

ČESKÉ VYSOKÉ UČENÍ TECHNICKÉ V PRAZE
FAKULTA DOPRAVNÍ

Adam Vysocký

**Analýza možného provozu business jet s dlouhým
doletem z Prahy**

Bakalářská Práce

2015



K621.....

Ústav letecké dopravy

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(PROJEKTU, UMĚLECKÉHO DÍLA, UMĚLECKÉHO VÝKONU)

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Zásady pro vypracování

Při zpracování bakalářské práce se řídíte osnovou uvedenou v následujících bodech:

- Úvod
- Analýza středoevropského trhu na poli dálkových letů v business aviation
- Analýza výběru letadla vhodného pro dálkové lety
- Kalkulace účetnictví
- Srovnání ukázkových situací
- SWOT analýza
- Závěr

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Rozsah průvodní zprávy: minimálně 35 stran textu (včetně obrázků, grafů a tabulek, které jsou součástí průvodní zprávy)

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- Michal Pazourek - Business aviation in Europe - pernerscontact 5/2011
- NBAA - national business aviation association

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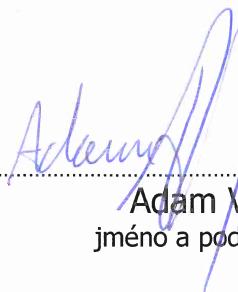


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(PROJECT, WORK OF ART)

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Guides for elaboration

During the elaboration of the bachelor's thesis follow the outline below:

- Introduction
- Central Europe market analysis with respect to long haul operations
- Long haul aircraft selection analysis
- Financial calculations
- Example situation comparison
- SWOT analysis
- Conclusion

Graphical work range: according to the instruction of the master's thesis supervisor

Accompanying report length: at least 35 pages of text (including figures, graphs and tables, which are part of the accompanying report)

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- John Sheehan - Business and Corporate Aviation Management: On demand air travel - 2003
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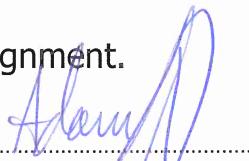
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Prague October 24, 2014

ČESKÉ VYSOKÉ UČENÍ TECHNICKÉ V PRAZE

Fakulta Dopravní

Analýza možného provozu business jet s dlouhým doletem z Prahy

Bakalářská Práce

Srpen 2015

Adam Vysocký

Abstrakt

Předmětem bakalářské práce "Analýza možného provozu business jet s dlouhým doletem z Prahy" je prozkoumat středoevropský trh na poli business aviation a zhodnotit jeho možnosti pro provoz dálkového business jet. Na základě tohoto zhodnocení je pak provoz takového letadla analyzován.

Abstract

The subject of the bachelor "Analysis of possible Long-Haul Business Jet Operations from PRG" is to investigate Central European business aviation market and evaluate its possibilities for operating long-haul business jet. On the basis of this evaluation is analyzed the operation of the aircraft.

Klíčová slova

Business aviation, business jet, dálkové lety, Gulfstream G550, Letectví

Key words

Business aviation, business jet, long-haul flights, Gulfstream G550, Aviation

Poděkování

Na tomto místě bych rád poděkoval všem, kteří mi poskytli podklady k vypracování Bakalářské práce. Zvláště pak děkuji pánům Ing. Michalovi Dvořákovi a Ing., Bc. Jakubovi Hospodkovi, Ph. D. za odborné vedení a konzultování bakalářské práce a za rady, které mi k práci poskytovali, dále bych chtěl poděkovat Ing. Michalovi Pazourkovi a Ing. Janovi Králíkovi za konzultace a rady k Bakalářské práci a za možnost se účastnit jejich projektu. Také bych chtěl poděkovat pánům Ing. Vladimírovi Čížkovi a Ing. Tomášovi Vláčilovi za poskytnutí důležitých informací. V neposlední řadě bych chtěl poděkovat svým rodičům a blízkým za podporu během celého studia.

Prohlášení

Předkládám tímto k posouzení a obhajobě bakalářskou práci, zpracovanou na závěr studia na ČVUT v Praze Fakultě dopravní.

Prohlašuji, že jsem předloženou práci vypracoval samostatně a že jsem uvedl veškeré použité informační zdroje v souladu s Metodickým pokynem o etické přípravě vysokoškolských závěrečných prací.

Nemám závažný důvod proti užití tohoto školního díla ve smyslu § 60 zákona č. 121/2000 Sb., o právu autorském, o právech souvisejících s právem autorským a o změně některých zákonů (autorský zákon).

V Praze dne 21.Srpna 2014


podpis

Table of content

List of abbreviations	10
1 Introduction.....	12
2 Central European Market Analysis.....	13
2.1 Methodology	13
2.2 PEST Analysis.....	13
2.2.1 Political factors	13
2.2.2 Economic factors	14
2.2.3 Social factors	17
2.2.4 Technological factors.....	18
2.3 Traffic analysis.....	18
2.3.1 Data.....	18
2.3.2 Long Range Aircraft flights analysis.....	19
2.3.3 Long haul flights with medium range aircraft analysis	19
2.3.4 Results	21
2.4 Porter's five forces analysis	21
2.4.1 Force one: Supplier power.....	21
2.4.2 Force two: Buyer power.....	22
2.4.3 Force three: Competitive rivalry	22
2.4.4 Force four: Threat of substitution	22
2.4.5 Force five: Threat of new entry	23
2.5 Conclusion.....	23
3 Aircraft selection analysis	24
3.1 Aircraft overview	24
3.1.1 Gulfstream G550	24
3.1.2 Gulfstream G650	25
3.1.3 Bombardier Global 6000.....	25
3.1.4 Dassault Falcon 7X.....	25
3.2 Evaluation.....	26

3.3	Conclusion.....	26
4	Financial calculation	28
4.1	Aircraft Financing Analysis.....	28
4.1.1	Operational models.....	28
4.1.2	Financing methods	30
4.1.3	Financing analysis	31
4.2	Operational cost	32
4.2.1	Fixed costs	32
4.2.2	Variable costs.....	36
4.2.3	Total costs.....	38
4.3	Aircraft use analysis.....	38
5	Example situation comparison	43
5.1	Long haul flights specifics.....	43
5.2	Example situation of long haul flight.....	43
5.2.1	Embraer Legacy 600	43
5.2.2	Gulfstream G550	44
5.3	Comparison	44
6	SWOT analysis	46
7	Conclusion.....	47
	Content of figures	50
	Content of tables.....	50
	References	51
	List of attachments.....	53

List of abbreviations

ICAO – International Civil Aviation Organization

SWOT – Strengths, Weaknesses, Opportunities, Threats Analysis

PEST – Political, Economical, Sociological, Technological Factors Analysis

EASA – European Aviation Safety Agency

EU – European Union

GDP – Gross Domestic Product

ŘLP ČR – Řízení letového provozu České Republiky

BIKF – Keflavík International Airport (ICAO code)

BIRK – Reykjavík Airport (ICAO code)

BIEG – Egilsstaðir Airport (ICAO code)

BIAR – Akureyri Airport (ICAO code)

EINN – Shannon Airport (ICAO code)

EICK – Cork International Airport (ICAO code)

EIDW – Dublin International Airport (ICAO code)

EGPK – Glasgow Prestwick International Airport (ICAO code)

EGPC – Wick Airport (ICAO code)

LPLA – Lajes Air Base Int. (ICAO code)

LPAZ – Santa Maria Airport (ICAO code)

LPPD – Ponta Delgada João Paulo II Airport (ICAO code)

LPPS – Porto Santo Airport (ICAO code)

GVAC – Amílcar Cabral International Airport (ICAO code)

GVNP – Praia International Airport (ICAO code)

GCLP – Gran Canaria Airport (ICAO code)

GCTS – Tenerife South Airport (ICAO code)

OMAD – Bateen Airport (ICAO code)

OMSJ – Sharjah International Airport (ICAO code)

CYQX – Gander International Airport (ICAO code)

CYYT – St. John's International Airport (ICAO code)

CYJT – Stephenville International Airport (ICAO code)

LKPR – Prague Václav Havel Airport (ICAO code)

KEWR – Newark Liberty International Airport (ICAO code)

FIR LKAA – FIR PRAHA (ICAO code)

FIR – Flight Information Region

NM – Nautical Mile

M – Mach

p.a. – per annum

APU – Auxiliary Power Unit

KTS – Knots

IFR – Instrumental Flight Rules

1 Introduction

Business aviation is part of aviation that is according to ICAO definitions situated between general aviation and commercial air transport. It combines charter, taxi and air ambulance operations with corporate operations. Business aviation is mainly used by executives of big international companies for traveling to their business or politicians. Business aviation has many advantages for the users, main advantage is its flexibility and speed. Business aviation users are usually very busy people with a tight schedule and saving every hour is very important for them. Also the business jet offers comfort of an office or living room and the passengers can fully focus on their work or relax to be fresh for the meeting.

Aim of the thesis is to analyze profitability of possible operation of long range business jet based in Prague. The current situation (2015) is that there are two operators offering long range business jet for charter flights, but the aircraft are more or less unavailable to hire, because they are mainly used by their owners. For that reason all the long haul charter private jet flights have to be done by aircraft hired from abroad or by medium range business jet with technical stop on the way.

Firstly the thesis analyzes current Central European market, its economic environment and demand for business aviation. Analysis of the market shows what kind of aircraft would suit for it and the thesis continues with aircraft selection analysis. During the selection are taken into account many factors and is chosen type of aircraft that would be based in Prague. This analysis is followed by financial calculation of operating the aircraft. The business plan of purchasing the aircraft has to be profitable and due to the demand prediction from Central European market analysis it is counted how many flight hours would the plane have to fly and how much the plane would be profitable. After the calculation of the costs the long range business jet is compared with current option, thus with medium range business jet. Aircraft are compared on specific flight. In the end there is the conclusion of the analysis accompanied by SWOT analysis.

2 Central European Market Analysis

To plan the purchase and operation of the aircraft it is fundamental to analyze the market, where the aircraft would be operated. The analysis has to focus on the environment of the market and historical data about the flights. Economic environment shows how the market would react to new product and how the customers would behave after the change. Analysis of the data shows the demand in the past and its possible development in the future.

Demand for the aircraft is important thing to know and predict for many reasons. Possible utilization of the aircraft shows how many flight hours and flight cycles would the aircraft pass through. Also on the number of the flight hours depends how many pilots and other crew members will be needed. The data is important for making the business plan of the operation of the aircraft, counting the operational costs of the flight and its variable component.

Market, where the new aircraft would be operated would consist of Czech Republic, Slovakia, Hungary and Poland. These countries are in action radius of the aircraft and does not dispose of own long range business jet for chartering.

2.1 Methodology

The market analysis in this paper is done in three steps. First step focuses on investigation of the economic environment of the market with PEST analysis. In the second step exact data from various sources are analyzed and processed for more accurate results. Last part of the analysis is Porter's Five Forces Model that includes both views and complexly evaluates the market situation.

2.2 PEST Analysis

PEST analysis is economical instrument to analyze the environment from the macro-economic point of view. Each letter in PEST abbreviation stands for different factors, P stands for political, E for economic, S for social and T for technological factors. PEST is often extended by two more letters L and E, which stands for legal and environmental factors. Legal and environmental factors are mentioned in political and technological ones in the analysis below.

2.2.1 Political factors

Aviation is influenced by local politics as any other business. The tax policies and regulations of the country limit the business and keep it safe for customers and for the companies in the business. Czech Republic is member of European Union and main regulations making civil aviation authority is European institution EASA. As was mentioned before business aviation is affected by taxes. There are two types of taxes for business aviation in the Czech Republic – EU-wide taxes, these taxes are more focused on ecological issues and national taxes.

EASA

Abbreviation EASA stands for European Aviation Safety Agency. It is European Union authority taking care of the strategy and safety management, the certification of aviation products, licensing flight personnel and the oversight of approved organizations and EU Member States. EASA was established in 2002 and replaced Institution JAA.

EASA creates rules and oversees their compliance to make the aviation to be on the highest level of safety to protect EU citizens within the EU and worldwide. It regulates aviation in ecologic way and makes the system of regulations clear and prevent duplications of rules. EASA also cooperates with other Aviation Authorities outside the Europe.[1]

2.2.2 Economic factors

European Union is the largest economics in the world. Many formal domestic companies are becoming with the European integration international, which induces need of traveling. Companies executives has to travel every day all around the world and using private aircraft makes the traveling more flexible and saves a lot of time and money.

The Czech Republic is one of the strongest and fastest growing economics between formal Eastern bloc European countries. It can be seen on the figure 1 that compares these countries and EU28 GDPs per capita. GDP is one of the indicators that shows economy status of the country and is also suitable for the analysis needs.

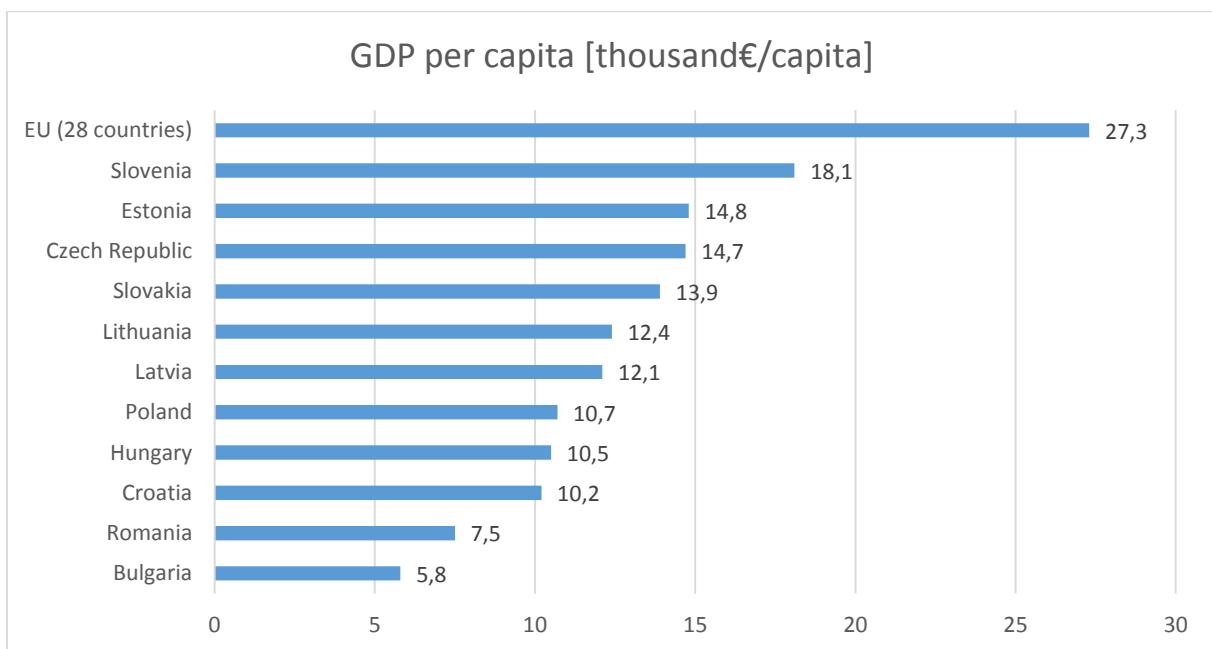


Figure 1 – GDP per capita of formal Eastern bloc countries (source: ec.europa.eu/eurostat)

Economic environment of a country is important for business aviation. Wealthier country means more opportunities for business jet operators and higher demand for flying private. On the other hand even though the economy is still growing, number of possible customers is

not growing that fast. Private Jet is still quite expensive thing and is available for a small group of the wealthiest companies and people.

There are 40 private jet aircraft operated by Czech operators. Not all of them are registered in Czech Republic and not all Czech private jets users use services of Czech operators. The figure 2 shows the distribution between bizliners, heavy jets, mid-size jets and light jets operated by Czech operators. Bizliners are rebuilt airliners that are adapted to the needs of exclusive customers or owners of the aircraft. The operating costs of this kind of aircraft are approximately 1.5 times higher than operating costs of heavy ultra-long range jets with similar or better performances, but with lower level of luxury. Heavy jets contains medium and long range aircraft of capacity of about 12–15 passengers, midsize jets are medium range jets with capacity up to ten passengers and light jets are small short range jets with capacity up to eight passengers.[2]

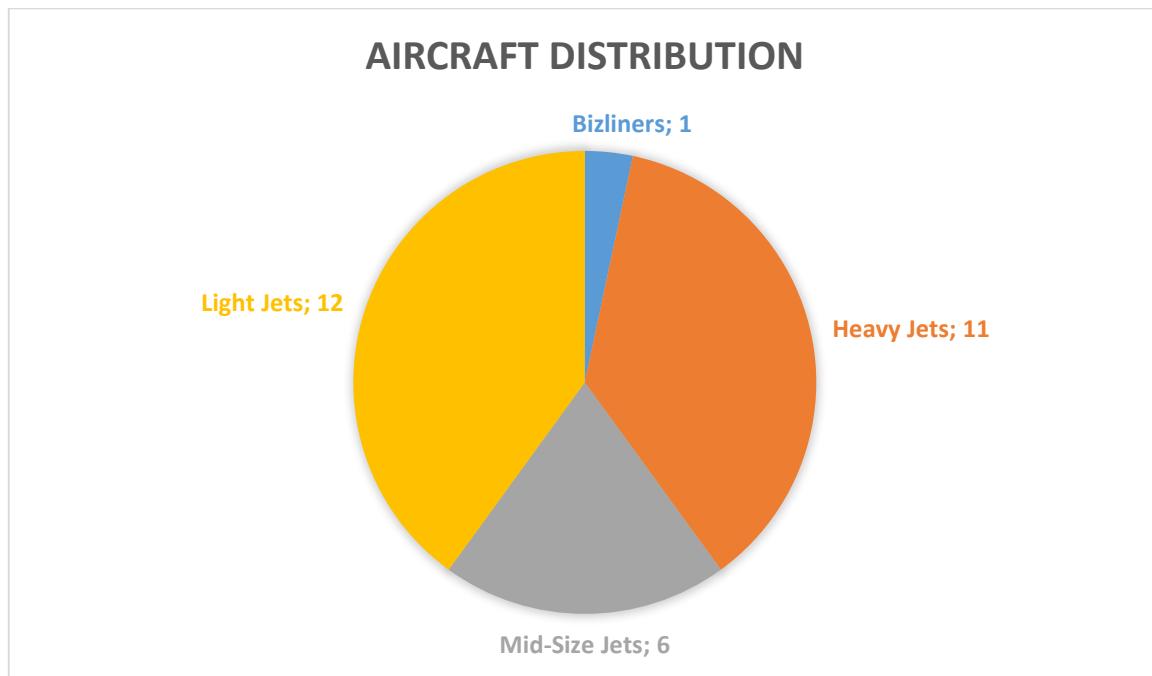
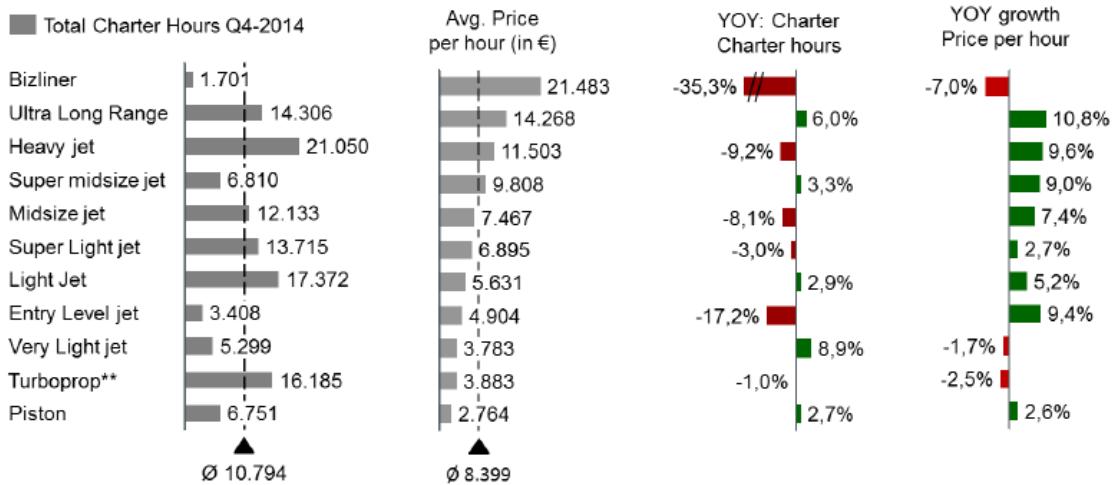


Figure 2 –Distribution of types of business jets operated in Czech Republic (source: www.ebaa.com)

Another figure is focused on chartered private flights during fourth quarter of the year 2014. Each line means different type of aircraft and columns means different information about type of the aircraft. First column shows total charter hours during the period, second one shows average price of the aircraft per hour in €. Last two columns show year changes of total chartered hours and change in average price.



Note:

- Pricing data (all inclusive ex de-icing) provided by **PrivateFly** (www.PrivateFly.com)
- Only O&Ds considered with Origin Europe and Destination Europe / World Wide
- * only Airbus A318 Elite, A319 and BBJ3 are considered.
- ** only 2 engine aircraft are considered

Figure 3 –Charter flight hours and charter pricing (source: www.ebaa.com)

Ultra long range business jet, the type of aircraft's use is analyzed in this paper is on private jet charter market on the growth. Annually the chartering grows by 6%. Average price of one hour of ultra-long range business jet is over 14 000 € and the price is still growing.

There are 19 active business aviation operators in the Czech Republic. To compare in Poland there are only 7 operators. This fact indicates that Czech Republic is very developed and have a good technical and economic environment for business aviation business.[2][3]

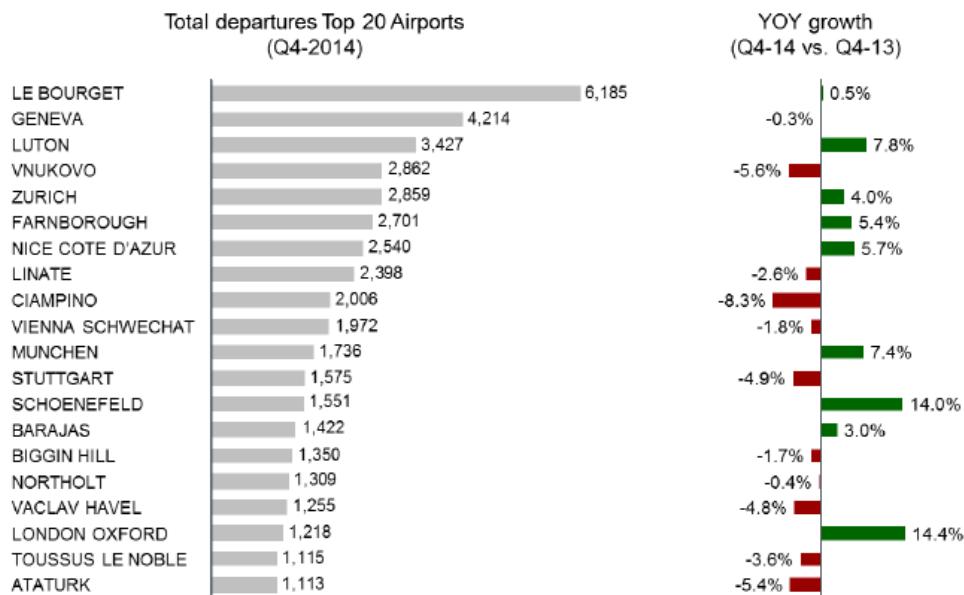


Figure 4 –Top 20 airport departures (source: www.ebaa.com)

In the graph above, showing number of business aviation departures on the top 20 European airports in fourth quarter of 2014, you can see that business aviation traffic in Vaclav Havel Airport is little bit on decrease, but still it is one of twenty busiest airports in the business aviation in the Europe and with Vnukovo airport the only airports from formal eastern bloc in this scale.

Big advantage of the Czech Republic is its position in the middle of the Europe. This can be large opportunity for making meetings of international companies here. This meetings means need of transportation from and to many countries all over the world and it means it is an opportunity for domestic business jets operators.

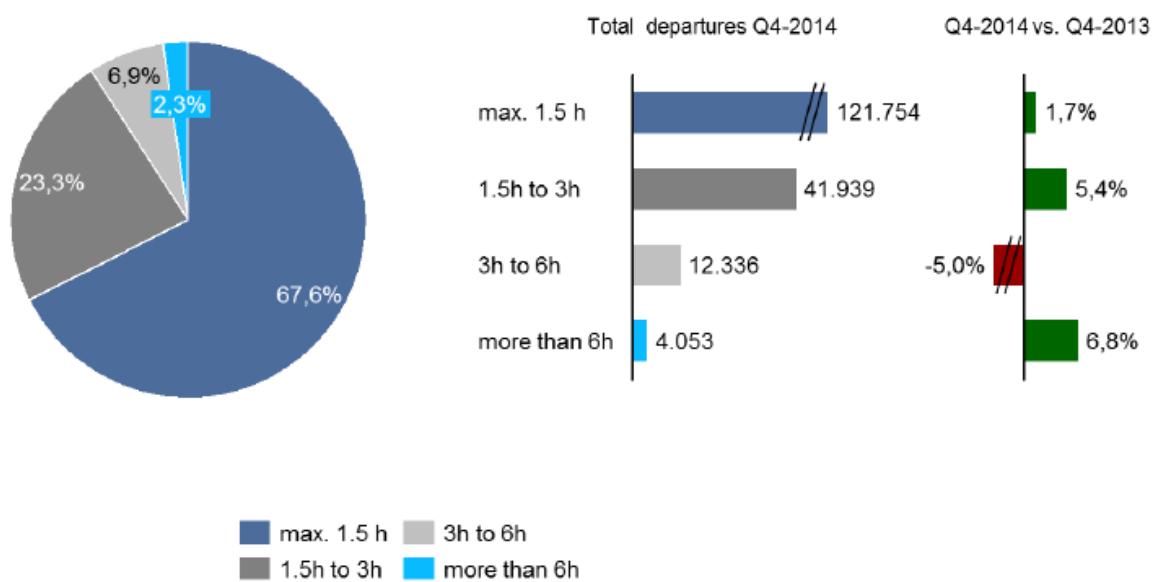


Figure 5 – Distribution of flight duration. (source: www.ebaa.com)

The figure 5 shows distribution of flights in business aviation in the fourth quarter of year 2014 according to their length. It is obvious that the longest flights makes minority in the statistics, on the other hand we can see in the graph that this sector is on the biggest growth. Majority of private jet flights operated from Czech airports are short hauls over Europe, but it is needed to take into account that business aviation is not always logical. So that it is not an exception that even for very short flights are used heavy long range jets. The users like to show off and uses size of the aircraft as an expression of their social status.

2.2.3 Social factors

View of business aviation is very different in Europe than for example in USA. Business aviation is for majority of people something extravagant and for rich people to show off their wealth. People don't think about the time savings and look at the business aviation as one of the least efficient means of travel. Especially in the Czech Republic are people affected by

the communist era and a lot of them look at the richest people as bad people that could not get so much money in legal way. In the USA it is more common to travel by plane and of course by business jets too. Europe is more focused on cheaper and more ecological means of transport such as trains. Also as was mentioned above European politics leads to stricter ecological restrictions and it is more complicated and more expensive to get all needed certifications here in Europe than in USA.

2.2.4 Technological factors

As the Czech civil aviation authority abides by EASA regulations there are not any other special stricter requirements that Czech registered aircraft have to comply with. EASA has influence to quite big part of the market, so that aircraft manufacturers takes EASA regulations into account and design aircraft to comply with it.

Czech airports feature good technical facilities. Vaclav Havel airport belongs to 20 busiest business aviation airports in Europe and it means it has to provide adequate service. Facilities of maintenance companies on the airport offer basic maintenance and line checks for many types of aircraft, from the long range ones for example to Gulfstream G550. Anyway for more complicated maintenance checks and repairs Czech market is still not big enough and it is needed to fly for it to airports for example in Germany.[4]

New technologies used on new aircraft also makes business aviation less expensive and more affordable for more companies. The operating costs of the aircraft are decreasing and speed and flexibility are increasing. Also new aircraft are more environment friendly and emit less exhaust gases.

2.3 Traffic analysis

For traffic analysis were used statistics made from data received from ŘLP ČR and data from one unnamed company. Data contained flight plans of flights operated from Czech airports from 1.4.2014 to 1.4.2015. From the flight plans was intended how often and what kind of aircraft flies long haul flights from Czech airports. These data contains only flights with departure from the Czech Republic, so that it is needed to take into account also flights back.

2.3.1 Data

Data used for the analysis were type of flight, departure aerodrome, destination aerodrome and type of aircraft. These data was sorted and not useful data were deleted. Useful data contained nonscheduled and general aviation flights, middle and long range aircraft. Than it differed by purpose. First were investigated all flights made by long range aircraft and then all

medium range aircraft flights to destinations typical for making technical stops during long haul flights.

2.3.2 Long Range Aircraft flights analysis

From sorted flight plans were chosen only flights of long range business jets. Then was investigated usage of all long range business jets and compared with data about flights of one specific type of the long range business jet from unnamed operator. Flights were divided into three groups – short haul flights shorter than two hours (SH), medium haul flights shorter than five hours (MH) and long haul flights longer than five hours (LH). It is also needed to take into account, that some flights are made by the owners of the aircraft and some are chartered flights. This can be differed from the flight plan because chartered flights should be nonscheduled (N) type of flight and private flight should be general aviation flight (G). Column TOTAL contains general aviation and nonscheduled flights together and last column G550 are all flights of Gulfstream G550 aircraft operated by unnamed Czech company.

Table 1 – Departures of long range business jets from Prague airport (source: own analysis of ŘLP ČR data)

	G		N		TOTAL		G550	
	Number of flights	Percent of total number	Number of flights	Percent of total number	Number of flights	Percent of total number	Number of flights	Percent of total number
SH	141	69%	172	75%	313	72%	93	72%
MH	31	15%	38	17%	69	16%	21	16%
LH	33	16%	20	9%	53	12%	16	12%
TOTAL	205		230		435		130	

In the table 1 it is obvious, that majority of long range aircraft flights are short haul flights, followed by medium haul flights and long haul flights are minority of total flights. The distribution is quite illogical, but as was written before, private aircraft users also uses size of the aircraft to show their wealth and social status. Also it can be seen that there is very similar number of private and chartered flights and that total data about all long range business jets has the same distribution between different flight lengths as the distribution between the flights of private G550s of one operator.

2.3.3 Long haul flights with medium range aircraft analysis

As there is not long range business jet for chartering based in Prague, some long haul flights are made with medium range aircraft with technical stop for refueling the aircraft. There are

few airports typical for these stops, they have been chosen after consultation with a flight operation specialist from unnamed company. These airports are not used for other reasons, usually they are quite remoted from civilization and they are not attractive for business jet's users as a final destination airport. List of these airports is given in the table 2.

Table 2 – Typical airports used for technical stop (source: own analysis)

Country	Airports
Iceland	BIKF/BIRK/BIEG/BIAR
Ireland	EINN/EICK/EIDW/EGPK/EGPC
Portugal	LPLA/LPAZ/LPPD/LPPS
Cape Verde	GVAC/GVNP
Gran Canarias	GCLP/GCTS
United Arab Emirates	OMAD/OMSJ
Canada	CYQX/CYYT/CYJT

Flights are again divided into nonscheduled and general aviation flights. Total number of flights operated by medium range business jet to airports typical for technical stop were forty-nine. Twenty-three were general aviation flights and twenty-six nonscheduled flights.

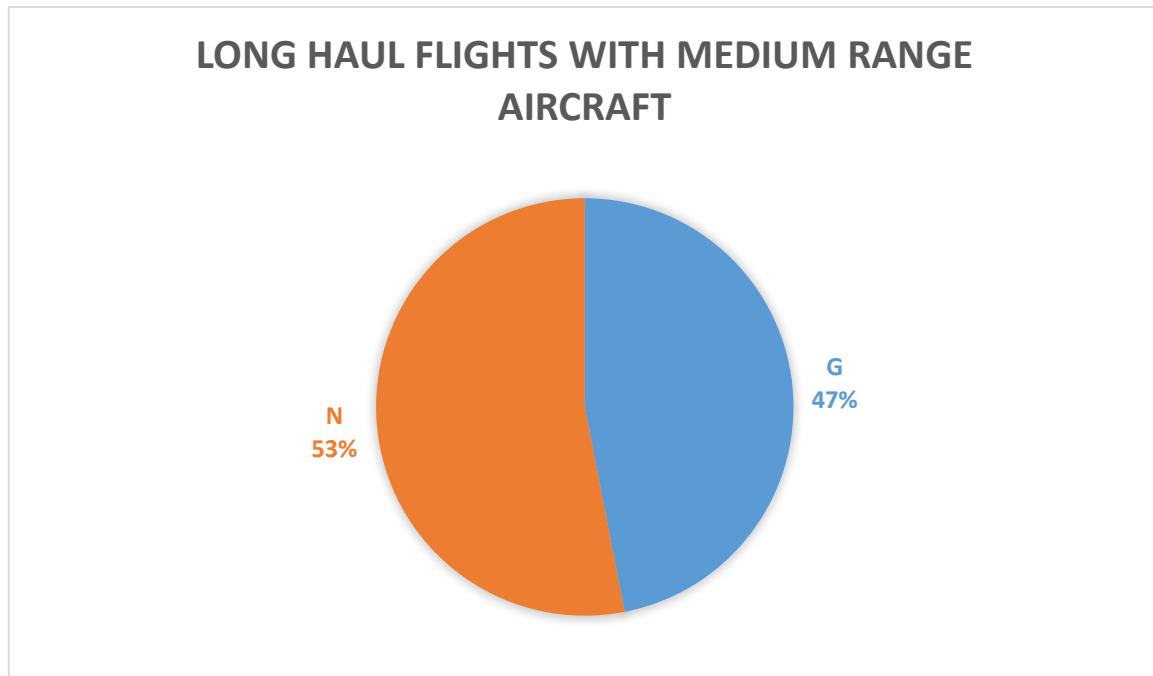


Figure 6 – Departures of medium range business jets from Prague airport to typical airports used for technical stop (source: own analysis of RLP ČR data)

2.3.4 Results

Total number of long haul flights operated from Prague by long and medium range aircraft during given period one year were 102, one half of these flights are general aviation flights and one half are nonscheduled flights.

For purpose of this work are usable only charter flights, so that only nonscheduled flights. Total number of these flights are 56. With average duration of flight 7,5 hours it makes 420 flight hours per one year. This means 420 flight hours of flights from Czech Airports. This number has to be multiplied by two, because there are also flights back. Total number of chartered long haul flight hours is something around 840 hours per year.

Beside these flights there is also obviously demand for this big aircraft for medium and short haul flights. With 141 short haul flights of average duration 1 hour and 33 medium haul flights of average duration 3,5 hours it makes another 299 flight hours of flights from and to Czech airports.

Total possible utilization of the aircraft is about 1039 flight hours per year. This number is much overstated. The aircraft cannot be available all the time in Prague and it is needed to take into account flights that are operated from Czech airports, but these are flights back to home destination of the user.

2.4 Porter's five forces analysis

To find out new opportunities in the business and determine future strategy, it is important to analyze the market and data about the demand and understand the influencing powers acting on the sector. Porter's five forces analysis may serve as a tool taking into account five forces determining the competitive environment. Each force represents the ability of players on the market to reduce the others profitability.

2.4.1 Force one: Supplier power

Supplier power is represented by companies providing long range business jets chartering. Even though there are some operators, operating its aircraft from Prague airport, offering long range business jet, it is impossible to buy charter flight with it. Majority of time the aircraft is used by its owners and they also usually do not allow to charter the aircraft at all.

The only option is to charter long range business jet from abroad, usually from Germany or Austria. This option has one big disadvantage and it is expenses connected with repositioning. Also the flexibility of it is lower than if the aircraft would be based in Prague.

2.4.2 Force two: Buyer power

Second force buyer power takes into account all possible customers on the market and how big share of the market it is possible to retake. Size of the market were investigated in previous analysis of the traffic. It is obvious that as a new product it is almost impossible to retake whole market. After a discussion with a specialist it was stated, that the advantages of the new aircraft would be enough for majority of customers and they would probably use it for their long haul flights.

Even though there is so big potential of possible flights, the aircraft cannot be available in Prague all the time and not all customers would be willing to change their operator. On the other hand the aircraft does not have to be limited only for Czech airports. The action radius of the aircraft supply is about one hour of flight around the base airport. There is great potential in other markets like the Slovakian, Hungarian or Polish one. The new aircraft would be able according to specialist to retake about 60% of the market, it means about 625 flight hours. Another 20% of flights can be operated from not base airports. All together it makes about 750 flight hours per year.

Most favorite remote destination among private jet users includes North America and South and East Asia. Flight to destination like China or Maldives takes more than 10 hours. This means that new aircraft has to perform flights over 5500 NM long.

2.4.3 Force three: Competitive rivalry

Competitors, as was mentioned in supplier power, are other operators. Competitors can be operators operating medium range business jets from Prague or operators operating long range business jet from airports for which the Prague airport is in their action radius. There is not competitor offering such services as would be long range business jet based in Prague. It means there is really good environment for starting new business like this.

Medium range business jets are not suitable for long haul flights. Technical stops are very annoying for the passengers and flight cannot be straight. For the reason it is obvious that many passengers traveling this way would change for more comfortable flight.

2.4.4 Force four: Threat of substitution

Substitution for business jets are for example business classes of commercial airlines or airlines focusing only on business class travelers. The biggest disadvantage of traveling with these airlines is their lower flexibility than traveling by private jet. Traveling by business jet also saves a lot of time and keep passenger's high level of comfort at the same time. Especially from Prague there are not straight flights to many remote destinations and passengers have to do connecting flight to European hub of some bigger airlines.

Another advantage is that having the whole aircraft for such a few people makes the traveling less disturbing and passenger can easily focus on their work or just relax. It is important for the executives to come to the meeting fresh and not tired, this can be quite hard when traveling by commercial airlines with all other passengers.

2.4.5 Force five: Threat of new entry

There is always some threat of new entry. If the competitors operating smaller aircraft would see that business model of operating long range business jet is working, they would probably try the same strategy. For these reasons it is important to offer better quality service and probably try to get some know how from some experienced operator.

2.5 Conclusion

Even though the society and politics are not in favor of business aviation, the ecological trends are preferring more efficient means of transport and there is only limited group of people who can afford it, Central European market still has some empty gaps that can be filled with new product. The economics is still growing and traveling is becoming more important for the business. Compared to western countries Czech Republic still lags in number of business jets and their operators.

From the perspective of the market the aircraft that would be probably suitable for the Czech one should be long range business jet able to fly 10 or more hour long flights to west coast of North America or China and other remote destinations. It should be some heavy jet, but probably not bizliner. Bizliners are on the top level of the business jets and due to its price the clientele is even more limited. In Czech Republic there is only one client using bizliner and it is not very likely that some others would be willing to pay the price for it.

Long range business jet would bring new opportunities for the customers and would be probably fully utilized. 750 hours is value that would be impossible for one crew to serve. Utilization of the aircraft should not be over 450 flight hours per one crew and year and this is value much below the potential of the market. In next steps it is important to count the operating costs of the aircraft compare different financing schemes and compare the profitability of the aircraft with different usage of it. It is needed to count if it is more profitable to use just one crew or to have two crews.

3 Aircraft selection analysis

Central European analysis showed that aircraft that would fit to the market should be long-range business jet with range over 5500 NM. Long range aircraft is designated to fly long haul flights, so that it is important to look at the size of the cabin because of the comfort of the passengers and also the speed of the aircraft. The aircraft has to be affordable for the users, reliable, and known between the users at the specific market. Choosing the aircraft between business jets users is affected by many factors, such as experiences with the aircraft, look of the aircraft or comfort and equipment of the interior of the aircraft. Also it is important to check if the maintenance companies at the airport are capable to do at least line checks and other basic maintenance of specific type of the business jet.

Long range aircraft prices range around fifty million euros for the aircraft, so that it is more logical for such a small market to think about purchasing older aircraft. Five years old aircraft costs about 75% of the original price and this is already reachable price for the aircraft that would be operated on Central European market. [5]

From the analysis were also excluded bizliners that are on one hand capable to fly long distances on the other hand their operational costs and purchasing costs exceed the user's possibilities.

With these conditions, the range of possible aircraft narrowed down to four aircraft. Two aircraft of Gulfstream Aerospace production – G550 and G650, one Bombardier Aerospace business jet – Bombardier Global 6000 and one Dassault Aviation aircraft – Dassault Falcon 7X.

3.1 Aircraft overview

Following lines will describe the characteristics and specifications of each aircraft from the list of four mentioned above.

3.1.1 Gulfstream G550

Gulfstream G550 is ultra-long range business jet with the biggest share on the specific market. In October 2014 there were 455 G550s in operation. The aircraft is produced since 2003 and has a reputation of the most reliable ultra-long range business jet. [6]

The cabin of the aircraft is 2.24 meters wide and 1.88 meters high. These parameters makes the cabin smallest from four analyzed aircraft. Seats configuration offers up to 19 places for sitting passengers or up to eight places for sleeping. [7]

Performances of the aircraft allows it to take off and land on various airports, thanks to its short takeoff and landing distances. The maximum cruise speed is M0.885 and range 6750 NM. Aircraft advantage is also its maximum cruise altitude, which is 51 000 ft. It means that the

aircraft is not affected very much by the traffic of the commercial airlines aircraft that flies lower.[7]

Price of the Gulfstream G550 is about 45 000 000 € and operational costs per one flight hour are 7 823 €.[8]

3.1.2 Gulfstream G650

Gulfstream G650 is flagship of the Gulfstream Aerospace Aircraft. The aircraft is produced since 2012 and there are already 76 in operation of them.[6]

G650 have with its 2.59 meters of width and 1.95 meters of height the largest cabin from compared aircraft. Seat configuration again as in the G550 offers up to 19 places for sitting passengers, but the aircraft can transport up to 10 lying passengers.[9]

Also from the perspective of the performances is G650 the best aircraft from the list, range of the aircraft is 7000 NM and the maximum cruise speed is M0.925. The maximum cruise altitude is 51 000 ft.[9]

Price of the Gulfstream G650 is about 57 500 000 € and operational costs per one flight hour are 9 395 €. These values makes the aircraft the most expensive one in this list.[8]

3.1.3 Bombardier Global 6000

Global 6000 is Bombardier business jet with longest range. The aircraft is produced since 2012 and is already used by 99 users.[6]

Size of the cabin is 2.41×1.88 meters. Global 6000 in typical configuration of seats can take up to 13 passengers.[10]

Bombardier is the slowest between the compared aircraft its maximum cruise speed is M0.88. Range is also much worse than the Gulfstream ones. The aircraft can fly at speed of M0.85 with 8 passengers to destinations 6000 NM remoted.[10]

Price of the Bombardier Global 6000 is about 40 000 000 € and operational costs per one flight hour are 7 956 €.[8]

3.1.4 Dassault Falcon 7X

The only European ultra-long range business jet is a flagship of the Dassault Aerospace of its business jets production. Dassault started to produce the aircraft in 2007 and till October 2014 produced 222 aircraft that are operating. Falcon is the only aircraft with three engines between the compared business jets.[6]

The cabin's size is the second smallest from the aircraft on this list and it is 2.34 meters wide and 1.88 meters high. Maximum capacity of the aircraft is 16 passengers.[11]

Maximum range of Falcon 7X is the smallest between compared aircraft, the business jet can reach only 5 950 NM, on the other hand it is the second fastest plane in the comparison and its maximum cruise speed is M0.90.[11]

Price of the Dassault Falcon 7X is about 45 000 000 € and operational costs per one flight hour are 7 649 €.[8]

3.2 Evaluation

The table 3 compare the main specifics of the aircraft.

Table 3 – Aircraft specifics (source: own analysis)

Aircraft	Range (NM)	Maximum Speed	Max Number of Passengers	Operational costs of one flight hour	Price
Gulfstream G650	6 750 NM	M0.885	19	7 823 €	45 000 000 €
Gulfstream G550	7 000 NM	M0.925	19	9 395 €	57 500 000 €
Bombardier Global 6000	6 000 NM	M0.88	13	7 956 €	40 000 000 €
Dassault Falcon 7X	5 950 NM	M0.90	16	7 649 €	45 000 000 €

3.3 Conclusion

As was mentioned in the beginning for such a small market it is not suitable to buy a new aircraft that is very expensive. Most logical approach is to buy about five years old aircraft that is on about 75% of its original price and it is still not that old that the aircraft would not be used up. Due to the fact, that Gulfstream G650 and Bombardier Global 6000 are produced only since 2012 there is no possibility of buying such old aircraft and all the second hand aircraft are still quite expensive a lot.[6]

The selection of the aircraft in the business aviation is as was stated before influenced by many soft factors, such as the look of the aircraft, its size or popularity of the aircraft among other users from the same country. From this point of view is the favorite of Czech users Gulfstream G550.

G550 is as was mentioned in the overview very favorite on the whole world market of ultra-long range business jets. Its parameters are better almost in all ways than Dassault Falcon 7X ones and its price and operational costs are on the same level. Another advantage of the Gulfstream is, that there is certified maintenance company for line maintenance of the G550 model.

All the facts are for the Gulfstream G550 and mainly because of its popularity on Czech market the aircraft were chosen for the analysis.

New Gulfstream G550 costs about 45 million euros, five years old aircraft is offered on the internet for 35 million euros. The aircraft is also thanks to its popularity very easy to sell, that makes the investor flexible and allows it to sell it in the reason if the business would not go well or if he would like to change the type of the aircraft.[5]

4 Financial calculation

After choosing the aircraft it is important to go through the financial part of the business plan. The aircraft is purchased as an investment and it should profit. This part will be about counting the profitability of the investment and financing the operation of the aircraft.

4.1 Aircraft Financing Analysis

Aircraft is a huge investment and it is important, during business plan making, to take into account its financing. There are several options of it and it depends on many factors to choose which one is the best for particular investment.

4.1.1 Operational models

The business model of operating the business jet differs depending on the owner's plans with the aircraft. There are four most common business models and each of them fits to different strategy. The models are: Full Ownership, Fractional Ownership, Charter and Jet Membership Programs. Combination of the models is also common case. Owners can charter free capacity of the aircraft or at least they usually try to sell empty legs. [12][13]

Full ownership

This model is quite not the thing, this analysis is about. This model fits for the users that fly more than 400 flight hours per year and owning the aircraft themselves is suitable for them. Advantages are having the aircraft ready whenever the owner needs it and not letting other people fly in the aircraft. The aircraft is maintained and operated by specialized business jet operator. [12][13]

Fractional ownership

Again the model is about using the aircraft by the owners, not about the aircraft being offered for flights on the market. This ownership is suitable for users with need between 50 and 400 flight hours per year, the other hours are shared with other shareholders of the aircraft. The advantage is that all expenses for maintenance and operation of the aircraft are split among all owners. [12][13]

The charter business model

Using chartered aircraft is the easiest way for business jet user that does not want to be bounded to fly some amount of flight hours per year. Users also do not have big investments into purchasing and maintaining the aircraft. On the other hand if the user flies more than specific amount of hours it is more expensive than other models for him. Chartering is thanks to its flexibility and simplicity most favorite way of private flying in Europe. The aircraft is already booked with the crew and the booking is made by brokers or the operator itself. [12][13]

From the other side of the perspective the charter operator operates the aircraft for the profit. It wants to be the aircraft flying as much as possible and to sell the flights as much profitable as it can be. Chartering the aircraft is quite risky and expensive business that has to be really well counted in advance. [12][13]

Jet membership

The jet membership is based on principle of having prepaid flight hours for specific time period. The users can use certain types of aircraft and does not have a lot of extra costs. This model is the most profitable for users that fly less than 50 hours per year. Jet cards, how the membership is sometimes called, are usually available from 25 flight hours per year. [12][13]

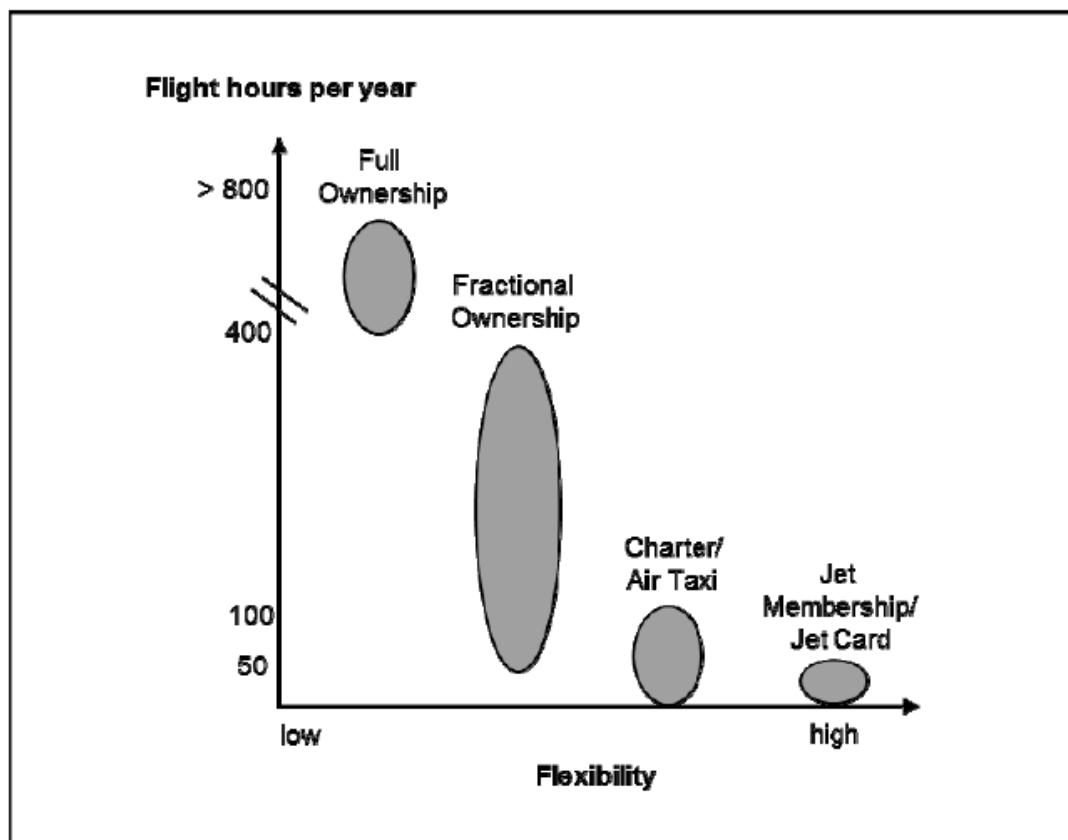


Figure 7 – Business models and intensity of use (source: The European business aviation industry–status quo and future projections)

The figure 7 shows different business models suitability according to the use of the aircraft and needs of the user. The vertical axis show intensity of usage of the aircraft and horizontal axis is flexibility in the aircraft type. It is obvious that for full ownership of the aircraft the owner will not have the possibility of using different type of the aircraft for different flights on the other hand the jet membership program users has the flexibility, because the fleet of the operator is usually wide.

4.1.2 Financing methods

Business jet financing is difficult topic that would be widespread enough to write whole thesis about it. There are several financing methods, the most common are mentioned and described in lines below. Some of them have many other versions, but for the analysis it is not that important to be that detailed. The most usual methods are purchasing aircraft for cash, having a bank loan for the aircraft and financial or operational leasing.

Purchasing aircraft for cash

First option of purchasing aircraft for cash is not that common and it is not very practical way of financing. The interest rates of the loans and fees for the leasing are on acceptable level and there are many other more profitable ways how to invest such a huge amount of money.

Bank Loan

Loan for an aircraft is specific for a bigger amount of money than typical bank loan. In most cases banks or the other landing institutions require to secure the loan with the aircraft itself. The repayment period ranges from three to fifteen years and loan usually covers up to 70% of the aircraft purchase cost. Interest rate of the loan depends on many factors including creditworthiness of the investor, type of the aircraft or the repayment prospects. For these reasons lender requires important information about repayment schedule or cash flow projection. Interest rates are oscillating around 2,5% p.a. value and bank loans terms are very good for the investors up to date.[14][15][16]

Leasing

Difference between bank loan and leasing is in the ownership of the aircraft. In the loan is the aircraft owned by the investor, on the contrary, when the aircraft is leased it is owned by the leasing company itself. This company is called lessor and operator is in this contract called lessee. The lessor gives the lessee exclusive right of usage of the aircraft for agreed period, during which is the lessee obligated to pay the lessor specified payments.

Lessor can be bank, specialized leasing company or company set up by high tax paying investors seeking capital allowances to offset against their income, thereby reducing their tax payments.

Leasing has many advantages for starting business, such as its flexibility. Lessee can sign the leasing contract only for short time that secure it from ageing of the fleet and allows it to evaluate the profitability of new business after shorter period. On the other hand, leasing can be more expensive than loan and lessee has no profit from selling the aircraft after the usage and has limited options in dealing with the aircraft.[14][15]

Finance Lease

Finance lease usually consist of higher first rental and then fixed rentals for an agreed period. The term of finance leasing is ranging from ten to twenty years, but more likely the contract last ten to twelve years. Both sides have no possibility of cancelation of the contract before the end of it, or have, but with a major penalty.

Lessor expects profit from the rental, tax benefits and residual value of the aircraft and doesn't have to be involved or skilled in this kind of business. Finance lease is sometimes called full pay-out lease, because it usually lasts for the whole operational life of the aircraft. In the end of the contract the lessee has usually an option to purchase the aircraft for fair market value. However, even though the lessee is not legal owner of the aircraft, it takes all the risk, but also the benefits of the owner.[14][15]

Operating Lease

Operating leasing is contract between lessor and lessee, where the lessee pays periodically agreed amount of money over the term of the contract. Lessor for that rent lessee the aircraft. These payments cover depreciation, interests and return to the lessor. Lessee also have to pay supplemental rent that covers maintenance and other expenses.

Operating leasing is the most flexible option for an operator. Shorter term (1–12 years) allows easier adaptation to market changes. It is also easier for lessee to terminate the contract early without paying a huge penalty.

Even though the lessee pays the supplemental rent, it is usually responsible for the maintenance of the aircraft, the supplemental rent or the maintenance reserve is usually used for the major overhauls – D checks. Lessee also pays all the operational costs of the aircraft. In the end of the contract term the lessee is obliged to return the aircraft in specific conditions, to prevent long ground time during passing the aircraft to another lessee.

Company providing operational leasing must be professional in aviation business and has to be experienced during negotiating with the lessee. It needs to make sure about the maintenance facilities and professional stuff of the operator.[14][15]

4.1.3 Financing analysis

Aim of the analysis is to choose the best option for financing of specific aircraft. Main differences in different financing methods are flexibility, taxation issues and its costs. Investors expect profit on an investment to be as high as possible, but they also want to stay on acceptable level of risking.

On the other hand there are many soft factors for the investors, who usually prefer to own the business jet than operating it on the leasing basis. Owning the aircraft allows the investor

to modulate it for the specifics of the market. Also the aircraft can be sold after some period and changed for new one. If the aircraft would be leased the investor has no profit from selling the aircraft and he has to pay penalty for withdrawing from the contract.

To compare the financing methods one by one it is needed to focus on the differences and advantages and disadvantages of each method. Purchasing the aircraft for cash is very irrational option and good investor would probably invest the money different way. Financial and operational leasing are less risky than bank loan, but it has many disadvantages and it is less profitable for the operator, who even does not have the profit from selling the aircraft in the end of intended operational period. The last option is bank loan. This option is risky in the matter that the investor would lose the aircraft if he would not be able to repay the loan. On the other hand investor has the possibility to sell the aircraft and he do not have to be in that big loss and he can do any modification to the aircraft if it is in compliance with the restrictions.

After the comparison and consultation with a specialist bank loan has been chosen as the financing method for the case analyzed in this paper. The main reasons were the independency in operating the aircraft and low values of the interest rates of the bank loans.

4.2 Operational cost

Operational costs does not contain only fuel, but it is needed to include many items important for operation of the aircraft. The costs can be divided into two parts that will afterward give us average costs per one hour of flight or per one nautical mile. These costs are fixed and variable costs. Fixed costs has the same value per year and is not dependent on usage of the aircraft. It has to be payed even if the plane is grounded and there is almost no possibility of reducing it when there is no demand for the aircraft. The other costs are variable costs, these costs are connected with the usage of the aircraft and it is paid only when the aircraft is in use.

4.2.1 Fixed costs

As was mentioned in previous paragraph, fixed costs are costs that are needed to be paid whether the aircraft is flying or standing on the ground. These costs are then allocated into flight hours according to the number of hours that the aircraft is capable to fly per given period. It means that more flight hours the aircraft flies is better. The fixed component of the costs is allocated into more hours and it is lower.

Fixed costs include, for example, expenses connected with financing the aircraft (loan repayment or leasing fees) and depreciation of the aircraft. Another fixed costs are, for example, expenses on pilots and cabin crew salaries and their training, insurance

of the aircraft or its parking and many other expenses for modulation and modernization of the aircraft and so on.

Fixed costs analysis

Crew salaries

This item contains salaries of pilots – captain and first officer and cabin crew – usually one flight attendant. The cost can differ according to number of crew that is needed for the aircraft. One crew is capable to fly around 450 hours per year. To serve the whole market potential two crews are needed. The average salary of captain is 124 920.0 €, first officer earns about 72 935.0 € per year and flight attendant 69 055.0 €. It is also needed to count with benefits like health and social insurance, etc. so that about 30% of the salaries – 80 073.0 €. All together it makes 346 983.0 € per year for one crew and 693 966.0 € for two crews per one year.[17]

Hangar

During the stay of the aircraft at the base airport it is needed to hangar it to protect it from damage caused by weather conditions. It varies with the size of the aircraft. The price in this paper is calculated from the square footage of the aircraft multiplied by average cost per square foot of the major business aviation airports. The square footage of the aircraft is multiple of the wingspan and the aircraft length. Average price used in the analysis according to the Conclin and de Decker calculation is 91 944.0 €.[17]

Insurance

There are two types of insurance that need to be taken into account during the costs calculation – Hull insurance and Liability insurance.

Hull insurance protect the owners against loss caused by damage or destruction of the aircraft. There are three levels of this insurance graded according to the state when the insurance can be applied. The levels are ground, ground in motion and all risk insurance. Ground insurance covers the accidents only when the aircraft stays on the ground and it is not moving, ground in motion also covers the damage made during taxiing and other movement on the ground and all risk insurance also covers the loss on the aircraft caused during the flight. The insurance is counted as a percentage of the hull of the aircraft that contains aircraft instruments, radios, autopilots, wings, engines and all other parts attached to or carried on the aircraft. In the analysis is again used value counted by Conclin and de Decker calculation and it makes 916.0 € per year. [17]

Liability insurance covers the damage caused by using, maintenance or owning the aircraft. It protects the third party and pays costs connected with bodily injuries and property damages. The price of the insurance differs on insurance limit. In this paper is used limit 200 million dollars and the insurance costs according to Conclin and de Decker calculation 12 802.0 €.

Together both insurances costs 47 718.0 € per year. [17]

[Recurrent training](#)

The crew needs to go through recurrent flight training every year. Conclin and de Decker calculation counts with simulator based training of the crew and takes into account their accommodation and expenses connected with transport to the training center. The cost of the training for one crew is 73 090.0 € per year, for two crews it is 146 180.0 €.[17]

[Aircraft modernization](#)

During the operational of the aircraft the requirements are changing and also the aircraft needs to be modernized and modified for the needs of the users. There are also several repairs of damages that are not covered by the insurance. Conclin and de Decker calculation expect the costs of these expenses to be on average 25 863. 0 € per year. [17]

[Navigation chart service](#)

Costs of chart service subscription differs according to the missions the aircraft is used for. Long range aircraft chart services are more expensive, because it is needed to pay worldwide subscription and not only the regional one. Conclin and de Decker calculation quantify the price to 14 180.0 € per year. [17]

[Refurbishing](#)

Everyday use of the aircraft takes effect on the interior and exterior of the aircraft. The furniture in the aircraft has only limited lifetime and for example the seats needs to be after some time re-upholster. Refurbishing also contains cleaning or repainting of the aircraft. Price per year is calculated at 136 382.0 €.[17]

[Computerized maintenance program](#)

Modern aircraft have systems to monitor their condition and record their use. These systems facilitate the maintenance program and pay attention if the aircraft is not behaving anyhow different than normal. Typical annual price of computerized record keeping service for scheduled aircraft maintenance and components is according to the Conclin and de Decker calculation 6 983.0 €.[17]

[Weather service](#)

Weather forecast services are also important in aviation. The price of annual subscription is about 543.0 € per year. [17]

[Depreciation](#)

The aircraft is depreciating due to its everyday use. It is needed to take depreciation of the aircraft into account, because it is losing its value by the time. For the needs of the analysis is used book depreciation of 5% of the aircraft value per year, because it is expected, that the

aircraft would be sold after 10 years for 50% of the price that it was bought for. Average price of five years old aircraft is about 35 000 000.0 €. Five percent of the price is 1 750 000. € and it is also book depreciation of the aircraft per year.

Aircraft financing

As was mentioned above the financing method that fits for the analyzed aircraft is bank loan. Five years old Gulfstream G550 costs about 35 000 000.0 € and the loan covers 70% of the price, it means 24 500 000.0 €. Interest rate is about 2.5% p.a.. The formula to count annuity payment is:

$$a = D \cdot \frac{r}{1 - (1 + r)^{-n}}$$

Where a is annuity payment, D is the initial payout, r is interest rate per term and n is number of terms. So in this case it is:

$$a = 24500000 \cdot \frac{0,025}{1 - (1 + 0,025)^{-10}} = 2\ 799\ 339,7 \text{ €}$$

The repayment for the aircraft is 2 799 339.7 € per year and the investor has to invest 10 500 000.0 € for purchasing the aircraft. For fixed costs are counted only interests of the repayments, rest of the financing is covered by depreciation. For that reason it is important to count how much is the interest on average per year.

$$I = \frac{a \cdot n - D}{n} = \frac{2799399,7 \cdot 10 - 24500000}{10} = 349\ 399,7 \text{ €}$$

Aircraft and flight management

The aircraft has to be operated and managed by licensed operator. The operator offers the aircraft on the market and do all the support for the flight and operation of the aircraft. Expenses for these services are usually covered by fixed payments to operator each months. The prices ranges around 15 000.0 € per month it means about 180 000.0 € per year, which will also be the price used for the analysis. This price was determined on the base of consultation with an expert.

Total fixed costs

In the table 4 is calculation of the fixed costs for one and two crews.

Table 4 – Fixed costs (source: own analysis)

Item	One crew	Two crews
Crew salary	346 983.0 €	693 966.0 €
Hangar	91 944.0 €	91 944.0 €
Insurance	47 718.0 €	47 718.0 €
Recurrent training	73 090.0 €	146 180.0 €
Aircraft modernization	25 863.0 €	25 863.0 €
Navigation chart service	14 180.0 €	14 180.0 €
Refurbishing	136 382.0 €	136 382.0 €
Computerized maintenance program	6 983.0 €	6 983.0 €
Weather service	543.0 €	543.0 €
Depreciation	1 750 000.0 €	1 750 000.0 €
Financing	349 399.7 €	349 399.7 €
Aircraft and flight management	180 000.0 €	180 000.0 €
Total fixed costs per year	3 023 085.7 €	3 443 158.7 €

Total costs of the aircraft are divided into one flight hours according to flight hours flown per given period, in this case and usually per one year. For one crew total fixed costs are 3 023 085.7 € and for two crews costs are 3 443 158.7 €.

4.2.2 Variable costs

Variable costs are on the contrary dependent on the operation of the aircraft and if the aircraft is not needed and used and it is on the ground, the operator does not pay it.

Variable costs contains of expenses connected with the flight and maintenance. It includes, for example fuel and lubricants expenses, expenses connected with maintenance of the engines, airframe, APU or thrust reversers. Part of expenses for the flight are also expenses for accommodation of the crew, parking fees out of base airport and navigational, emissions and airport fees.

Variable costs analysis

Fuel

Fuel makes the majority of variable costs per one hour. It is counted as multiple of average fuel consumption of the aircraft and average price of the fuel. Average consumption with 15% reserve of Gulfstream G550 is about 1703 liters/hour. Average price of the fuel with all taxes and fees is according to Conclin and de Decker calculation about 1.4 € per liter. All together it makes 2 384.2 € per flight hour. [17]

Maintenance labor

The average costs of maintenance in the analysis takes into account ten years of maintenance program. The maintenance costs differ every year due to checks that are regular but their period is longer than one year. In the price are included scheduled and unscheduled maintenance, line replacement of parts, minor airworthiness directives, service bulletins, etc.. Average price for the maintenance labor according to Conclin and de Decker calculation is about 111.9 € per one flight hour. [17]

Parts Airframe/Engine/Avionics

With maintenance is connected changing of parts that has limited service life. In the price are included all airframe, avionics and minor engine consumable parts required for routine scheduled line maintenance, unscheduled maintenance, etc.. Parts expenses per one flight hour are according to Conclin and de Decker calculation about 101.7 €.[17]

Engine restoration

The cost of engine restoration is again as maintenance labor based on 10 years average. On average the restoration of engine costs about 605.0 € per one flight hour. [17]

APU Allowance

Also the Auxiliary Power Unit needs to be maintained and it is important to count with expenses for it into the flight hour costs. Conclin and de Decker calculation quantify the costs to 39.4 € per one flight hour. [17]

Miscellaneous Flight Expenses

As miscellaneous flight expenses are considered other expenses connected with the flight such as landing and parking fees, crew expenses or supplies and catering.

Every landing aircraft except for emergency landings has to pay landing fees. If the aircraft stays at the airport, it is also needed to pay the parking for it. Every airport has different prices, so it is hard to give a fixed price. Again Conclin and de Decker calculation average price for landing and parking fees is usable for the analysis and it is 75.4 € per one flight hour.

Crew expenses contains all the expenses connected with the time that the crew has to be out of home. It means accommodation, expenses for meals and other expenses. The average price of crew expenses per flight hour is about 216.8 €.

Average price of these expenses is about 114.4 € per one flight hour.

All together the miscellaneous costs are 406.6 € per one flight hour. [17]

Total variable costs

In the table 5 is calculation of the variable costs per one flight hour.

Table 5 – Variable costs (source: own analysis)

Item	Cost per one hour
Fuel	2 384.2 €/FH
Maintenance labor	111.9 €/FH
Parts Airframe/Engine/Avionics	101.7 €/FH
Engine Restoration	605.0 €/FH
APU Allowance	39.4 €/FH
Miscellaneous flight expenses	406.6 €/FH
Total	3648.8 €/FH

Total variable costs of one flight hour of the aircraft is on average about 3648.8 €. This value is fixed value of total operational costs per one hour and does not depend on number of total flight hours flown by the aircraft per year.

4.2.3 Total costs

Total costs per flight hour of the aircraft are counted as a sum of average fixed costs per flight hour and average variable costs per flight hour of the aircraft. These costs can be related also to nautical miles.

As the fixed costs component of the total operational costs per one hour depends on utilization of the aircraft, the price differs according to how much the aircraft flies. To count the price it is needed to analyze how much the utilization influences the cost of one flight hour.

4.3 Aircraft use analysis

In the tables below is analyzed influence of number of flight hours on total cost of one flight hour.

Distribution of variable costs are the same, no matter how many flight hours per year the aircraft flies.

Table 6 – Total variable costs (source: own analysis)

Number of flight hours	Variable costs per year	Variable costs per one hour
250	912 200.0 €	3648.8 €
300	1 094 640.0 €	3648.8 €
350	1 277 080.0 €	3648.8 €
400	1 459 520.0 €	3648.8 €
450	1 641 960.0 €	3648.8 €
500	1 824 400.0 €	3648.8 €
550	2 006 840.0 €	3648.8 €

Number of flight hours	Variable costs per year	Variable costs per one hour
600	2 189 280.0 €	3648.8 €
650	2 371 720.0 €	3648.8 €
700	2 554 160.0 €	3648.8 €
750	2 736 600.0 €	3648.8 €
800	2 919 040.0 €	3648.8 €

Fixed costs behave other way around and more the aircraft flies, less the costs are. On the edge between operating the aircraft with one or two crews is only negligible step and 450 hours are less profitable than 400 flight hours per year.

Table 7 – Total fixed costs (source: own analysis)

Number of flight hours	Number of crews	Fixed costs per year	Fixed costs per one hour
250	1	3 023 085.7 €	12 092.3 €
300	1	3 023 085.7 €	10 077.0 €
350	1	3 023 085.7 €	8 637.4 €
400	1	3 023 085.7 €	7 557.7 €
450	2	3 443 158.7 €	7 651.5 €
500	2	3 443 158.7 €	6 886.3 €
550	2	3 443 158.7 €	6 260.3 €
600	2	3 443 158.7 €	5 738.6 €
650	2	3 443 158.7 €	5 297.2 €
700	2	3 443 158.7 €	4 918.8 €
750	2	3 443 158.7 €	4 590.9 €
800	2	3 443 158.7 €	4 303.9 €

Total costs have the same progression as fixed costs, just with added variable costs. With price that was set after consultation with a specialist – 9 500.0 € per flight hour, it is obvious that edge value of the flight hours flown to be the aircraft profitable has to be around 600 flight hours per year. Also you can see, that operating the aircraft just with one crew would be unprofitable.

Table 8 – Total costs (source: own analysis)

Number of flight hours	Total costs per year	Total costs per flight hour
250	3 935 285.7 €	15 741.1 €
300	4 117 725.7 €	13 725.8 €
350	4 300 165.7 €	12 286.2 €
400	4 482 605.7 €	11 206.5 €
450	5 085 118.7 €	11 300.3 €
500	5 267 558.7 €	10 535.1 €
550	5 449 998.7 €	9 909.1 €
600	5 632 438.7 €	9 387.4 €
650	5 814 878.7 €	8 946.0 €
700	5 997 318.7 €	8 567.6 €
750	6 179 758.7 €	8 239.7 €
800	6 362 198.7 €	7 952.7 €



Figure 8 – Operational costs of the aircraft (source: own analysis)

The same as was said before is obvious on the graph above. You can see that with more flight hours the costs decrease and the flights are cheaper. On the graph is also obvious that there is step between the use of one and two crews.

To analyze the profit of the aircraft it was needed to define the price of one flight hour of the aircraft. As was stated before the price were chosen after consultation with a specialist to 9 500 € per flight hour.

Table 9 – Profit of the aircraft (source: own analysis)

Number of flight hours	Total costs per flight hour	Price	Profit	Annual profit
250	15 741.1 €	9 500.0 €	-6 241.1 €	-1 560 285.7 €
300	13 725.8 €	9 500.0 €	-4 225.8 €	-1 267 725.7 €
350	12 286.2 €	9 500.0 €	-2 786.2 €	-975 165.7 €
400	11 206.5 €	9 500.0 €	-1 706.5 €	-682 605.7 €
450	11 300.3 €	9 500.0 €	-1 800.3 €	-810 118.7 €
500	10 535.1 €	9 500.0 €	-1 035.1 €	-517 558.7 €
550	9 909.1 €	9 500.0 €	-409.1 €	-224 998.7 €
600	9 387.4 €	9 500.0 €	112.6 €	67 561.3 €
650	8 946.0 €	9 500.0 €	554.0 €	360 121.3 €
700	8 567.6 €	9 500.0 €	932.4 €	652 681.3 €
750	8 239.7 €	9 500.0 €	1 260.3 €	945 241.3 €
800	7 952.7 €	9 500.0 €	1 547.3 €	1 237 801.3 €

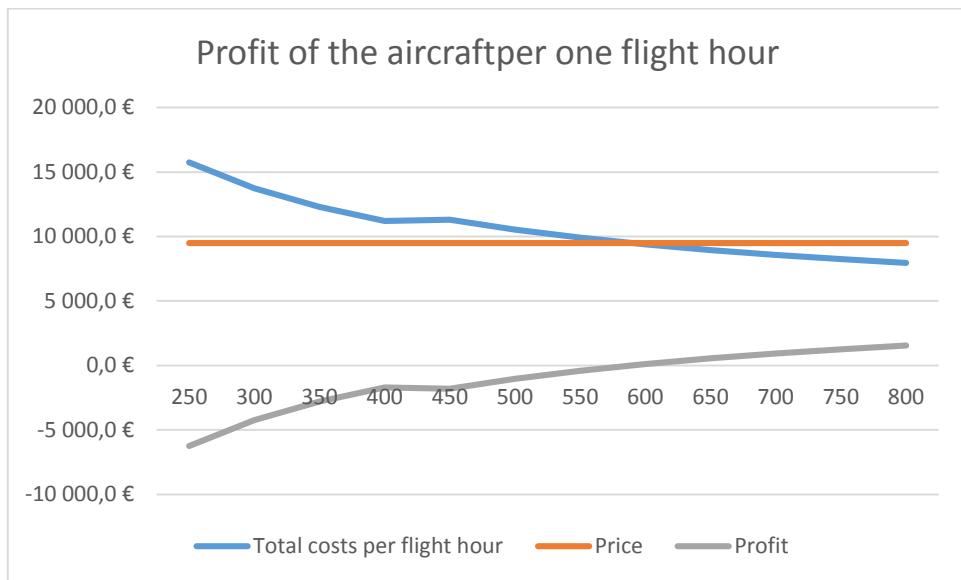


Figure 9 – Profit of the aircraft (source: own analysis)

In chartering business it is needed to utilize the aircraft as much as possible. To cover the whole market possible demand, it means 750 hours per year, the aircraft would have to fly approximately 15 hours per week. 15 hours per week are two long haul flights every week or two medium haul and two short haul flights. This number is reachable value and the aircraft would make in this case almost one million euros per year.

There is no need of thinking about third crew, even though the aircraft is not fully used, in business aviation 750 or 800 flight hours is already a lot for one aircraft. Especially for long range business jet, it is expected, that the aircraft waits for the users in the destination for their

coming back and the aircraft can wait there for more days. Selling empty legs from the destination or charging the user for empty leg to base airport would be hard or impossible.

Major part of the costs are made by depreciation and fuel expenses. These components are making the costs higher than costs of smaller jets, but Gulfstream G550 is exclusive good and users using aircraft like G550 are willing to pay the price for the comfort.

5 Example situation comparison

As was mentioned in the beginning to fly long haul flight from Czech Republic it is needed to use aircraft from abroad or fly with medium range jet with technical stop to refuel the aircraft. To see the difference between using medium range business jet and long range business jet following lines compares these options on one specific city pair.

5.1 Long haul flights specifics

Long haul flights are specific for passengers and also for the operator and its flight planning department. The flights takes more than 7 hours, so that it is needed to make it for the passengers comfortable as much as possible.

It is very tricky for operation control center or flight planning department to plan such a flight. The flight planners have to be experienced and take into account many problems that can occur. Atlantic flights and flights over remoted areas has to be planned with special requirements. Also the flights are very affected by weather conditions. Wind can change the travel time on such a long flight very much and also the temperature affects the fuel consumption and other specifics of the aircraft.

For passengers has to be the flight smooth and comfortable. They usually travel for business and it is needed to rest before or after meetings to be fully relaxed and fresh after the flight. Catering has to be customized for such a long flight and consist of more than one meal.

5.2 Example situation of long haul flight

As an example situation is chosen city pair Prague – New York. Distance between these two cities is 3 558 NM and most of the route runs over the ocean. Destination airport is airport nearby New York in New Jersey typically used for business aviation flights—Newark Liberty International Airport.[18]

Medium range business jet compared with Gulfstream G550 in this paper is the most favorite business jet among Czech users and it is Embraer Legacy 600. Range of the aircraft is 3 250 NM, so that the plane cannot fly between the cities in one leg.

5.2.1 Embraer Legacy 600

Embraer Legacy 600 is medium range heavy business jet offering up to 13 seats, which can take the passengers to 3 250 NM remoted destinations. Maximum cruise speed is M0.80 and typical cruise speed is M0.78. The cabin is 1.82m high and 2.1m wide. The interior is smaller than interior of G550 and it is also not customized for such a long flights. This means less comfort for passengers. Typical price of one flight hour of Embraer Legacy 600 is according to specialist 5 500.0 €.[19]

Flight from Prague Vaclav Havel Airport (LKPR) to Newark Liberty International Airport (KEWR) is too long for Legacy to be flown as one leg and it is important to make a technical stop to refuel the aircraft. After a consultation with a specialist was chosen Keflavík International Airport (BIKF). This airport is situated on Iceland and it is one of the possible Airports to make a stop when flying over Atlantic. First leg from LKPR to BIKF is long approximately 1 436 NM and it takes the Legacy with cruise speed M0.76 3 hours and 37 minutes. Second leg from BIKF to KEWR is long approximately 2 260 NM and it takes with the same speed 5 hours and 19 minutes. First leg is flown with head wind 3 KTS and the second one with tailwind 17 KTS.[18]

Together both flights means 8 hours and 56 minutes use of the aircraft. In the comparison will be counted 9 flight hours for this flight that makes with price of Legacy 5 500.0 € per flight hour 49 500.0 €.

Total time for passengers is not only 9 hours but it is needed to take into account the time for refueling at Keflavik Airport. The refueling takes one hour and all together it is ten hours of the transportation to New York from Prague for passengers. The reason why the flight is less comfortable is not only the length of the flight, but also the thing that the aircraft have to land, refuel and take off during the technical stop and it is quite noisy, disturbing and uncomfortable.

5.2.2 Gulfstream G550

Gulfstream G550 can fly the flight in one leg. The flight is approximately 3 558 NM long and Gulfstream G550 makes the flight with 6 KTS head wind and speed M0.85 in 7 hours and 53 minutes. The length of the flight is approximated to 8 hours. It means with price 9 500.0 € for one flight hour of Gulfstream G550 8 hours flight costs 76 000.0 €.[18]

5.3 Comparison

From the lines above it is obvious that Embraer Legacy 600 is much cheaper than Gulfstream G550, on the other hand the comfort of the aircraft is incomparable. The difference in time is two hours, but also when the aircraft does the technical stop the passengers are disturbed and if they are sleeping they would probably be woken up. The difference in price is 26 500.0 €. This difference is quite big and it depends on the users whether they are willing to pay the difference for the comfort.

As was mentioned before, size of the aircraft is also expression of social status of the users, so that 26 500.0 € is not only price for better comfort. The Gulfstream is also bigger it can take up to 6 more passengers than the Embraer. Price for one seat in 13 seats Embraer Legacy 600 is for this flight 3 800.0 € for one seat in 19 seats Gulfstream G550 it is 4 000.0 €. This is

another reason to use Gulfstream and it is its capacity. Legacy 600 is suitable for 13 passengers, but traveling with that much people in such a small plane is uncomfortable.



Figure 10 – Prague–New York routes (source: www.skyvector.com)

6 SWOT analysis

To analyze all strengths, weaknesses, opportunities and threats of the investment is used SWOT analysis.

Table 10 – SWOT analysis (source: own analysis)

S – Strengths	W – Weaknesses
<ul style="list-style-type: none">- New product on the market- More comfortable long haul flights- No need of chartering the aircraft from abroad for long haul flights- No need of traveling long haul flight with an aircraft that is not designed for the flight- Time saving- Possible usage of the aircraft also for short haul flights- One of the most reliable aircraft- Operators with experience with Gulfstream G550 at the Prague Airport- Maintenance company providing G550 line checks at the Prague airport	<ul style="list-style-type: none">- Costs of the aircraft- Limited clientele- Small market- Price of the aircraft
O – Opportunities	T – Threats
<ul style="list-style-type: none">- Possibility of operating the aircraft also in other central European countries- Prague as a point in the middle of Europe has an great position for business meetings	<ul style="list-style-type: none">- New competitors- Low demand for the aircraft- Stricter restrictions from European Union- Unpredictable development of fuel prices

7 Conclusion

Aim of the thesis was to analyze possible operation of long range business jet based in Prague. The analysis of Central European market showed, that there is an empty gap on the market and long range business jet would fill it. In the Czech Republic there is also good economic environment for business aviation and Prague airport have good facilities to handle private aircraft. Demand analysis was made by evaluating old flight plans provided by ŘLP ČR. The flight plans showed how often and where the business aviation users are flying and what kind of aircraft they use for their trips. The whole demand with coverage of other markets than just the Czech one was determined to 750 flight hours per year. Analysis also find out that most remoted destinations are in South East Asia and west coast of North America, so that suitable aircraft for the market should be capable to fly to that far destinations.

The aircraft that would fit for the market was chosen to be Gulfstream G550, other aircraft compared with this one were Gulfstream G650, Bombardier Global 6000 and Dassault Falcon 7X. G550 were chosen because of its reliability and experiences with its operation between Czech operators. The aircraft is capable to fly to more remoted destination than Falcon 7X and Global 6000 and it is cheaper to operate than G650. G550 cabin is customized for long haul flights and it is much more comfortable for the passengers than currently offered smaller medium range business jets.

Thesis aim was to analyze aircraft that should be purchased as an investment to make some profit, not to serve the owner for his private and business trips. For that reason was chosen model of chartering the aircraft. The aircraft does not have competitors only among other chartering providing companies, but also the competitors are among the owners of the aircraft that are fully or fractionally owned and the owner or owners charter the free capacity of the aircraft for lower prices than fully chartered aircraft can be offered for. On the other hand there are not such an aircraft operated in Prague, so that the aircraft would have to be repositioned to Prague and the repositioning would cost approximately the difference. To finance the aircraft was chosen a bank loan. Interest rates of the bank loans range around 2.5% nowadays and the banks are willing to finance up to 70 % of older aircraft. For 35 million euros five years old Gulfstream G550 it means 24.5 million euros from the bank and 10.5 million euros have to be financed from the investor sources. The overpayment for ten years 24.5 million euros loan with 2.5% interest is about 3.5 million euros.

To find out best options of financing was used a book of Peter T. Morrell Airline Finance and John J. Sheehan's book Business and Corporate Aviation Management: On Demand Air Travel. The flight plans provided by ŘLP ČR were all flight plans of non-scheduled and general

aviation IFR flights flown over LCAA FIR with departure airport from Czech Republic and Slovakia.

Aircraft operational costs differs due to utilization of the aircraft. More the aircraft is used lower the price for the aircraft can the operator offer. Aircraft purchased for chartering has to be used as much as possible. The analysis of the costs showed that less than 600 flight hours per year are for the aircraft with price 9 500.0 € would be unprofitable. Optimal for the aircraft would be utilization of 750 hours per year. More hours would be even more profitable, but 800 hours are already a lot for two crews per aircraft. With 750 hours per year would be the profit 1 260.3 € per one flight hour and 945 241.3 € per year.

To calculate majority of the costs were used Conclin and de Decker operational costs calculation. This calculation is mainly set up for American market, but after consultation with a specialist was decided that the numbers are very similar for Europe and the calculation is suitable for the analysis.

In current situation there is almost impossible to buy a long haul flight with long range business jet without any repositioning. The only option is to buy some empty leg, but this is not very likely to happen that there would be empty leg to destination users want to travel in needed time. Other option is to use a medium haul business jet that is not customized for such a long flights and traveling this way is very uncomfortable. On the other hand this option is much cheaper especially for smaller group of passengers. Example situation showed the differences between using medium range business jet and long range business jet for long haul flight from Prague to New York and the difference in time were only 2 hours, but the difference in price were 26 500.0 € and this is a huge difference in the price

There are many advantages that would long range business jet bring to the market but there are also a lot of risks for the investor and it is really a tough question if the advantages cover the possible risk. The aircraft would be a new attractive product on the market offering new dimension of business jet traveling on the one hand, on the other hand the clientele on Czech market is limited and the price for using more expensive business jet is quite high. Even though the market is small, there are possibilities to operate flights from airports that also suffer from lack of long range business jet in abroad, especially from Slovakia, Hungary or Poland. This gives the operator more opportunities, but there are still threats in competitors that can react to the new product with start of operating similar aircraft.

Bigger aircraft like G550 would probably be used enough, because users sometimes demand bigger aircraft even for shorter trips. The aircraft would induce profit, but the profit would be fully dependent on the demand of the users and there is no certainty of constant demand for such an aircraft. Business model fully based on chartering the aircraft is quite risky option on

such a small market as the Czech one is. To prevent possible loss it would be safer to sell at least some aircraft flight hours in advance. Model would be similar to jet membership, but free capacity of the aircraft would be chartered. Other possible less risky model is that the investor and owner of the aircraft would use the aircraft for own purpose and the rest free capacity would be offered on the market for chartering.

Whole thesis should be addressed to possible investors that would think about investment into business jet. Investment into long range business jet based in Prague is little bit risky due to limited market on the one hand but on the other hand the economics of Central European countries is still growing and so the demand for the aircraft. If the investor is willing to risk such an amount of money, he should probably try to invest into long range business jet. Big advantage of chosen Gulfstream G550 is that the aircraft is popular on the market and in case that the owner would like to back out from the business, it is quite easy to sell the aircraft for appropriate price.

Content of figures

Figure 1 – GDP per capita of formal Eastern bloc countries (source: ec.europa.eu/eurostat)	14
Figure 2 –Distribution of types of business jets operated in Czech Republic (source: www.ebaa.com)	15
Figure 3 –Charter flight hours and charter pricing (source: www.ebaa.com)	16
Figure 4 –Top 20 airport departures (source: www.ebaa.com).....	16
Figure 5 – Distribution of flight duration. (source: www.ebaa.com).....	17
Figure 6 – Departures of medium range business jets from Prague airport to typical airports used for technical stop (source: own analysis of ŘLP ČR data)	20
Figure 7 – Business models and intensity of use (source: The European business aviation industry–status quo and future projections).....	29
Figure 8 – Operational costs of the aircraft (source: own analysis)	40
Figure 9 – Profit of the aircraft (source: own analysis).....	41
Figure 10 – Prague–New York routes (source: www.skyvector.com)	45

Content of tables

Table 1 – Departures of long range business jets from Prague airport (source: own analysis of ŘLP ČR data)	19
Table 2 – Typical airports used for technical stop (source: own analysis)	20
Table 3 – Aircraft specifics (source: own analysis)	26
Table 4 – Fixed costs (source: own analysis).....	36
Table 5 – Variable costs (source: own analysis)	38
Table 6 – Total variable costs (source: own analysis)	38
Table 7 – Total fixed costs (source: own analysis)	39
Table 8 – Total costs (source: own analysis)	40
Table 9 – Profit of the aircraft (source: own analysis).....	41
Table 10 – SWOT analysis (source: own analysis)	46

References

- [1] Easa.europa.eu (2015) *The Agency*, Available at: <https://www.easa.europa.eu/the-agency> (Accessed: 2nd June 2015).
- [2] EBAA (2015) *CZECH REPUBLIC Business Aviation Outlook 2014*, Available at: [http://www.ebaa.org/documents/document/20150605122608-czech_republic_id_card_2014_2_1_\(english\).pdf](http://www.ebaa.org/documents/document/20150605122608-czech_republic_id_card_2014_2_1_(english).pdf) (Accessed: 3rd June 2015).
- [3] EBAA (2015) *BUSINESS AVIATION – QUARTERLY INSIGHT EUROPE Q4–2014*, Available at: http://www.ebaa.org/documents/document/20150604174434-quarterly_insight_q4_2014 (Accessed: 20th June 2015).
- [4] ABS JETS (2014) *ABS Jets authorized for G550 maintenance*, Available at: <http://absjets.com/en/press-centre/news/abs-jets-authorized-for-g550-maintenance>(Accessed: 12th August 2015).
- [5] AvBuyer (2015) *Private Jets*, Available at: <http://www.avbuyer.com/aircraft/jets>(Accessed: 15th August 2015).
- [6] Mike Chase (2014) 'How does the Bombardier Global 6000 compare versus Global 5000 and Gulfstream's G550 & G650?', Available at: <http://www.avbuyer.com/articles/business-aviation-comparative-analysis/how-does-the-bombardier-global-6000-compare-with-global-5000-gulfstreams-g550-g650/> (Accessed: 16th August 2015).
- [7] Gulfstream Aerospace Corporation (2015) *THE GULFSTREAM G550*, Available at: <http://www.gulfstream.com/aircraft/gulfstream-g550> (Accessed: 16th August 2015).
- [8] PrivateFly (2015) *LONG RANGE JET*, Available at: <http://www.privatefly.com/private-jets/longrange-jet-hire.html> (Accessed: 16th August 2015).
- [9] Gulfstream Aerospace Corporation (2015) *THE GULFSTREAM G650*, Available at: <http://www.gulfstream.com/aircraft/gulfstream-g650> (Accessed: 16th August 2015).
- [10] Bombardier (2015) *GLOBAL 6000*, Available at: <http://businessaircraft.bombardier.com/en/aircraft/global/global6000.html> (Accessed: 16th August 2015).
- [11] DASSAULT AVIATION (2015) *Falcon 7X*, Available at: <http://www.dassaultfalcon.com/en/Aircraft/Models/7X/Pages/overview.aspx> (Accessee d: 16th August 2015).
- [12] Linz, M., Ziegler, Y., & Lang, K. (2011). The European business aviation industry—status quo and future projections. Aeronautica, Available at: <https://dancecult.net/index.php/aviation/article/view/181/148> (Accessed: 12th July 2015).

- [13] EBAA (2015) *THE BUSINESS AVIATION COMMUNITY*, Available at:
<http://www.ebaa.org/en/facts-figures/the-business-aviation-community.aspx> (Accessed: 12th July 2015).
- [14] Peter S. Morrell (2007) *Airline Finance*, Third Edition edn., Cranfield University, UK: Ashgate Pub Co.
- [15] John Sheehan (2003) *Business and Corporate Aviation Management*, First Edition edn., : McGraw–Hill Education.
- [16] Curt Epstein (2012) 'AIRCRAFT FINANCE', [www.ainonline.com](http://www.ainonline.com/aviation-news/aviation-international-news/2012-12-01/ain-2012-aircraft-financing), Available at: <https://www.ainonline.com/aviation-news/aviation-international-news/2012-12-01/ain-2012-aircraft-financing> (Accessed: 12th July 2015).
- [17] Conclin and de Decker Aviation Information (2012) *Aircraft Cost Evaluator*, : Conclin and de Decker Aviation Information.
- [18] SkyVector (2015) *SkyVector Aeronautical Charts*, Available at: <https://skyvector.com/> (Accessed: 19th August 2015).
- [19] EMBRAER SA. (2012) *Legacy 600*, Available at:
<http://www.embraerexecutivejets.com/en-us/jets/legacy-600/pages/overview.aspx> (Accessed: 19th August 2015).
- [20] Ackert, S. (2012). Basics of Aircraft Market Analysis. Aircraft Monitor, Available at: http://www.aircraftmonitor.com/uploads/1/5/9/9/15993320/basics_of_aircraft_market_analysis___v1.pdf (Accessed: 10th June 2015).
- [21] Nils Hallerstrom (2013) Modeling Aircraft Loan & Lease Portfolios, : PK AirFinance, Available at: <http://www.pkair.com/common/docs/modeling-aircraft-loan-and-lease-portfolios.pdf> (Accessed: 10th June 2015).
- [22] Pazourek, M. (2012). Business Aviation in Europe, Available at:
http://pernerscontacts.upce.cz/24_2011/Pazourek.pdf (Accessed: 10th June 2014).
- [23] EBAA (2015) WHAT IS BUSINESS AVIATION?, Available at:
<http://www.ebaa.org/en/facts-figures/what-is-business-aviation.aspx> (Accessed: 15th July 2015).

List of attachments

Attachment A CD