

# ACQUISITION OF AVIATION TECHNOLOGY – OPTIONS AND FACTORS AFFECTING THE PRICE OF AIRCRAFT LEASING

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The text shows the different possibilities of financing the purchase of aviation technology. Purchasing aircrafts means for aviation companies extremely high costs. Prices of aircrafts vary depending on the quantity and type of aircraft purchased. Airlines are concerned about costs which increase with the age of the aircrafts, therefore this text describes features of maintenance, life and ageing of aviation technology too.

**K e y w o r d s:** airlines, aviation technology, funding, leasing, life of aircrafts, ageing of aircraft, maintenance of aircraft

## 1 INTRODUCTION

The purchase of aircrafts signifies considerable investments for airlines. Price varies according to the technical parameters (kind, size, capacity of aircraft etc.), quantity and model of aircraft. Currently, just a few airline companies have a financial capital for buying aviation technology in full price. At the moment the trend is that airline companies do not buy aviation technology by way of „Cash flow”, but they are renting or leasing of aircrafts. Payments are determined by economic conditions.

Qualitatively operating characteristics of the aircraft and other products are decreasing. The decline rate in time is characterized by many factors: number of flight hours, technical life of the aircraft components, fatigue failures of aircraft components and aircraft components' corrosion.

The decline rate of qualitative characteristics is influenced by increasing costs of maintenance, repair or modernization of aviation technology.

Very important factors for buying a suitable kind of aircraft for an airline company are the costs necessary for maintenance of the aircraft in technical and operational life.

## 2 FINANCING THE PURCHASE OF AIRCRAFTS

Many airline companies have problems with purchasing aircrafts straight from the producer because of their high costs. The cheapest model of Boeing company (B737-700) costs about 75 mil. \$ and by Airbus (A318) costs about 67 mil. \$. Their the newest and largest models, for example B747-8800, costs about 330 mil. \$ and A380 about 389 mil. \$. Airline companies' lack of money together with high costs for acquisition of aircraft create good financial conditions for leasing companies. The number of aircrafts rented by leasing companies in the world is about 37% and these numbers are still growing. In the year 2020 it is likely to be 50% of all operational aircrafts (Fig.1).

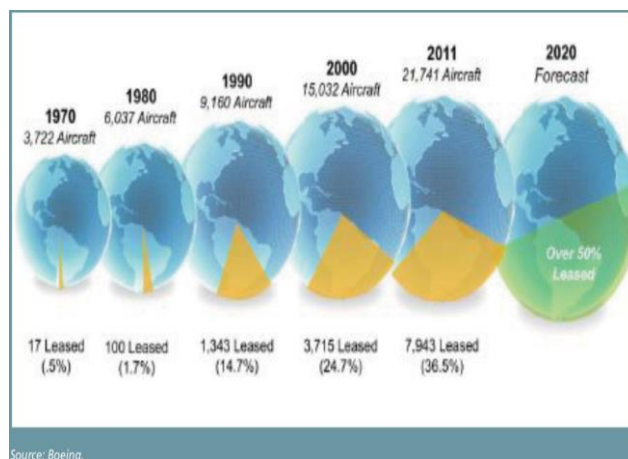


Figure 1 Aircraft-leasing increase rate in time

Currently exist some possibilities of financing the acquisition of aircrafts:

1. Purchasing in cash,
2. Loan with guarantee,
3. Operational leasing,
4. Financial leasing.

At the moment, purchase of aircrafts in cash appears to be the best and the most effective way of financial investment for airline companies. This depends on several factors, for example it is difficult to predict the consequences of the global economic crisis, the increasing price of aviation fuel on global markets, the instability of dollar and euro currencies on financial exchanges, the social impacts on the general public, etc.

### 2.1 Loan with guarantee

Loan with guarantee is a means of financial loan in cash to airline companies. This kind of loan is limited and directly related to buying aircraft. In case of problems in repaying loans the aircraft is taken away from the carrier and sold. The income is taken as a guarantee on the loan by the bank. The advantage of this method of financing is the carrier's direct ownership of the aircraft and the possibility of reducing depreciation and taxes or their distribution for a longer period of time in order to improve the economic performance of the company.

## 2.2 Operational leasing

Operational leasing is a short-time (10 years) method of financing acquisition of aviation technology. Either the lessee or lessor is the owner of the aircraft. He ensures insurance, maintenance, registry of aircraft, etc. When the leasing paid for, the aircraft is returned to lessor. He also may require that the aircraft is to be returned in the same maintenance conditions, as it was rented, so the landlord could use it as soon as possible to provide an operating leasing contract to another tenant. The leasing is particularly suitable for new entrants, for whom this is the only way to finance their fleet as emerging company. The temporariness of this financing form eliminates the major problems with aircraft obsolescence in many countries with changing regulations and market conditions. The major advantage is to allow flexible carrier to cover the expansion of market demand and diversification of the fleet which can be the most appropriate and effective way to do so.

## 2.3 Financial leasing

Financial leasing is a means long-time form of acquisition of a fleet. Leasing provider buys aircrafts by combination of liabilities and own capital. This aircraft provides on the leasing to carriers. For the operator, there is an option to purchase the aircraft, after the expiration of the lease or it may be automatically transferred to the aircraft lessor. During the leasing all ownership rights and privileges are of the aircraft lessor, but if this is officially listed as leasing finance, counting aircraft carrier an asset, as opposed to operating leasing, where the contract only affects the cash flow. The carriers are attracted because the leasing allows them to subtract depreciation over the life of the aircraft which offset gains from taxes as well as reducing the interest paid to lenders who financed the purchase of the aircraft.

In leasing for the carrying aviation company exists two main variations:

1. leasing with crew, insurance and maintenance,
2. leasing the bare aircraft.

In the first case, leasing provider (or airline company) provides aircraft with crew, ensure insurance and regular maintenance (fixed costs). The tenant pays for fuel, airport fees and other expenses (variable costs). In the second case, the tenant pay for fixed and variable costs.

## 2.4 Financial market

Many factors enter the financial market. The long-term prediction in ideal capacity for commercial passenger carrier in air is about 150 people. The most interesting aircrafts from the point of view, are therefore the models: A319, A320 a B737, B738. Therefore, when asked loans, showing interest in buying or renting some

of these aircrafts raises the probability of success for financial and leasing companies to a higher than when buying other types of aircraft. The interesting fact is that very similar types of aircrafts B736, B739 a B739ER presents a major risk for leasing and financial groups and therefore purchase is generally more difficult for these models of aircraft. In general is easier to obtain a leasing for aircrafts that represent the top selling models. It should be noted that market conditions are constantly changing, but the use of specific types of aircraft is less flexible.

## 2.5 Advantages and disadvantages of leasing

For some this may be a surprising fact that even highly financially strong airlines have in their fleet leased aircrafts.

As an example we can find in the following table an overview of the fleet of Emirates.

Table 1 Overview of the fleet of Emirates

Additional options Aircraft	In operation lease	of which on operating lease	of which on finance	of which owned	Change from 31-Mar-10	On firm order
A330-200	27	22	4	1	-2	
A340-300	8	8				
A340-500	10	8	2			
A350-900/1000XWB						70 50
A380-800	15	4	11		+7	75
B777-200	3	2		1		
B777-200ER	6	5		1		
B777-200LR	10	4	6			
B777-300	12	12				
B777-300ER	53	34	19		+1	48
Passenger	144	99	42	3	+6	193 50
B777-200LRF	2	2				
B747-400F	2	2				
Total	148	103	42	3	+6	193 50

### Advantages of leasing:

- shorter waiting time for the aircraft. In the case of direct purchase aircraft from the manufacturer, the customer have to be prepare for a five-year delivery time while through leasing companies can be sure that the aircraft will available in the date specified in the contract.
- requirements for investments in capital are reduced and the availability of aircraft growing with insufficiently high gain for their direct purchase.

### Disadvantages of leasing:

- requirements for compliance with the conditions of the leasing contract. In case the tenant of the aircrafts has financial problems, the leasing company becomes the largest creditor. If the leasing company decides to take leased aircrafts (because of the suspected insolvency of the tenant), the airline company must stop the operation

and the chance to overcome financial problems is rendered impossible.

- on the basis of operational leasing, the airline company will not reach the value of the fleet.
- the lessor may restrict the use of the aircraft. It is a measure by which a leasing company ensures that the aircraft will not be over used and after the expiry date of the leasing contract it will be returned in technical sufficient conditions for the next lease.

## 2.6 Leasing companies

Leasing companies are basically financial institutions. Their advantage over the airline company is that airline companies can get lower interest rates from the state.

The following table contains a list of the largest leasing companies and values of their fleets.

Table 2 List of the largest leasing companies in the world

TOP 50 LESSORS AND MANAGEMENT COMPANIES BY FLEET VALUE									
Rank			Total fleet value		Total	Average value		Managed only	
2013	2010	Company	\$m	Change	Fleet	\$m	Change	\$m	Share
1	(1)	GESAC	34,581	-0.2%	1,755	19.7	3.6%	1,489	4.3%
2	(2)	ILFC	27,801	-4.8%	1,031	27.0	-4.7%	1,096	3.9%
3	(5)	AerCap	8,447	24.8%	326	25.9	11.0%	1,185	14.0%
4	(3)	BBAM	7,849	11.9%	327	24.0	9.5%	6,913	88.1%
5	(6)	CIT Aerospace	7,493	16.4%	263	28.5	8.4%	76	1.0%
6	(7)	BOC Aviation	6,742	8.0%	179	37.7	-2.9%	739	11.0%
7	(4)	RBS Aviation Capital	6,692	3.1%	246	27.2	-1.5%	-	-
8	(8)	AWAS	5,168	22.7%	224	23.1	12.3%	134	2.6%
9	(9)	Aviation Capital Group	4,781	15.0%	245	19.5	12.2%	143	3.0%
10	(11)	Aircastle Advisor	3,729	14.0%	140	26.6	10.8%	133	3.6%

How we can see on the table 2, the largest leasing company is firm GESAC, division of the group GE Money. According to its websites is owner about 1700 aircrafts which are rented to 220 costumers in 75 countries of the world. GESAC in addition offers renting of engines, aircrafts components and financial advisory services to its customers.

The total value of the fleets of 50 largest leasing companies in the world is about 171 billions USD.

The closure and some aspects of the leasing agreement are graphically illustrated in the following figure.

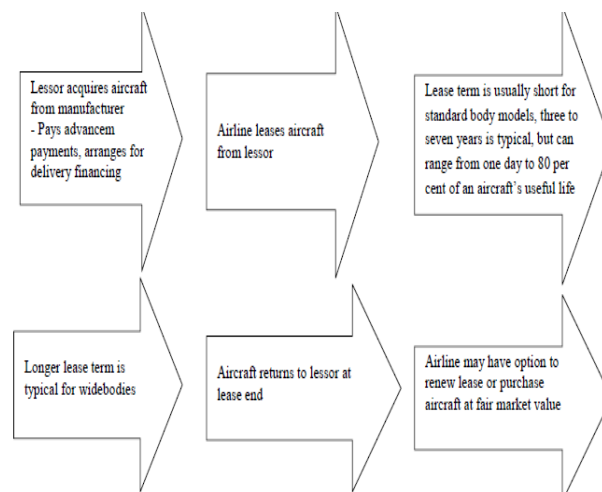


Figure 2 Process of the leasing

## 3 MAINTENANCE AND CHECK OF THE AIRCRAFTS

### 3.1 Maintenance of the aircraft

Maintenance is a basic service for each type of operation. For the area of the aircraft and aviation equipment it is intended to preserve or restore the functions and structure of the aircraft in such a way that they operate according to the required safety standard.

The objective of the maintenance for aviation technology is:

- ensuring of the high reliability of the flight,
- ensuring of the good technical condition of the aviation technology,
- achieving of the specified parameters of the aviation technology,
- the prevention of the failures.

The maintenance plan is developed by producer, aviation authority and operator. This is called triangular bond. The analytical work is divided into three areas:

- systems and power unit,
- components of the aircraft,
- zone inspection.

Maintenance requirements are handled by the aircraft manufacturer and approved by the Authority. Proposal of the maintenance plan contains rules how and in what intervals should be maintaining of the aircraft to fully applicable regulations.

The basic classification of maintenance:

**Planned maintenance** – is a means summary of the activities in which maintain the product without fault conditions by means of systematic inspections, substitution of certain parts and controls at prescribed intervals.

**Unplanned maintenance** – is a means summary of the activities in which renewing of the operational

reliability is implementing immediate removal of occurred faults.

### 3.2 Economic and operational impacts

The decline rate of characteristic of the aircraft is directly affected by the increasing cost of necessary maintenance, repair or modification.

The maintenance costs of the aircraft are some extremely important indicators for assessing the suitability of the aircraft type for the airline company with regard to the typology of its operation. The airline company must know the prices of the aircraft maintenance that could affect its scope with regard to operational reliability and its potential impact on flight safety. The maintenance costs can be in the same model of the aircraft for the different airline companies differently depending on the operating conditions of the airline.

Costs for maintenance are divided into:

**Direct costs** – comprehend the costs of labor and spare parts and other material directly incurred for maintenance of the aircraft or its parts.

**Indirect costs** – comprehend the costs of labor and material costs that are directly attributable to the performance of maintenance of the aircraft, for example: administration, the cost of an office building. Indirect costs may range from 50% to 200% of direct operating costs and are greatly influenced by the organization performance of the maintenance in the airline company.

### 3.3 Maintenance of the aircraft

Maintenance of the aircraft means regular controls that must be carried out on all the aircrafts during the time of their use. The airline companies' operating aircrafts must comply with the maintenance of specified maintenance system approved by the FAA (Federal Aviation Administration) and EASA (European Aviation Safety Agency). Under the supervision of the FAA, each operator prepares conditions of the airworthiness maintenance program (CAMP) within their operating specifications. CAMP includes regular and detailed inspections too. The airline companies called the technical inspections by term „checks“, by which we can divided checks into: A check, B check, C check a D check.

#### 3.3.1 A check

A check is performed at intervals of 500 to 800 flight hours or 200 to 400 cycles, what is approximately every 3 to 5 days. Performed overnight at the airport hangar. The real time of the check varies according to the type of the aircraft, number of cycles (take-off and landing is considered one cycle) or the number of the flight hours since the last inspection. The airline company can check the aircraft with a little delay, subject to meeting certain predetermined conditions. Checks are

carried out in areas of the landing gear, control surfaces, fluid levels, oxygen systems, lighting and auxiliary power systems.

#### 3.3.2 B check

B check is performed at intervals of 4 to 8 months. Usually is done 1-3 days at the airport or in the hangar. A check is performed and internal control systems, hydraulic systems and emergency equipment of the cockpit and cabin.

#### 3.3.3 C check

C check is performed approximately every 12 to 21 months or after the specific number of the real flight hours (FH), it depends of the producer. This control is more extensive than control B. Checks are carried out almost on the whole of the aircraft, which must be decommissioned over its control and shall not leave the maintenance. This requires more space than control A and B. Usually used a home hangar of the airline company. The time required to complete such checks are one to two weeks.

#### 3.3.4 D check

D check is the complete inspection of the aircraft and its functional elements. It is also known as Heavy Maintenance Visit (HMV). It shall be conducted approximately every five years, according to the numbers of the flight hours, for example: B747 after each 22 500 flight hours.

The repair means that is carried out to remove the entire aircraft in special halls and can take up to 2 months, depending on the parameters and the numbers of involved aircraft technicians.

Due to the requirements for the inspection and control complexity is the most expensive of all the above mentioned.

Due to the high costs of such a control most airline companies (especially those with large fleets) plan D control for their aircraft for several years to come. Given that the costs of the D checks can be equal to the costs of acquisition of new aircraft, it happens that the older aircraft before performing this check removed from the fleet. Commercial aircraft undergo 2 to 3 D checks before it is disposed. Therefore, only a few companies offered D checks.

## 4 LIFETIME AND AGEING OF THE AVIATION TECHNOLOGY

Many manufacturers of the aircrafts indicate economic life for their aircrafts about 20 years. This time interval can be affected by various conditions, for example: changing economic conditions, natural conditions (temperature, humidity), hangar, cleaning or physical life.

The operating parameters of the aircraft, as well as each product are decreasing with the time. The rate of decline in the time is characterized by a number of

quantities. The safe life of the aircraft is ensured with the amount of computations and examination spectra of the load and fatigue properties of the aircraft structures.

#### 4.1 Ageing of the aviation technology

During operation of the aircraft is occurring to the ageing. To the increase the safety of the flight operations, airline company handles for all types of the aircraft older than 14 years - Program of ageing.

This program includes:

- the check of the implementation of all statutory modification or the replacement of the aircraft structure having shown problems with rifts,
- preventive program for the aircraft corrosion,
- the check of all repairs of the aircraft structures, whether they are carried out in accordance with the instructions,
- program of additional inspections of the aircraft structures.

Program of additional inspections of the aircraft structures includes:

- type of the damage for which is applied the program,
- the probability of the damage,
- establishment of the criteria for the assessment of damage,
- determination of the limiting values,
- intervals of the inspection,
- methods and inspection procedures,
- obligatory modifications or limitations of the lifetime,
- types of activities for which is the program valid.

#### 5 CONCLUSION

The value of the aviation technology represents a high investment costs for the airline company. Of course it is known that the price is different from the ordered quantity, type and generally very few airline companies are paying by tabular price per piece. The airline company can choose what type of the leasing will repaid for the selected aircraft type. They can choose wet leasing, where is leased aircraft with crew or fuel or dry leasing where is leased only the aircraft. Of course, there are still operational and financial leasing which we talked about earlier in the text of this paper.

The aircrafts be able to operation and safety must be carried out regular maintenance of the aircraft, how we wrote above.

The airline companies are concerned about the costs, which will growing with the age of the aircrafts. Therefore, there are many studies that try to influence ageing of the aircraft precisely defined and calculated. Many times, the effect of the ageing of the aviation technology can not be considered at all because aircrafts tend to be written off earlier from the reason of the

technical progress and the different requirements for air transport than of the high costs for their maintenance.

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