- Judging from the wind direction (wind rose) at the project site, Runway 08 was set as the main runway and precision approach procedures were established accordingly.

- A study was made to avoid any violations of PANS-OPS concerning the obstacles, specially the mountain on the west side and the tower on the northeast side of the runway. Instrument approach procedures were established for Runway 26 for more flight safety and for maintaining higher operational efficiency of the new airport.

- Procedures were worked out to fit large type aircraft (category D) operations.

- Dual procedures were planned in consideration of the case of one facility becoming out of service.

- Topographic conditions of the places where facilities will be installed were surveyed. Further checks of the possibility of the installation of the facilities maintenance road were made .

6.3.1 VOR/DME-ILS Approach for Runway 08

a. Two types of initial approach procedures were designed for this ILS approach for Runway 08; one is a DME-ARCS in the initial approach segment, the other is a BASE TURN in the initial approach segment. As compared to the DME-ARCS, the disadvantage of the BASE TURN is that the latter has a longer final segment.

b. Normally, the ILS GP of less than 3 degrees is preferred, but ICAO does not fix any rule regarding this value. Based on the fact that a GP of greater than 3 degrees is used in an airport located in mountainous area in Morocco, the GP of 3.2 degrees was adopted in this procedure.

c. The result of test by the ICAO CRM (collision risk model) showed that the minimum acceptable OCH (obstacle clearance height) above the threshold is 57 m and total risk is 9×10^{-8} in this approach procedure for category D aircraft operations. (When specified OCH is 60 m, total risk is 2.6×10^{-8}.) The results of CRM study are summarized in Tables 6-2 and 6-3 and detailed data are given in Appendix VI-1 and VI-2 (see schematic diagrams in Fig. 6-3 and Fig. 6-4).

Table 6-2 PRELIMINARY RESULTS FOR ILS CATEGORY I (8 nm FINAL)

Speed Cat.	Type of Report	OCA/H Metres	Total Risk	Highest Risk Obstacle Ident.	Description	Risk
A	Specified OCH	60	2.9E-11	OBS 01	GP Antenna	2.7E-11
A	Minimum OCH	45	7.1E-08	OBS 01	GP Antenna	6.2E-08
B	Specified OCH	60	2.3E-10	OBS 01	GP Antenna	2.2E-10
B	Minimum OCH	48	8.3E-08	OBS 01	GP Antenna	7.6E-08
C	Specified OCH	60	2.5E-09	OBS 01	GP Antenna	2.5E-09
C	Minimum OCH	52	9.4E-08	OBS 01	GP Antenna	8.9E-08
D	Specified OCH	60	2.6E-08	OBS 01	GP Antenna	2.6E-08
D	Minimum OCH	57	9.0E-08	OBS 01	GP Antenna	8.9E-08

Table 6-3 PRELIMINARY RESULTS FOR ILS CATEGORY I (10 nm FINAL)

Speed Cat.	Type of Report	OCA/H Metres	Total Risk	Highest Risk Obstacle Ident.	Description	Risk
A	Specified OCH	60	2.9E-11	OBS 01	GP Antenna	2.7E-11
A	Minimum OCH	45	7.1E-08	OBS 01	GP Antenna	6.2E-08
B	Specified OCH	60	2.3E-10	OBS 01	GP Antenna	2.2E-10
B	Minimum OCH	48	8.3E-08	OBS 01	GP Antenna	7.6E-08
C	Specified OCH	60	2.5E-09	OBS 01	GP Antenna	2.5E-09
C	Minimum OCH	52	9.4E-08	OBS 01	GP Antenna	8.9E-08
D	Specified OCH	60	2.6E-08	OBS 01	GP Antenna	2.6E-08
D	Minimum OCH	57	9.0E-08	OBS 01	GP Antenna	8.9E-08

OBSTACLES					
IDENT	QNH	QNH-181m	LOTN	MOC	OCH
A	924m	743m	X-1.5NM Y-1.9NM	84m	827m
B	738	557	X-1.4 Y-1.8	150	707
C	595	414	X-1.0 Y-0.1	150	564
D	597	416	X-8.9 Y-1.7	150	566
E	673	492	X-9.1 Y-2.2	75	567

NOTE: X IS THE DISTANCE FROM RWY THR
Y IS THE DISTANCE FROM EXTENDED RWY CENTER LINE

REMARKS:

1. POSSIBLE TO MAKE A HOLDING PATTERN OVER VOR/DME.
2. NO SPECIAL PROBLEMS FOR STRAIGHT MISSED APPROACH.
3. MINIMUM ACCEPTABLE OCH IS 57m ABOVE THR, CONFIRMED BY ICAO CRM.
4. IAS 230 KTS FOR INITIAL APPROACH.
5. CROSS SECTION IS NOT IN SCALE.

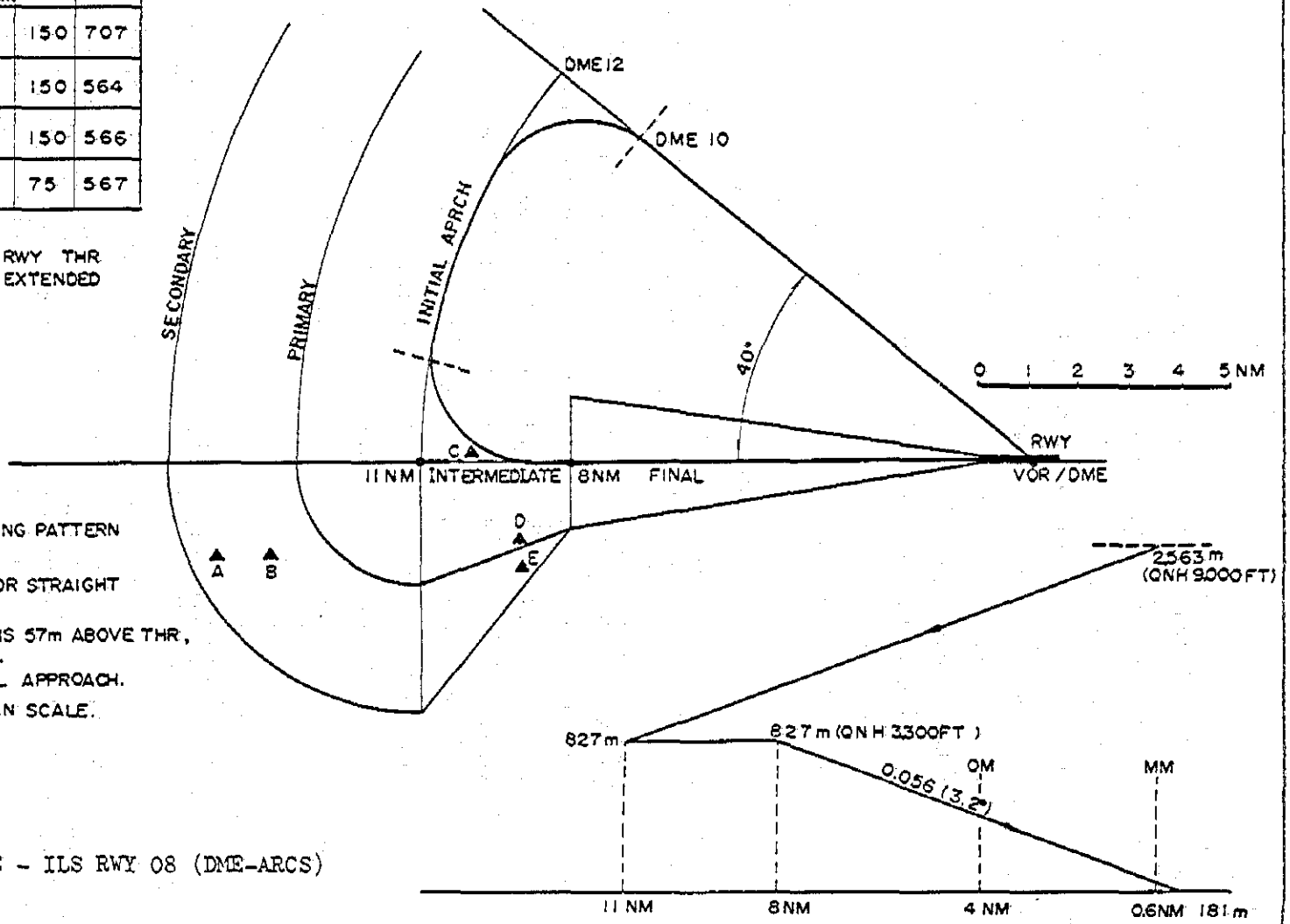
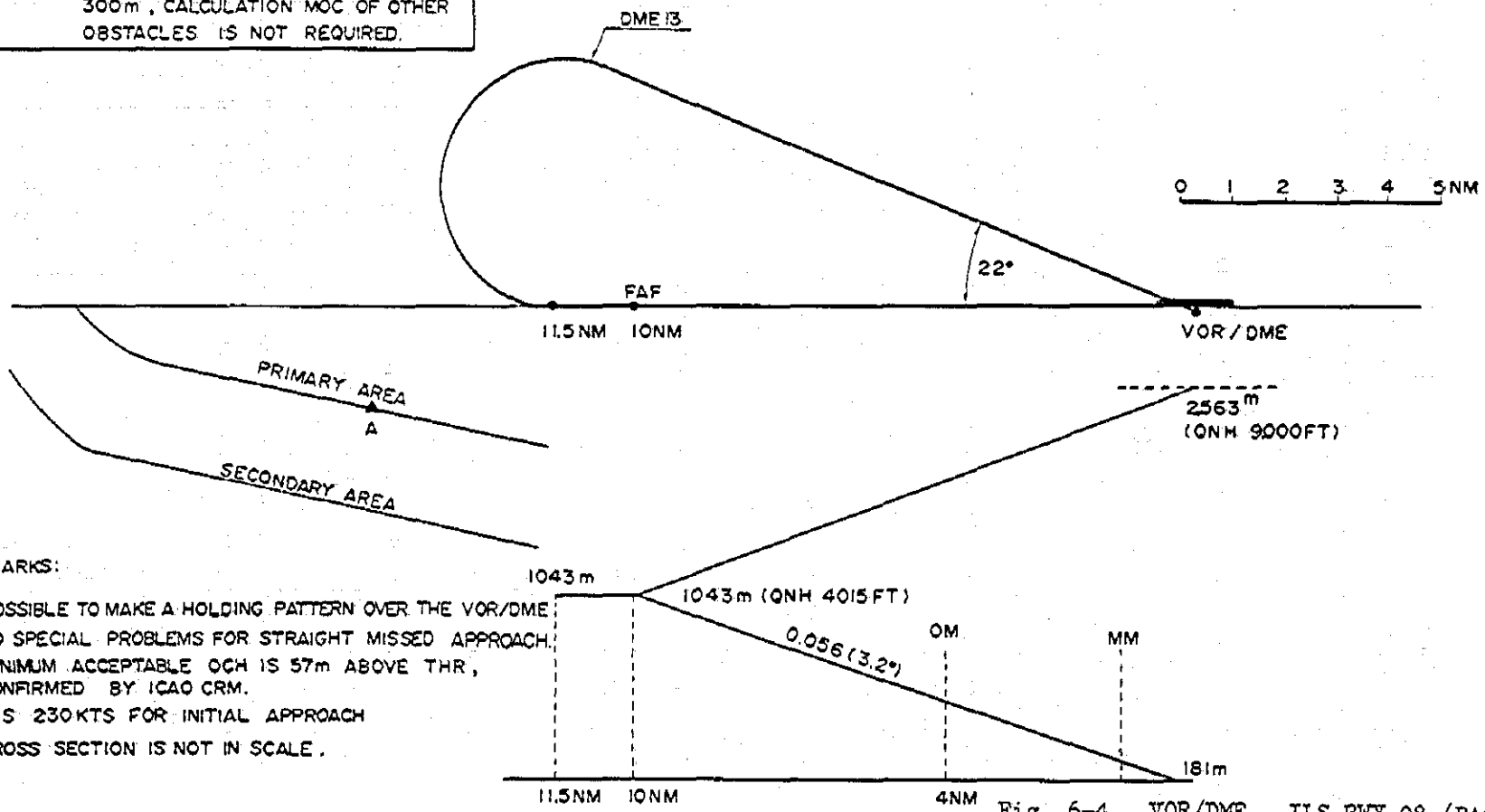


Fig. 6-3 VOR/DME - ILS RWY 08 (DME-ARCS)

OBSTACLES					
IDENT	ONH	ONH-181 m	LCTN	MOC	OCH
A	924 m	743 m	X-15NM Y-1.9NM	300 m	1043 m

NOTE: 1) X IS THE DISTANCE FROM RWY THR.
Y IS THE DISTANCE FROM EXTENDED RWY CENTER LINE.
2) AS DESIGNED THE HEIGHT OF FAF IS 1042m WHICH IS THE HIGHEST OBSTACLE (ALTITUDE 924m MOUNTAIN) IN THIS AREA PLUS CLEARANCE OF 300m, CALCULATION MOC OF OTHER OBSTACLES IS NOT REQUIRED.



REMARKS:

1. POSSIBLE TO MAKE A HOLDING PATTERN OVER THE VOR/DME.
2. NO SPECIAL PROBLEMS FOR STRAIGHT MISSED APPROACH.
3. MINIMUM ACCEPTABLE OCH IS 57m ABOVE THR, CONFIRMED BY ICAO CRM.
4. IAS 230 KTS FOR INITIAL APPROACH
5. CROSS SECTION IS NOT IN SCALE.

Fig. 6-4 VOR/DME - ILS RWY 08 (BASE TURN)

6.3.2 VOR/DME Approach for Runway 08

In order to maintain necessary obstacle clearance from the west side mountain, the final approach will be done by using VOR and DME together (refer to schematic diagram in Fig. 6-5).

6.3.3 NDB-ILS Approach for Runway 08

This procedure will be applied when VOR/DME is out of service or for aircraft which are not equipped with VOR/DME receivers. IF (intermediate fix) and FAP (final approach fix) are required to be established by intersections of Al Hoceima Airport VOR or Melilla Airport NDB and Nador New Airport NDB (refer to schematic diagram in Fig. 6-6).

6.3.4 VOR/DME Approach for Runway 26

In order to maintain necessary clearance from east side obstacles (broadcasting station tower, etc.), the final approach will be done by means of both VOR and DME (refer to schematic diagram in Fig. 6-7).

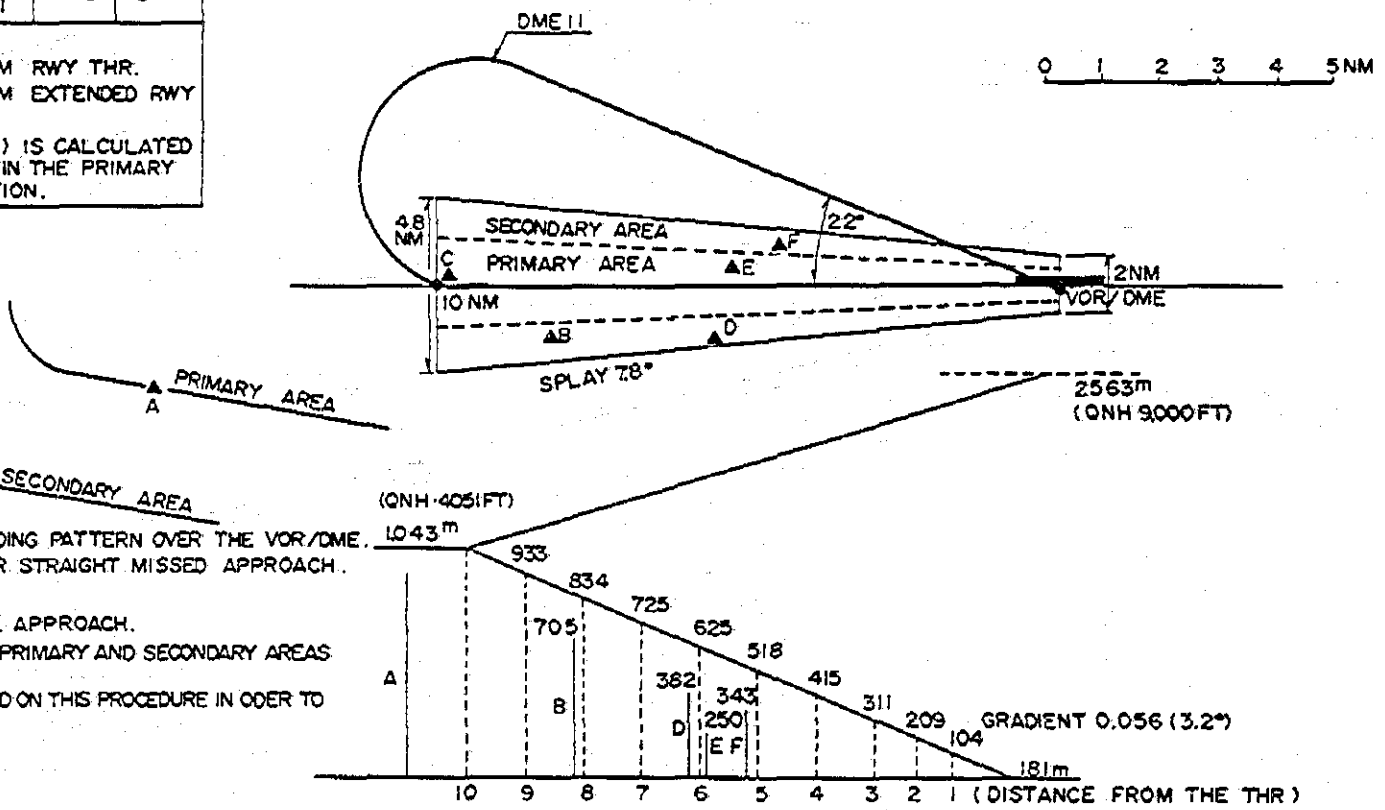
6.3.5 NDB Approach for Runway 26

This procedure is to be put into practice when VOR/DME is out of service or for aircraft which are not equipped with VOR/DME receivers. The location of NDB shall be so determined as broadcasting tower will be out of the primary and secondary areas of NDB for avoiding collision risk in the final approach (refer to schematic diagram in Fig. 6-8).

Fig. 6-5 VOR/DME RWY 08

OBSTACLES					
IDENT	ONH	ONH-181m	LCTN	MOC	OCH
A	924m	743m	X-1.5NM Y-1.9NM	300m	1.043m
B	812	631	X-8 Y-1.9	75	706
C	595	414	X-1.0 Y-0.1	75	489
D	489	308	X-6.2 Y-1.78	75	383
E	357	176	X-5.8 Y-0.9	75	251
F	450	269	X-5.1 Y-1.1	75	344

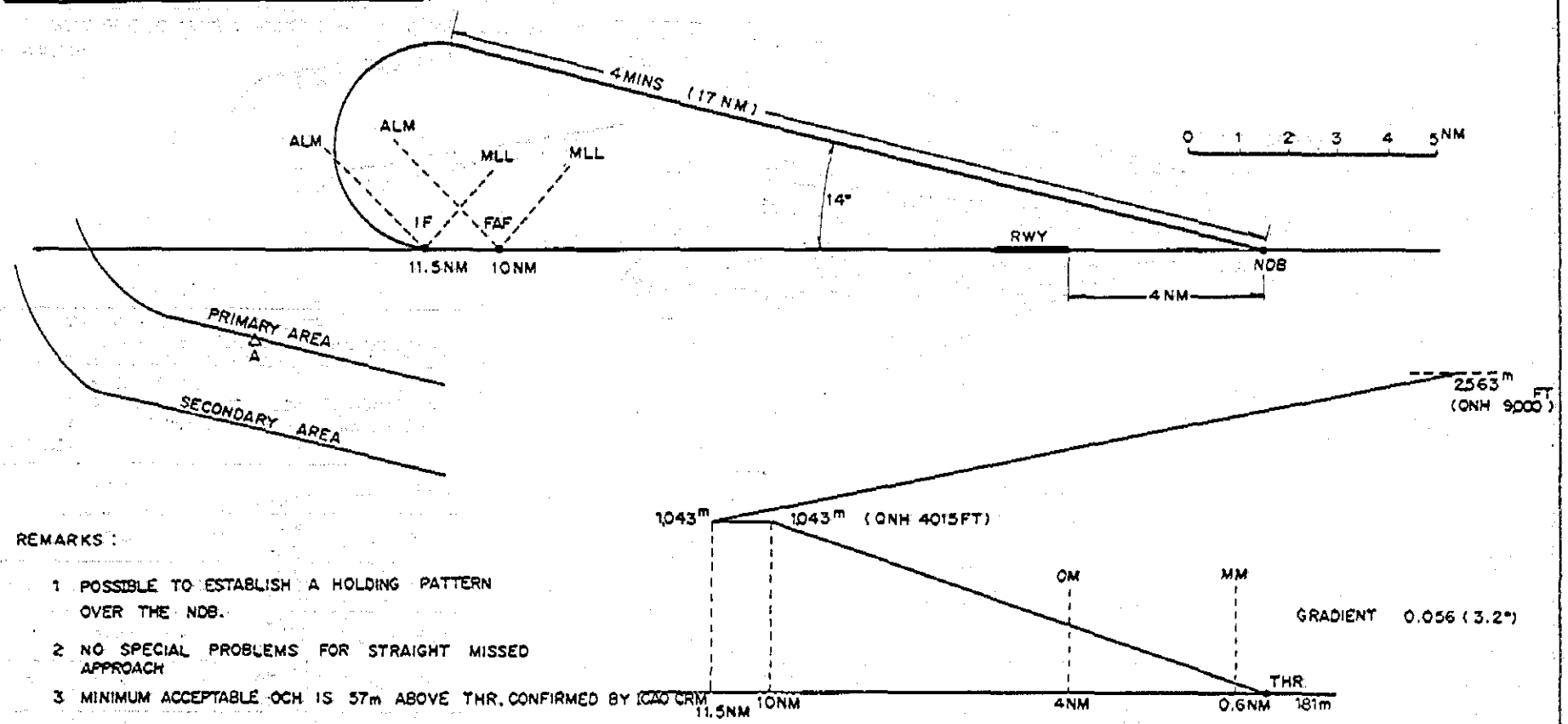
NOTE:
1) X IS THE DISTANCE FROM RWY THR. Y IS THE DISTANCE FROM EXTENDED RWY CENTER LINE.
2) MOC OF OBSTACLES(B-F) IS CALCULATED AS THEY ARE LOCATED IN THE PRIMARY AREAS FOR SIMPLIFICATION.



REMARKS
1. POSSIBLE TO MAKE A HOLDING PATTERN OVER THE VOR/DME.
2. NO SPECIAL PROBLEMS FOR STRAIGHT MISSED APPROACH.
3. POSSIBLE OCH IS 75m.
4. IAS 230 KTS FOR INTIAL APPROACH.
5. CROSS SECTION AND VOR PRIMARY AND SECONDARY AREAS ARE NOT IN SCALE
6. GRADIENT OF 3.2° IS ADOPTED ON THIS PROCEDURE IN ODER TO COINCIDE WITH THAT OF ILS

OBSTACLES					
IDENT	ONH	ONH-181 m	LOCTN	MOC	OCH
A	924 m	743 m	X-15NM Y-1.9NM	300 m	1043 m

NOTE: X IS THE DISTANCE FROM RWY THR
Y IS THE DISTANCE FROM EXTENDED RWY CENTER LINE



REMARKS :

1 POSSIBLE TO ESTABLISH A HOLDING PATTERN OVER THE NDB.

2 NO SPECIAL PROBLEMS FOR STRAIGHT MISSED APPROACH

3 MINIMUM ACCEPTABLE OCH IS 57m ABOVE THR. CONFIRMED BY ICAO CRM

4 IAS 230 KTS FOR INITIAL APPROACH

5 REQUIRED TO ESTABLISH IF AND FAF BY THE INTERSECTION OF ALM VOR OR MLL NDB AND NADOR NDB.

6 CROSS SECTION IS NOT IN SCALE.

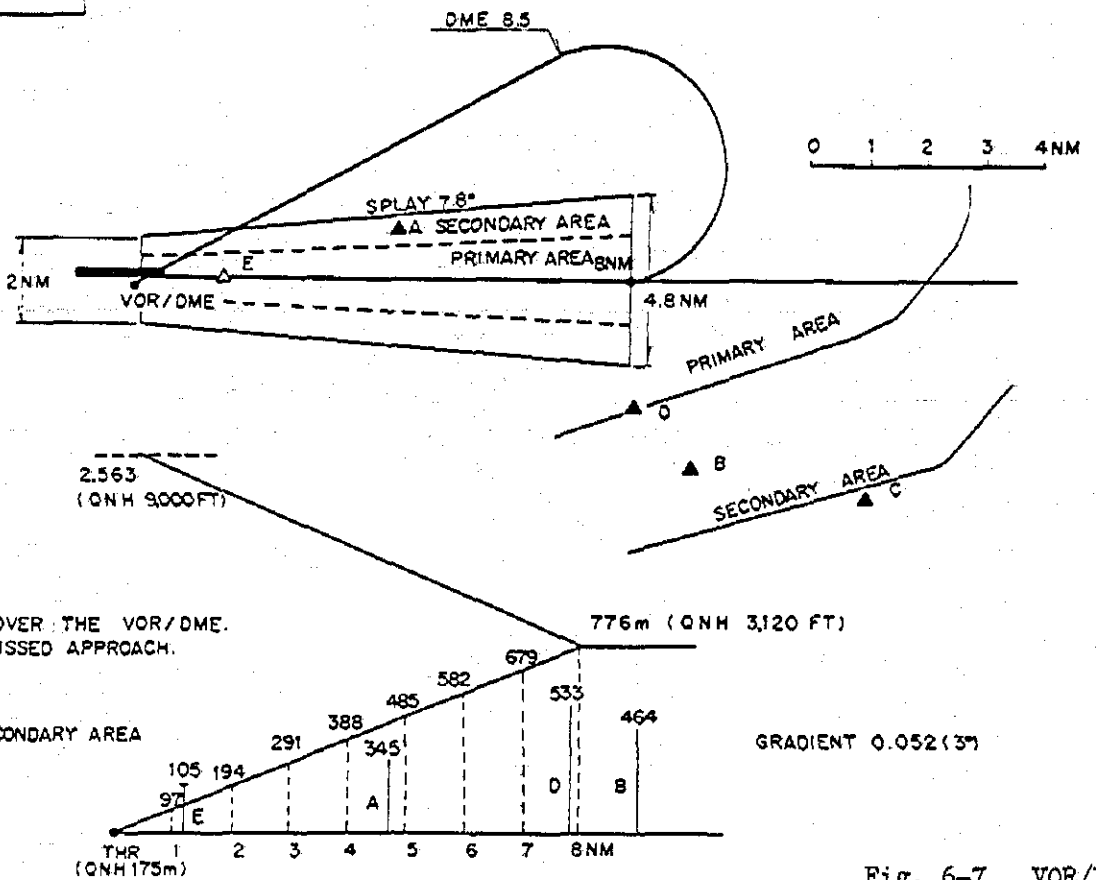
Fig. 6-6 NDB-ILS RWY 08

OBSTACLES					
IDENT	QNH	QNH-175m	LOCTN	MOC	OCH
A	492m	307m	X-4.8NM Y-1.7NM	38m	345m
B	489	314	X-9 Y-3.3	150	464
C	700	525	X-12 Y-3.67	OUT OF RANGE	—
D	408	233	X-8 Y-2.3	300	533
E (CABLE)	205	30	X-1	75	105

NOTE:

X IS THE DISTANCE FROM RWY THR.

Y IS THE DISTANCE FROM EXTENDED RWY CENTER LINE.



REMARKS

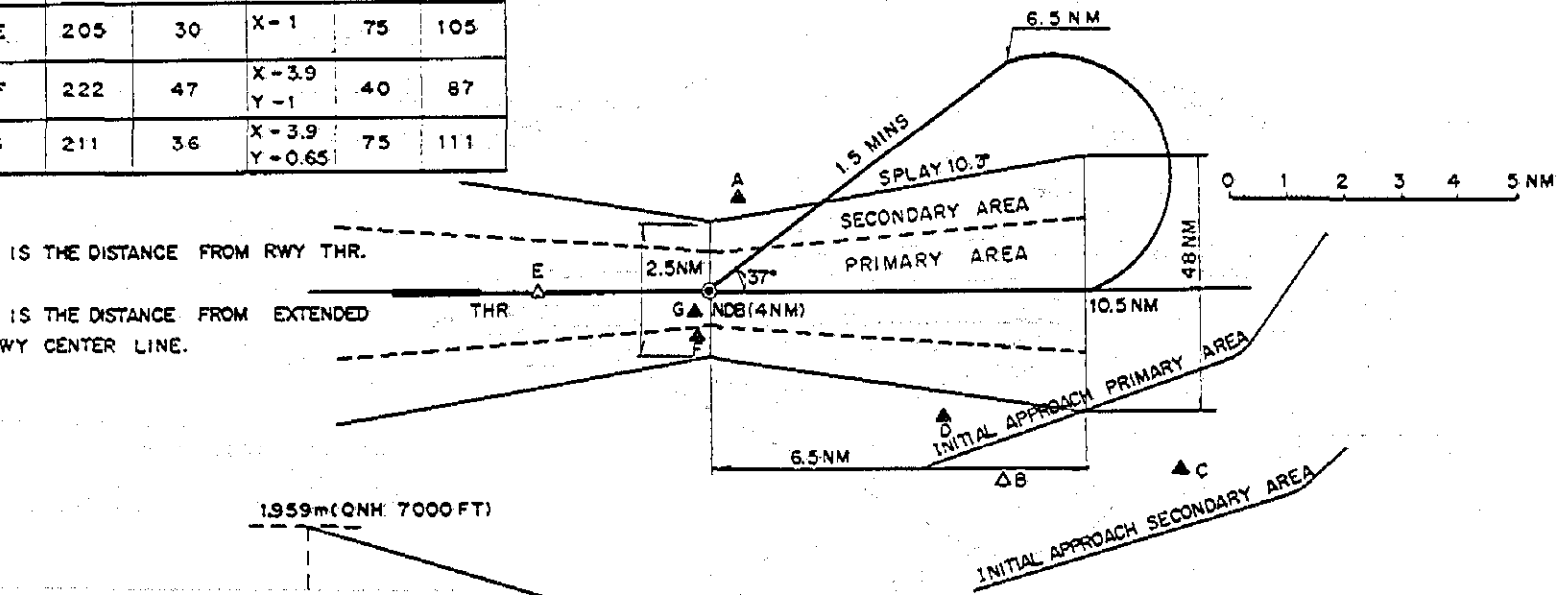
1. POSSIBLE TO MAKE A HOLDING PATTERN OVER THE VOR/DME.
2. NO SPECIAL PROBLEMS FOR STRAIGHT MISSED APPROACH.
3. POSSIBLE OCH IS 105m.
4. IAS 230 KTS FOR INITIAL APPROACH.
5. CROSS SECTION AND VOR PRIMARY/SECONDARY AREA ARE NOT IN SCALE

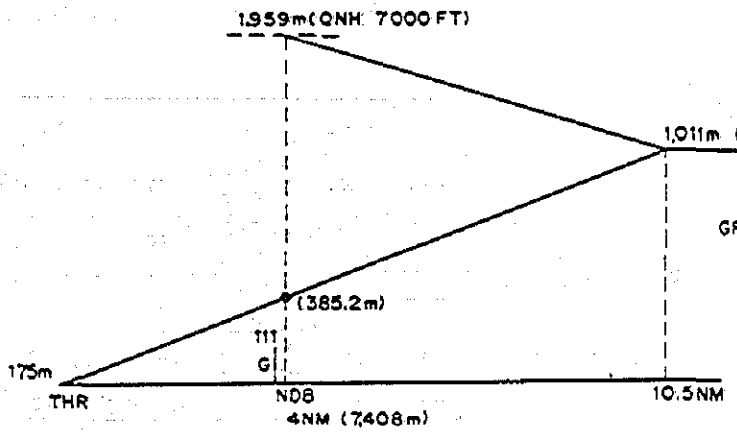
Fig. 6-7 VOR/DME RWY 26

OBSTACLES					
IDENT	QNH	QNH-175m	LCTN	MOC	OCH
A	482m	307m	X-4.8NM OUT OF Y-1.7NM RANGE		—
B	489	314	X-9 Y-3.3	200	514
C	700	525	X-12 Y-3.67	150	675
D	408	233	X-8 Y-2.3	300	533
E	205	30	X-1	75	105
F	222	47	X-3.9 Y-1	40	87
G	211	36	X-3.9 Y-0.65	75	111

NOTE:
X IS THE DISTANCE FROM RWY THR.

Y IS THE DISTANCE FROM EXTENDED RWY CENTER LINE.





GRADIENT 0.052 (3°)

REMARKS

1. POSSIBLE TO MAKE A HOLDING PATTERN OVER THE NDB.
2. NO SPECIAL PROBLEMS FOR STRAIGHT MISSED APPROACH.
3. POSSIBLE OCH IS 111m.
4. IAS 230 KTS FOR INITIAL APPROACH.
5. CROSS SECTION IS NOT IN SCALE.

Fig. 6-8 NDB RWY 26

Remarks:

(1) In order to establish and to practise the above-mentioned procedures at the project site, some air space is required for approach control area. Judging from the fact that the control area radiuses of the vicinal Oujda-Angads and Al Hoceima Airports are 22 nm and 15 nm respectively, it seems that a control area radius of about 20 nm is required in case of the Nador New Airport. Besides, to determine the air space of the Nador New Airport, it is requisite to take into due consideration the air space of Melilla Airport.

(2) To ensure smooth air traffic control, it seems necessary to establish new airways which connect Taza with Nador and Al Hoceima with Nador in future.

6.4 RADIO NAVIGATIONAL AIDS, COMMUNICATIONS AND METEOROLOGICAL FACILITIES

In order to implement the flight procedures as planned, the following facilities are required as shown in Table 6-4. The requirements of meteorological facilities are described in this section because meteorological observation is one of important factors relating to flight operations.

Table 6-4 PROPOSED NAVAIDS, COMMUNICATION AND METEOROLOGICAL FACILITIES

FACILITIES	NR	LOCATION	PURPOSE OF USE	REMARKS
ILS (LLZ.GP. OM.MM)	1 set	Refer to Schematic Diagram	Approach RWY 08	CAT 1 operation
VOR/DME	1 set	1 nm east from threshold of RWY 08, 120 m or more south from center line of RWY	1) Approach RWY 08 2) Approach RWY 26 3) Route Indicator	Power output of 200 W is required
NDB	1 set	About 4 nm east from threshold of RWY 26 on the extended RWY center line.	1) Approach RWY 08 with ILS 2) Approach RWY 26 3) Route Indicator	Power output of 50W or more is required.
VHF Transmitter and Receiver	3 sets	In the Control Tower	1) Approach Control 2) Tower Control 3) Emergency Use	1) Emergency use on frequency 121.5 MHZ. 2) Tape Recorders are required for each channel
Direct Hot Line System	1 set	- Ditto -	Direct communication between Nador Tower and Area Control Center at Casablanca	P.T.T. (Ministère des Postes et Télécommunications) Cable is available for this communication
Teletype Set	1 set	Operation Office in the Terminal Building	NOTAM Delivery etc.	KSR (Key Board Send and Receive) is required.
Teletype Set	1 set	Met. Room in the Terminal Building	Weather Data Delivery	- Ditto -

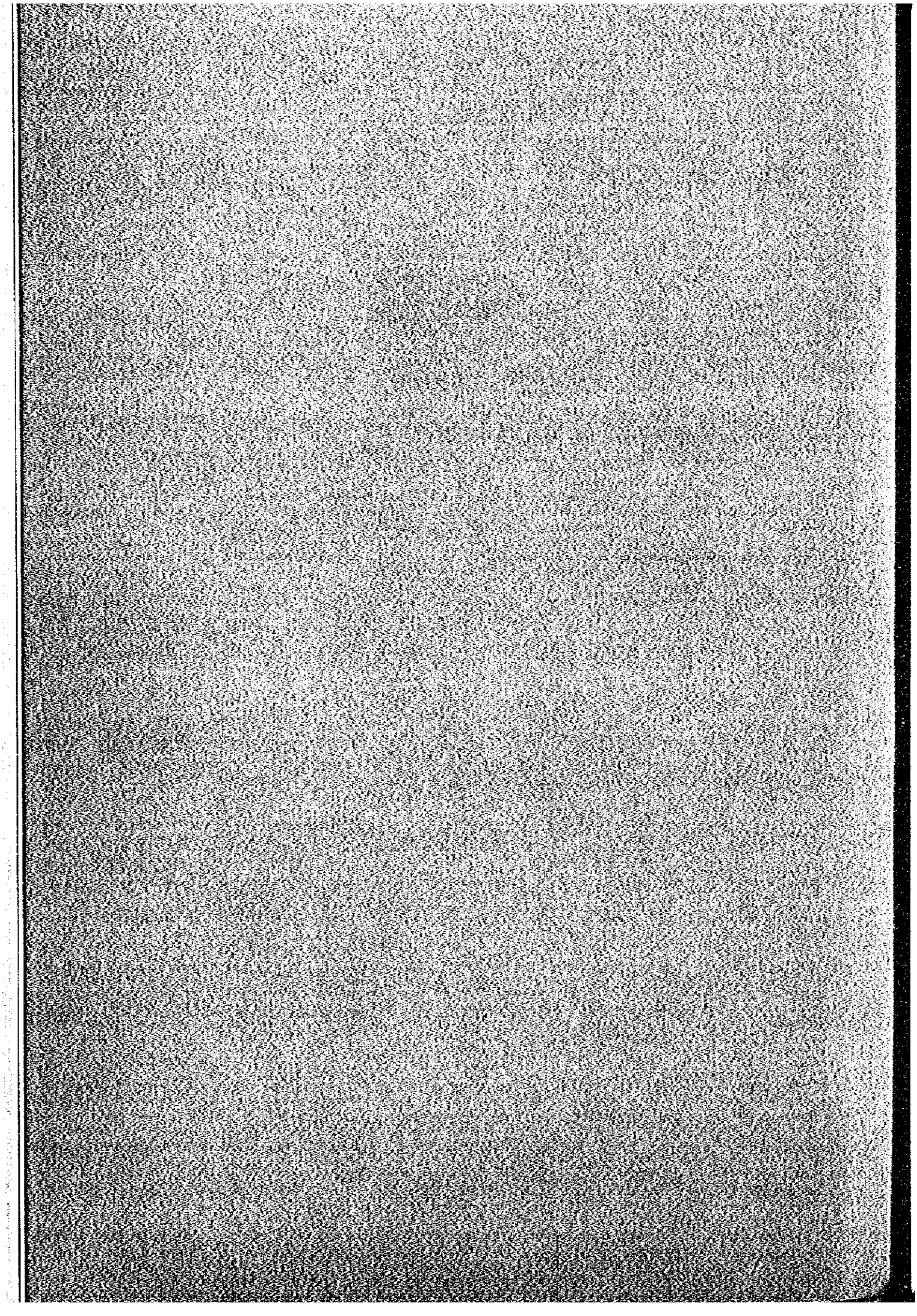
to be continued

Continued

FACILITIES	NR	LOCATION	PURPOSE OF USE	REMARKS
RVR (Runway Visual Range)	1 set	Observation Equipment at end area of RWY. Indicator in the Tower and Met. Office	Observe Visibility of RWY 08 Approach Area	
Meteorological Observation Equipment	1 set	Observation Area and in the Tower/ Met. Office	Measuring Wind Speed, Direction, Temperature, Dewpoint, Humidity, Ceiling, etc.	Ceilometer is required for precise cloud height measurement.
Facsimile Receiver	2 sets	Met. Office in the Terminal Building	Receiving Weather Map, etc.	

CHAPTER 7

ENVIRONMENTAL ASPECTS



CHAPTER 7

ENVIRONMENTAL ASPECTS

7.1 GENERAL

Airport is to be constructed based on the needs of the regional society. However, it often causes bad influences on the environment, particularly the life of the inhabitants of the region, by the noise of aircraft and so on, or brings about destructive impacts on the ecological system.

The development plan of new airport was therefore formulated taking into consideration such influences as : i) Aircraft noise, ii) impacts on ecological system and iii) influence on water and air.

7.2 AIRCRAFT NOISE

The existing Nador Airport is surrounded by residential and commercial areas and from the standpoints of safety of flight operations and environmental conservation, several problems have to be dealt with. For such reasons, the site of the new airport was selected at 26 km from the Nador City. At the proposed site, there is no big agglomerations on the landing and take-off routes of the aircraft (See Fig. 7-1 and 7-2). But, Djebel El Arrouit and Tistoutine villages located at about 3 km and 10 km respectively from the extremity of the runway will be subjected, to some extent, to the noise influence. In Morocco there are no established standards of staturoty restriction for the nuisance by noise of aircraft.

Referring to the statutory standards of compensation for damages caused by aircraft noise presently in effect in Japan and in other countries, the ambient noise volume in these villages is judged to be below the range which requires countermeasures or damage compensation.

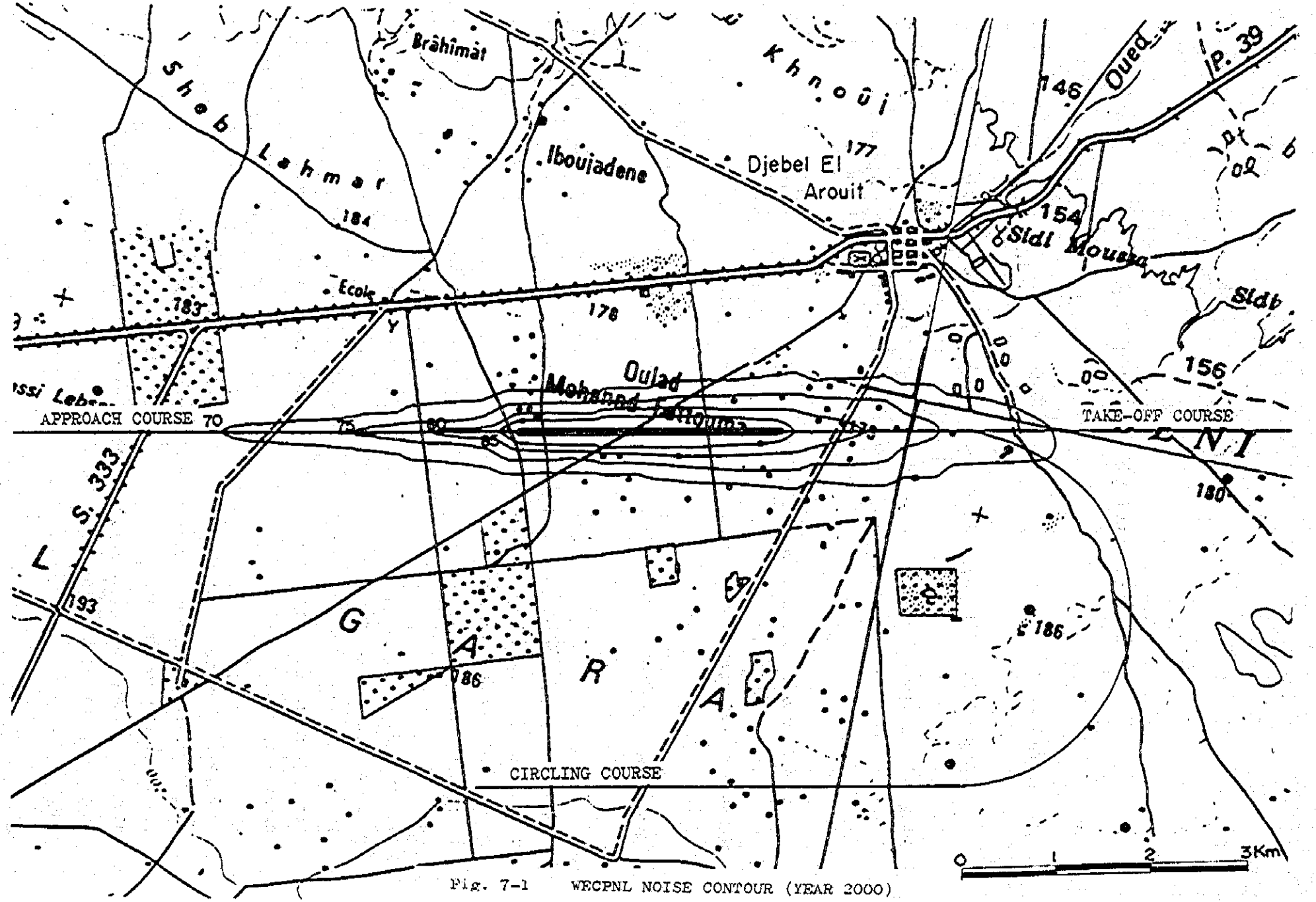


Fig. 7-1 WECPNL NOISE CONTOUR (YEAR 2000)

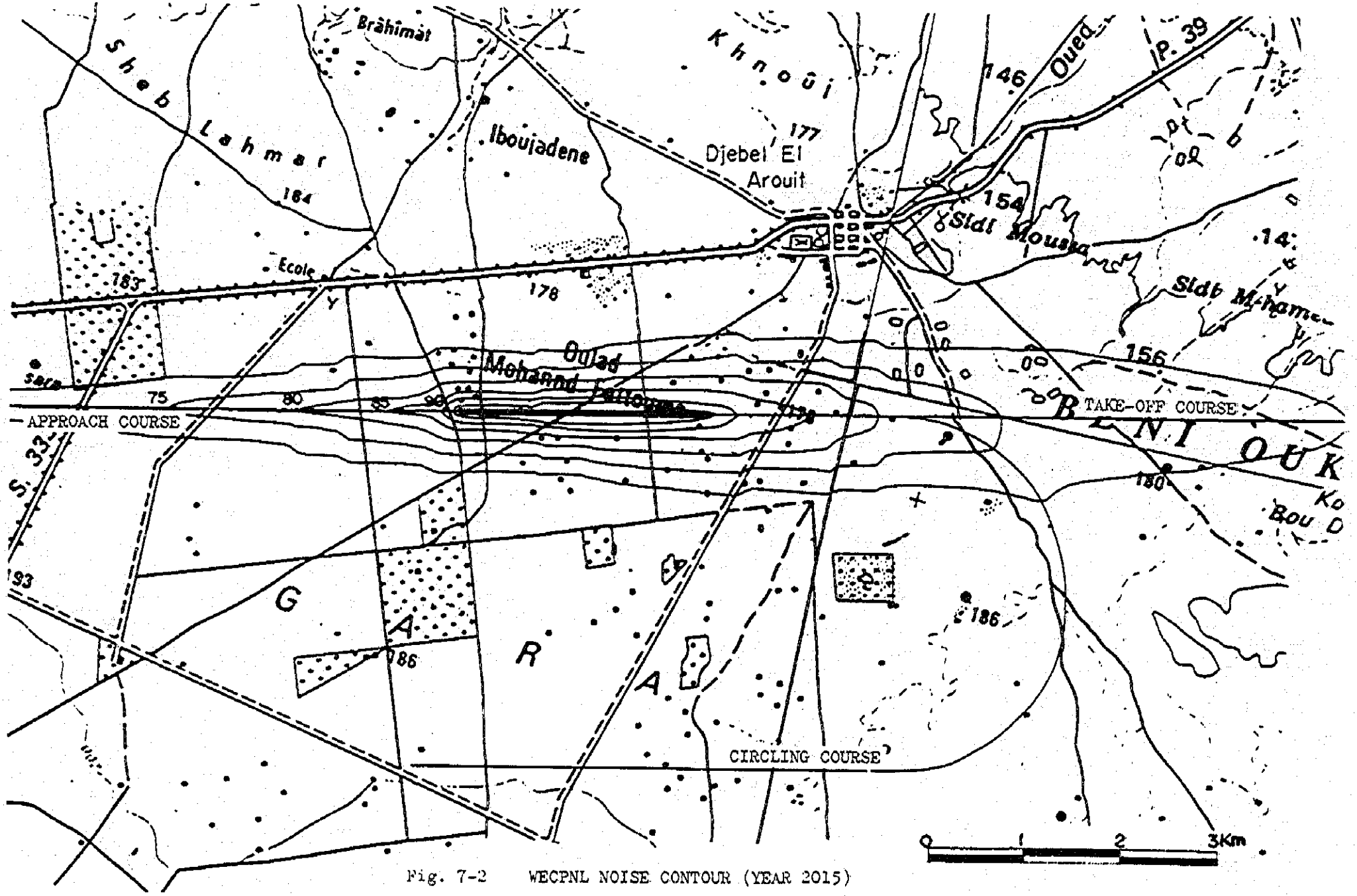


Fig. 7-2 WECPNL NOISE CONTOUR (YEAR 2015)

7.3 IMPACTS ON ECOLOGICAL SYSTEM

In general, impacts on ecological system are divided into i) impact on fauna and ii) impact on flora. In the vicinity of the new airport site, there is no significant fauna or flora.

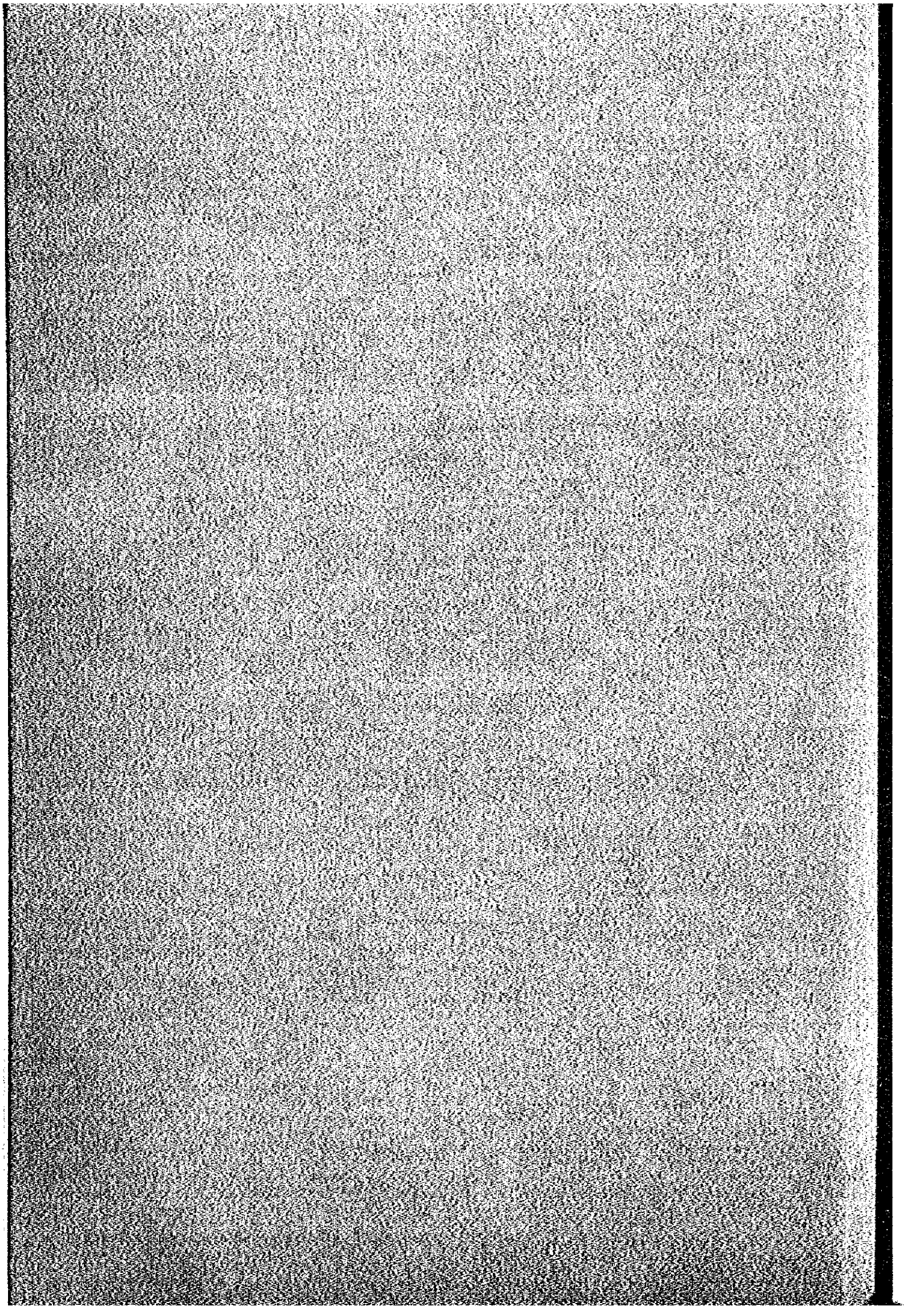
7.4 INFLUENCE ON WATER AND AIR

Eventual sources of water pollution resulting from operation of an airport are domestic sewage, wastes and discharge of hot water from the airport facilities. In the case of the new airport, only the domestic sewage would pose some problem of water contamination. As a counter-measure, it was planned therefore to install a sewage treatment plant in the new airport. Besides this, no other special attention is required to be paid to preserve water quality because the amount of wastes produced by the airport as well as the volume of hot water generated by its stand-by generators in emergency cases are virtually insignificant.

As to the air, considering the forecasted aircraft movements and relevant ground services, the airport operation will have only minimal and unharmful impact on the air environment. On the other hand, it is commonly recognized up to the present that airport operation in general has none substantial polluting effect on the air space.

CHAPTER 8

CONSTRUCTION SCHEDULE AND COST ESTIMATE



CHAPTER 8

CONSTRUCTION SCHEDULE AND COST ESTIMATE

8.1 CONSTRUCTION CONDITIONS

8.1.1 Construction Materials

Possible sources and availability of such major construction materials as sand, gravel, crusher-run, cement, asphalt, steel and reinforcement bar required for the construction are studied. All of such materials appear to be good in quality and adequate in amount.

1) Sand and Gravel

Potential sources of sand and gravel to be used mostly for filling, asphalt pavement and concrete are planned to be the borrow pits located within ten (10) kilometers from the site.

2) Crusher-run

Potential sources of crusher-run to be used for subgrade are planned to be the quarry sites which are easily found within twenty (20) kilometers from the site.

3) Cement and Asphalt

Production capacity of the newest and biggest cement factory named "CIMENTERIE DE L'ORIENTAL" at Oujda produces 1,200,000 tons/year.

Production capacity of sole asphalt manufacturer named "SABLIMA" at Mohammedia is 120,000 tons/year for road construction and 20,000 tons/year for industrial use.

Local cement and asphalt are, therefore, considered to be sufficiently available for construction works.

4) Steel Materials and Reinforcement Bar

Production capacity of an ironworks complex at Selouane under construction will reach 420,000 tons/year in 1984, where steel materials and reinforcement bars will be available.

8.1.2 Civil Works

1) Major Works

As explained in Chapter 5, major works involved in the construction are earthworks, pavement works and drainage works. Earthworks include transportation, filling, excavation, spreading, grading and compaction. It appears to be unnecessary to execute stripping and remove surface soil as the site is poor in vegetation, mostly without any grass and tree.

2) Construction Equipment

Following construction equipment is planned to be used: shovel dozer (for excavation), dump truck (for transportation), bulldozer and grader (for spreading) and tire, macadam and vibrating roller (for compaction), etc.

3) Transportation Route

Haulage roads to borrow pits are to be provided. The existing national highway to be used as the major access road for construction materials and equipment from Nador City to the site is being widened by adding one (1) lane each on both ways. And it is scheduled to be completed before the project construction works start. Some portions of the haulage roads to borrow pits might have to be improved by placing crusher-run on the surface for reinforcing their bearing strength, or be widened.

4) Temporary Facilities

The following temporary facilities are necessary for construction:

For conveyance and storing	:	Temporary construction road and stockyard
For spreading and compaction:		Temporary drainage facilities

In addition, provision of such facilities as office, quarters, motor pool and temporary electric power facilities was also planned.

The construction roads have to be constructed for smooth transportation of the materials. They will also serve for passage of the construction equipment.

Stockyard for most of subgrade materials is not necessary, as filling is executed synchronously in accordance with the work progress in the runway and the apron. However, for the following materials of which volume is large, stockyard was planned to be provided at the site.

- Sand, gravel and cement for asphalt pavement and concrete
- Brick and reinforcement bar for building works

Temporary drainage system was planned to be provided to drain rainwater quickly for keeping in good condition the earthworks at the site.

5) Plants

Plants were planned to be pertinent in capacity, type and number according to the work schedule and the work volume.

- Asphalt Plant

  Asphalt plant was planned according to the work period of fourteen (14) months and the work volume.

- Batching Plant

  Batching plant was planned according to the work period of six (6) months and the work volume.

6) Office, Quarters and Motor Pool

Necessary space for office and quarters was planned according to the number of workers at the site. A motor pool with a repair shop is also to be provided according to the number of vehicles at the site.

7) Temporary Electric Power Facilities

The temporary electric power facilities will be provided for the office and quarters in the early period of construction and for building construction, asphalt plant and batching plant in the later period of construction.

8.1.3 Building Works

For all the buildings of the Project, reinforced concrete structures are to be adopted. This construction method is most popular in Morocco. It is rather important to make an appropriate construction time schedule, since many building works to be executed at the site are closely interrelated in terms of availability of workers and materials. Navigational aids have to be carefully accommodated and appropriately installed.

8.2 CONSTRUCTION TIME SCHEDULE

The construction time schedule was worked out as shown in Fig. 8-1, on the condition that detailed design and land acquisition be completed before the commencement of construction works. For Stage I, Construction period is determined to be three (3) years including seventeen (17) months for such civil works as filling and grading. The above earthworks were planned to be executed by using the construction equipment and machinery to the maximum extent possible for securing good working conditions and high efficiency.

The extension works of air passenger terminal and car parking will be carried out in the 14th and 15th years from commencement of project construction.

8.3 CONSTRUCTION COST ESTIMATE

Table 8-1 shows the construction cost estimated on the following conditions.

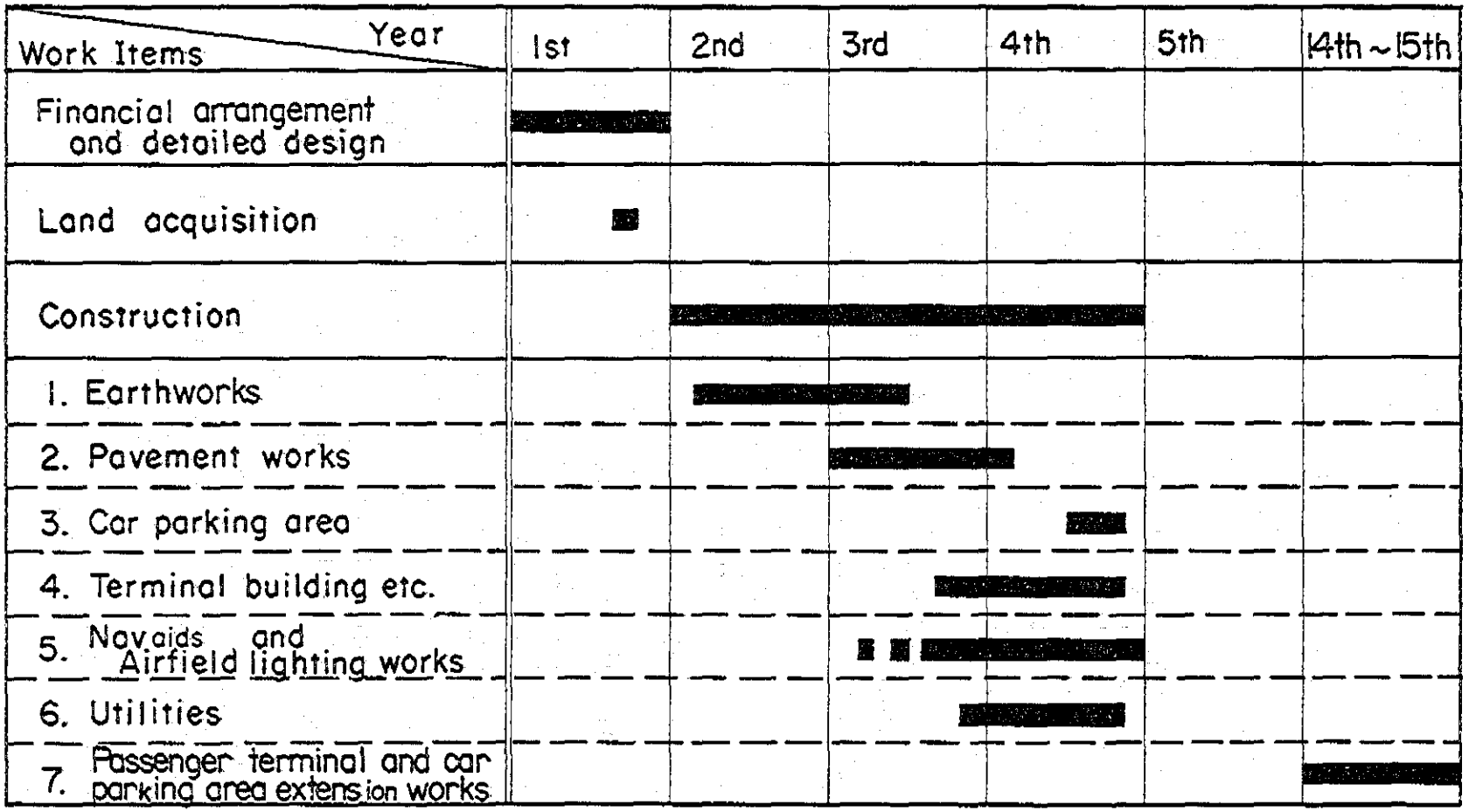


Fig. 8-1 CONSTRUCTION TIME SCHEDULE

Table 8-1 CONSTRUCTION COST ESTIMATE

(At 1984 Price, Unit: US$1,000)

Item	Construction Cost		
	Foreign Portion	Local Portion	Total
1. Earthworks	1,659	961	2,620
2. Pavement works	3,459	2,006	5,465
3. Terminal building etc.	3,506	1,532	5,038
4. Nav-aids and airfield lighting works and utilities	5,528	921	6,449
Sub-total	14,152	5,420	19,572
5. Engineering	1,415	542	1,957
6. Land and compensation	-	463	463
7. Physical Contingency	1,557	643	2,200
8. Price Contingency	1,180	2,141	3,321
Total	18,304	9,209	27,513

Remarks: The breakdown of the estimated construction cost is shown in Appendix VIII.

1) All the costs are calculated based on the price level in early 1984.

2) Price escalation rate for foreign currency portion is assumed to be 1.5% per year throughout the construction period. As for local currency portion, the rates of 8% in 1984, 7% in 1985 and 6% per year thereafter throughout the construction period are applied.

3) Exchange rate adopted in this estimate is: US$1 = DH8.06 = ¥235.

4) Engineering cost is estimated at 10% of the construction cost.

5) Physical contingency is taken at 10% of the total amount of construction, engineering and land acquisition and compensation costs.

6) For all the imported materials and equipment, import duty is assumed to be exempted.

7) Local indirect tax (net of subsidy) of 10% is assumed.

8) Out of the total construction cost, the following costs are to be paid in foreign currency.
   - Procurement cost of the construction equipment.
   - Procurement cost of imported materials such as equipment and building construction materials.
   - General expenses and fee of the contractor.
   - Wages for foreign workers.

9) The following costs are to be paid in local currency.
   - The operating expenses for the construction equipment.
   - The procurement costs of the construction materials which are available locally.
   - The inland transportation costs of the materials and laborers.
   - Wages of the native laborers.
   - The acquisition costs of land and compensation for buildings' relocation.

The annual distribution of construction cost is shown in Table 8-2. The total cost estimated on the above basis is as follows:

(At 1984 Price, Unit: US$1,000)

Foreign portion	Local portion	Total
18,304	9,209	27,513

Table 8-2 ANNUAL DISBURSEMENT SCHEDULE OF CONSTRUCTION COST

(At 1984 Price, Unit: US$1,000)

Year	Foreign Portion	Local Portion	Total
1986	1,258	1,365	2,623
1987	7,159	3,725	10,884
1988	9,887	4,119	14,006
Total	18,304	9,209	27,513