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OPTIMAL FLEET STUDY SELECTION FOR A LOW COST AIRLINE

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Overview

The main objective of this Project is the optimal fleet study selection of a new low cost company.

This Project firstly consists on the research of documentation concerning air traffic statistics. Subsequently the compiled statistics documentation is cross-documented for a further route selection study. The aim is to specify and characterise the air traffic studied to find our airline routes.

Thanks to the stated processes it is then possible to find the final route selection. We will proceed with the route cost calculation which will be the result obtained of a broad number of calculation processes. The last part of the memory describes the optimal fleet and route values, where we will characterise our low cost company making sure that the results obtained are suitable according to the standards of the Project.

The contents of this Project are purely explanative. It describes the established guidelines, the marked objectives, and the difficulties that appeared throughout the entire Project, the techniques to abroad the problems and the results obtained.

Table of Contents

List of Figures

List of Tables

GLOSSARY

LCC	Low Cost Company
WW	World War
EU	European Union
DOC	Direct Operational Costs
IOC	Indirect Operational Costs
AENA	Aeropuertos Españoles y Navegación Aérea
CARG	Compound Anual Average Growth
IATA	International Air Transport Association
ICAO	International Civil Aviation Organization
DMC	Direct Maintenance Costs
IMC	Indirect Maintenance Costs
PAX	Passengers
MTOW	Maximum Take-Off Weight
AIP	Aeronautical Information Publication

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1. INTRODUCTION

In the current airline market state, low cost airlines highlight by offering the lowest fares. To make up for revenue lost in decrease ticket prices, low cost airlines have to be airlines with a lower operating cost structure than their major airline competitors. As low cost carrier business model practices vary widely, we are going to focus on the best fleet study selection under economic criteria in a specified scenario. This study will characterize both our fleet as our company.

1.1 PROJECT OBJECTIVE

The main objective of this project is to find the optimum fleet according to economic criteria for a low cost airline operating in a determined geographical area. We will characterize our low cost to suit it to the actual aviation market.

1.2 PROJECT SCOPE

The present project contemplates the different phases accomplished for the study of the optimum fleet for a low cost airline, describing the best solution for each case. The different phases described are the following:

- Planning and documentation for the project,
- Low cost area of interest to find the suitable routes to be exploited,
- Air traffic statistics in order to know the number of traffic that our airline could manage,
- Direct operational Costs (DOC) and Indirect Operational Costs (IOC) to achieve estimates of ticket price and other economic factors,
- Market comparison by analyzing sale prices of similar low costs in order to place ourselves in the market,
- Low Cost characterization.

All the different described phases will blend together bringing an optimum fleet value under our projects requirements.

1.3 DOCUMENT STRUCTURE

The projects scope stated before, has been structured in different chapters.

In Chapter 2, we give an introduction about the context of the Project. We will explain the planning and documentation process with its key elements and its purpose in order to introduce the reader in project details. This introduction will then help us understand better the work done throughout the Project.

Chapter 3 is dedicated to air transport statistics. We will create an air traffic database in order to state different criteria such as annual air passenger transport operations. Our project will nourish of this database which will be the core of this entire project. This database will be very important because it will give the guidelines of our project.

In Chapter 4, we look for potential locations for our low cost airline based on the possible documentation collection gathered in previous chapters. This will lead to the research of multiple routes where we will need to choose the ones that best suits our airline based on mostly economic factors.

In Chapter 5 we narrow into DOC and IOC. We will explain our airlines direct and indirect operational costs. This costs will mainly be characterized by aeronautical taxes, fuel and leasing. Thanks to this costs we will be able to make our first ticket pricing estimates.

In the next chapter, we obtain the optimum fleet value for a determined aircraft. we will finally give an optimum fleet value which comprises all our project requirements.

In Chapter 7 market comparison takes place. We will need to explain the airlines markets architecture in order to know which place will our airline occupy. We will outline the steps that our airline will follow for maximum capital estimate and expectation gain.

Chapter 8 brings the Projects conclusions, where we will state the viability of our airline and show our initial and final project planning.

2. AIRLINE HISTORY

2.1 KEYNESIAN ECONOMIC POLICIES FOLLOWED BY MONETARY ECONOMIC POLICIES.

Airline history can be explained thanks to a milestone that changed the future of airline companies. The end of the second World War produced the decolonization of many countries, which produced the upraising of new government companies to unify these countries. Until the early 80s, most airlines dedicated to international routes of passenger traffic were mostly owned by the state governments, which absorbed company losses. This air transport development period was ruled by keynesian economic policies, which followed the following formula,

$$C + I + G + X - M = Y(GDP)$$

Figure 1: Keynesian Formula

which means: Consumption + Investment + Government spending + Exports – Imports = Gross Domestic Product.

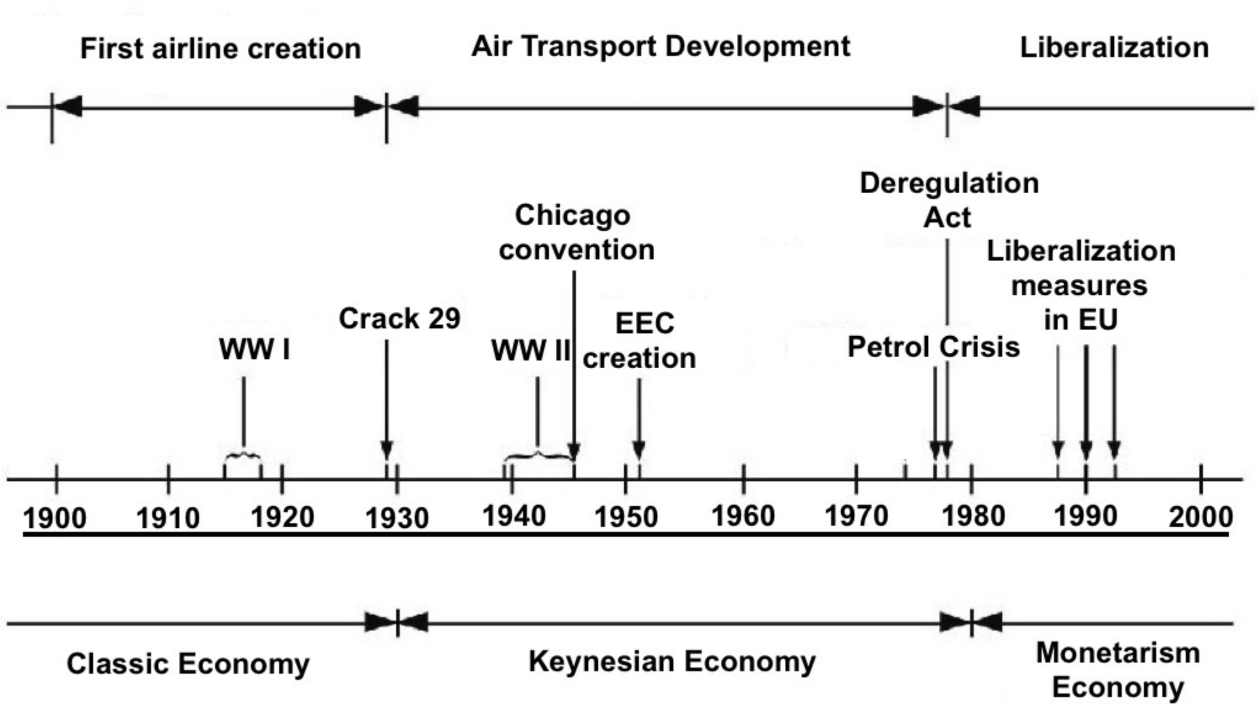


Figure 2: Air Transport Timeline

In the 80s, after the derregulation act milestone, the west economic orientation changed from keynesian to monetarism. This changed the way of understanding economic labor and social relations. Both public and private companies, gradually realized that they had to compete in a market where the product demand was not guaranteed. Consequently and for the sake of economic productivity, large traditional airlines had to become more competitive. To become more competitive some changes had to be established, as for example:

- Partition of the company in different sectors. Normally divided in maintenance, handling and sales sectors,
- Job elimination with job productivity increase for the remaining places,
- Outsourcing,
- Progressive sale offices closure.

2.2 LOW COST COMPANIES (LCC)

This way of understanding air transport was born with the United States company Southwest Airlines under Herbert Kellehers initiative, who was the founding president of the company and the concept inventor. Southwest Airlines was created in 1967 in Texas after overcoming legal problems with competitor airlines, began operating in 1971.

Figure 3: Southwest Airlines Company Logo

As important data, we can highlight the fact that this company has very low operating costs; between 25% - 40% lower than those of its competitors. It has never regarded losses, Southwest continued producing profits even in the 91-94 crisis, which produced a loss of 13,000 million dollars to United States airlines.

This business model can be described reviewing the Southwest Airlines strategy, which is based on 10 basic principles:

1. Secondary airports choice with good major cities conection,
2. Use of a single model of aircraft. This single model selection allows you to save money on pilot training, maintenance and high aircraft buying cost due to large number of units purchased at the same time, etc. In this project we are going to find the optimum fleet value for our LCC. Southwest Airlines, like many other low cost airlines, use exclusively the Boeing B737, although there is also a strong presence in the market of the Airbus A320,
3. Intense aircraft use. Aproximately two hours more per day than its competitors,
4. Unique cabin class. No separation between business and economic seats. Free seating criteria,
5. No extras provided during flight to passengers,
6. Internet or phone ticket sales,
7. Very low fare rates and high frequency routes. The selected routes are those that have little competition, where Southwest Airlines can quickly get a large part of the market with its policy of low rates and high frequencies,
8. Competition with other transportation modes, especially the bus. The middle range is short; aproximately 750km,
9. Highly motivated employees,
10. Salaries are competitive and benefits are distributed among employees.

In Europe, low cost companies such as; Ryanair, Virgin Express, Spanair, Easyjet, Air Berlin, are currently the fastest growing companies. We need to diferentiate between Ryanair and the other low cost companies due that Ryanair is a pure low cost more likely as Southwest Airlines.

Europe's low cost model, except for Ryanair, is different to the Southwest Airlines followed model, on these three cases:

1. Cabin service, however minimum, is given and charged to the passenger,
2. Existence of preferential seats in some companies such as wider seats,
3. Employees apparently less motivated than in the Southwest Airlines case.

3. AIR TRANSPORT STATISTICS

In this chapter we will try to assess and classify the existing air transport statistics market, to find where there will be more possibilities for our airline to obtain better economic results. This will be managed by controlling as many air traffic as possible. In order to find an optimization fleet value for our low cost airline we need to know the number of air passengers that are transported, or thought to be transported between two studied airports in a given year. Due to the lack of european air transport statistics available we had to dismiss our first idea of having international flights; a form of commercial flight within civil aviation where the departure and the arrival take place in different countries.

After that first setback we focused on domestic flights; a form of commercial flight within civil aviation where the departure and the arrival takes place in the same country. We chose Spain to be the country for our LCC mainly thanks to the plentiful statistics that can be drawn from Aena.

3.1 SPANISH AIR TRAFFIC STATISTICS

Aena is the spanish acronym for “Aeropuertos Españoles y Navegación Aérea”, literally Spanish Airports and Air Navigation. It is the Spanish public body that owns and operates the majority of airports in Spain and is also responsible for Air Traffic Control throughout Spain. In its web page we can find the evolution of the numbers of passengers, flights and cargo handled for the different owned airports.

Our goal after looking into the spanish air traffic statistics was to find air routes where our airline could operate by:

- Competing with other airlines on an existing route,
- Creating new routes,
- Continue operating a route that an airline has dismissed.

3.2 2012 SPANISH ANNUAL ROUTE TRAFFIC STATISTICS

The first thing done in order to find air routes where our low cost company could operate was to manage a table where we could show the annual traffic per route for the 46 different spanish airports studied and the airlines operating that air traffic.

The next figure shows an extract of the table where the anual 2012 traffic statistics between two different airports is shown for regular domestic flights. For example we can see that 306.792 passengers flew from Bilbao to Barcelona, and 304.524 flew from Barcelona to Bilbao.

DEPARTURES/ARRIVALS	A Coruña	Albacete	Alicante	Almeria	Asturias	Badajoz	Barcelona-El Prat	Bilbao
A Coruña	44						91.130	
Albacete								
Alicante					2.552		201.911	21.708
Almeria							29.905	178
Asturias			2.258		134		175.215	
Badajoz							18.969	
Barcelona-El Prat	91.493		207.327	30.025	177.320	18.840	369	304.524
Bilbao	101		21.215				306.792	

Table 1: 2012 Air Traffic Statistics

In order to understand the previous figure, the next figure shows the different companies that operate on a specific route. Following the above example we can see that the based airline companies for the Bilbao-Barcelona route are: Vueling, Iberia and Ryanair. We can also see that for example 2.258 passengers flew from Asturias to Alicante and no airline is based for that route.

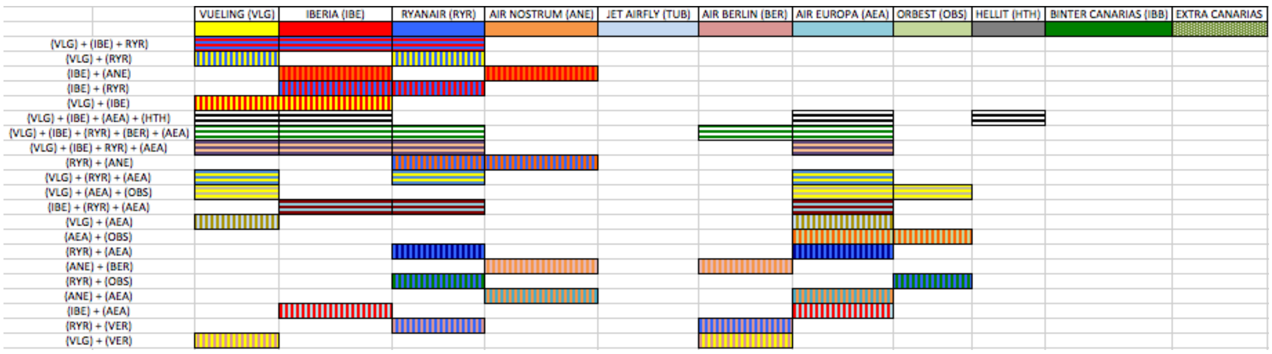


Table 2: Airlines Operating per Route

Therefore our first approximation is to see if there is a high number of air traffic which has no based airline as at the Asturias to Alicante Route.

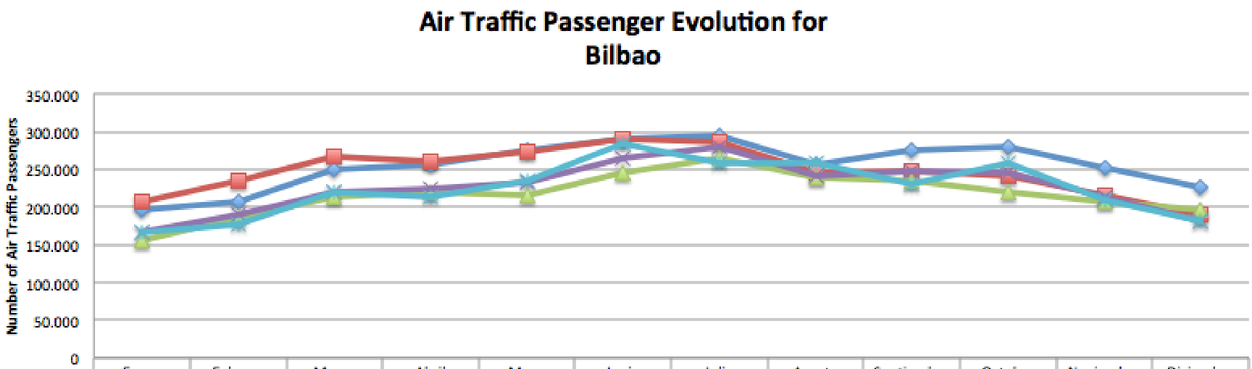
What we discovered was that 3,1% of Spains air traffic was not covered by any airline.

This means that we could handle 1.015.837 passengers. Despite of being an interesting value, it is formed by the sum of many routes that have no airlines based therefore the traffic per route is very low.

Another thing that we detected was that Bilbao and Ibiza were the airports that had the highest values of air traffic that was not served by any airlines. Talking about Ibiza this is normal because there are many tour operators that charter flights to the island and mostly for summer. After trying to understand why Bilbao was one of the highest I discovered that it was because Ryanair had started to not operate on some routes from Bilbao.

Therefore, after documentating about this, I perceived that Ryanair was not going to operate more on Asturias and Bilbao airports and Gerona for domestic flights due to Aena tax rise.

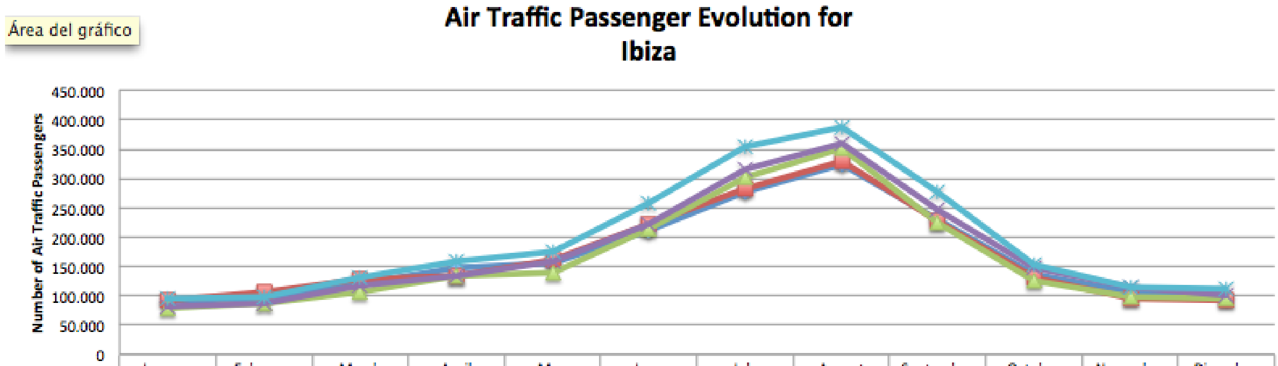
The next step was to chart the air traffic passenger evolution per month for the different airports from 2007 until 2011. The next figures show this evolution for Bilbao and Ibiza airports for the stated year range.



	Enero	Febrero	Marzo	Abril	Mayo	Junio	Julio	Agosto	Septiembre	Octubre	Noviembre	Diciembre
2007	196.027	207.668	250.750	256.171	275.721	289.999	294.252	257.342	274.667	280.426	252.465	226.526
2008	206.721	235.950	266.741	260.979	273.280	291.587	286.623	244.653	246.781	241.540	215.885	189.533
2009	155.539	186.287	212.740	219.104	216.696	246.541	264.231	239.420	234.373	220.074	206.127	197.168
2010	167.081	189.272	218.929	223.555	233.620	265.701	279.498	241.826	248.436	245.342	214.288	180.379
2011	166.049	178.131	220.501	214.000	234.488	284.912	257.902	257.968	230.418	257.968	210.287	182.439

Figure 4: Air Traffic Passenger Evolution for Bilbao Airport

From the air traffic passenger evolution for Bilbao airport we can state that the air traffic for regular domestic flights during these past years has remained constant and there is no big variation between different months or stations as winter or summer.



	January	February	March	April	May	June	July	August	September	October	November	Dicember
2007	90.935	95.908	120.179	147.179	156.189	211.584	276.356	324.105	231.367	137.973	106.266	99.264
2008	92.322	105.735	128.735	133.617	162.245	220.849	282.129	328.469	227.418	131.477	96.439	93.706
2009	79.095	87.456	105.240	134.240	139.674	214.500	302.090	352.559	224.025	124.784	98.768	96.107
2010	81.864	88.422	116.496	135.084	157.329	221.786	315.466	359.856	246.857	146.613	113.703	101.128
2011	94.174	97.507	131.946	157.911	176.361	256.929	353.799	387.128	276.259	152.350	115.900	111.828

Figure 5: Air Traffic Passenger Evolution for Ibiza Airport

In the other hand, if we analise the air traffic passenger evolution for Ibiza we can see that each year the traffic has rised and there is a very big difference between summer where it has its maximum annual peak, and winter. Considering winter months to be: October, November, December, January, February and summer months to be May, June, July, August and September in the next figure we can see the seasonality in the sum of the air traffic passengers.

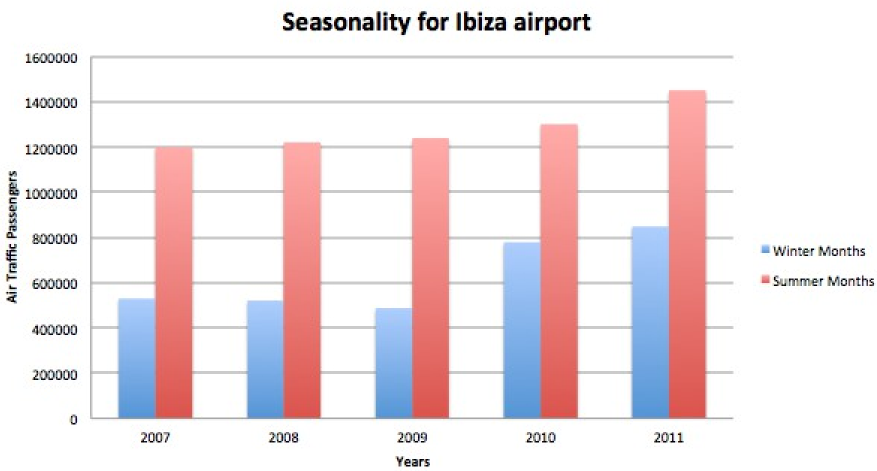


Figure 6: Seasonality for Ibiza Airport

The summer months nearly doble in air traffic passengers the winter months, therefore we can state that Ibiza is a holiday destination and Bilbao a more regular destination.

3.3 2012 SPANISH MONTHLY AIRPORT STATISTICS

From Aena statistics we have obtained the monthly air passengers traffic for 2007 to 2011 year range and the 2012 traffic per route. We could not obtain the monthly air passenger traffic for 2012. As we know the amount of passengers that departure and arrive from each different airport and the total value we could calculate the monthly rate for 2012.

In order to calculate and elaborate the prediction of 2013 air traffic there are three main methologies recommended by IATA that can be followed:

- From historical air traffic series: horizons are extrapolated from existing airports to study historical trends.
- Qualitative techniques: estimation of the potential passenger traffic from the objective air target market. This is used for new airports.
- Causal methods: Econometric models, regression and weighting models identify socio-economic variables that influence the growth or decline in traffic. We will need the historical trends of socio-economic data. We will also need to relate mathematically the socio-economic variables with traffic demand and predict the socio-economic trends.

The historical air traffic series methology is based on the collection and preparation of historical databases where the demand parameters are to be estimated for a current most recent scenario available. The historical data for some or all parameters has to be found, at least the past 5 years. As we have the historical air traffic series for our airports thanks to aena statistics we will only need to extrapolate the historical data to a horizon scenario.

In order to extrapolate we can use the following:

- An estimation of the trends of variation (% annual growth) of different traffic parameters, from the series of the past 5 years.
- Use the CARG (compound annual average growth).

As we have the historical series of the past 5 years we could manage to obtain the %

annual growth for each different airport being studied. For example the % annual growth for Ibiza is 2,8.

The next table shows the 2013 air traffic passenger estimation for the Bilbao route. If we compare with the 2012 we can see a 2,759 % annual growth estimation value.

ROUTE BILBAO - BARCELONA		ANNUAL TRAFFIC
Jaunary	7,14%	22.358
February	7,53%	23.552
March	8,68%	27.149
April	8,46%	26.467
May	8,63%	27.018
June	9,06%	28.353
July	9,64%	30.164
August	8,96%	28.037
September	8,83%	27.641
October	8,54%	26.713
November	7,50%	23.469
December	7,03%	22.007
	100,00%	312.928

Table 3: 2013 Air Traffic Passenger Estimation for Bilbao-Barcelona-El Prat Route

3.4 ACTUAL SPANISH DAILY ROUTES

After searching for the annual and monthly air traffic statistics is time to focus on the daily current routes (15/04/2013). This is important in order to characterize each type of flight. It is helpful to know if a certain route has mainly business or leisure passengers, for example, because then we can program the weekly flight days. This information can also be useful in order to know the amount of aircrafts actually being used for the different routes. As an example, the following figure shows the daily Bilbao to Barcelona routes.

eparture T	Arrival Tim	Flight Estimation Tin	Departure	Arrival	Mon	Tuesd	Wednesd	Thurs	Frida	Saturd	Sunda	Flight
07:05	08:10	01:05	Bilbao	Barcelona-El Prat	L	M	X	J	V	S		Vueling 1439
07:55	09:00	01:05	Bilbao	Barcelona-El Prat	L	M	X	J	V			Vueling 1431
08:45	09:50	01:05	Bilbao	Barcelona-El Prat	L	M	X	J	V			Vueling 1421
11:45	12:50	01:05	Bilbao	Barcelona-El Prat							D	Vueling 1427
16:00	17:05	01:05	Bilbao	Barcelona-El Prat						S		Vueling 1441
16:30	17:35	01:05	Bilbao	Barcelona-El Prat	L	M	X	J	V			Vueling 1427
18:05	19:10	01:05	Bilbao	Barcelona-El Prat	L			J	V		D	Vueling 1441
19:25	20:30	01:05	Bilbao	Barcelona-El Prat	L	M	X	J	V		D	Vueling 1423
08:10	09:15	01:05	Bilbao	Barcelona-El Prat			X					Ryanair 7334
12:25	13:30	01:05	Bilbao	Barcelona-El Prat	L	M		J		S	D	Ryanair 7334
12:40	13:45	01:05	Bilbao	Barcelona-El Prat					V			Ryanair 7334
22:05	23:10	01:05	Bilbao	Barcelona-El Prat	L	M	X	J	V	S	D	Ryanair 7336

Table 4: Daily Bilbao - Barcelona-El Prat routes

4. ROUTE SELECTION

In this chapter we are going to use the results obtained in chapter 3 air traffic statistics in order to select our possible airline routes. We know that the low cost airline Ryanair is not going to operate anymore in Bilbao, Asturias and neither in Girona for domestic flights. Therefore there is a high air traffic demand that has been left free to use, and where we can possibly establish our airline routes.

4.1 ROUTE SELECTION POSSIBILITIES

As only 3,1% of the spanish annual air traffic is free from an airline operating, the best thing is to focus on the air traffic left by Ryanair. First of all we need to see the routes that Ryanair is not operating anymore. We are going to focus on these 3 airports:

- Asturias,
- Bilbao,
- Gerona.

DEPARTURES/ARRIVALS	Asturias	Bilbao	Girona
A Coruña			
Albacete			
Alicante	2.552	21.708	
Almeria		178	
Asturias	134		
Badajoz			
Barcelona-El Prat	177.320	304.524	134
Bilbao			
Burgos			
Córdoba			
El Hierro			
FGL Granada-Jaén			
Fuerteventura	2.921	8.003	
Girona			1
Gran Canaria	8.045	46.768	
Huesca-Pirineos			
Ibiza	5.497	34.869	14.189
Jerez de la Frontera		3.186	
La Gomera			
La Palma		1.042	
Lanzarote	15.044	59.234	
León			
Logroño			
Madrid-Barajas	263.317	418.459	66.681
Madrid-Cuatro Vientos			
Madrid-Torrejón			
Málaga-Costa del Sol	5.228	78.950	
Melilla			
Menorca	2.464	30.016	
Murcia-San Javier			
Palma de Mallorca	47.780	80.607	30.764
Pamplona			
Reus			
Sabadell			
Salamanca			
San Sebastian			
Santander	261	161	
Santiago		20.683	
Sevilla	357	111.746	
Son Bonet			
Tenerife Norte	321	56.307	
Tenerife Sur	27.313	14.984	
Valencia	9.886	33.971	
Valladolid			
Vigo		6.954	
Vitoria			
Zaragoza			
TOTAL	568.440	1.332.350	111.769

Table 5: 2012 Air Traffic Statistics for the Asturias, Bilbao and Gerona Airports

The above figure shows the 2012 air passenger traffic that arrived to the three airports mentionned. To know what airline is operating Table 2 can be used.

4.1.1 ASTURIAS POSSIBLE ROUTE SELECTION

From the above figure we can state the different possible route selection. As we can see there are four routes where Ryanair was operating, these routes are the following:

Departure	Arrival	2012 Annual Air Passenger Traffic	Airlines
Asturias	Barcelona-El Prat	175.215	Vueling, Iberia, Ryanair
Barcelona-El Prat	Asturias	177.320	Vueling, Iberia, Ryanair
Asturias	Gran Canaria	8.061	Ryanair
Gran Canaria	Asturias	8.045	Ryanair
Asturias	Madrid-Barajas	262.616	Iberia, Ryanair
Madrid-Barajas	Asturias	263.317	Iberia, Ryanair
Asturias	Tenerife Sur	27.319	Air Europa, Ryanair
Tenerife Sur	Asturias	27.313	Air Europa, Ryanair

Table 6: Asturias Possible Route Selection 1

There are two very good routes with a high traffic demand. These are the Barcelona and Madrid routes.

There is also another good route that is only operated by one airline company. This route is interesting because we could compete with the airline. This route is the following:

Departure	Arrival	2012 Annual Air Passenger Traffic	Airlines
Asturias	Palma de Mallorca	46.371	Air Berlin
Palma de Mallorca	Asturias	47.780	Air Berlin

Table 7: Asturias Possible Route Selection 2

4.1.2 BILBAO POSSIBLE ROUTE SELECTION

We are going to follow the same principle as we did for the Asturias route selection. We are going to state all the possible routes. First of all the routes that were operated by Ryanair.

Departure	Arrival	2012 Annual Air Passenger Traffic	Airlines
Bilbao	Barcelona-El Prat	304.524	Vueling, Iberia, Ryanair
Barcelona-El Prat	Bilbao	306.792	Vueling, Iberia, Ryanair
Bilbao	Madrid-Barajas	418.020	Iberia, Air Europa, Ryanair
Madrid-Barajas	Bilbao	418.459	Iberia, Air Europa, Ryanair

Table 8: Bilbao Possible Route Selection 1

Both routes have a very high demand which makes both routes to be a very good goal for our airline to achieve. There are also other good routes to take into account:

Departure	Arrival	2012 Annual Air Passenger Traffic	Airlines
Bilbao	Ibiza	34.447	-
Ibiza	Bilbao	34.869	-
Bilbao	Málaga	77.759	Vueling
Málaga	Bilbao	78.950	Vueling
Bilbao	Palma de Mallorca	79.537	Air Berlin
Palma de Mallorca	Bilbao	80.607	Air Berlin
Bilbao	Menorca	30.309	-
Menorca	Bilbao	30.016	-

Table 9: Bilbao Possible Route Selection 2

There are two routes where we could manage the 100% of the air passenger traffic; Ibiza and Menorca. There are also two other routes where only one airline is operating and we could compete with them.

4.1.3 GIRONA POSSIBLE ROUTE SELECTION

For the possible route selection for Girona airport we can see that all routes selected have no airlines operating therefore we can operate the 100% of the demand.

Departure	Arrival	2012 Annual Air Passenger Traffic	Airlines
Gerona	Ibiza	13.419	-
Ibiza	Gerona	14.189	-
Gerona	Madrid-Barajas	64.783	-
Madrid-Barajas	Gerona	66.681	-
Gerona	Palma de Mallorca	29.613	-
Palma de Mallorca	Gerona	30.764	-

Table 10: Girona Possible Route Selection

4.2 FINAL ROUTE SELECTION

The strategy of a low cost airline is to use secondary airports which presumably will have lower tax rates than primary airports as going to be seen in chapter 5. We can see that our possible route selection includes 2 primary airports; Barcelona and Madrid, and 9 secondary airports; Asturias, Bilbao, Gerona, Menorca, Palma de Mallorca, Ibiza, Málaga-Costa del Sol, Gran Canaria and Tenerife Sur. We need to know how much air traffic we will handle for further fleet optimization values. Therefore we have to study the % air traffic that we aim to control. The next table shows the % air traffic for a certain route with the actual operating airlines. We will aim to operate for example in the Asturias – Madrid route 33% of the air traffic which is the percentage Ryanair was operating before they left Asturias airport.

Route		Established Airlines			% Air Traffic Aim
Asturias, Bilbao	Barcelona-El Prat	Vueling	Iberia	Ryanair	30%
Asturias	Madrid-Barajas	Iberia		Ryanair	33%
Asturias	Tenerife Sur	Air Europa		Ryanair	50%
Asturias, Bilbao	Palma de Mallorca	Air Berlin			50%
Bilbao	Madrid-Barajas	Iberia	Air Europa	Ryanair	25%
Bilbao	Málaga-Costa del Sol	Vueling			40%
-	-	-			100%

Table 11: % air traffic per route with the actual operating airlines

4.2.1 ASTURIAS FINAL ROUTE SELECTION

We are now going to analize the 5 different preselected routes which involve Asturias airport. We are not going to operate to Gran Canaria because this route had a very low 2012 air traffic demand. Therefore we have the following 4 routes:

- Madrid-Barajas – Asturias,
- Asturias – Tenerife Sur,
- Asturias – Barcelona-El Prat,
- Asturias – Palma de Mallorca.

With the % air traffic that we aim to control we obtain the amount of passengers that we are going to handle per route. This number is shown in the next figure. We can see that the Madrid-Barajas – Asturias route is the one with the highest value.

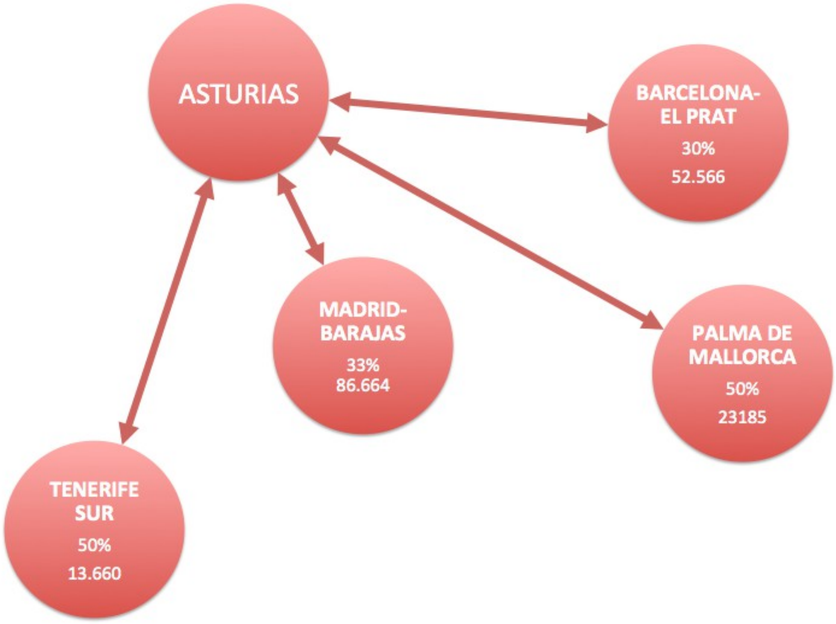


Figure 7: Asturias Routes

If we do a simple calculation we can verify that all the Madrid-Barajas – Asturias demand is nearly the same value as the sum of the other demands.

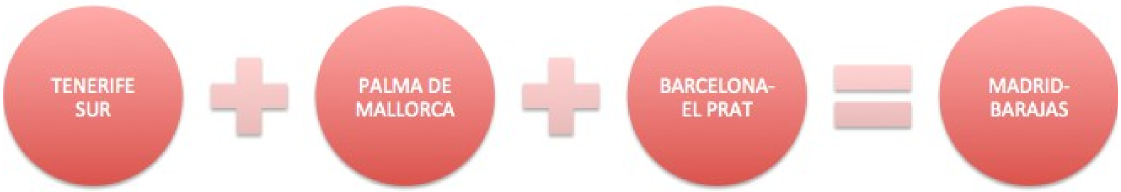


Figure 8: Asturias Route Demands

13.660 + 23.185 + 52.566 ≈ 89.411

We know that Madrid-Barajas demand is 86.664 very similar to the sum of the other 3 routes. We have obtained this coincidence by chance.

The optimum Asturias final route selection is to make all flights start from Madrid-Barajas and fly to Asturias. Then they could fly to the 3 other destinations and come back to Asturias and then finally fly back to Madrid-Barajas.

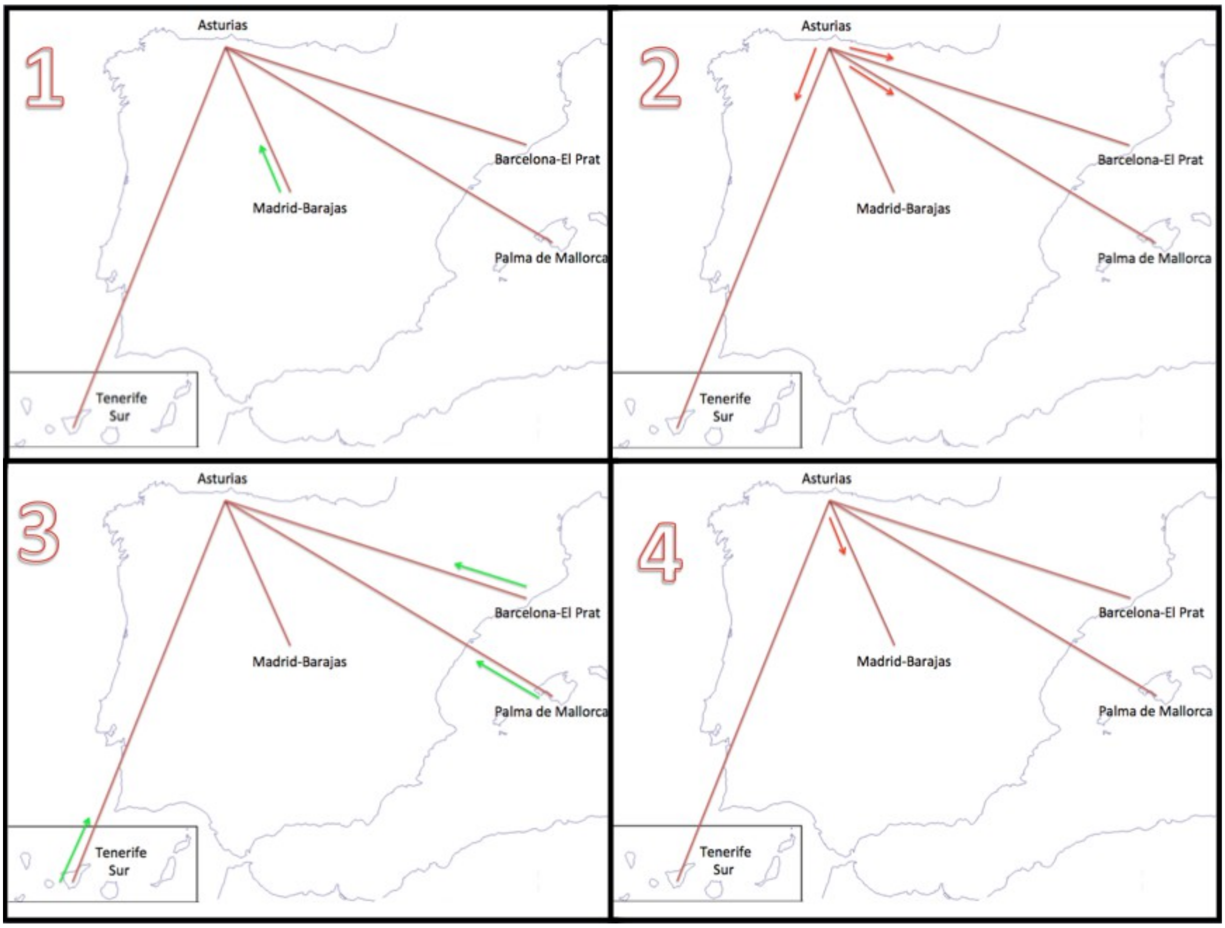


Figure 9: Asturias Route Directions

4.2.2 BILBAO FINAL ROUTE SELECTION

We are now going to analize the 5 different preselected routes which involve Bilbao airport. We are going to follow the same procedure as in the Asturias final route selection. We are going to study all 6 routes preselected. These routes are:

- Madrid-Barajas – Bilbao,
- Bilbao – Barcelona-El Prat,
- Bilbao – Ibiza,
- Bilbao – Palma de Mallorca,
- Bilbao – Málaga-Costa del Sol,
- Bilbao – Menorca.

We know the % of air traffic that we aim to control therefore we can try to see if the Madrid-Barajas – Bilbao demand is the same as the sum of the other routes, as done before for Asturias.

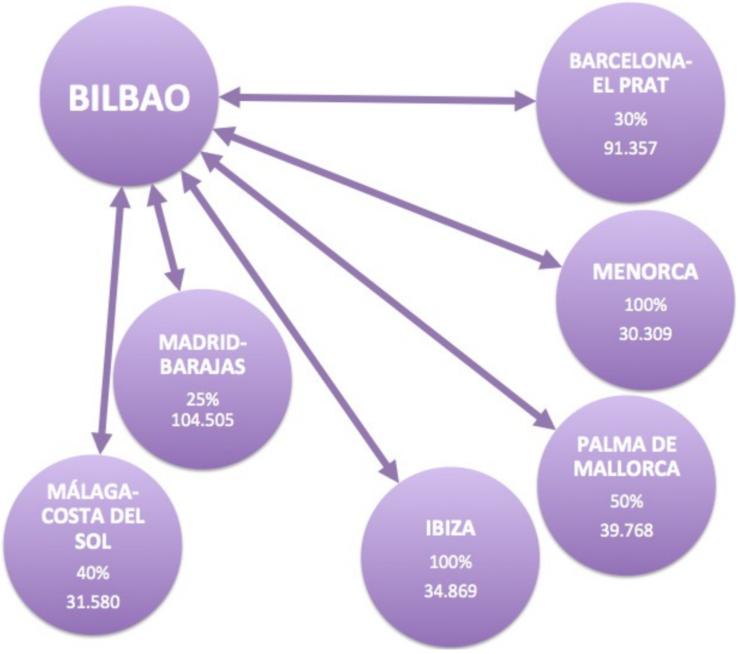


Figure 10: Bilbao Routes

Figure 11: Bilbao Route Demands 1

91.357 + 34.869 + 39.768 + 31.580 + 30.309 ≠ 104.505

The addition of all the other airport demand is 227.883. The demand of Madrid-Barajas air traffic is 104.505 so this time the approximation is not valid. We can see that there is a big demand on 2 routes; Madrid-Barajas – Bilbao and Barcelona-El Prat – Bilbao. The second approximation is to leave apart Barcelona-El Prat and see if the sum of the other airports are similar to Madrid-Barajas demand.

Figure 12: Bilbao Route Demands 2

34.869 + 39.768 + 31.580 + 30.309 ≠ 136526

This second approximation as the first one does not give a similar value to the demand of madrid-Barajas air traffic.

So our final solution is to use the route Barcelona-El Prat – Bilbao to be independent to Madrid-Barajas due to the high demand that it has. Then the optimum Bilbao final route selection is to fly from Madrid-Barajas to Bilbao. Then those aircrafts would fly to Ibiza, Palma de Mallorca, Málaga-Costa del Sol and Menorca. They will fly back to Bilbao and eventually to Madrid-Barajas. In the other hand, there will be aircrafts that will fly from Barcelona-El Prat to Bilbao. Some flights will come back to Barcelona-El Prat and others will fly to Ibiza, Palma de Mallorca, Málaga-Costa del Sol and Menorca. Finally they will fly back to Bilbao and then to Barcelona-El Prat. The following figure explains it graphically:

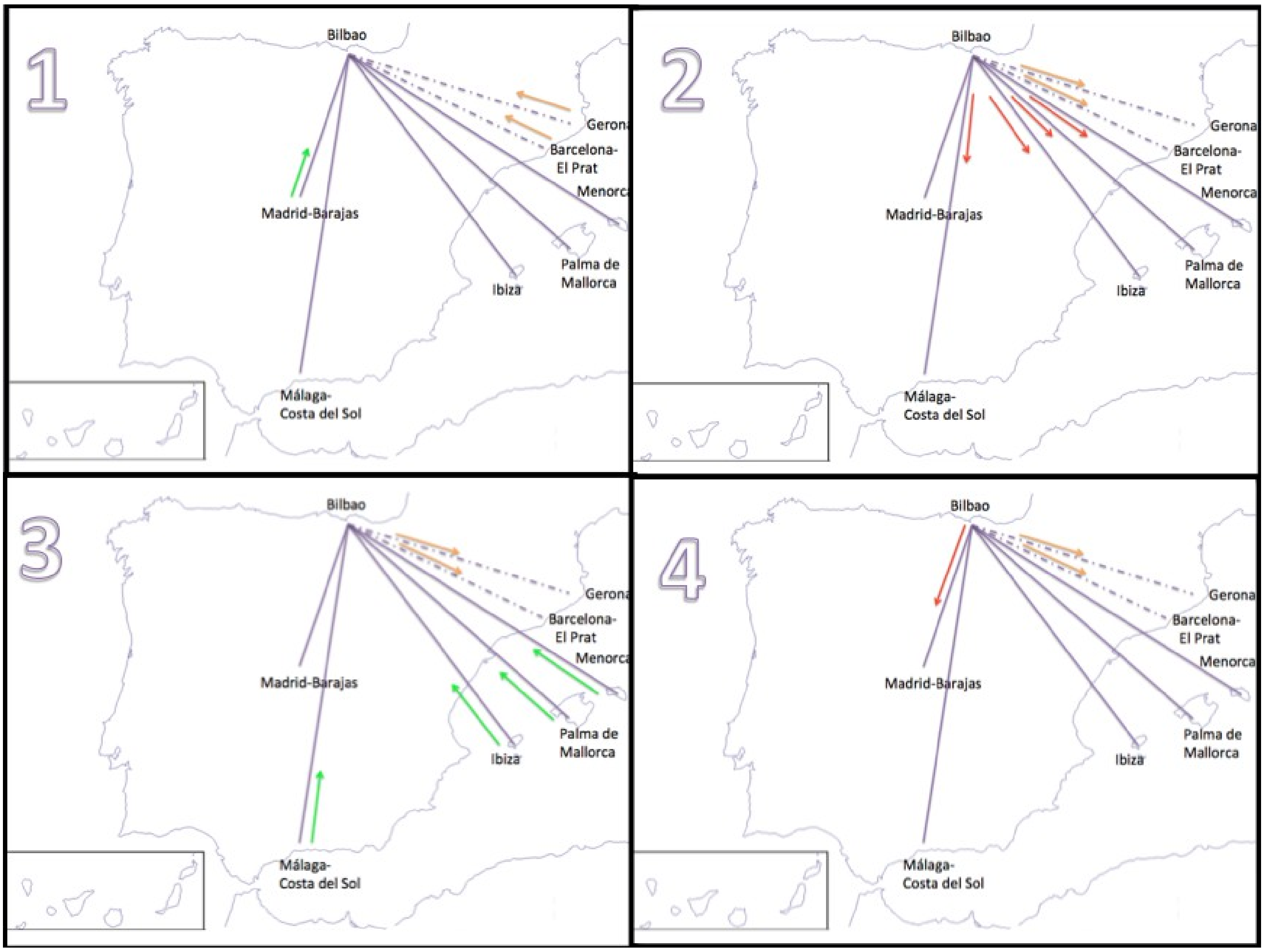


Figure 13: Bilbao Route Directions

4.2.3 GIRONA FINAL ROUTE SELECTION

For Girona final route selection there are no airlines operating in any of the preselected routes therefore we can operate the 100% of the demand. Following the same approximation done in the previous cases we reach to the conclusion that:

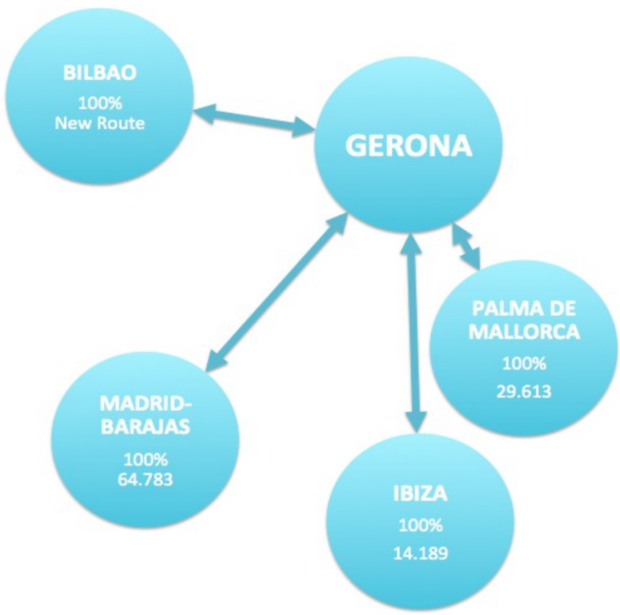


Figure 14: Girona Routes

Figure 15: Girona Route Demands

13.419 + 29.613 ≠ 64.783

We have the same problem as in the Bilbao final route selection case. We have more demand on the Madrid-Barajas – Girona route than in the Girona – Ibiza and Girona – Palma de Mallorca routes.

Our solution is to create a new non existing route from Girona to Bilbao knowing that we have also a high demand route from Barcelona-El Prat to Bilbao. By creating this route we can satisfy Bilbaos air traffic demand as done with the Barcelona-El Prat – Bilbao route.

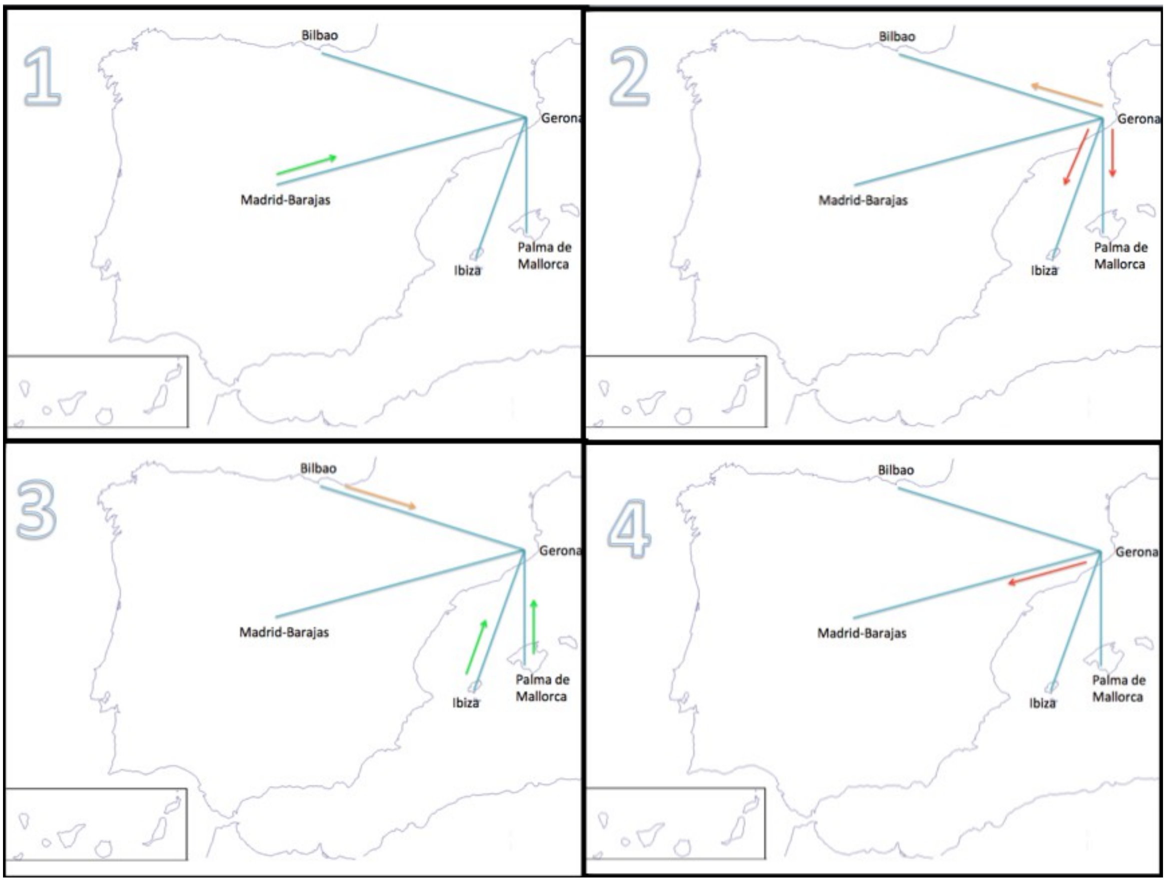


Figure 16: Girona Route Directions

4.2.4 BARCELONA FINAL ROUTE SELECTION

This route as explained in Bilbao final route selection is the only independent route from Madrid-Barajas. All the other routes have in common that all the aircrafts depart from Madrid-Barajas. The aircrafts of this route are the only ones that sleep at Barcelona-El Prat airport while as known all the other sleep at Madrid-Barajas airport. This route as the Girona – Bilbao route helps to fulfill Bilbaos demand.

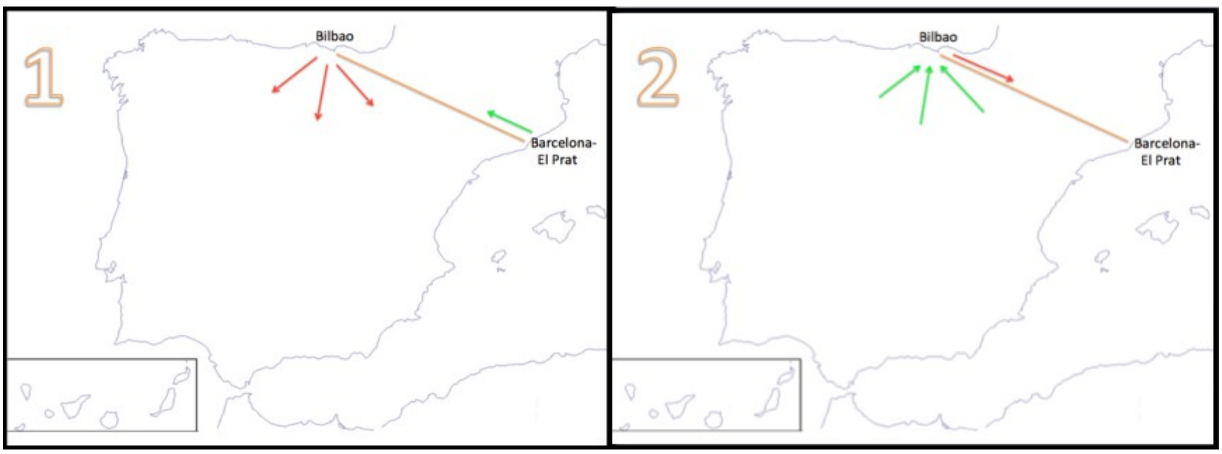


Figure 17: Barcelona Route Directions

5. COSTS

In order to find an optimum fleet value we need to focus on our low cost airline costs. The economic costs calculation is a necessity in any company. We need to break down costs in order to measure the effectiveness of each of the areas in which the company can divide. The breakdown of costs vary from one airline to another according to the accounting characteristic of the country of origin, however, all airlines are conditioned in some way by the classification of costs established by ICAO. This fact is established by the obligation of the member countries of this organization to provide an annual financial data report. ICAO distinguishes costs in two main blocks:

- Operating costs,
- Not operating costs.

Operating costs are those related to the service provided by the airplanes and the ones we are going to focus on, ie, tax navigation payment. While not operating costs are related to the airlines financial operations, ie, transactions involving money movements.

5.1 OPERATING COSTS

Operating costs are subdivided into direct operating costs (DOC) and indirect operating costs (IOC).

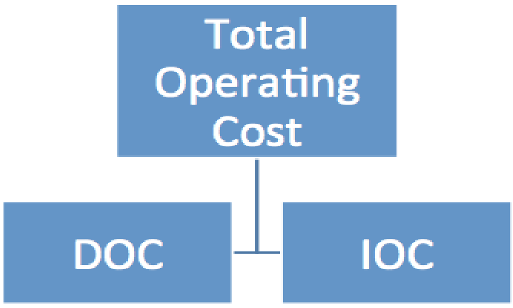


Figure 18: Total Operating costs

Direct operating costs relate to the aircrafts operation, therefore with the fleet, while, indirect operating costs are those related to the airlines operation not involving the aircraft, therefore to the operation. From now on we are going to use the acronyms.

As mentioned before there are several ways to set and charge the breakdown of the costs of an airline. The next table shows the two different methods of cost allocation for operating costs with an afterwards description of each.

DOC	IOC
Fuel	Handling
Flight Crew	Passenger services • Catering
Cabin Crew	Ticketing, sales and promotion
Landing Fees	General and administrative
Navigation Fees	
Insurance	
Maintenance • Direct • Burden	
Ownership • Interest (non operating) • Depreciation (non cash) • Leasing	
• Handling (aircraft)	

Table 12: DOC and IOC

From now onwards on this chapter we are going to calculate our direct operational costs to quantify an aproximate value in order to know the expenses incurred by the aircraft for the selected routes.

5.2 FLEET ANALYSIS

For the following cost analysis we have chosen ten different aircrafts in order to find which one will be the best in economic terms by being the aircraft with lowest costs of operation.

AIRCRAFT	MTOW (Kg)	1 CLASS SEATS
Boeing 737-800	79000	189
Airbus A320-200	78000	180
Airbus A319-100	75500	156
Airbus A321-200	93500	220
ATR 72-500	22800	74
Boeing 777-200ER	297550	440
Mc-Donnell Douglas MD-88	67813	172
CRJ 200ER	22995	50
Embraer ERJ 145 EP	20600	50
ATR 42-200	18600	50

Table 13: Aircraft Analysis

In order to find and choose these aircrafts what we did was to search which type of fleet were using different low costs. After this search whe could tell that most of them used the two first models; the Boeing 737-800 and the Airbus A320-200. We also choosed the Boeing 777-200ER to compare the results with an aircraft not used by low cost to try to find out why.

5.3 FUEL COST

The fuel cost as we know is subjected to fluctuations due to political situations. Therefore we can reply to these type of situations with two different strategies:

- Hedging: We buy fuel in advance at a fixed price, delaying the fuel price increase effect if there is one. If the price drops, we have chosen a bad strategy because we will lose money.
- Tankering: This strategy is about refueling on those airports where fuel is cheaper. As our area of interest is Spain the fuel price difference will not be so big as if we had long intercontinental routes where fuel price, as for example in the gulf, is way cheaper.

Other reducing fuel options are:

- The use of more efficient aircrafts,
- Adequate network and operation design (level flight, cruise speed, etc.),

For the study of JET-A1 actual fuel price made on the 15th of February, 2013 the global average price paid at the refinery for aviation JET-A1 was $\$3{,}293/gal$:

15 Feb 2013	Share in World Index	cts/gal	$/bbl	$/mt	Index Value 2000=100	vs. 1 week ago	vs. 1 month ago	vs.1 yr ago
Jet Fuel Price	**100%**	**329.3**	**138.3**	**1090.1**	**378.1**	**-1.1%**	**6.5%**	**2.5%**

Table 14: Jet Fuel Price (IATA Platts)

We know that $1\ US\ Dollar\ per\ US\ gallon = 0{,}200708139€\ per\ litre.$ So therefore:

$$\$3{,}293/gal * 0{,}200708139€/litre = 0{,}668€/litre$$

For our study we will use the hedging strategy basing our fuel price on $0{,}668\,€/litre$.

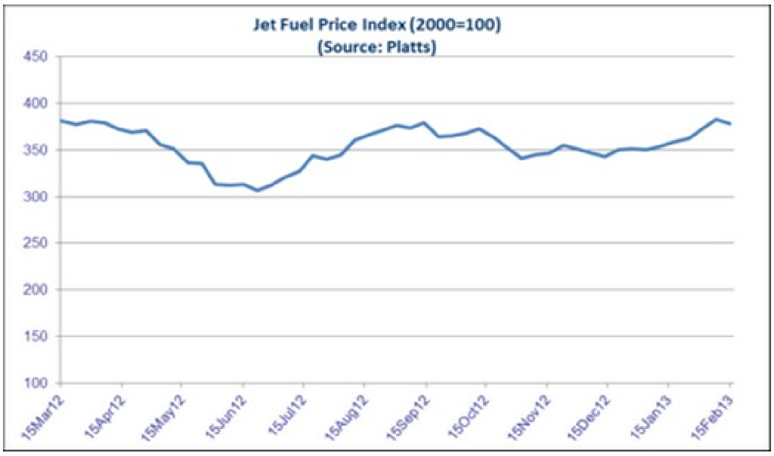


Figure 19: Jet Fuel Price for the Past 6 Months (IATA Platts)

Taking a look at the price action over the six past months we can see that the fuel price has not undergone significant changes.

Now taking a longer term view perspective of price movements we can see that since January 2009 when the jet fuel price was on its lowest value the fuel price has increased 3,5 times its costs. We can see that the progression is to continue increasing.

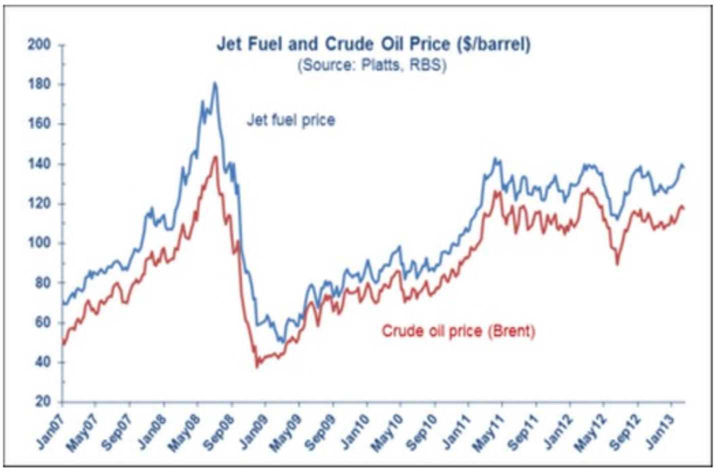


Figure 20: Jet Fuel Price for the Past 6 Years (IATA Platts)

5.4 ESTIMATED FUEL USAGE COST

In this section we are going to calculate the estimated fuel usage cost for the ten different airplanes for chapter 4.

In order to calculate the estimated fuel usage cost, we first need the estimated fuel usage for each route for each different airplane. The next figure is an example showing the estimated fuel usage. In this case, the aircraft used is an AIRBUS A319-100 for a Madrid-Barajas - Asturias route. From this spreadsheet we can see that the estimated fuel usage is 1956 kg and the reserve fuel is 2705 kg, so therefore there is 4662 kg of fuel on board. The loadsheet of the next figure is obtained by an advanced flight simulaton fuel planning at the next web page *http://fuelplanner.com/index.php*

```
====================================================================
L O A D S H E E T          CHECKED       APPROVED              EDNO
                                                                  0
ALL WEIGHTS IN KILOGRAMS

DATABASE JUN/12 // AIRBUS A319-132 (V2524-A5 ENGINES)

FROM/TO        FLIGHT      A/C-REG      VERSION    CREW   DATE     TIME
LEMD/LEAS      2005        __FRR        12JN21     2/03   26APR13  1524

                         WEIGHT  DISTRIBUTION
LOAD IN COMPARTMENTS     001405   B103/13
PASSENGER/CABIN BAG      009729   Y110/88
                                           EFU.1956/  RSV.2705
TOTAL TRAFFIC LOAD       011135
DRY OPERATING WEIGHT     041504
ZERO FUEL WEIGHT ACTUAL  052639    MAX  58469
TAKE OFF FUEL            004662
TAKE OFF WEIGHT ACTUAL   057301    MAX  75479
TRIP FUEL                001956
LANDING WEIGHT ACTUAL    055345    MAX 062460
                                  ++-------------------------------+
                                  |           LAST MINUTE CHANGES |
                                  | DEST   SPEC  CL/CPT  + - WEIGHT |
                                  |                                 |
                                  |                                 |
                                  |                                 |
                                  +--------------------------------+
UNDERLOAD BEFORE LMC      18177               LMC TOTAL + -
--------------------------------------------------------------------
SI BLOCK TIME 00:54   RESERVE 01:15   TIME TO EMPTY 02:09   CI 47
END LOADSHEET          [ A319 ]        [ LEMD-LEAS ]       [ 26APR13 ]
====================================================================
```

Figure 21: Fuel Spreadsheet

As our fuel price was stipulated on $0{,}668\,€/Litre.$ The estimated fuel usage cost will be $0{,}668\,€/litre * 1956\text{kg} = 1306{,}61\,€$.

The next table shows an estimated fuel usage cost for the different aircrafts studied.

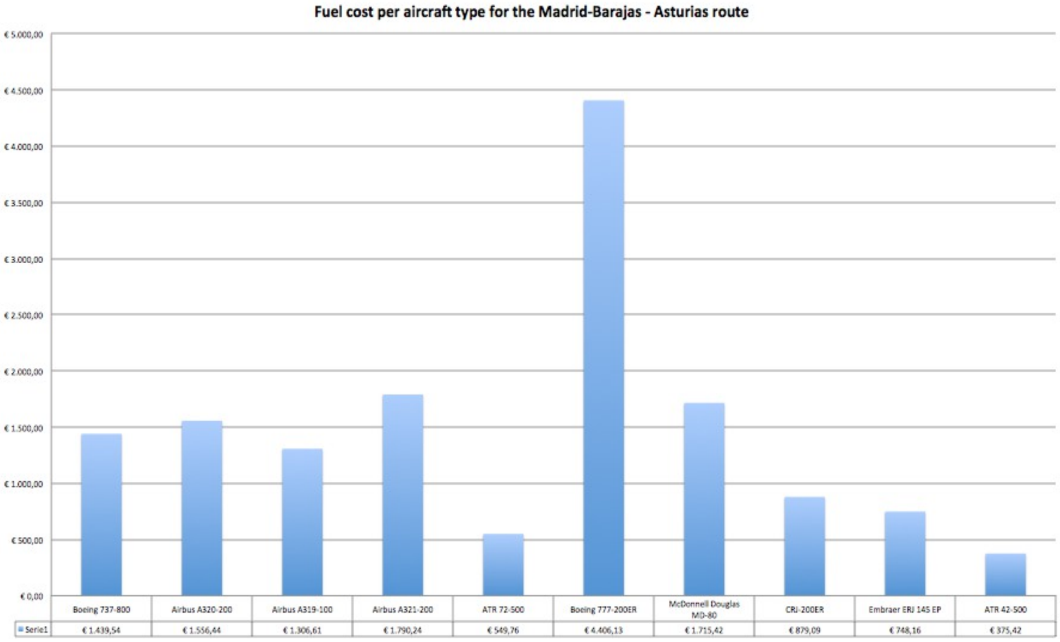


Figure 22: Fuel Cost per Aircraft Type for the Madrid-Barajas - Asturias Route

As we can see the most economic aircraft in terms of fuel cost is an ATR 42-500.

5.5 MAINTENANCE COST

Maintenance cost is difficult to assess given the large number of parameters involved exposed to external conditions.

Maintenance costs can be divided into:

- Direct Maintenance Costs (DMC): This costs cover manpower and the associated maintenance materials used.
- Indirect Maintenance Costs (IMC): This inderect costs cover as diverse issues as: administration, data files, system quality, tools, facilities, etc.

There are two types of maintenance; Line maintenance and Base maintenance:

- Line Maintenance (DMC): The maintenance that does not require an extensive disassembly of the aircraft (A and B revisions). No need for the plane to be stopped for a long period.
- Base Maintenance (DMC): This maintenance is classified as "heavy maintenance" because it is based on a more thorough revision, with an extensive disassembly which requires more time.

The next figure is an example of an A-320 maintenance cost breakdown. As we can see the powerplant maintenance is the most expensive sector followed by the aircrafts components not including the motors.

The distribution of maintenance costs is the following:

- 67% Off aircraft
- 33% On aircraft

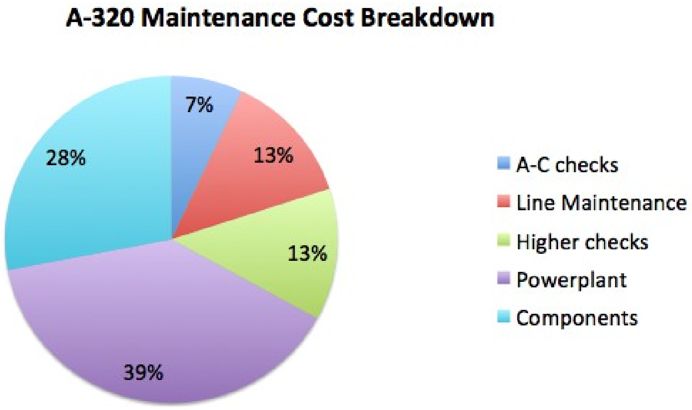


Figure 23: Airbus A320 Maintenance cost Breakdown

Our low cost airline will save a large amount of money because our fleet maintenance will be done “in house”. This means that the maintenance will occur at night when the airplanes will be sleeping in a major airport as the airport of Madrid-Barajas.

The age of the aircraft and knowing if there is still production will influence in maintenance costs. When choosing our fleet we have to follow the next parameters considering maintenance:

- Single type of aircraft. We need to choose a single type of aircraft because maintenance costs will be cheaper because we will save on aircraft parts, workers, replacements, etc.
- Market production. We need to know that the aircraft manufacturer still fabricates the different aircraft parts.
- Due to short routes our fleet will require a more intensive maintenance, therefore we will need to choose an aircraft which requires less and cheaper maintenance hours.

Our company will offer the maintenance service to a third company because we will not have our own maintenance capability. We will focus on air business and we will outsource other services.

5.6 CREW COST

When talking about crew cost we have to fix on the following concepts:

- Salaries,
- Diets,
- Training.

There are two types of tripulations:

- Cockpit crew. Generally arranged by a pilot in command and a second officer.
- Passenger cabin crew. They include the same concepts as those of the cockpit crew but the training costs are not significant.

ICAO considers these costs as IOC. However, the number of flight attendants on board is stipulated in ICAOs regulations:

- 1 flight attendant per each 4 to 15 pax in 1st class,
- 1 flight attendant per each 10 to 20 pax in business class,
- 1 flight attendant per each 20 to 50 pax in turist class.

As our airplanes will only have a turist class we will only need to follow the third ICAO regulation.

We are going to offer a competitive salary.

- New Joiners : €1200 over first 6 months,
- After just one year: € 22000 gross per annum.

As the training is conducted by a third party provider there will be a fee. The cost can will be deducted from the salary during the first 12 months.

5.7 2013 AENA TAX RATES

In this section we are going to describe Aenas tax rates for airport services and aircraft fleets. These tax rates are charged to every flight landing, taking-off or flying over Spanish territory. The billing and collection of the first two tax rates is delegated to Eurocontrol.

5.7.1 ROUTE TAX RATES

The route tax rate is a cost compensation incurred for the facilities and air navigation services on route.

The formula of the tax to be paid is the following:

$$r = t * N$$

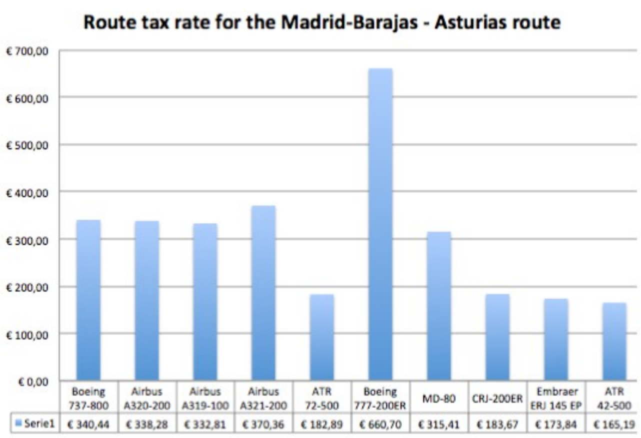
Where:

- r is the total tax,
- t it is the spanish unit price rate (in Euros), and
- N is the number of service units ($N=d*p$ being d the distance coefficient (orthodromic distance / 100), and p the weight coefficient $(MTOW/50)*0,5$).

	UNIT PRICE RATE (t)
Peninsula	71,84
Canary Islands	58,51

Table 15: Unit Rate Price

The following figures show the calculation for route tax rate for the ten different airplanes considered for the Madrid-Barajas – Asturias route.



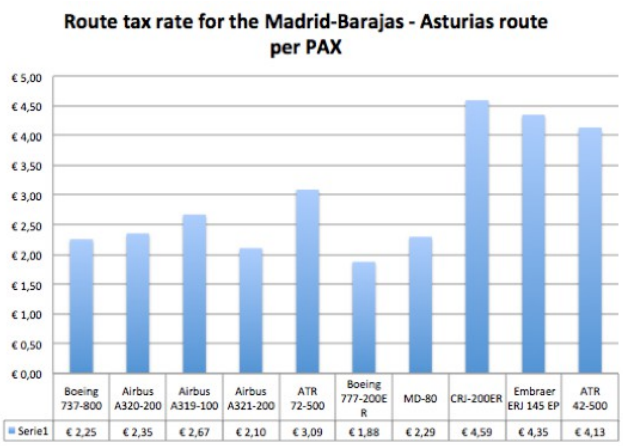


Figure 24: Route Tax Rates

The left figure shows that the ATR 42-500 will be the aircraft with a lower tax for the Madrid-Barajas – Asturias route to pay, but if we look at the right figure we can see that the passengers which will have to pay less route tax rate will be the Boeing 777-200ER passengers. Instead the ATR 42-500 passengers will be one of the ones which will pay a higher amount for that specific tax.

5.7.2 APPROXIMATION TAX RATES

The rate of approximation is an air navigation service provided tax for safety and fluidity of movement in this phase of flight. The rate of approximation is applicable in all airports open to civilian traffic to which Aena provides air navigation approximation services. We consider the approximation and departure operations as an only service for this rate.

The 2013 stablished formula is the following:

$$R = t * (P/50)^n$$

Where:

- R is the total rate to pay for the operation,
- t is the unit rate,
- P is the maximum takeoff weight of the aircraft (MTOW),
- n is a coefficient valued 0.9,
- $(P/50)^n$ are the service units.

With the following value for t depending on the airports category:

AIRPORT	UNIT PRICE RATE (€)
Alicante, Barcelona, Bilbao, Fuerteventura, Gran Canaria, Ibiza, Lanzarote, Madrid Barajas, Málaga, Menorca, Palma de Mallorca, Sevilla, Tenerife Norte, Tenerife Sur y Valencia	17,12
Almería, Asturias, Girona, Federico García Lorca-Granada Jaén, Jerez, A Coruña, La Palma, Reus, Santiago y Vigo	15,41
Santander, Zaragoza, Madrid/Cuatro Vientos, Melilla, Pamplona, San Sebastián, Vitoria, Badajoz, Murcia/San Javier, Valladolid, Salamanca, Sabadell	12,84

Table 16: Unit Price Rate

The following table shows the calculation for aproximation tax rate for the ten different airplanes considered for the Madrid-Barajas – Asturias route.

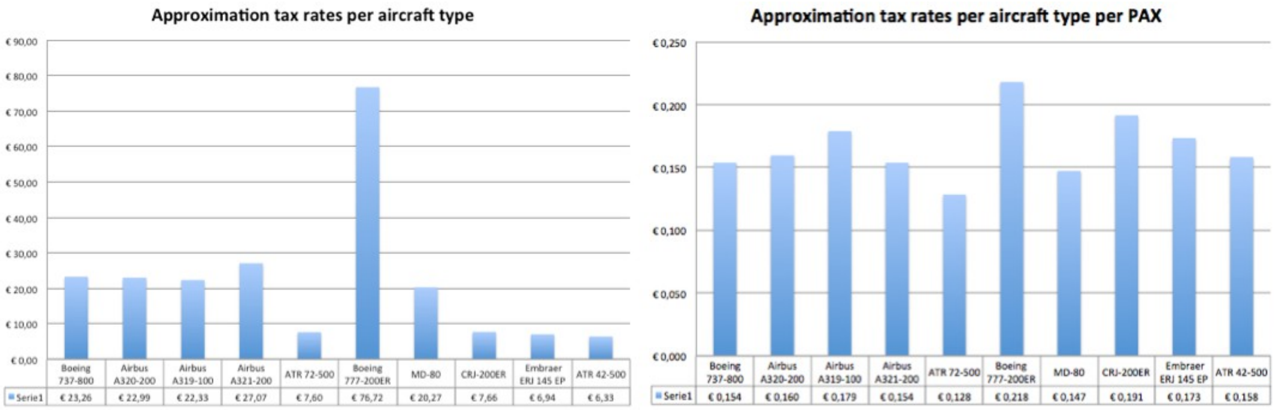


Figure 25: Approximation Tax Rates per Aircraft Type

The above figures show that there is no great difference on the cost per passenger for this specific tax.

5.7.3 LANDING AND AIRPORT TAX RATES

This type of tax is required for the use of the airports runways, and the rendering services needed for such use. This tax rate is calculated according to the maximum takeoff weight, and varies depending on the type of flight. We are only going to focus on domestic flights. The following tables show the parameters used for the calculations:

	LANDING		AIRPORT SERVICE	
AIRPORT	€ Tm	Minimum per operation €	€ Tm	Minimum per operation €
Madrid-Barajas	8,387050	154,62	3,515400	71,88
Barcelona-El Prat	7,388850	136,19	3,493700	71,48
Alicante, Gran Canaria, Tenerife Sur, Málaga-Costa del Sol-Costa del Sol y Palma de Mallorca	7,009100	96,92	3,428600	51,20
Bilbao, Fuerteventura, Girona, Ibiza, Lanzarote, Menorca, Santiago, Sevilla, Tenerife Norte y Valencia	5,880700	16,29	3,146500	8,71
Almería, Asturias, Coruña, Granada-Jaén, Jerez, La Palma, Murcia, Reus, Santander, Vigo y Zaragoza	4,307450	10,82	2,462950	6,18
Albacete, Algeciras, Badajoz, Burgos, Ceuta, Córdoba, Cuatro Vientos, Hierro, Huesca, La Gomera, León, Logroño, Melilla, Sabadell, Salamanca, San Sebastián, Son Bonet, Pamplona, Torrejón, Vitoria y Valladolid.	2,842700	5,86	2,094050	4,311

Table 17: Landing and Airport Tax Rates 1

- Domestic flights
- 1.2. Domestic flights in Canary Islands, Balearic Islands, Ceuta and Melilla (except interislands)

	LANDING		AIRPORT SERVICE	
AIRPORT	€ Tm	Minimum per operation €	€ Tm	Minimum per operation €
Gran Canaria, Tenerife Sur y Palma de Mallorca	5,957735	82,38	3,4286	51,20
Fuerteventura, Ibiza, Lanzarote, Menorca, y Tenerife Norte	4,998595	13,85	3,146500	8,71
La Palma	3,661333	9,20	2,462950	6,18
Ceuta, Hierro, La Gomera, Melilla y Son Bonet.	2,416295	4,98	2,094050	4,31

Table 18: Landing and Airport Tax Rates 2

The following table shows the calculation for landing and airport tax rate for the ten different airplanes considered for the Madrid-Barajas – Asturias route.

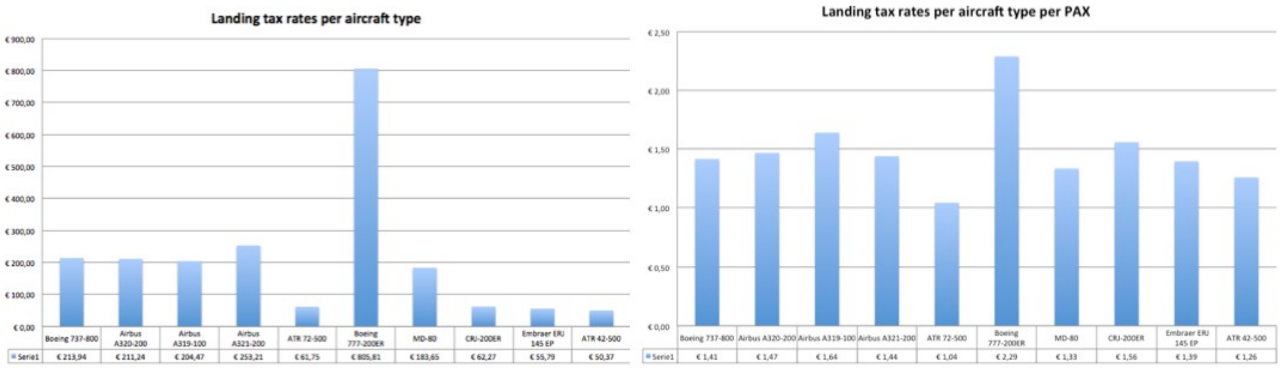


Figure 26: Landing Tax Rates per Aircraft Type

As in the previous taxes we can see that we will pay more with a Boeing 777-200ER. This time 4 times more approximately. In the other hand when dividing the tax amount into the number of passengers we can see that barely all passengers will pay nearly the same except for the Boeing 777-200ER passengers who will pay more or less 1€ more.

5.7.4 PARKING TAX RATES

There are three different parking tax rates depending on which parking zone does the aircraft use. This rates will not be applied between 00:00 and 6:00, local time and parking time will be calculated in a 15 minutes block-to-block time.

Figure 27: Parking Types

- Remote parking position

This parking zone can only be reached by passengers by a shuttle bus.

The remote parking position formula is the following:

$$E = (e * Tm * Ft) + Sh$$

Where:

- E is the total amount to pay for the service,
- e is the unit rate,
- Tm is the maximum takeoff weight of the aircraft (MTOW),

- *F* is the parking 15 minute block time,
- *Sh* is the number of shuttle buses needed.

Airport	€ per each 15 minute block time	Maximum amount €	
		First 24 hours	Maximum per 24 hours since 2nd day
Madrid-Barajas	0,127770	1,614	880
Barcelona-El Prat	0,121881		
Alicante, Gran Canaria, Tenerife Sur, Málaga-Costa del Sol and Palma de Mallorca	0,120770		
Bilbao, Fuerteventura, Girona, Ibiza, Lanzarote, Menorca, Santiago, Sevilla, Tenerife Norte and Valencia	0,067107		

Shuttle Bus price (€)
43

Table 19: Parking Tax Rates

With the following value for *e* depending on the airports category and the shuttle bus price:

- Close remote parking position

Close remote parking positions are those positions where passengers can go walking directly from the terminal to the airplane.

This tax is obtained with the same formula as for rhe remote parking position without adding the shuttle bus price.

- Fingers

The finger is a moving walkway, usually covered, which stretches from the gate of an airport terminal to the door of an aircraft, allowing access without need to descend to the airports platform.

This tax uses a very simple formula:

$$P = P1 * Ft$$

Where:

- *P* is the total amount to pay,
- P1 is the unit price rate,
- Ft is the 15 minute block time that the aircraft remains at the finger.

With the following value for *P1* the unit price rate depending on the airports category:

AIRPORT	P1 (€)
Madrid-Barajas	33,231163
Barcelona-El Prat	30,128606
Alicante, Gran Canaria, Tenerife Sur, Málaga-Costa del Sol and Palma de Mallorca	26,496460
Bilbao, Fuerteventura, Girona, Ibiza, Lanzarote, Menorca, Santiago, Sevilla, Tenerife Norte and Valencia	25,477319
Almería, Asturias, Coruña, Granada-Jaén, Jerez, La Palma, Murcia, Reus, Santander, Vigo and Zaragoza	25,477319
Albacete, Algeciras, Badajoz, Burgos, Ceuta, Córdoba, Cuatro Vientos, Hierro, Huesca, La Gomera, León, Logroño, Melilla, Sabadell, Salamanca, San Sebastián, Son Bonet, Pamplona, Torrejón, Vitoria and Valladolid	25,477319

Table 20: Parking Tax Rates 2

5.7.5 PASSENGERS USE AND SECURITY TAX RATES

This tax is applied for the passengers use of the airport terminal areas non-accessible to visitors, for passengers secrutiy.

To obtain this tax we have to add both taxes:

$$C = P * S$$

Where,

- C is the total amount to pay,
- P is the passengers airport use tax,
- S is the passengers security tax.

The following table shows both of the tax amounts.

AIRPORT	PAX	SECURITY
Madrid-Barajas	15,67	3,75
Barcelona-El Prat	14,58	
Alicante, Gran Canaria, Tenerife Sur, Málaga-Costa del Sol and Palma de Mallorca	6,50	
Bilbao, Fuerteventura, Girona, Ibiza, Lanzarote, Menorca, Santiago, Sevilla, Tenerife Norte and Valencia	5,54	
Almería, Asturias, Coruña, Granada-Jaén, Jerez, La Palma, Murcia, Reus, Santander, Vigo and Zaragoza	3,97	
Albacete, Algeciras, Badajoz, Burgos, Ceuta, Córdoba, Cuatro Vientos, Hierro, Huesca, La Gomera, León, Logroño, Melilla, Sabadell, Salamanca, San Sebastián, Son Bonet, Pamplona, Torrejón, Vitoria and Valladolid	2,60	

Table 21: Passenger Use and Security Tax Rates

5.7.6 FUEL TAX RATES

There is also a fuel tax rate due to the transport and supply of fuels and lubricants in the airport whatever the mode of transport or supply.

The tax is *0,007270 € / litre* of aviation fuel supplied.

5.7.7 EXTRA TAX RATES

So far we have explained the most important taxes. The rest of them are mainly annual rates and not operational rates as the ones explained before. Therefore we will estimate a 5% cost increase.

5.8 ROUTE TOTAL TAX

The route total tax is the final total tax price for each type of route and aircraft needed to be payed. With the addition of all the taxes explained in this chapter we can obtain the different total tax prices per route. We created a spreadsheet to calculate those taxes and the following figures show the total tax price per passenger for the same route but for different aircrafts.

Figure 28: Total Tax Price per Route

As we can see from the above figure the Asturias – Madrid-Barajas tax for this route is higher than the Madrid-Barajas – Asturias route. There is this big difference because the landing and airport tax rates and the approximation tax rates are higher for the Madrid-Barajas airport than for the Asturias airport. We have calculated the total tax rates for each route and type of aircraft.

5.9 AIRCRAFT ACQUISITION

There are lots of factors that have to be looked very closely when wanting to acquire an aircraft. The main factors are the aircrafts performances, manufacturer and price. Although there are other factors that may influence as aircraft acquisition company prestige or if the aircraft is atractive for the passengers. Currently the two most important forms of an aircraft acquisition are purchasing and leasing.

5.9.1 AIRCRAFT PURCHASE

When purchasing an aircraft there is a very important parameter. This parameter is the airlines capital, in other words, how much money does the airline have.
The purchase of a fleet or a single aircraft is not a foolishness because we are talking of an outlay of millions of euros to acquire such goods. The price of an aircraft also depends

on how many aircrafts are going to be purchased, therefore the total cost of an aircraft when lots of them are bought is going to be lower than the price when only one aircraft is bought.

The following table shows the price ranges for the studied aircrafts:

AIRCRAFT	PRICE (M€)
BOEING 737-800	63,0 – 70,0
AIRBUS A320-200	58,3 – 65,5
AIRBUS A319-100	53,6 – 59,9
AIRBUS A321-200	68,8 – 74,0
ATR 72-500	11,0 - 13,5
BOEING 777-200ER	177,5-190,0
MD-88	41,5 – 48,5
CRJ-200ER	7,7 – 10,0
EMBRAER ERJ 145 EP	15,6 – 18,6
ATR 42-500	9,2 – 12,2

Table 22: Aircraft Purchase Prices

Once we have a fleet we have to take into account the depreciation of the aircraft for a future fleet renewal. Although the depreciation of an aircraft is often imposed by the accounting standards of each country, it is commonly accepted by these three factors:

- Aircrafts use,
- time pass,
- and tecnological obsolescence.

In first place it should be stated that the cost related to the depreciation of an aircraft by its use, for example, flight per hour, is a concept that can also be included in direct operating costs. Depreciation caused by time pass is caused by the loss of efficiency of the aircraft relative to more modern aircrafts (even the same model). Finally, it is clear that when there is a technological jump and a manufacturer incorporates an element that improves the performance of their aircraft over those of its competitors, the competitors aircrafts are immediately depreciated in the market.

The estimation of the depreciation of an aircraft is something that airlines should keep in mind because it marks the deadline for fleet renewal.

As an example, here we have some aircrafts costs due to depreciation:

AIRCRAFT	YEAR BUILT	2006 (M$)	2011 (M$)	2016 (M$)	2021 (M$)
BOEING 747-200	1984	3,5	2,6	1,0	0,0
BOEING 747-200	1988	7,1	7,6	4,0	0,3
BOEING 747-400	1995	49,2	29,0	27,6	17,5
MD-11	1995	36	29,2	20,9	13,7

Table 23: Depreciation

5.9.2 AIRCRAFT LEASING

Operating lease is a form of acquisition that today exceeds 30% of the units produced. Leasing companies consider aircrafts as an investment with a high residual value. The availability of aircrafts on leasing, benefits many companies when "buying" an aircraft that could not otherwise buy. Aircraft manufacturers would like to control the number of leasing companies because if many, they could difficult the direct selling market. Aircraft leasing is very common on low cost airlines and this is the strategy that we are going to follow.
There are different leasing modalities:

	ACMI Leasing	Wet Leasing	Damp Leasing	Charter Leasing	Dry Leasing
Aircraft	X	X	X	X	X
Crew	X	X		X	
Fuel				X	
Maintenance	X		X	X	
Assurance	X		X	X	
Navigation tax				X	

Table 24: Aircraft Leasing Types

The leasing option going to be used for our low cost company is wet leasing, where the aircraft, maintenance and assurance is included.

Aircraft leasing prices are drawn from proprietary transaction databases of collateral verifications LLC on January 2013 from the following web page *http://www.myairlease.com/resources/fleetstatus.* The following table shows the different leasing prices per month for each different aircraft studied.

	Max (€/month)	Min (€/month)	Mean (€/month)
Boeing 737-800	€ 360.000	€ 190.000	€ 270.000
Airbus A320-200	€ 300.000	€ 45.000	€ 225.000
Airbus A319-100	€ 235.000	€ 90.000	€ 176.250
Airbus A321-200	€ 375.000	€ 170.000	€ 281.250
ATR 72-500	€ 190.000	€ 95.000	€ 142.500
Boeing 777-200ER	€ 900.000	€ 500.000	€ 675.000
McDonnell Douglas MD-80	€ 280.000	€ 500.000	€ 210.000
CRJ-200ER	€ 90.000	€ 60.000	€ 67.500
Embraer ERJ 145 EP	€ 77.000	€ 53.000	€ 57.750
ATR 42-500	€ 145.000	€ 68.000	€ 108.750

Table 25: Aircraft Leasing Price

The prices shown on the column at the right are the ones going to be used as the price per month to lease that type of aircraft.

We can see that the leasing prices correspond to a great amount of money and more when multiplied by the number of airplanes required. We have to say that the tax costs and the fuel costs are more important than the leasing costs because when we finally determine the total leasing price we will surely make front to that payment by incrementing the ticket prices by 1-3€ per PAX, but the passengers will need to pay between 10-20€ depending on the route for taxes and between 10-30€ for fuel.

6. OPTIMUM FLEET VALUE

Fleet choices are among the most significant decisions an airline has to make. Large scale changes to the aircraft fleet, including potentially determining new principal aircraft and engine platforms, will touch nearly every aspect of the business, from day to day flight operations and customer satisfaction throughout to financial performance and shareholder return.

Growth in forescast demand coupled with the introduction of a wider range of new aircraft frame and engince choices make the decision highly complex. At the same time, margin compression and competitive pressures increase the risk as well as the value at stake

Comprehensive analysis of the key issues, complexities and uncertainties as well as the risk-return trade-off of alternative options should be considered so as to assess the impact on the company's financial performance as well as operational effectiveness.

In this chapter we use the acquired knowledge from previous chapters. In chapter 3 we have looked into air traffic statistics for each type of route. In chapter 4 we have chosen the routes where our airline is going to operate. Bonding both chapters we can find an optimum fleet value for each type of route.

6.1 TYPE OF AIRCRAFTS

To get an optimum fleet value, first of all, we need to choose a type of aircraft. We are going to study 10 different types of aircrafts. A brief description of each type of aircraft is going to be given.

6.1.1 BOEING 737-800

The Boeing 737-800 is a short- to medium-range twin-engine narrow-body jet airliner. It can have a one class layout distribution up to 189 seats with a 79.000kg MTOW. Ryanair's actual fleet is composed of 305 Boeing 737-800.

6.1.2 AIRBUS A320-200

The Airbus A320-200 is a short- to medium-range twin-engine narrow-body jet airliner. It can have a one class layout distribution up to 180 seats with a 78.000kg MTOW. EasyJet actual fleet is composed of 211 Airbus A320-200.

6.1.3 AIRBUS A319-100

The Airbus A319-100 is a shortened, minimum-change version of the A320-200. It can have a one class layout distribution up to 156 seats with a 75.500kg MTOW. EasyJet actual fleet is composed of 167 Airbus A319-100.

6.1.4 AIRBUS A321-200

The Airbus A321-200 is a stretched first derivative of the A320-200. It can have a one class layout distribution up to 220 seats with a 93.500kg MTOW. China Southern Airlines actual fleet is composed of 57 Airbus A321-200.

6.1.5 ATR 72-500

The ATR 72-500 is a twin-engine turboprop short-haul regional airliner, it is a stretched variant of the ATR 42-500. It can have a one class layout distribution up to 74 seats with a 22.800kg MTOW. Air Nostrum actual fleet is composed of 10 ATR 72-500.

6.1.6 BOEING 777-200ER

The Boeing 777-200ER is a long-range wide-body twin-engine jet airliner. It can have a one class layout distribution up to 440 seats with a 297.550kg MTOW. Emirates actual fleet is composed of 87 BOEING 777-200ER. This aircraft is not an airplane which low cost carrier usually operate.

6.1.7 MCDONNELL DOUGLAS MD-80

The McDonnell Douglas MD-80 is a family of twin-engine, short to medium-range, single-aisle commercial jet airliner. It can have a one class layout distribution up to 172 seats with a 67.813kg MTOW. American Airlines actual fleet is composed of 180 McDonnell Douglas MD-80.

6.1.8 CRJ 200-ER

The CRJ 200-ER is a short-haul regional airliner. It can have a one class layout distribution up to 50 seats with a 22.995kg MTOW. SkyWest Airlines actual fleet is composed of 151 CRJ 200-ER.

6.1.9 EMBRAER ERJ 145 EP

The Embraer ERJ 145 EP is a short-haul regional jets. It can have a one class layout distribution up to 50 seats with a 20.600kg MTOW. ExpressJet Airlines actual fleet is composed of 242 Embraer ERJ 145 EP.

6.1.10 ATR 42-500

The ATR 72-500 is a twin-engine turboprop short-haul regional airliner. It can have a one class layout distribution up to 50 seats with a 18.600kg MTOW. TRIP linhas Aéreas actual fleet is composed of 19 ATR 72-500.

The next figures show the comparison between all aircrafts in terms of MTOW and number of seats.

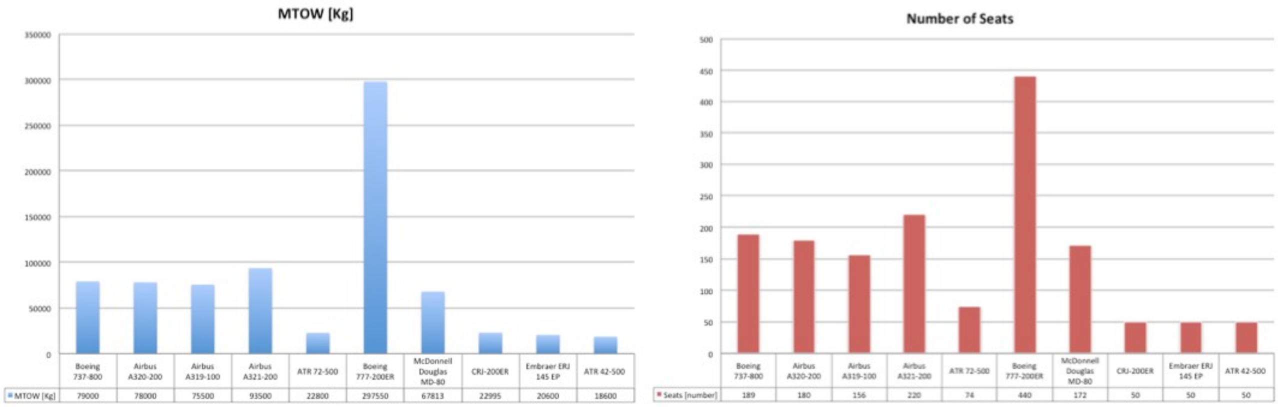


Table 26: Aircraft Selection MTOW and Number of Seats

6.2 OPTIMUM FLEET ROUTE VALUE

The optimum fleet route value is an important value that we need to calculate to know how many aircrafts are needed to manage a specific route. First of all we have to calculate the optimal fleet route value to obtain a further total fleet optimum value. So as to accomplish this, in previous chapters, we have chosen our airline routes, the % of traffic that we aim to control due to historical data and the % of traffic per month. As our aircrafts are going to operate in maximum seating capacity we just need to create a table showing the percentage of traffic per month and the number of aircrafts needed for those particular routes.

The next figure shows the approximation done with the purpose of finding the number of aircrafts needed per month for each type of aircraft for all routes.

ROUTE		ANNUAL TRAFFIC	% TRAFFIC										
Madrid-Barajas	**Asturias**	263.317	33%				**Number of Aircrafts per month for each type of aircraft**						
		Monthly Traffic	Boeing 737-800	Airbus A320-200	Airbus A319-100	Airbus A321-200	ATR 72-500	Boeing 777-200ER	cDonnell Douglas MD-8	CRJ-200ER	Embraer ERJ 145 EP	ATR 42-500
January	7,14%	6.208	41,06	43,11	49,75	35,28	104,87	17,64	45,12	155,21	155,21	155,21
February	7,53%	6.540	43,25	45,42	52,40	37,16	110,47	18,58	47,53	163,50	163,50	163,50
March	8,68%	7.539	49,86	52,35	60,41	42,83	127,34	21,42	54,79	188,47	188,47	188,47
April	8,46%	7.349	48,61	51,04	58,89	41,76	124,15	20,88	53,41	183,74	183,74	183,74
May	8,63%	7.502	49,62	52,10	60,12	42,63	126,73	21,31	54,52	187,56	187,56	187,56
June	9,06%	7.873	52,07	54,67	63,09	44,73	132,99	22,37	57,22	196,83	196,83	196,83
July	9,64%	8.376	55,40	58,17	67,11	47,59	141,49	23,80	60,87	209,40	209,40	209,40
August	8,96%	7.786	51,49	54,07	62,38	44,24	131,51	22,12	56,58	194,64	194,64	194,64
September	8,83%	7.676	50,76	53,30	61,50	43,61	129,65	21,81	55,78	191,89	191,89	191,89
October	8,54%	7.418	49,06	51,51	59,44	42,15	125,30	21,07	53,91	185,44	185,44	185,44
November	7,50%	6.517	43,10	45,26	52,22	37,03	110,08	18,51	47,36	162,92	162,92	162,92
Dicember	7,03%	6.111	40,42	42,44	48,97	34,72	103,23	17,36	44,41	152,78	152,78	152,78
TOTAL	100,00%	86.895										
RUTA		ANNUAL TRAFFIC	% TRAFFIC									
Asturias	**Madrid-Barajas**	262.616	33%				**Number of Aircrafts per month for each type of aircraft**					
		Monthly Traffic	Boeing 737-800	Airbus A320-200	Airbus A319-100	Airbus A321-200	ATR 72-500	Boeing 777-200ER	cDonnell Douglas MD-8	CRJ-200ER	Embraer ERJ 145 EP	ATR 42-500
January	6,49%	5.625	37,20	39,06	45,07	31,96	95,02	15,98	40,88	140,63	140,63	140,63
February	6,97%	6.038	39,94	41,93	48,38	34,31	102,00	17,15	43,88	150,96	150,96	150,96
March	8,41%	7.290	48,22	50,63	58,42	41,42	123,15	20,71	52,98	182,26	182,26	182,26
April	8,09%	7.010	46,36	48,68	56,17	39,83	118,41	19,91	50,94	175,24	175,24	175,24
May	8,55%	7.405	48,98	51,43	59,34	42,08	125,09	21,04	53,82	185,14	185,14	185,14
June	9,50%	8.230	54,43	57,15	65,94	46,76	139,02	23,38	59,81	205,74	205,74	205,74
July	10,18%	8.826	58,37	61,29	70,72	50,15	149,09	25,07	64,14	220,65	220,65	220,65
August	9,55%	8.281	54,77	57,50	66,35	47,05	139,87	23,52	60,18	207,01	207,01	207,01
September	9,88%	8.563	56,64	59,47	68,62	48,66	144,65	24,33	62,23	214,08	214,08	214,08
October	8,53%	7.395	48,91	51,36	59,26	42,02	124,92	21,01	53,74	184,88	184,88	184,88
November	7,67%	6.645	43,95	46,14	53,24	37,75	112,24	18,88	48,29	166,12	166,12	166,12
Dicember	6,18%	5.355	35,42	37,19	42,91	30,43	90,45	15,21	38,92	133,87	133,87	133,87
TOTAL	100,00%	86.663										

Table 27: Number of Aircrafts needed per month per each type of aircrafts for all routes

The above tables show the number of times that a route is needed to be done to guarantee the monthly air traffic demand for the Madrid-Barajas – Asturias and the Asturias – Madrid-Barjas routes. We need to transform that value from a monthy value into a weekly value. If we calculate the weekly optimum value we will obtain the precise minimum number of routes needed to guarantee the weekly air traffic demand for all types of aircrafts.

The next figure shows both the monthly and weekly optimum number of routes.

ROUTE		ANNUAL TRAFFIC	% TRAFFIC																			
Madrid-Barajas	Asturias	276.115	33%																			
Asturias	Madrid-Barajas		Boeing 737-800	Weekly	Airbus A320-200	Weekly	Airbus A319-100	Weekly	Airbus A321-200	Weekly	ATR 72-500	Weekly	Boeing 777-200ER	Weekly	cDonnell Douglas MD-8	Weekly	CRJ-200ER	Weekly	Embraer ERJ 145 EP	Weekly	ATR 42-500
January	6,82%	6.212	41,09	9,28	43,14	9,74	49,78	11,24	35,30	7,97	104,94	23,70	17,65	3,99	45,15	10,19	155,31	35,07	155,31	35,07	155,31
February	7,25%	6.603	43,67	10,92	45,86	11,46	52,91	13,23	37,52	9,38	111,54	27,89	18,76	4,69	47,99	12,00	165,08	41,27	165,08	41,27	165,08
March	8,54%	7.785	51,49	11,63	54,06	12,21	62,38	14,09	44,23	9,99	131,50	29,69	22,12	4,99	56,58	12,78	194,63	43,95	194,63	43,95	194,63
April	8,27%	7.538	49,86	11,63	52,35	12,21	60,40	14,09	42,83	9,99	127,34	29,71	21,42	5,00	54,78	12,78	188,46	43,97	188,46	43,97	188,46
May	8,59%	7.827	51,76	11,69	54,35	12,27	62,71	14,16	44,47	10,04	132,21	29,85	22,23	5,02	56,88	12,84	195,67	44,18	195,67	44,18	195,67
June	9,28%	8.454	55,91	13,05	58,71	13,70	67,74	15,81	48,04	11,21	142,81	33,32	24,02	5,60	61,44	14,34	211,36	49,32	211,36	49,32	211,36
July	9,91%	9.031	59,73	13,49	62,72	14,16	72,37	16,34	51,31	11,59	152,56	34,45	25,66	5,79	65,63	14,82	225,78	50,98	225,78	50,98	225,78
August	9,26%	8.435	55,79	12,60	58,58	13,23	67,59	15,26	47,93	10,82	142,48	32,17	23,96	5,41	61,30	13,84	210,88	47,62	210,88	47,62	210,88
September	9,36%	8.526	56,39	13,16	59,21	13,82	68,32	15,94	48,44	11,30	144,02	33,60	24,22	5,65	61,96	14,46	213,15	49,74	213,15	49,74	213,15
October	8,53%	7.777	51,43	11,61	54,01	12,19	62,31	14,07	44,19	9,98	131,36	29,66	22,09	4,99	56,52	12,76	194,42	43,90	194,42	43,90	194,42
November	7,58%	6.910	45,70	10,66	47,99	11,20	55,37	12,92	39,26	9,16	116,72	27,23	19,63	4,58	50,22	11,72	172,75	40,31	172,75	40,31	172,75
December	6,61%	6.019	39,81	8,99	41,80	9,44	48,23	10,89	34,20	7,72	101,67	22,96	17,10	3,86	43,74	9,88	150,48	33,98	150,48	33,98	150,48
TOTAL	100,00%	91.118																			

Table 28: Monthly and Weekly Optimum Number of Routes

Until now, we have obtained for all our selected routes a specific number of times that a route will be needed to be performed in order to satisfy our calculated demand. The next graph shows the number of routes per week needed for the Madrid-Barajas – Asturias route to satisfy its demand. We can see that at the summer months the number of times this route has to be done is higher than for the winter months, therefore we may need to lease more aircrafts for the summer months. If the aircraft has a larger seat capacity as the Boeing 777-200ER then less number of routes are needed per week to satisfy the monthly demand. We also can see that we will need to lease the same number of aircrafts for the Embraer ERJ 145 EP, the ATR 42-500 and the CRJ 200ER because they have the same seat capacity. We need to find the balance between the number of aircrafts leased and the number of flights per month.

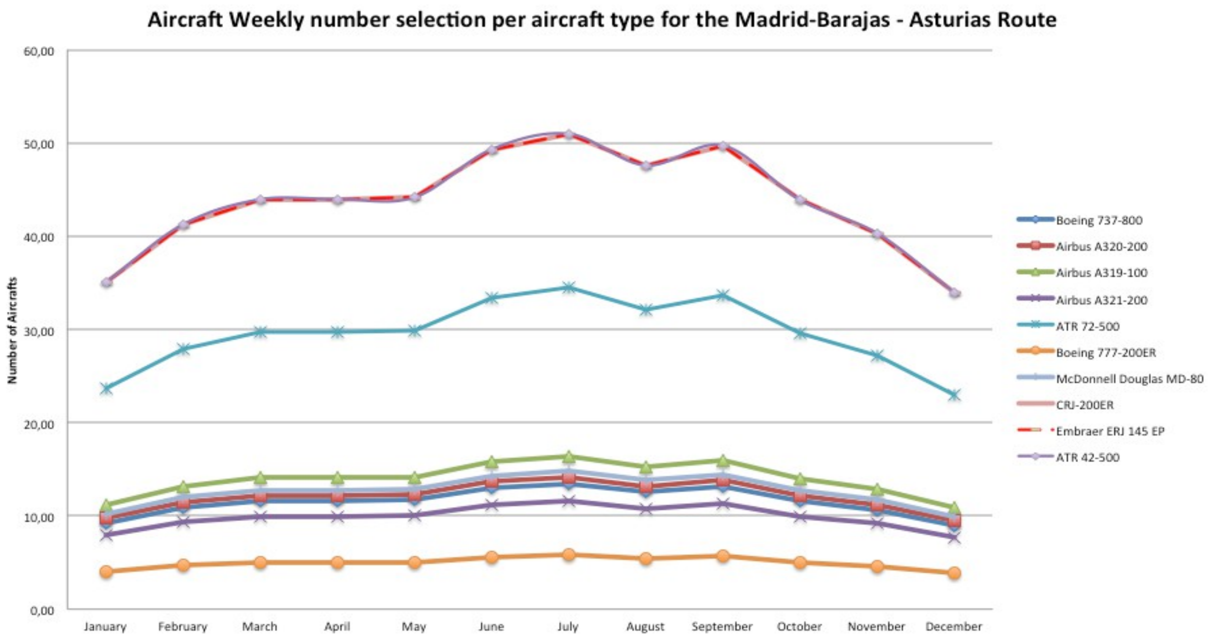


Figure 29: Aircraft Weekly number seletion per aircraft type

As explained in chapter 4 all aircrafts follow an itinerary. For example we know that for the Asturias – Tenerife Sur route the aircraft used firstly does the Madrid-Barajas – Asturias route. Because of this, we need to equal the same number of aircrafts that fly to and from Asturias. We know that we will have an exact number of aircrafts that fly to and from because in chapter 4, we calculated that the demand from and to a specific destination was the same. Therefore if the demand is the same, the number of aircrafts used will also be the same.

In all flights we have selected a mean aircraft occupation value around 80% because we exclude defining politics demand management. We have chosen this value because the International Air Transport Association (IATA) states that the average occupancy rate of all low cost airlines in 2012 was around 80% . The best airline in terms of seat occupation is EasyJet with an 87.3% followed by Ryanair with an 82%.

If we look at the month of February for the A319-100 for the Asturias routes we obtain the following:

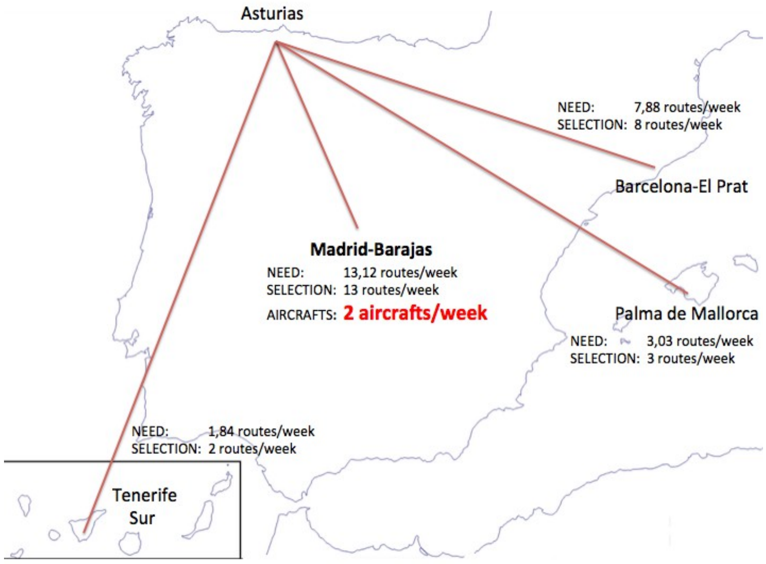


Figure 30: Asturias Fleet Selection

If we add all the routes/week we can see that they will give the same value. This value is 13 routes/week. We know that there are 3 possible routes, these are:

Figure 31: Asturias Routes

The aircraft number selection per week has been done with time operation calculations. This calculations gave an optimum aircraft value of 2 per week. The calculations for this case are detailed next:

- Tenerife Sur:

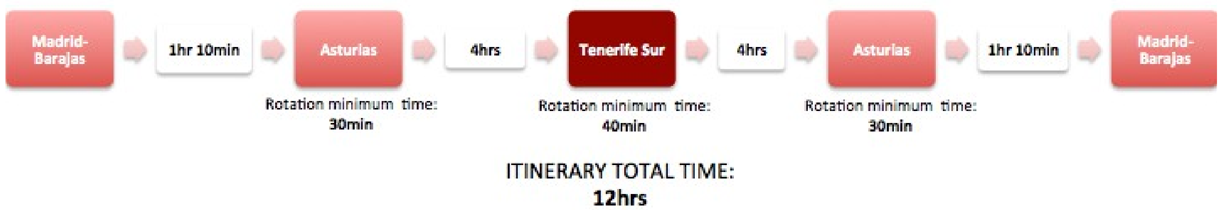


Figure 32: Tenerife Sur Time Calculations

- Palma de Mallorca:

Figure 33: Palma de Mallorca Time Calculations

- Barcelona-El Prat

Figure 34: Barcelona-El Prat Time Calculations

We have obtained the itinerary total time. We now need to know the airport operational hours to know at what time we could start to operate. This information can be found in the Aeronautical Information Publication (AIP). The airports operational hours are the following:

- Madrid-Barajas: H24
- Asturias: Summer: 05:30-21:45, Winter: 06:30-22:45
- Tenerife Sur: H24
- Palma de Mallorca: H24
- Barcelona-El Prat: H24

We have only an hour restriction at the Asturias Airport. We are always going to operate in Madrid-Barajas after 06:30 and before 00:00 because these are public transport covered hours. We have a 17hrs 30min range of operation.

The Tenerife Sur itinerary has to be done twice a week and we know that we take 12 hours to complete it. Therefore we can only do this route once per day per aircraft. This means that if we count the number of days that our aircraft is going to operate, until now we have 2 days.

If we now take into account the Palma de Mallorca and the Barcelona-El Prat itineraries we have that the itinerary total times are of 7hrs 15min and 7hrs 10min in order for both of them. The Madrid-Barajas rotational time is 1hr. We are going to calculate if we could do two of these itineraries in one day.

- 2 times the Palma de Mallorca itinerary: 15hrs 30min
- 2 times the Barcelona-El Prat itinerary: 15hrs 20min
- Palma de Mallorca and Barcelona-El Prat itinerary: 15hrs 25min

We can see that all three itineraries serve the operational time range restriction of 17hrs 30min and the Asturias summer and winter restriction. We know that we need to satisfy the Barcelona-El Prat route 8 times a week and the Palma de Mallorca route 3 times a week. Therefore we will need 6 days to deal with all these routes if we do two of these itineraries per day. We will need 8 days if we add all of them, and a week has 7 days. This means that we cant use an only aircraft for all of these routes. We choose to operate with 2 aircrafts and to work the Palma de Mallorca and Barcelona-El Prat itineraries separately to obtain a greater range of possibilities. By using 2 aircrafts and having a total number of 13 routes we know that aircraft number 1 will have a daily route to operate and aircraft 2 will have 6 routes to operate in 7 days.

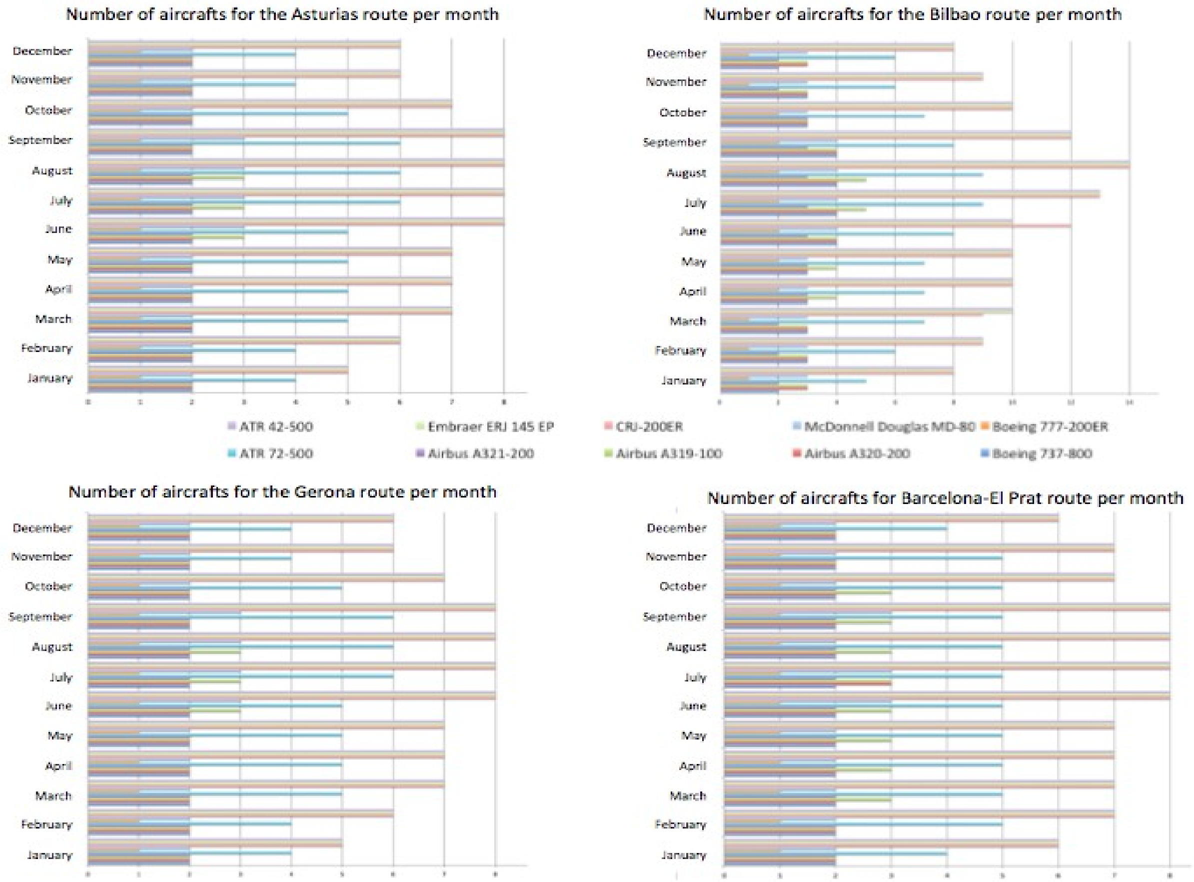


Figure 35: Number of Aircrafts per Route

The explained calculations for this routes and type of aircraft have been managed for the total of routes and total number of aircrafts studied. The following graphs show the total number of aircrafts needed for each pack of routes.

Finally the next figure shows the sum of all four pack of routes, which is the total optimum fleet values for each month.

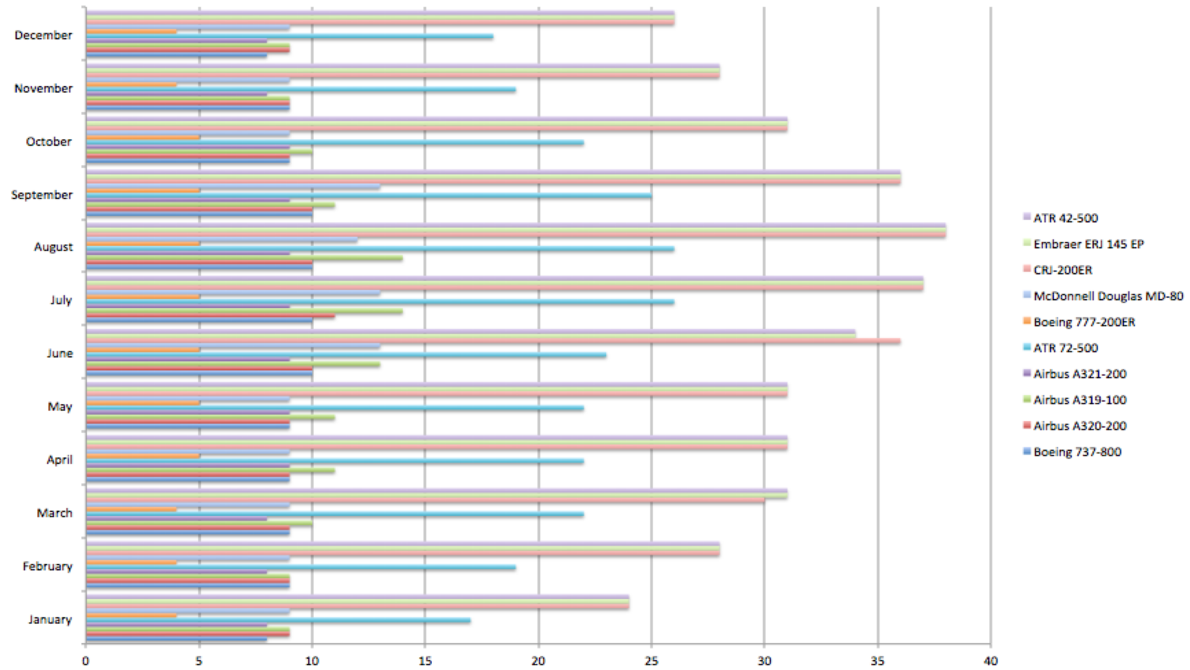


Figure 36: Total Optimum Fleet Value per aircraft Type

6.3 LOWEST OPTIMUM FLEET ROUTE COST

After calculating the exact number of each type of aircrafts needed for our route selection, its time to calculate which will be the best aircraft in economic terms. We need to compute which will be the cheapest aircraft to use. In previous chapters we have calculated the total tax per route, the leasing aircraft price and the number of aircrafts needed. We are going to divide the explanaition in two. We will first show the total leasing price per route per aircraft per month and then we will show the total tax per route per aircraft per total number of passengers per month.

6.3.1 TOTAL LEASING PRICE PER AIRCRAFT PER MONTH AND YEAR

We know the number of aircrafts needed per route and the price of leasing each aircraft. We just need to calculate which aircraft will have the cheapest total leasing price per month and year.

The next graph shows the leasing price per month for each type of aircraft.

Figure 37: Leasing Price per Month per each Aircraft

The next graph shows the total anual leasing price for each type of aircraft. We can see that the cheapest aircraft to lease would be the Airbus A319-100 and the most expensive the Embraer ERJ 145 EP.

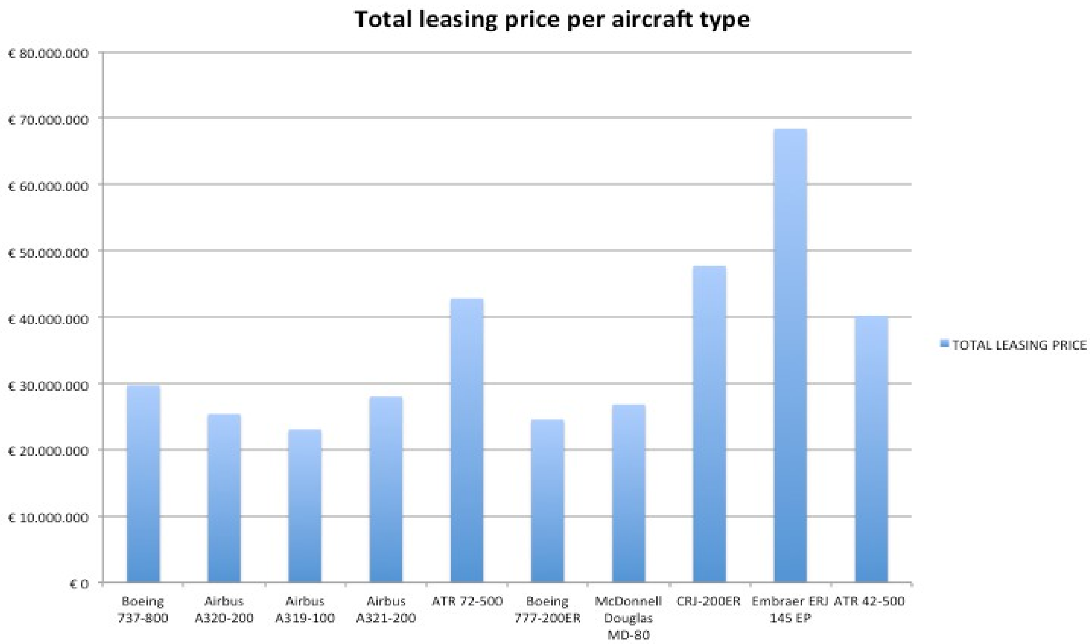
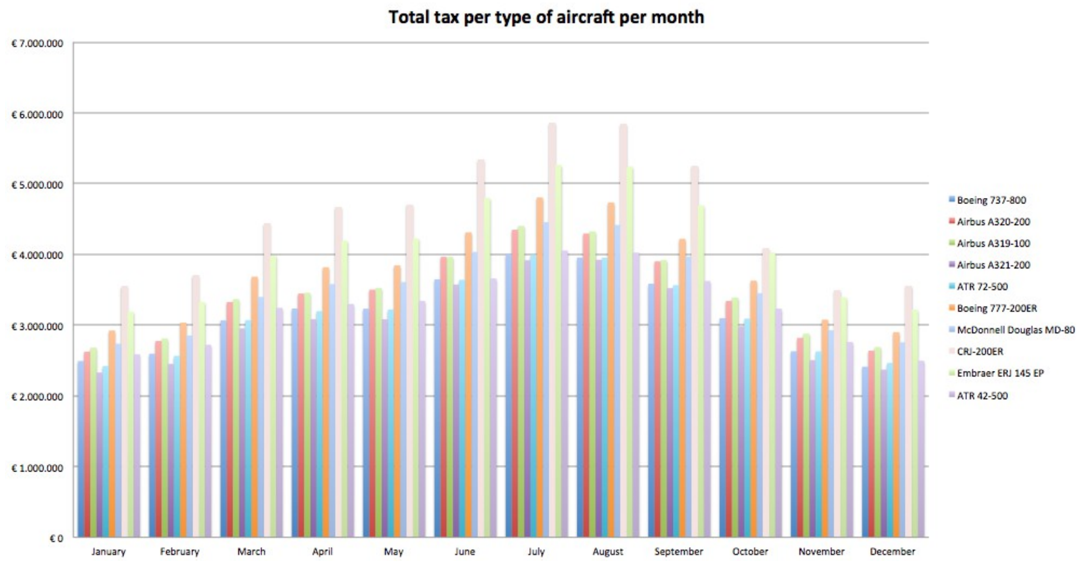


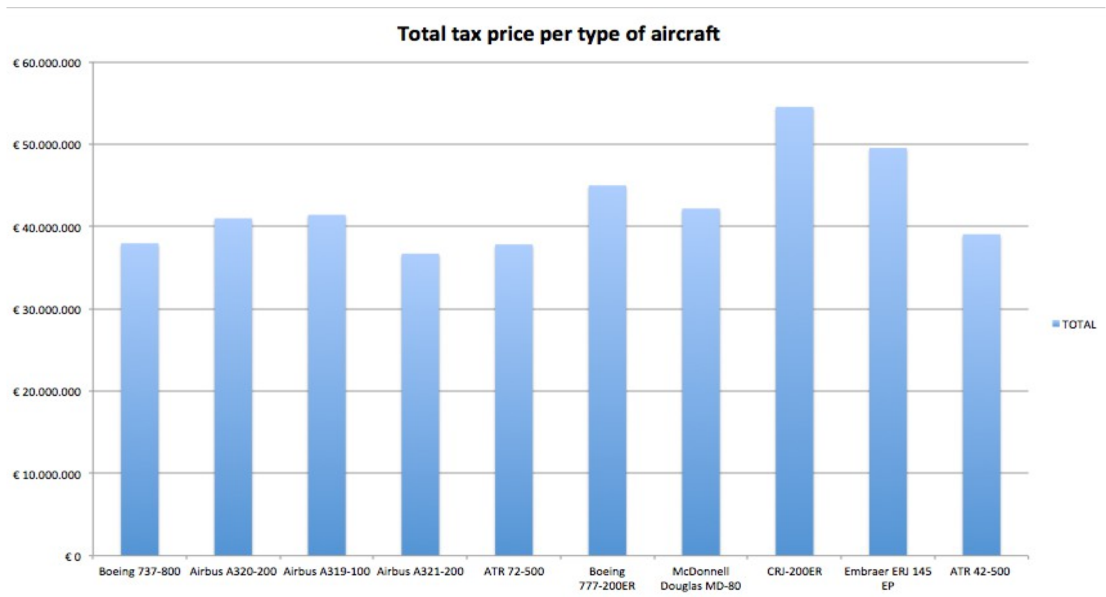
Figure 38: Total Leasing Price per Aircraft Type

6.3.2 TOTAL TAX PER TYPE OF AIRCRAFT PER MONTH

From chapter 5 we have obtained all the different taxes for each type of route per type of aircraft. What we have done is to add all the taxes for all routes but differenciating them per type aircraft. Therefore the next image shows the total tax price per month to be payed for the different selected for study aircrafts.



The next image shows the total tax price for each type of aircraft. As we can see, the aircraft which needs to pay less taxes for the chosen routes is the Airbus A321-200.



6.4 OPTIMUM FINAL FLEET AND AIRCRAFT SELECTION

The last thing to be done to select the type of aircraft that our company is going to lease is to check which will be the cheapest gobal aircraft. We just need to add all the costs to see which will be the best choice. For our low cost company, as seen in the next figure, the best aircraft would be an AirbusA319-100 with an anual €64.501.848 cost.

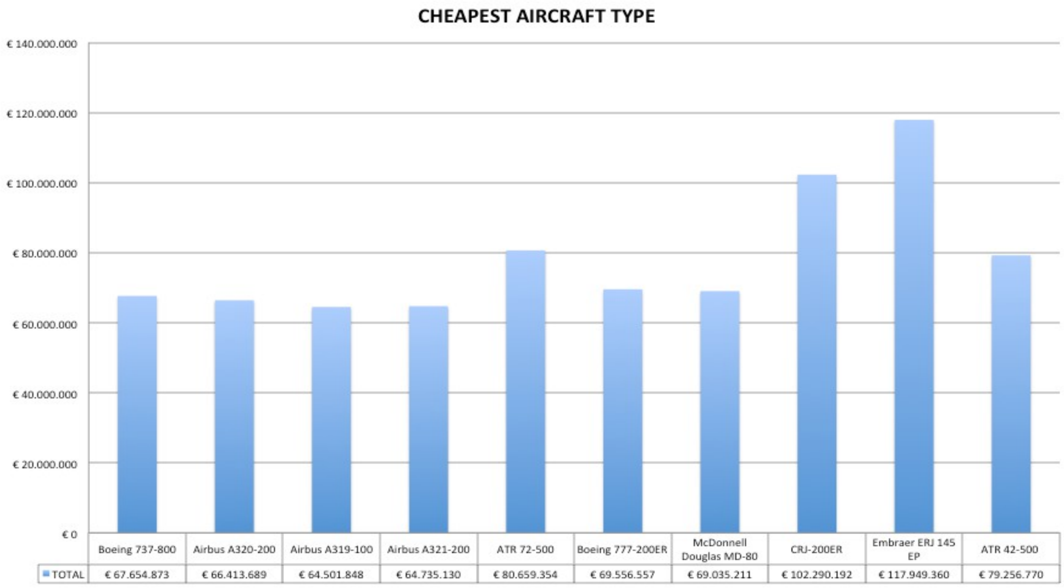


Figure 39: Comparison between Leasing Prices

After having choosed the Airbus A319-100 we can state the optimum number of aircrafts to lease. The following figure shows the number of A319-100 leased per month.

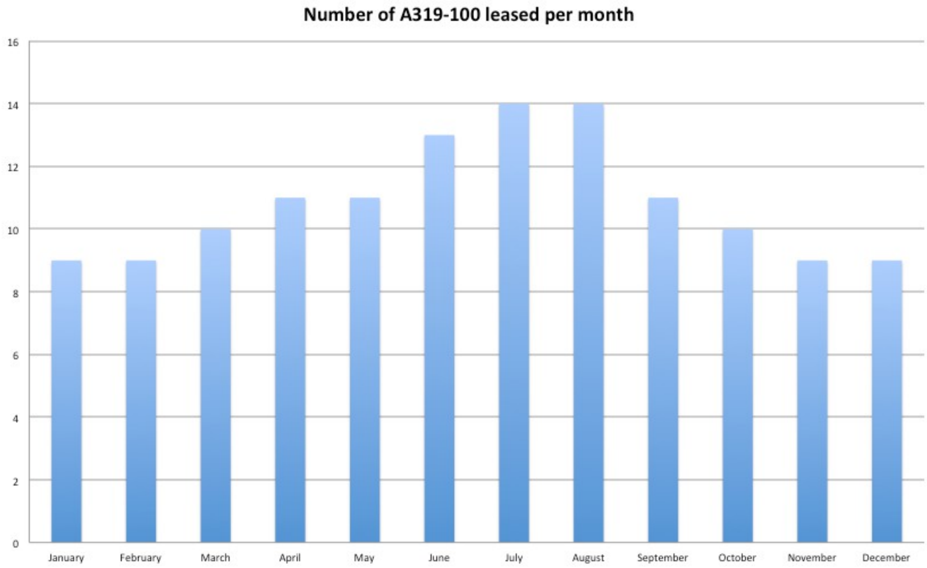


Figure 40: Number of A319-100 leased per month

The minimum number of aircrafts leased is going to be 9 during the months of November to February, both inclusive. We have obtained a maximum of 14 A319-100 leased for the months of July and August.

7. MARKET COMPARISON

In this chapter we are going to compare different means of transport with our airline for the same routes to establish our market comparison. We will also estimate for all of our routes the ticket price in order to characterise it with other transports. The capital expectation gain will be evaluated which will tell us if our airline is viable.

7.1 TICKET PRICE ESTIMATION

When talking about ticket price there are no one size fits all tickets. Airline tickets are not like city bus tickets. An airline president is famous for once saying, "If there are 300 seats on a flight, then there should be 300 different fares for that flight". This alludes to the economic argument that each passenger has a different value for traveling and that value is the price they should pay. Airlines actually are might getting close to getting as much money from each passenger as they are willing to pay.

What this means for you is that for any given flight airfares are competitively priced sometimes; other times they gouge you. Airfares within the EU change at least five times per day. If we don't give specific cities or dates we can give a general airline ticket rule guidance:

- Nearly all flights within the next two weeks are "premium priced".
- Round trip tickets are usually less expensive than one way if they include a Saturday night stayover.
- Flights more than two weeks from now which are not expected to fill to capacity will remain reasonably priced.
- Sometimes flights more than four weeks in the future have some fares which are less expensive, but they will disappear rapidly.
- Flights purchased at the last minute (within 24 hours of departure), can either be very expensive or very cheap. It all depends on demand for the flight.

For our airline ticket price estimation we are going to follow an IATA report for the EU average ticket price for 2012 per advance purchase dates. The following figure shows the average 2012 ticket price that was of 273€. We can see that the cheapest day to buy was with 42 days in advance and the most expensive from 0 to 7 days in advance.

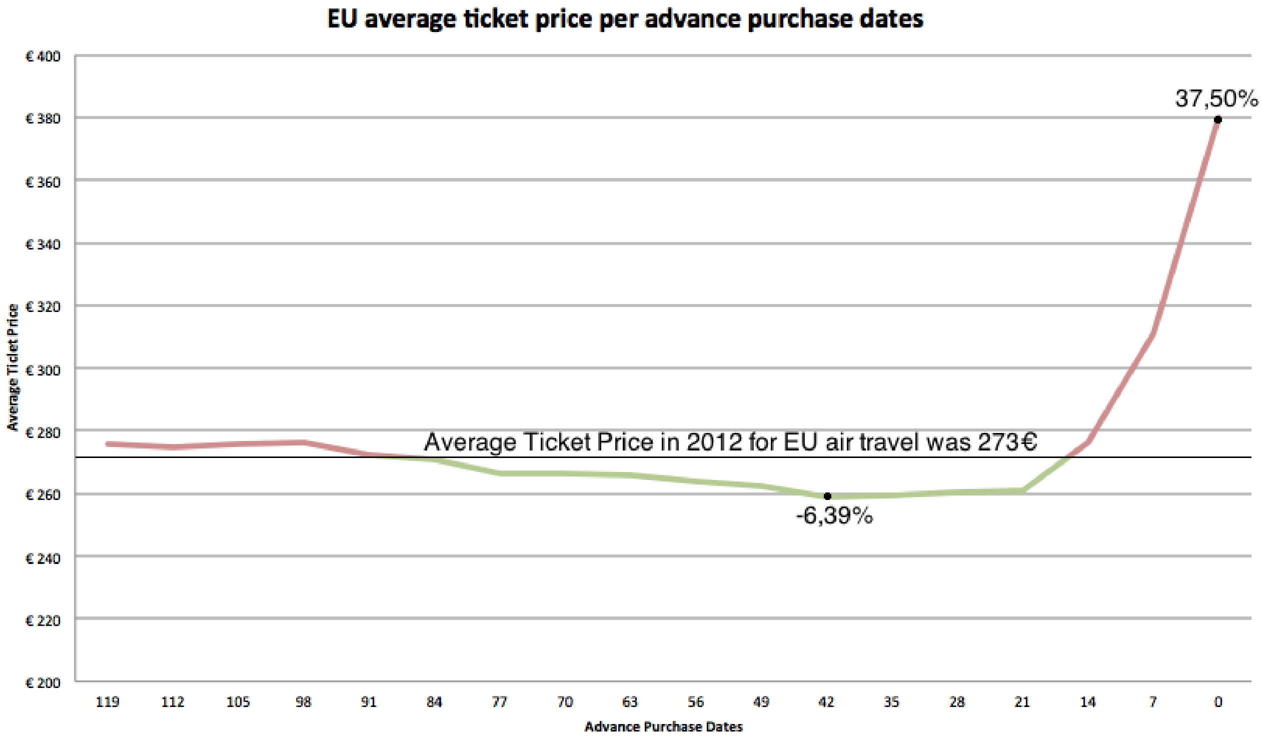


Figure 41: EU average ticket price per advance purchase dates

We are going to base our ticket price estimation in the previous figure. This means that the perentage difference in price from the cheapest price will depend directly on the previous figure, as seen on the next figure. The cheapest price will include a minimum gain of 10€ per single route.

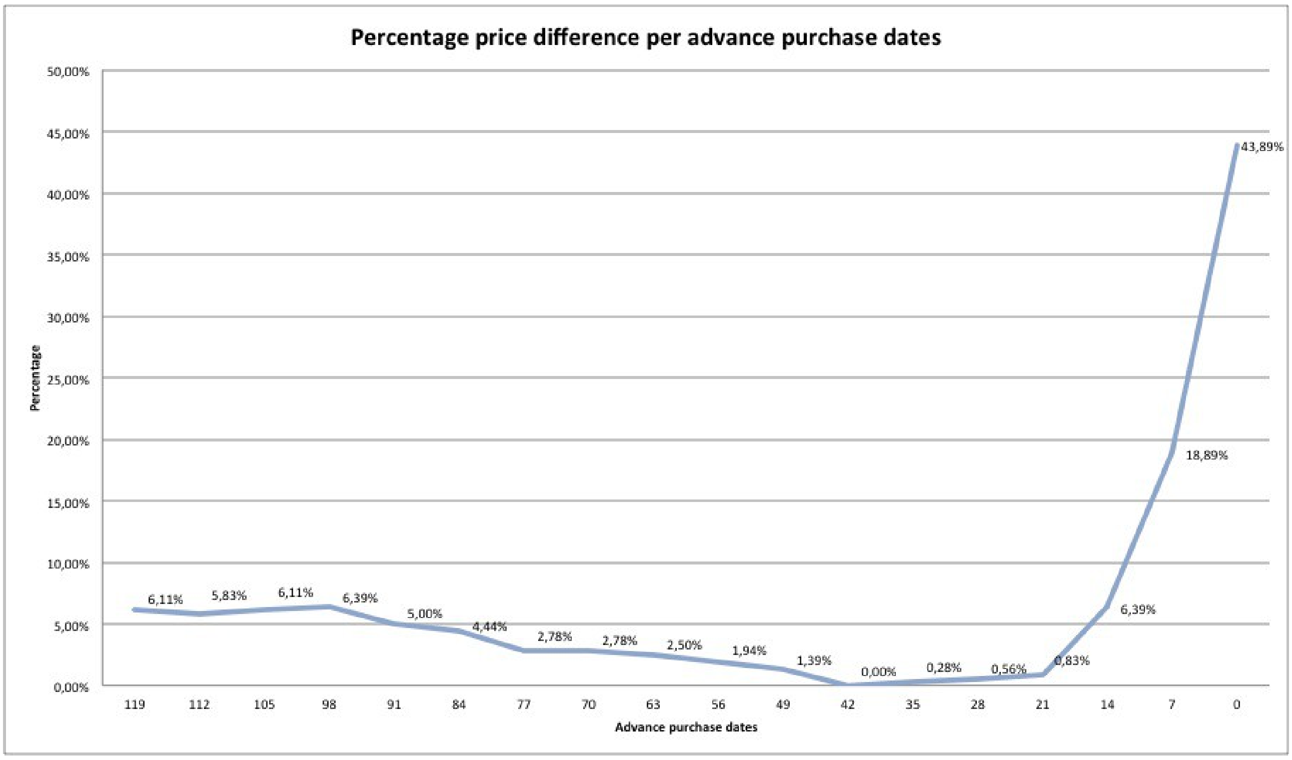


Figure 42: Percentage Price Difference per Advance Purchase Dates

After having analized in chapter 5 the route costs we are going to estimate the ticket price for the following routes:

- Madrid-Barajas – Asturias
- Asturias – Madrid-Barajas

We obtain the following minimum prices:

MADRID-BARAJAS - ASTURIAS	ASTURIAS – MADRID-BARAJAS	ROUND TRIP	BOTH SINGLE TRIPS
30,99€	43,91€	69,35€	74,90€

Table 29: Minimum Ticket Prices

The Madrid-Barajas – Asturias and the Asturias – Madrid-Barajas ticket prices are different as we said in chapter 5 because of the different airport taxes. The approximation and landing taxes are more expensive as other different taxes for the Madrid-Barajas airport than for the Asturias airport.

The following figure shows the prices at which these routes are going to be sold. These prices differ by advance purchase dates.

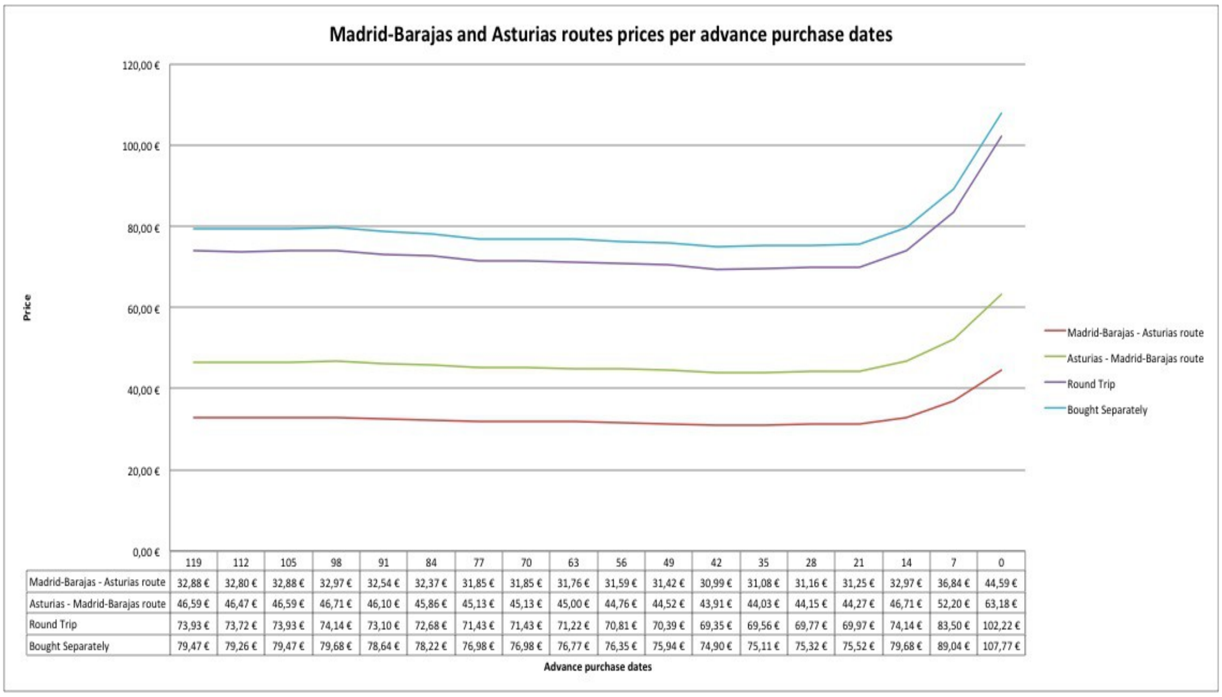


Figure 43: Madrid-Barajas and Asturias Route Prices per Advance Purchase Datess

We can see that the cheapest day to buy an air ticket for these two routes is with 42 to 49 days in advance.

The ticket price estimation has been done for all of our routes in order to find an estimate of our anual capital gain.

7.2 OTHER MEANS OF TRANSPORT

As our company has a national market our competitors will be cars and buses. The ticket route prices have been calculated in previous chapters and we need to compare those prices to those other means of transport. As to follow with the Madrid-Barajas – Asturias route example we are going to calculate the prices of doing this route by car and bus.

TRANSPORT MEAN	MADRID-BARAJAS - ASTURIAS	ASTURIAS – MADRID-BARAJAS	ROUND TRIP	BOTH SINGLE TRIPS
AIRPLANE	32,80€	43,91€	69,35€	74,90€
CAR	69,64€	69,64€	139,28€	139,28€
BUS	33,55€	33,55€	63,75€	67,10€

Table 30: Other Means of Transport Prices

The cheapest mean of transport for a single passenger is the bus which has fixed prices. The price shown for the airplane is the minimum ticket price. Depending on the number of passengers that travel with the same car the price could be the cheapest because the prices should be divided by the number of car passengers. If four people travel by car the Madrid-Barajas – Asturias single route would cost 17,41€ per passenger, nearly half the price of the other two means of transports.

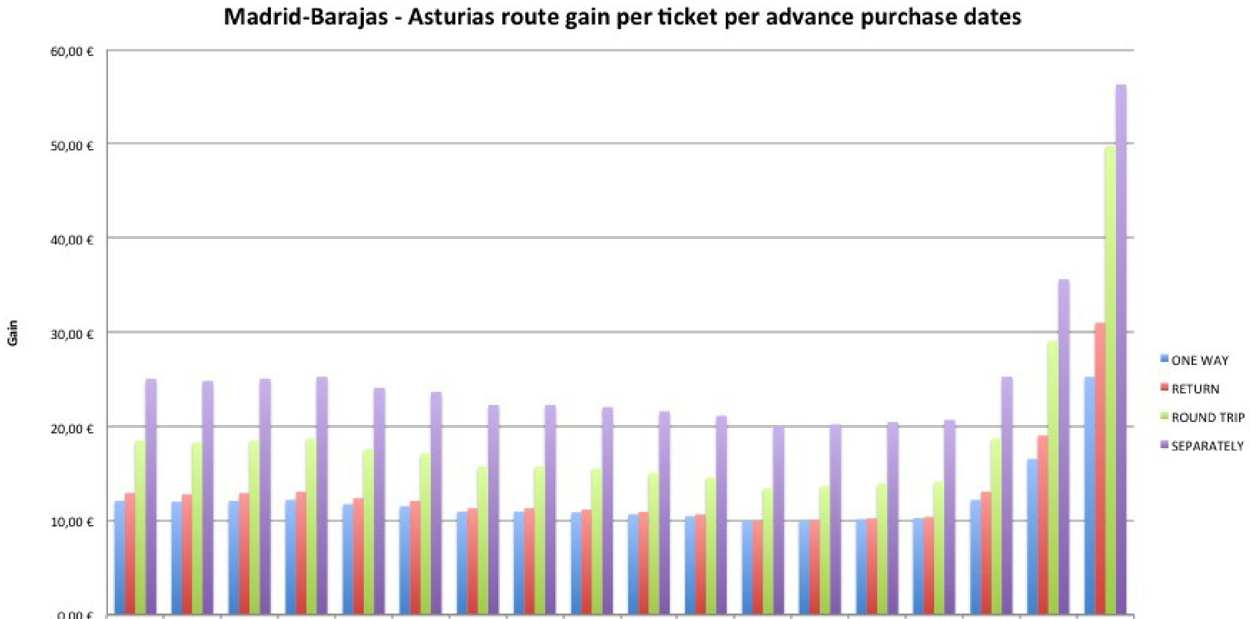
The other market where we compare with these two means of transport is the travel duration. The time difference between the quickest the airplane and the other two will be bigger when bigger the distance is. Following with the previous example the following table shows the duration.

TRANSPORT MEAN	DURATION
AIRPLANE	1h 10min
CAR	4h 57min
BUS	5h 40min

Table 31: Transport Duration

7.3 CAPITAL EXPECTATION GAIN

In section 7.1 we estimated an air price ticket depending on the price difference per advance purchase dates. In this section we are going to characterize our total air ticket gain. We said that per ticket we where going to have a minimum gain of 10€ but depending on the date that the air ticket was bought we where going to have a greater gain. The following figure shows the Madrid-Barajas – Asturias route gain per ticket per advance purchase dates.



	119	112	105	98	91	84	77	70	63	56	49	42	35	28	21	14	7	0
ONE WAY	12,13 €	12,03 €	12,13 €	12,22 €	11,74 €	11,55 €	10,97 €	10,97 €	10,87 €	10,68 €	10,48 €	10,00 €	10,10 €	10,19 €	10,29 €	12,22 €	16,57 €	25,27 €
RETURN	12,93 €	12,79 €	12,93 €	13,06 €	12,40 €	12,13 €	11,33 €	11,33 €	11,20 €	10,93 €	10,67 €	10,00 €	10,13 €	10,27 €	10,40 €	13,06 €	19,05 €	31,03 €
ROUND TRIP	18,51 €	18,28 €	18,51 €	18,74 €	17,59 €	17,13 €	15,76 €	15,76 €	15,52 €	15,06 €	14,61 €	13,46 €	13,69 €	13,92 €	14,14 €	18,74 €	29,08 €	49,76 €
SEPARATELY	25,05 €	24,82 €	25,05 €	25,29 €	24,14 €	23,67 €	22,30 €	22,30 €	22,07 €	21,60 €	21,15 €	20,00 €	20,23 €	20,46 €	20,69 €	25,29 €	35,62 €	56,30 €

Advance Purchase Dates

Figure 44: Madrid-Barajas - Asturias Route Gain per Ticket per Advance Purchase Dates

For each route as seen we have divided the route in four different types;

- One way
- Return
- Round Trip
- Separate flights

As prices are different for each four types we now need to know the percentage of passengers for each type. To do these we had to create a survey due to the lack of information. Our survey demanded people to tell which type of modality when buying air tickets for 2012 they used. 48 people answered and this is what we obtained:

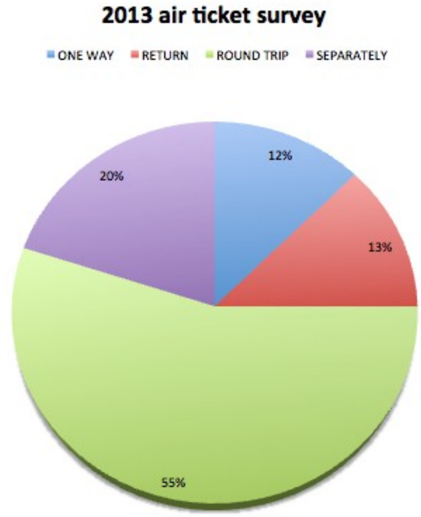
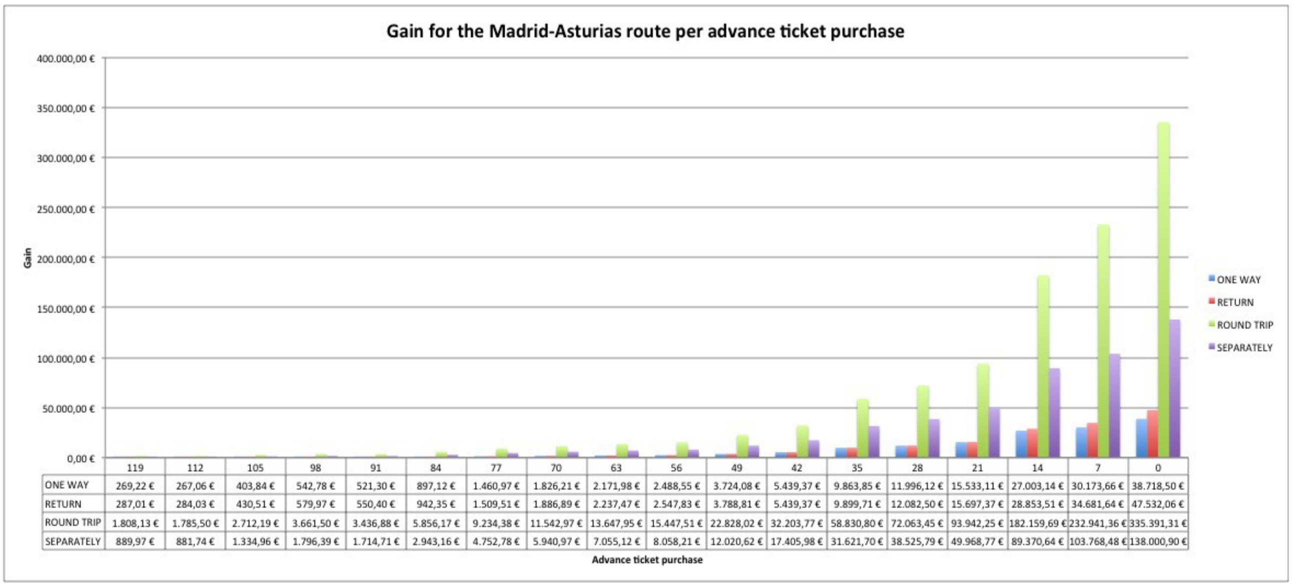


Figure 45: 2012 Air Ticket Survey

Now we know the percentages of passengers that will buy each type of air ticket. During the project we have estimated the number of passengers that we will transport per route. With this data we can quantify the total anual gain per route . For the Madrid-Asturias route we will have the following profits.



	119	112	105	98	91	84	77	70	63	56	49	42	35	28	21	14	7	0
ONE WAY	269,22 €	267,06 €	403,84 €	542,78 €	521,30 €	897,12 €	1.460,97 €	1.826,21 €	2.171,98 €	2.488,55 €	3.724,08 €	5.439,37 €	9.863,85 €	11.996,12 €	15.533,11 €	27.003,14 €	30.173,66 €	38.718,50 €
RETURN	287,01 €	284,03 €	430,51 €	579,97 €	550,40 €	942,35 €	1.509,51 €	1.886,89 €	2.237,47 €	2.547,83 €	3.788,81 €	5.439,37 €	9.899,71 €	12.082,50 €	15.697,37 €	28.853,51 €	34.681,64 €	47.532,06 €
ROUND TRIP	1.808,13 €	1.785,50 €	2.712,19 €	3.661,50 €	3.436,88 €	5.856,17 €	9.234,38 €	11.542,97 €	13.647,95 €	15.447,51 €	22.828,02 €	32.203,77 €	58.830,80 €	72.063,45 €	93.942,25 €	182.159,69 €	232.941,36 €	335.391,31 €
SEPARATELY	889,97 €	881,74 €	1.334,96 €	1.796,39 €	1.714,71 €	2.943,16 €	4.752,78 €	5.940,97 €	7.055,12 €	8.058,21 €	12.020,62 €	17.405,98 €	31.621,70 €	38.525,79 €	49.968,77 €	89.370,64 €	103.768,48 €	138.000,90 €

Figure 46: Gain for the Madrid-Asturias Route per Advance Ticket Purchase

The Madrid-Barajas -Asturias total anual gain is:

Figure 47: Madrid-Barajas - Asturias Total Gain

The only calculation needed to complete the total gain of routes is the addition of all the route gain.

ROUTE		TOTAL GAIN
Madrid-Barajas	Asturias	1.938.076,54 €
Asturias	Tenerife Sur	380.673,35 €
Asturias	Palma de Mallorca	673.633,04 €
Asturias	Barcelona-El Prat	1.279.065,95 €
Madrid-Barajas	Bilbao	2.946.343,23 €
Bilbao	Málaga	730.542,40 €
Bilbao	Ibiza	783.569,57 €
Bilbao	Palma de Mallorca	919.393,78 €
Bilbao	Menorca	697.150,63 €
Madrid-Barajas	Girona	1.597.621,24 €
Girona	Ibiza	286.995,38 €
Girona	Palma de Mallorca	644.168,48 €
Girona	Bilbao	579.339,84 €
Barcelona-El Prat	Bilbao	2.091.769,15 €
	TOTAL	**15.548.342,56 €**

Table 32: Total Gain of all routes

After calculating the anual gain for each route we have obtained an anual total gain for the sum of all routes of 15.548.342,56 €.

8. CONCLUSIONS

Fleet choices are among the most significant decisions airlines make. The greater choice of airframe means there is a greater value opportunity. At the same time the challenges facing the industry also means there is greater risk and greater impact of not reaching the best possible deal. In order to protect and enhance value, airlines are seeking to adopt a more robust and integrated approach to decision-making that better aligns fleeting decisions with their long-term stategic direction.

Identifying and incorporating long-term complexities and uncertainties within the evaluation provides enhanced understanding of the risk-reward trade-offs, which in turn enables better financial and operational outcomes.

The first thing done of the project was to plan the development of it. We planned it with the purpose of helping the reader understand better its structure. The aim was to use it as a guideline of the the structure of the final project.

We used Gantt diagrams to illustrate the Projects planning. The next figure shows the Initial Gantt diagram that was done before starting with the project.

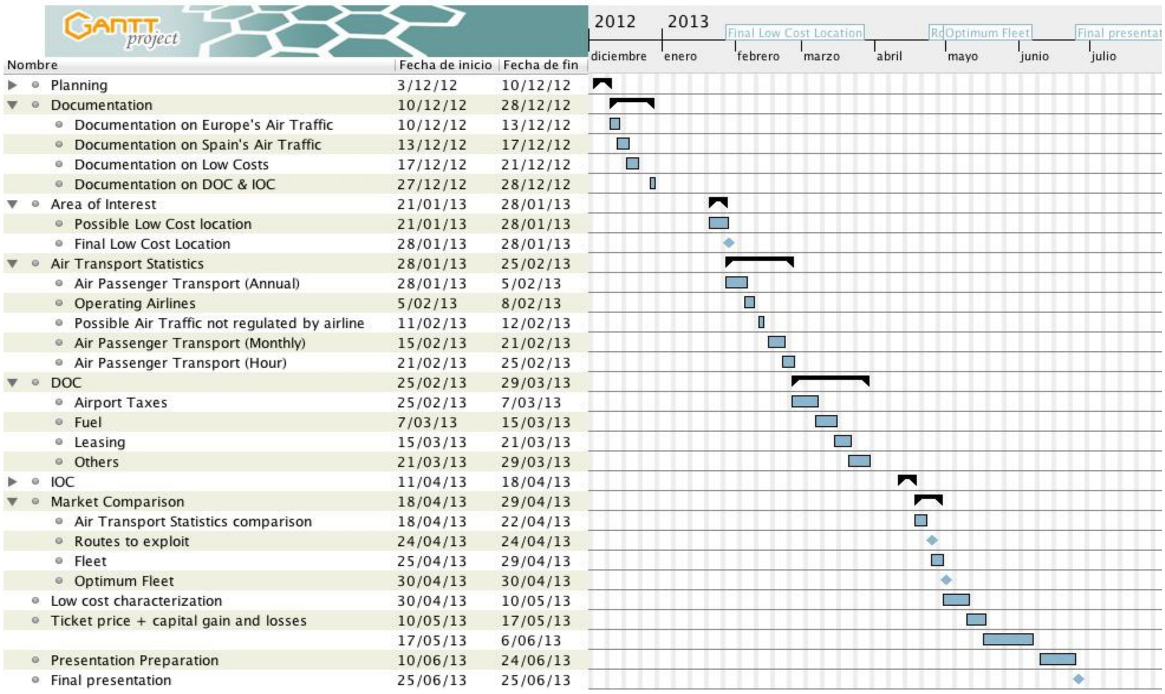


Figure 48: Initial Gantt Diagram

The last thing done was the Final Gantt diagram. This was done to illustrate how the project had evolved since the beggining and then to compare it with the suggested initial planification diagram.

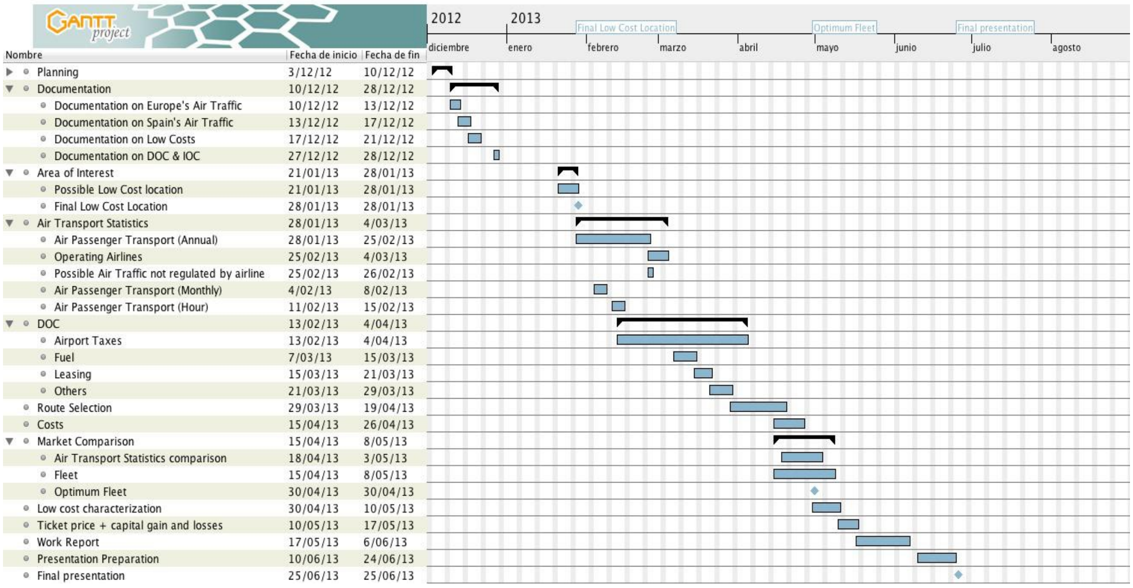


Figure 49: Final Gantt Diagram

If you compare the above Gantt diagrams you can see that both diagrams differ. The main differences appeared in the air transport statistics where we had to spend a lot of time charaterising the air traffic market. Another big difference was the airport taxes and the costs that were very difficult to calculate.

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Figure 21, 22: http://fuelplanner.com/index.php

Error: No se encuentra la fuente de referencia: http://www.aena.es/csee/Satellite/Home

Figure 41: http://www.iata.org/Pages/default.aspx

All other figures are made by me.

Table 1, 3, 5, 6, 7, 8, 9, 10, 11: http://www.aena-aeropuertos.es/csee/Satellite/estadisticas/es

Table 2, 4: All Different Airlines

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Table 22: Airplane Design Class Notes

Table 23: Airplane Design Class Notes

Table 25: http://www.myairlease.com/resources/fleetstatus

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All other tables are made by me.