

CHAPTER 11 COMPARATIVE EVALUATION OF THE ALTERNATIVE
AIRPORTS DEVELOPMENT CONCEPTS

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11.1 General

This chapter sets forth the comparative evaluation of the alternative airports development concepts which have been selected in Chapter 9 and studied in detail in Chapter 10, and recommends the most suitable and viable airports development concept in this Study area.

It is recommended that a succeeding Feasibility Study and/or future studies should be implemented based on the results of this evaluation.

Alternative concepts selected in Chapter 9 are summarized below:

Concept-A:

This concept consists of two airports development in the southern part of this Study area, viz., ALT. Y4 for Yogyakarta and ALT. S1 for Surakarta, and Semarang airport development in the northern part.

Concept-C:

This concept also consists of two airports in the southern part, viz., new airport ALT. W1 as a replacement of the existing Yogyakarta airport and ALT. S1 for Surakarta, and Semarang airport development in the northern part.

Concept-F:

In this concept, there is one airport, ALT. K1 combining both the existing Yogyakarta and Surakarta airports in the southern part and Semarang airport in the northern part.

Each concept has the same development scheme, the development of Semarang airport. This is mainly due to the following reasons.

Semarang is the capital city of the Central Java province with a population of approximately 1.1 million and functions as the center of economic activities in the northern part of Central Java.

Under these circumstances, Semarang airport plays an important role as a trunk line airport at present and is expected to maintain its role in future since the air traffic demand will exceed 1.6 million passengers by the year 2010. The passenger traffic survey executed by the Study Team concludes that the passengers utilizing Semarang airport mainly come from Semarang city and surrounding areas.

It is, therefore, recommended that the development of Semarang airport be implemented independently irrespective of the airport(s) development in the southern part of this Study area, after reviewing of the said Detail Design based on the updated air traffic demand.

Thus, the comparative evaluation among Concepts A, C and F is substantially that for the airport development concepts in the southern part, viz., Yogyakarta and Surakarta airports.

11.2 Comparative Evaluation of the Concepts

The results of overall comparison of the previously mentioned three concepts is summarized in Table 11.2.1.

From these results, it was concluded that Concept-A, which comprises the redevelopment of the existing Yogyakarta and Surakarta airports, is the most suitable and feasible for the airports development concept in this Study area for the following reasons.

- a) Airspaces above the existing Yogyakarta airport with a radius of 25 NM and above the existing Surakarta airport with a radius of 20 NM are established as restricted areas for the purpose of training of military aircraft.

Due to these restricted areas, civil flights are obliged to pass through the corridors which are established with a 5 NM width by connecting navigational aids and/or compulsory reporting points, for safe air traffic operations to and from Yogyakarta and Surakarta airports.

In Concept-A, airspace utilizations are basically the same as present, because schemes Y4 and S1 are redevelopments of the existing airports.

On the contrary, it is required to adjust the aforementioned airspace in case of Concepts C and F. This adjustment is considered very difficult because of the proximity of the two existing airports and one additional airport, i.e., W1 in Wonosari or K1 in Klaten.

- b) Concept-F has a great disadvantage in terms of accessibility from/to major cities comparing the total access distance in each Concept, as follows:

| | | |
|------------|------------------|-------|
| Concept-A: | Yogyakarta to Y4 | 11 km |
| | Surakarta to S1 | 16 km |
| | | <hr/> |
| | | 27 km |
| Concept-C: | Yogyakarta to W1 | 30 km |
| | Surakarta to S1 | 16 km |
| | | <hr/> |
| | | 46 km |
| Concept-F: | Yogyakarta to K1 | 47 km |
| | Surakarta to K1 | 29 km |
| | | <hr/> |
| | | 76 km |

Moreover, it is desirable to widen and improve the existing road (Solo road) connecting Yogyakarta and Surakarta cities for it to function as the access road in case of Concept-F, although the cost for it was not included in the cost estimates shown in Table 11.2.1. This road has only 6 m width and is congested at present.

- c) Aircraft noise estimated in Concept-F, i.e., K1 will adversely affect the residential area compared with the other concepts.

As described in Chapter 10, the residential area influenced by aircraft noise with the scale of WECPNL of more than 70 is approximately 430 ha in the year 2010 in the scheme for K1, which is about 1.5 times larger than the other concepts.

This is mainly because large aircraft like B-747s shall be introduced to handle the total air traffic demand of both Yogyakarta and Surakarta airports using one airport.

- d) The construction costs of Concepts A, C and F are to be, respectively Rupiah 165.3 billion, Rupiah 166.0 billion and Rupiah 117.8 billion. Judging from these costs and lowest EIRR (15.0 %) of Concept-C, Concept-C is not considered adequate for the airports development concept in the Study area.

The construction cost of Concept-F is about Rupiah 47.5 billion cheaper than that of Concept-A. However, the results of economic analysis reveal that there are no big differences in EIRR and NPV between the two. The new airport K1 in Concept-F is located far from both existing Yogyakarta and Surakarta airports. This incurs additional time and travelling cost. They were, therefore, evaluated and added as additional disadvantages of Concept-F.

Concepts A and F are, accordingly, considered almost the same in terms of the economic impact to the nation.

- e) Although, in Concept-A Y4 has an aircraft operational problem caused by two runways crossing each other at the extended runway center line, it can be alleviated by establishing the consolidated aerodrome control.

- f) The tourism resort in the southern part of this Study area is divided by Mts. Merapi and Merbabu into 2 zones, viz., the easterly zone of the said mountains with Surakarta as the center and the southerly and southwesterly zone with Yogyakarta as the center.

Yogyakarta and Surakarta have prospered and developed independently with respective cultures and traditions being twin cities since ancient times.

By implementing Concept-A, easier and cheaper air transportation will be provided to tourists who intend to visit each tourist resort.

Table 11.2.1 Comparison Table of Alternative Concepts

| Alternative Concepts | Concept-A | | Concept-C | | Concept-F |
|---|--|--|---|------------------------------|-------------------|
| | Yogyakarta Airport (Y4) | Surakarta Airport (S1) | New Yogyakarta Airport (W1) (Monosari) | New Airport (K1) (Klaten) | |
| Comparison Items | | | | | |
| I. Aerodrome Data | | | | | |
| 1. Airport Elevation | 103 m | 119 m | 200 m | 112 m | |
| 2. Airport Reference Temperature | 33° | 35° | -- | -- | |
| 3. Aerodrome Reference Code | 4D | 4D | 4D | 4E | |
| 4. Runway Designation Number | Runway 04/22 | Runway 08/26 | Runway 11/29 | Runway 12/30 | |
| 5. Type of Runway Operation | Precision Approach CAT-I | Precision Approach CAT-I | Precision Approach CAT-I | Precision Approach CAT-I | |
| 6. Runway Dimensions | 2,500m x 45m | 2,150m x 45m | 2,500m x 45m | 2,500m x 45m | |
| 7. Airport Property Area | | | | | |
| II. Aircraft Operational Considerations | | | | | |
| 1. Obstacle Limitation Surfaces | | | | | |
| a. Approach Surface | - Trees to be felled | - Trees to be felled | - No obstructions | - No obstructions | - No obstructions |
| b. Transitional Surface | - No obstructions | - Control tower, AEN; NDB antenna, microwave located or demolished | - No obstructions | - No obstructions | - No obstructions |
| c. Inner Horizontal Surface | - No obstructions | - No obstructions | - No obstructions | - No obstructions | - No obstructions |
| 2. Flight Procedures | - No restrictions | - No restrictions | - No restrictions | - No restrictions | - No restrictions |
| 3. Air Traffic Control | x - Consolidated aerodrome control to be necessary for simultaneous operation on two runways | | | | |
| 4. Air Space Utilization | - Some adjustment of training area for the air force to be necessary | - Same as left | x - Same as left x - Difficult to adjust the training area | x - Same as left x x | |

Table 11.2.1 (Cont'd)

| Alternative Concepts Comparison Items | Concept-A | | Concept-C | | Concept-F | |
|---|---|---|--|---|---|---|
| | Yogyakarta Airport (Y4) | Surakarta Airport (S1) | New Yogyakarta Airport (W1) (Morosari) | New Yogyakarta Airport (W1) (Morosari) | New Airport (K1) (Klaten) | New Airport (K1) (Klaten) |
| 5. Wind Coverage | - 98.6% (13kt cross wind) 99.8% (20kt cross wind) | - 98.4% (13kt) 99.7% (20kt) | - 97.5% (13kt) 99.8% (20kt) (Based on the wind data at Yogyakarta Airport) | - 98.4% (13kt) 99.7% (20kt) (Based on the wind data at Surakarta Airport) | - 98.4% (13kt) 99.7% (20kt) (Based on the wind data at Surakarta Airport) | - 98.4% (13kt) 99.7% (20kt) (Based on the wind data at Surakarta Airport) |
| Main Disadvantages | x - Aerodrome control should be consolidated - Adjustment of training area to be necessary | - Same as left | x x x - Adjustment of training area is difficult | x x x - Same as left | x x x - Same as left | x x x - Same as left |
| III. Airport Development Considerations | | | | | | |
| 1. Distance from Yogyakarta or Surakarta City | - 8km from Yogyakarta (15 min.) | - 14km from Surakarta (20 min.) | x - 30km from Yogyakarta (40 min.) | x - 47km from Yogyakarta (60 min.) - 29km from Surakarta (35 min.) | x - 47km from Yogyakarta (60 min.) - 29km from Surakarta (35 min.) | x - 47km from Yogyakarta (60 min.) - 29km from Surakarta (35 min.) |
| 2. Future Expansibility | - No problems | x - Relocation of many houses to be required for the further extension of runway | - No problems | - No problems | - No problems | - No problems |
| 3. Access Road | - New access road: 3.5km | - New access road : 1.5 Km | - Improvement of existing road: 10km | - Improvement of existing road: 5km | - Improvement of existing road: 5km | - Improvement of existing road: 5km |
| 4. Land Acquisition | - Residential area 28 ha. Agricultural area 115 ha. | - Residential area 10 ha. Agricultural area 7 ha. | - New access road: 1km - Agricultural area 130 ha. | - New access road: 0.3km - Agricultural area 143 ha. | - New access road: 0.3km - Agricultural area 143 ha. | - New access road: 0.3km - Agricultural area 143 ha. |
| 5. Others | | - Close coordination between DGAC and Air Force to be necessary for Airport Development | | | | |
| Main Disadvantages | x | x | x x - longer access distance from Yogyakarta city | x x - Same as left - Additional expense is required for improvement of existing road | x x - Same as left - Additional expense is required for improvement of existing road | x x - Same as left - Additional expense is required for improvement of existing road |

Table 11.2.1 (Cont'd)

| Alternative Concepts | Concept-A | | Concept-C | | Concept-F |
|---|---|---|---|---|---|
| | Yogyakarta Airport (Y4) | Surakarta Airport (S1) | New Yogyakarta Airport (W1) (Wonosari) | | New Airport (K1) (Klaten) |
| Comparison Items | | | | | |
| IV. Social Considerations | | | | | |
| 1. Residential Area Influenced by Aircraft Noise (More than WECNL 70) | - 140 ha. | - 150 ha. | - 100 ha. | x | - 430 ha. |
| 2. Land Use | - Consist of rice field, crop field and residential area No future plan in REPELITA IV | - Consist of rice field and residential area No future plan in REPELITA IV | - Consist of crop field and air strip now rarely used by Air Force Simple irrigation plan in REPELITA IV | | - Consist mainly of crop field No future plan in REPELITA IV |
| 3. Compensations | - Relocation of many houses (280 nos.) | - Relocation of many houses (100 nos.) | - 4 houses to be relocated | | - No houses to be relocated |
| Main Disadvantages | | | | | x - Influence of aircraft noise pollution is the largest |
| V. Construction Considerations | | | | | |
| 1. Topographical and Geological Conditions | - Diversion of Tepus river (3m depth, 2km length) to be required | | x - The soil is composed of hard limestone | | |
| 2. Earth Work Volume | - 0.7 million cu.m | - 0.2 million cu.m | - 1.2 million cu.m | | - 1.0 million cu.m |

Table 11.2.1 (Cont'd)

| Alternative Concepts | Concept-A | | Concept-C | | Concept-F |
|---|--|------------------------|---|------------------------------|--------------------|
| | Yogyakarta Airport (Y4) | Surakarta Airport (S1) | New Yogyakarta Airport (W1) (Wonosari) | New Airport (K1) (Klaten) | |
| 3. Construction Cost (Preliminary Estimate) (Unit: Million Rp.) | (YOG) | (SOC) | (NEW YOG) | (Total) | |
| (1) Land Acquisition and Compensation Cost | 13,874 | 1,849 | 9,229 | 11,078 | 8,059 |
| (2) Civil Works | 27,405 | 12,480 | 32,762 | 45,242 | 29,371 |
| (3) Building Works | 16,893 | 7,710 | 16,893 | 24,603 | 22,806 |
| (4) Navaid Works | 34,792 | 19,504 | 34,792 | 54,296 | 34,792 |
| (5) Utilities Works | 4,454 | 4,368 | 4,454 | 8,822 | 6,657 |
| (6) Special Service Facilities Works | 5,415 | 1,492 | 5,415 | 6,907 | 5,963 |
| Total of Construction Works | 102,833 | 47,403 | 103,545 | 150,948 | 107,048 |
| Contingency (10%) | 10,283 | 4,740 | 10,355 | 15,095 | 10,705 |
| Grand Total | 113,116 | 52,143 | 113,900 | 166,043 | 117,753 |
| Main Disadvantages | - Construction cost is the highest. | | | | |
| V. Economic Considerations | | | | | |
| 1. Economic Internal Rate of Return (EIRR) | 15.5% | | 15.0% | | 16.2% |
| 2. Net Present Value (NPV) at discount rate 12% | 39,735 million Rp. | | 32,387 million Rp. | | 35,863 million Rp. |
| Main Disadvantages | - Poorest contribution to the national economy | | | | |

CONCLUSIONS AND RECOMMENDATIONS

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Based on this extensive and comprehensive study, a long-term airports development plan in Central Java and D.I. Yogyakarta is recommended to be implemented in accordance with the following development policy.

(1) Development Policy for the Major Airport

The existing Yogyakarta airport, considered to reach its capacity around the year 1994, has great defects in terms not only of size and the system of the facilities but also for providing the safest possible aircraft operations. Due to the problems, it cannot be considered practical and recommendable to redevelop the existing airport as a large-size commercial airport from the long-term viewpoint. The existing Yogyakarta airport should, therefore, transfer its civil aviation functions to a new airport which is planned to be located 2 km east of the existing airport so that the new airport can commence operations in 1995.

It is judged the existing Surakarta airport will be saturated due to increasing passengers in 1993 at latest. Since the existing airport has no significant defects as regards redevelopment unlike Yogyakarta airport, redevelopment works composed mainly of runway extension and replacement of the terminal area should be implemented prior to reaching this saturation.

With respect to Semarang airport, in order to maintain its important role as the gateway to Semarang city which is the capital and the center of economic activities in the Central Java province, redevelopment of the existing airport at earliest possible time should be implemented in accordance with the previous master plan and detailed design after necessary review based on the updated traffic demand.

(2) Development Policy for the Airstrips

Although the introduction of the F-27/HS748 class propeller aircraft into Cilacap airport is expected after the year 2000, the extension of existing runway is considered economically impractical due to geographical constraints.

It is, therefore, recommended to carry out a detailed study including the site selection for a new airport at an appropriate stage.

As for the new local airstrip development, there seems a possibility of establishing new airstrips in both Tegal and Pati in the northern part of the Central Java province. Thus, a further study should be prepared at an appropriate stage after thoroughly ascertaining its necessity.

(3) Rearrangement Policy for Airspace Utilization

In order to ensure the safe aircraft operations over Yogyakarta and Surakarta airports, it is recommended that the following measures be taken with close coordination and understanding of military authorities by establishing a committee to handle any problems occurring.

- Establishment of Terminal Radar Approach Control System (PSR/SSR) to cover the Yogyakarta MCA.
- Enforcement of the provision of SSR transponder with aircraft operated in Yogyakarta MCA
- Widening the corridors in compliance with the stipulation of ICAO
- Installation of navigational aids at or in the vicinity of the compulsory reporting point "Lumba".

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