THE FEASIBILITY OF OPERATIONAL AND COMMERCIAL ASPECTS OF B737-500 AIRCRAFT FOR JAKARTA-BANYUWANGI-JAKARTA ROUTE OPERATED BY PT. NAM AIR

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ABSTRACT

Banyuwangi region in East Java Indonesia has developed to be a world-class tourist destination. It has developed tourism supporting sectors such as infrastructure, investment and manufacturing. This is an opportunity NAM Air can take advantage to bridge inter-regional relations by providing air connectivity, namely air transportation services, opening the Jakarta-Banyuwangi-Jakarta route using B737-500 aircraft. The purpose of this study is to determine the feasibility of operational and commercial aspects of the Jakarta-Banyuwangi-Jakarta route. The analysis in this study uses a qualitative descriptive method, while the data collection methods are observation, library data, and interviews. The results of this study indicate that there is a need to develop Banyuwangi airport infrastructure, increase B737-500 aircraft utilization and increase the market capacity so that the flight routes continue to exist sustainably supporting the government programs, while still achieving the company’s goal.

Keywords: Infrastructure development, market capacity and aircraft utilization.

1.0 INTRODUCTION

People use transportation from the place of origin to the destination to do their activities, e.g. in education, business, vacation, religious activity or other activities. Thus, they may start selecting and identifying the effectiveness and efficiency of transportation modes to be used to arrive at a certain destination. One of them is aircraft.

Indonesia is a very wide archipelago country with geographically spreading locations of its islands, making the inter-island distances far enough. Thus, transportation mode using aircraft is still the prima donna in the demand for long distance inter-island, domestic, as well as international transportation. This is in line with the economic growth of Indonesia’s regions which influences the traffic of people travelling using air transportation mode, with no exception of Banyuwangi region.

The Ministry of Tourism of the Republic of Indonesia has developed 10 priority destinations of tourism as “New Balis” and has determined three main programs in 2017, namely
digitalization, homestay, and connectivity. These programs are to support the new branding of 10 main tourism destinations as sub-brands to align with the master brand of Wonderful Indonesia; one of them is the sub-brand of “The Majestic Banyuwangi”.

NAM Air is a subsidiary of Sriwijaya Air group takes participation in supporting the air connectivity which encourages tourists to visit Banyuwangi. However, NAM Air also needs to consider its business development and the achievement of company’s objectives by obtaining maximum load factor and big market capacity in order to continuously maintain the existence of that route.

Now, Banyuwangi airport has runway as long as 1,850 meters with the runway characteristics of Pavement Classification Number (PCN) 39 F/C/T and the airport category “C”. Thus, it is clear that the runway of Banyuwangi airport is fairly restricted in its length (runway length) and strength (pavement). In order to support the tourism development in Banyuwangi while achieving the company’s target, the company needs to analyze whether the route is feasible from the operational and commercial points of view if using B737-500 aircraft.

2.0 RESEARCH METHOD

The data collection is carried out by directly visiting the research object in the field. This primary data will be studied to analyze the selected topic and the field research is performed in the forms of observation, documentation study, and interview.

The method of data analysis used in this study is descriptive qualitative where the qualitative research is based on the philosophy of positivism which is used for studying an object in its natural condition (as the opposite of experiment) where the researcher is the key instrument; the data analysis is inductive/qualitative; and the result of qualitative research emphasizes more on the meaning rather than on the generalization.

In this study, the authors use data analysis tools commonly used in the commercial aviation, namely:

1. Payload Allowable Calculation based on Aircraft Structure to calculate:
   a) MZFW (Maximum Zero Fuel Weight)
   b) MTOW (Maximum Take Off Weight)
   c) MLW (Maximum Landing Weight)

2. Aircraft Performance to calculate:
   a) Operational Take-Off Weight based on Runway Strength which is called Pavement Classification Number (PCN).
   b) Operational Take-Off Weight based on Runway Length, including Field Length Limit (FL) and Climb Limit (CL)

3. Route Analysis consisting of payload, average load factor, trip fuel and block fuel.
4. Data analysis technique using descriptive qualitative method.

3.0 RESEARCH FINDINGS AND DISCUSSIONS
A. Analysis of the Influence of Runway Length and Runway Strength on the Take-Off Weight Operation of B737-500 Aircraft for the BWX-CGK Route.
   1. Analysis of the CGK-BWX Route
      a. Take Off Weight (TOW) based on Runway Strength

CGK RWY 07L -25R PCN
114 R/D/W/T

OTOW = 60.781 kg + [(72)/(22)] x (28.122 kg)
OTOW = 60.781 kg + [(3.272)] x (28.122 kg)
OTOW = 60.781 kg + 92.015 kg
OTOW = 152.796 kg

2. Take-Off Weight (TOW) Based on Runway Length

\[
OTOW = MTOW + \left[ \frac{PCN_{act} - ACN_{max}}{(ACN_{max} - ACN_{min})} \right] \times (MTOW \ - \ DOW)
\]

\[
OTOW = 60.781 \text{ kg} + \left[ \frac{(114 \ - \ 42)}{(42 \ - \ 20)} \right] \times (60.781 \text{ kg} \ - \ 32.059\text{kg})
\]
3. Landing Weight (TOW) based on Runway Strength

**BWX RWY 08-26**  
**PCN 39 F/C/X/T**

\[
OTOW = MTOW + \left( \frac{(PCnct-CNmax)}{(ACNmax-CNmin)} \right) \times (MTOW - DOW)  
\]

\[
OTOW = 60.781 \text{ kg} + \left[ \frac{39 - 37}{37 - 17} \right] \times (60.781 \text{ kg} - 32.659 \text{ kg})  
\]

\[
OTOW = 60.781 \text{ kg} + \left[ \frac{2}{20} \right] \times (28.122 \text{ kg})  
\]

\[
OTOW = 60.781 \text{ kg} + [0.1] \times (28.122 \text{ kg})  
\]

\[
OTOW = 60.781 \text{ kg} + 2812.2 \text{ kg}  
\]

\[
OTOW = 63.593 \text{ kg}  
\]

4. Payload calculation for the CGK-BWX Route

\[
\text{Payload} = \{(MLW + Trip Fuel)\} - \{(DOW + B.F)\}  
\]

\[
\text{Payload} = (49.895 \text{ kg} + 3655 \text{ kg}) - (32.926 \text{ kg} + 7389 \text{ kg})  
\]

\[
\text{Payload} = (53.550 \text{ kg}) - (40.315 \text{ kg})  
\]

\[
\text{Payload} = 13.235 \text{ kg}  
\]

If the weight is converted into the number of passengers with the assumption that the standard body weight (SBW) is 90 kg (including 20 kg free baggage), thus:

\[
\frac{\text{Maximum Payload}}{\text{Standard Body Weight}} = \frac{13.235 \text{ kg}}{90 \text{ kg}}  
\]

Number of passengers = 147 persons
The number of passengers who can be accommodated for the CGK-BWX route is as many as 147 persons or \( LF = 100\% \).

B. Market Capacity Analysis of the CGK-BWX Route

<table>
<thead>
<tr>
<th>Year</th>
<th>Month</th>
<th>Flight</th>
<th>C-Class PAX</th>
<th>Y-Class PAX</th>
<th>L/F PAX</th>
<th>SALABLE SEAT</th>
<th>Infant</th>
<th>Baggage</th>
<th>Cargo</th>
</tr>
</thead>
<tbody>
<tr>
<td>2017</td>
<td>JUN</td>
<td>15</td>
<td>58</td>
<td>1.583</td>
<td>92.09%</td>
<td>1.782</td>
<td>61</td>
<td>11.473</td>
<td>54</td>
</tr>
<tr>
<td></td>
<td>JUL</td>
<td>30</td>
<td>119</td>
<td>3.120</td>
<td>90.86%</td>
<td>3.565</td>
<td>51</td>
<td>22.127</td>
<td>1.307</td>
</tr>
<tr>
<td></td>
<td>AUG</td>
<td>38</td>
<td>137</td>
<td>3.520</td>
<td>80.89%</td>
<td>4.521</td>
<td>46</td>
<td>22.226</td>
<td>4.294</td>
</tr>
<tr>
<td></td>
<td>SEP</td>
<td>55</td>
<td>73</td>
<td>4.447</td>
<td>68.93%</td>
<td>6.557</td>
<td>43</td>
<td>28.163</td>
<td>21.180</td>
</tr>
<tr>
<td></td>
<td>OCT</td>
<td>45</td>
<td>77</td>
<td>3.995</td>
<td>76.06%</td>
<td>5.354</td>
<td>37</td>
<td>23.963</td>
<td>23.618</td>
</tr>
<tr>
<td></td>
<td>NOV</td>
<td>55</td>
<td>158</td>
<td>4.949</td>
<td>77.92%</td>
<td>6.554</td>
<td>48</td>
<td>32.993</td>
<td>24.170</td>
</tr>
<tr>
<td></td>
<td>DEC</td>
<td>63</td>
<td>116</td>
<td>5.695</td>
<td>78.73%</td>
<td>7.381</td>
<td>79</td>
<td>34.686</td>
<td>26.953</td>
</tr>
</tbody>
</table>

C. Market Capacity Analysis of the CGK-BWX Route

<table>
<thead>
<tr>
<th>Year</th>
<th>Month</th>
<th>Flight</th>
<th>C-Class PAX</th>
<th>Y-Class PAX</th>
<th>L/F PAX</th>
<th>SALABLE SEAT</th>
<th>Infant</th>
<th>Baggage</th>
<th>Cargo</th>
</tr>
</thead>
<tbody>
<tr>
<td>2018</td>
<td>JAN</td>
<td>53</td>
<td>49</td>
<td>4.511</td>
<td>72.06%</td>
<td>6.328</td>
<td>55</td>
<td>29.718</td>
<td>20.630</td>
</tr>
<tr>
<td></td>
<td>FEB</td>
<td>44</td>
<td>41</td>
<td>3.914</td>
<td>75.03%</td>
<td>5.271</td>
<td>47</td>
<td>21.912</td>
<td>21.221</td>
</tr>
<tr>
<td></td>
<td>MAR</td>
<td>52</td>
<td>52</td>
<td>4.720</td>
<td>76.58%</td>
<td>6.231</td>
<td>46</td>
<td>27.846</td>
<td>26.444</td>
</tr>
<tr>
<td></td>
<td>APR</td>
<td>51</td>
<td>37</td>
<td>4.616</td>
<td>76.12%</td>
<td>6.113</td>
<td>44</td>
<td>25.380</td>
<td>23.905</td>
</tr>
</tbody>
</table>
From the result of the calculation for CGK-BWX sector above, some conclusions can be made as follows:

1. Based on the Runway Strength of Soekarno-Hatta airport, the aircraft can take off with maximum Take-Off Weight 58.740 kg.
2. Based on the Runway Length of Soekarno-Hatta airport, in the OAT 32°C, dry condition and zero wind the aircraft can carry the take-off weight as many as 58.876 kg limited by climb limit.
3. Based on the Runway Strength of Banyuwangi airport, the aircraft can perform landing with maximum landing weight as many as 49.895 kg
4. Based on the calculation of payload allowable based on aircraft performance and payload allowable based on aircraft structure, then the payload allowable for the CGK-BWX route is 13.235 kg limited by Maximum Landing Weight where the Load factor is 100%.
5. Based on the data of load factor NAM Air during the operation from June 2017 to April 2018, the average load factor for the CGK-BWX route is as many as 78.66% and, thus, the achievement of market capacity has not been as expected yet.

D. Analysis of the Influence of Runway Length and Runway Strength on the Take-Off Weight Operation of B737-500 aircraft for the BWX-CGK Route.

1. Analysis of the BWX-CGK Route
   a. Take-Off Weight (TOW) based on Runway Strength

   **BWX RWY 08-26**
   **PCN 39 F/C/X/T**

   \[
   \text{OTOW} = \text{MTOW} - \left( \frac{\text{PCNact-CNmax}}{\text{ACNmax-CNmin}} \right) \times (\text{MTOW} - \text{DOW})
   \]

   \[
   \text{OTOW} = 60.781 \text{ kg} + \left( \frac{39 - 37}{37 - 17} \right) \times (60.781 \text{ kg} - 32.659 \text{ kg})
   \]

   \[
   \text{OTOW} = 60.781 \text{ kg} + \frac{2.156}{20} \times 28.122 \text{ kg}
   \]

   \[
   \text{OTOW} = 60.781 \text{ kg} + 0.0108 \times 28.122 \text{ kg}
   \]

   \[
   \text{OTOW} = 60.781 \text{ kg} + 0.31 \times 28.122 \text{ kg}
   \]

   \[
   \text{OTOW} = 60.781 \text{ kg} + 8.44 \text{ kg}
   \]

   \[
   \text{OTOW} = 69.221 \text{ kg}
   \]

   \[
   \text{OTOW} = 69.221 \text{ kg} - 32.659 \text{ kg}
   \]

   \[
   \text{OTOW} = 36.562 \text{ kg}
   \]
b. Take-Off Weight (TOW) based on Runway Length

![Figure 2: Runway Analysis NAM Air](image)

\[ OTOW = MTOW - \left( \frac{PCN_{\text{act}} - CN_{\text{max}}}{ACN_{\text{max}} - CN_{\text{min}}} \right) \times (MTOW - DOW) \]

\[ OTOW = 60.781 \, \text{kg} - \left( \frac{114 - 42}{42 - 20} \right) \times (60.781 \, \text{kg} - 32.659 \, \text{kg}) \]

\[ OTOW = 60.781 \, \text{kg} + \frac{72}{22} \times 28.122 \, \text{kg} \]

\[ OTOW = 152.796 \, \text{kg} \]

c. Landing Weight (TOW) based on Runway Strength

**CGK RWY 07L – 25R PCN 114**

**R/D/W/T**

\[ \text{Payload} = OTOW - (DOW + \text{Block Fuel}) \]

\[ \text{Payload} = 52.298 \, \text{kg} - (32.926 \, \text{kg} + 8208 \, \text{kg}) \]

\[ \text{Payload} = 11.164 \, \text{kg} \]
If the weight is converted into the number of passengers with the assumption that the standard body weight (SBW) is 90 kg (including 20 kg free baggage), thus:

\[
\text{Number of passengers} = \frac{\text{Maximum Payload}}{\text{Standard Body Weight}}
\]

\[
\text{Number of passengers} = \frac{11.164 \text{ kg}}{90 \text{ kg}}
\]

Number of passengers = 124 persons

The number of passengers who can be accommodated for the BWX-CGK route is as many as 124 persons or Load Factor (LF) = 95%.

2. Market Capacity Analysis of the BWX-CGK Route

<table>
<thead>
<tr>
<th>Year</th>
<th>FLIGHT</th>
<th>PAX C-CLASS</th>
<th>PAX Y-CLASS</th>
<th>L/F</th>
<th>SALABLE SEAT</th>
<th>INFANT</th>
<th>BAGG</th>
<th>CARGO</th>
</tr>
</thead>
<tbody>
<tr>
<td>2017</td>
<td>JUN</td>
<td>15</td>
<td>36</td>
<td>1.188</td>
<td>68.61%</td>
<td>1.784</td>
<td>30</td>
<td>7.313</td>
</tr>
<tr>
<td></td>
<td>JUL</td>
<td>30</td>
<td>132</td>
<td>3.212</td>
<td>93.62%</td>
<td>3.572</td>
<td>84</td>
<td>27.197</td>
</tr>
<tr>
<td></td>
<td>AUG</td>
<td>38</td>
<td>88</td>
<td>3.372</td>
<td>76.35%</td>
<td>4.532</td>
<td>46</td>
<td>21.537</td>
</tr>
<tr>
<td></td>
<td>SEP</td>
<td>56</td>
<td>67</td>
<td>4.573</td>
<td>69.35%</td>
<td>6.691</td>
<td>40</td>
<td>18.896</td>
</tr>
<tr>
<td></td>
<td>OCT</td>
<td>45</td>
<td>80</td>
<td>4.246</td>
<td>80.71%</td>
<td>5.360</td>
<td>50</td>
<td>30.643</td>
</tr>
<tr>
<td></td>
<td>NOV</td>
<td>55</td>
<td>133</td>
<td>5.140</td>
<td>80.39%</td>
<td>6.559</td>
<td>142</td>
<td>39.782</td>
</tr>
<tr>
<td></td>
<td>DEC</td>
<td>62</td>
<td>75</td>
<td>5.572</td>
<td>76.19%</td>
<td>7.412</td>
<td>69</td>
<td>39.736</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Year</th>
<th>FLIGHT</th>
<th>PAX C-CLASS</th>
<th>PAX Y-CLASS</th>
<th>LOAD FACTOR</th>
<th>SALABLE SEAT</th>
<th>INFANT</th>
<th>BAGG</th>
<th>CARGO</th>
</tr>
</thead>
<tbody>
<tr>
<td>2018</td>
<td>JAN</td>
<td>53</td>
<td>48</td>
<td>4.759</td>
<td>75.93%</td>
<td>6.331</td>
<td>82</td>
<td>34.961</td>
</tr>
<tr>
<td></td>
<td>FEB</td>
<td>44</td>
<td>29</td>
<td>3.914</td>
<td>74.73%</td>
<td>5.276</td>
<td>19</td>
<td>11.308</td>
</tr>
<tr>
<td></td>
<td>MAR</td>
<td>52</td>
<td>55</td>
<td>4.511</td>
<td>73.21%</td>
<td>6.237</td>
<td>52</td>
<td>29.591</td>
</tr>
<tr>
<td></td>
<td>APR</td>
<td>44</td>
<td>99</td>
<td>4.936</td>
<td>82.30%</td>
<td>6.118</td>
<td>44</td>
<td>32.466</td>
</tr>
</tbody>
</table>
From the result of calculation for CGK-BWX sector, some conclusions can be made as follows:

a. Based on the Runway Strength of Banyuwangi airport, the aircraft can take off with maximum Take-Off Weight as many as 58,740 kg.
b. Based on the Runway Length of Banyuwangi, at OAT 33°C, with flaps 15, wet/worst condition and zero wind, the aircraft can carry Take-Off Weight as many as 52,298 kg limited by field length.
c. Based on the Runway Strength of Soekarno Hatta airport, the aircraft can perform landing with maximum landing weight as many as 49,895 kg.
d. Based on the calculation of payload allowable based on aircraft performance and payload allowable based on aircraft structure, then the payload allowable for the BWX-CGK route is as many as 11,164 kg limited by Runway Length, where the Load Factor can only be filled until just 95%.
e. Based on the data load factor NAM Air during its operation from June 2017 until April 2018, the average load factor for CGK-BWX is as many as 77.40% and thus the achievement of market capacity has not been as expected.

E. Analysis of CGK-BWX-CGK Route Using B737-500 Aircraft based on the Assumption of Market Capacity and Increased Load Factor.

The following is the cost structure of B737-500 aircraft per hour.

Referring to the data of flight achievement of B737-500 for CGK-BWX-CGK route in April 2018, the load factor is as many as 82.30% so that the TOC (Total Operating Cost) is $5,211.62 per hour, assuming that the aircraft utilization per month is 250 hours. By assuming the profit margin is 10%, the selling price will be $5,732.78 per hour and the selling price/seat hour will be $44.10. Thus, it can be known that the BEP (Break Even Point) of the seat that must be achieved for this route is as many as 118 seats or 91% of the total 130 seats (Load Factor 100%). The data existing on the table above shows that the load factor of B737-500 for CGK-BWX-CGK route in April is 82.30% (107 pax). So, it is known that the load factor on this route is less than the BEP as many as 91% (118 pax). In the condition with such TOC and BEP, then it can be said that B737-500 aircraft for CGK-BWX-CGK route is still unfeasible to fly. In the other word, if the aircraft is operated for this route it will result in a potential loss for the company unless it can achieve the load factor more than 91% with the average price per pax is at $44.10 or Rp 611,711 per hour flight.
Based on the calculation of Flight Plan, PT. NAM Air determines the block time for CGK–BWX route = 1 hour 40 minutes or 1.67 hours, then the average price of a ticket is $1.67 \times \text{Rp 611,711} = \text{Rp 1,021,557 per pax}$. Whereas the block time for BWX–CGK route = 1 hour 45 minutes or 1.75 hours, then the average price of a ticket is $1.75 \times \text{Rp 611,711} = \text{Rp 1,070,494 per pax}$. Based on the calculation of average ticket price, which is equal to the middle class of each sector of CGK–BWX–CGK, it is less competitive compared with the ticket price for CGK–SUB–CGK route where Surabaya is located near Banyuwangi and can become alternative substitution.

Therefore, if the utilization of B737-500 aircraft is optimal it can lower the TOC, as seen in the table above, influencing the selling price per seat hour to be lower. It means the price will be cheaper and more competitive. With a competitive price, an airline will potentially obtain higher market capacity. In the other hand, however, the recent growth of passengers still fluctuates since the CGK-BWX-CGK is one of the new routes making the growth of
passengers is unpredictable. Nevertheless, based on the analysis result of each sector, i.e. the operation of CGK-BWX-CGK route with average load factor as many as 78.03%, the company needs to make more maximum efforts.

4.0 CONCLUSIONS

Based on the discussion on the feasibility of commercial aspect for B737-500 aircraft, the authors conclude as follows:

1. Based on the feasibility analysis of the operational aspect of B737-500 aircraft for the CGK-BWX route operated by PT NAM Air, this route basically has a payload as expected by the company so it can be said that the aircraft for the CGK-BWX route is feasible to fly.

2. Based on the feasibility analysis of the operational aspect of B737-500 aircraft for the BWX-CGK route operated by PT NAM Air, it can be known that the performance of B 737-500 aircraft is still unfeasible. In this route the load which can be carried is only passenger, whereas cargo cannot be carried. This is because the condition of Banyuwangi airport infrastructures is less supportive thus influencing the aspect of aircraft operation, including a big number of loads cannot be carried in this route.

3. Based on the feasibility analysis of the operational and commercial aspects of B737-500 aircraft for the CGK-BWX-CGK route, it is seen that the route is still unfeasible because the load factor or the load to be carried cannot exceed the BEP (Break Even Point) which influences the Total Operating Cost (TOC), making the price high and not competitive. This can also influence the company’s market capacity to decrease and make loss for the company.

Based on the above conclusions, the authors give some suggestions as follows:

1. Subsidy from Local Government

   It is necessary to develop the infrastructures of Banyuwangi airport so that the utilization of B737-500 aircraft for the CGK-BWX-CGK route can have maximum payload—ability to carry passengers and cargo. The infrastructure development can be done by lengthening the runway of Banyuwangi airport in order to fulfill the company’s future expectation. This program will surely need not little fund for initial implementation and maintenance as well as for bigger scale development in the next stage. Therefore, sustainable commitment is required.

2. Increasing Aircraft Utilization

   NAM Air needs to increase the utilization of B737-500 aircraft to be more than 250 hours so that the TOC will be lower. The aircraft should fly as frequently as possible, starting from the first flight as early as possible in the morning where the schedule is still commercially feasible and the last flight to be scheduled to
end at midnight. Turnaround should be as quick as possible every time the aircraft has a transit to ensure minimum time spent in an airport so that the selling price per seat hour will become more competitive and obtain wider coverage of market capacity.

3. Market Penetration and Development

The effort PT NAM Air as its business strategy to increase the market capacity of the Jakarta-Banyuwangi-Jakarta route is market penetration by more proactively promoting its product in unique and creative ways. It also needs to build better cooperation with travel agents to sell tickets at a more competitive price by providing the travel agents with more promising commission incentives from each ticket sold.

5.0 REFERENCES

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