CHAPTER 5 EVALUATION OF THE EXISTING AIRPORTS, AIRSTRIPS AND AIRSPACE UTILIZATION

CHAPTER 5 EVALUATION OF THE EXISTING AIRPORTS, AIRSTRIPS AND AIRSPACE UTILIZATION

5.1 General

This Chapter discusses the evaluation of the existing airports, airstrips and airspace utilization in the Study area.

5.2 Existing Airports

5.2.1 Yogyakarta Airport

Table 5.2.1 shows the anticipated time of saturation of the existing facilities at Yogyakarta airport. This table was prepared based on the following assumptions, in order to define the "Without Project" case (termed as the WOP case) for economic analysis in Chapter 10 in which the forecast traffic volume will exceed the capacities of existing airport facilities with an overflow of passengers occuring.

a) Although there are many deficiencies in the existing airport with respect to the operational requirements for aircraft safety, such as many obstructions to aircraft, no provision for runway end safety areas, insufficient length of runway, etc., as hereafter discussed, the present category of aircraft operation is assumed to be continued, because improvement of these deficiencies would require substantial redevelopment of the airport, requiring a rather large budget.

b) The maximum aircraft operated is assumed to be DC-9-32 with necessary weight restrictions as it is. An introduction of larger aircraft or release of the weight restriction will require a substantial amount of construction work, such as a runway extension and/or pavement overlay.

As shown in Table 5.2.1, the existing Yogyakarta airport will be saturated around 1994. This is defined as the WOP case. The major points are as follows:

a) The existing apron with 6 gate positions (DC-9:4, SP:1, STOL:1) are available, which are equivalent to those required in the year 1994, cannot accommodate 7 gate positions (DC-9:5, SP:1, STOL:1) which will be required in the year 1995.

b) The existing passenger terminal building with its floor area of 2,850 sq.m (excluding the VIP area) is considered appropriate for the present air traffic (approx. 10 sq.m/passenger). Expansion will, however, be required before 1990 when the unit floor area per passenger will become 7 sq.m.

c) Replacement of the equipment for air navigation will be required by around 1992 due to end of the service life of these facilities.

d) The largest demand from/to Yogyakarta is presently generated on Yogyakarta-Jakarta route on which 5 round-trip flights by DC-9-32 are operated on Saturdays and Sundays. On the assumptions that DC-9-32 will continue to be operated, the frequency of the daily round-trip flights on the said route will increase to 10 and 11 round-trip flights in 1994 and 1995, respectively. Ten daily flights on one air route is assumed the maximum number of flights taking into considerations the fleets owned by airline companies and the economy of airlines cost for aircraft operations.

Note: The largest number of daily flights on one route presently in service in Indonesia is 10 flights on the Jakarta-Surabaya route by DC-9-32.

Table 5.2.1 Anticipated Time of Saturation - Yogyakarta Airport

FACILITY	YEAR (1985 – 1990 – 1994 – 1995 – 2000)	DESCRIPTION
Runway 09/27 Length (1,850 m)		- DC-9-32 aircraft can be operated on the existing runway with due weight restriction.
Pavement Strength (PCN30)		- Pavement overlay (structural) will not be required for the operation of of DC-9-32 aircraft.
Connecting Taxiway	Parallel taxiway justified	- Parallel taxiway can be justified before 1990, but the existing exit taxiway can be used in terms of capacity.
Apron Gate Positions		- Apron expansion will be required before 1995 when 5 gate positions for DC-9-32s and two positions for SP and STOL are required.
Passenger Terminal Building		- The minimum standard of the floor area per passenger is considered to be 10 sq. m/passenger.
Air Navigation Systems		- Most of the equipment for air navigation have to be replaced by around 1992.
Practical Number of Daily Flights on One Route	20 flights/day (10 round trips)	- Number of daily flights on Yogyakarta-Jakarta route by DC-9-32 will reach 20 flights in 1994, which is considered the maximum number practically.

Note: This table was made based upon an assumption that the maximum aircraft operated is DC-9-32, the same as present.

(1) Aerodrome Reference Code

The aerodrome reference code of the existing Yogyakarta airport is 4C.

(2) Runway

The runway data is shown in Table 5.2.2.

Table 5.2.2 Runway Data of Yogyakarta Airport

Runway Designation	True Bearing	Dimensions	Pavement Strength
09/27	088°/268°	1,850 m x 40 m	PCN 30 FCXU

The largest aircraft presently in service is DC-9-32. The runway length of 1,850 m is inadequate for take-off operations with full passenger payloads for the DC-9-32 for Jakarta and Denpasar, and weight restriction is required. In order to operate a DC-9-32 with a full payload, a 400 m runway extension is necessary.

The existing crosswind coverages were analyzed based on the 3 years data from 1982 to 1984 observed at Yogyakarta airport, as shown in Fig. 5.2.1.

The results show that the usability factor of the runway meets the operational requirements of 95 % coverage for both larger and smaller aircraft than the DC-9-32.

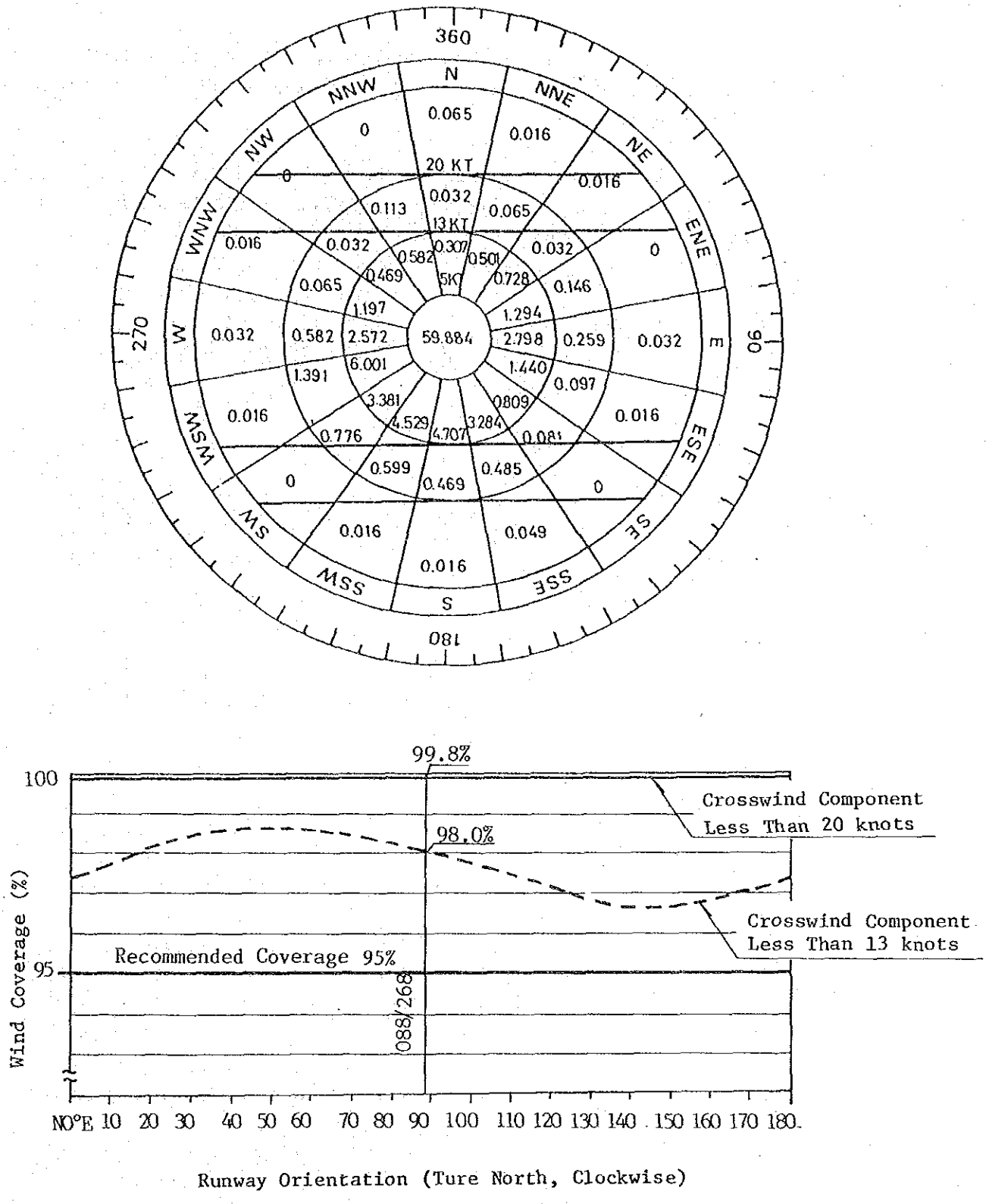


Fig. 5.2.1 Crosswind Coverage of Yogyakarta Airport
1982 - 1984 (3 years)

As for the runway width, the existing 40 m does not comply with the ICAO standard stipulating 45 m. The existing runway is not provided with overruns and runway end safety areas.

Rivers are located at both ends of the runway at distances of 35 m from Runway 09 threshold, 69 m from Runway 27 threshold, respectively as shown in Fig. 5.2.2. These rivers make the runway extension difficult.

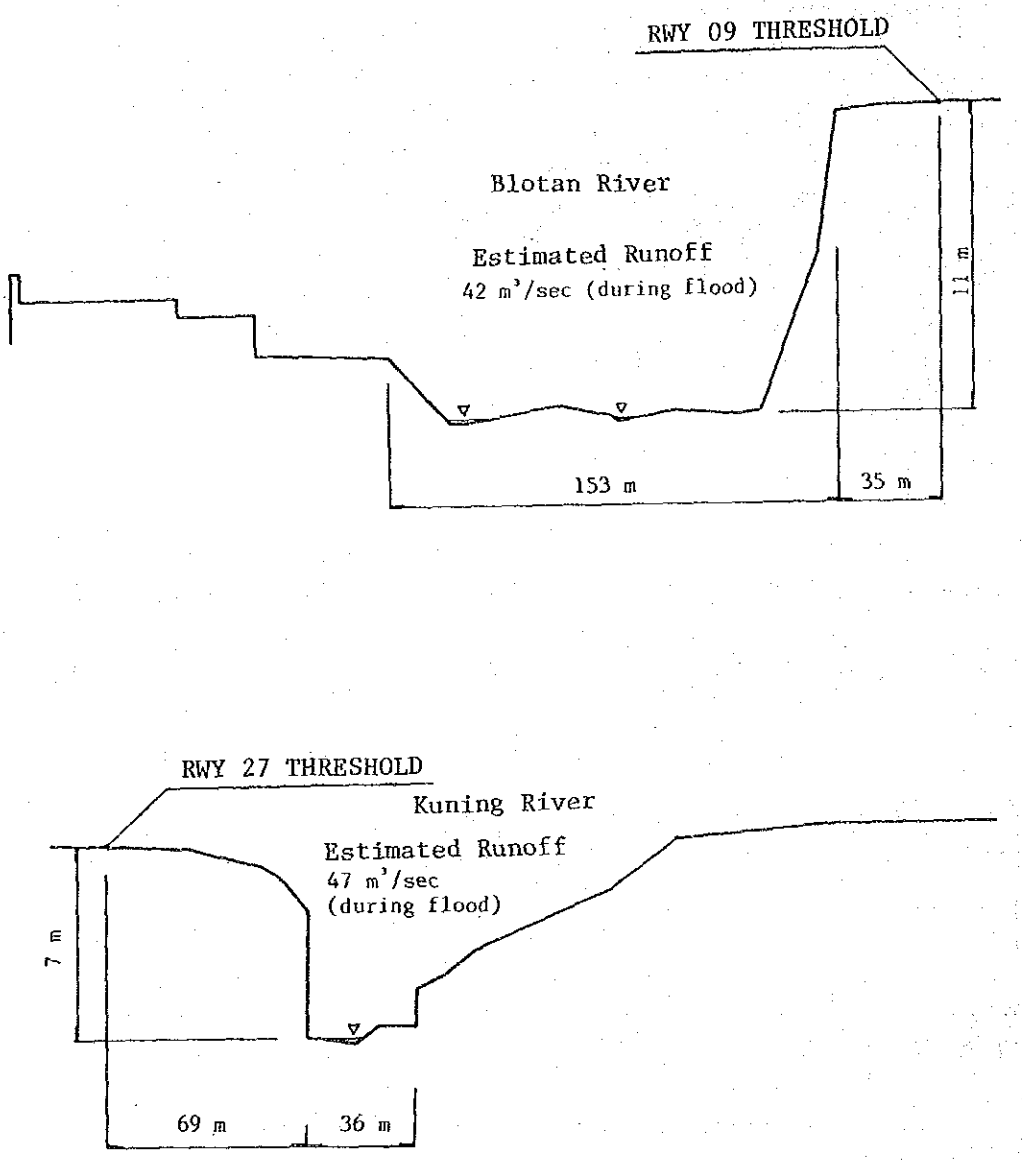


Fig. 5.2.2 Cross Sections of Rivers at Runway Ends

The existing runway is made of asphalt-concrete pavement with a few overlays being applied after 1972.

Pavement thickness is 75 cm at 09 end and 77.5 cm at 27 end respectively, and resulting pavement classification number (PCN) is reported to be 30 with a low strength subgrade according to the AIP INDONESIA.

Since the aircraft classification number (ACN) of MD-82 is 39 for the Study route with no weight restrictions and exceeds the aforesaid PCN by as much as 30 percent, it is considered that the existing pavement is not suitable for the MD-82 which will be introduced after 1990, making an overlay necessary.

(3) Runway Strip

The width of the existing runway strip is only 75 m on each side of the runway. A double this figure (150 m width) will be necessary to meet the ICAO requirements.

(4) Taxiway

A parallel taxiway can be justified before 1990, but the existing exit taxiway can be used in terms of the capacity.

(5) Apron

The existing apron is located on the north side of the runway with a 95 m edge-to-edge separation. It is connected to the runway with a stub taxiway 115 m away from the runway 27 threshold.

The apron area of 246.5 m x 86 m can accommodate four DC-9-32s by nose-in parking configurations and each SP and STOL by the self-maneuvering configuration. The apron will reach its capacity in 1990 based on the assumption that the larger aircraft than the present DC-9-32 will be introduced to cope with the demand increase. At this time, the maximum aircraft will be MD-82 class.

No jet aircraft can be parked on the existing apron in order to keep the transitional surface free of obstructions if the 150 m wide runway strip which is required for non-precision approach or precision approach Category-I runway is established.

(6) Passenger Terminal Building

The existing terminal building has a floor area of 2,850 sq.m (excluding the area for VIP).

The present peak hour traffic of 300 passengers (2-way) is considered to be adequately handled by the existing floor space. Further expansion will, however, become necessary before 1990 when the peak hour traffic will exceed 480 passengers (2-way). The minimum required floor area is assumed to be 10 sq.m per passenger.

(7) Air Navigation Systems

The existing air navigation systems are shown in Table 5.2.3.

The equipment necessary for instrument and non-precision approach are installed at present.

There is a plan to install an Instrument Landing System (ILS) Category-I for the Runway 09 approach. The installation will be completed by the end of 1987.

A terminal VOR/DME instead of "OF" NDB will be required inside the airport area in order to ensure safe aircraft operations.

Table 5.2.3 Outline of the Existing Air Navigation Systems - Yogyakarta

Equipment	Outline	Remarks
NAVAIDS		
NDB	"OF", 270 KHz	
DVOR/DME	"YOG", 112.8 MHz CH 75 X	DVOR/DME at 7 NM west of the airport
ATC/COM		
ATC console	Aerodrome control, Approach control	
VHF A/G radio	123.4, 120.2 MHz (APP) 122.4 MHz (ADC)	
ATS direct speech circuit	Between Jakarta, Semarang	
AFTN Message	Between Jakarta, 1 circuit	Leased from PERUMTEL
Magnetic tape-recorder	ATC use	
Time distribution system		
UHF link	Under construction	
VISUAL AIDS		
Aerodrome beacon	At terminal area	
Approach lighting system	RWY 27, Medium intensity	

(Cont'd)

Equipment	Outline	Remarks
Runway edge lights	Medium intensity	
Runway threshold lights	RWY 09/27	
Runway threshold identification lights	RWY 09/27 thresholds	
Runway end lights	Ditto	
VASIS	2 Bar VASIS for RWY 09/27	
Taxiway edge lights		
Apron floodlighting	3 unit	
Wind direction indicator lights		
Landing tee		
OTHER		
Main transformer	300 KVA	

(8) Obstacle Limitation Surfaces

The runway of Yogyakarta airport will be classified for instrument and non-precision approach runway 4C, since the instrument straight-in approaches are made by use of VOR/DME and visual aids, and the largest aircraft operated are DC-9-32s. The dimensions and slope of the obstacle limitation surfaces for the existing Yogyakarta airport are shown in Table 5.2.4.

Fig. 5.2.3 shows the obstruction chart which was made by reading the contour lines of the geographical map (scale: 1/50,000) and incorporating the results of the preliminary topographic survey in the vicinity of the airport.

a) Antennas and houses at the west of Runway 09 threshold infringe Runway 09 approach surface.

b) Many obstacles at the north of the runway, such as the antennas, water tank, control tower, passenger terminal building, etc., infringe the transitional surface.

c) Hilly terrain at approx. 8 km east of Runway 27 threshold infringes largely the 2nd section of the Runway 27 approach surface. (see Fig. 5.2.4)

As a whole, there are many obstructions which protrude upon the obstacle limitation surfaces of the non-precision approach runway and which are not considered easy to remove. Thus, the existing runway does not meet the requirement for a non-precision approach runway.

Most of these obstructions infringe even the obstacle limitation surfaces of non-instrument approach runway.

Table 5.2.4 Obstacle Limitation Requirements for the Existing Yogyakarta Airport

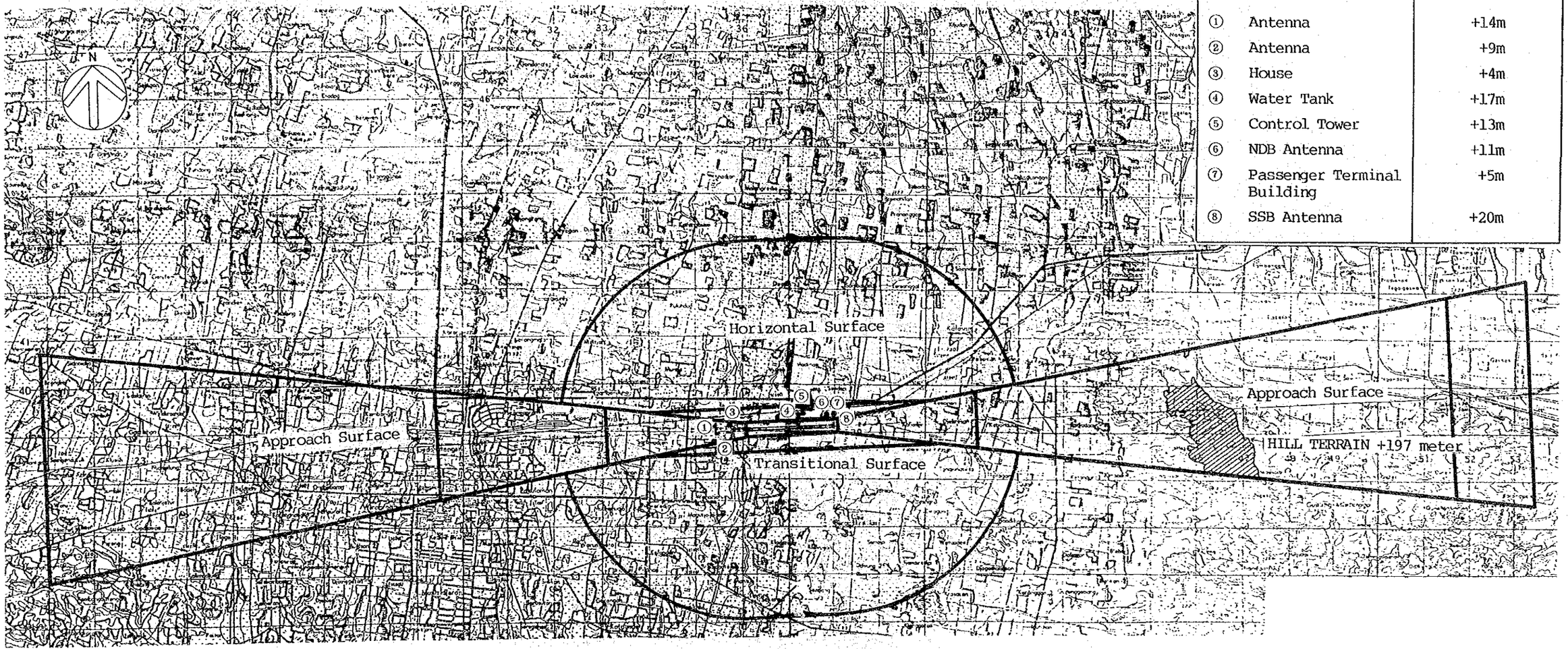
Surface and dimensions[a]	Runway classification									
	Non-instrument				Non-precision approach			Precision approach category I		Precision approach category II or III
	Code number				Code number			Code number		Code number
	1	2	3	4	1,2	3	4	1,2	3,4	3,4
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
CONICAL										
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.

Present requirements for Yogyakarta Airport

(Source : Annex 14 - Aerodromes / ICAO)

No	OBSTRUCTION	HEIGHT ABOVE THE SURFACE
①	Antenna	+14m
②	Antenna	+9m
③	House	+4m
④	Water Tank	+17m
⑤	Control Tower	+13m
⑥	NDB Antenna	+11m
⑦	Passenger Terminal Building	+5m
⑧	SSB Antenna	+20m



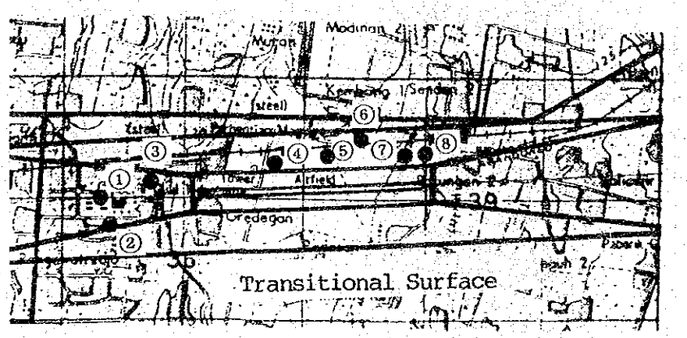


Fig. 5.2.3 Obstruction Chart of the Existing Yogyakarta Airport

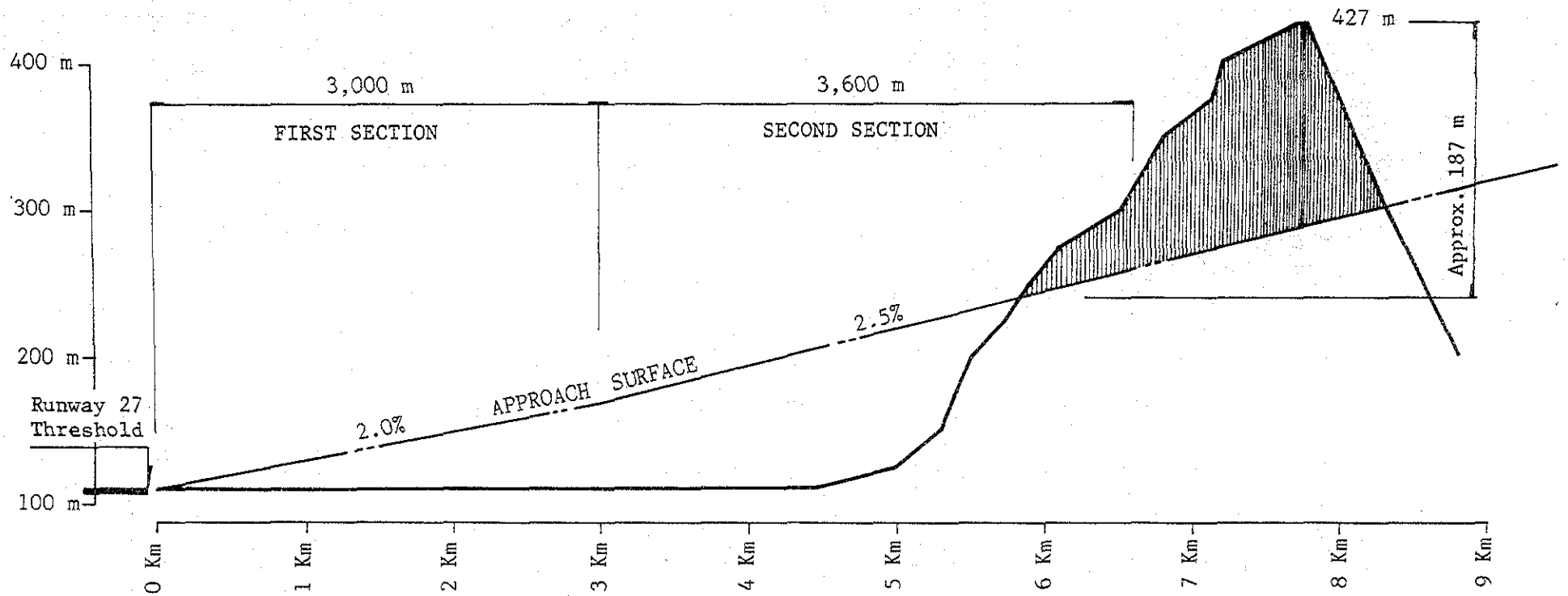


Fig. 5.2.4 Hilly Terrain Infringes Approach Surface

5.2.2 Surakarta Airport

Table 5.2.5 shows the anticipated time of saturation of the existing facilities at Surakarta airport. This table was prepared based on the following assumptions in order to define the WOP case.

a) Although existing runway strip does not meet the requirement stipulated in ANNEX-14, ICAO and there are some obstacles infringing the transitional surface as stated hereafter, the current situation concerning the aircraft operations is assumed to be continued.

b) The maximum aircraft is assumed to be F-28-4000 with necessary weight restriction as it is, because an introduction of larger aircraft will require substantial investment such as runway extension and/or pavement overlay and it does not mean the WOP case.

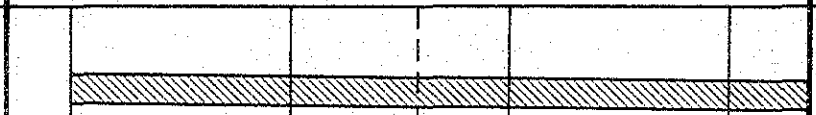
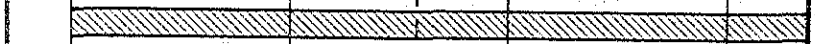
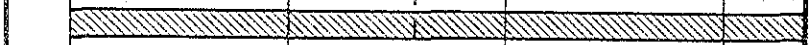
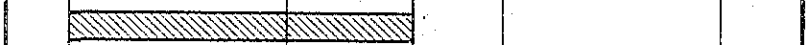
It is estimated that the existing Surakarta airport will be saturated for passenger traffic of year around 1993 at latest as explained below.

a) The expansion of the existing civil apron which can accommodate 4 F-28s will be necessary in 1994 when 5 gate positions for F-28 will be required. Although the transmigration apron located on the north of the existing runway can accommodate up to 6 F-28s in capacity, pavement overlay will be required for the F-28 because the pavement of the apron has been constructed for the design load of C-130.

b) The passenger terminal building of 670 sq.m (excluding floor area for VIP) is the bottle-neck of the airport facilities in terms of the capacity. The building has a capacity of accommodating passengers of one F-28-4000 aircraft and the average floor area per passenger during the peak hour, which occurs in the morning when two departing flights for Jakarta and Surabaya duplicate, is estimated to be about 4 sq.m per passenger. This is far below the normal standard.

c) Replacement of existing radio navaids and/or airfield lighting facilities will become necessary before 1995 due to the end of service life.

Table 5.2.5 Anticipated Time of Saturation - Surakarta Airport

FACILITY	YEAR (1985 / 1990 / 1993 / 1995 / 2000)	DESCRIPTION
Runway — Length (1,900 m)		- F-28 aircraft can be operated on the existing runway with due weight restrictions.
Runway — Pavement Strength (PCN28)		- Pavement overlay will not be required for the operation of F-28 aircraft.
Connecting Taxiway		- The existing connecting taxiway can be used in terms of the taxiway capacity.
Apron Gate Positions		- Apron expansion will be required before 1994 when 5 gate positions for for F-28-4000s are required.
Passenger Terminal Building		- Existing passenger terminal building has alreay reached its capacity. (4 sq.m/passenger at present)
Air Navigation Systems		- Most of equipment for air navigation have to be replaced before 1995.

Note: This table is made based upon an assumption that the maximum aircraft operated is F-28-4000, the same as present.

(1) Aerodrome Reference Code

The aerodrome reference code of the existing Surakarta airport is 3C.

(2) Runway

The runway data is shown in Table 5.2.6.

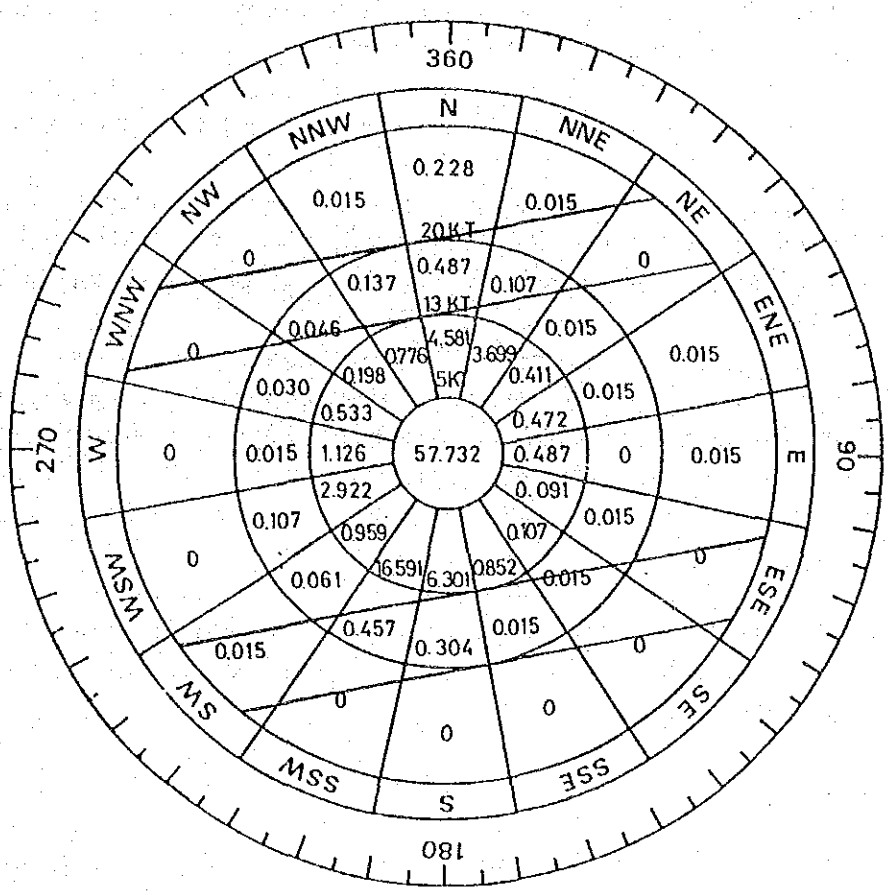
Table 5.2.6 Runway Data of Surakarta Airport

Runway Designation	True Bearing	Dimensions	Pavement Strength
08 / 26	079° / 259°	1,900 m x 45 m	PCN 28 FCYU

The largest aircraft presently in service is the F-28-4000. The runway length of 1,900 m is sufficient for take-off operations with a full payload for the F-28-4000 for Jakarta under normal conditions. The weight restriction is, however, required because there are no refueling facilities at Surakarta airport and fuel for the return trip to Jakarta is necessary to be carried from Jakarta.

Extension to 2,150 m of the runway will, moreover, be required when the 150 seater aircraft is introduced.

The existing wind coverages were analyzed based on the 3 years data from 1982 to 1984 observed at Surakarta airport as shown in Fig. 5.2.5.



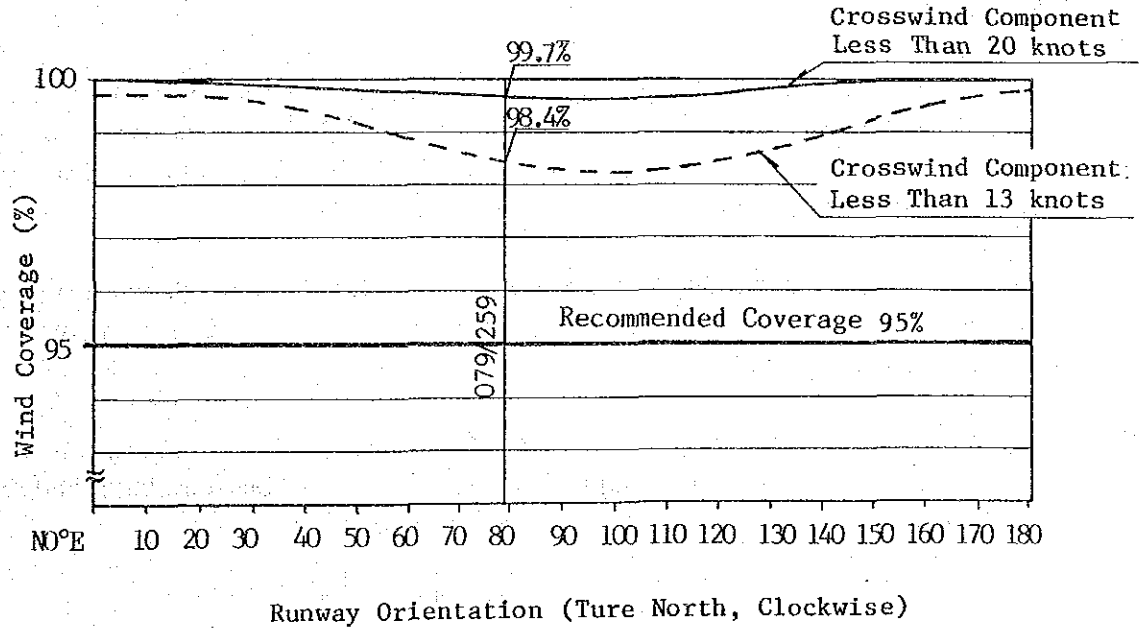


Fig. 5.2.5 Crosswind Coverages of Surakarta Airport
1982 - 1984 (3 years)

The result shows that the usability factor of the runway meets the operational requirements of 95% coverage.

Runway end safety areas do not satisfy the ICAO requirements.

The existing runway is made of asphalt-concrete. There are considerable differences in total pavement thickness, viz., 45 cm at 08 threshold, 78 cm at original Runway 26 threshold and 85 cm at extended portion.

Pavement classification number (PCN) of the existing runway is estimated to be 28. Compared with the aircraft classification number (ACN) of MD-82, it is judged that the existing pavement has insufficient strength for MD-82 and pavement overlay will be necessary.

(3) Runway Strip

The width of the runway strip is only 75 m on each side of the runway. A double this figure (150 m width) will be necessary in order to meet the ICAO requirements.

(4) Taxiway

No parallel taxiway will be justified before the year 2010 and the existing connecting taxiway can be used in terms of capacity.

(5) Apron

The existing apron for the commercial use, which is located on the south side of the runway with about a 105 m edge-to-edge separation, has an area of 97 m x 83 m and can accommodate four F-28s by self-maneuvering nose-out parking configurations.

Therefore, the existing apron can accommodate the demand up to the beginning of 1990's on condition that the existing width of runway strip will remain unchanged.

No jet aircraft, even the F-28, can be parked on the existing apron if the non-precision or precision approach Category-I is implemented because the tail wing will protrude upon the transitional surface.

The existing apron for the transmigration purpose, which is located opposite to the civil apron with a separation distance of 184 m from the runway edge, has an area of 186 m x 90 m and can accommodate MD-82 class aircraft without infringing the transitional surface of precision approach Category-I.

However, pavement overlay will be required for these or larger aircraft due to the weeker pavement.

(6) Passenger Terminal Building

The existing terminal building has a floor area of 670 sq.m, (excluding area allotted for VIP purposes) which seems to be able to handle passengers of only one departure and one arrival of F-28 aircraft at the same time.

The peak hour passengers as of 1985 are estimated to be about 180 based on the current timetable. Based on this peak hour traffic volume, the unit space per passenger of the existing terminal is estimated 4 sq.m, which is judged to be an overcrowded condition.

Thus, it is considered that the existing terminal building has already reached its capacity.

(7) Air Navigation Systems

The outline of the existing air navigation systems at Surakarta airport is shown in Table 5.2.7.

Table 5.2.7 Outline of the Existing Air Navigation Systems - Surakarta

Equipment	Outline	Remarks
NAVAIDS		
NDB	"SO", 255 KHz	under construction
VOR/DME		
ATC/COM		
ATC console	Aerodrome control	
VHF A/G radio	122.7 MHz	
ATS direct speech circuit	Between Surabaya, SSB	Plan: Yogyakarta, Denpasar (PERUMTEL)
AFTN Message	Between Surabaya, SSB	
Tape recorder and reproducer	8 channels	
VISUAL AIDS		
Aerodrome beacon		
Approach lighting system	Runway 08	
Runway edge lights		
Runway threshold lights		
Turning lights		

(Cont'd)

Equipment	Outline	Remarks
Runway threshold identification lights		
VASIS		
Taxiway edge lights		
Wind direction indicator lights		
Landing tee		
Apron floodlighting		

(8) Obstacle Limitation Surfaces

The runway of Surakarta airport is classified as instrument and non-precision approach runway 3C where the maximum aircraft is the F-28-4000.

Table 5.2.8 and Fig. 5.2.6 show the dimensions of the obstacle limitation surfaces and the obstruction chart of the existing Surakarta airport, respectively.

a) There are obstacles such as antennas, beacons, control tower, etc., which infringe the transitional surface.

b) There are no obstacles that infringe the approach surface.

Thus, the existing runway of Surakarta airport does not meet the operational requirements for a non-precision approach runway.

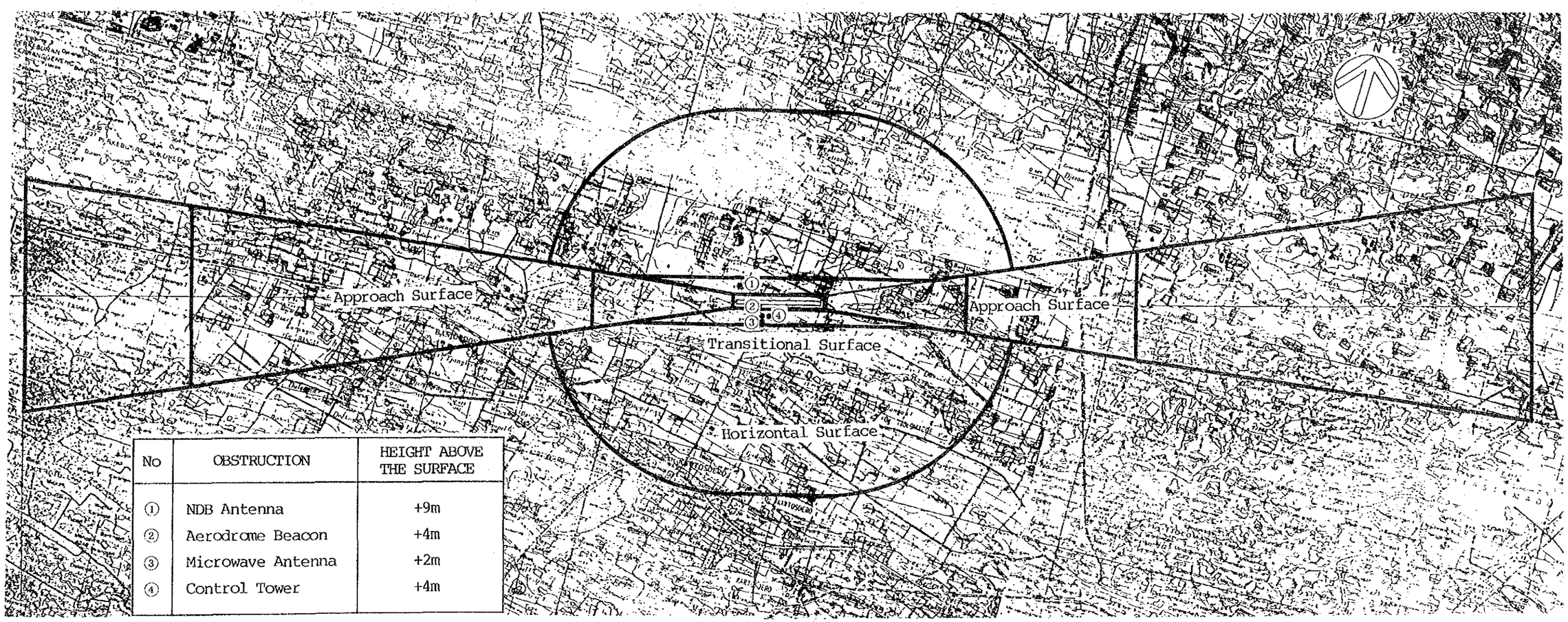
Table 5.2.8 Obstacle Limitation Requirements for the Existing Surakarta Airport

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.

Present requirements for Surakarta Airport

(Source : Annex 14 - Aerodromes / ICAO)



No	OBSTRUCTION	HEIGHT ABOVE THE SURFACE
①	NDB Antenna	+9m
②	Aerodrome Beacon	+4m
③	Microwave Antenna	+2m
④	Control Tower	+4m

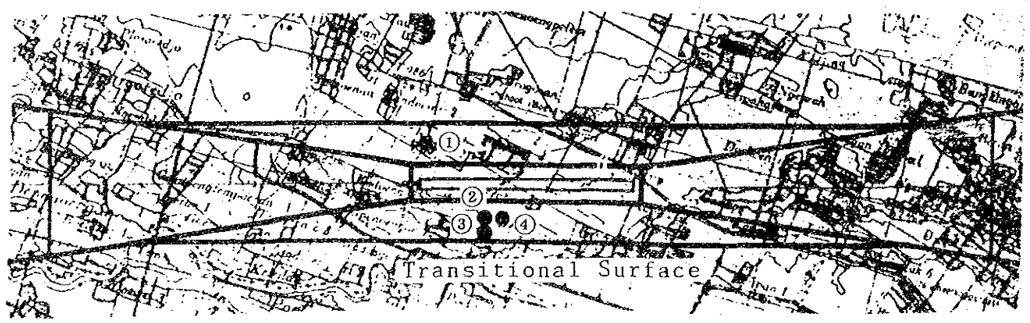


Fig. 5.2.6 Obstruction Chart of the Existing Surakarta Airport

5.2.3 Semarang Airport

In order to cope with the future increase in traffic demand, DGAC has executed a feasibility study entitled "Studies for the Improvement of Seven Domestic Airports", in 1981, and the master plan and detailed design in "First Development Phase of 9 Airports" in 1984, being financed by the Asian Development Bank.

In these studies and designs, a new 2,500 m runway will be constructed on the northeast side of and in parallel with the existing runway with a separation of 273 m. Terminal area will also be constructed on the northeast side of the new runway. Fig. 5.2.7 shows the airport layout plan for the Phase I development in the design year of 1992.

To cope with the demand increase until the aforementioned development plan is completed, extension of the existing runway up to 1,650 m and expansion of the car park were carried out and completed in 1985. Expansion of the passenger loading apron is also planned.

DGAC has already decided to implement the development plan. In this section, therefore, the requirements of the major facilities in the master plan are evaluated making comparison with those based on the review forecast made in Chapter 3 of this report.

A comparison between the master plan and the reviewed results is given in Table 5.2.9.

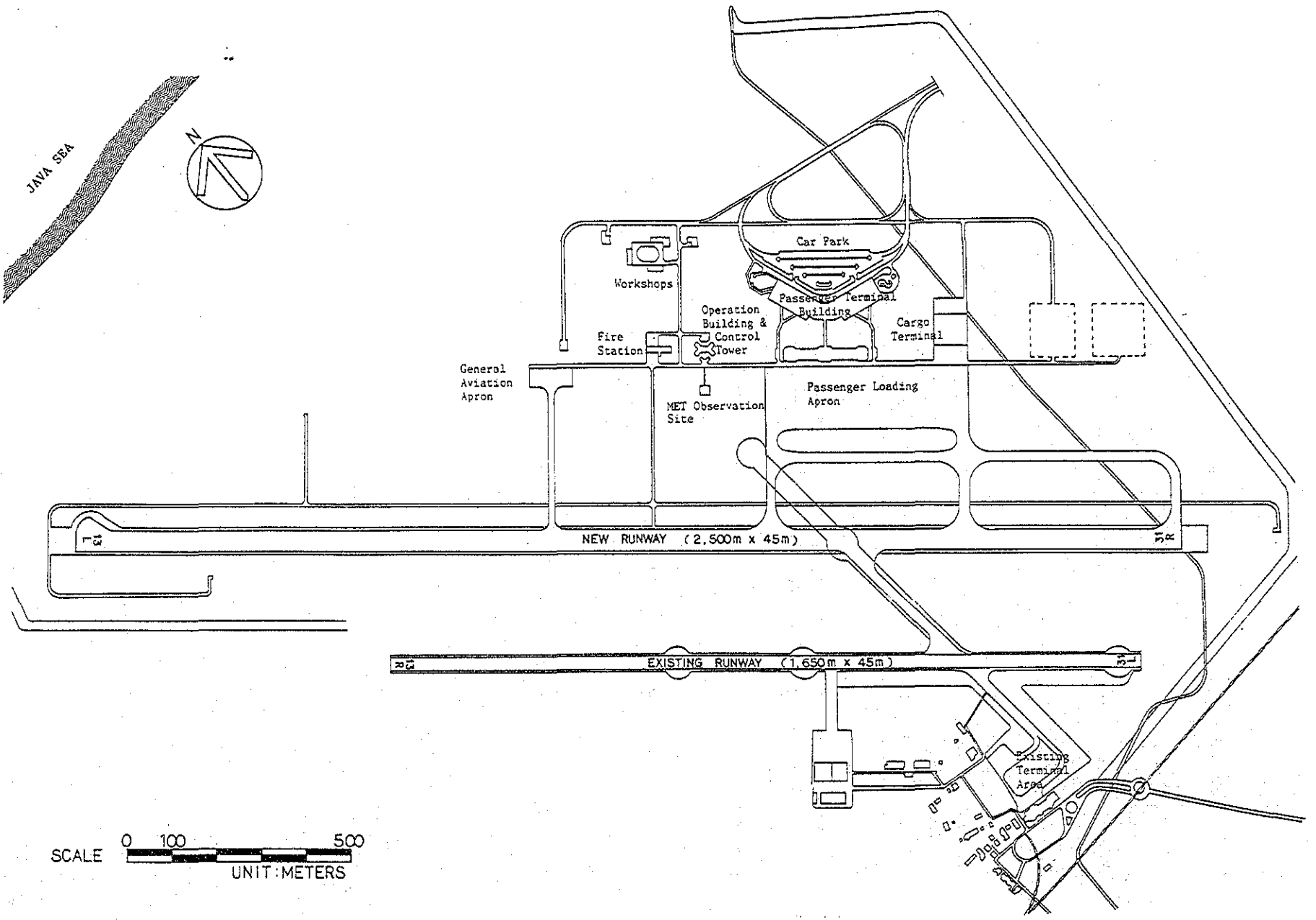


Fig. 5.2.7 Airport Layout Plan of the Phase I Development

Table 5.2.9 Review of the Master Plan for Semarang Airport

Items \ Phase/Design Year	Present Condition as of 1984	Master Plan			Review		
		Phase I	Phase II	Phase III	Phase I	Phase II	Phase III
		1992	2000	2005	1995 *1	2000	2005
1. Annual Passengers	344,422	1,687,000	3,040,000	4,203,000	911,000	1,214,000	1,778,000
2. Peak Hour Passengers (Arr. + Dep.)	300*2	799	1,358	1,724	780	1,000	1,420
3. Annual Aircraft Movements	10,231	29,273	46,492	63,533	8,700	9,400	9,400
4. Peak Hour Aircraft Movements (Arr. + Dep.)	6	13	19	22	7	7	7
5. Largest Aircraft in Service	F-28-4000	A 300	B-747		A300/DC10		B-747
6. Runway (m x m)	1,400 x 45	2,500 x 45			2,500 x 45		
7. Runway Strip (m x m)	1,520 x 200	2,620 x 300			2,620 x 300		
8. Taxiway	-	Partial P-TWY	Full P-TWY		Parallel Taxiway Justified		
9. Passenger Terminal Apron (gate positions)	F-28 : 2 VCV : 1	A300 : 3 A320 : 1 SP : 4	B747 : 4 SP : 6	B747 : 5 SP : 6	A300/DC-10:2 F28 :2 MD82/A320 :2 SP :1	A300/DC10: 4 MD82/A320: 1 SP : 1	B747 : 4 MD82/A320: 2 F-28 : 1
10. Passenger Terminal Building (m^2)	1,600	18,900	20,900	29,500	11,700	15,000	21,300

Note *1 : Phase I design year is revised to 1995 taking into account the delay of the project implementation at present. Design years of the other phases are kept the same as the master plan.

*2 : Estimated figure.

In the master plan, the recent stagnation in passenger traffic was considered to be due to the saturation of the airport capacity. Therefore, the potential demand was projected by assuming the year 1978 as the saturation year and the starting year of the forecast.

To be based on this assumption, the potential passenger demand in 1984 would have to be 668,000, which is double the actual traffic.

On the other hand, the review forecast was prepared by utilizing the current traffic volume as the starting point of the forecast, because such a saturated condition cannot observed at present.

The growth rate projected for the future estimation was also revised lower in accordance with the updated GRDP by REPELITA IV.

In this comparison, the Phase I design year was revised to the year 1995 taking into account the delay of the project implementation at present. The design years of the other phases were kept the same as the master plan.

Table 5.2.9 shows that the passenger demand is expected to decrease by about 45 % in the design year of the Phase I development and also by about 60 % in the years 2000 and 2005 as compared with that of the original master plan.

It is, therefore, recommended to construct the passenger terminal apron (gate positions) step by step in accordance with the reviewed requirements. But as for the passenger terminal building, it may be required to modify the layout plan completely before the construction start and/or to adjust the area to be constructed by the Construction Management Service Team.

5.3 Airstrips

5.3.1 General

As explained in Chapter 3, Cilacap airstrip owned and operated by PERTAMINA, at which regular flights between Cilacap and Jakarta are operated by CASA and DHC-6 aircraft by Merpati Nusantara Airlines, will be required to be served by F-27 class propeller aircraft to cope with anticipated demand.

The runway of Cilacap airstrip, however, cannot be economically extended due to geographical constraints. It is accordingly recommended that a new airport to replace the existing one should be studied in the Cilacap area. The possibility of developing Wirasaba grass strip (military use at present) as a new Cilacap airport should also be studied due to the advantages of less land acquisition and no obstructions to aircraft.

5.3.2 Development Policy of Cilacap Airport

As explained in Section 3.4.2, the passenger traffic volume on the Cilacap -Jakarta route is forecast to be 26,000 and 48,000 in the year 2000 and 2010, respectively. This route traffic indicates that small propeller aircraft such as the F-27 class will be introduced in the year 2000 and 2010 in accordance with the Design Standard for Aircraft Introduction in Fig. 3.6.2.

The operation of F-27 class propeller aircraft requires a runway length of 1,800 m.

However, the extension of the existing runway from 660 m to 1,800 m is considered economically impractical for the following reasons:

a. Runway 13 threshold is on a steep cliff and the runway extension will require a tremendous volume of earthwork which is economically impractical.

b. Runway 31 threshold and the overrun areas face undulating terrain with small hills and cliffs. The maximum extension of the runway toward southeast is deemed up to around 200 - 300 m practically.

c. Thus, the existing runway can be extended up to around 1,000 m in total length, but there is no land for navigational aids, especially for the approach lighting system.

Hence, a new airport replacing the existing one is considered to be necessary in order to introduce the propeller aircraft and meet future air traffic demands.

Although careful and detailed studies will be required for the selection of new site and airport development, possibility of redevelopment of Wirasaba grass strips (used for military strip at present) for the new Cilacap airport should be examined as one of the possible new airport sites. Wirasaba grass strip has the following dimensions and can be extended more than 2 km toward Runway 11 threshold in terms of the terrain conditions. No obstruction to aircraft exists.

Outline of Wirasaba Airstrip

Coordinates	:	109° 25'E, 07° 27'S
Elevation	:	50 m
Areas	:	86 ha
Runway	:	850 m x 50 m (Grass)
Designation	:	Runway 11/29

5.4 Airspace Utilization

5.4.1 Present Condition of Airspace Configuration

Present airspace configuration over Central Java and D.I. Yogyakarta is shown in Fig. 5.4.1

(1) Flight Information Region (FIR)

The airspace below FL 245 of the areas is divided into two flight information regions; namely, Jakarta FIR (GND/MSL up to FL 245) and Bali FIR (GND/MSL up to FL 245) by the line of longitude 110° 23' east.

The airspace above FL 245 of the areas is designated as a part of the Jakarta Upper Information Region (UIR) which is controlled by the Jakarta ACC.

Fig. 5.4.2 shows the conceptual radar coverages over Java island at present. PSRs with a coverage of 90 NM at Jakarta, Surabaya and Bali, and SSRs with a coverage of 180 NM at Jakarta, Semarang, Surabaya and Bali are in operation for air traffic control services. These radar facilities form a part of radar network in Indonesia which are used for enroute and terminal control services.

Central Java is located within the coverages of SSRs which are installed at Semarang and Surabaya. However, the existance of high mountains such as Mts. Lawu, Merapi and Merbabu keeps the airspace approximately at or below 15,000 feet altitude over the southern part of the Study area out of radar coverages. It means that terminal control area for Yogyakarta APP, especially the Yogyakarta airport area, is out of radar coverage for both PSR and SSR in the existing radar network.

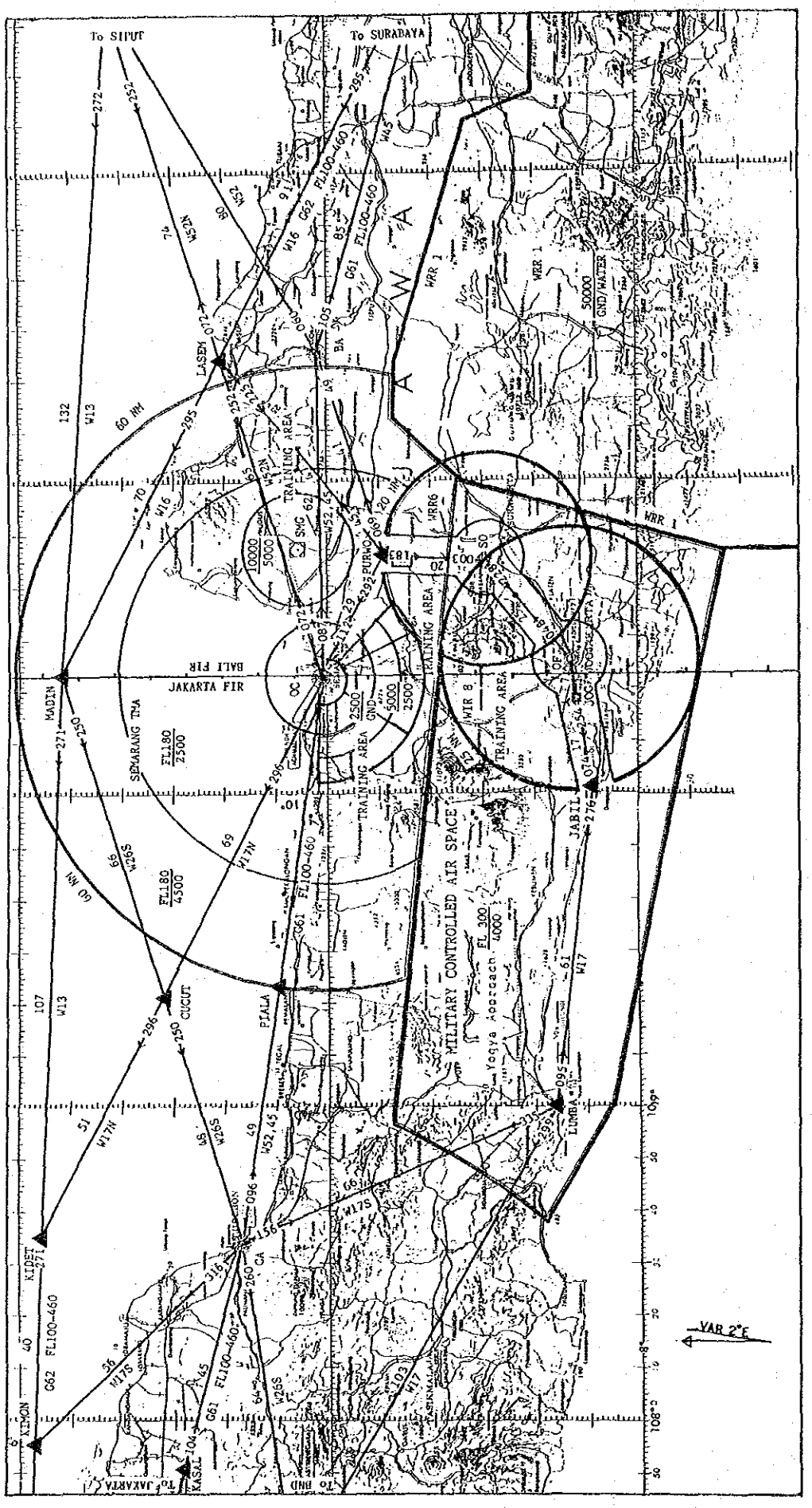


Fig. 5.4.1 Present Condition of Airspace Configuration over Central Java and D.I. Yogyakarta

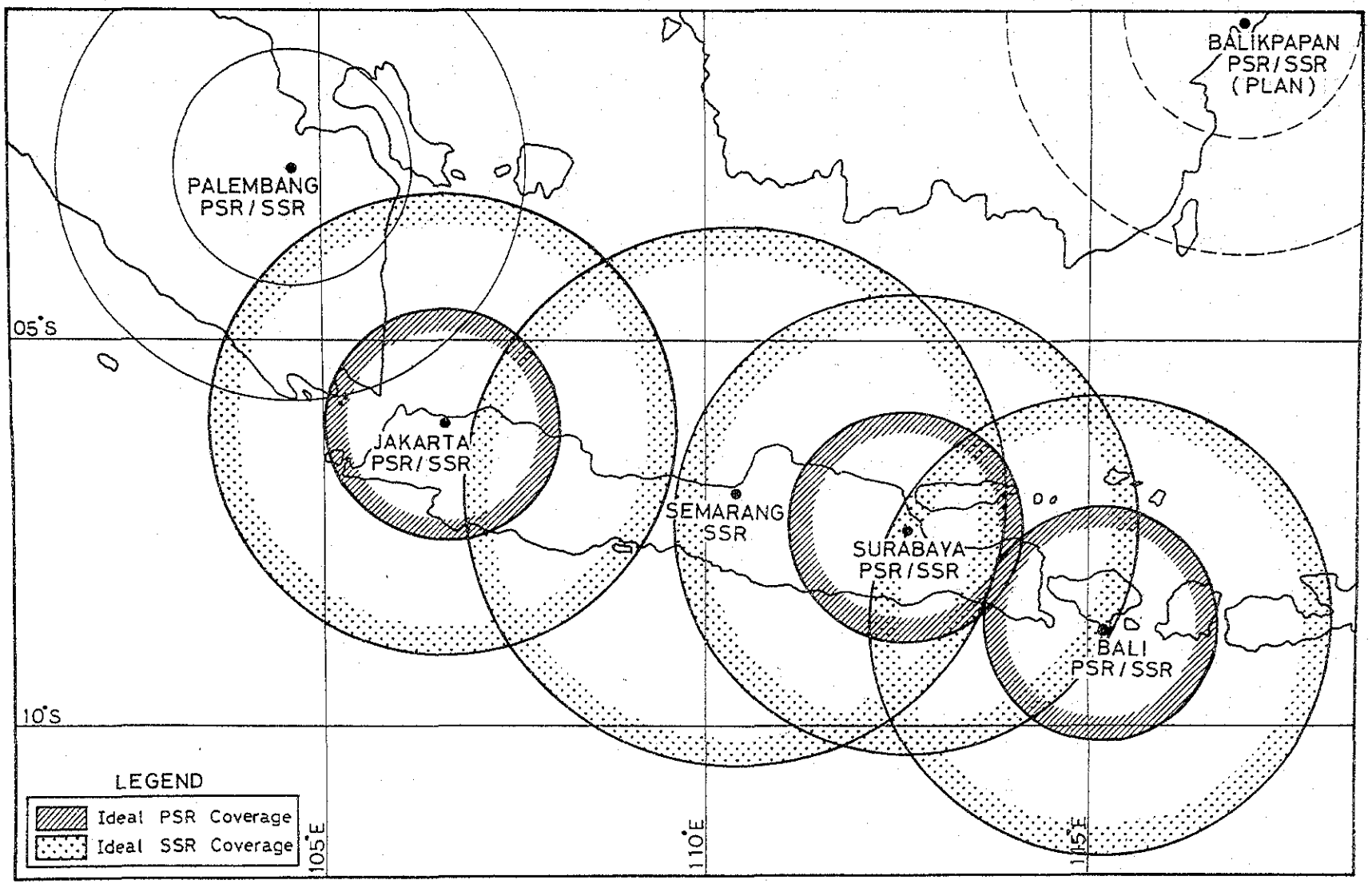


Fig. 5.4.2 Conceptual Radar Coverages over Java Island

(2) Terminal Control Area

There are 2 approach control facilities in operation at Semarang and Yogyakarta airports. The Yogyakarta approach control facility began its operations since January 1, 1986. The area and altitudes for responsibilities of each approach control services are shown below.

FLIGHT INFORMATION REGIONS AND CONTROL AREAS

NAME AND LATERAL LIMITS	UPPER LIMIT / LOWER LIMIT	UNIT PROVIDING SERVICE	RADIO CALL SIGN (LANGUAGE)	REMARKS
1	2	3	4	5
Semarang Terminal Control Area (TMA) 07.15S 109.24E thence along the arc of a circle with radius 60NM centred at "CC" NDB clockwise to 07.13S 111.23E 07.13S 111.12E 07.26S 111.00E 07.22S 110.23E 07.15S 109.24E	FL 180 / 2500ft/4000ft	APP Semarang	RTF: Semarang Approach (En)	Hours of operation 2300 - 1200 Lower Limits - 2500 ft within radius of 40NM centred at "CC" NDB. - 4000 ft between radii of 40NM and 60NM centred at "CC" NDB. Transition level: FL 130 Transition altitude : 11.000 ft
Yogyakarta Military Controlled Air Space (MCA) 07.12.00S 108.58.00E 07.22.00S 110.27.20E then along a circle radius of 20NM centred at "SO"NDB to 07.22.30S 111.03.30E 07.26.00S 111.00.00E 08.17.00S 110.46.00E 07.55.00S 109.00.00E 07.42.00S 108.38.20E then along a circle radius of 150NM centred at Radar Head Cengkareng to 07.12.00S 108.58.00E	FL 300 / 4000ft	APP Yogyakarta	RTF: Yogya Approach	Hours of operation 2300 - 1100 Frequency 123.4 (Primary) 120.2 (Secondary)

Source: AIP Indonesia and AIRAC 05 June A-04/86

(3) Control Zone and Aerodrome Traffic Zone

The control zone and/or aerodrome traffic zone are established at Yogyakarta, Semarang and Surakarta airports for aerodrome control services with the following dimensions:

TOWER	HOURS (GMT)	LATERAL LIMITS	UPPER LIMIT	LANGUAGES	REMARKS
1	2	3	4	5	6
ADI TOWER	23.00 - 11.00	ATZ A circule with a radius of 5 NM centred at "OF" NDB	2,500 FT	En	Yogyakarta airport 122.4
YANI TOWER	23.00 - 12.00	CTR A circle with a radius of 15NM centred at "OC" NDB ATZ	2,500 FT	En	Semarang airport 122.3 Landing/Take-off Runway 13 Normal circuit for landing and immediate left turn after take off, unless otherwise instructed by ATC. Runway 31 Right hand turn for landing and normal current for take off.
MARMO TOWER	00.00 - 10.00	ATZ A circle with a radius of 5NM centred at "SO" NDB.	2,500 FT	En	Surakarta airport 122.7

Source: AIP Indonesia and AIRAC 05 June A-04/86

(4) Restricted Area

In the eastern part of Central Java and D.I. Yogyakarta, the following restricted areas are established for the purpose of military training activities.

PROHIBITED, RESTRICTED AND DANGER AREAS.

IDENTIFICATION and NAME / LATERAL LIMIT	UPPER LIMIT / LOWER LIMIT	TYPE OF RESTRICTION / HAZARD	REMARKS
1	2	3	4
RESTRICTED AREAS WAR 1 MADIUN 07.13S 111.12E 07.13S 111.23E 07.27S 112.10E 07.40S 112.15E 07.40S 112.56E 07.46S 113.12E 08.12S 113.37E 08.30S 113.37E 08.30S 112.15E 10.25S 112.15E 10.25S 110.46E 08.25S 110.46E 07.26S 111.00E 07.13S 111.12E.	50,000 FT ALT / GND/WATER	Training Area	INDONESIAN AIR FORCE. Except the area above WIR 11, Lower limit FL-200.
WAR 6 ADISUMARMO WIRYOKUSUMO Beyond radius 5NM up to 20NM centred at "SO" NDB (without Yogyakarta - Solo Corridor)	6,000 FT / GND/WATER	Training Area	Indonesian Air Force.
RESTRICTED AREAS WAR 8 ADISUCIPTO TRAINING AREA Beyond radius 5NM up to 25NM centred at "OF" NDB (without Yogyakarta - Solo Corridor)	FL-300 / GND/WATER	IAF Flying School	Indonesian Air Force For jet/piston, incoming/over flying aircraft to fly above 3,000 feet or below 4,000 feet. Contact Adi Tower for information Training Area divided into two categories: - Low area altitude: 2,000 - 5,000 feet. - High area altitude: 6,000 - 10,000 feet. Activity 23.00 - 10.00

(Source: AIP Indonesia and AIRAC 05 June A-04/86)

In addition, training areas for helicopters and fixed-wing aircraft are designated practically in the vicinity of Semarang airport and over the Semarang VOR/DME as shown in Fig. 5.4.1.

(5) ATS Route

With the existance of the restricted areas mentioned above, most of ATS routes connecting Jakarta and main airports located in the eastern part of Indonesia such as Surabaya, Bali, etc., converge on the Semarang TMA so as to avoid the restricted areas.

Most of the scheduled flights between Jakarta and Yogyakarta use ATS route W-17, but they are forced to make dead-reckoning flights between the reporting points "Lumba" and "Jabil" due to the fact that there are no navigational aids on the said segment of ATS route W-17.

Appropriate action should, therefore, be taken to ensure the safe aircraft operations with due consideration to the mountainous terrain along the north of this segment.

5.4.2 The Existing Procedures for IFR Operations at Main Airports

The existing procedures for IFR operations such as instrument approach, holding and standard instrument departures, etc., are shown in figures below.

(1)	Fig. 5.4.3	VOR Approach Runway 09 (JOG VOR/DME Holding)	- Yogyakarta
(2)	Fig. 5.4.4	VOR Approach Runway 09 (JABIL Holding)	- Yogyakarta
(3)	Fig. 5.4.5	Holding Patterns	- Yogyakarta
(4)	Fig. 5.4.6	Instrument Departure Routes	- Yogyakarta
(5)	Fig. 5.4.7	ADF Approach Runway 26	- Surakarta
(6)	Fig. 5.4.8	ADF Approach Runway 13 (High Level)	- Semarang
(7)	Fig. 5.4.9	ADF Approach Runway 13	- Semarang
(8)	Fig. 5.4.10	Standard Instrument Arrival	- Semarang
(9)	Fig. 5.4.11	Standard Instrument Departure	- Semarang

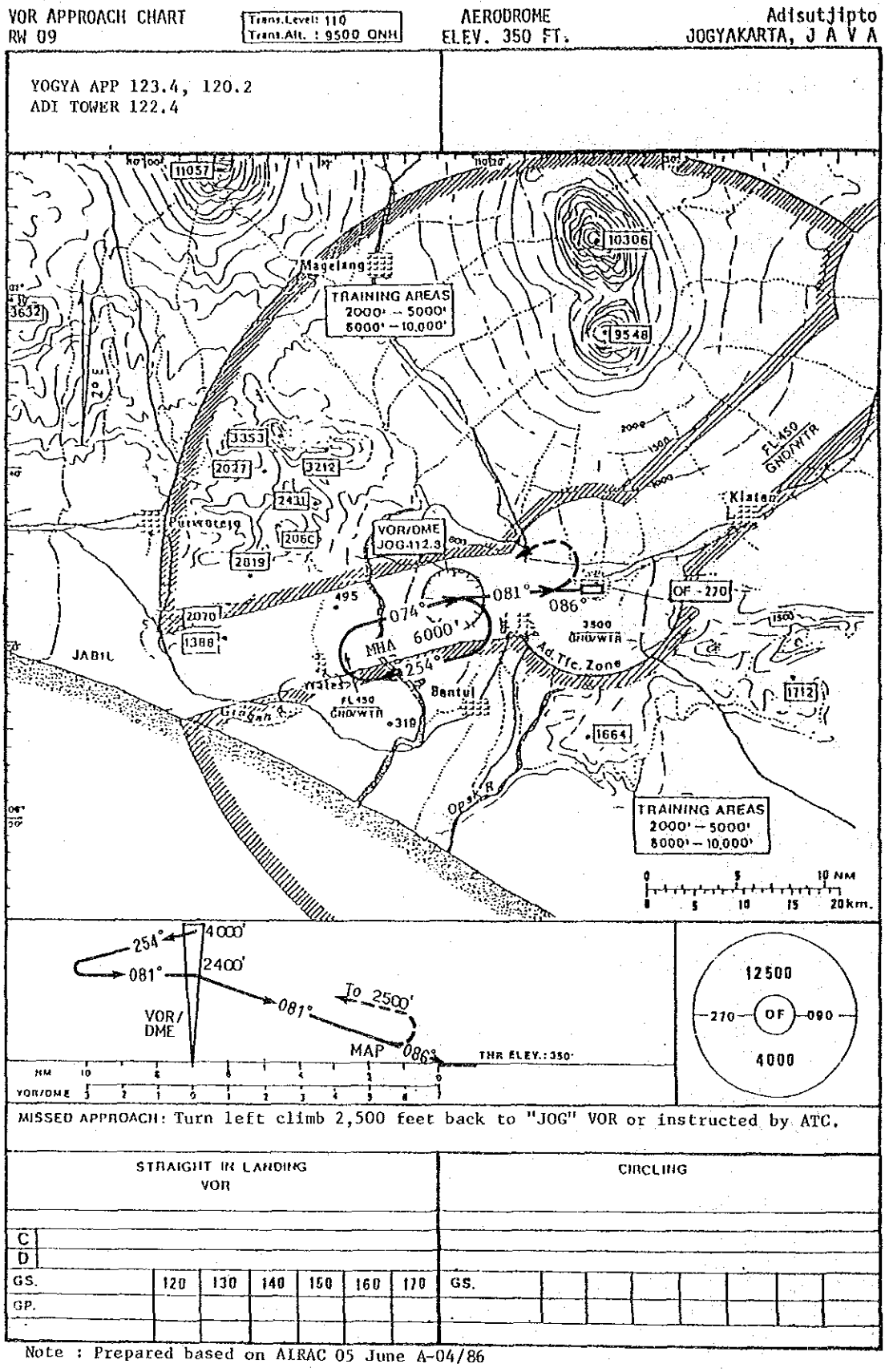
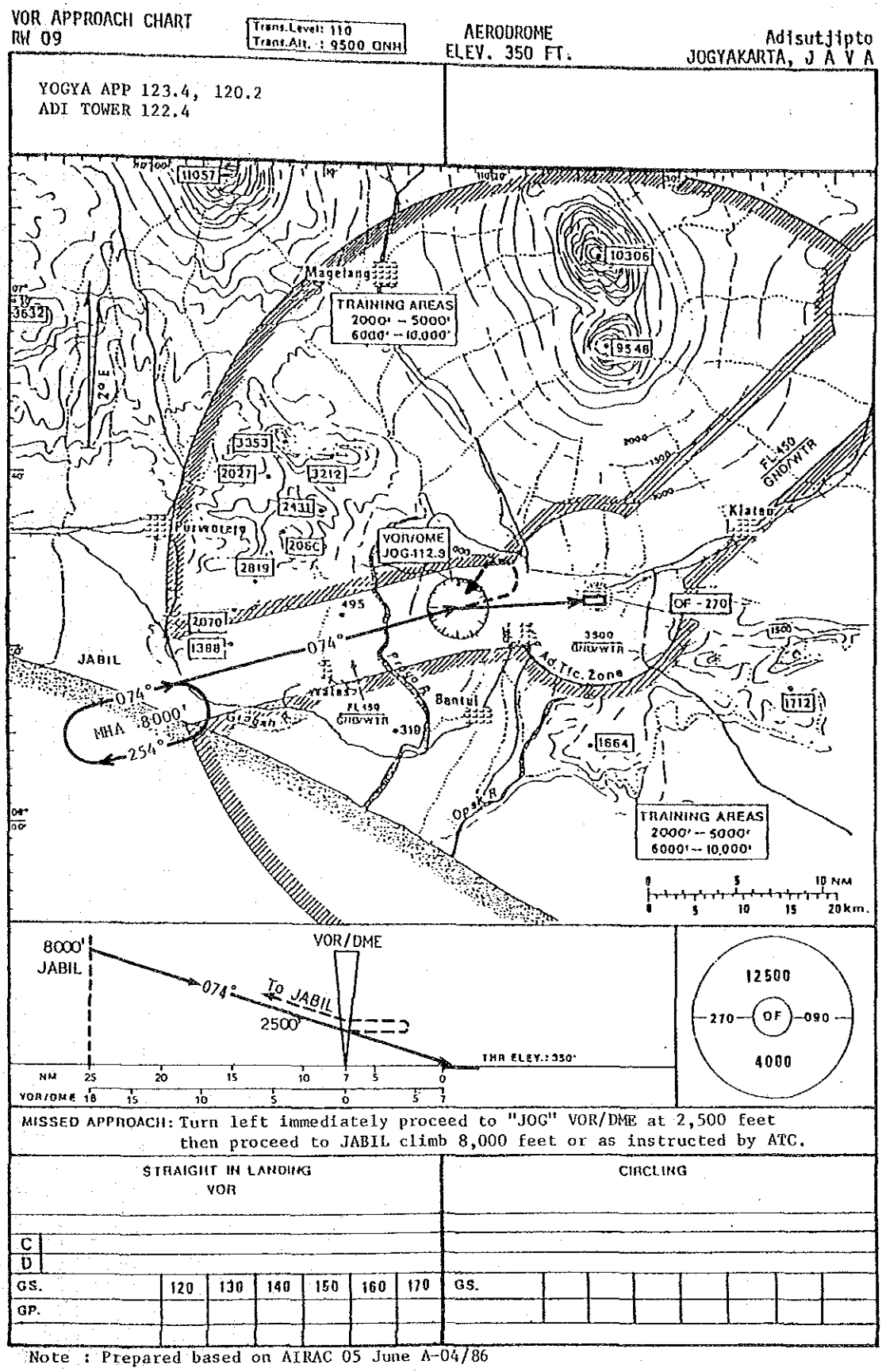


Fig. 5.4.3 VOR approach Runway 09 - Yogyakarta Airport (JOG VOR/DME Holding)

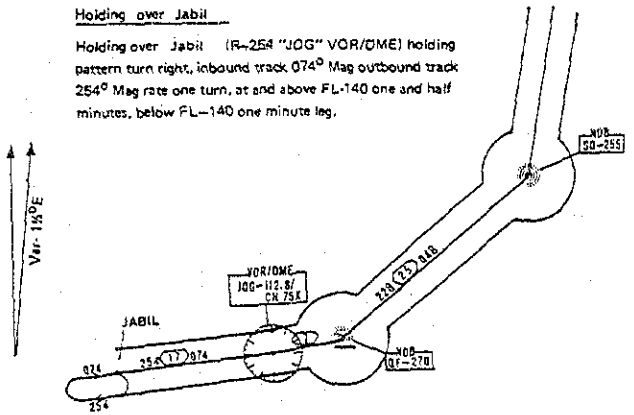


Note : Prepared based on AIRAC 05 June A-04/86

Fig. 5.4.4 VOR Approach Runway 09 - Yogyakarta
(JABIL Holding)

Holding over Jabil

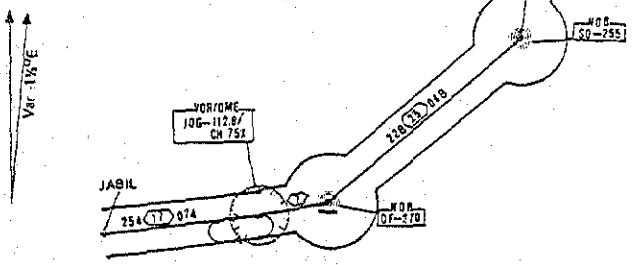
Holding over Jabil (R-254 "JOG" VOR/DME) holding pattern turn right, inbound track 074° Mag outbound track 254° Mag rate one turn, at and above FL-140 one and half minutes, below FL-140 one minute leg.



Note : Approach from Jabil direct to "JOG" VOR/DME on R-254 altitude 2.500 feet then make visual approach or as instructed by ATC. If visual contact is not established turn left immediately, proceed to "JOG" VOR/DME at 2500 feet then proceed to Jabil climb to 8,000 feet or as instructed by ATC.

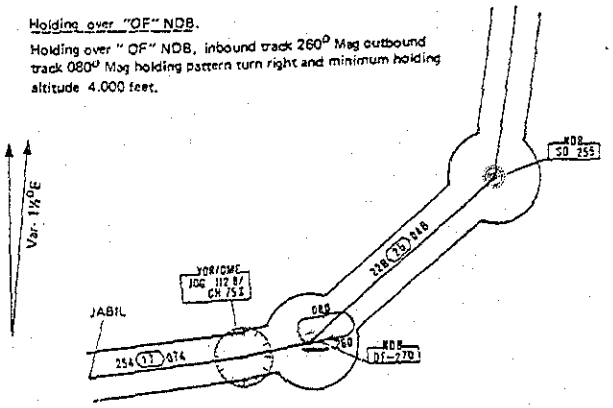
Holding over "JOG" VOR/DME.

Holding over "JOG" VOR/DME, inbound track 074° Mag outbound track 254° Mag holding pattern turn right, maximum holding altitude 6.000 feet. This holding pattern may be used when there is no traffic in the aerodrome traffic circuit and no training activities.



Holding over "OF" NDB.

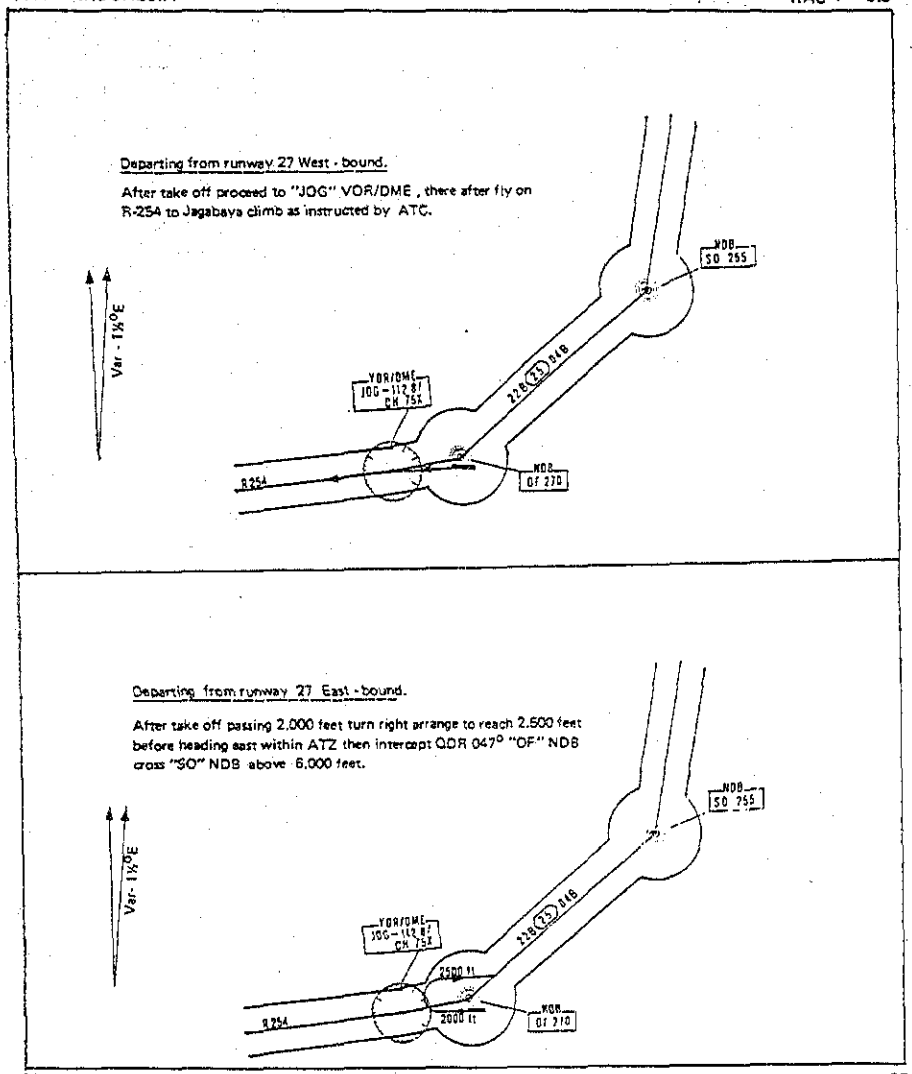
Holding over "OF" NDB, inbound track 260° Mag outbound track 080° Mag holding pattern turn right and minimum holding altitude 4.000 feet.



Note : Both holding pattern, over "JOG" VOR/DME and "OF" NDB shall not be used simultaneously ATC clearance must be obtained for holding over "JOG" VOR/DME or "OF" NDB.

Note : Revision due to AIRAC 05 June A-04/86 is included.

Fig. 5.4.5 Holding Patterns - Yogyakarta



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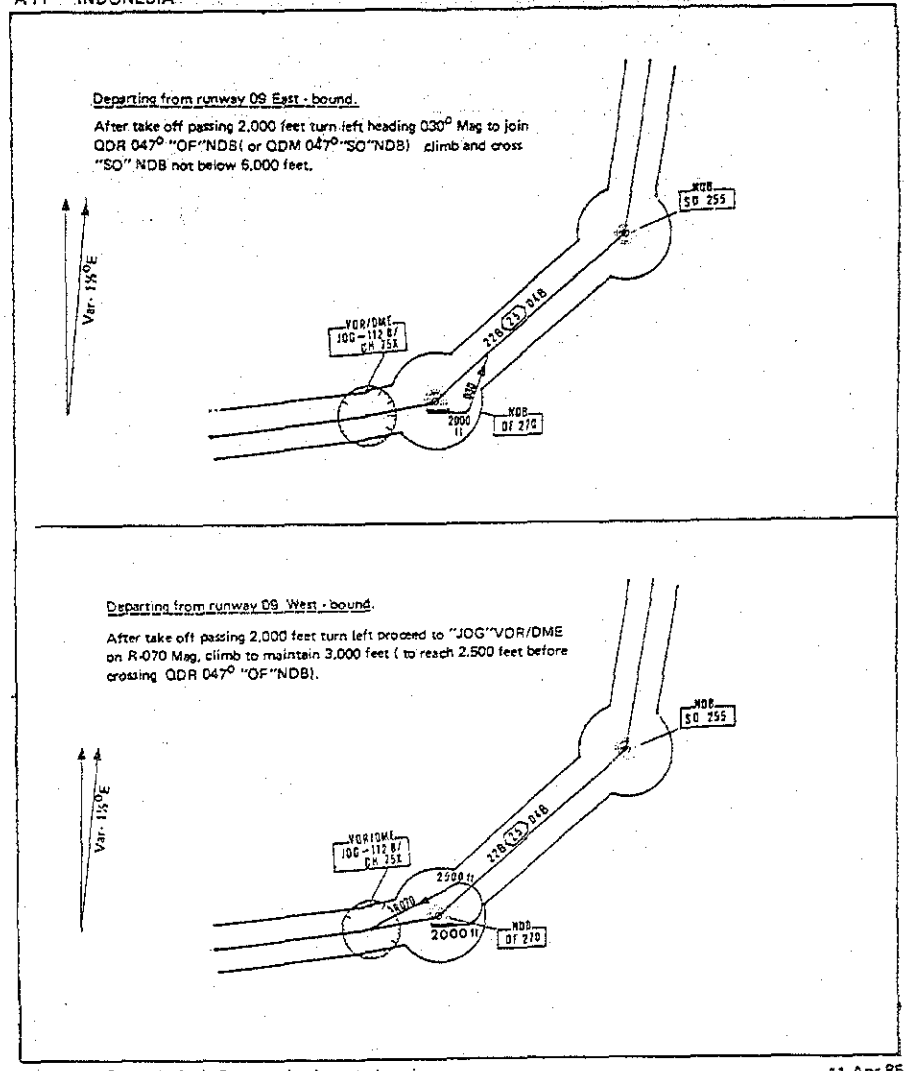

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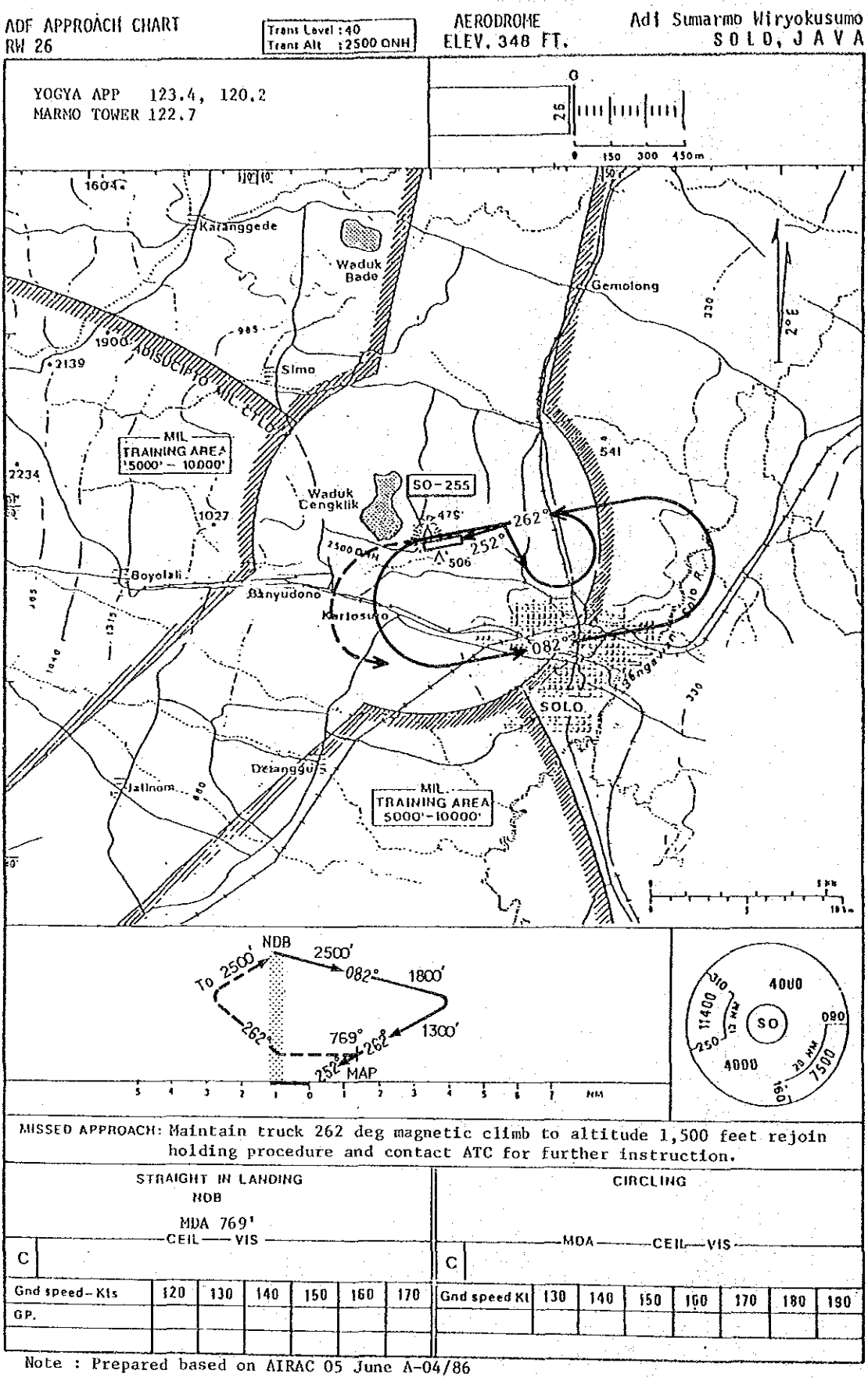
Note : Revision due to AIRAC 05 June A-04/86 is included.

Fig. 5.4.6 Instrument Departure Routes - Yogyakarta Airport



Note : Prepared based on AIRAC 05 June A-04/86

Fig. 5.4.7 ADF Approach Runway 26 - Surakarta Airport

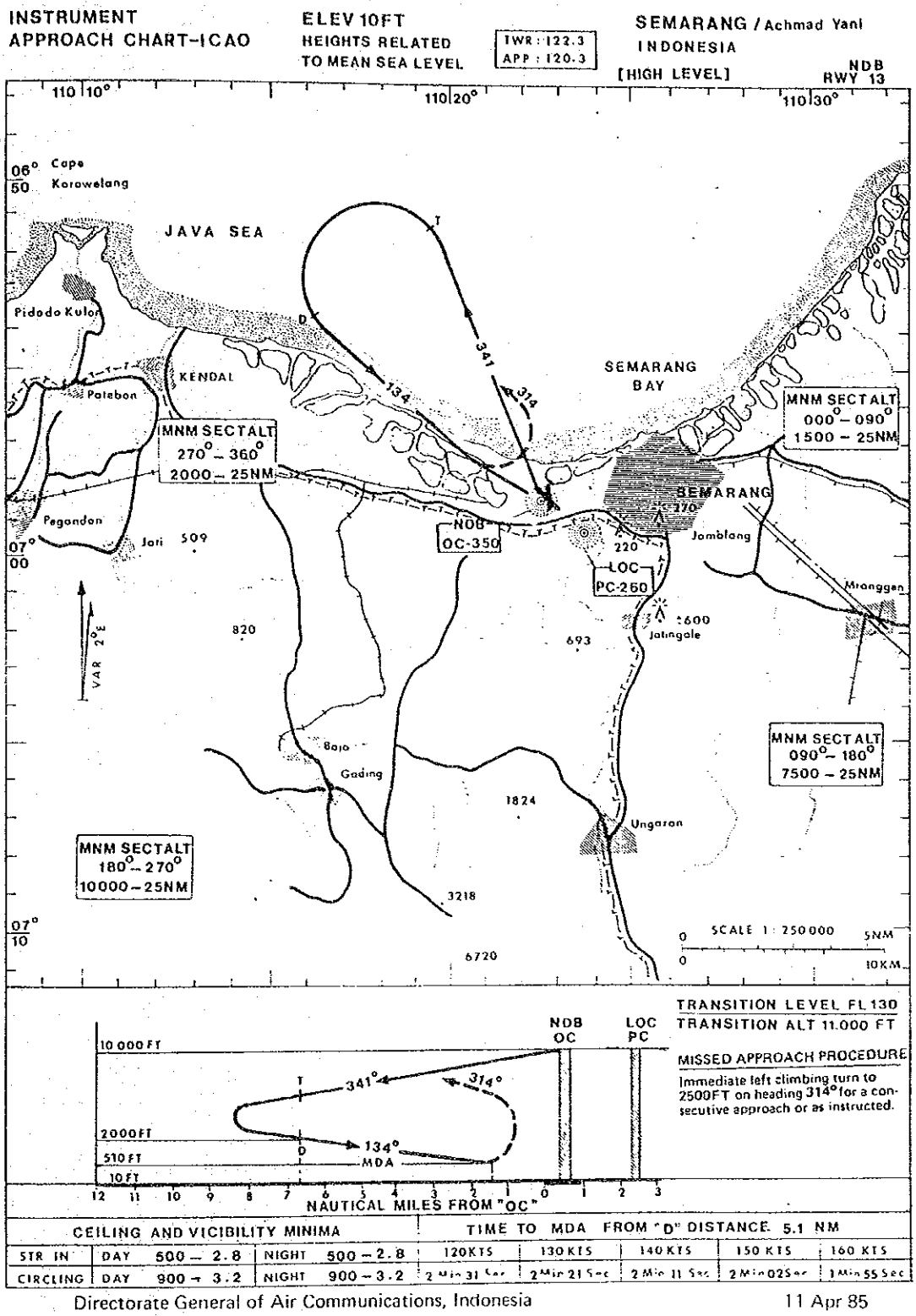


Fig. 5.4.8 ADF Approach Runway 13 (High Level)
- Semarang Airport

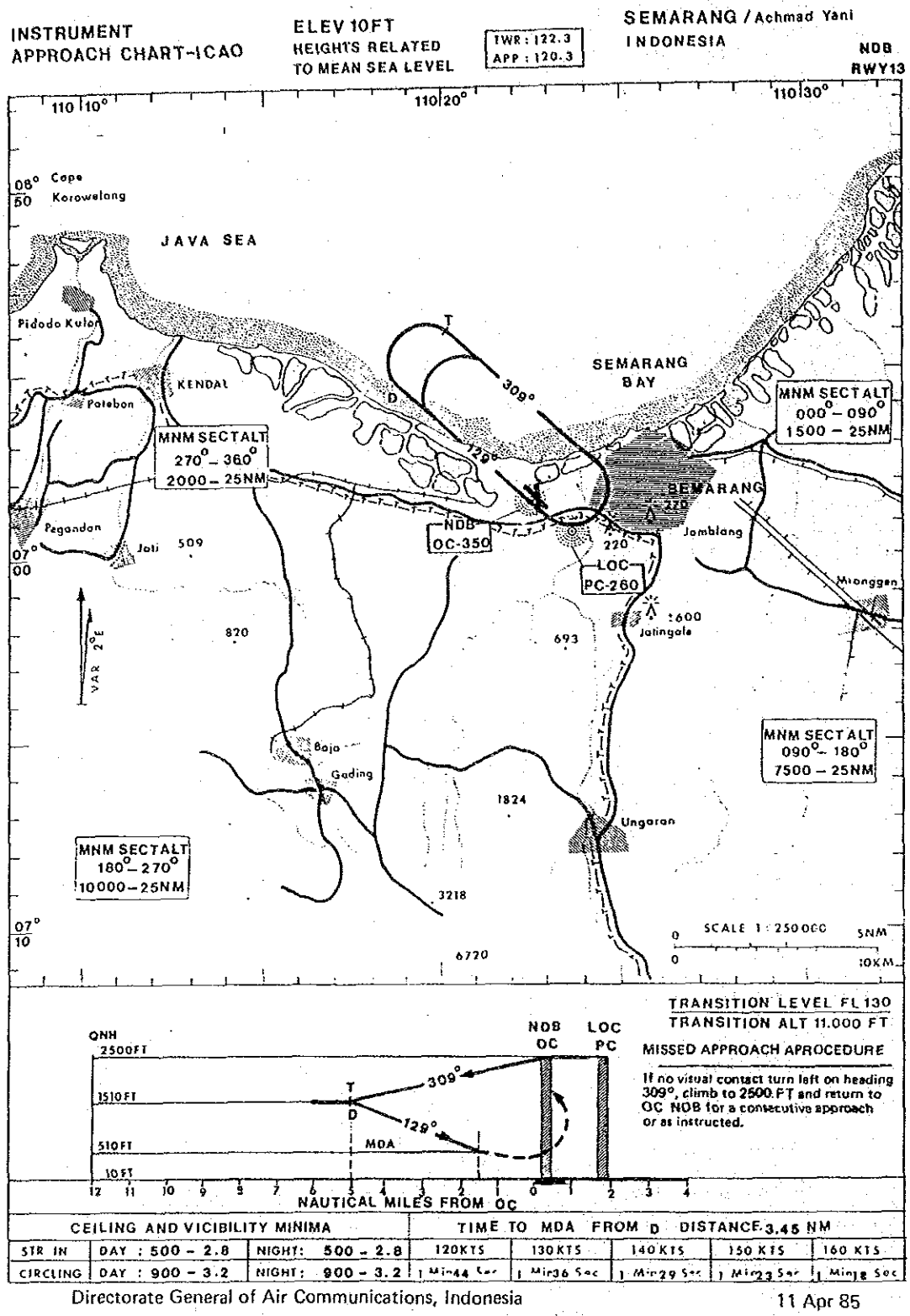
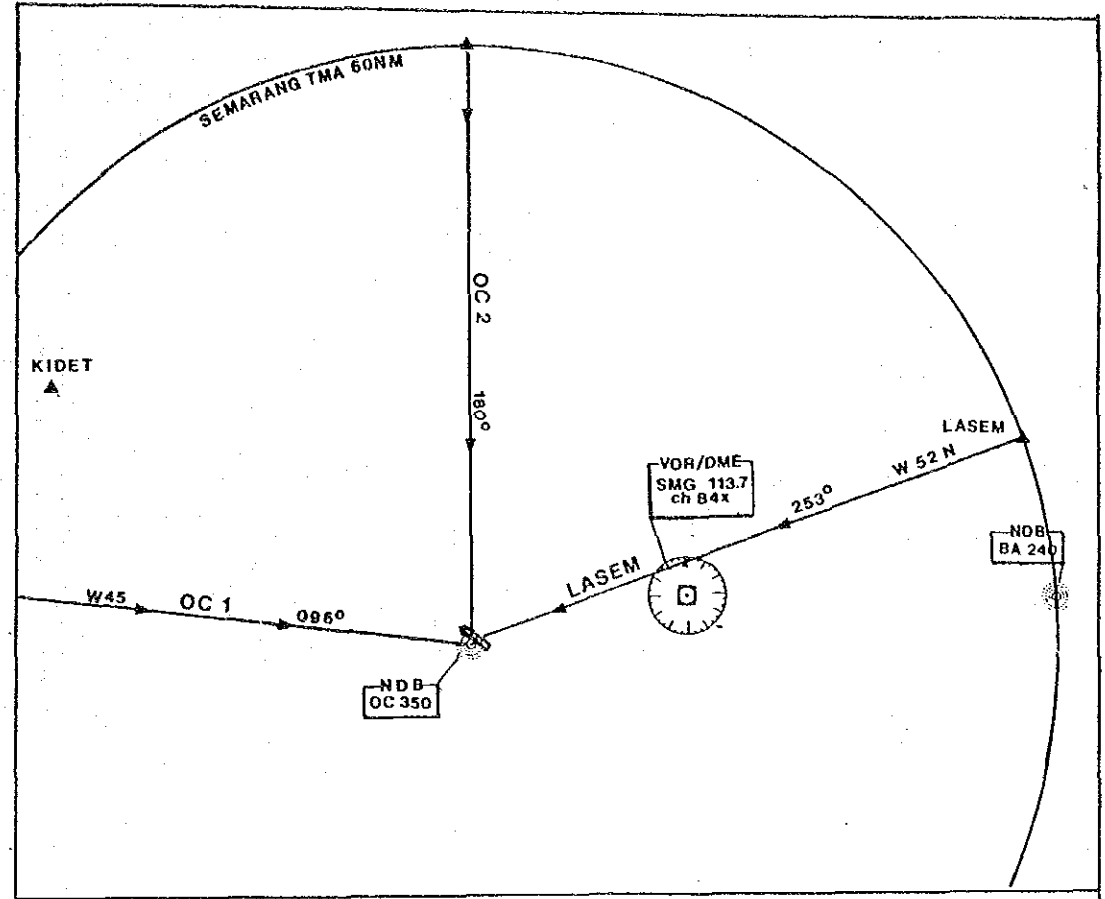


Fig. 5.4.9 ADF Approach Runway 13 - Semarang Airport



STANDARD INSTRUMENT ARRIVAL

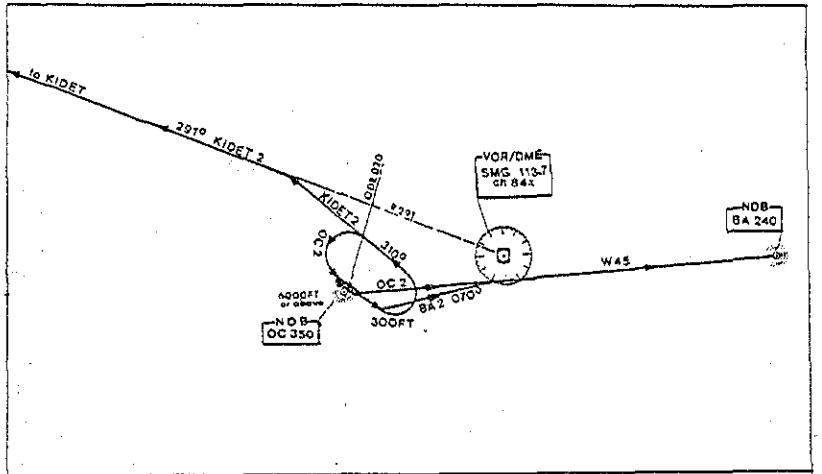
A. YANI – SEMARANG.

OSCAR CHARLIE ONE ARRIVAL : Aircraft inbound on W–45 shall proceed direct to "OC" on QDM – 096° for instrument approach.

OSCAR CHARLIE TWO ARRIVAL : Aircraft inbound from the north at TMA shall proceed to "OC" on QDM – 180°, for instrument approach.

L A S E M ARRIVAL : Aircraft inbound on W–16 or W–52N shall proceed to "OC" on QDM – 253 for instrument approach.

Fig. 5.4.10 Standard Instrument Arrival at Semarang Airport



STANDARD INSTRUMENT DEPARTURES (SID)

ACHMAD YANI AIRPORT

KIDET TWO DEPARTURE :

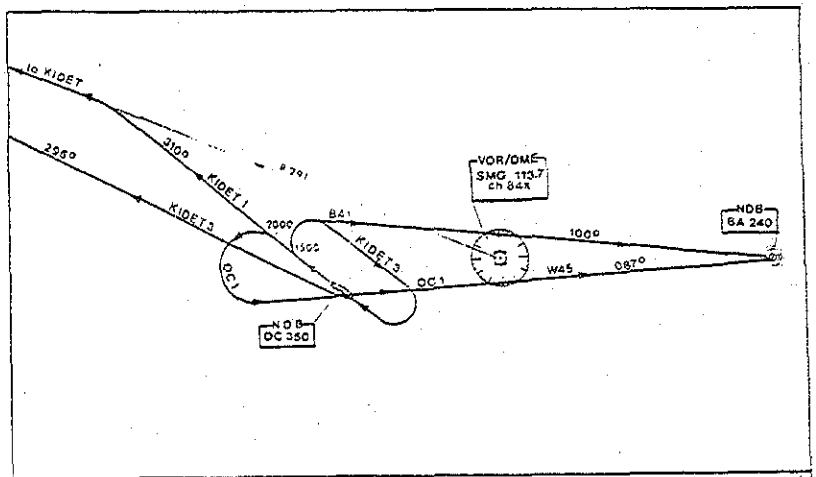
Take-off Runway 13 at 300FT turn left heading 310° to intercept Radial 291 SMG proceed to KIDET to join W16.

BRAVO ALPHA TWO DEPARTURE :

Take-off Runway 13 at 300FT turn left heading 070° to join W45.

OSCAR CHARLIE TWO DEPARTURE :

Take-off Runway 13 at 300FT turn left heading 310° until intercept QDR 357 OC NDB turn left to cross OC NDB at or above 6000FT to join W45.



STANDARD INSTRUMENT DEPARTURES (SID)

ACHMAD YANI AIRPORT

KIDET ONE DEPARTURE :

Take-off Runway 31 maintain runway heading until intercepting R–291 SMG proceed to KIDET join W16.

KIDET THREE DEPARTURE :

Take-off Runway 31 at 1500FT turn right back to cross OC at or above 6000FT proceed to KIDET on QDR 296 OC.

BRAVO ALPHA ONE DEPARTURE :

Take-off Runway 31 at 1500FT turn right direct to BA to join W45.

OSCAR CHARLIE ONE DEPARTURE :

Take-off Runway 31 maintain runway heading at 2000FT turn left direct to OC depart OC at or above 6000FT join W45.

Fig. 5.4.11 Standard Instrument Departure - Semarang Airport

5.4.3 Corridors in the Training Areas

For the safety of air traffic operations to and from Yogyakarta and Surakarta airports, corridors with a 5 NM width are established between compulsory reporting points of Jabil and Purwo via "YOG" VOR/DME, "OF" NDB and "SO" NDB in the training areas of WRR 6 and WIR 8.

Lower and upper limits are 2,500 feet and FL 300, respectively.

(1) Relationship between Training Areas and IFR Operations

Fig. 5.4.12 through 5.4.14 show the relationship between training areas and IFR operations for civil aviation aircraft. As can be seen in these figures, protected areas necessary for procedures for IFR operations in the corridor such as holding, instrument approach, standard instrument departure, etc., overlap partly with the training areas.

Although various measures are being applied by military authorities for prevention of near collisions as described in following sub-section (2), the possibility of occurrence of a near collision is considered to increase in proportion to the increase of civil flights in future due to circumstances in and around Yogyakarta and Surakarta airports.

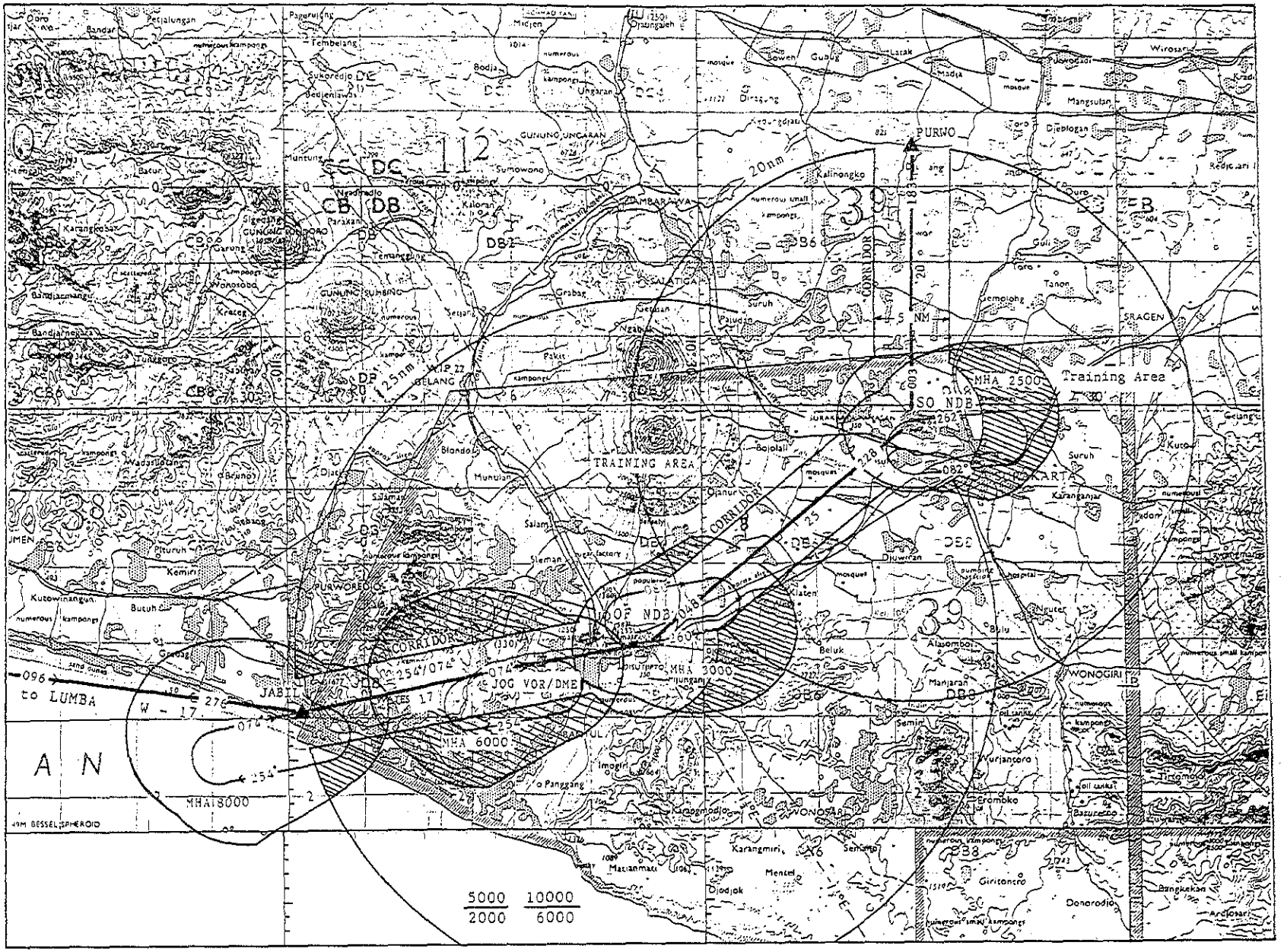


Fig. 5.4.12 Relation between Training Areas and the Protected Area of Holding Pattern over JABIL, "YOG" VOR/DME, "OF" and "SO" NDBs

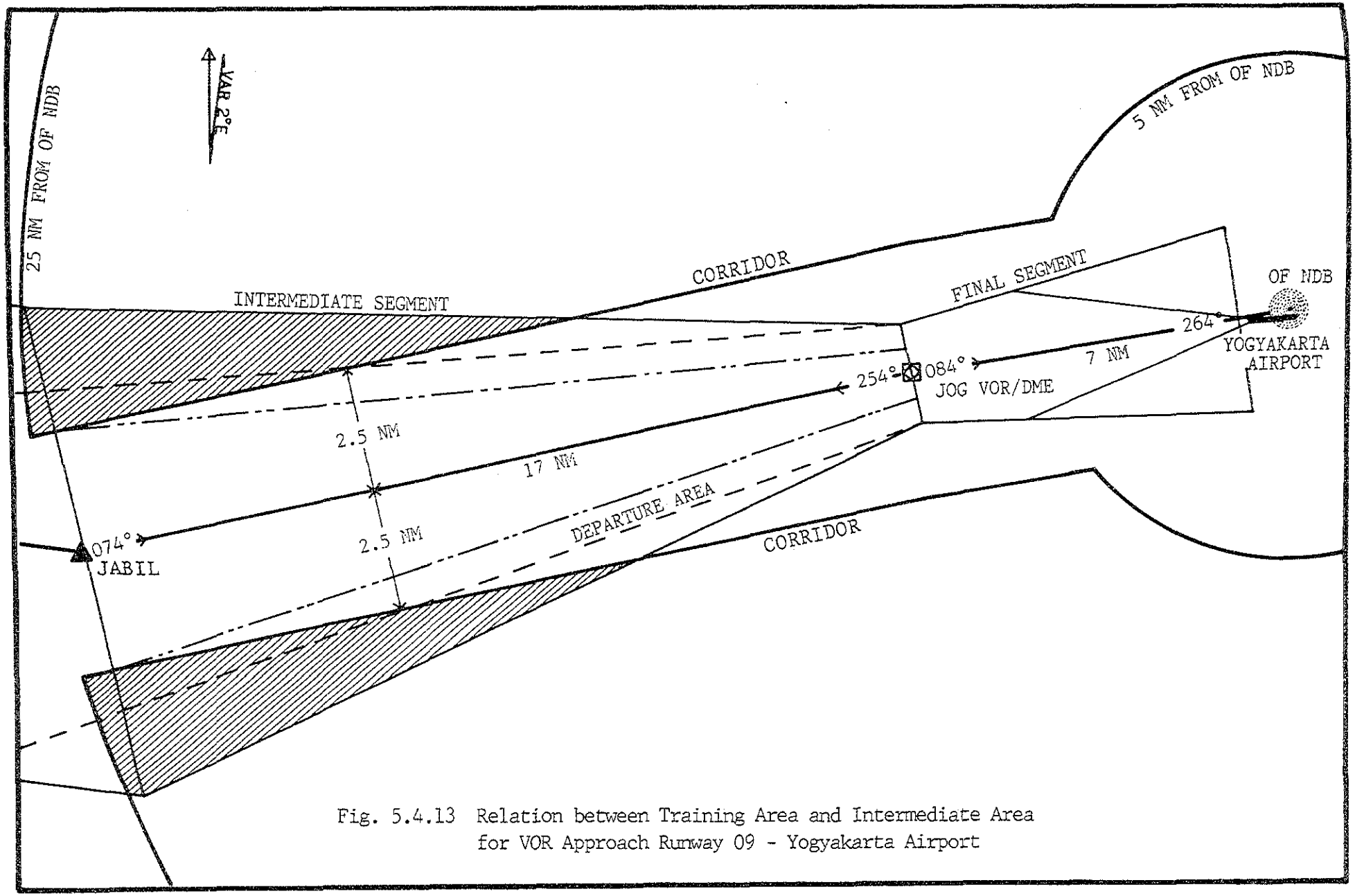


Fig. 5.4.13 Relation between Training Area and Intermediate Area for VOR Approach Runway 09 - Yogyakarta Airport

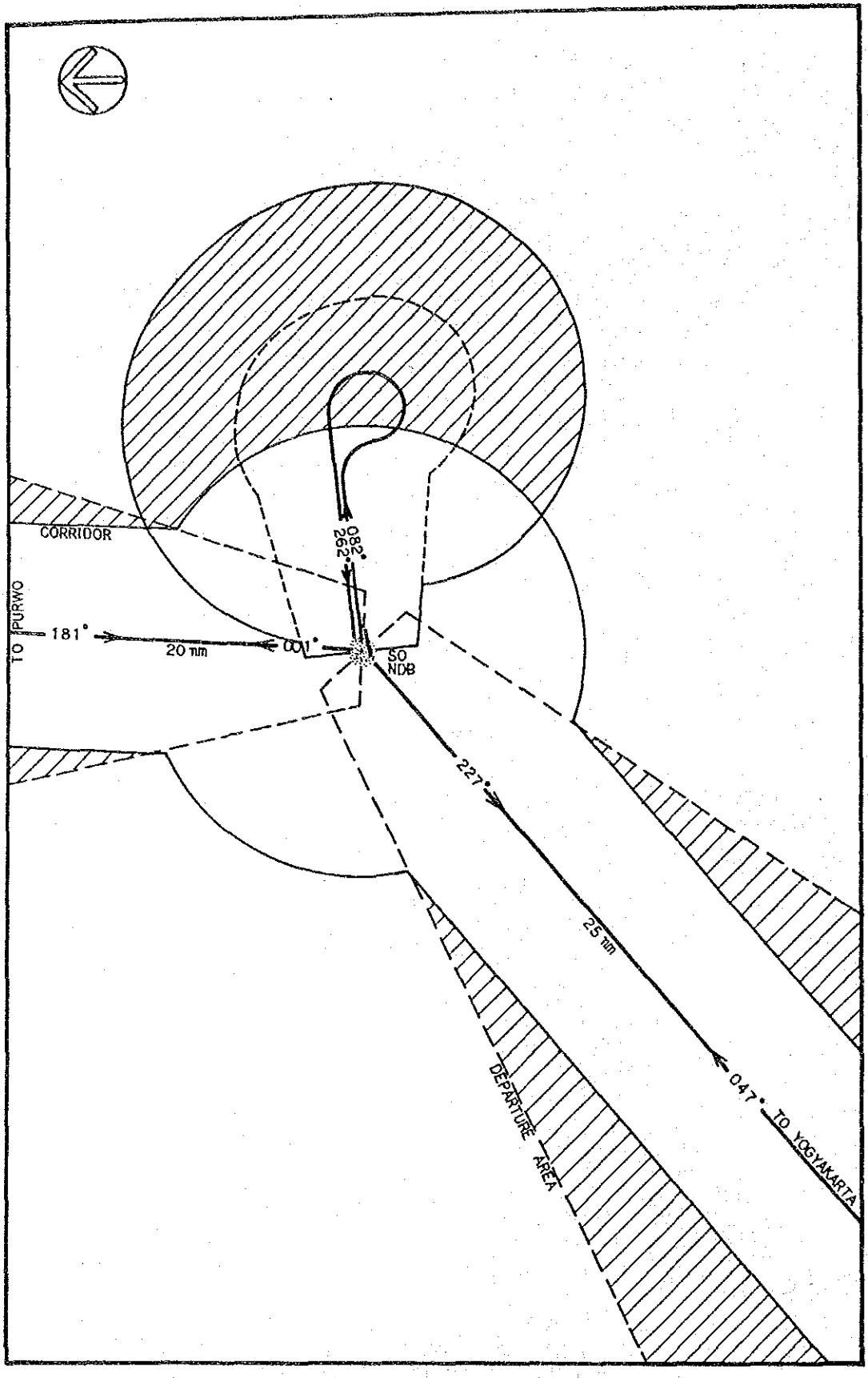


Fig. 5.4.14 Relation between Training Area and Protected Area for ADF Approach Runway 26 - Surakarta Airport

(2) Measures for Prevention against Near Collision

At present, military training with approximately 80 movements per day are conducted in the Adisucipto and Adisumarmo Training Areas. Primary and basic practices in Adisumarmo Training Area, and first solo flight, basic and advanced practices in Adisucipto Training Area are conducted under visual meteorological conditions.

Taking into consideration the existing special conditions of mixed operations by scheduled flights and military training aircraft, local traffic procedures for each airport and other various measures are presently applied for prevention against near collisions by military authorities. Some measures are stated as follows:

a) Restriction to be applied on VFR flights

No aircraft shall be operated under VFR within Yogyakarta - Solo corridor unless prior authorization has been obtained from Yogya Approach Control Office (APP).

b) Responsibility of Yogya APP, Adi TWR and Marmo TWR

Yogya Approach Control Office is responsible:

- For the provision of Air Traffic Control Service, Flight Information Service and Alerting Service to all controlled flights operating within Yogyakarta Military Controlled Airspace (MCA) and Yogyakarta - Solo Corridor.

- For the provision of Flight Information Service and Alerting Service only to training flight within Adisucipto Training Area (WIR-8).

Adisucipto Aerodrome Control Tower is responsible:

- For the provision of Aerodrome Control Service to all aerodrome traffic operating within Adisucipto Aerodrome Traffic Zone (ATZ).

Adisumarmo Aerodrome Control Tower is responsible:

- For the provision of Aerodrome Control Service to all aerodrome traffic operating within Adisumarmo Aerodrome Traffic Zone (ATZ).

- For the provision of Flight Information Service to all training flights within Adisumarmo Training Area (WRR-6) and within corridor Adisumarmo ATZ north boundary to Purwo at attitude 5,000 feet or below.

5.4.4 Recommendation to the Airspace Utilization

To exclude the possibility of a near collision, it is considered that the following actions should be taken with close coordination and understanding of military authorities responsible for training activities that may affect civil flights.

a) Terminal Radar Control System (PSR/SSR) which has the capability to cover the Yogyakarta MCA as wide as possible should be established to conduct radar control service for IFR operations and radar assistance service for training aircraft from low altitudes in the Yogyakarta area.

b) To improve the efficiency of radar control service and radar assistance service especially during the poor weather conditions, SSR transponder, an airborne device, should be equipped with aircraft which operate in Yogya MCA especially in and around Yogyakarta and Surakarta airports.

c) The width of the said corridor should be revised in compliance with the ANNEX 11, Air Traffic Services, ICAO.

d) Navigational aids should be installed at or in the vicinity of compulsory reporting point "Lumba" for safe aircraft operations.

CHAPTER 6 ALTERNATIVE CONCEPTS FOR AIRPORTS DEVELOPMENT

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6.1 General

In this chapter, alternative concepts for airports development in Central Java and D.I. Yogyakarta are considered focusing on the major airports in this region, i.e., Yogyakarta, Surakarta and Semarang airports.

An airport development concept for these three airports will be selected from the alternatives considered here after extensive studies including expandability of the existing airports, appropriate location of airports corresponding to the demand distribution, compatibility with the regional plan, and land use, etc.

6.2 Alternative Concepts for Airports Development

a) Airport Development in Semarang

As regard airport development, it is considered necessary to develop Semarang airport as a trunk-line airport. Therefore, construction work will be implemented after a review of the detailed design which has already been completed, based on the updated air traffic demand.

b) Airport(s) Development in Yogyakarta and Surakarta

Seven alternatives are listed as mathematical combinations of the airport(s) development for Yogyakarta and Surakarta.

They can be divided into 2 groups, i.e., alternatives with 2 airports (Concepts A, B, C and D) and alternatives with one airport (Concepts E, F and G) as shown in Table 6.2.1.

Table 6.2.1 Alternative Concepts of the Airports Development

Airport Development / Concepts	Yogyakarta		Surakarta		Semarang
	Redevelop-ment	New Airport	New Airport	Redevelop-ment	
Concept - A	X			X	X
Concept - B	X		X		X
Concept - C		X		X	X
Concept - D		X	X		X
Concept - E	X				X
Concept - F		X			X
Concept - G				X	X

Note: "X" indicates development policy of each alternative.