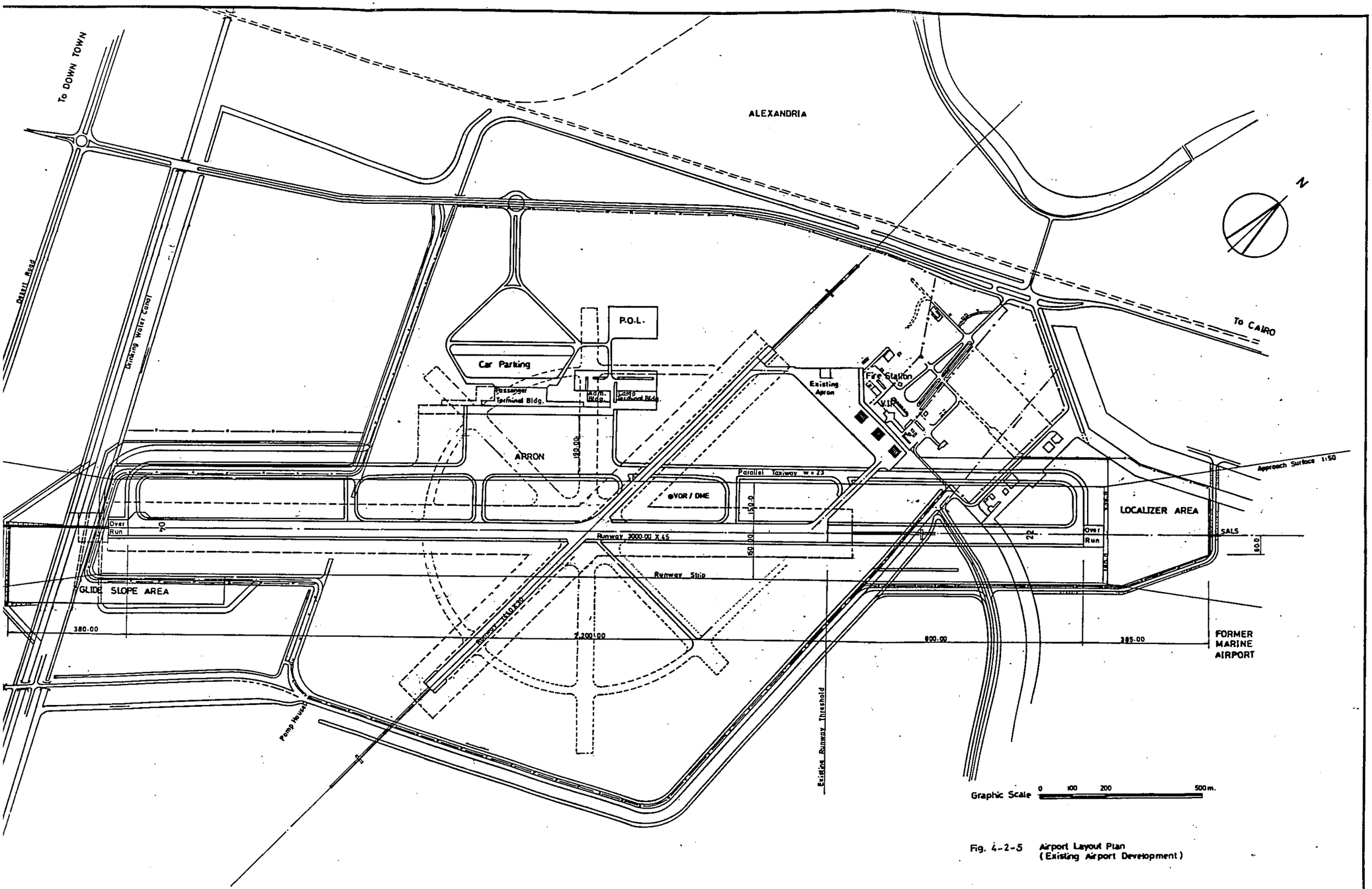


Fig. 4-2-5 Airport Layout Plan
(Existing Airport Development)

Furthermore, visibility on approach end of Runway 22 will be reduced by smoke of factories. It is, therefore recommended that a land use regulation should be set forth in the northern area of the airport so that any building or factory may not constitute obstacle nor emit smoke in this area.

ii) Aircraft operational considerations

The main approach direction to the runway 04/22 has been considered RWY22 by the previous study report (NACO) and the construction of approach lighting system for RWY 22 is underway. The main appraoch direction to the runway 04/22 has, however, been changed to RWY 04 for the precision approach category-I operations for the following reasons:

a. ILS approach procedures to RWY 22 conflict with the danger area; i.e. HE/D12 "El Maamura", a sector of a circle centered 311740N, 300200E, radius 20km between directions 305° and 035° as shown in Fig. 4-2-7.

b. The wind analysis indicates that the usability factor of RWY 04 exceeds that of RWY 22 in the coverage of the cross-wind component less than 13kt and the tail wind component less than 5kt as shown in Figs. 4-2-8 and 9.

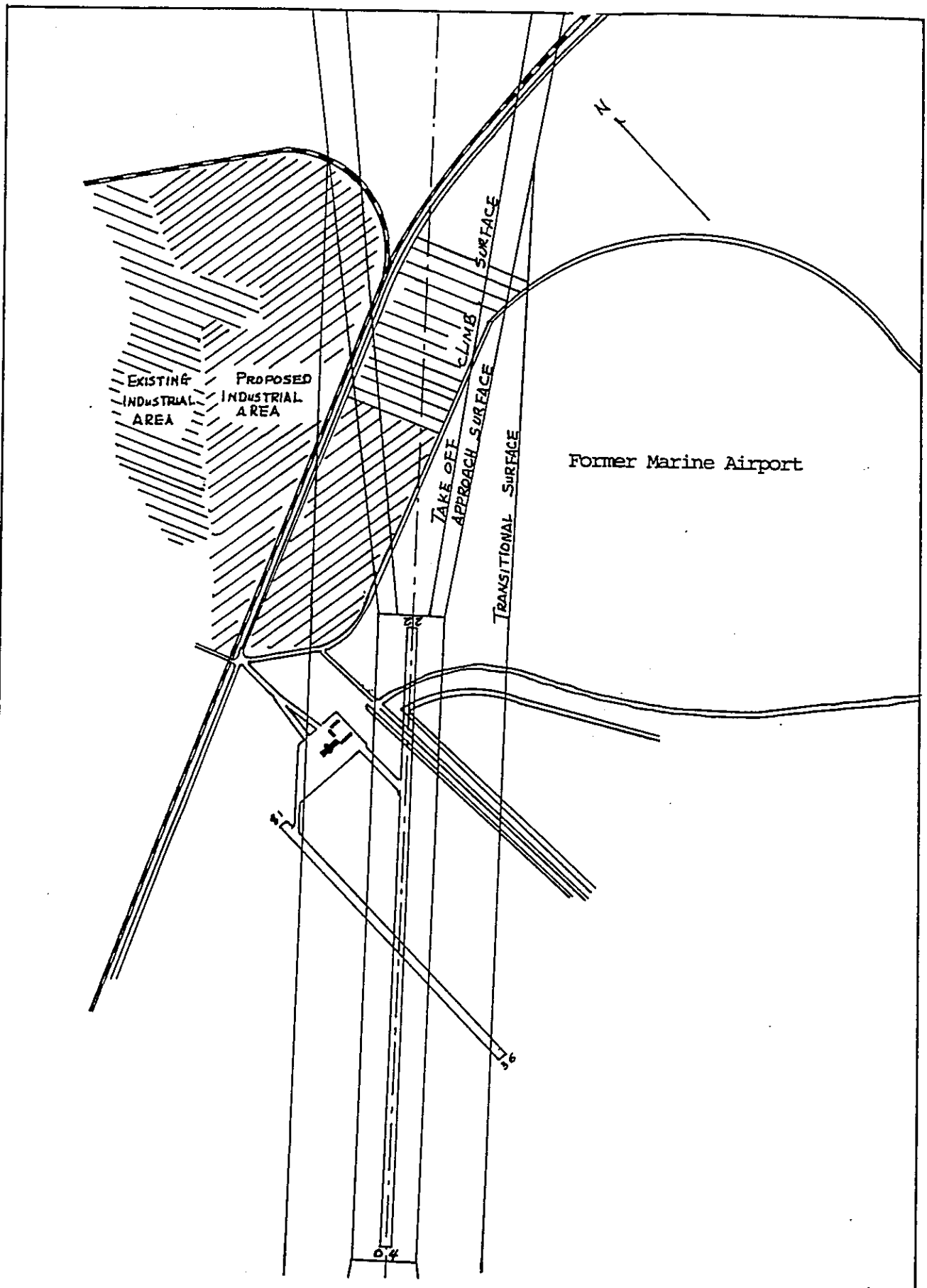


Fig. 4-2-6 Relations between final segment of approach area for Runway 22 and proposed industrial area

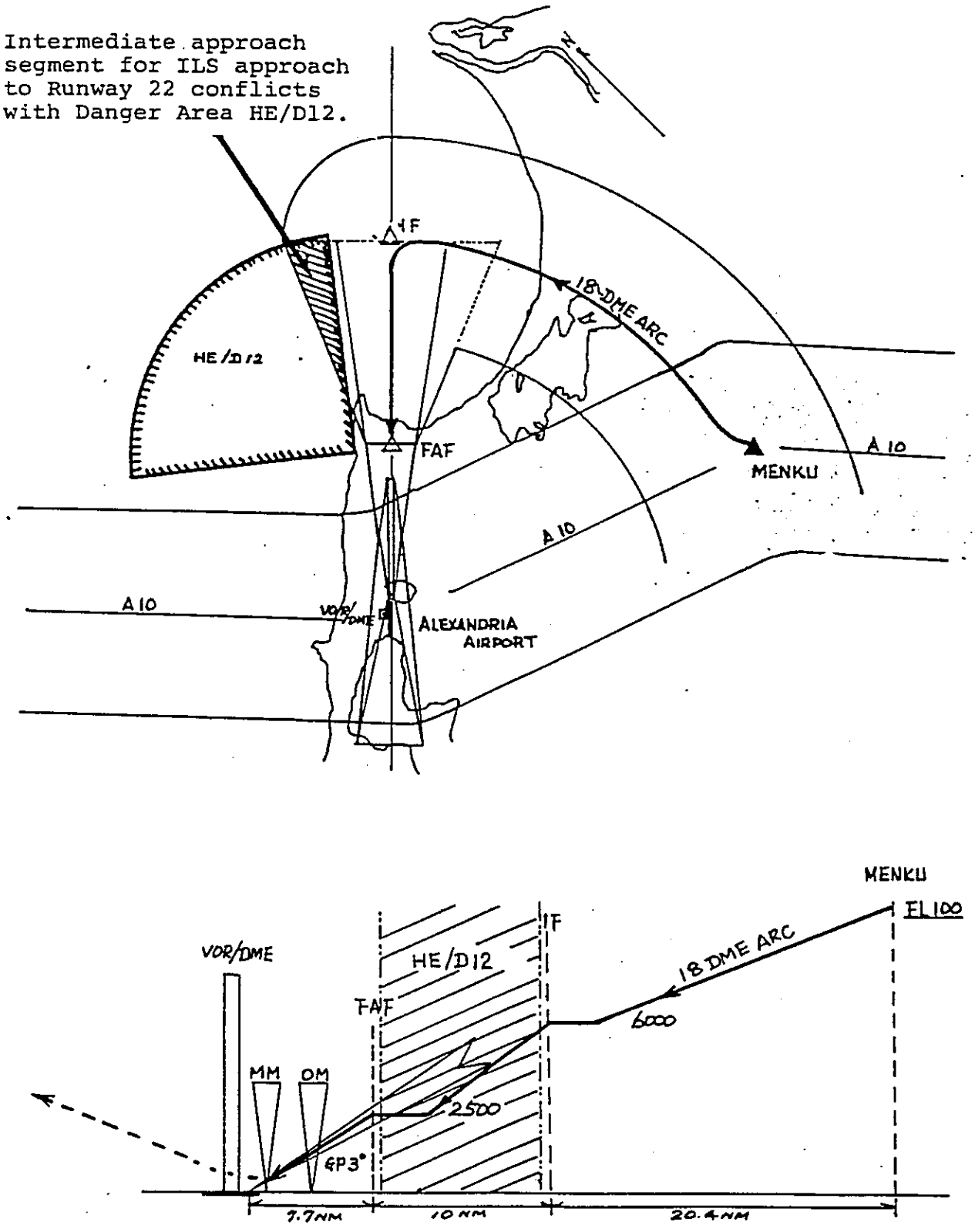
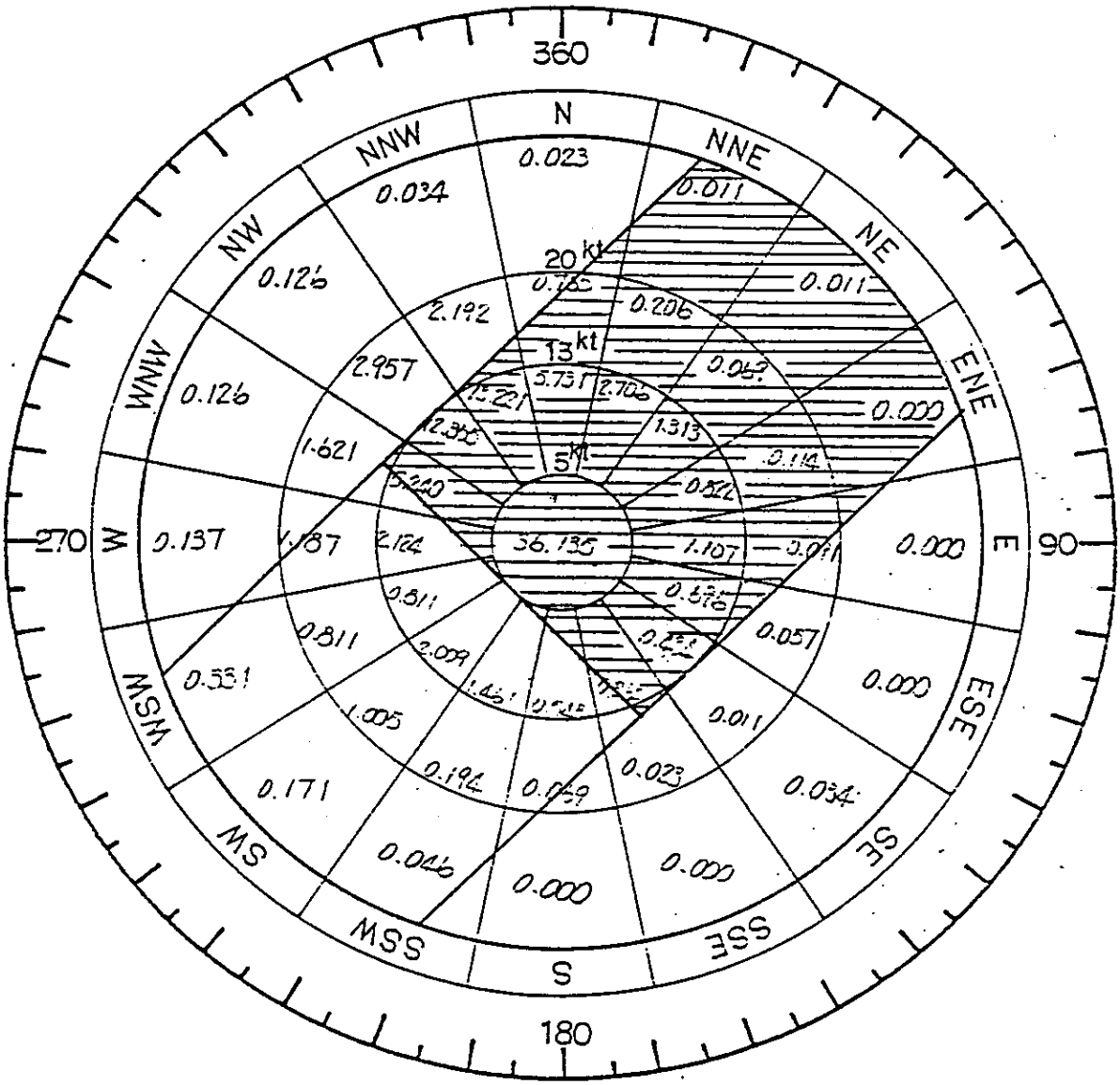
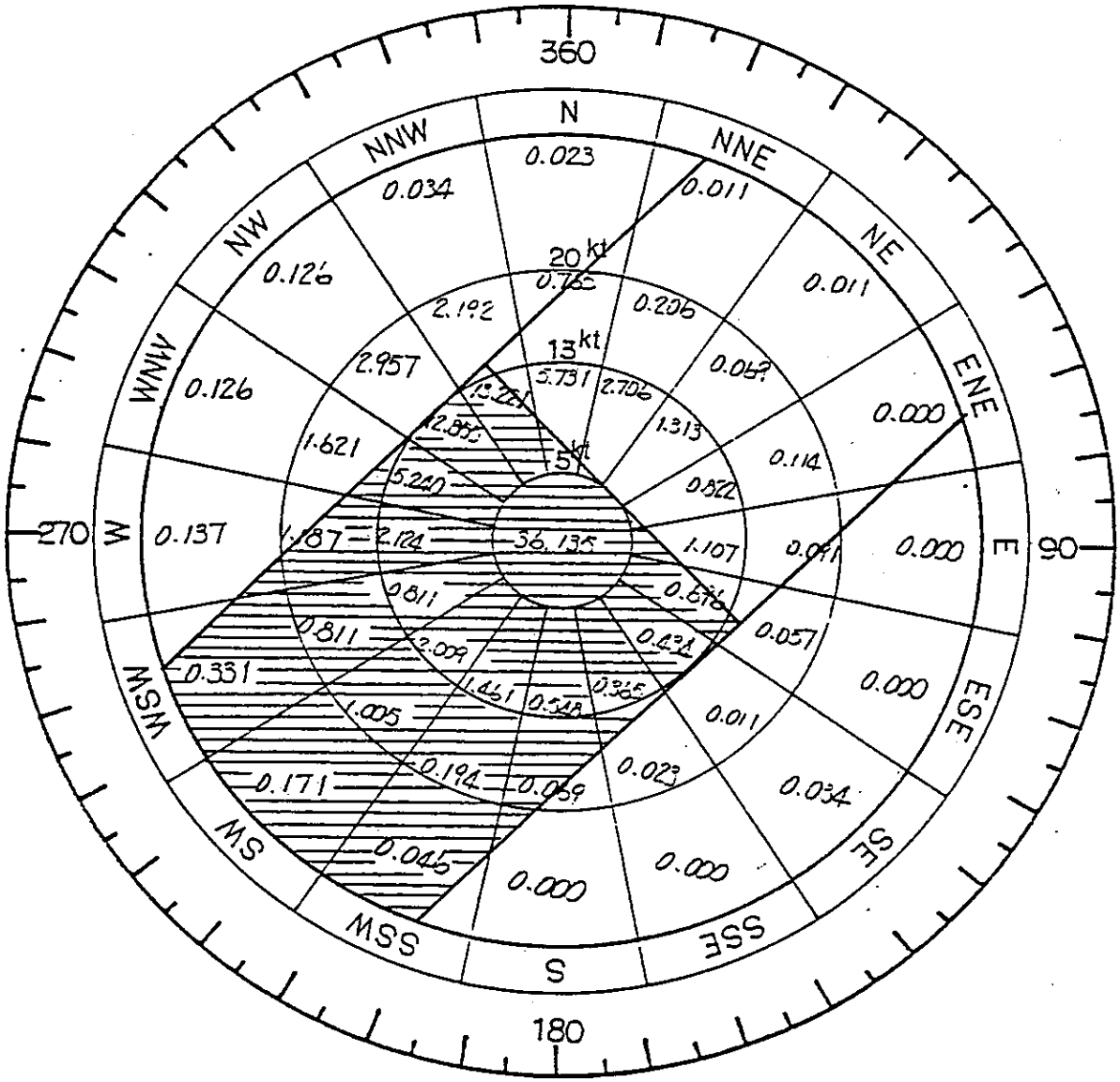


Fig. 4-2-7 Relations between Danger Area HE/D12 and intermediate segment for ILS approach to Runway 22



LOCATION : NOZHA AIRPORT
PERIOD : 1981-1983 (3YEARS)
R/W DIRECTION : N 45°30' E
WIND COVERAGE : 81.7% (CROSS WIND 13Kt)
(TAIL WIND 5Kt)

Fig. 4-2-8 Usability Factor of RWY04



LOCATION : NOZHA AIRPORT
PERIOD : 1981-1983 (3YEARS)
R/W DIRECTION : N 45°30' E
WIND COVERAGE : 78.6% (CROSS WIND 13Kt)
(TAIL WIND 5Kt)

Fig. 4-2-9 Usability Factor of RWY22

(3) Taxiway

The parallel taxiway is located at 180m from the center line of the runway in accordance with ICAO standards.
The location and number of the perpendicular exit taxiways are planned considering the turn-off distance of various aircraft, as shown in Fig. 4-2-10. A part of the existing taxiway at the runway 22 threshold will be overlaid and be used for a portion of a new exit taxiway.

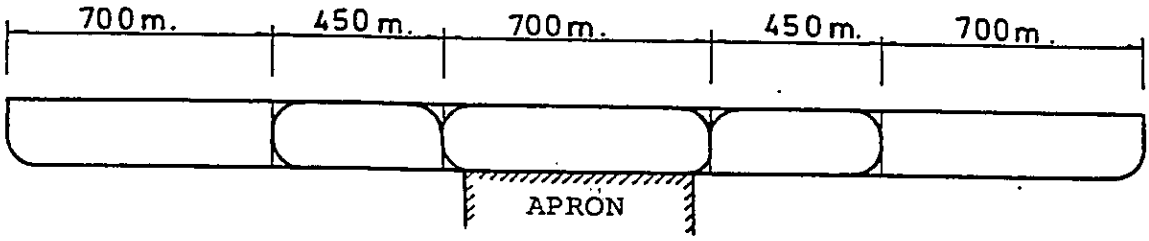


Fig. 4-2-10 Location of Exit Taxiways

(4) Apron

The aircraft parking configuration is planned to be a linear concept for the least pavement area. Boarding bridges will be equiped for better passenger services.

(5) Layout of terminal facilities

The existing terminal facilities are located at the north end of the runway. The existing terminal facilities are not considered suitable for the expansion to cope with the future traffic demand because of their obsolence, limited size and old system. Three alternative areas as shown in Fig. 4-2-11 can be considered for the development of the future terminal facilities.

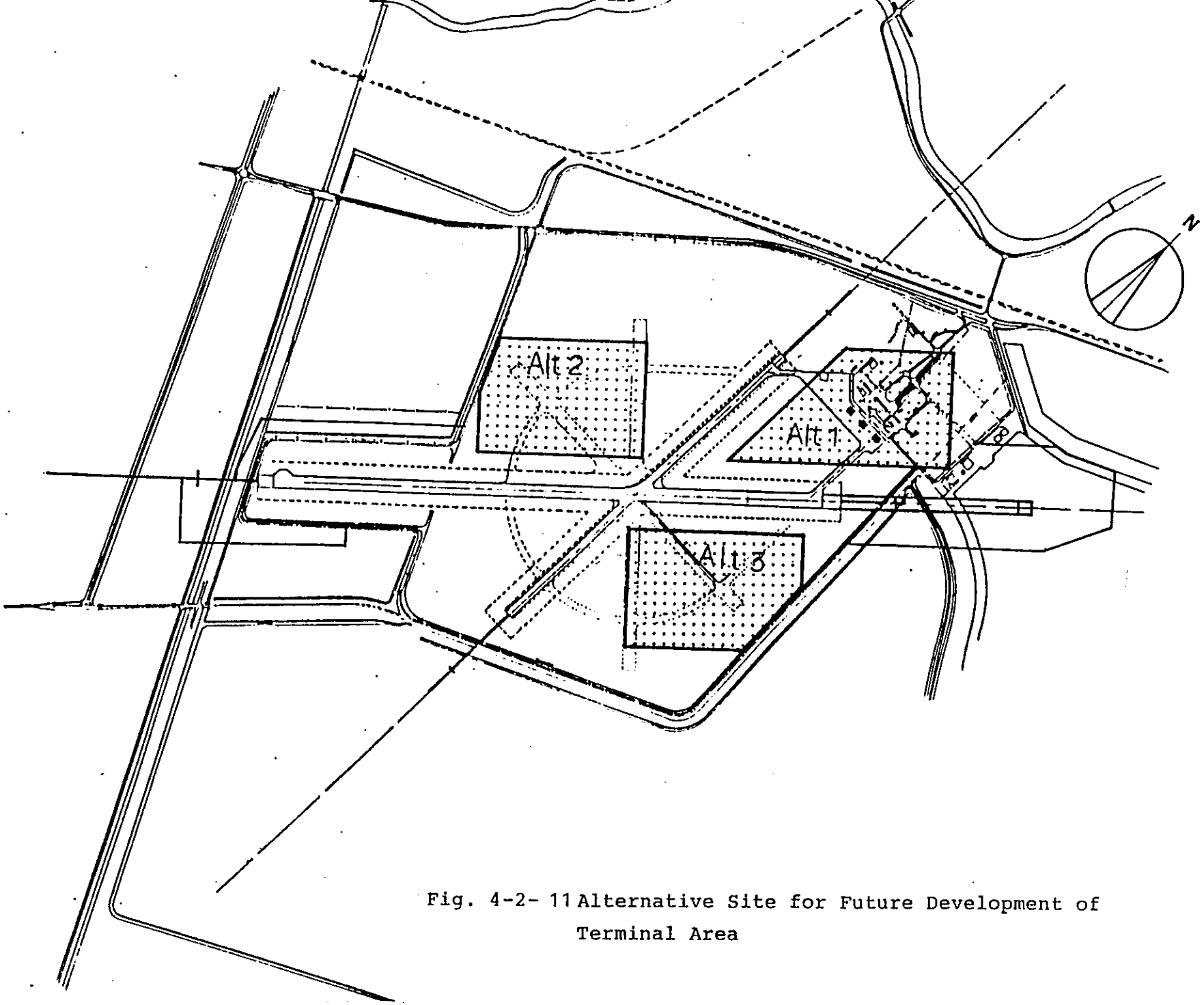


Fig. 4-2- 11 Alternative Site for Future Development of Terminal Area

Table 4-2-2 Comparative Evaluation of Terminal Area

Evaluation Item \ Alternatives	Alternative-1		Alternative-2		Alternative-3		Remarks
1. Location of Terminal Area (from the viewpoint of aircraft operations and airport operations)	△	Area of the existing terminal facilities. North end of the main runway	O	About gravity center of the airport and about midway of RWY 04-22	△	About gravity center and midway of RWY04-22 but communications to be made across runway if any facility remains on northwest	Legent O Good △ Fair X Poor
2. Effective Utilization of the Existing Terminal Facilities	X	The existing terminal facilities to be demolished. No effective use of the existing terminal facilities is available.	O	The existing fire-station, heliport, VIP building could be utilized. The existing apron and buildings could be used for small aircraft.	O	The existing fire-station, heliport, VIP building could be utilized. The existing apron and building could be used for small aircraft.	
3. Access Road*	O	Least distance to the desert road.	O	About 0.2 km of new access road directly to the desert road to be constructed.	X	About 2.5 km of new access road detouring around the main runway to be constructed.	* Access road in airport property.
4. Constructional Factor	X	The construction may disrupt the operation of the existing terminal. Construction on the weak foundation.	△	Construction on the weak foundation	△	Construction on the weak foundation.	
5. Future Expansibility	O	To be expanded to the former marine airport.	O	To be expanded on the North along RWY 18/36 Larger expansibility	△	To be expanded to the South along RWY 18/36. The least expansibility.	

Table 4-2-2 indicate their comparative evaluation. As a result of the comparison with each other, Alternative-2 is considered to be superior to the other alternatives in terms of location, expansibility and construction and is selected for a development of new terminal area.

(6) Passenger Terminal Building

The passenger terminal building is considered to be a linear concept building with both international passenger and domestic passenger processing facilities. Boarding bridges are planned for enplaning and deplaning of passengers. The airside of the building will be 2 story separating departing and arriving passengers, and the landside 1 story.

(7) Cargo terminal building

Cargo terminal building is sited as shown in Fig. 4-2-5 considering the phased development of the apron and passenger terminal building and their respective expansion area.

(8) Administration Building and Control Tower

The administration building and control tower is sited separately from the passenger terminal building and near the gravity center of the runway for the easiness of air traffic control.

4-3 Airport Facility Planning

Airport facilities have been preliminarily planned for the comparison between the redevelopment of Nozha airport and the development of a new airport.

4-3-1 Runway Profile and Grading Plan

The runway profile in the reclaimed area is planned as shown in Fig. 4-3-1 so that the elevation of the runway will be at least 2m above the water level of the former marine airport, or the pavement of the runway will be at least 1m above the water level. As a result, the runway slope is planned at 0.5 percent upward toward the extended RWY22 threshold as shown in Fig 4-3-1. The existing runway will require pavement overlay of about 45cm thick for Case-3 traffic (2million pax.).

4-3-2 Pavement Structures

(1) Improvement of Subgrade Soil

The existing land of Nozha airport is reclaimed from Lake Maryut by the dredging soil, and the ground water table is very high (about 0.5 to 0.7m below ground level). According to the previous study (NACO), it is reported that very soft clay (qc= 1 to 3 Kg/cm^2) of 6m thick lies below the ground. This was confirmed by N-value of 0 to 2 obtained from soil investigation performed by JICA.

It is obvious that movements of large jet aircraft will c use a significant uneven settlement due to the consolidation of the foundation if a pavement is constructed on the weak foundation without any measure. Hence, the improvement of subgrade soil is mandatory and the improvement by sand drain is planned because of the thickness of weak soil stratum, i.e. 6m as shown in Fig. 4-3-3. The sand-drain is applied for acceleration of consolidation settlement. By this improvement, CBR value of 10 percent and K75 of 5 Kg/cm3 will be obtained on the subgrade.

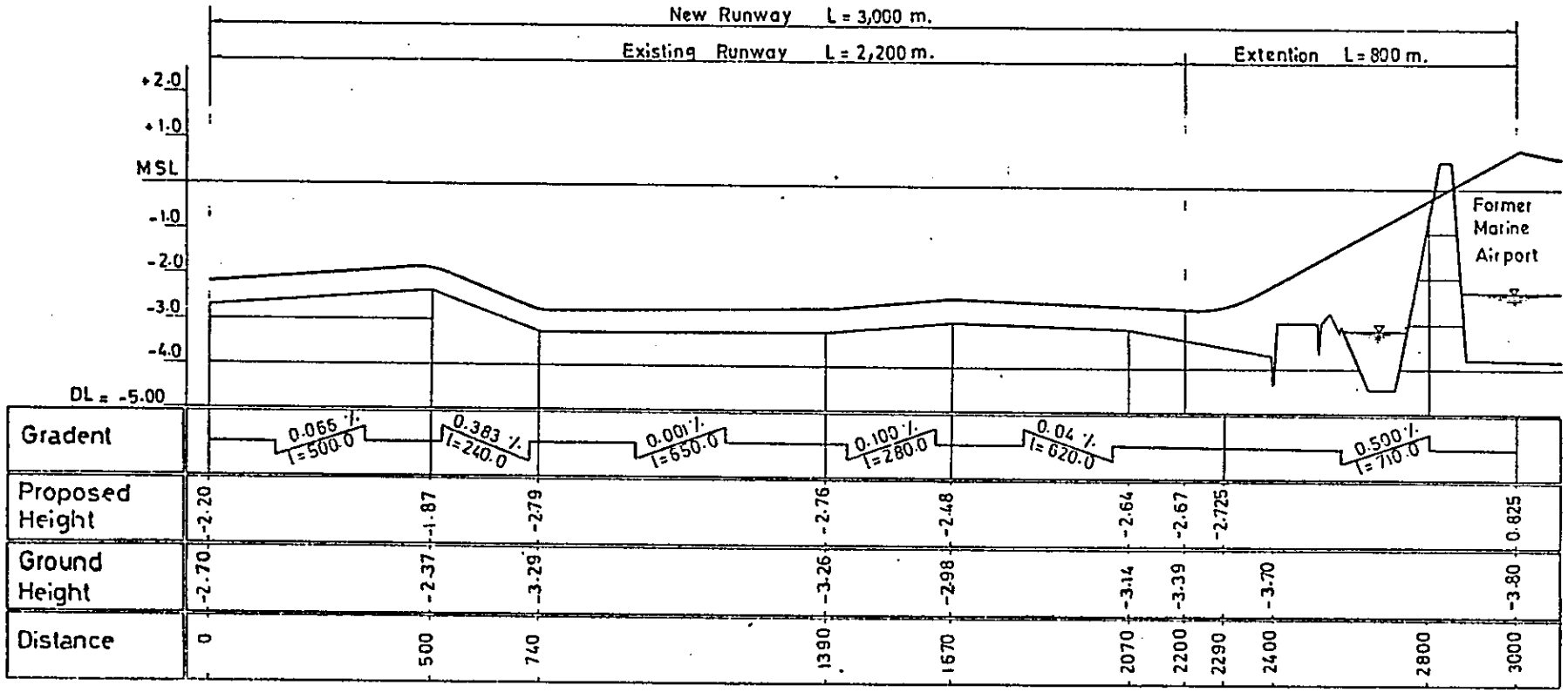


Fig.4-3-1 Proposed Runway Profile

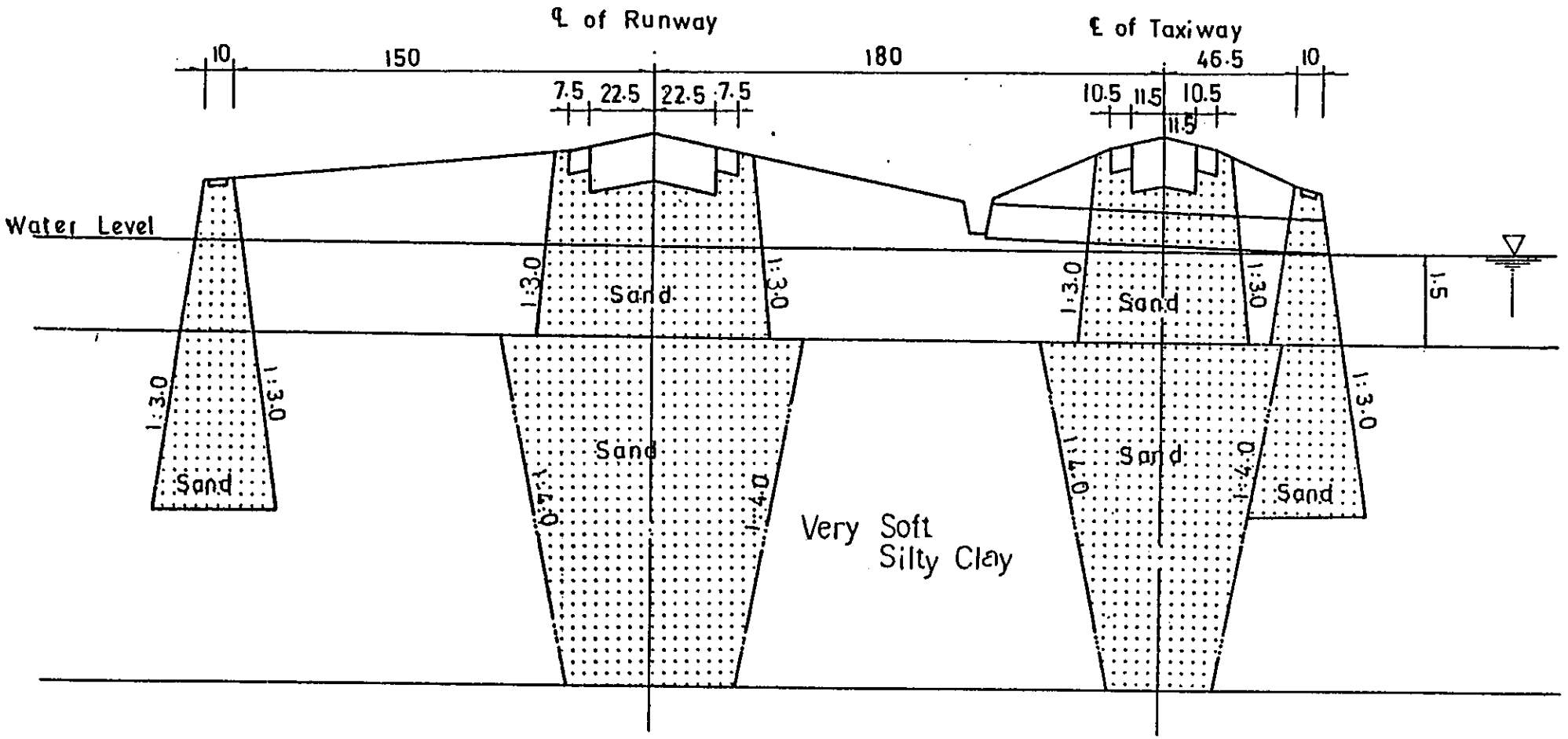


Fig. 4-3-2 Typical Cross Section at Nozha

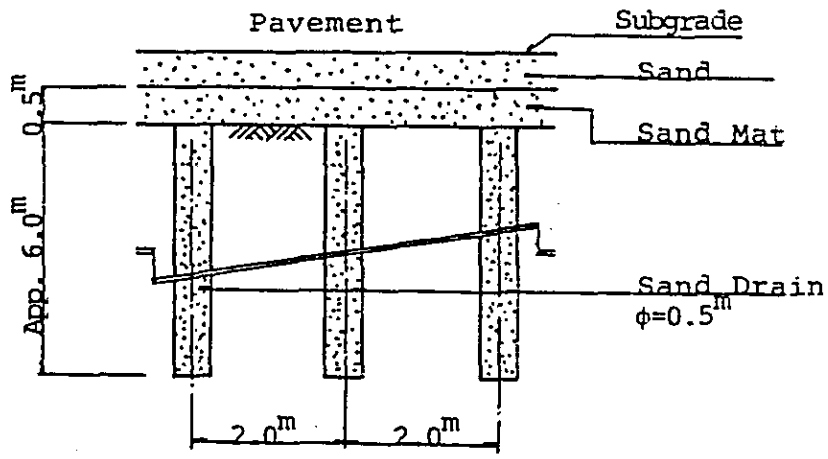


Fig. 4-3-3 Typical Cross Section of Sand Drain

(2) Types of pavement

There are two types of pavement namely the rigid pavement (cement concrete) and the flexible pavement (asphalt concrete).

The flexible pavement is considered suitable for this project except for the passenger loading apron where the rigid pavement is prefered due to fuel spillage and possible subsequent rutting or defacement of the flexible pavement surface.

(3) Pavement thickness

The thickness of the flexible pavement and rigid pavement are determined based on the Corps of Engineers Method and PCA Method respectively.

The applied design criteria and standard pavement thickness are as follows:

1) Ultimate annual passengers in the design period:

Annual passengers of 2 million

Design aircraft :A-300-B4

Design period :10 years

Repetition of design load : 3,000 times

a) New runway and taxiway

Subgrade CBR value : 10%

Component	Thickness
Bituminous surface course	4cm
Bituminous binder course	4cm
Ditto	5cm
Graded aggregate base course	30cm
Crusher-run subbase course	33cm
Total	76cm

b) Overlay on existing Runway 04-22

Subgrade CBR value : 3%

Thickness of bituminous overlay : 23cm

c) New Apron

Subgrade K value : K_{75}= 5.5 Kg/cm³

Base course K value : K_{75}= 7.0 Kg/cm³

Component	Thickness
Cement concrete slub	30cm
Graded aggregate base course	30cm
Total	60cm

4-3-3 Drainage

According to the meteorological data (1964-1983) at Nozha airport, the annual minimum rail fall is 47.5mm (1982); the maximum, 148.5mm (1974); and the annual mean, 81mm. The daily maximum rain fall is 31mm (Oct. 1973) and there is generally little rain fall from May to September. Meteorological Authority reports that a hourly rain fall intensity is less than 8mm per hour. The existing terrain at the airport property area is mostly flat, thus it is difficult to drain by slop to the existing drainage. It is judged that no special drainage facility is required since the amount of rain fall is very small and an infiltration effect to the ground water can be expected because of permeable soil.

4-3-4 Buildings

The structure of the buildings is planned by reinforced concrete structure. Due to the weak foundation, pile foundation is necessary for the passenger terminal building, administration building, and control tower. Four piles with a diameter of 300mm (500mm for control tower) and 12m long will be necessary per 100 sq.m.

4-3-5 Air Navigation Systems

The air navigation systems required for category-I operation will be preovided when the runway extension to 3,000m is implemented as listed in Table 4-3-1. Life time of these electronics equipment is generally, as maximum, around 10 years if the necessary maintainence work is carried out. The maximum use of the existing equipment is considered for the redevelopment plan.

Table 4-3-1 Air Navigation Systems Plan

Equipment	Outline	Remarks
RADIO NAVAIDS		
ILS	ILS RWY 04, category - I	
Locator	at outer marker station	
VOR/DME	Replacement of the existing equipment.	
MLS	Replacement of the ILS above.	
NDB	Replacement of the existing equipment.	
Navaids monitor and control equipment.		
ATC/COM		
Tower console		
VHF air/ground radio	5 frequencies Replacement of the existing equipment.	
UHF air/ground radio		
VHF link	Between outer marker station.	
AFTN teletype		
ISB radio	For AFTN TTY and ATS direct speech.	Back-up for commercial carrier
Tape recorder	Relocation of the existing tape recorder.	
Master clock and Interphone	ATC use.	

Table 4-3-1 Cont'd

Equipment	Outline	Remarks
LIGHTINGS		
Approach lighting System	RWY 04, Category - I.	Supporting struture on the lake
Simple approach Lighting system	RWY 22.	Ditto
Runway edge lights	Extension of the existing lights.	
Runway threshold/end lights	Relocation of the existing fixture.	
PAPI	Relocation of the existing lights.	
Taxiway edge lights	For parallel taxiway.	
Apron flood lights	For new apron.	
Illuminated Wind indicater	Relocation of the existing lights.	
Aerodrome beacon	Relocation of the existing lights.	
Air traffic light gun	For air traffic control tower.	
Power supply system		
MET		
Surface sensors	Surface wind, temperature, dew point rainfall	
Data collecting equipment	Automated data collection and recording.	
Runway visual range equipment	RVR measurement.	

Table 4-3-1 Cont'd

Equipment	Outline	Remarks
Ceilometer	Cloud height measurement	
Weather facsimile		
Weather Teletype		
HF receiver		
OTHERS		
Measuring equipment and spare parts		

4-4 Aircraft Noise Polution on the Area Surrounding Airport

The aircraft noise contour is preliminarily calculated and the noise influence is assessed in Progress Report in order to compare an environmental factor for the redevelopment of the existing airport and the development of a new airport.
Fig. 4-4-1 and 4-4-2 show the aircraft noise contours for various RWY directions both at present and for Case-4 traffic (3 million annual passengers) in WECPNL (Weighted Equivalent Conceived Noise Level) unit. For the details of WECPNL unit, refer to Annex 16, Environment Protection,ICAO.
The existing area influenced by aircraft noise level more than WECPNL 70 is estimated on the basis of 8 F-27 daily and 2 B737 daily operations in 1984. This area will expand to about 8 times wider when the airport serves Case-4 Traffic.
covered by aircraft noise contours for case-4,
The area covered by aircraft noise contours,
excluding the airport property area, the former marine airport and Lake Maryut, is as follows:

More than WECPNL 70 = Approx. 850 ha
More than WECPNL 75 = Approx. 330 ha
More than WECPNL 80 = Approx. 60 ha

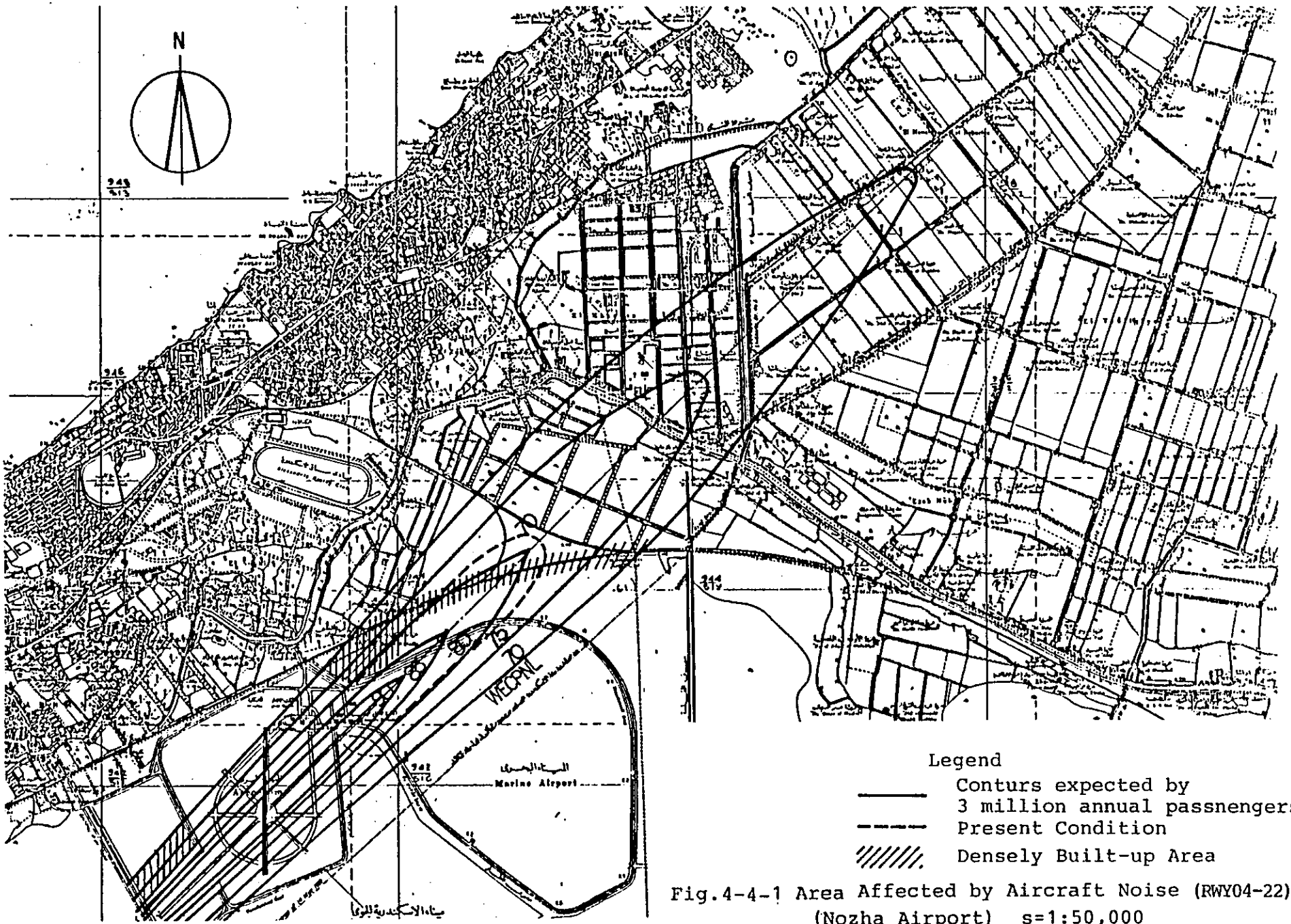
Although the area expected to be covered by WECPNL 75 to 80 and above 80 are planned to be agricultural area and industrial area in the future land use in Alexandria respectively, many houses and small buildings (about 10,000 people lives now) exist on the north of the airport boundary near RWY04 threshold. Many houses are also located on the north of the former marine airport and along the Agricultural Road between Alexandria and Cairo across the final approach area for RWY22. From the above, serious noise problems are foreseen when take-off and landing operations of large jet aircraft become more frequent.
Especially for the houses along the Agricultural road, the following measures will become necessary.

i) Relocation of houses

ii) Land acquisition

iii) Sound proof construction

The land use controls for the airport vicinity in other countries as shown in Table 4-4-1.



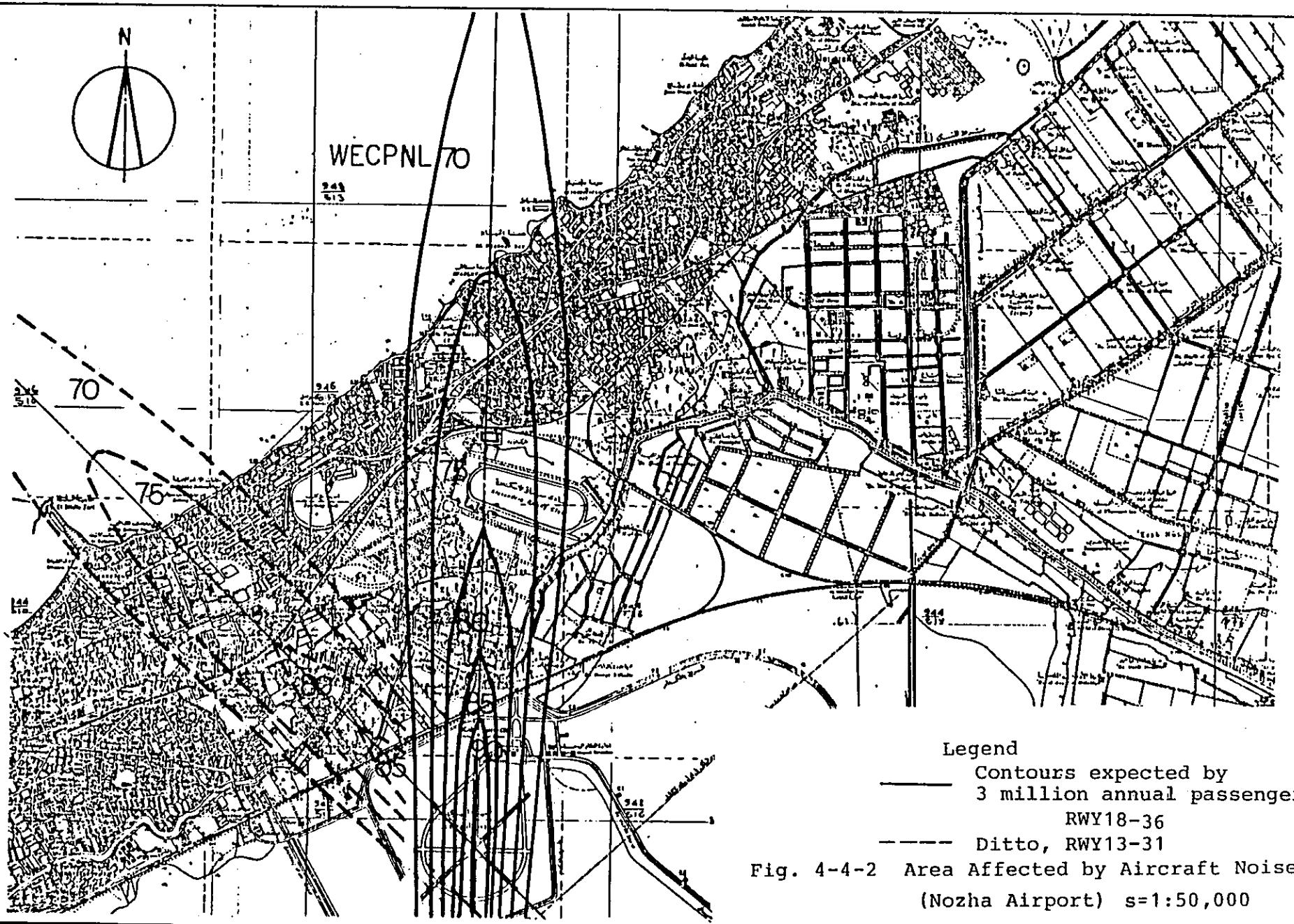
Legend

Conturs expected by 3 million annual passnengers

Present Condition

Densely Built-up Area

Fig.4-4-1 Area Affected by Aircraft Noise (RWY04-22) (Nozha Airport) s=1:50,000



Legend

——— Contours expected by 3 million annual passengers, RWY18-36

– – – – – Ditto, RWY13-31

Fig. 4-4-2 Area Affected by Aircraft Noise (Nozha Airport) s=1:50,000

Table 4-4-1 Land Use Controls for Noise

Conversion: WECPNL = NEF + 48 = N-10

Japanese		USA		French	
WEC-PNL	Standard	NEF	Standard	N	Standard
More than 70	No construction of schools, hospitals, etc, is permitted	Less than 30	Necessary noise reduction measures, required for schools, hospitals, churches. Compatible with residential, commercial, hotel, offices, outdoor recreational, industrial.	Less than 84	No building restrictions.
More than 75	No construction of residences is permitted.			More than 84	New residential development to be avoided.
More than 80	Noiseproof construction for existing residence is necessary.	More than 30	Compatible with commercial, outdoor recreational and industrial. Schools, hospitals, churches, theaters, etc. are not permitted.	More than 89	No school, hospital residential building public building permitted.
More than 90	Compensation for removal of the existing residences.	More than 40	Outdoor recreational (non-spectator) is only compatible. Necessary noise reduction measures for industrial and commercial bldg.	More than 96	No building permitted.

CHAPTER 5 DEVELOPMENT CONCEPT OF NEW ALEXANDRIA INTERNATIONAL AIRPORT

5-1 Construction Site of New Airport

5-1-1 Location of Site

As shown in Fig. 5-1-1, the new airport site is located in desert area near Hawariya some 40 km southwest from Alexandria city, and also 11 km southwest from Desert Road between Alexandria and Cairo. 40 minutes by car is required from Alexandria city to the new airport site. In this site, an area of 36 km² (6 km X 6 km) was originally preserved for new airport construction in 1971. However, it is ascertained as a result of site reconnaissance that about two third of the above area has been already occupied by military for their new airfield under construction. Therefore, a new airport development is studied within the area in the east part of the 6 km by 6 km area as shown in Fig. 5-1-2. This site is located approximately 10 km south from the Mediterranean coastline. The site lies on the undulating terrain with elevations from 35m to 70m. There is a hill with a top elevation of 70m in the center of this site. From this hill the terrain descend toward both north and south. The site is capable of providing the required airspace for the establishment of preferable flight procedures.

5-1-2 Regional Development near New Airport Site

In the surrounding area of the new airport, a trunk road connecting Alexandria to Mersa Matruh runs along the mediterranean coast, and national railway connecting Alexandria to Mersa Matruh and Salum along the south shore of Lake Maryut.

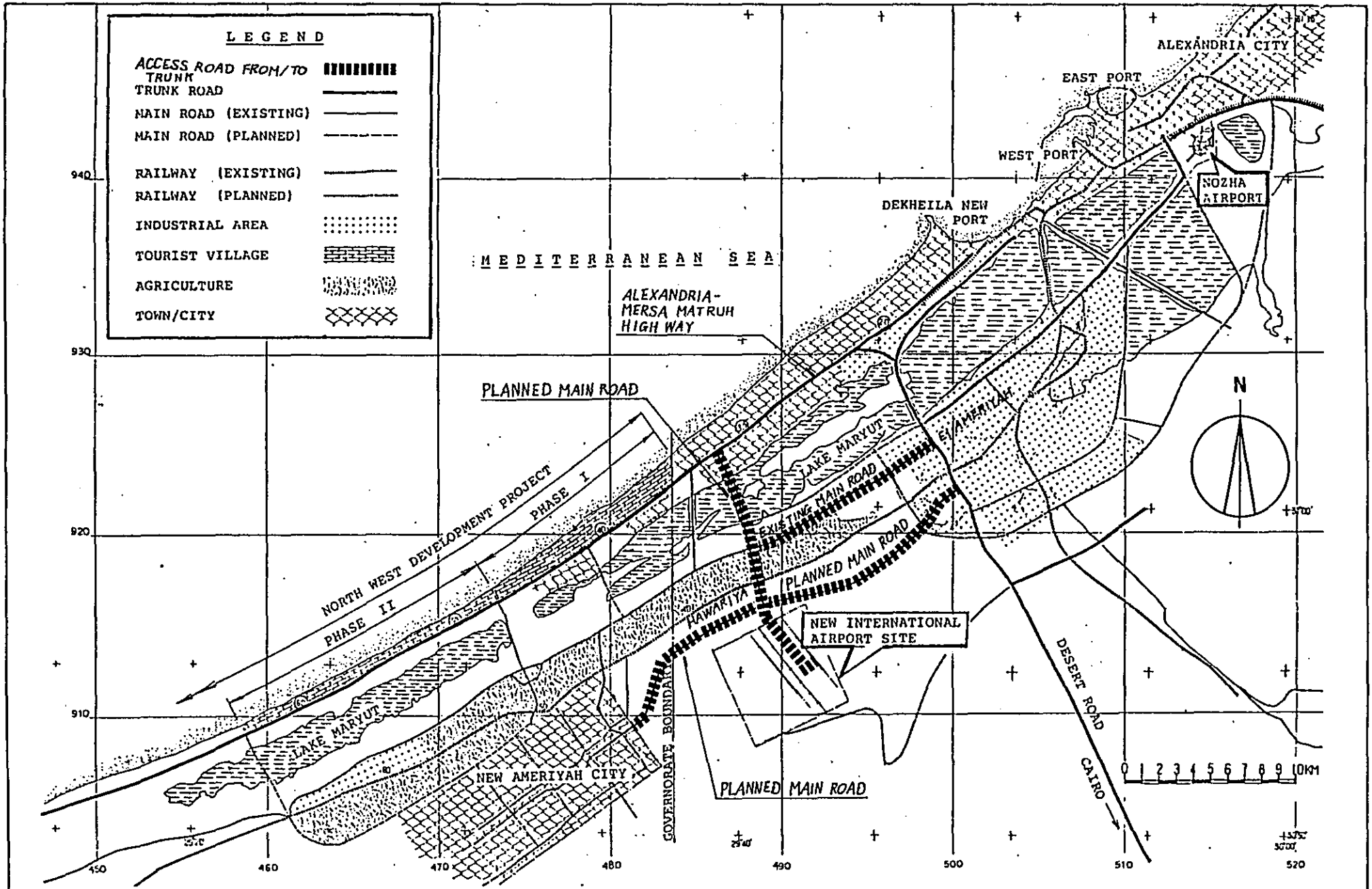


Fig. 5-1-1 Land Use Plan of Airport vicinity

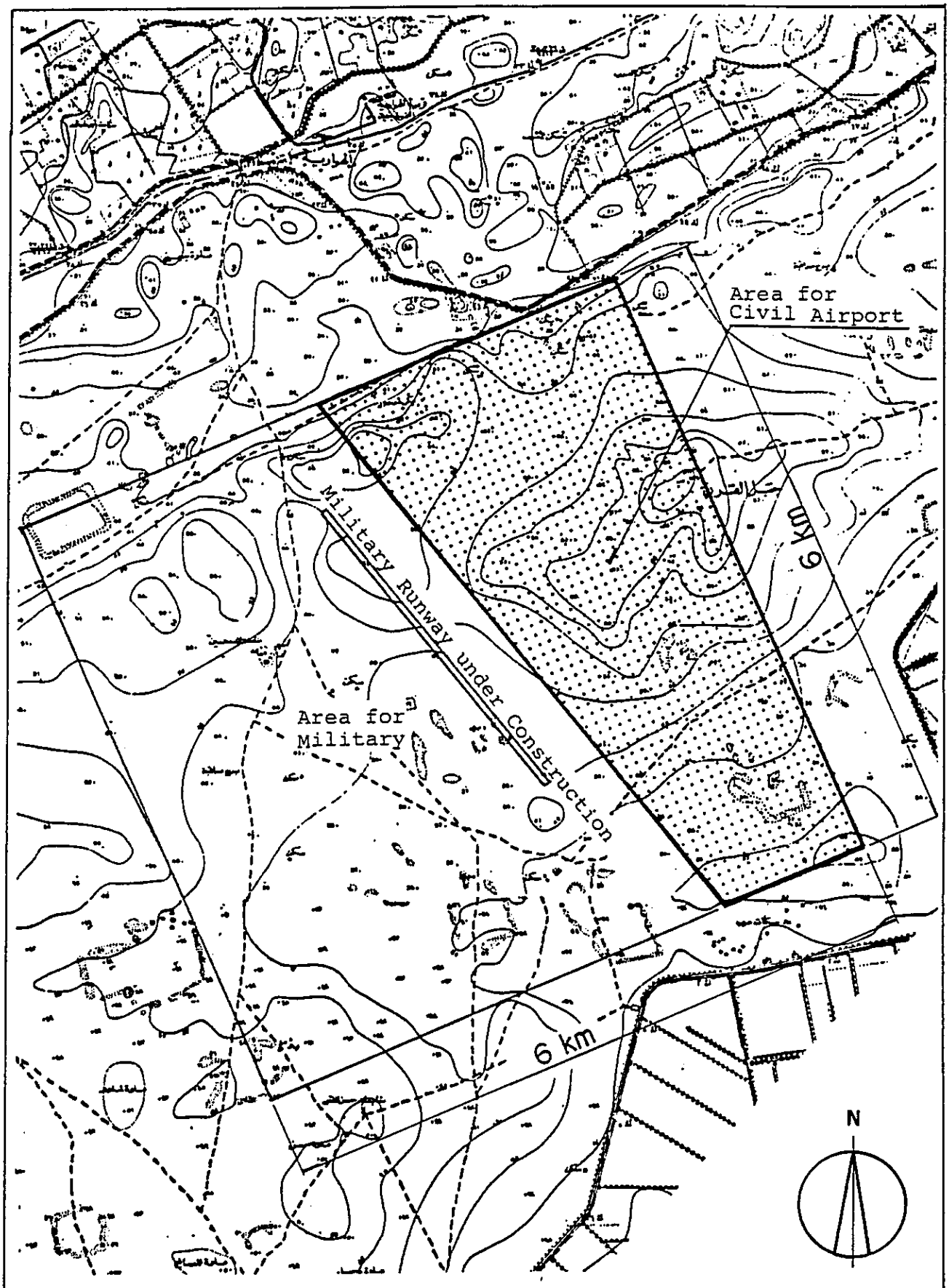


Fig. 5-1-2 Area Allocated for New Alexandria International Airport S=1:50,000

North West coast development along the coast line is underway as shown in Fig. 5-1-1. This development includes industrial and free zone area along the road between the desert road and Hawariya in the east of the airport, and New Ameryia city project in the west. The new airport is to be located at the center of the regional development area and will play an important role as not only the northern gateway of Egypt but the gateway to the North West coast including Alexandria city and New Ameriyah city, if the new airport is developed.

5-1-3 Meteorological Observation Data and Analysis

The meteorological observation equipment consisting of the following equipment have been installed at the new airport site as shown in Fig. 5-1-3 and the observation is underway.

- Wind vane and recorder (wind direction and speed)
- Thermo-Hydrograph (temperature and humidity)

The observation data during August, 1984 at the new airport site has been analyzed for the comparison with the meteorological records at Nozha airport compiled by the meteorological office. Although no definite conclusion can be made, observation data of only one month (August) based on preliminary evaluation of the meteorological conditions at the new airport site can be made as follows:

(1) Temperature

The authorized aerodrome reference temperature at Nozha airport is 30.6°C as indicated in AGA 2-1, Aeronautical Information Publications (AIP), Arab Republic of Egypt. This referece temperature is based upon the average aerodrome reference temperature of about 40 years (1942-1980) at the meteorological office in Nozha airport (Source: Meteorological Authority). The observed monthly mean of daily maximum temperature at the new site is 31.0°C for this August (August is usually the hottest month of year in Alexandria).

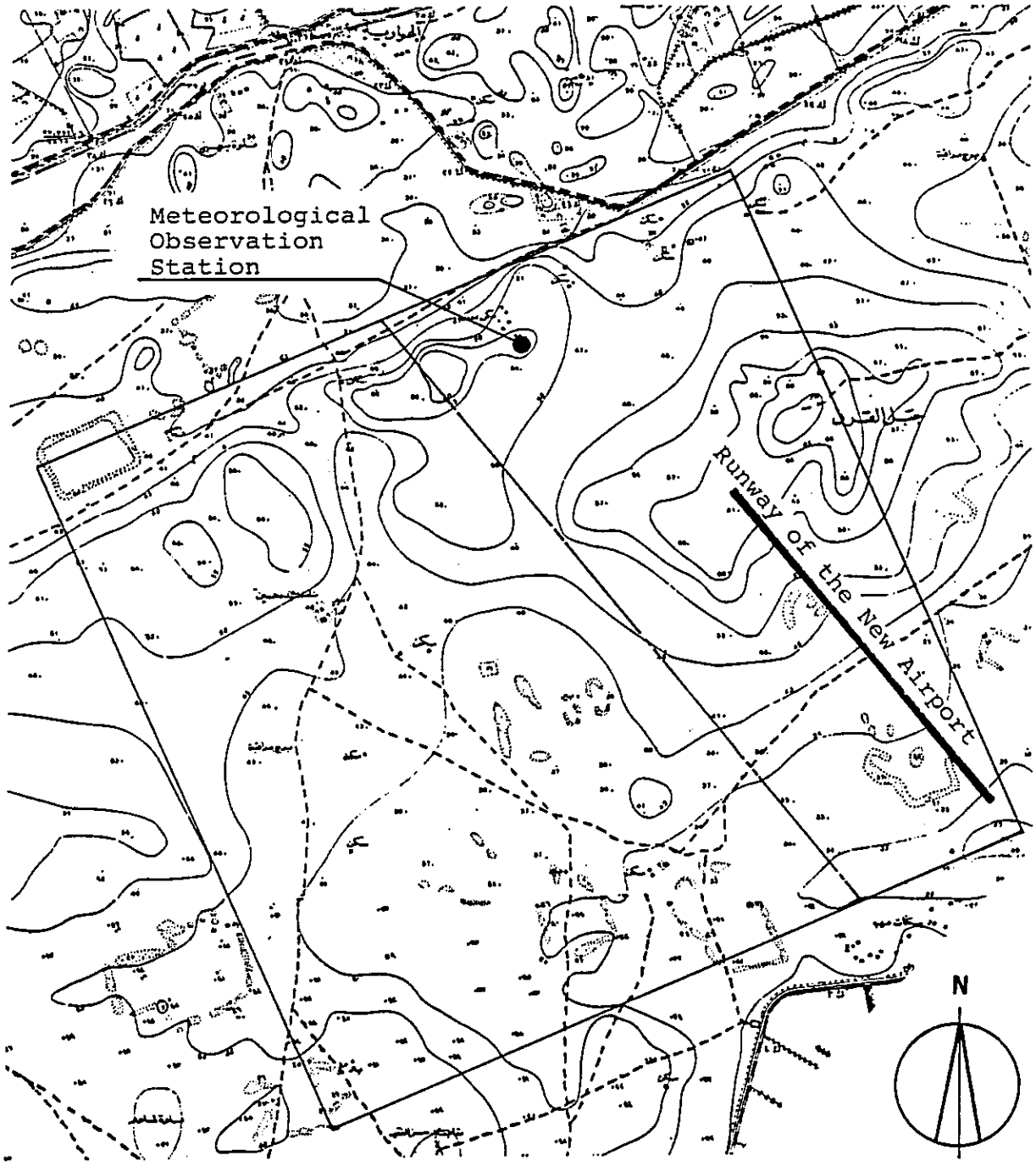


Fig. 5-1-3 Location of Meteorological Observation Station
S=1:50,000

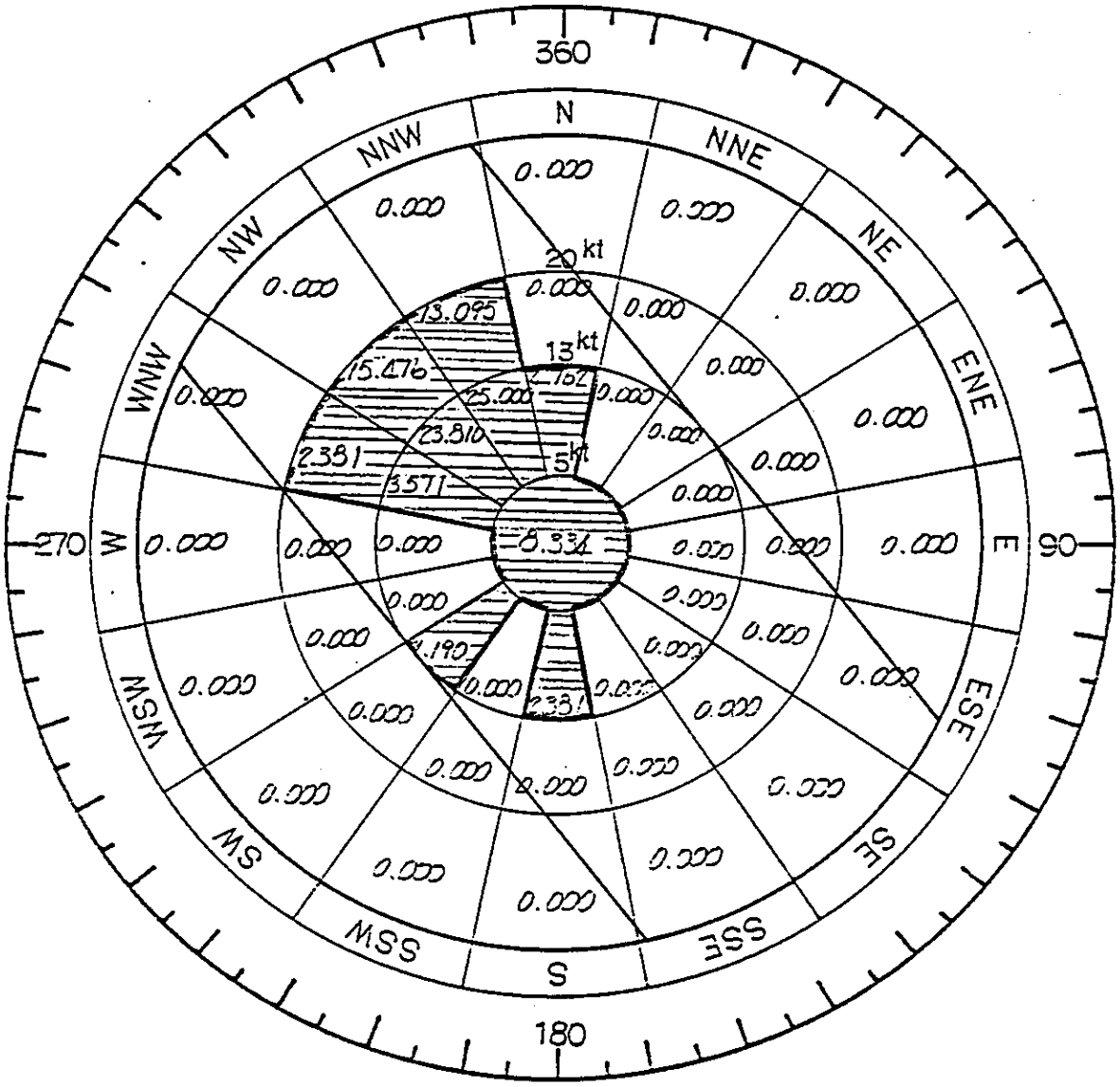
Since no significant difference between the authorized aerodrome reference temperature has been found, the authorized aerodrome reference temperature is used for the planning of the new airport.

(2) Wind

The wind rose at the new airport (August, 1984) is compared to the wind rose at Nozha airport (August, 1984). The distribution of the wind components is very similar and the prevailing wind is north west wind in both roses, as shown in Fig. 5-1-4 and 5.
Since Nozha airport and the new airport site are not different from each other in wind conditions, the wind-rose of the existing Nozha airport is applied for the planning of the new airport.

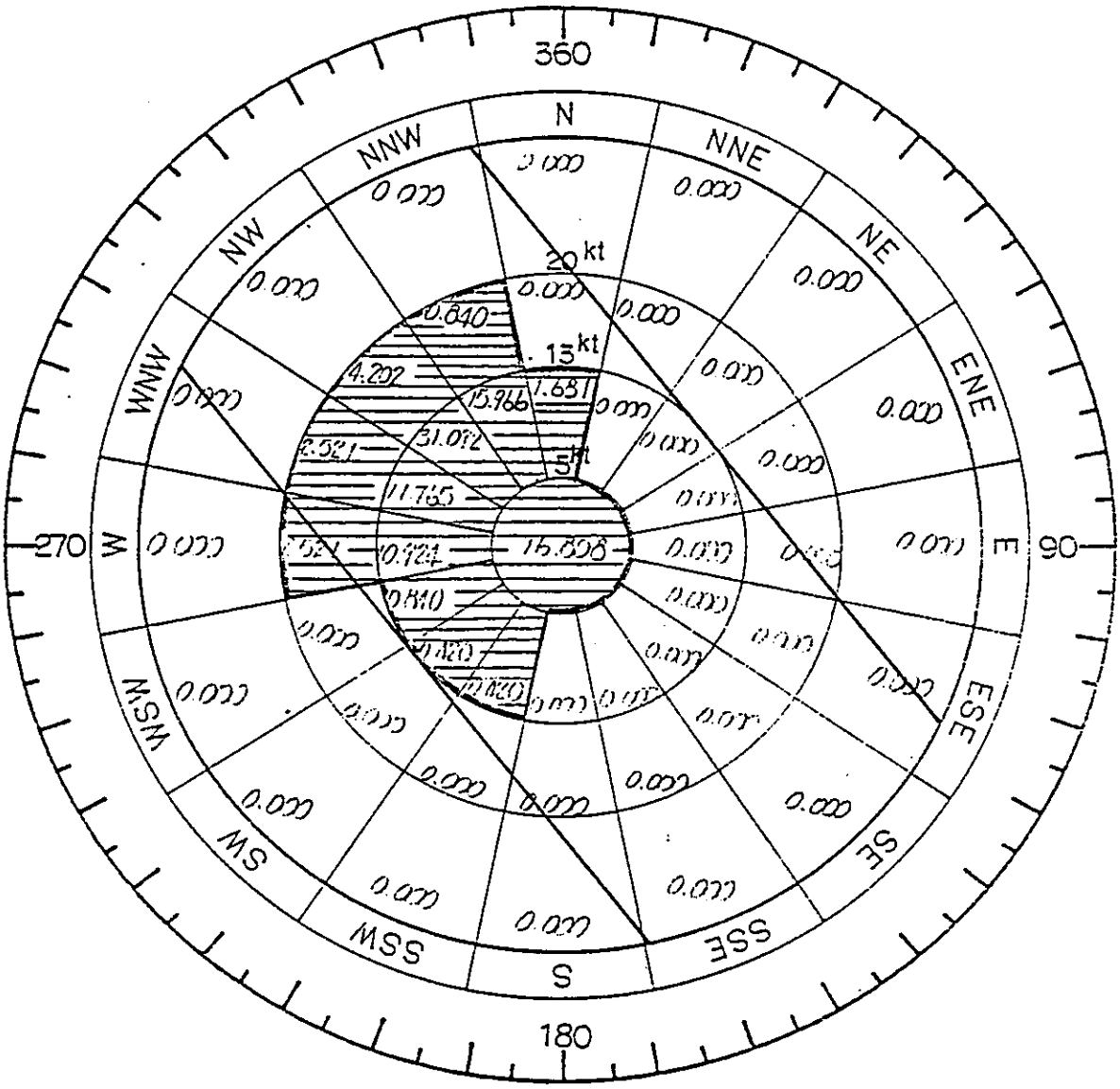
(3) Wind Coverage for the New Runway

The cross-wind coverage has been calculated for the new runway (N142°E, true north) using the wind rose of Nozha airport. Fig. 5-1-6 and 7 show the cross-wind coverage. The cross-wind coverage is 96.3 percent for a cross-wind component less than 13kt and 99.4 percent for 20kt. Figs. 5-1-8 and 9 show, for a reference, the cross-wind coverage of the new runway based on the wind rose of Dekheilla airport. Figs. 5-1-10 and 11 show the cross-wind coverage for any orientation, and these figures indicate that the orientation (N142°E, true north) of the planned runway is the optimum one.



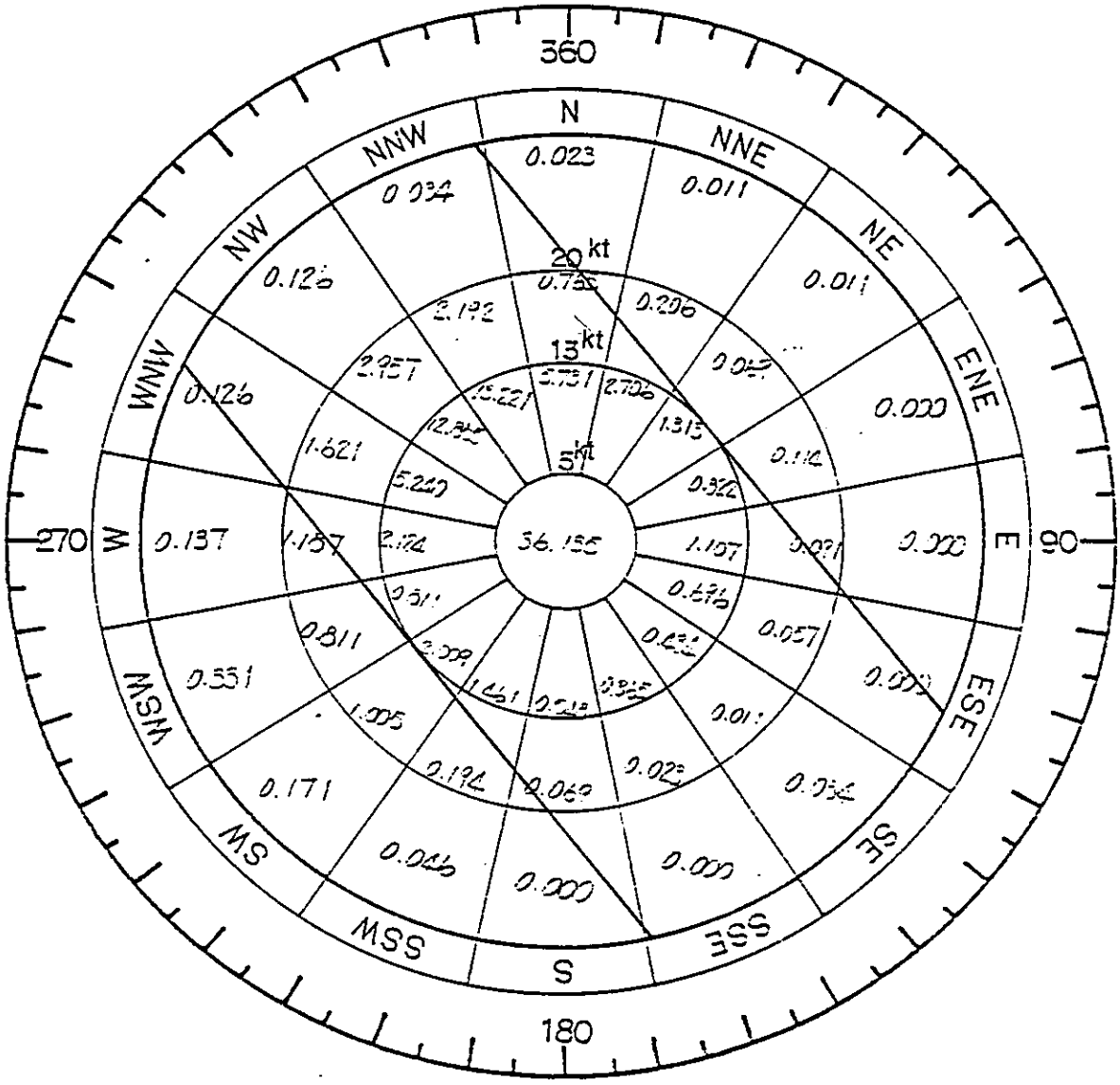
DATA SOURCE: NEW AIRPORT SITE
PERIOD : August, 1984
R/W DIRECTION : N 142°E
WIND COVERAGE : 100% (CROSS WIND 13Kt)

Fig. 5-1-4 Wind Rose Observed at New Airport Site



DATA SOURCE	: NOZHA AIRPORT
PERIOD	: August, 1984
R/W DIRECTION	: N 142°E
WIND COVERAGE	: 98.7% (CROSS WIND 13Kt)

Fig. 5-1-5 Wind Rose Observed at Nozha Airport



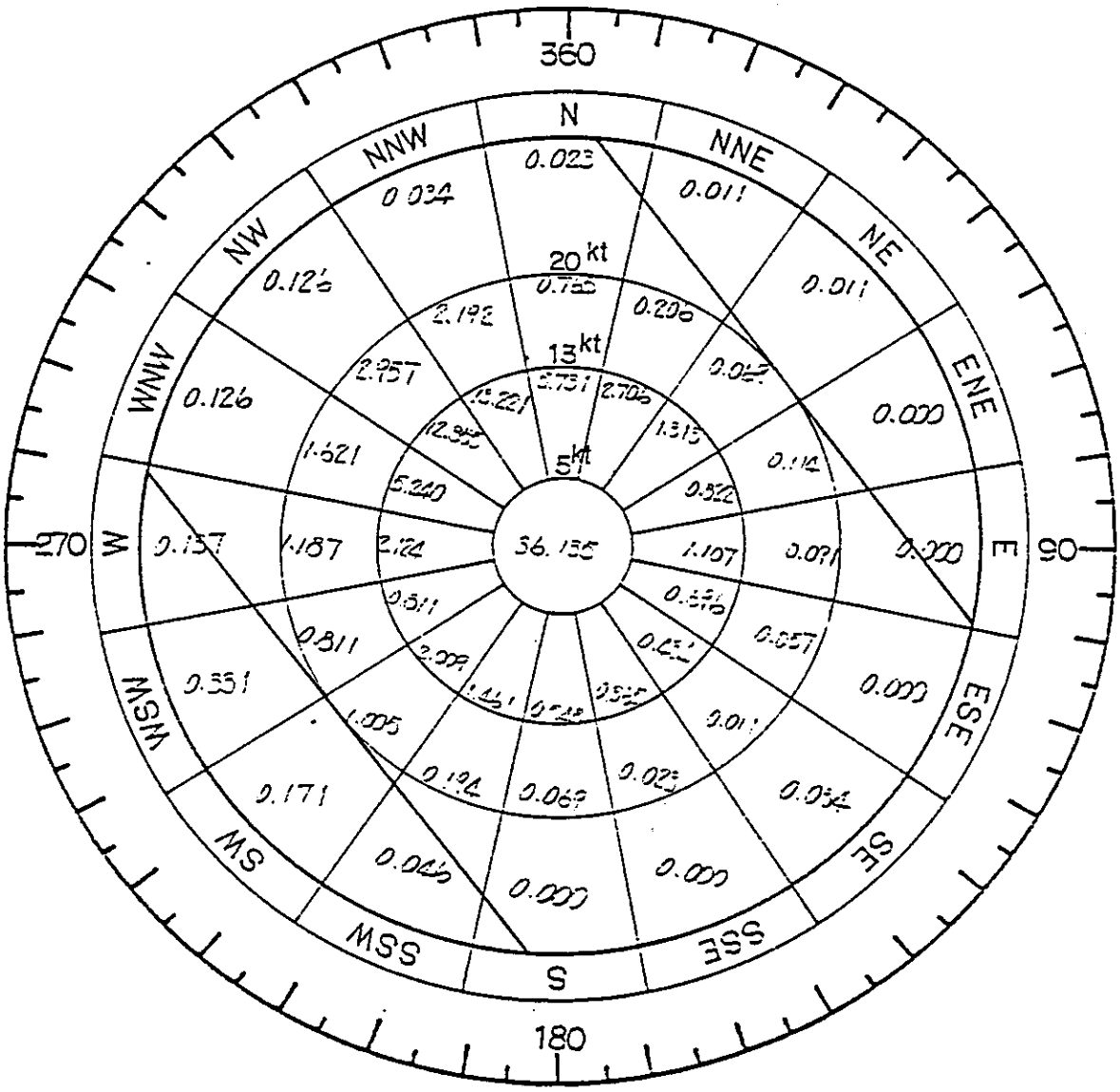
DATA SOURCE : NOZHA AIRPORT

PERIOD : 1981-1983 (3YEARS)

R/W DIRECTION : N142°E

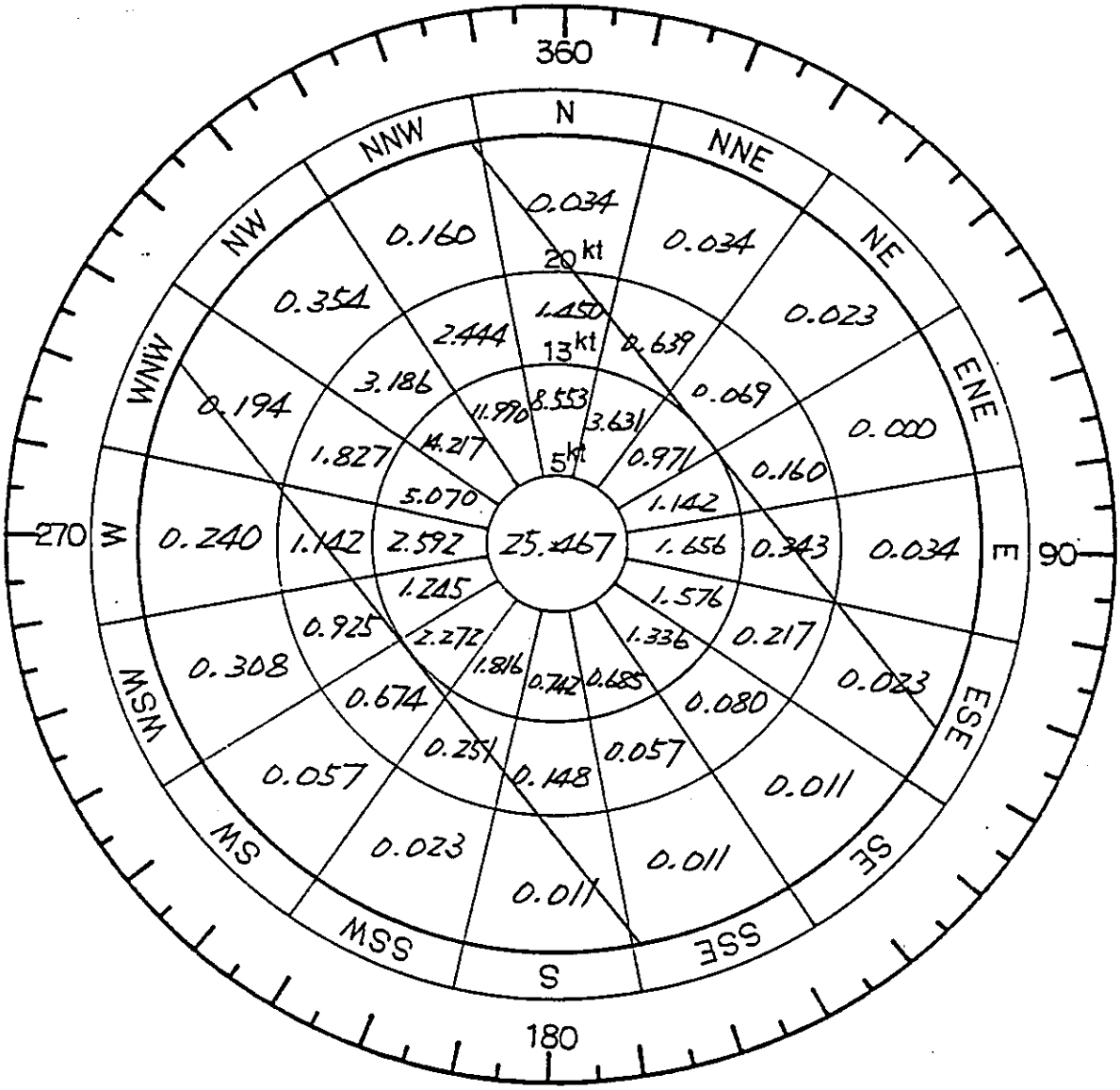
WIND COVERAGE : 96.3% (CROSS WIND 13Kt)

Fig.5-1-6 Cross- Wind Coverage for the New Runway (13kt)



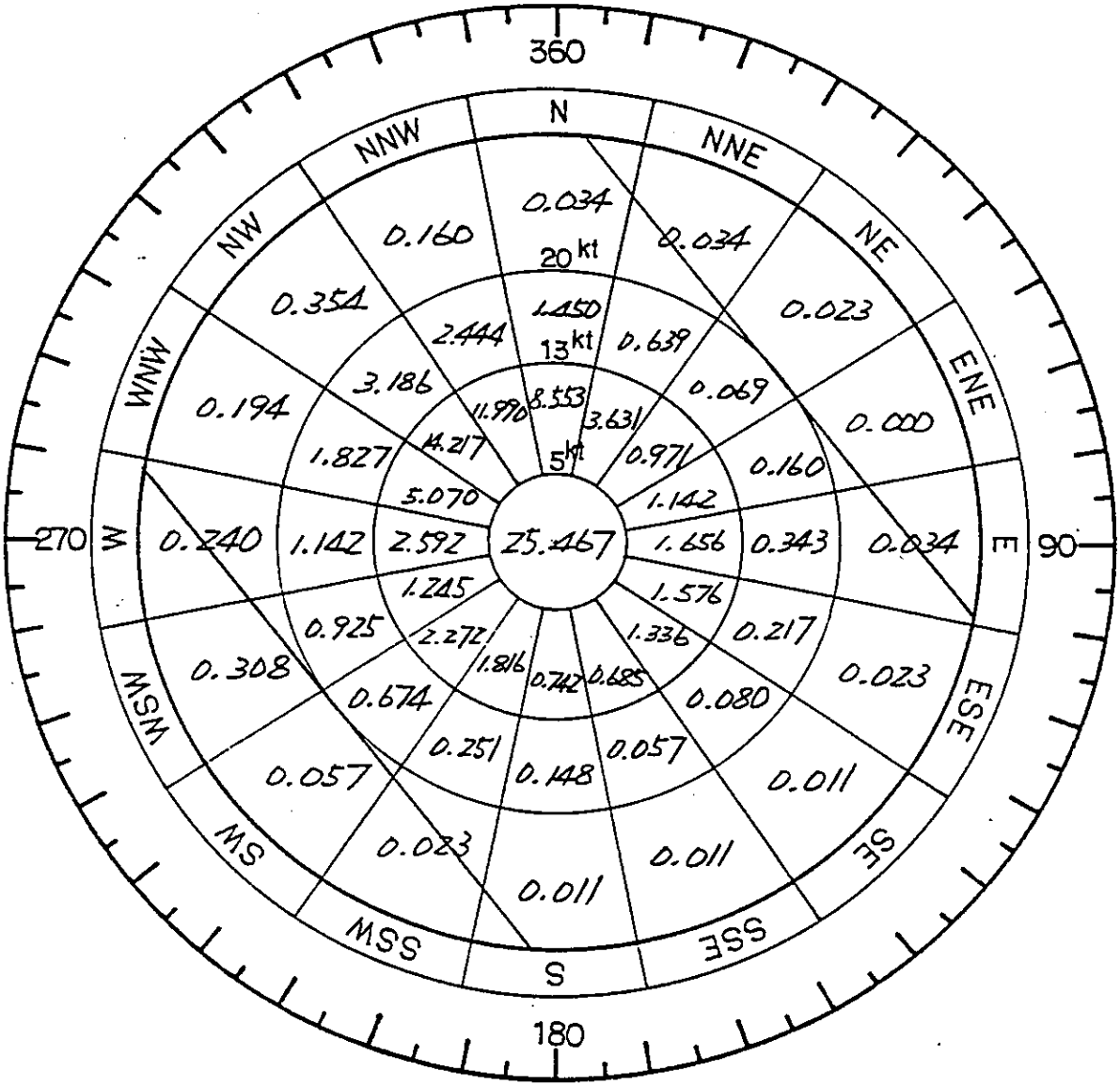
DATA SOURCE : NOZHA AIRPORT
PERIOD : 1981-1983 (3YEARS)
R/W DIRECTION : N142°E
WIND COVERAGE : 99.4% (CROSS WIND 20Kt)

Fig. 5-1-7 Cross-Wind Coverage for the New Runway (20kt)



DATA SOURCE : DEKHEILA AIRPORT
PERIOD : 1981-1983 (3YEARS)
R/W DIRECTION : N142°E
WIND COVERAGE : 95.9%

Fig. 5-1-8 Cross-Wind Coverage for the New Runway (13kt)



DATA SOURCE : DEKHEILA AIRPORT
PERIOD : 1981-1983 (3YEARS)
R/W DIRECTION : N142°E
WIND COVERAGE : 99.5%

Fig. 5-1-9 Cross-Wind Coverage for the New Runway (20kt)

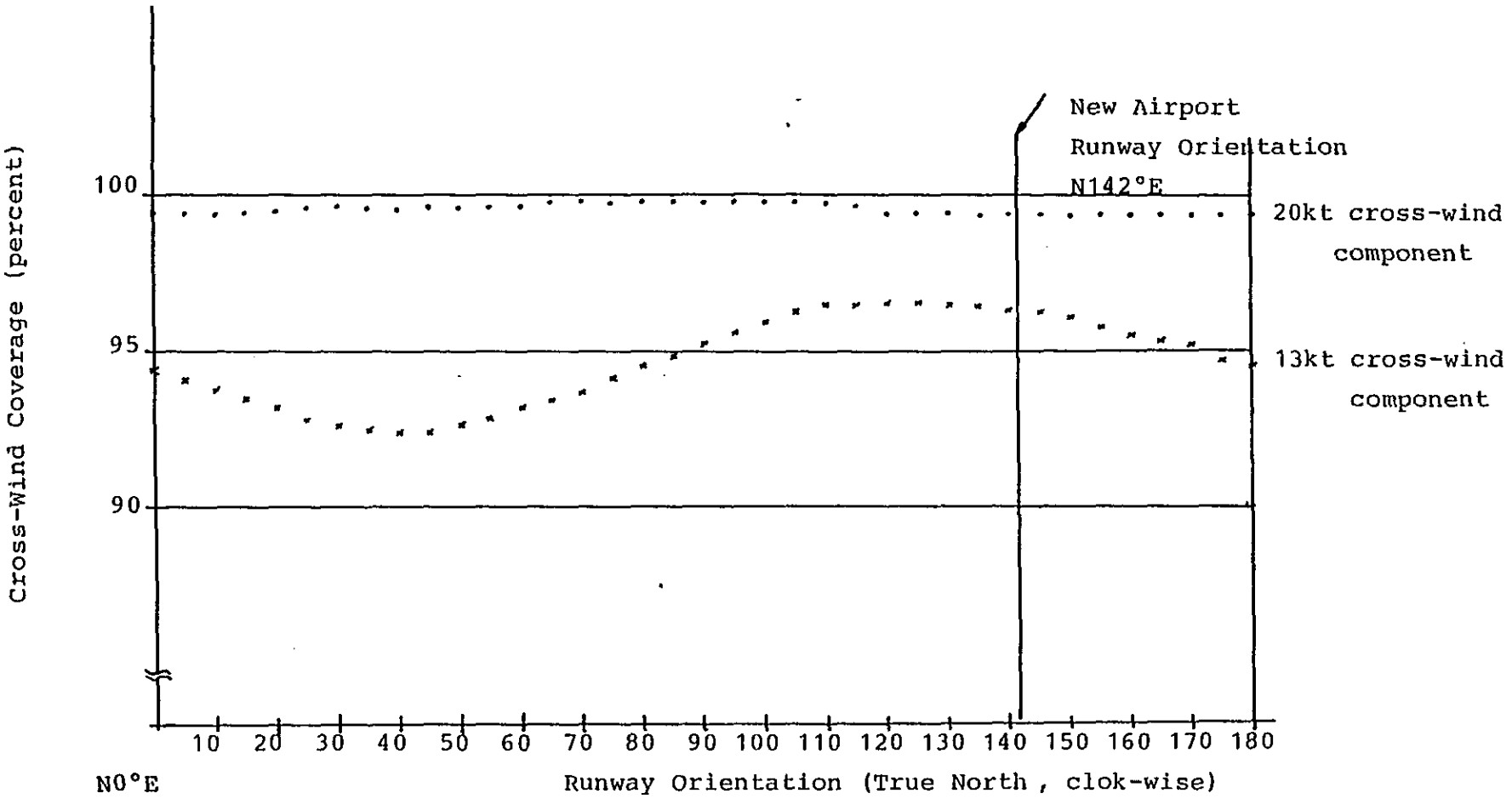


Fig. 5-1-10 Runway Orientation VS. Cross-Wind Coverage (1)
(Data Source : Nozha Airport, 1981-1983)

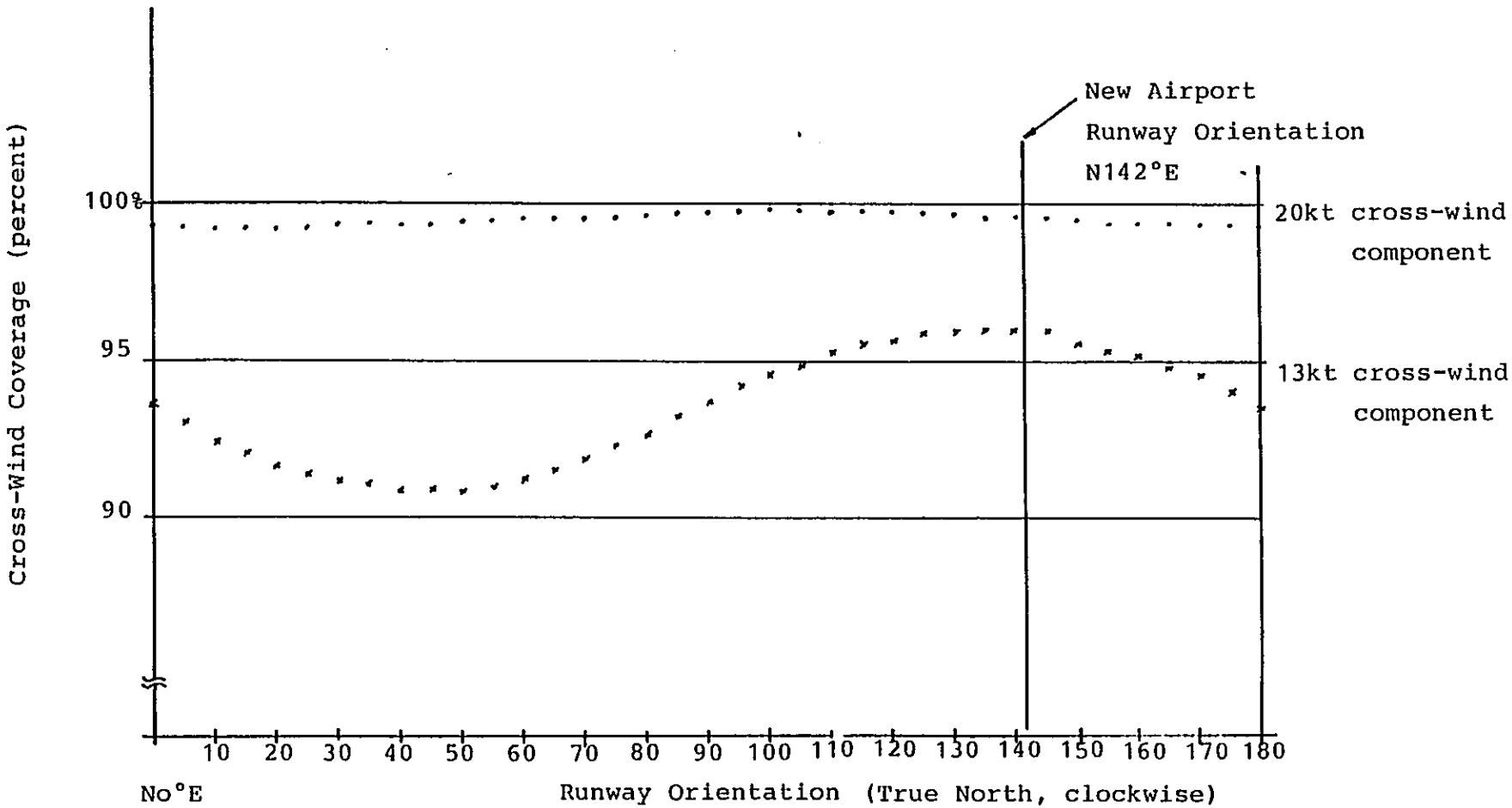


Fig. 5-1-11 Runway Orientation VS. Cross-Wind Coverage (2)
(Data Source : Dekheilla Airport, 1981-1983)

Table 5-1-1 Runway Orientation VS. Cross-Wind Coverage
(Data = Nozha Airport)

R/W DIRECTION , CROSS WIND & WIND COVERAGE

UNIT :(%)

R/W DIRECTION / CROSS WIND	N 0° E	N 5° E	N 10° E	N 15° E	N 20° E	N 25° E	N 30° E	N 35° E	N 40° E	N 45° E	N 50° E	N 55° E	N 60° E	N 65° E	N 70° E	N 75° E	N 80° E	N 85° E
13 Kt	94.5	94.1	93.8	93.5	93.2	92.9	92.7	92.6	92.6	92.6	92.7	92.9	93.1	93.4	93.7	94.1	94.5	94.9
20 Kt	99.4	99.4	99.4	99.5	99.5	99.6	99.6	99.6	99.6	99.7	99.7	99.7	99.7	99.8	99.8	99.8	99.8	99.8

R/W DIRECTION / CROSS WIND	N 90° E	N 95° E	N 100° E	N 105° E	N 110° E	N 115° E	N 120° E	N 125° E	N 130° E	N 135° E	N 140° E	N 145° E	N 150° E	N 155° E	N 160° E	N 165° E	N 170° E	N 175° E
13 Kt	95.3	95.7	95.9	96.2	96.4	96.5	96.6	96.7	96.6	96.5	96.3	96.2	96.0	95.8	95.5	95.3	95.1	94.8
20 Kt	99.8	99.8	99.8	99.8	99.7	99.7	99.6	99.5	99.5	99.5	99.4	99.4	99.4	99.4	99.4	99.4	99.4	99.4

LOCATION : NOZHA AIRPORT
PERIOD :1981-1983 (3YEARS)

Table 5-1-2 Runway Orientation VS. Cross-Wind Coverage
(Data : Dekheilla Airport)

R/W DIRECTION , CROSS WIND & WIND COVERAGE

UNIT : (%)

R/W DIRECTION / CROSS WIND	N 0° E	N 5° E	N 10° E	N 15° E	N 20° E	N 25° E	N 30° E	N 35° E	N 40° E	N 45° E	N 50° E	N 55° E	N 60° E	N 65° E	N 70° E	N 75° E	N 80° E	N 85° E
13 Kt	93.5	93.0	92.5	92.1	91.7	91.4	91.2	91.0	90.9	90.9	90.9	91.0	91.2	91.5	91.8	92.2	92.6	93.1
20 Kt	99.2	99.1	99.1	99.1	99.1	99.1	99.2	99.2	99.2	99.2	99.3	99.3	99.4	99.4	99.4	99.5	99.5	99.6

R/W DIRECTION / CROSS WIND	N 90° E	N 95° E	N 100° E	N 105° E	N 110° E	N 115° E	N 120° E	N 125° E	N 130° E	N 135° E	N 140° E	N 145° E	N 150° E	N 155° E	N 160° E	N 165° E	N 170° E	N 175° E
13 Kt	93.6	94.1	94.5	94.9	95.2	95.5	95.7	95.9	95.9	95.9	95.9	95.8	95.6	95.4	95.1	94.8	94.4	94.0
20 Kt	99.7	99.7	99.7	99.7	99.7	99.7	99.7	99.6	99.6	99.5	99.5	99.4	99.4	99.3	99.3	99.3	99.2	99.2

LOCATION : DEKHEILLA AIRPORT
PERIOD :1981-1983 (3YEARS)

5-1-4 Outline of Soil Investigations

(1) Soil Investigation Items and Location

Soil investigations as itemized in Table 5-1-3 have been performed for the new airport site during August and September. The locations of soil investigations are indicated in Fig. 5-1-12.

(2) Result of the Investigation

Very hard silty or clayey sediments with N-valve of 20~80 were confirmed by borings and test pits. Some of them with higher N-valve is considered to be "marl" which is an argillaceous calcium carbonate deposit. Platy limestone is observed at terrace higher than about 50m in elevation.

These sediments are considered to be classified in the formation of late tertiary.

In the construction site of the military runway, bulldozer, scraper and ripper are used for the earth work.

Limestone is hard enough for a use as aggregate.

Table 5-1-3 Soil Investigation Item at New Airport Site

Item	Volume
Mechanical Boring	L = 20m 1 place L = 10m 2 places
Test Pit	5 places
Test in place	
. Standard penetration Test	40 tests
Laboratory Test	
. Physical property Test	8 units
. Moisture-Density Test	5 Samples
. Modified CBR Test	5 Tests
. Density of Soil	8 Tests

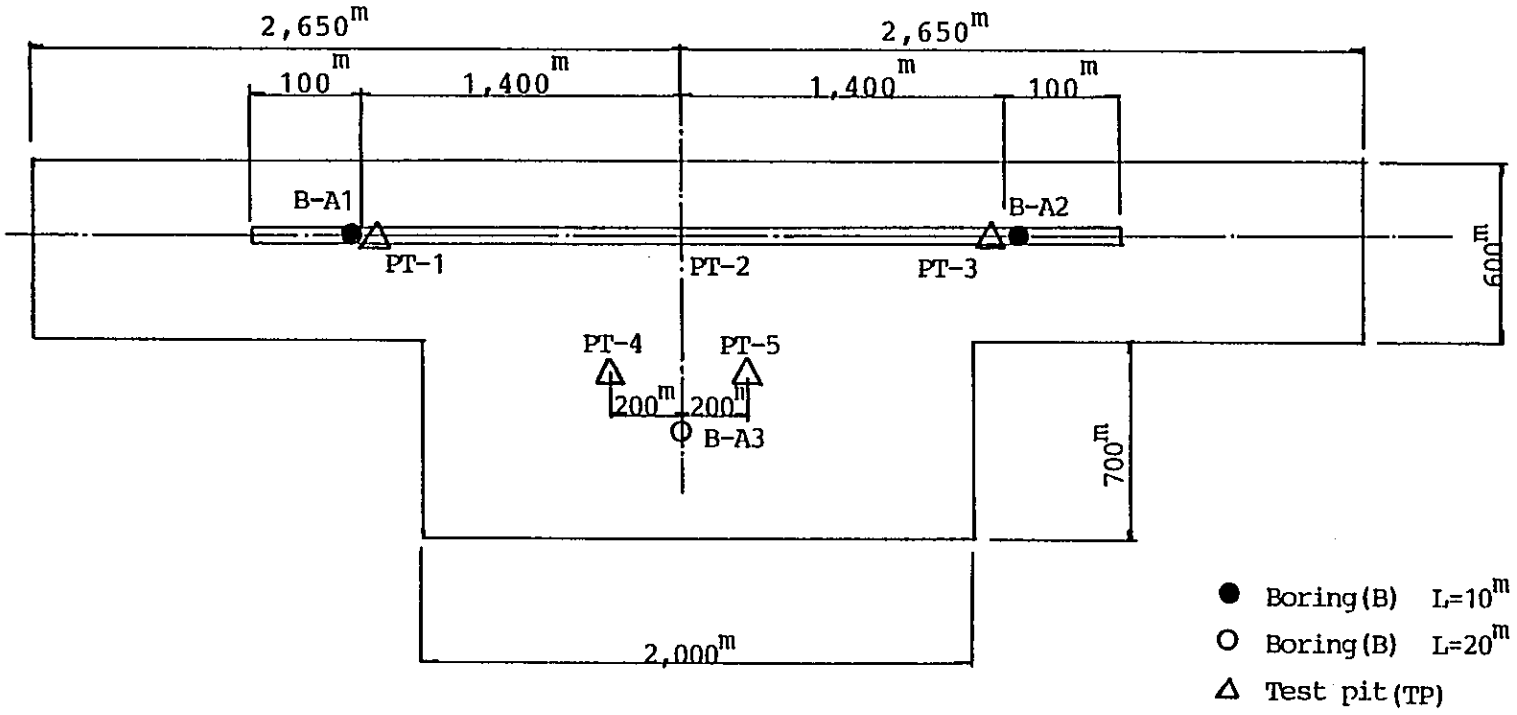


Fig. 5-1-12 Location of Soil Investigation

5-1-5 Outline of Topographic Survey

(1) Survey Item and Area

The topographic survey has been completed for an area of about 460 ha as shown in Fig. 5-1-13. The survey area was determined based on the discussions with Egyptian Civil Aviation Authority. The runway of the new airport was tentatively located parallel to the military runway with a separation of 2,000m which was altered to 1,900m for less earthwork volume after the topographic survey.
Survey Items are as follows:

i) Establishment of principal points

ii) Traverse survey

iii) Center-line survey

iv) Profile leveling

v) Cross section leveling

(2) Outline of Survey Results

No man made structure such as building, road, etc. nor plant other than small weeds, is found in the survey area. The ground elevation along the surveyed center line is between about 33 and 63 meters above sea level.
A hill with the highest point of 62.93m is located in the midway of the surveyed center line from which the terrain slopes gently down to both north and south by about 1.2 percent. However, the terrain is generally flat transversely.

The bench mark at Hawariya station of the National Railway was used as the datum point for the elevation and the traverse network was established for the survey area as shown in Fig. 5-1-14.
The same co-ordinates system as was used by the military airport was applied for the survey.

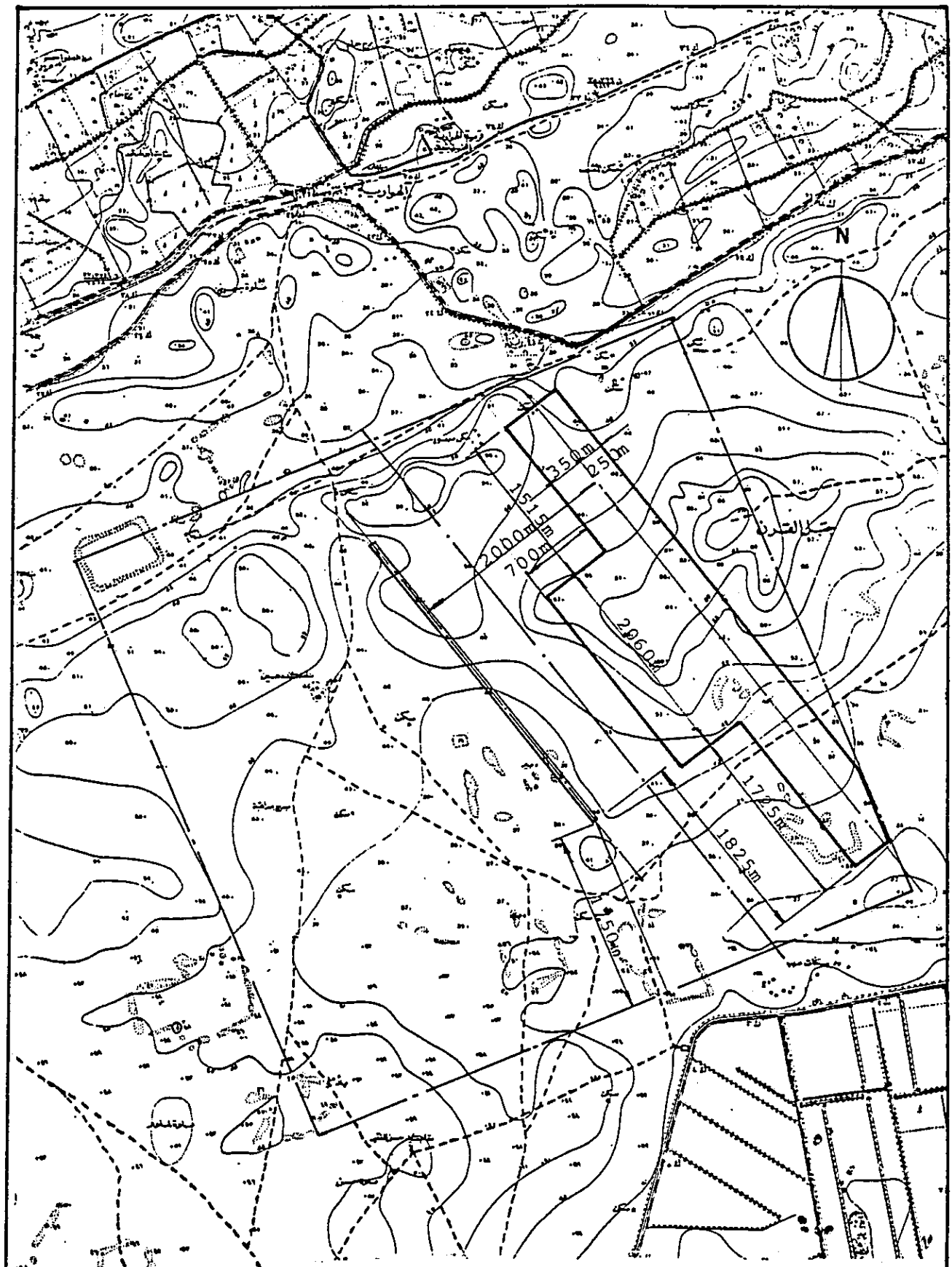


Fig. 5-1-13 Area of Topographical Survey

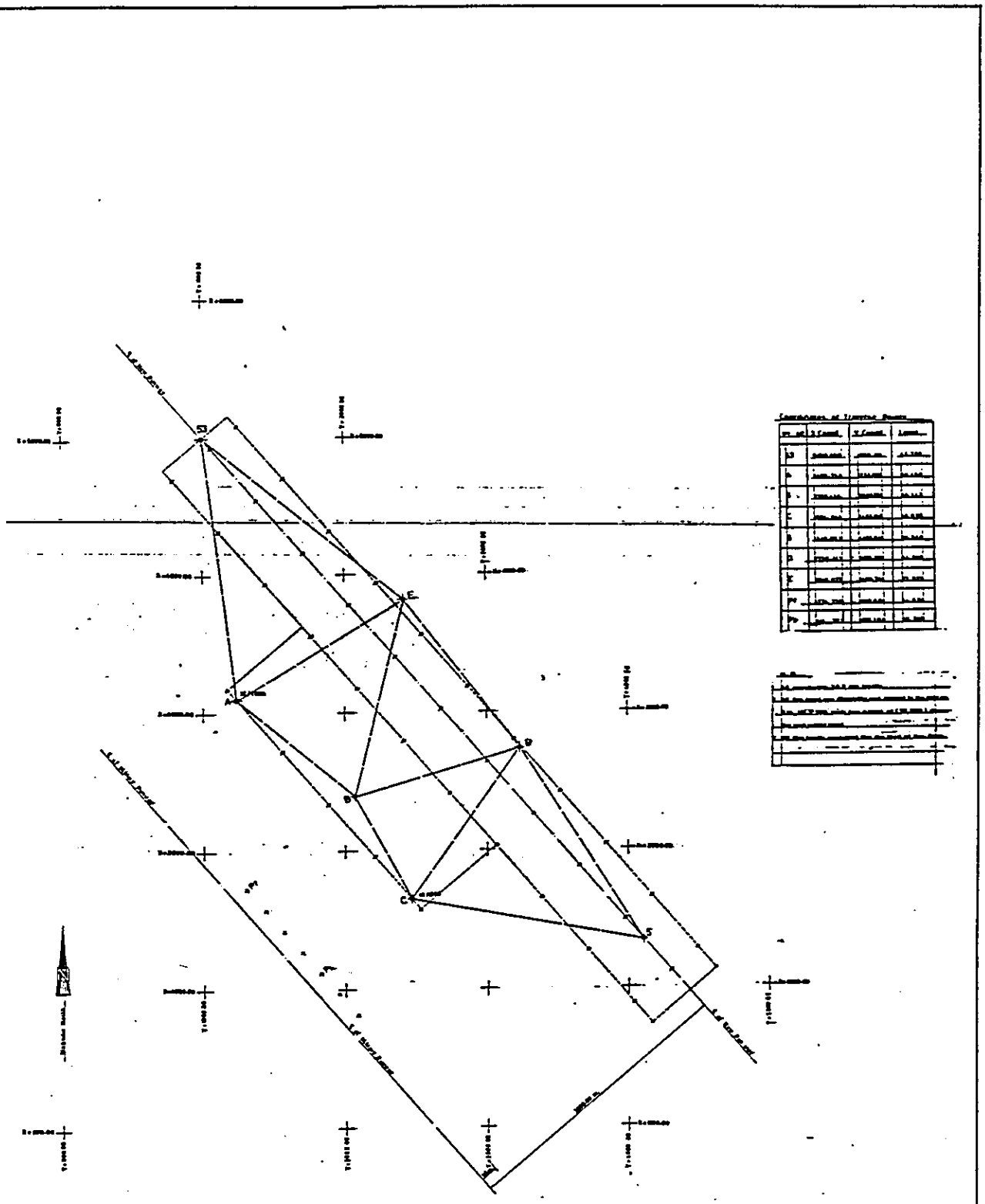


Fig. 5-1-14 Traverse Net

5-2 Airport Layout Plan

An airport layout plan was drawn for the development of a new airport. The runway location map and the airport layout plan are respectively shown in Fig. 5-2-1 and 2.
The factors as explained hereinafter have been considered in the preparation of the airport layout plan.

5-2-1 Runway Configuration

(1) Runway Orientation

The orientation of the runway was determined to be N 40° W (RWY 14/32) and parallel with the adjacent military runway with a separation of 1,900m considering wind coverage and safety and simultaneous aircraft operations at both airport without disruption.

The cross-wind coverage of RWY 14/32 is 96.3 percent for cross-wind less than 13kt and 99.5 percent for 20kt, based on the 3 years observation data at Nozha airport. The wind observation during August, 1984 at the new airport indicates that the cross-wind coverage is 100% for cross-wind less than 13kt. (Refer to subsection 5-1-3).
The runway orientation is, accordingly, considered good for the wind conditions.
For reference, the cross-wind coverages of RWY 14/32 are respectively 95.9% and 99.5% for less than 13kt and 20kt cross-wind component based on the observation data during the last 3 years at Dekheilla airport.

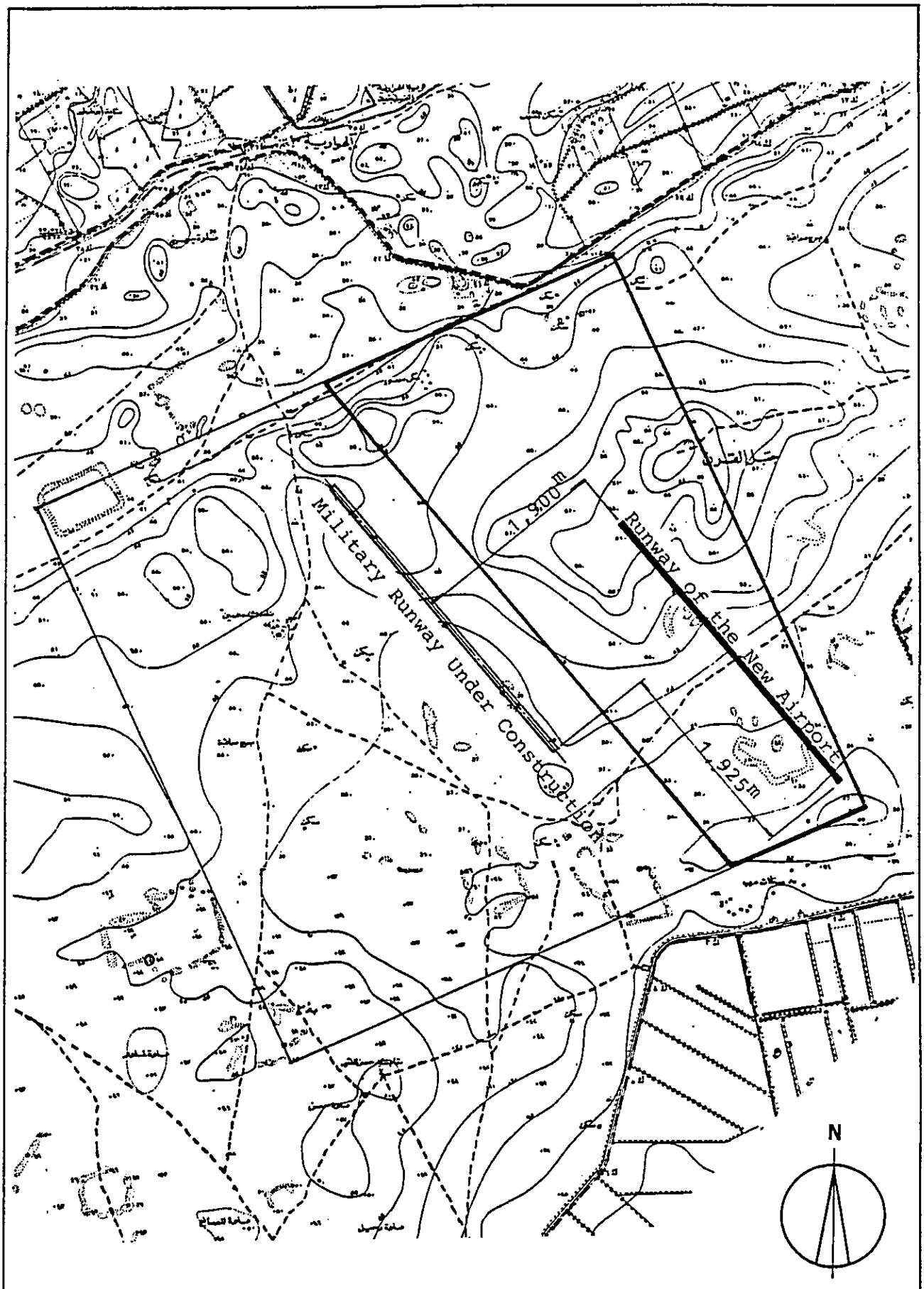


Fig. 5-2-1 Location of Runway for New Alexandria International Airport

S=1:50,000

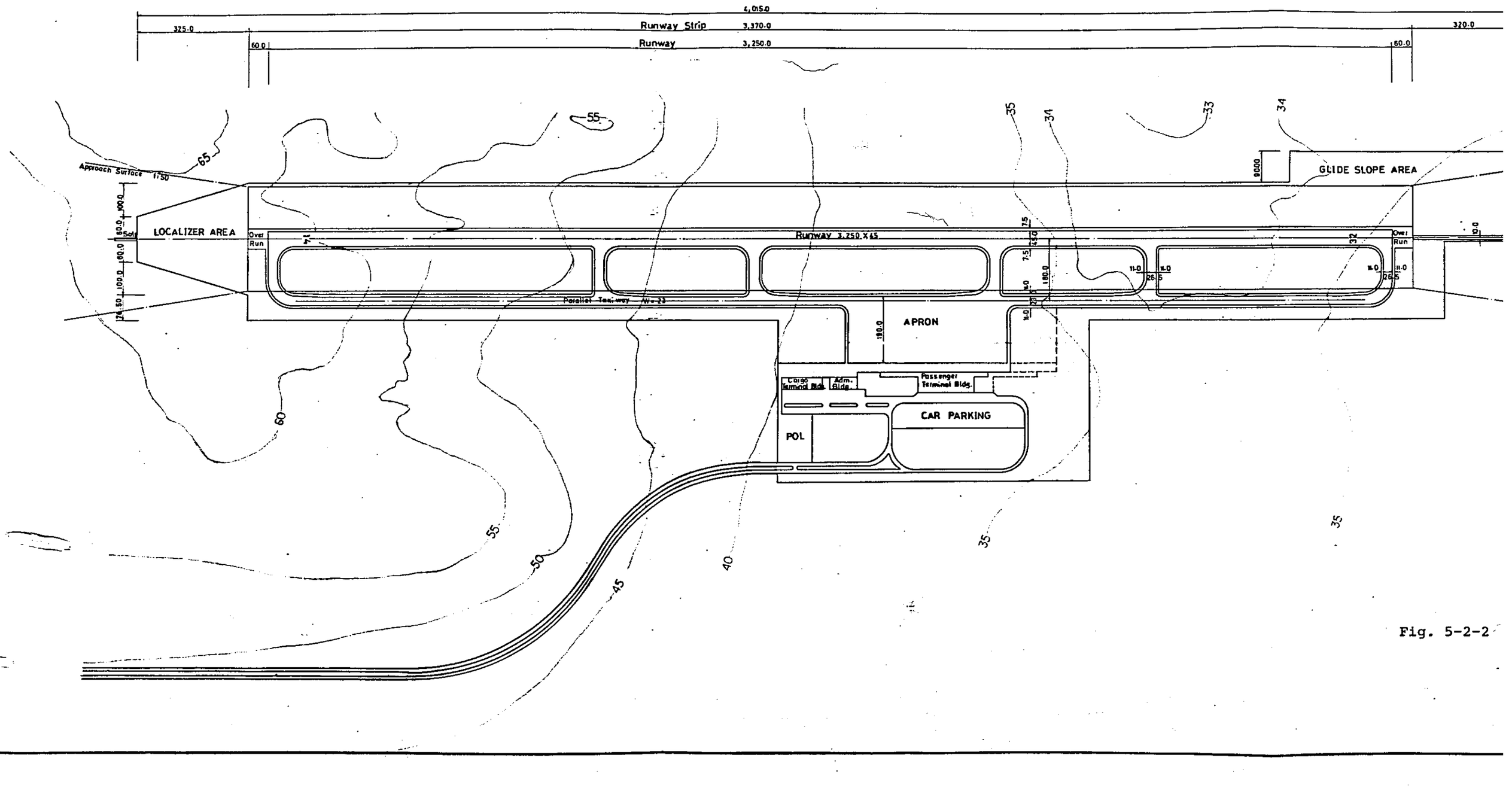

4,015.0
325.0
Runway Strip 3,370.0
Runway 3,250.0
320.0
60.0
60.0
Approach Surface 1:50
65
55
35
34
33
34
9000
GLIDE SLOPE AREA
LOCALIZER AREA
Runway 3,250 X 45
Parallel Taxi-way W=23
APRON
Cargo Terminal Bldg.
Adm. Bldg.
Passenger Terminal Bldg.
CAR PARKING
POL
60
55
50
45
40
35
35

Fig. 5-2-2

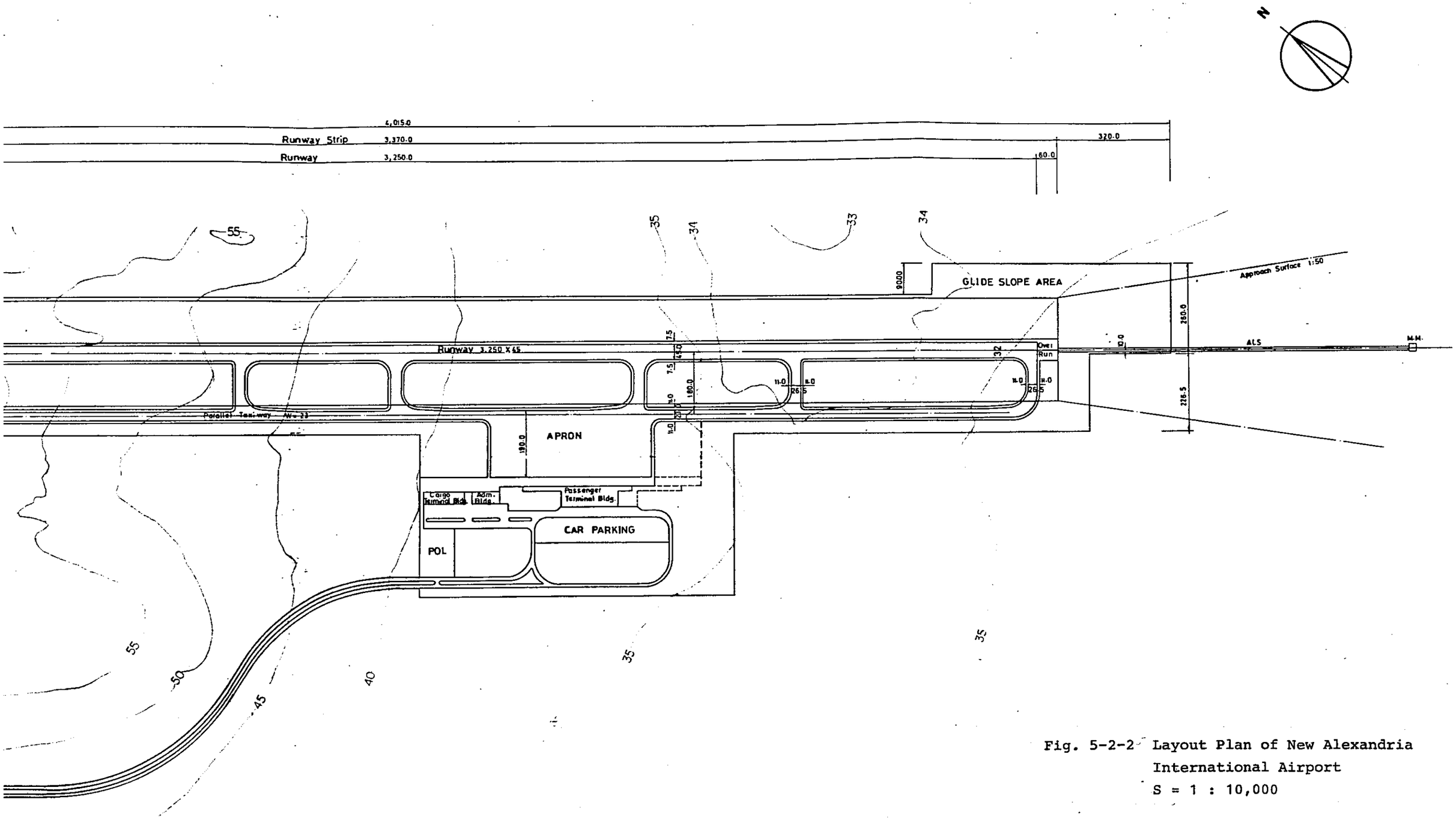


Fig. 5-2-2 Layout Plan of New Alexandria International Airport
S = 1 : 10,000

(2) Separation of Two Runways

In prior to the topographic survey, the runway configuration was discussed with Egyptain Civil Aviation Authority and determined to be paralled to the military runway with a separations of 2,000m. However this separation was reduced to 1,900m for less earth work volume after several trials of grading plan for an achievement of the least and balanced cut and fill volume.

A runway separation of 1,900m is also considered to be acceptable for the following reasons:

i) Simultaneous aircraft operations are possible for runways separated more than 1,300m from each other.

ii) There is still an ample space for terminal facilities between the boundary of military airport and the new runway, even if unexpected demand would arise.

(3) Longitudinal Location of the Runway

The longitudinal location of the runway is determined to be staggered by situating the southern threshold at 1,925m south from the southern threshold of the military runway so that the least earth work volume can be achieved within the limit of the preserved land. However, an area for the middle marker, approach lighting system and a part of ILS glide slope facility is located beyond the limit of the reserved land in order to reduce the earth work volumes. As a result, about 11 ha of additional land will be required.

5-2-2 Obstacle Limitation Surface

There is nothing to infringe upon the obstacle limitation surfaces nor to limit the establishment of aircraft operations.

5-2-3 Navaids and Lighting

The prevailing wind is from the north west and the main approach direction is determined to be RWY 32 (toward the north west). Hence, ILS approach lighting system, etc., for precision approach Category-I is planned for RWY 32 approach.

5-2-4 Airport Access Road

Airport access road is planned as shown in Fig. 5-2-4 in order to connect conveniently with Alexandria city and North West coast development area.
An access from Alexandria will be made by the existing desert road or the coastal highway between Alexandria and Mersa Matruh which is scheduled to be widened to 4 lanes by the early 1990's. New Ameriyah city will be connected with the airport by the road with 2 lanes which is planned by Alexandria Governorate.

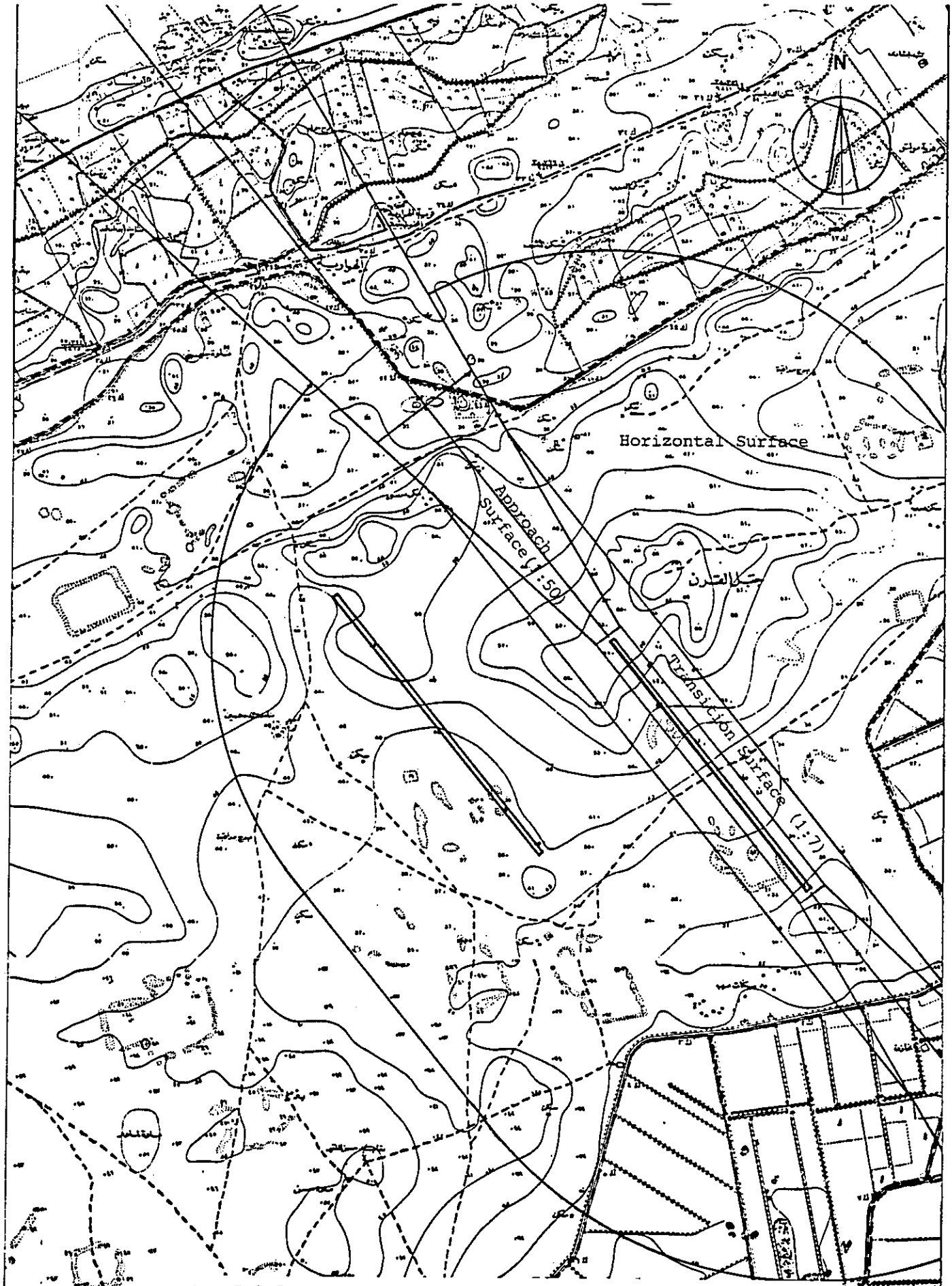


Fig. 5-2-3 Obstruction Limitation Surfaces for New Alexandria International Airport S=1:50,000

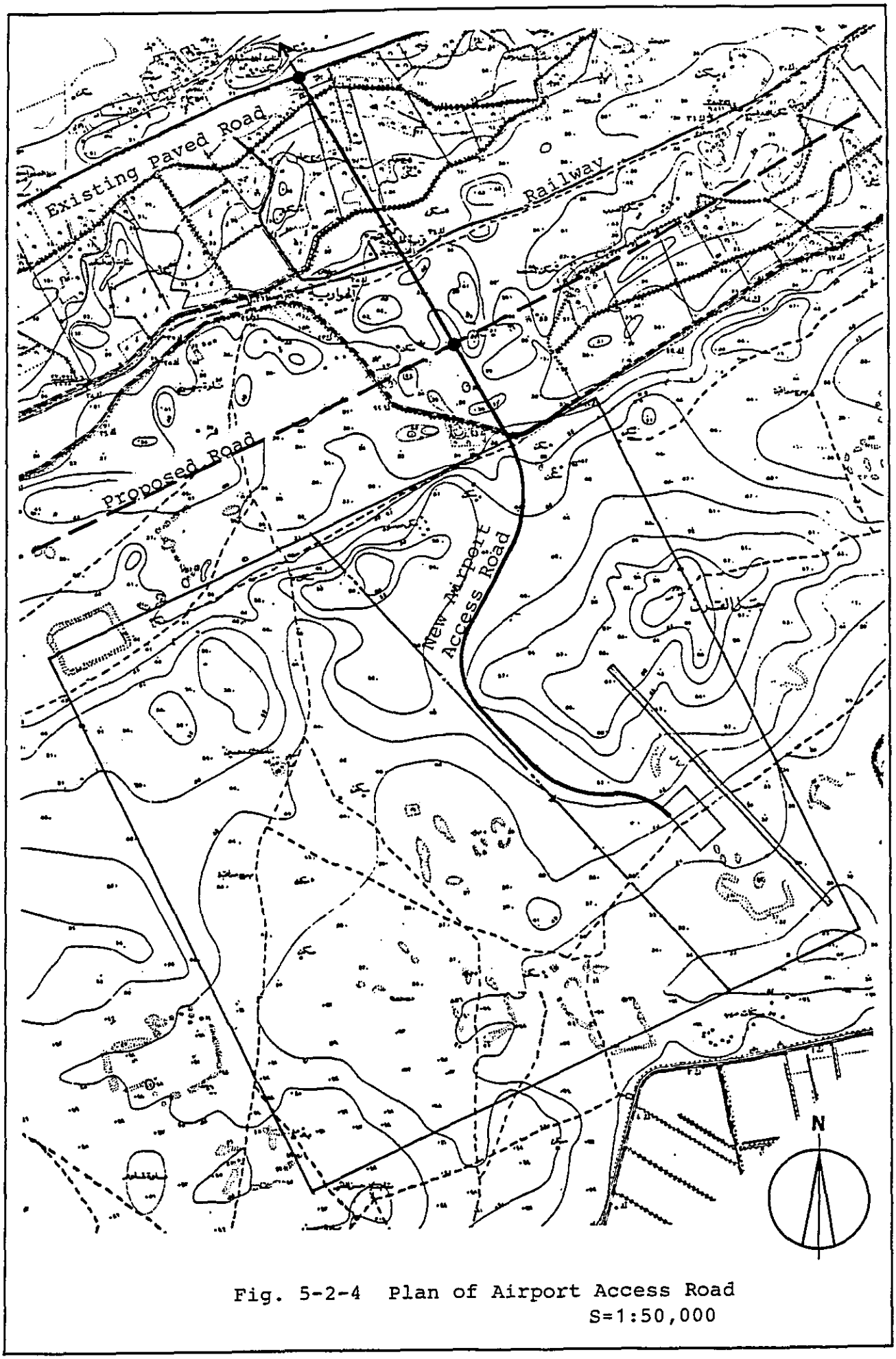


Fig. 5-2-4 Plan of Airport Access Road
S=1:50,000

5-3 Airport Facility Planning

5-3-1 Grading Plan

The grading plan for the airport is generally established so as to achieve the least and a balanced earth work volume. The profile of the centerline of the runway and the typical cross section of the airfield are shown in Figs. 5-3-1 and 2 respectively. The total earth work volume for the total airport construction is estimated to be about 1,000,000 cu.m of cut and fill operation. The major planning criteria and policies in accordande with ICAO recommendations are summarized as follows:

(1) The new airport is planned on the southern slope of the hill with a gradient of about 1.2 percent. Therefore, the longitudinal slope for the central potion of the runway is planned to be 1.2 percent for the construction economy. However, 0.8 percent is adopted for the first and the last quarter of the runway in accordance with ICAO Annex 14.

(2) A transverse slope for the runway and taxiway is planned to be 1.3 percent considering the tolerance of the pavement works and the easiness of overlay works in future.

(3) The area to be cleared and graded for the runway strip is basically as shown in Fig. 5-3-3.

(4) Within the above area, cross section is planned with down slopes of 1.0% and 2.5% toward the outside for cut and fill sections respectively in order to minimize the earth work volume and to facilitate an adequate water flow.

(5) The allowable maximum transverse slope of 5% is basically adopted for the area beyond the above-mentioned cleared and graded area, in order to minimize the earth work volume.

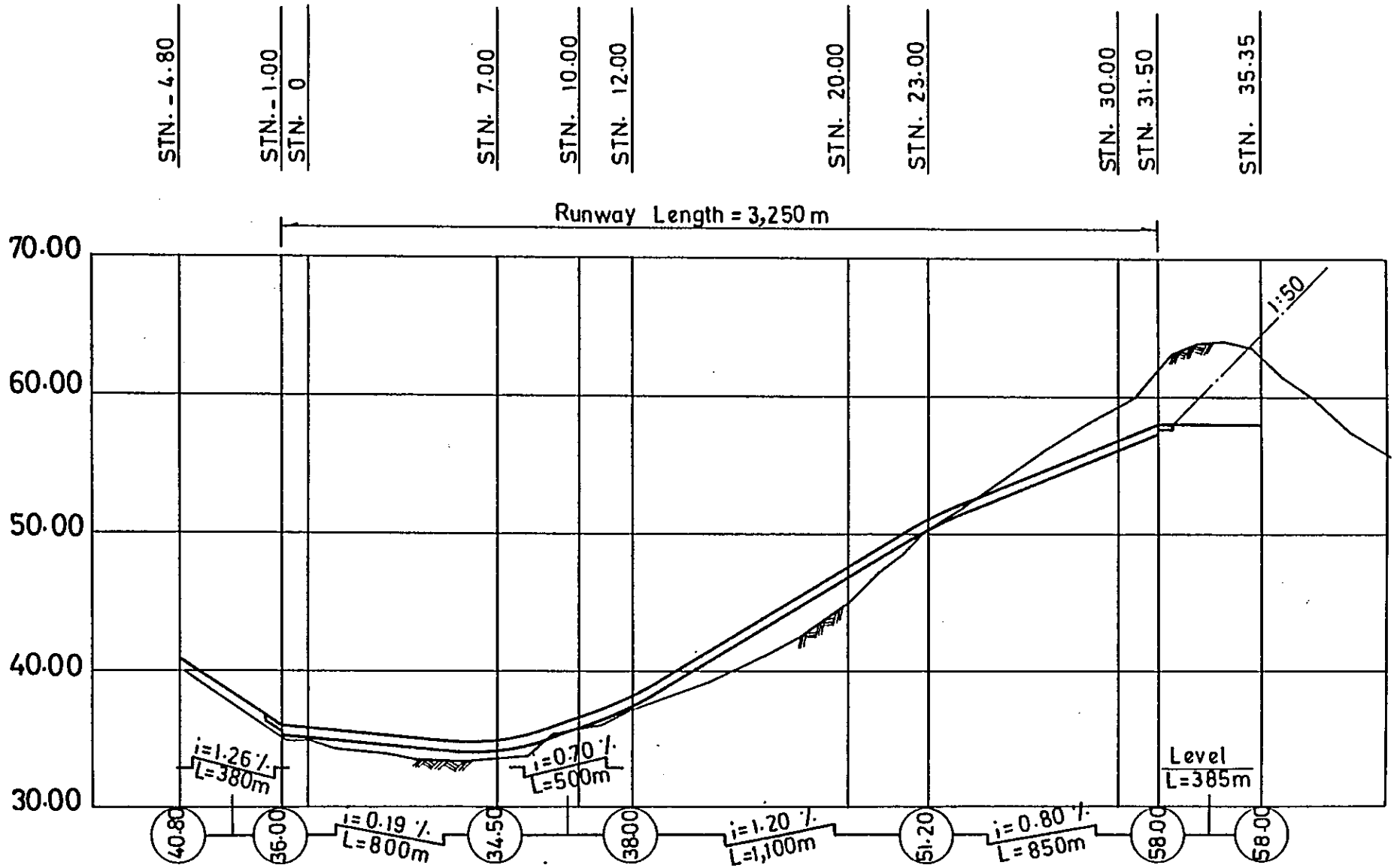


Fig. 5-3-1 Runway Profile of New Alexandria International Airport

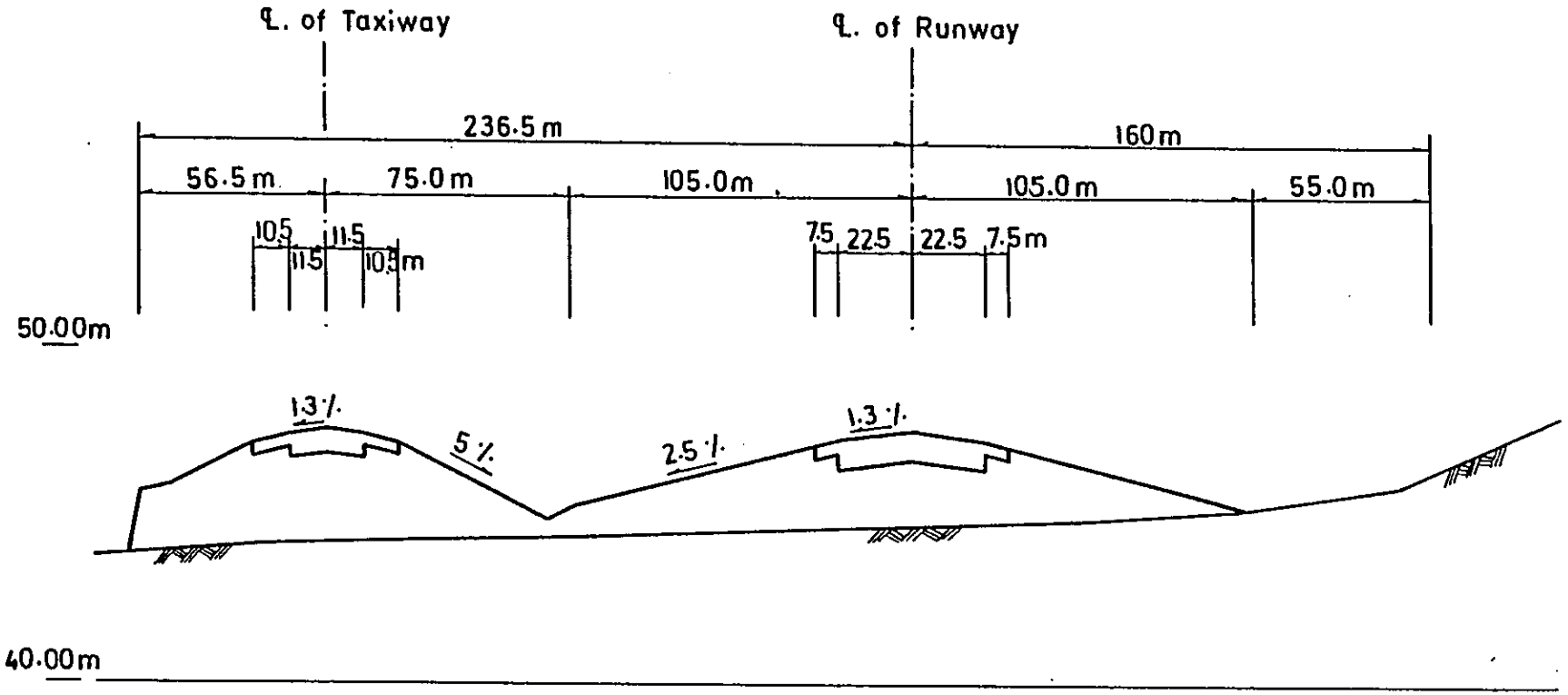


Fig. 5-3-2 Typical Cross Section of New Alexandria International Airport

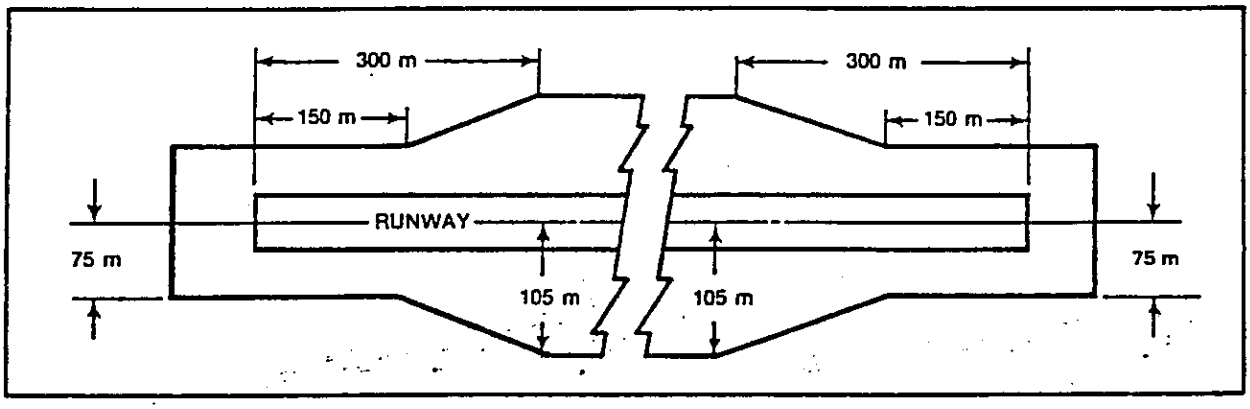


Fig. 5-3-3 Area to be Cleared and Graded

5-3-2 Pavement

(1) Subgrade Bearing Strength

Subgrade soil is silty clay. Subgrade CBR value is planned to be more than 20%. Cement stabilization of subgrade soil is considered where subgrade CBR value of 20% is not achieved. Subgrade K value is planned to be more than 6.0Kg/cm^3 by cement stabilization as necessary. The planning of pavement structure is not based on actual results of the soil investigations because soil investigation has not been completed by today as of Sept. 15, 1984. The pavement structure will be further studied based on the actual test results and incorporated in the Interim Report.

(2) Types of Pavement

As mentioned in Section 4-3-2, flexible pavement is planned for runway and taxiways except passenger loading apron where rigid pavement will be adopted.

(3) Pavement Thickness

The pavement thickness is planned as follows based on the Corps of Engineers Method and PCA Method.

i) Ultimate annual passengers during the design period : 2 million

Design aircraft : A-300B-4

Design period : 10 years

Repetition of design load : 3,000 times

a) Runway and taxiway

Subgrade CBR Value : 20%

Component	Thickness
Bituminous surface course	4cm
Bituminous binder course	4cm
Ditto	5cm
Graded aggregate base course	31cm
Total	44cm

b. Apron

Subgrade K value : K_{75} = 6.0 kg/cm³

Subbase K value : K_{75} = 7.0 kg/cm³

Component	Thickness
Cement concrete slub	32cm
Graded aggregate base course	25cm
Total	57cm

5-3-3 Drainage System Plan

The overall drainage system is planned as indicated in Fig. 5-3-4. According to meteorological data from 1964 to 1983, maximum daily rainfall during the last 20 years at Nozha and Dekheila is 65mm and 64mm respectively. Rainfall intensity of 60 minutes is about 8mm according to Meteorological authority in Cairo. Therefore, the storm water drainage will be made basically by evaporation and infiltration in the new airport except terminal area in which a necessary drainage facility consisting of catch basin, drain pipe, U-shaped channel, etc. will be planned.

5-3-4 Air Navigation System

The air navigation systems required for category-I operation have been planned as shown in Table 5-3-1. Life time of these electronics equipment is, at maximum, about 10 years if a necessary maintenance is carried out.

Table 5-3-1 Air Navigation Systems Plan

Equipment	Outline	Remarks
NAVIAIDS		
ILS	RWY32, Category-I	
Locater	at outer marker station	
MLS	Replacement of ILS above	
VOR/DME	Conventional type	Terminal VOR/ DME
NDB		Terminal NDB
Navaids monitor and control		
ATC/COM		
Tower console		
VHF air/ground radio	5 frequencies	
UHF air/ground radio		
VHF link	Between outer marker station	
AFTN teletype		
ISB radio	AFTN/ATS direct speech	Back up for common carrier
Tape recorder		
Master clock and interphone	ATC use	
LIGHTS		
Approach lighting system	RWY32,Category-I	
Simple approach lighting system	RWY14	

Table 5-3-1 Cont'd.

Equipment	Outline	Remarks
Runway edge lights		
Runway threshold/end lights		
PAPI	RWY 14/32	
Taxiway edge lights		
Apron flood lights		
Illuminated wind indicater		
Aerodrome beacon		
Power supply and control equipment		
Air traffic light gun		
MET		
Surface sensors	surface wind,temp, dew point, rain fall	
Data collecting equipment	Automated data collection and recording	
Runway visual range equipment	RVR measurement	
Ceilometer	Cloud heiht measurement	
Weather facsimile		
Weather teletype		
HF receiver		
Others		
Measuring equipment and spare parts.		

5-4 Land use of Airport Surroundings

5-4-1 Existing Land Use

The new airport is located in desert area dotted with only a few houses of Bedouin. There are agricultural land on both north and south of the new airport site. There are dozens of houses near Hawariyah Station and along the paved road with two lanes in the north of the new airport site. It is judged from the above present condition that the new airport can be developed compatible with the existing land use in the airport vicinity.

5-4-2 Future Land Use and New Airport Plan

Green zone and agricultural zone with a width of about 2Km each is planned in the north of the new airport according to the comprehensive plan "Alexandria 2005", issued by Governorate of Alexandria. Residential area and tourist villages are also planned between National railway and Mediterranean sea in "Alexandria 2005" as shown in Fig. 5-4-1.

The aircraft noise contour WECPNL 70 will extend to Lake Maryut when about 3 million passengers are handled at the airport and the planned residential area will be influenced by aircraft noise. Therefore, the planned residential area should be changed to green area, agricultural land or industrial area at the earliest possible date if the new airport construction is determined.

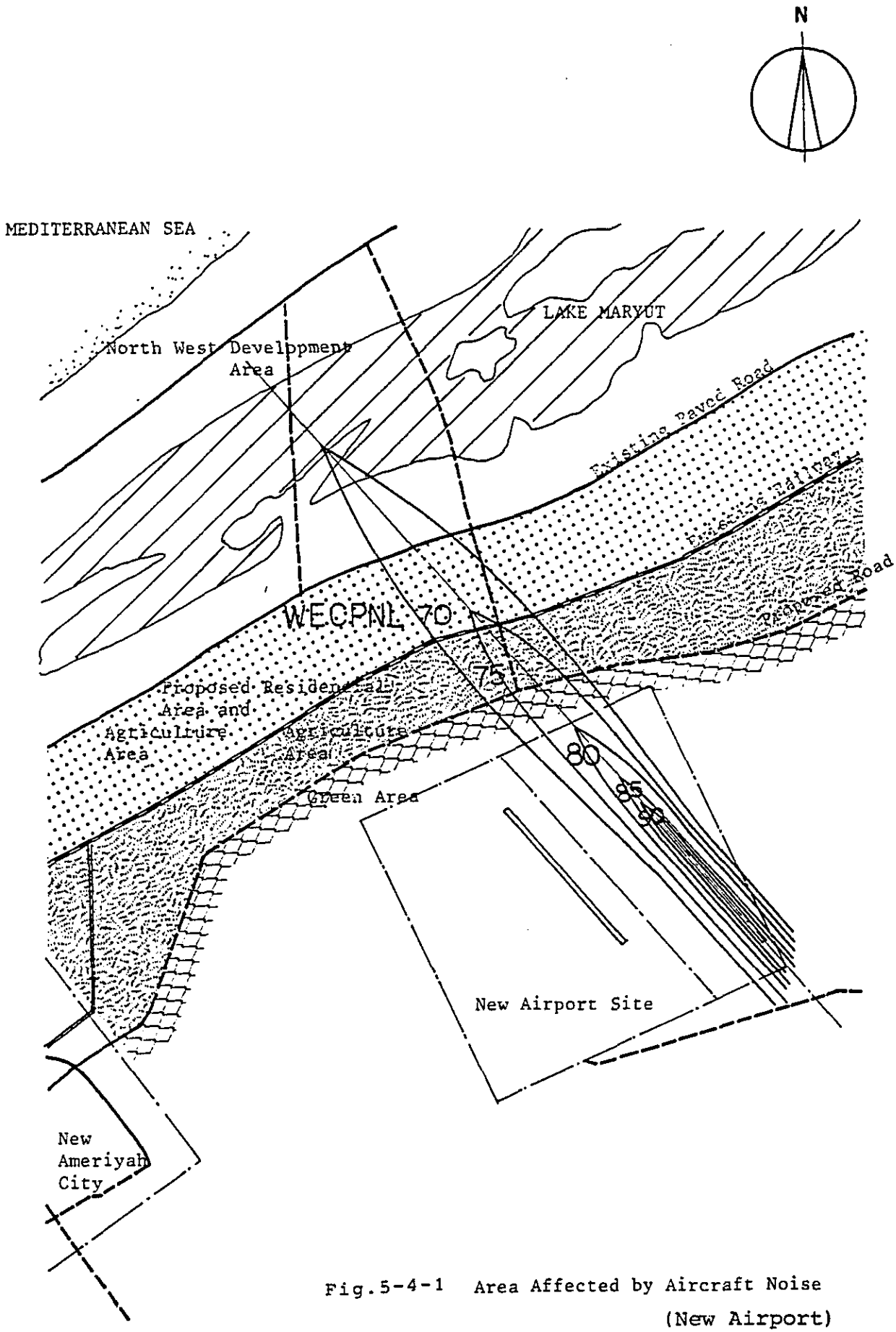


Fig.5-4-1 Area Affected by Aircraft Noise (New Airport)

5-5 Alternative Site for New Airport

The construction of Military airfield is now underway in the western area of the area (6km x 6km) preserved for a new airport which occupies about two third of the total area. Therefore, the remaining area on the east side is to be used for the new airport as shown in Fig. 5-1-2. This area is very limited in terms of freedom of planning and requires a large amount of earth work volumes and a longer runway by slope correction due to a 70m high hill in the center of the area. A grading plan has been made by applying the maximum longitudinal slope of 1.2 percent in order to achieve the least and a balance of cut and fill volume. As a result, cut operation of 6m high at the hill top and fill operation of 3m high at maximum will be required and thus, the cut volume will amount to 1 million cu.m which is balanced with fill volume which is considered to be an excessive amount for an airport built in desert. As the longitudinal slope of runway (computed by dividing the difference between the maximum and minimum elevation along the runway center line by the runway length) is about 0.8 percent, the runway length is corrected to 3,250m, which is 250m longer than the required runway length of 3000m for zero percent slope. In this regard, it is to be desired that the new airport will be sited on a flat terrain in the desert area, if the airport site can be freely sought in the neighboring desert area. Fig. 5-5-1 shows three alternative sites, for example, which may require less earth work volumes and shorter runway length.

Alternative-A:

Alternative-A is a scheme to locate the new airport on a flat terrain outside the allocated area, separating about 5.5 km from the military runway. The longitudinal slope of the runway will be almost level (0 percent) and thus, the required length will be 3,000m.

The earth work volume is roughly estimated to be about 400 thousand cu. m. of cut and fill operation.

Alternative-B

Alternative-B is a scheme to locate a new airport on a relatively flat area separating about 2.3 km. from the military runway. The longitudinal slope of the runway will be about 0.2 percent and the runway length will be 3,000m. The earth work volume is roughly estimated to be approximately 600 thousand cu. m. of cut volume to be balanced with fill.

Alternative-C

Alternative-C is a scheme to construct only terminal facilities for civil use on the east side of the military runway which will be jointly used by both military and civil aircraft. This concept will be the cheapest among others.

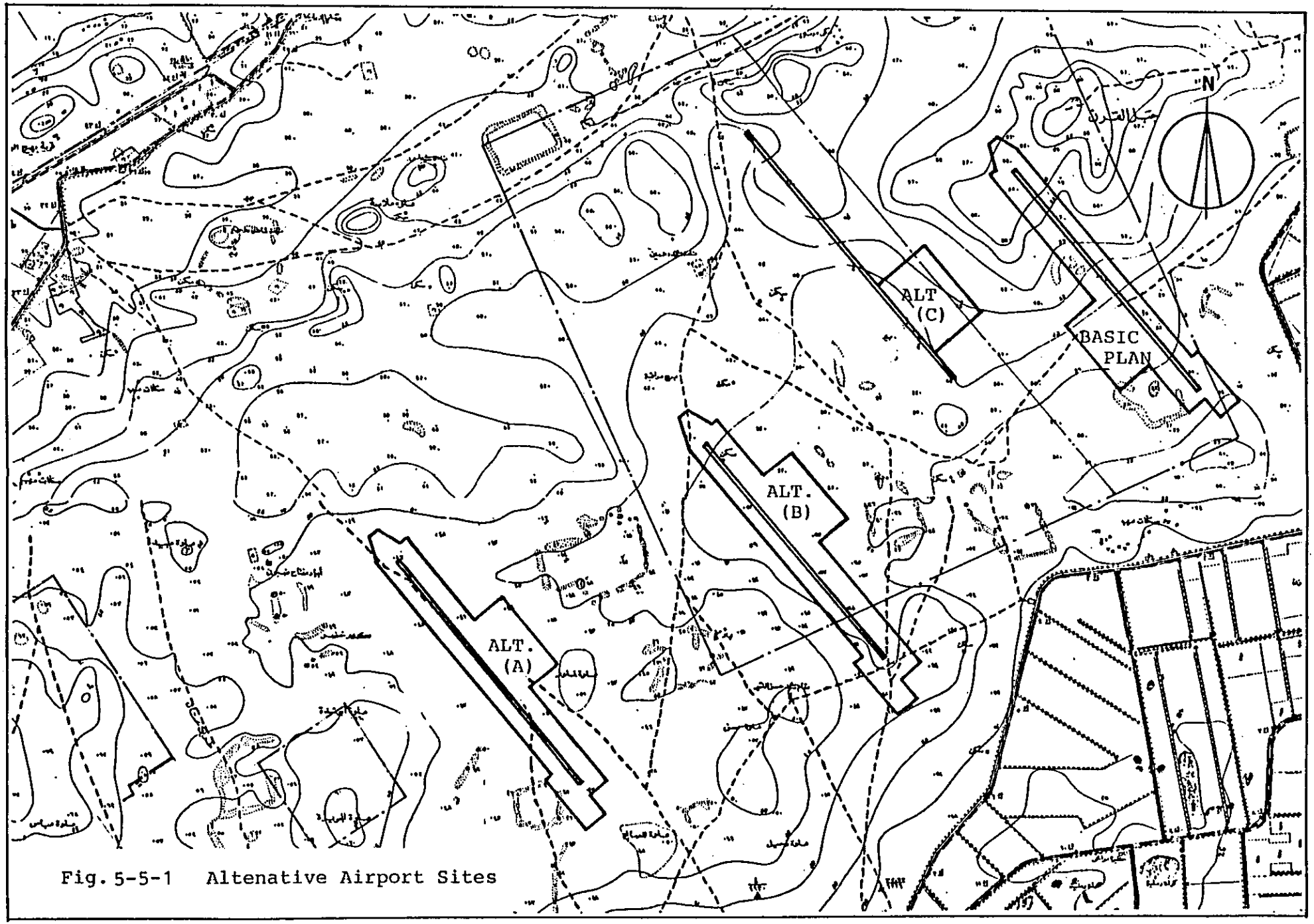


Fig. 5-5-1 Altenative Airport Sites

5-6 Necessary Improvements for Nozha Airport during the Transitional Period

For the new airport development scheme, the construction will require at least 7 years to complete. Some of the facilities at Nozha Airport will reach their capacity in 7 years. At least the following immediate improvement works will be required in order for the existing facilities to serve the traffic during the transitional period to the new airport if the new airport is selected.

i) Pavement overlay on runway, taxiway and apron
ii) Renovation of passenger terminal building
iii) Temporary cargo shed
iv) Expansion of car parking area

CAHPTER 6. COMPARATIVE EVALUATION OF ALTERNATIVES

6-1 Overall Comparison

A comparative evaluation of the redevelopment scheme of Nozha airport and the new airport construction scheme was performed in order to summarize the characteristics of Alternatives as results of studies carried out during 3 month long stay in Egypt. This comparison is summarized in Table 6-1-1. Unless the construction cost is estimated, it is difficult to judge which alternative is better. However, there are some qualitative indications that new airport construction is suitable not only as the gateway of Alexandria and the North West Coast, but also for the future development of this region, as compared with the redevelopment of Nozha airport when the size of airport becomes large. The following statements summarize the major features of the new airport construction qualitatively.

6-1-1 Economy in Construction Cost

The new airport construction may be cheaper than the redevelopment on Nozha airport because Nozha airport requires land reclamation, improvement of weak foundation, overlay on the existing pavement, etc. The redevelopment of Nozha airport will not only tend to disturb the airport operation during the construction but also require closing of the airport for about two years in order to carry out the construction work within the restricted area for the aircraft operations. If this closing is not possible, night construction work should be executed within the above restricted area and will raise the construction cost for the redevelopment of Nozha airport. The new airport development is free from any such requirement. The new airport will offer the opportunity to develop Nozha airport property area for residential or industrial use which contributes to the future of Alexandria city. In this case, the new airport will profit from the sale of the property area.

6-1-2 Minimal Influence of Aircraft Noise

There is much potential that Nozha airport will sooner or later suffer from serious aircraft noise problems arising from the airport neighbors which might protest the airport operation and the further development of the airport, and consequently require the airport to be replaced, otherwise an exorbitant compensation will be requested for the airport operation. The social change according to the upgrading of the living standard will introduce the above movement as experienced in many airports in the world. Therefore, it is recommended to construct the new airport where this adverse noise effect can be avoided by setting for the proper land use regulation at the beginning.

6-1-3 Compatibility with Land Use

The neighboring land use plan should be made based on the requirements of the airport. These include zoning by noise level, height restrictions, exclusion of electrical interruption, restriction on similar lighting, airport expansion,etc. For the new airport, any necessary requirements can be incorporated in the future land use plan while the existing airport will require a large amount of compensation in order to improve the land use and set forth the zoning standard by noise level, in the future.

6-1-4 Compatibility with NW Coast Development

The center of industrial activities will gradually move to the west from Alexandria city in the future. New Ameriyah city located about 10 kilometers west of the new airport will contain free zone, warehouses and various kinds of industries. In order to promote industrial business activities and to attract investors into this area, not only a seaport but also an airport is required in the vicinity area as basic infrastructure. Although it is difficult to speculate the future industrial structure in this region based on the present situation, it is at least necessary to take into account that the air transport will become closely related with the industry and play an important role for the regional economic development if the airport is conveniently located to the user. In this regard, the new airport is superior to Nozha airport because both the new airport and its vicinity can be developed with a lot of flexibility in harmony with each other while Nozha airport would become difficult to even live with the present community because of its location encompassed by the township.

6-1-5 Acceptable Airport Accessibility

Nozha airport is located in Alexandria city and the access to the airport from the city center is very good. As NW coast development including new Ameriyah city goes on, population and economic activities will gradually move to the west. One third of the population (about 8 million in 2000) is proportionally estimated to be closer to the new airport than to Nozha airport. For economic activities, the new airport will become still closer. A new highway connecting between Alexandria and Mersa Matruh will be completed in early 1990's and this highway will connect the airport with Alexandria city in 30 minute drive.

6-1-6 Higher Airport Expansibility

Although Nozha airport is considered to have an enough space to accommodate at least Case 4 traffic, it is difficult to cope with unexpected passenger and freight traffic in connection with NW coast development because of its limited land and the existence of the cross-wind runway. The new airport has an ample space along the runway and is much more flexible with regard to terminal facilities and any other future possible requirements including airport industrial planning as necessary.

6-1-7 Higher Airport Serviceability

Airport in Alexandria is required to be operational at all times as an international gateway to Egypt and an alternate of Cairo international airport. At Cairo international airport, about 25 percent of daily traffic is served in 8 hours between 10PM and 6AM. In this respect, the new airport suffices the requirements of 24 hour operation. However, night curfew would be imposed on Nozha airport for a noise abatement in the future.

6-2 Utilization Methods of Nozha Airport

The following alternative concepts are studied for the utilization of Nozha airport based on the assumption that the new airport development is selected for implementation.

Alternative concept A:

A new airport will totally replace the existing Nozha airport with accompanying advantages. All the civil aviation in the existing airport will be transferred to the new airport. In this concept, Nozha airport will be utilized for:-

i) General aviation and VIP airport, and heliport

ii) Agricultural land use

iii) Housing or factory lot for sale by raising the existing elelvation with fill

iv) Public land use such as park, sport facilities and recreational facilities, etc.

Alternative concept B:

A new airport will be constructed to accommodate the international traffic demand as a northern gateway to Egypt and Nozha airport will be used for domestic purposes. In this concept, a new airport may operate some domestic services in order to ease the problem of interconnections between two airports.

Concept B is not considered to be economically feasible for the following reasons.

i) Traffic demand which would support the necessity of two airports is not anticipated for Alexandria region.

ii) If the new airport is operated for international purposes only and Nozha airport for domestic purposes, a latent transfer demand between international and domestic lines will not be at all stimulated because of 45 kilometer long transfering distance.

iii) Many duplications of manning requirements, facility requirements, operation, maintenance, etc. will be necessary for the operation of the two airports. Thus, uneconomical operations will be required for not only the Government but also the airlines and private companies operating at the airports.

iv) This concept has a potentiality of noise problem and no opportunity to sell the existing airport property area while the Concept-A will not suffer from any noise problem and will make available the existing airport conveniently located in Alexandria city for other useful development.

Therefore, the Concept-A is considered as a basal condition for the utilization of Nozha airport in case of the new airport construction. This will be confirmed by comparing with each other in terms of construction cost in the Interim Report. As the utilization of Nozha airport as general aviation and VIP airport, etc. is not economically justifiable judging from anticipated demands, it is recommended that the Nozha airport should be diverted to other utilizations such as ii) and iii), listed under Alternative concept A which will benefit the future development of Alexandria city as well as the new airport construction.

Table 6-1-1 Comparison Table of Nozha Airport and New Airport

ALTERNATIVE AIRPORT DEVELOPMENT SCHEME / COMPARISON ITEM	NOZHA AIRPORT (The redevelopment plan for 2 million annual Passengers)	NEW AIRPORT (The development plan for 2 million annual Passengers)	Remarks
I. Aerodrome Data			
1. Airport Name (Tentative)	NOZHA AIRPORT	NEW ALEXANDRIA INTERNATIONAL AIRPORT	
2. Airport location	31° 11' 00" N 29° 56' 45" E	30° 55' 00" N 29° 43' 00" E	
3. Airport elevation	- 3.35m (-11ft)	42.0m (138ft)	
4. Airport reference temperature	30.6° C	30.6° C	
5. Aerodrome reference code	4 D	4 D	
6. Runway designatin number	Runway 04/22 Runway 18/36	Runway 14/32	
7. Runway dimension	1,440m X 30m 3,000m X 45m	3,250m X 45m	
8. Airport property area	380 ha	200 ha	
II. Aircraft Operational Considerations			
1. Obstacles	X - RWY 04 Approach Surface: Trees and lighting poles to be removed - Inner Horizontal Surface: Chimneys and antenna - RWY 18 Approach Surface: Many buildings, trees, mosque, for instrument approach.	None	

Table 6-1-1 Cont'd

ALTERNATIVE AIRPORT DEVELOPMENT SCHEME / COMPARISON ITEM		NOZHA AIRPORT		NEW AIRPORT	Remarks
2. Aircraft operations procedures	X	- Establishment of aircraft operations procedures to be limited to southern side due to the township on the north side. - Establishment of ILS RWY 22 approach is difficult due to danger area HE/D12.		- No restriction, except circling area to be limited to the east side.	
3. Air space utilization	X	- Danger Area HE/D12		- Close coordination with Air Force to be necessary for air space use.	
4. Cross-wind coverage		- Small aircraft requires both two runways. RWY 04/22: 13kt 92.6%, 20kt 99.7% RWY 18/36: 13kt 94.5, 20kt 99.4 Total: 13kt 97.2, 20kt 99.9		RWY 14/32: 13kt 96.3%, 20kt 99.4%	
5. Main approach and take-off runway		Runway 04		Runway 32	
Main Disadvantages	X X X	- Strict control of obstacles (Height restrictions) to be mandatory - Danger area HE/D12 and township limit aircraft operations procedures		- No problem	
III. Airport Development Considerations					
1. Distance from Alexandria city and North Coast Development area		- 7km from Alexandria station - About 50km from North Coast		- 45km from Alexandria station - About 10km from North Coast Development Area - Near from the center of industrial business area	
2. Airport accessibility from/to Alexandria		- Good	X	- Further	
from/to North Coast	X	- Further		- Good	

Table 6-1-1 Cont'd

ALTERNATIVE AIRPORT DEVELOPMENT SCHEME / COMPARISON ITEM	NOZHA AIRPORT		NEW AIRPORT		Remarks
3. Expansibility	X X X	- Terminal area is limited to accommodate unexpected demands. - Further extension of the runway requires relocation of desert road, drinking water canal, and reclamation.		- No restrictions	
4. Others			X	- Close coordination between ECAA and Air Force to be necessary for airport development.	
Main Disadvantages	X X X	- Longer access distance from North Coast Development Area. - Lesser expansibility for unexpected future demands.	X X	- Longer access distance from Alexandria city.	
IV. Operation and Maintenance of Airport	X	- Weak foundation and airport elevation below sea level require higher operation and maintenance cost.			
V. Social Considerations					
1. Aircraft noise influence	X X	- Area influenced by aircraft noise (more than WECPNL 70): 850 ha. - Many houses and small buildings exist within contour line of WECPNL 70 and serious noise problems is foreseen.		- None.	
2. Land use	X	- Restrictions of height ans smoke to be given to the industrial development area - Strict land use regulation being compatible with the airport surrounding area to be planned.		- Coordination with other projects to be necessary. - Land use regulation to be established.	

Table 6-1-1 Cont'd

ALTERNATIVE AIRPORT DEVELOPMENT SCHEME / COMPARISON ITEM	NOZHA AIRPORT		NEW AIRPORT		Remarks
3. Compensations	X	- Marine club, boat house, fish farm, road, drinking water canal, lighting poles, houses to be compensated.		- None.	
Main Disadvantages	X	- Extremely high compensation cost to be necessary for aircraft noise measures.		- No problem	
	X	- More facilities to be compensated.			
	X	- Restriction of building height, land use regulation and its execution are first priority.			
VI. Constructional Considerations					
1. Topographical and geological conditions	X	- Runway extension involves reclamation from the former marine airport (24 ha) and soil improvement (replacement and sand drain).	X	- Longer runway length to be required.	
		- Additional pump station to be required	X	- Maximum runway slope of 1.2% is applied for central portion due to the existing terrain.	
	X	- Approach lighting system to be installed in the lake.		- Existing terrain call for large scale of earth work.(1 million cu. m. of cut and fill)	
2. Special measures to be taken		- Land acquisition of 5.2 ha to be required.		- Expansion of the airport property area presently reserved to be necessary.	
		- Construction related to the runway and taxiway require the closing of the airport for 2 years of night works between the last flight and first flight of the day.			
		- Establishment of obstacle limitation surfaces and adjustment of land use in adjacent area to be required, prior to the runway extension.			
		- Diversion of the drinking water canal.			

Table 6-1-1 Cont'd

ALTERNATIVE AIRPORT DEVELOPMENT SCHEME / COMPARISON ITEM	NOZHA AIRPORT		NEW AIRPORT		Remarks
Main Disadvantages	X X X X	- Reclamation and soil improvement to be necessary for RWY extension. - Longer construction period will be required to avoid a conflict with the existing air traffic.	X X	- Existing terrain calls for large scale earth work and steep gradient but less than the allowable maximum slope. - Longer runway length to be required.	

CHAPTER 7. ACTIVITIES OF THE STUDY TEAM

The study team has conducted its activities in accordance with the work time schedule stipulated in the Inception Report. After the presentation of the Inception Report to Egyptian Civil Aviation Authority on July 15, , the study team started its activities covering data collection, site reconnaissance, topographic survey, soil investigations, meteorological observation, interviews with various ministries and airline officies, analyses of the collected data, and studies and preparation of the Progress Report.

7-1 Activities in Alexandria

(1) Meteorological Observation at The New Airport Site

The study team transported the meteorological observation equipment to Alexandria on July 24, and carried out a preparation work necessary for installation of the equipment in the new airport site. All the installation works was completed at the beginning of August. The meteorological observation was started with air temperature and humidity on August 1, and wind direction and speed on August 15. The observation data was taken out in the end of August in order to compare with the data observed at Nozha airport and Dekheilla airport. The equipment is working satisfactorily as of the end of September.

(2) Topographic Survey

i) Topographic Survey at The New Airport Site

The study team made a contract of the topographic survey of the new airport site with a surveying company on August 1. The survey was started from August 8 under the supervision of the team member. As the datum point for the elevation, the bench mark at Hawariya station of National Railway was used and the location of the center line of runway was determined based on the southern threshold and the center line of the military runway. All the site survey works were completed on September 8.

ii) Obstacle Survey

The study team conducted the obstacle survey at Nozha airport on August 28 and 29 in order to confirm whether or not any obstacle protrudes upon the obstacle limitation surfaces.

(3) Soil Investigations

The study team made a contract of the soil investigation of both Nozha airport and the new airport site on August 1. The soil investigations were started from August 9 under the supervision of a team member.

i) Nozha Airport

The soil investigation was started from August 9 at Nozha airport and three borings were completed by August 17. Since then, the laboratory tests on the obtained specimens have been carried out.

ii) New Airport Site

After the completion of the soil investigation at Nozha airport, the soil investigation at the new airport site was started from August 17. The borings were completed on August 23. After that, the excavation of test pits, preparation of specimens , and CBR and plate bearing tests were carried out at the new airport site.

(4) Site Reconnaissance and Data Collection

The site reconnaissance of Nozha airport, the new airport site and the surrounding area, and data collection at Alexandria were performed from August 12 to August 16 by 5 team members, and from August 25 to August 30 by 2 team members. Another three trips to Alexandria have been made since the end of August (as the end of September). Main purposes to visit Alexandria were to investigate the present condition of Nozha airport including utilization, facilities, land use in the airport neighboring area, etc, and to collect necessary data from the following sources:

- Governorate of Alexandria
- Department of North West Coast Development
- Governorate of New Ameriyah City
- University of Alexandria

7-2 Activities in Cairo

The study team set up the office in the administration building of Cairo International Airport on the 17th of July. Immediately after opening the office, the study team initiated at the data collection with cooperation of a counterpart member of ECAA in accordance with the list of data collection attached to the Inception Report. The major ministries and government offices which the study team visited and interviewed with are as follows:

- Ministry of Planning
- Ministry of Economy
- Ministry of Tourism
- Ministry of Interior
- Ministry of Housing
- Central Agency for Public Mobilization and Statistics
- Ministry of New Town
- Cairo Airport Authority
- Meteorological Authority
- Egypt Air

The study team have been in close contact with Egyptian Civil Aviation Authority, Cairo Airport Authority and Egypt Air in order to have a through knowledge of Nozha airport, new airport site adjacent to a military airfield, civil air transport system in Egypt, air traffic control, fleet of Egypt air, the necessity of new airport, etc.

Table 7-1-1 Activities of the Study Team.

Date	Activities
11 July, 1984	- Arrive in Cairo from Japan. Member of Japanese Advisory Comitte, Project Manager and other 5 members.
12 July	- Courtesy call on Embasy of Japan and JICA. - Visit to Egyptian Civil Aviation Authority (ECAA). Presentation of the Inception Report.
13 July	- Mobilization to Alexandria
14 July	- Site reconnaissance of Nozha airport and the new airport site.
15 July	- Discussions on the Inception Report with ECAA.
16 July	- Signing ceremony of the minutes of meeting. - Visit to Cairo Area Control Center.
17-18 July	- Preparation for setting up the office for the study team
19 July	- Discussion on the meteorological observation with ECAA.
21-23 July	- Check of the meteorological equipment and arrangement for transportation
24-26 July	- Visit to Alexandria (2 team members). - One team member stayed at Alexandria up to August 28.
28-31 July	- Discussion with the counterpart team - Installation of Meteorological equipment. - Visit to ECAA and Egypt Air for data collection.
1 August	- Contract with Egyptian firm on topografic survey and soil investigation. - Visit to Meteorological Authority for data collection. - Commencement of the Met. observation (Air temperature and humidity)

2-7 August	- Arrive in Cairo from Japan(1 team member - Visit to Ministry of Planning,Ministry of Planning and Central Agency for Public Mobilization and Statistics for data collection - Office work
8 August	- Commencement of the topographic survey
9-10 August	- Discussions with the counterpart team - Visit to Ministry of Interior, Ministry of Housing, Egypt Air for data collection - Commencement of the soil investigation (Nozha) - Office work
12-16 August	- Visit to Governorate of Alexandria, Department of North West Coast Development, Governorate of New Ameriyah City, University of Alexandria, Nozha Airport, etc., for data collection.
17 August	-Arrive in Cairo from Japan(1 member) - Commencement of the soil investigation (New site)
18-24 August	- Office work - .Discussion with the conterpart team member. - Visit to Meteorological Authority, Cairo Airport Authority, Egypt Air for data collection and discussion.
25-30 August	- Obstacle survey at Nozha - Leave Cairo for Japan(1 team member) - Office work - Visit to Cairo Airport Authority for data collection
1-8 September	- Office work - Data collection of the construction cost. - Discussion with the counterpart team member.
9 September	- Arrive in Cairo from Japan(1 team member

11-12 September	- Office work - Discussion with the counterpart team member.
13 September	- Visit to Alexandria to check the operation of met. equipment.
14-29 September	- Office work

APPENDIX -A

LIST OF DATA COLLECTED BEFORE THE COMMENCEMENT OF THE STUDY

IN EGYPT ON JULY 11, 1984

CATEGORY	REPORT/DATA PREVIOUSLY COLLECTED	SOURCE	REMARKS
A : THE EXISTING REPORT ON NEW AIRPORT DEVELOPMENT	A - 1 New Alexandria Airport Master Plan Report Part 1 - General Master Plan. Sept. 1974 Part 2 - Runway Preliminary Design. Jan. 1979 Part 3 - Passenger Terminal Building. Dec. 1974	ECAO	NACO
	A - 2 New Alexandria Airport Study Passenger Terminal Building Drawings. Oct. 1974	ditto	NACO 6 sheets
	A - 3 New Alexandria Airport Preliminary Runway Design. Jan. 1979	ditto	NACO 12 sheets
	A - 4 Arab Republic of Egypt Preliminary Investigation Report for New Alexandria International Airport Construction Project. Jul. 1979	Japan Transport Consultant Association (JTCA)	
	A - 5 New Alexandria International Airport Pre-feasibility Study Report. Jul. 1979	ECAO	Pacific Consultants International (PCI)

CATEGORY	REPORT/DATA PREVIOUSLY COLLECTED	SOURCE	REMARKS
B : THE EXISTING STUDIES ON NOZHA AIRPORT DEVELOPMENT	B - 1 Nozha Airport Alexandria Feasibility Study Report. Jan. 1978	ECAO	NACO
	B - 2 Nozha Airport Alexandria Feasibility Study Drawings. Jan. 1978	ditto	NACO 17 sheets
	B - 3 Nozha Airport Alexandria Civil Works Contract, Volume 1 of 4, Conditions.	ditto	NACO
	B - 4 Nozha Airport Alexandria Civil Works Contract, Volume 2 of 4, General Specifications. Nov. 1978	ditto	NACO
	B - 5 Nozha Airport Alexandria Building Works Contract, Volume 1 of 3, Conditions.	ditto	NACO
	B - 6 Nozha Aiprot Alexandria Building Works Contract, Volume 2 of 3, Structural Specification.	ditto	NACO
	B - 7 Nozha Airport Alexandria New Lay-out. Nov. 1978	ditto	NACO Drawing S=1 : 5,000
	B - 8 Nozha Airport Alexandria Extension Runway 04-22 Lay-out, Longitudinal Profile, Cross Sections and Pavement Details. Nov. 1978	ditto	NACO Drawing

CATEGORY	REPORT/DATA PREVIOUSLY COLLECTED	SOURCE	REMARKS
C : GEOGRAPHY AND GEOLOGY	C - 1 Alexandria City Map S=1 : 100,000	ECAO	
	C - 2 New Site Map S=1 : 25,000	DITTO	
	C - 3. A map on a scale of 1 to 500,000	(PCI)	
D : METEOROLOGY AND CLIMATOLOGY	Nil		
E : DEMOGRAPHY	E - 1 Population and Development	Central Agency for Public Mobilization and Statistics	Sep. 1978

CATEGORY	REPORT/DATA PREVIOUSLY COLLECTED	SOURCE	REMARKS
F : ECONOMY AND INDUSTRY	F - 1 The Five-Year Plan, 1978-1982 Vol. 10 Part-1 Vol. 10 Part-2 Vol. 12 Part-4 Vol. 13	Ministry of Planning	Aug. 1977
	F - 2 Five Year Plan for Economic and Social Development 1982/83 - 1986/87	ditto	Dec. 1982
	F - 3 Summary of Programs and Potential for Investments in Egypt * Extract	Ministry of Devolopment	
	F - 4 Statistical Year Book, 1974, 1977, 1978, 1981, 1982.	Central Agency for Public Mobilization and Statistics	
	F - 5 Monthly Bulletin of Foreign Trade Part-1 Part-2	ditto	Aug. 1983
	F - 6 A.R.E. Tourist Movement, 1962-1972.	Ministry of Tourism Statistics Department	1975
	F - 7 Statistical Bulletin, Jan., April, June, July, Aug. and Oct. 1978.	Minsitry of Tourism	1978
	F - 8 National Plan for Tourism Arab Republic of Egypt. Vol. 1, Vol. 2, Vol. 3, Vol. 4, Vol. 5	Steigenberger Consulting Ltd. and Studiehreis Fur Tourisms	Apr. 1978

CATEGORY	REPORT/DATA PREVIOUSLY COLLECTED	SOURCE	REMARKS
G : REGIONAL AND LOCAL MASTER PLANNING	G - 1 New Ameriyah City Master Plan, Main Report.	Ministry of Devlopment and New Communities	Oct. 1978
	G - 2 New Ameriyah City First Stage Plan, Main Reprot.	ditto	ILACO HASSAN ISMAIL AND PARTNERS CEAT Aug. 1978
H : ENVIRONMENT	Nil		
I : TRANSPORTATION (other than air transport) AND COMMUNICATION	I - 1 Egypt National Transport Study Phase II-1981	Ministry of Transport	NEDECO

CATEGORY	REPORT/DATA PREVIOUSLY COLLECTED	SOURCE	REMARKS
J : AIR TRANSPORT	J - 1 Booklet of Egypt Air	Egypt Air	
	J - 2 Annual Statistical Report, Civil Aviation Organization, 1969, 1970, 1972, 1975, 1976, 1977, 1980, 1981, 1982	ECAO	
	J - 3 Annual Report of All Airport	ditto	
	J - 4 Statistical Report in Civil Aviation in the ARE 1982	ditto	
K : THE EXISTING AIRPORT FACILITIES	K - 1 Refer to B-2		

CATEGORY	REPORT/DATA PREVIOUSLY COLLECTED	SOURCE	REMARKS
L : AIRSPACE USE AND AIR NAVIGATION	L - 1 Aerodrome Information Publication (AIP), in Egypt.	ECAO	
	L - 2 Air Navigation Plan-Africa-Indian Ocean Region.	ICAO	Jan. 1983
	L - 3 Notam 9/1983 (ATS Route System within Cairo FIR)	ECAO	Sept. 1983
	L - 4 A New System of Air Traffic Control for Egypt.	ditto	Sofeaira

CATEGORY	REPORT/DATA PREVIOUSLY COLLECTED	SOURCE	REMARKS
M : AIRPORT ADMINISTRATION	M - 1 Organization of MOCA.	MOCA	Chart
N : ENGINEERING	N - 1 Foundation Investigation on the New Alexandria Airport. Jul. 1978	The Egyptian Authority for Roads and Waterways	

APPENDIX -B

LIST OF DATA COLLECTED IN EGYPT DURING A PERIOD FROM JULY 11, 1984 TO SEPTEMBER 20, 1984

CATEGORY	DATA AND REPORT COLLECTED IN EGYPT	SOURCE	REMARKS
C: GEOGRAPHY AND GEOLOGY	C-1 Sheet 91/480 BAHIG STA	ECAO	Scale 1:25.000
	C-2 Sheet 91/465 and 92/465 BURG EL ARAB	ditto	ditto
	C-3 Sheet 93/495 EL MEX	ditto	ditto
	C-4 Sheet 88/42 EL HAMMAM	ditto	Scale 1:100.000

CATEGORY	DATA AND REPORT COLLECTED IN EGYPT	SOURCE	REMARKS
D : METEOROLOGY AND CLIMATOLOGY	D-1 Percentage Frequency Of Surface Wind Speed NOZHA	EMA	
	D-2 Maximum and Minimum Air Temperature (NOZHA 1981)	ditto	
	D-3 NOZHA Station, MET observation data Period 1942-1980	ditto	
	D-4 Meteorological Observation Data Nozha airport 8/1~ 8/30 1984	ditto	
	D-5 Surface Wind Of Dekheila 1978-1980	ditto	
	D-6 Maximum and Minimum Air Temperature (DEKHEILA 1981)	ditto	
	D-7 Dekheila MET observation data Period 1957-1980	ditto	

CATEGORY	DATA AND REPORT COLLECTED IN EGYPT	SOURCE	REMARKS
E : DEMOGRAPHY	Population of Alex.-September 1976	Central Agency for public mobilization and statistics.	
	E-1 Part 1		357 pages
	E-2 Part 2		890 pages
	E-3 Part 3		308 pages

CATEGORY	DATA AND REPORT COLLECTED IN EGYPT	SOURCE	REMARKS
F : ECONOMY AND INDUSTRY	Statistics of quarterly industrial production	Central Agency for Public Mobilization and Statistics	
	F-1 First quarter August 1983		
	F-2 Second quarter November 1983		
	F-3 Statistical yearbook 1982-1983	Central Agency for Public Mobilization and Statistics	
	F-4 Statistical Indicators (52-1979)	Central Agency for Public Mobilization and Statistics	

CATEGORY	DATA AND REPORT COLLECTED IN EGYPT	SOURCE	REMARKS
G : REGIONAL AND LOCAL MASTER PLANNING	G-1 Comprehensive plan -Alexandria 2005	Alexandria University	
	G-2 North-West Coast Development plan	Department of North-West Cost Development Authority	
	G-3 General Location of New Ameriyah City	Ministry of Building and New housing	
	G-4 Terms of Reference NW coast development	Ministry of develop and new communities	

CATEGORY	DATA AND REPORT COLLECTED IN EGYPT	SOURCE	REMARKS
J : AIR TRANSPORT	J-1 Annual Statistical Report, Civil Aviation Organization, 1978, 1979, 1983	ECAO	
	J-2 Aeronautical Information Publication, Arab Republic of Egypt	ditto	
	J-3 Yearly Report of Working Activity	Egypt Air	
	J-4 Boeing 707 operations Manual	ditto	
	J-5 Boeing 767 A 300 B 4 Operations Manual	ditto	
	J-6 Yearly Comparison Report between Egypt Air and other Foreign Companies	ditto	
	J-7 Egypt Air Annual Report 1981	ditto	
	J-8 (Comparison between 1975 and 1974) Table of Air Transportation 1976	ditto	
	J-9 (Comparison between 1982 and 1981) Table of Air Transportation 1983	ditto	
	J-10 (Comparison between 1976 and 1975) Table of Air Transportation 1977	ditto	
	J-11 (Comparison between 1980 and 1978, 1979) Table of Air Transportation 1980	ditto	

CATEGORY	DATA AND REPORT COLLECTED IN EGYPT	SOURCE	REMARKS
J : AIR TRANSPORT	J-12 Weekly schedule of aircraft (Airbus and Fokker 27)	Egypt Air	
	J-13 Information Bulletin Project and Development Department	ditto	
	J-14 Flight between CAI and ALY year 1983 -year 1982 year 1981	ditto	
	J-15 Telx. Cairo-Kuwait	ditto	
	J-16 Telx. Cairo-Bangkok	ditto	
	J-17 Statistical Reporting Form Calendar year 1975	ditto	
	J-18 Statistical Reporting Form Calendar year 1976	ditto	
	J-19 Statistical Reporting Form Calendar year 1978	ditto	
	J-20 Statistical Reporting Form Calendar year 1979	ditto	
	J-21 Statistical Reporting Form Calendar year 1981	ditto	

CATEGORY	DATA AND REPORT COLLECTED IN EGYPT	SOURCE	REMARKS
J : AIR TRANSPORT	J-22 Statistical Reporting Form Calendar year 1982	Egypt Air	
	J-23 Statistical Reporting Form Calendar year 1983	ditto	
	J-24 Statistical Reporting Form Calendar year 1980	ditto	
	J-25 Flight Guide B 737	ditto	
	J-26 Flight Guide B 767	ditto	
	J-27 Flight Guide B 707	ditto	
	J-28 Comprehensive Program of El-Hegg Aircraft	ditto	
	J-29 Number of Flights Per 24 hours Winter Season 1983-1984	CAIRO Airport Authority	
	J-30 Weekly Scheduled Flights (Winter 83-84)	ditto	
	J-31 Schedule of Night Stay in Cairo Airport	ditto	
	J-32 Annual Statistical Report 1983	ditto	
	J-33 Air Alex. Domestic Time Table	Air Alex.	

CATEGORY	DATA AND REPORT COLLECTED IN EGYPT	SOURCE	REMARKS
J : AIR TRANSPORT	J-34 Parking report for 1984	Egypt Air	
	J-35 Destinations of Summer 84	ditto	

CATEGORY	DATA AND REPORT COLLECTED IN EGYPT	SOURCE	REMARKS
K : THE EXISTING AIRPORT FACILITIES	K-1 Data of Construction Cost-Nozha Airpor*	ECAO	
	K-2 Civil Works Contract Drawings Nozha Airport	ditto	
	K-3 Building Works Contract Drawings Nozha Airport	ditto	
	K-4 Layout plan of Apron in Cairo Airport	CAIRO Airport Authority	
	K-5 Cairo Apron Chart	ditto	
	K-6 Layout plan of Drainage Nozha Airport	ECAO	

CATEGORY	DATA AND REPORT COLLECTED IN EGYPT	SOURCE	REMARKS
L : AIRSPACE USE AND AIR NAVIGATION	L-1 Modernization of the Egyptian ATC system	ECAO	

CATEGORY	DATA AND REPORT COLLECTED IN EGYPT	SOURCE	REMARKS
M : AIRPORT ADMINISTRATION	M-1 Number of Employees of Cairo Airport Authority	CAIRO Airport Authority	

CATEGORY		DATA AND REPORT COLLECTED IN EGYPT	SOURCE	REMARKS
N : ENGINEERING	N-1	Coordinates of national datum point for topographical Survey (West of Delta)	Surveying Authority	