

# DEVELOPING LELYSTAD AIRPORT AS A LOW-COST SECONDARY AIRPORT

B.J.J. BENNEBROEK (1260634), B.A.M. BUUTFELD (1260731), A. VAN HELDEN (1229303), B.A.J. SCHELLEKENS (1261622)

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## ABSTRACT

The Dutch government set out its civil air transport policy in the Luchtvaartnota. The main conclusion drawn in this document is a limitation on the number of air traffic movements imposed on Schiphol traffic. Excess traffic will need to be relocated, for instance to Lelystad Airport. This airport is selected to focus on non-mainport related traffic. However, ‘mainport related traffic’ is not clearly defined in the Luchtvaartnota.

This paper proposes a decision tree as a tool to decide whether a certain flight is mainport related or not, and selects the low-cost carriers and charter airlines as eligible for relocating from Schiphol to Lelystad. To relocate these airlines, incentives should be offered at Lelystad. Therefore, the requirements of these airlines for airports are analysed and the consequences of these requirements for Lelystad Airport are identified. This results in an estimated total investment of €60.4 million. Next, the airport charges for Lelystad Airport to cover these costs are calculated. When compared to Schiphol’s tariffs, the airport charges for Lelystad are about half of Schiphol’s. This will create an incentive for airlines to relocate to Lelystad.

## 1. INTRODUCTION

The Dutch government published its civil air transport strategy in a document called the ‘Luchtvaartnota’ in April 2009. The main conclusion drawn in this document is a limitation imposed on the growth of the largest and most important airport in the Netherlands: Schiphol. According to the Luchtvaartnota Schiphol may grow to a maximum of 510,000 air transport movements (ATM) per year in 2020 (Ministerie van Verkeer en Waterstaat (2009b)).

In 2009 Schiphol accommodated about 407,000 ATM and with the current economic crisis, Schiphol is far from reaching its maximum capacity. The Luchtvaartnota however still expects the demand for Schiphol to grow to more than 570,000 ATM in 2020, at which point Schiphol will eventually have to refuse traffic.

The Luchtvaartnota recognises a solution for this problem in relocation of Schiphol traffic to other, regional airports in the Netherlands. It was concluded that a total of 70,000 ATM may be moved to the airports of Eindhoven and Lelystad to relieve Schiphol from a lack of capacity (Ministerie van Verkeer en Waterstaat (2009b)).

The Luchtvaartnota however does not specify which flights should be moved from Schiphol to Lelystad and Eindhoven. It only states that the implementation should follow market developments and that relocation should be limited to ‘non-mainport related traffic’, without further defining the aforementioned term. Therefore there currently is no clear definition of the traffic that should move to Lelystad according to the Luchtvaartnota, nor an overview of the impact of this decision on Lelystad Airport.

### 1.1. Research question and methodology

This paper intends to create a clear definition of ‘non-mainport related traffic’ and thus a selection of flights that can be moved to Lelystad Airport without damaging the business model of mainport Schiphol. Furthermore this paper investigates the consequences on the infrastructure, operations and financial performance of

Lelystad Airport.

This leads to the following research question: *What non-mainport related air traffic should be moved from Schiphol to Lelystad to comply with the aims set out by the Luchtvaartnota and what are the consequences for the infrastructure, operations and financial performance of Lelystad Airport?*

The research question will be answered in four steps:

1. Definition of ‘non-mainport related traffic’ and selection of flights currently based at Schiphol that adhere to this definition (section 2);
2. Determination what the airlines operating these flights require of an airport (section 3.1);
3. Determination of consequences of these requirements for the airside, landside, connectivity and airport charges of Lelystad Airport (sections 3.2 through 3.6);
4. Calculation of financial consequences of the required investments (section 4).

Section 5 presents the main conclusions of this research and section 6 gives some recommendations. The remainder of this section discusses the current state of research into multi-airport systems and the present-day situation of Lelystad Airport.

### 1.2. Developing multi-airport systems

The Dutch government is not the first government to try to split air traffic over multiple airports. Multi-airport systems exist in cities such as London, Paris and New York. Research on these airport systems has resulted in four important conclusions for (the development of) multi-airport systems consisting of one primary airport (in this case Schiphol) and a secondary airport (Lelystad) (De Neufville (1995); Bonnefoy et al. (2008)):

1. Enforcing airlines to move their operations from the primary to the secondary airport by government intervention or regulation does not work;

2. The secondary airport should focus on a niche market such as shorter range flights, seasonal charter flights or low cost flights;
3. Current underutilized secondary airports should be protected as they may be needed for handling a niche of the primary airport's traffic in the future;
4. Additional necessary infrastructure on the secondary airport should be built gradually, allowing the airport adjust to changing circumstances.

Especially the first conclusion is important as it shows that to move airlines from Schiphol to Lelystad, there should be incentives for these airlines to move. After analysing which traffic may be moved to Lelystad in section 2, section 3 discusses the requirements imposed on Lelystad Airport by these airlines and the respective traffic types. Fulfilling these requirements should create incentives for the selected airlines to move their operations from Schiphol to Lelystad.

### 1.3. Lelystad Airport today

Today, Lelystad Airport is a small airport owned by the Schiphol Group, focused on general aviation. In 2009, the airport handled almost 134,000 ATM, of which 60% are training flights. Only 1% was business aviation (Schiphol Group (2010)). Currently Lelystad handles no scheduled flights (Lelystad Airport (2010)).

Lelystad Airport currently has a single runway of 1,250 m in length and 30 m in width. The airport does not have a passenger terminal. All current facilities and buildings are located to the south of the runway (Lelystad Airport (2010)).

## 2. SELECTION OF SCHIPHOL TRAFFIC ELIGIBLE FOR RELOCATION TO LELYSTAD

The first step in selecting the traffic that should move from Schiphol to Lelystad Airport is defining what is meant by the term 'non-mainport related traffic' as used by the Luchtvaartnota (section 2.1). Then, this definition can be applied to the current traffic mix of Schiphol to make a selection of flights that are eligible to move to Lelystad (section 2.2).

### 2.1. Definition of 'non-mainport related traffic'

The term 'mainport' is a Dutch invention, and is used for the most important international ports in the Netherlands: the port of Rotterdam and Amsterdam Airport Schiphol. The Luchtvaartnota often mentions the term, but does not give a clear definition. With this, also the type of Schiphol traffic that could move to a secondary airport — the 'non-mainport related traffic' — is not clearly defined. This section therefore aims to provide a clear definition of this term.

The Dutch government identifies three characteristics of a mainport (Ministerie van Verkeer en Waterstaat (2005)):

- A mainport is a *hub*, connecting many national, European and international transport destinations;
- A mainport has a connection with a *metropolitan area* with a strong residential, social, recreational and business climate;

- A mainport is a *node*, enhancing a competitive international business network.

The Boston Consulting Group (2004) furthermore defines three strategies for 'mega-hubs' (airports processing over 40 million passengers per year):

- Focus on the *lead airline* and its alliance, as well as regional feeders;
- Provide the highest *quality of service* and innovative ways to spread capacity throughout the day;
- Differentiate intelligently between *premium and basic products*.

From both the characteristics of a mainport and the strategy guidelines for mega-hubs, three criteria are defined for deciding whether a flight is mainport related or not:

1. KLM is the lead airline at Schiphol and member of the SkyTeam alliance. Therefore the first criterion is: *Is the flight operated by a SkyTeam member?*
2. Schiphol relies heavily on transfer passengers. The second criterion therefore is: *Does the flight feed the transfer strategy of Schiphol?*
3. The synergy with the metropolitan area of Amsterdam is very important for a lot of (business) flights to Schiphol; some flights rely solely on the vicinity of the metropolitan area. This leads to the third criterion: *Does the flight profit from a synergy with the metropolitan area?*

If any of these questions is answered with 'yes', the associated traffic is mainport related. Otherwise, the traffic is non-mainport related. Exhibit 1 shows the decision tree summarizing the criteria.

### 2.2. Selection of traffic eligible for moving to Lelystad

Using the new definition of mainport related traffic, Schiphol's traffic is analysed. Exhibit 2 shows the different types of flights currently operated at Schiphol: flights operated by SkyTeam members, scheduled flights operated by non-SkyTeam airlines, freight traffic, low-cost carrier (LCC) flights, charter flights and general aviation (GA).

Next, the decision tree from exhibit 1 is applied to the traffic mix of Schiphol. The resulting selection of non-mainport related traffic is summarized in exhibit 3.

SkyTeam alliance flights are directly identified as being mainport related. Non-SkyTeam scheduled flights from airlines such as British Airways or Lufthansa also profit from and contribute to the hub function of Schiphol. These flights are therefore also labeled 'mainport related'. Freight traffic profits heavily from the hub function and the international network of Schiphol (Ministerie van Verkeer en Waterstaat (2005)) and are therefore attributed the same label.

LCC and charter flights operate a mainly point-to-point network, focusing almost entirely on origin and destination passengers (Doganis (2002); Franke (2004)). So, these flights are not part of SkyTeam and do not carry transfer or feeder passengers for the Schiphol hub.

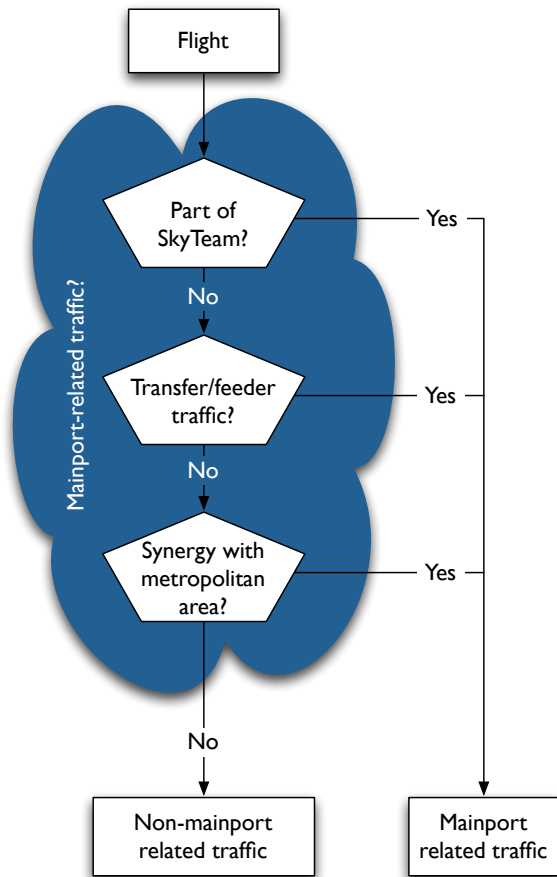


EXHIBIT 1.— Decision tree to determine whether Schiphol traffic is mainport related

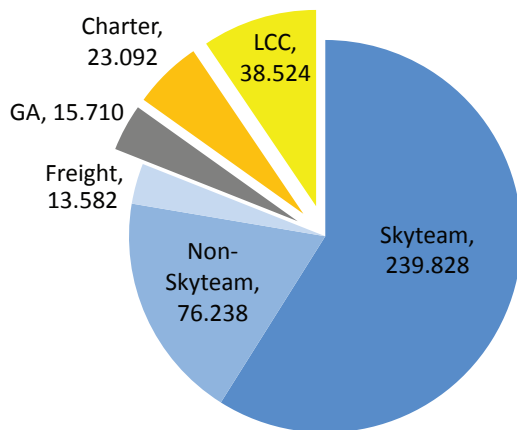


EXHIBIT 2.— Types of flights operated at Schiphol, with total ATM (Schiphol (2010)). Using exhibits 1 and 3, the segments of LCC, charter and general aviation are selected as non-mainport related traffic.

Furthermore it seems that charter and low-cost carrier passengers are willing to travel further for cheaper

flights<sup>1</sup> (Warnock-Smith and Potter (2005)). Considering the third criterion, this is an indication that even though Amsterdam is a popular tourist destination, this particular group of passengers is willing to fly from Lelystad instead of Schiphol. Thus, for the traffic types LCC and charter all three questions in the decision tree are answered negatively, and these traffic types are therefore classified as non-mainport related.

It is more difficult to make a general statement about general aviation. Some flights in this category are private business flights, which profit very much from the synergy with the Amsterdam metropolitan area. These flights are therefore clearly mainport related. Also emergency and medical flights fit into the GA category. These flights are also mainport related, as the geographical presence near Amsterdam is necessary for their task (Korps landelijke politiediensten (2010)). Other GA flights however, such as training or other leisure flights, do not profit from a synergy with the metropolitan area and are therefore not mainport related.

In conclusion, three types of Schiphol traffic have been classified as non-mainport related (LCC, charter and part of GA). Because the Luchtvaartnota only uses the characteristic of 'non-mainport related traffic' to describe the traffic that should move from Schiphol to Lelystad, the three aforementioned traffic types are in principle suitable for relocation in order to reach the goals set out in the Luchtvaartnota. For analyzing the consequences of relocation of the aforementioned traffic types for Lelystad Airport, only charter and low-cost flights are considered. It is argued that only these two traffic types pose additional requirements onto secondary airports. Furthermore GA traffic arguably does not pose significant additional strain on the current airport capacity.

### 2.2.1. Traffic and passenger volumes

To determine the volume of traffic eligible for relocation to Lelystad, monthly charter flight and passenger data is directly obtained from Schiphol traffic data (Schiphol (2010)). In total, Schiphol charter traffic counts 23,000 ATM and 3.3 million passengers annually. Low-cost flight and passenger data is not directly available from Schiphol data. However, the traffic data does state that the low-cost airline segment provides for 10.2% of the total ATM volume. It is assumed that this figure applies to only the number of passenger flights (any potential error by leaving out freight ATM is only marginal) (Schiphol (2010)). This assumption implies a total number of 38,500 low-cost flight movements. To calculate the passenger volume, an average of the seat capacity of aircraft types frequently used by low-cost and charter airlines implies that an average LCC flight movement caters for 172 seats. Further calculations then assume an average load factor of the airline Ryanair (at 82%) to apply as the industry standard (Ryanair (2010)). This assumption results in a total annual LCC passenger count of 5.4 million. (See exhibit 12 in the appendix for an overview of monthly LCC and charter traffic at Schiphol.)

For further calculations it is assumed that Lelystad Airport will cater for 50% of the total number of re-

<sup>1</sup> This holds especially true for Dutch passengers of LCCs, who are now traveling to low-cost airports as far as Charleroi in Belgium and Weeze in Germany to fly for a lower fare.

EXHIBIT 3.— The decision tree of exhibit 1 applied to the different traffic types of Schiphol to select the non-mainport related flights

	SkyTeam?	Transfer/feeder?	Synergy with Amsterdam?	Mainport related?
SkyTeam	Yes	—	—	Yes
Non-SkyTeam	No	Yes	—	Yes
Freight	No	Yes	—	Yes
LCC	No	No	No	No
Charter	No	No	No	No
GA	No	No	Yes/No	Yes/No

located flight movements. This is in accordance with the policy decisions made in the Luchtvaartnota, which assumes an equal distribution of traffic of a grand total of 70,000 ATM between Lelystad Airport and Eindhoven Airport, so 35,000 ATM each (Ministerie van Verkeer en Waterstaat (2009b)). The initial assumption implies a total of an approximate 31,000 flight movements and 4.3 million passengers relocated to Lelystad Airport for charter and low-cost traffic alone (see exhibit 4; for monthly flight and passenger numbers see exhibit 13 in the appendix). This complies with the range given by the Luchtvaartnota.

EXHIBIT 4.— Traffic and passenger volumes for the new Lelystad Airport

Parameter	Value
LCC and charter ATM per year	31,000
LCC and charter pax per year	4,300,000

### 3. REQUIREMENTS FOR AIRPORT INFRASTRUCTURE AND OPERATIONS

As seen in section 1.2, the only way to successfully relocate airlines to a secondary airport, is to create incentives at the secondary airport. This section defines these incentives and analyses their impact on Lelystad Airport. Section 3.1 defines what low-cost and charter airlines require of airports. Sections 3.2 through 3.6 discuss the effect of these requirements on Lelystad.

#### 3.1. Defining airline requirements

To create incentives at Lelystad for LCCs and charter airlines, this section looks at the requirements these airlines pose on airports. Analysis of the implications for Lelystad associated with these requirements is focused on LCC flights as these have a very specific set of requirements.

Barrett (2004) concludes that an LCC generally has seven specific requirements related to an airport's service level:

1. Low airport charges;
2. Quick (25 minute) turnaround time;
3. Single-story airport terminals;
4. Quick check-in;
5. Good catering and shopping facilities at airport;
6. Good facilities for ground transport;
7. No executive/business class lounges.

Furthermore, the airline Ryanair can pose as a suitable benchmark. Although this carrier does not operate from Schiphol, it is the largest LCC player in the European

market. Ryanair furthermore exclusively operates Boeing 737-800 aircraft, the largest type of the most commonly used LCC narrow-body aircraft (Franke (2004)). Ryanair has very specific technical requirements of airports (Ryanair (2007)), including:

- Minimum runway length of 1852 m LDA at sea level;
- Minimum runway width of 45 m;
- Minimum taxiway width of 23 m;
- Minimum MTOW capacity of 74,990 kg;
- Minimum ICAO Category 7 fire cover;
- Minimum ILS Category 1.

Currently, Lelystad Airport does not fulfill these requirements. Therefore Lelystad has to invest in its infrastructure.

#### 3.2. Consequences for the airside

For the airside of Lelystad Airport, Ryanair's requirements have significant consequences. The runway will have to be extended to a minimum of 1852 m. The Dutch government decided in 2009 that Lelystad's runway would be extended to a length of 2100 m, and a width of 30 m (Ministerie van Verkeer en Waterstaat (2009a)). This will be too narrow for Ryanair, and this decision will thus have to be amended. For further analysis the new runway will be assumed to be 2100 by 45 m.

Because Lelystad's current runway is not strong enough to cope with the landings and take-offs of large narrow-body aircraft, it is recommended that the current runway is not reused, but that a complete new runway is constructed. Also shoulders and taxiways will have to be constructed. As a sanity check, the capacity of the new runway may be calculated using the FAA airfield capacity model (Swedish (1981)). A new runway capacity is estimated at 47.8 aircraft per hour (see exhibit 10 in the appendix). Assuming 20 operational hours a day, this would imply an annual airfield capacity of approximately 349,000 ATM. Therefore it is clear that a single runway will be sufficient for Lelystad's traffic.

The new developments of Lelystad Airport will take place to the north of the runway (Ministerie van Verkeer en Waterstaat (2009a)). Here a new apron should be constructed with facilities for an LCC fleet. This new apron should be optimized to cater for quick, 25 minute turnaround times, as required by the LCCs.

Finally, Lelystad will also have to invest in navigational and visual aids, such as a category 1 ILS, and new ground support equipment (GSE) and a fire brigade.

### 3.3. Consequences for the landside

The landside related requirements imply a need for a single-story airport terminal offering dedicated low-cost facilities. Currently Lelystad does not have any of these facilities, but the airport does have room for a new terminal building to the north of the runway.

The size of the new terminal can be approximated by modeling the required peak hour capacity (Roling (2007)). This results in a required terminal area of 9.400 m<sup>2</sup> (for the complete calculations, see exhibit 11 in the appendix).

### 3.4. Consequences for connectivity

A good connectivity of the airport proves to be an important requirement for low-cost airlines. At the moment Lelystad is easily accessible by car, but public transportation is not sufficient. Currently only one bus connects the airport with the train station in Lelystad. This bus stops once or twice per hour near the airport. To offer a sufficient public transportation link, there will be a need for additional public transportation, for instance in the form of a shuttlebus, to the train station. From there, there are frequent connections to Amsterdam and the rest of the Netherlands.

The construction of a new terminal on the northern side of the airport will render the current parking facilities at the south obsolete. Therefore the airport will have to invest in new parking spaces near the new terminal.

### 3.5. Operational consequences

Lelystad Airport is currently open 16 hours per day, from 7 AM to 11 PM. It is expected that this is insufficient to cater for charter flights specifically, as charter airlines often operate ‘W-pattern’ schedules. In this pattern, the schedule aims to operate each aircraft for two return flights to charter destinations daily. Such a schedule often requires a wider operating window, according to a personal interview with a manager of Rotterdam The Hague Airport<sup>2</sup>. This suggests that the airport should extend to daily opening hours from 5 AM to 1 AM in order to sufficiently cater for charter operations. This may prove a problem as the Dutch government prescribes an operating window from 6 AM to 11 PM (Ministerie van Verkeer en Waterstaat (2009a)).

### 3.6. Consequences for airport charges

One of the most important requirements for low-cost airports is low airport charges. In this case the airlines are currently based at Schiphol and should be incentivized to relocate to Lelystad. If Lelystad will be able to offer lower airport charges, this will surely incentivize LCCs and charter airlines. Section 4 analyses this aspect further. Currently, Lelystad Airport’s charges are much lower than Schiphol’s as there are little facilities at the airport. When commercial airlines will relocate to Lelystad, it seems certain that these charges have to increase to cover the costs for the required investments.

Furthermore, Lelystad will have to revise its tariff structure. Currently this structure is focused on general aviation and is definitely not suitable to cope with large

volumes of commercial flights with larger aircraft. For instance, currently there are separate charges for turning on the runway lights — something that is necessary for most commercial flights. Lelystad could use Rotterdam The Hague Airport’s tariff structure as an example, as theirs is focused more on commercial operations (Lelystad Airport (2009); Rotterdam Airport (2010)).

## 4. FINANCIAL CONSEQUENCES

Now that the consequences of the airlines’ requirements for Lelystad Airport have been defined, the financial effects of the required investments can be analysed. This section looks into these financial consequences in three steps:

1. Approximate the total required investment and the operational costs for running the new Lelystad Airport (sections 4.1 and 4.2);
2. Calculate the airport charges required to cover these costs (section 4.3);
3. Compare these charges with charges at Schiphol (section 4.4), to see if the calculated charges create incentives for the airlines to relocate their operations to Lelystad.

If step 3 shows that the airport charges are higher than Schiphol’s, there will be very little incentive for low-cost airlines to relocate to Lelystad Airport. However, if the charges are lower than at Schiphol, airlines will be interested in moving.

In step 2, a financial model is developed and used to calculate the airport charges for an average low-cost or charter flight in order to cover depreciation and operational costs. Thus the resulting tariff is based on a break-even state of operations for Lelystad Airport. This strategy is maintained to enable a good comparison with Schiphol’s charges. If Lelystad’s charges are much lower than those at Schiphol, it may have some level of flexibility in increasing these charges so that the airport would make a profit.

### 4.1. Investments

As discussed in section 3, Lelystad Airport has to invest in new infrastructure in order to cater for low-cost and charter flights. The required investments are estimated in exhibit 5.

EXHIBIT 5.— Estimation of required investments in infrastructure (annotated version in exhibit 14 in the appendix)

Investment	Value
Runway	€ 6,379,000
Runway shoulder	€ 2,126,000
Apron	€ 13,162,500
Taxiways	€ 3,139,500
Navigational & visual aids	€ 2,800,000
GSE	€ 3,000,000
Roadside connection	€ 1,000,000
Low-cost terminal	€ 18,800,000
Other	€ 10,000,000
<b>Total</b>	<b>€ 60,407,000</b>

The figures mentioned in this table are based on various sources and assumptions. In a personal interview

<sup>2</sup> Interview with Steven van der Kleij, Manager Informatie, Capaciteit & Beleid, Rotterdam The Hague Airport, June 3, 2010

with two NACO consultants<sup>3</sup>, ratios were provided for the calculation of apron, runway, shoulder, taxiway and terminal costs per square meter, as well as an indication of the fixed cost for navigational and visual aids. Combined with the necessary runway and shoulder dimensions and the earlier calculated terminal surface, the required investments for the runway, shoulder and terminal are calculated. The apron is computed by assuming a square 450 m area for all airside requirements, including fuel tanks, lighting etc. The required investment in ground support equipment is based on a personal interview with a manager of Rotterdam The Hague Airport<sup>4</sup>. Investments for the road connections are estimations based on the cost level of other investments. Finally, a 15% margin has been included as ‘Other’ to account for unforeseen costs.

The aforementioned assumptions and calculations result in a total investment of €60.4 million. The financial model provides an estimation for the charges needed to cover the depreciation costs of these investments. The depreciation periods used are based on Schiphol Group’s current depreciation periods and can be found in exhibit 15 in the appendix.

Because there is uncertainty in some of the investment costs, section 4.5 analyses the sensitivity of the investment level.

#### 4.2. Operational costs

To estimate the additional operational costs for Lelystad Airport, the operational costs per workload unit (WLU) of Eindhoven Airport are used as a reference. This gives a first approximation of operational costs for a low-cost airport in the Netherlands. In 2009, Eindhoven Airport handled about 1.7 million WLU at an operational cost of €14.6 million (Eindhoven Airport (2010)). This leads to an operational cost per WLU of €8.50 (also see exhibit 16 in the appendix). For Lelystad Airport, with a future 4.3 million passengers per year, this results in a total operational cost of €37 million.

#### 4.3. Revenue

The income of the airport in the financial model is based on airport charges paid by the airlines. The financial model assumes that Lelystad Airport uses the dual-till principle. This means that non-aeronautical revenue sources such as parking fees, retail at the airport, development of real estate etc. are not included as revenue and costs in the model. These non-aeronautical revenue sources will improve the final financial result when incorporated, but will also require additional investments. A complete business case for developing Lelystad Airport will have to include plans for non-aeronautical investments and revenue forecasts.

Airport charges are the aeronautical revenue in the model. The model calculates the required airport charges to break even with the depreciation and operational costs. For a total of 31,000 flights — a relocation of 50% of Schiphol’s current LCC and charter traffic — the resulting airport charges for Lelystad are an average of

€1260 per aircraft. As the profit and loss account in exhibit 6 and the performance ratios in exhibit 7 show, this tariff leads to a marginal profit margin. (The profit is not equal to zero due to rounding errors in the model.)

EXHIBIT 6.— Profit and loss account for the new Lelystad Airport

Revenue	Airport charges	€	39,126,000
Costs	Operational costs	€	37,073,000
	Depreciation	€	1,928,000
<b>EBIT</b>		€	<b>125,000</b>

EXHIBIT 7.— Performance ratios for the new Lelystad Airport

Ratio	Value
WLU	4.34 million
Airport Throughput Units	612 million
Total revenue per WLU	€9.01
Total costs per WLU	€8.98
Gross operating profit margin	0.32%
Return on investment <sup>a</sup>	3.40%

<sup>a</sup>EBITDA over total investment

#### 4.4. Comparison with Schiphol charges

To make a comparison with Schiphol charges for LCCs and charter airlines, an average charge is calculated for Schiphol using the following assumptions: the typical fleet of an LCC and charter airline are of ICAO class B; the flights are overland and primarily during the day; the aircraft weigh 76.5 tonnes and carry 141 passengers on average. These averages are based on the assumption of an even distribution of the use of Airbus 320 and Boeing 737 Next Generation family models, with an average load factor of 82%. This results in an average airport charge of €2365 at Schiphol (Schiphol (2009)).

As the calculated airport charges for Lelystad are €1260, it can be concluded that Lelystad Airport can be cheaper for airlines than Schiphol. This means that a critical LCC requirement — low airport charges — can be fulfilled, even while investing in other requirements such as a single-story terminal and a new apron. Fulfilling these requirements thus creates incentives for airlines to relocate from Schiphol to Lelystad.

Furthermore this charge structure leaves room for increases in tariff, because the charges required for Lelystad are almost half of Schiphol’s charges. This increases the potential for profitability of Lelystad Airport.

#### 4.5. Sensitivity analysis of charges

The calculated required airport charges for Lelystad Airport depend on a lot of assumptions, some subject to uncertainties. The volume of traffic that relocates to Lelystad and the level of investment are identified as the largest uncertainties. For this reason a sensitivity analysis is performed to calculate the effect of a change in these two parameters on the break-even airport charges of Lelystad.

Exhibit 8 shows the analysis for different percentages of relocated traffic. From this graph it can be seen that even if only 10% of Schiphol’s LCC and charter traffic

<sup>3</sup> Interview with Kjell Kloosterziel and Emanuel Roche of NACO Airport Consultants, June 23, 2010

<sup>4</sup> Email from Steven van der Kleij, Manager Informatie, Capaciteit & Beleid, Rotterdam The Hague Airport, June 18, 2010

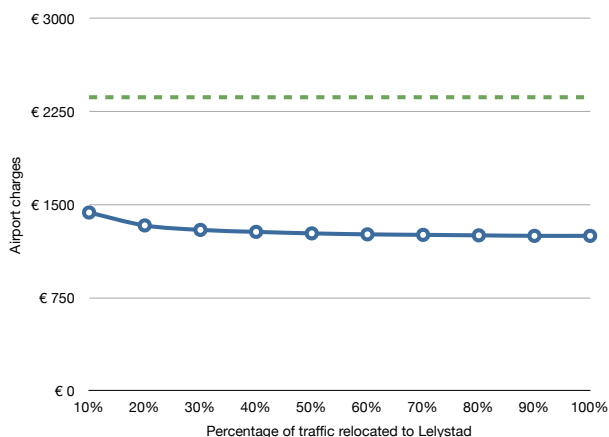


EXHIBIT 8.— Required Lelystad airport charges (solid line) to cover aeronautical costs for different percentages of relocated flights from Schiphol, in comparison with airport charges at Schiphol (dashed line)

would relocate to Lelystad (instead of the assumed 50%) the required airport charges at Lelystad are still lower than those at Schiphol.

To calculate the sensitivity of the airport charges related to the level of investment, the uncertain investments in the apron, GSE, roadside connections and other costs are set to three different levels: the ‘base’ scenario from exhibit 5, a low scenario at 50% of these costs and a high scenario at 150%. Exhibit 9 shows the resulting investment levels and the effect on Lelystad’s required airport charges. It is clear that this effect is zero. This is because a large difference in investments has a relatively small effect on the yearly depreciation costs, compared to the yearly operational costs.



EXHIBIT 9.— Required Lelystad airport charges (solid line) to cover aeronautical costs for different investment levels (columns), in comparison with airport charges at Schiphol (dashed line)

Thus, even taking into account the uncertainties related to the assumptions, it may be expected that Lelystad is able to maintain lower charges for LCC and charter airlines than Schiphol.

## 5. CONCLUSIONS

The question researched in this paper was: *What non-mainport related air traffic should be moved from*

*Schiphol to Lelystad to comply with the aims set out by the Luchtvaartnota and what are the consequences for the infrastructure, operations and financial performance of Lelystad Airport?*

To answer this question a decision tree was developed as a tool to decide whether certain traffic is mainport related or not. This decision model asks the questions whether a flight is operated by a SkyTeam member, whether the flight feeds the transfer strategy of Schiphol and whether the flight profits from a synergy with the metropolitan area of Amsterdam. If any of these questions is answered with ‘yes’, the flight is classified as mainport related. Using this decision tree, the segments of LCC and charter traffic are selected as non-mainport related traffic and can as such be relocated to Lelystad. If 50% of the Schiphol traffic volume of these segments is moved to Lelystad, this will result in approximately 31,000 ATM and 4.3 million passengers per year for Lelystad Airport. This complies with the aims set out in the Luchtvaartnota.

From research on multi-airport systems it can be concluded that the development of Lelystad Airport can only be a success when the airlines move voluntarily. Therefore it is important to create incentives at the secondary airport for the airlines. By looking at what LCC and charter airlines require of airports the consequences of a relocation to Lelystad Airport are analysed. To cater for the airlines, Lelystad will have to invest in a new runway and apron, new taxiways, navigational and visual aids and a low-cost passenger terminal. The required total investments are approximately €60.4 million. Operational costs are approximated using the operational costs per WLU of Eindhoven Airport, resulting in an operational cost of €37 million per year for Lelystad.

To earn back the depreciation and operational costs Lelystad will charge airlines for using the airport. A financial model was developed to calculate the required tariff to break even. This charge is on average €1260 per aircraft. This is almost half of Schiphol’s average charge of €2365 for a class B aircraft carrying 141 passengers on an overland flight by day. Therefore, low-cost and charter airlines are offered a big incentive to relocate to Lelystad: lower airport charges.

A sensitivity analysis shows that the resulting airport charge for Lelystad does not significantly change when varying the uncertainties in the percentage of traffic that relocates to Schiphol or the level of investment.

However, relocating traffic when Schiphol is not at its maximum number of ATM (as it is today) means that, at Schiphol, expensive capacity is left unused. The new operations at Lelystad will bring in some money to compensate this, but using the existing overcapacity at Schiphol is a more profitable strategy for the owner of both airports (the Schiphol Group) than huge investments in Lelystad Airport. Naturally, this no longer holds true when Schiphol reaches its maximum capacity and must refuse traffic.

## 6. RECOMMENDATIONS

The analysis presented in this paper is not a complete business case for a new Lelystad Airport but only provides a brief overview of the most important aeronautical consequences of relocating LCC and charter airlines to Lelystad. For a complete business case also the other side

of the dual-till principle should be taken into account: the non-aeronautical revenue and investments, such as retail at the airport, real estate development, parking facilities etc. The provincial development company Ontwikkelingsmaatschappij Flevoland BV may play a role in this.

Furthermore, there are several legal aspects that should be considered before relocating traffic, such as the legal aspects of multi-airport systems in relation to European competition laws. Also the allocation of slots and grandfather rights at Schiphol may influence the prospects of airlines relocating to Lelystad. Next to this, an increase of traffic to Lelystad Airport will also have consequences for Dutch airspace and the approach and departure routes of both Lelystad Airport and Schiphol. This should be further investigated.

Further market research should be performed to study the demand for low-cost and charter flights departing and

arriving from Lelystad instead of Schiphol. Also the general aviation market can be studied further to investigate whether there are certain niches in this market that can be relocated from Schiphol to Lelystad.

The current boundaries of the runway of Lelystad Airport set by the government are too narrow for the technical requirements of Ryanair, as seen in section 3.2. Therefore the boundary for the maximum width of the runway should be increased to 45 m.

To further investigate the difference in airport charges between Schiphol and Lelystad, one could study the ratio between airport charges between the primary and secondary airport for existing airport systems.

Finally, when a decision is made to relocate traffic to Lelystad Airport, it may be wise to develop a roadmap setting out the necessary investments, keeping flexibility in developing Lelystad.

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## APPENDIX

EXHIBIT 10.— Input parameters for the Upgraded FAA Airfield Capacity model

Parameter	Value
Runway usage	Single runway, mixed mode, string operated
Time ratio departure/arrival	1:1
Aircraft classes	Light (L), Medium (M), Heavy (H)
Traffic mix	10% L, 90% M, 0% H
Nominal approach speeds (kts)	110 (L), 130 (M), 150 (H)
Inter-arrival error standard deviation	17 s
Probability of violation	0.05
Common approach path	8 nm
Fixed separation buffer arrival	10 s
Arrival & departure separation minima	ICAO 1992 standard

EXHIBIT 11.— Calculation of required terminal area

Parameter	Value	Unit
ATM peak <sup>a</sup>	12	ATM per hour
Passenger peak <sup>b</sup>	1,741	pax per hour
Service level <sup>c</sup>	B	
<b>Total terminal area</b>	<b>9400</b>	<b>m<sup>2</sup></b>
Waiting and circulating	2,003	m <sup>2</sup>
Check-in queues	1,393	m <sup>2</sup>
Hold room, controls	1,045	m <sup>2</sup>
Baggage reclaim area	1,567	m <sup>2</sup>
Departure hall	2,812	m <sup>2</sup>
Departure lounge	580	m <sup>2</sup>

<sup>a</sup>Assuming that the peak is twice that of the flat average rate in the busiest month

<sup>b</sup>Average passenger load of 141 per aircraft

<sup>c</sup>Roling (2007)

EXHIBIT 12.— Schiphol traffic per month

	ATM charter <sup>a</sup>	ATM LCC <sup>b</sup>	Pax charter <sup>a</sup>	Pax LCC <sup>c</sup>
Monthly average	1,924	3,210	272,000	425,097
Total	23,092	38,524	3,264,000	5,421,517
Jan	791	2,935	92,000	413,114
Feb	776	2,703	107,000	380,457
Mar	871	3,090	112,000	434,890
Apr	1,476	3,285	183,000	462,337
May	2,521	3,490	363,000	491,104
Jun	2,279	3,395	324,000	477,797
Jul	3,918	3,630	592,000	510,841
Aug	3,927	3,599	591,000	506,477
Sep	2,499	3,372	366,000	474,581
Oct	2,310	3,369	321,000	474,136
Nov	843	2,906	109,000	409,009
Dec	881	2,748	104,000	386,773

<sup>a</sup>Schiphol (2010)

<sup>b</sup>Schiphol (2010) states that 10.2% of traffic is low-cost

<sup>c</sup>Assuming an average passenger load factor of 82% (Ryanair (2010))

EXHIBIT 13.— Lelystad traffic for base scenario where 50% of Schiphol's LCC and charter traffic is relocated to Lelystad

	ATM charter	ATM LCC	Pax charter	Pax LCC	Total ATM	Total pax
Monthly average	962	1,605	136,000	225,897	2,567	361,897
Total	11,546	19,262	1,632,000	2,710,759	30,808	4,342,759
Jan	396	1,468	46,000	206,557	1,863	252,557
Feb	388	1,352	53,500	190,229	1,740	243,729
Mar	436	1,545	56,000	217,445	1,981	273,445
Apr	738	1,643	91,500	231,168	2,381	322,668
May	1,261	1,745	181,500	245,552	3,005	427,052
Jun	1,140	1,698	162,000	238,898	2,837	400,898
Jul	1,959	1,815	296,000	255,421	3,774	551,421
Aug	1,964	1,799	295,500	253,239	3,763	548,739
Sep	1,250	1,686	183,000	237,291	2,936	420,291
Oct	1,155	1,685	160,500	237,068	2,840	397,568
Nov	422	1,453	54,500	204,504	1,875	259,004
Dec	441	1,374	52,000	193,387	1,815	245,387

EXHIBIT 14.— Estimation of required investments in infrastructure

Investment	Value	Unit
Runway	€ 6,378,750	
Unit cost per m <sup>2</sup>	€ 68	
Length	2,100	m
Width	45	m
Runway shoulder	€ 2,126,250	
Unit cost per m <sup>2</sup>	€ 33	
Width	15	m
Apron	€ 13,162,500	
Unit cost per m <sup>2</sup>	€ 65	
Total surface	202,500	m <sup>2</sup>
Taxiways	€ 3,139,500	
Unit cost per m <sup>2</sup>	€ 68	
Length	2100	m
Width	23	m
Navigational & visual aids	€ 2,800,000	
GSE	€ 3,000,000	
Roadside Connection	€ 1,000,000	
Low-cost Terminal	€ 18,800,000	
Other	€ 10,000,000	

EXHIBIT 15.— Depreciation periods, based on Schiphol Group's depreciation periods (Schiphol Group (2010))

Investment	Period in years
Runway	37.5
Runway shoulder	37.5
Apron	45
Taxiways	37.5
Navigational & visual aids	17.5
GSE	18
Roadside connection	30
Low-cost terminal	30
Other	30

EXHIBIT 16.— Operational cost breakdown for Eindhoven Airport in 2009 (Eindhoven Airport (2010))

Cost item	Value
Operational costs	€ 8,646,201
Outsourcing	€ 8,249,549
Maintenance	€ 396,652
External costs	€ 3,922,801
External employees	€ 1,506,388
Marketing	€ 944,024
Accounting	€ 618,938
Other external costs	€ 853,451
Employee costs	€ 2,041,873
Salaries	€ 1,526,076
Social lasten	€ 134,854
Pension fund	€ 162,375
Other employee costs	€ 218,568
<b>Total costs</b>	<b>€ 14,610,875</b>