"Low-Cost Carriers in Japan: Challenges and Paths to Success -Using a corporate simulation model for empirical analysis"

By

Sayaka Shiotani

Ph.D. International Studies, Waseda University, 2007
Master of Business Administration, Waseda University, 2002
BA. International Business, Fordham University, 2000

SUBMITTED TO THE MIT SLOAN SCHOOL OF MANAGEMENT
IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF

MASTER OF SCIENCE IN MANAGEMENT OF TECHNOLOGY
AT THE
MASSACHUSETTS INSTITUTE OF TECHNOLOGY

JUNE 2013

Signature of Author: _____
MIT Sloan School of Management
May 10, 2013

Certified By: _____
Arnold I. Barnett
George Eastman Professor of Management Science
Thesis Supervisor

Accepted By: _____
Stephen J. Sacca
Director, MIT Sloan Fellows Program in Innovation and Global Leadership
MIT Sloan School of Management

[Page intentionally left blank]

"Low Cost Carriers in Japan: Challenges and Paths to Success : Using a corporate simulation model for empirical analysis"

By

Sayaka Shiotani

Submitted to the MIT Sloan School of Management on May 10, 2013 in partial fulfillment of the requirements for the degree of Master of Science in Management of Technology

ABSTRACT

This paper analyzes the causes behind the sluggishness of new airlines, low cost carriers (LCCs), in Japan. The object is to identify and to recommend innovative policy changes and ideas for the industry, by analyzing the condition and the development of management policy for the establishment of new airline companies and regulatory reforms.

The traditional airline companies all over the world have been struggling with the changes in current market. With the global deregulation movement on the airline industry in the 1980s, LCCs have established their business very rapidly. Following this global trend, two new airlines started in Japan in the late 1990s, but the market had not been active for a long time. It is only recently that other new LCCs started servicing the Japanese market, while the deployment of LCCs has become very active and successful in North America, Europe, and Asian countries except Japan.

First, this thesis focuses on the analysis of critical successful factors in the foreign market. Then this thesis examines the condition and business environmental issues that make the foreign LCC business model not so effective in the Japanese market.

Second, with the consideration of the previous section, the successful LCC business model is introduced and is verified using a variety of simulations including the financial simulation using the corporate model and risk analysis using the Monte Carlo Method.

These two sets of analytical results are put together for applying to other areas such as policy making, regulations, and market structural changes. Furthermore, the paper comes up with six critical points for the management policies of new airline companies: 1) Promotion of higher productivity and lower cost; 2) Appropriate airfare and the fare structures; 3) Appropriate routes selections and the number of flights; 4) Proactive utilization of secondary airports; 5) Penetration

to the air cargo market; and 6) Availability of sufficient fund for supporting the preparation and establishment of a new entity.

Traditionally, the government has tightly regulated the aviation industry in Japan. In order to consider and to deploy the LCC business establishment conditions, the analysis of government policies is becoming the key element. Integrating the results of the policy analysis and simulations analysis, this research recommends the following criteria. Elimination and changes of regulations and management structures, that may restrict the free competition and the management freedom of the new entities, are essential. From the perspective of aviation policy and the promotion of competition, the following requirements must be fulfilled in order to achieve these goals: 1) Converting the form of the market intervention methods on market structural restriction from proactive to reactive; 2) Elimination of the government control of the airports demands adjustment of both domestic and international routes, the foreign funds, and the cabotage restriction; and 3) Establishment of new airport policies for promoting more active use of secondary airports.

These findings will help promoting the healthy growth of the airline industry in Japan. Activities of consumers, airline companies, and the government will be revitalized and be benefited as a result.

Thesis Supervisor: Arnold I. Barnett
Title: George Eastman Professor of Management Science

Sayaka SHIOTANI, Ph.D.

Associate Professor of Business Management at J.F. Oberlin University in Japan

Dr. Shiotani is a recognized authority on the research in Low-Cost Carriers (LCCs) business. During her career at Japan Airlines Co., Ltd. (JAL), she received a bachelor's degree from Fordham University in New York, the United States, and an MBA and a doctor's degree from Waseda University in Tokyo, Japan. She currently continues to pursue her academic goals at the Massachusetts Institute of Technology Sloan School of Management Sloan Fellows Program, Class of 2013. She is also a visiting scholar at Harvard University Asia Center.

Her first book, *Key Factors for the Success of Low-cost Carriers In Japan: Innovation in Business Models and Aviation Policy* (2008, Chuokeizai-sha, Inc.) won many award:; the Academic Award from the Japan Society of Information and Management (2009) and the Japan Society of Public Unity Economy (2009), and the Japan Society of Logistics and Shipping Economics (2008), and the Sumita Air Award (2009).

Dr. Shiotani analyzes the LCCs and airport management through her academic viewpoint and her business experience as an international flight attendant at Japan Airlines, and presents policy proposals to revitalize aviation industry. Her focus includes tourism, aviation, service management, information and communication both from the economic and management perspectives. As a certified hospitality advisor she offers lectures and conducts training on hospitality at schools and companies. During her free time she uses her expertise as a sommelier and enjoys wine.

Major works: As a single author: *Key Factors for the Success of Low-cost Carriers In Japan: Innovation in Business Models and Aviation Policy* (2008, Chuokeizai-sha, Inc.). As a joint author: *Managing Airports* (2010, Chuokeizai-sha, Inc.), *Business Administration for Air Transportation Business* (2011, Doyukan, Inc.), *Dictionary of Management Education* (2006, Gakubunsha, Inc.), *Tourism Dictionary* (2007, Kirakusha, Inc.), *Contemporary Air Transportation Business* (2007, Doyukan, Inc.).

Acknowledgement

The goal of this thesis is defining the requirements for establishing low-cost carriers (LCCs) in Japan both from management and aviation policy point of view. This study discusses factors related to the success of LCCs outside of Japan, and analyzes the factors for sluggishness of LCCs in Japan. Analytical tools such as financial simulation for profitability analysis and the Monte Carlo Methods for risk analysis are applied to corporate model. Based on the results of the simulations, successful establishment factors for LCCs in Japan from management point of view as well as proposals on reform on issues related to aviation policies, which are restricting management policies, will be presented.

The world aviation industry has been experiencing harsh business circumstance provoked by intensified competition due to deregulation as well as by sudden events including the international terrorist attacks, steep rise in oil prices, and the epidemic. In such circumstances, the aviation market in the world sees the following trend. While the Legacy Carriers (LCs) are falling in financial trouble, Low-Cost Carriers (LCCs) are emerging in the market in North America, Europe, and Asia (other than Japan). When I was working as a flight attendant on the international flights of one of the legacy airlines before I decided on an academic career, I have witnessed both the rising of LCCs and the falling of LCs in the international aviation market.

It was not until the end of the 1990s that the two airlines entered the domestic aviation market in Japan. In contrast to the LCCs abroad, LCCs in Japan are facing financial troubles. The market does not see a significant increase in new entries. They were favorable competitors for somebody like me who was working at one of the major airlines at that time. When I started my carrier as an academic researcher when I was given an opportunity to study abroad by staying employed by the airline company I was working for, the factors for sluggishness of Japanese LCCs became my strong area of interest. My scholastic interest was further developed by the business engineering approach of analyzing the causes for sluggishness of LCCs, which was introduced by Emeritus Professor Masaki Ohta of Waseda University, who is an expert both in and aeronautics and financial engineering. This has become the major theme for my doctoral thesis.

In the pursuit of my academic goal, however, I became aware that businesses in the aviation industry, which is restricted by regulations, cannot solve their issues only by management policies, and that the issues which lie in the aviation policy must also be incorporated as well.

Acknowledgement

When I conducted a presentation at an academic conference in 2003, one of the commentators pointed out to me of the necessity of incorporating an aviation policy issues in my research. This ensured me to acknowledge the importance on further focusing on this viewpoint. In this thesis, I made my best effort in conducting a comprehensive research including proposals on reform of aviation policies.

This thesis for earning the degree of Master of Technology (MOT) at Massachusetts Institute of Technology Sloan School of Management Sloan Fellows Program is therefore a goal for my journey to find out the factors for the sluggishness of LCCs in Japan, which is an area I began to focus on when I started my academic career in New York during my last years of working in an airline company, when the company gave me the opportunity to study there. My focus on this area was further developed by master and doctoral programs at Waseda University, and became the theme for my doctoral thesis. In this thesis, the current situation of the LCCs was reflected, inputs for the model were updated, and competition status was incorporated into the model.

The significance of this research is that (1) this is the first academic research that focuses on the LCCs in Japan by applying management administration approach as an analytical tool, (2) it applies business approach on the aviation industry which is seeing more degree of freedom of management by deregulation, and that (3) it is the first research that applies financial simulating using corporate model and risk analysis using the Monte Carlo Methods. Also, the analysis methods of this research are comprehensive in a way that it focuses on simulation analysis as a core, along with other sources such as papers and articles, other economic analyses, and interviews with various professionals including airline company personnel and policy makers in and outside of Japan.

To explain, research about foreign LCC markets exists, but not exactly about the situation in Japan due to the short history of Japanese LCCs. Previously published literature includes only biography books from managers and newspaper articles. This thesis examines LCCs from the academic, business, and economic points of view.

Another point to note is that because the discussion covers a wide range of areas from management engineering to aviation, some parts may sound redundant for experts in the particular field. It is because my intention was to fully cover the topics related to this research by assuming a wide range of readers.

Acknowledgement

Needless to say, I am keeping in mind that I could not have completed this thesis without support and guidance from many people who have been involved in my pursuit of achieving my academic goals. In writing this master thesis and doctoral thesis, which this thesis is based on, from preparation process to completion of the thesis, professors gave me advice at a conference or study group. Some agreed on conducting a hearing with me. Sloan Fellows gave me useful advice.

First and foremost, I would like to express my deepest gratitude to my thesis advisor, Professor Arnold I. Barnett at the MIT Sloan School of Management, for his thoughtful support and for sharing this wisdom in guiding me precisely toward what I should aim for. He has broadened my view and expanded my network for future business in marketing.

Next, to Emeritus Professor Masaki Ota, who had been my advisor while I was studying under my master and doctoral program. He has taught me an econometric approach and knowledge on the aviation industry even after he retired. His insights and inputs had helped me complete this thesis tremendously. Also, to former Professor Hisashi Owada at Waseda University, who had guided me with the direction of research I should follow when I was facing with various difficult problems. He also gave me useful comments and important guidance of research while I was writing my master thesis.

I am hoping that I did my best effort in reflecting their advice and suggestions to my thesis.

I am also thankful to the staff of the Sloan Fellows Program, including Mr. Stephen J. Sacca, who took such care of all the international students, including myself.

I would like to thank my friends in Boston: Ms. Eri Takano, Mr. Masao Tomizawa, and Ms. Misato Kusakisako, who shared their expertise and helped me get through one of the toughest but most fruitful times of my life. I was truly honored to have met them and became friends in such a short period of stay in Boston.

I am greatly indebted to J. F. Oberlin University for giving me the opportunity to study at the MIT Sloan Fellows Program in Innovation and Global Leadership for a year and for sponsoring me during this superb educational experience, At J. F. Oberlin University, I particularly wish to thank the following people:

Acknowledgement

Professor Toyoshi Satow and Professor and Reverend Takayasu Mitani, who shared insights from their leadership as chief managing director and president of the university; Professor and Chair of the department of business management Koichi Miyashita, who fulfilled my duty in the university and supported me with practical advice while offering warm encouragement as I completed the manuscript; Professor Hiroaki Hatayama, who shared his own experiences while I was attending at the Sloan Fellows Program and gave me constant support throughout the year at the Sloan; Emeritus Professor and Chief Executive Advisor of the university, Michikazu Okada, who opened the window to this precious opportunity at Sloan, and encouraged me to tackle the issues in my life, and provided me with the big picture for the future.

I would also like to say thanks to my family who, from beyond the ocean, helped me go through this long journey with some sleepless nights throughout the year during this Sloan Fellows program. My mother Mitsuko, father Yasuichi, brother Eiji, my late grandmother Hiroko and my other family members always thought about me, encouraged me, and supported me in every way.

Finally, I should never forget to mention about my business experience in Japan Air Lines, Co., Ltd. for over ten years. The company gave me an opportunity to go study abroad while I was still an employee there. The company has also allowed me to build my business experience as an international flight attendant, which has become a background for my area of research. I am hoping that my research outcome will both contribute to the vitalization of the Japanese aviation market and benefit my former supervisors and colleagues in Japan Air Lines, Co., Ltd.

Sayaka SHIOTANI
Cambridge, Massachusetts
May 10, 2013

Table of Contents

Chapter 1 Objective, Structure, and Contribution of Thesis

1-1 Objective and Awareness of Issues

The goal of this thesis is defining the requirements for establishing low-cost carriers (LCCs) in Japan. This study discusses factors related to the success of LCCs outside of Japan, and analyzes the sluggishness of LCCs in Japan. Analytical tools such as financial simulation for profitability analysis and Monte Carlo Methods for risk analysis are applied to corporate model for successful establishment factors for LCCs in Japan. Based on the results of the simulations, the management issues are clarified. Lastly, institutional issues including law and regulation issues that restrict the management policies of LCCs are discussed, and suggestions are made about necessary regulations reforms.

1 Background: The Development of the Airline Industry and Emergence of Low-Cost Carriers (LCCs)

For a long time after the end of World War II, the airline industry worldwide was tightly regulated for entry, and prices and competitions were put aside in order to protect the vested interests of large-sized legacy carriers (LCs). Since the late 1970s, however, the stream of deregulations, initiated in the United States, soon spread through Europe and Asia. As competition became obvious under the deregulation, each airline company deployed new business models such as expansion of networks using hub and spoke systems, yield management, computer reservation systems (CRS), and Internet ticket sales.

Yet the global aviation industry in the 21st century has faced a number of events that have changed the management environment rapidly. Increased fear of air travel, initiated by terrorist attacks in September 2011, increased security measures for the boarding process, increase of liability insurance cost, restrictions on leisure and business air travel caused by epidemics such as SARS and the avian flu, higher fuel costs, and decreased numbers of passengers due to the slow economy worldwide, are all causing a slump for the aviation industry. LCs, especially in the United States, have been suffering a severe drop in their business.

While traditional large airline companies are suffering from economic depression and related issues, in contrast, LCCs are noticeable for their gain popularity. Thus, many of them are now

expanding their business widely.

LCCs have characteristics of combining high-frequency short- and mid-distance markets, simple yet effective operations, use of single type of aircraft, and low prices, and they capture cost-conscious customers. In the United States, Southwest Airlines, JetBlue Airways, and other LCCs account for 30% of all domestic passengers. In Europe, Ryanair and easyJet have grown to 100 routes each. In Asia, since 2000, about 30 LCCs have entered the market along with Air Asia from Malaysia.

2 Awareness of Issues

The above global movement is also affecting Japan with some gaps on timing and the scale. The Japanese aviation industry was protected under very strict demand adjustment regulations until the end of the 21st century. As a result, Japan Airlines (JAL) All Nippon Airways (ANA) and Japan Air System (JAS) segmented the domestic market. As the global movement to deregulation reached Japan, finally in the late1990s, the new entry of airline companies was approved. In 1998, Skymark and Air Do entered the domestic scheduled airline market, the first in 50 years.

Compared with LCCs in North America and Asia, however, Japanese LCCs have been sluggish and the new entry rate has been very low. Why are LCCs in other countries expanding, while their Japanese counterparts are struggling?

This thesis, with such awareness of issues in mind, examines the answers, namely, what requirements and conditions LCCs in Japan have to fulfill in order to have successful establishment.

1-2 Existing Researches in the Area and Contributions of This Research

1 Existing Researches

Prior researches will be introduced again in later chapters. Some studies which are related to the overall significance of this research will be listed in this chapter.

There are two main streams of previous researches overseas about LCCs from the economic

perspective; one is the deductive research, which deducts policy implication from abstract models, and the other is the inductive research which induces the conclusion from the actual cases. The former example includes study by Sinclair (1995), which discussed the entries and exits of LCC in the airline market. The latter examples include study by Dresner & Windle (1999), which analyzed the influence of new LCCs' entries over the LC's fare pricing policy, Williams (2000), which discussed the deregulation of the aviation market and LCCs' business development, Barzagan (2003) and Reynolds-Feighan (2001), which verified the difference between LCC's operations and scheduling, and Gudmundsson and Kranenburg (2002), which conducted an empirical analysis on how the entry of LCCs had an impact on the airfare in the deregulated market.

The studies which focused on the influence of deregulation by taking a specific airline for example include study by Bennet and Craun (1993), which analyzed the factors which deregulation brought Southwest Airlines' successful development, Morrison (2001), which discussed the impact of Southwest Airlines on the airline industry. In Japan, there a number of literatures which discuss the LCCs in North American and European markets. The following researches are related to the theme in Chapter 3: Murakami (2005) examined how new entries of LCCs in the US domestic market in 1998 affected on the LC's airfare policy and transportation capacity, and proved that it will be more beneficial for the society as LCCs grows in differentiating themselves in service and pursue low-cost. Fujimura (2005) also verified the difference between both LCs and LCCs in operations and pricing strategies.

While most literatures discuss LCCs in the United States, Barret (2001) analyzed the conditions of new LCCs entering the European aviation market. Prior researches focusing on Asian LCCs include Hanaoka (2004), which discussed on how international and domestic deregulation in Southeast Asia including Thailand gave an impact on the new entries of LCCs, and the fact that LCCs in Thailand are accepted by customers for low fares and branding. Another research is by O'Connell & Williams (2005), which verified the potential success of the business of North American and European in LCCs.

As shown above, most of the previous researches were analyzed from the economic point of view. There are only a limited number of literatures focusing on management strategies of LCCs from business management of view. Lawton (2002) and Freiberg & Freiberg (1998), for example, discussed Southwest Airlines business management in detail. Hideo Sawada (2005), founder of

Skymark, Japan's LCC pioneer, wrote about his company's business strategies. There is a limited number of studies which discuss the sluggishness factors between management policy and aviation policy of individual LCCs (Nakajo, 2005).

Nevertheless, no research is available that focuses on the successful establishment factors of an LCC by first analyzing the success factors of LCCs in North America and Europe as well as factors for sluggishness of LCCs in Japan, and then, based on these results, by analyzing profitability of an LCC through application of corporate simulation model as well as by risk analysis with Monte Carlo methods.

Much of the existing researches have studied financial simulations based on corporate simulation models and risk analyses using Monte Carlo methods. None of them, however, has been released outside of the private sector boundary, as the purpose for them was for business uses such as project evaluations and risk analysis.

2 Contributions of This Research

The following is what this thesis represents beyond the prior studies introduced in the previous section:

(1) Research about foreign LCC markets exists, but not exactly about the situation in Japan due to the short history of Japanese LCCs. Previously published literature includes only biography books from managers and newspaper articles. This thesis examines LCCs from the academic, business, and economic points of view.

(2) Other analyses with financial simulations with corporate models have not been applied beyond business use. This research combines financial simulations and risk analyses with Monte Carlo methods. And, for the first time, these types of analyses are employed for the aviation industry by academia.

(3) This research covers not only the analysis outcomes, but also detailed business policies, which are necessary for establishment of LCCs with profitability. In the long history of the heavily regulated transportation industry in Japan, the government defined almost all management policies from pricing to investments. Therefore, there have been very limited roles for business

entities in creating business strategies. Hence, only few business analysis tools have been applied. Recently, in the course of deregulation and the promotion of more competitive markets, business strategies have been playing very important roles in running successful transportation-related businesses. This thesis, with business analysis tools, makes the results very practical for the situations of air transport industry.

(4) This research presents proposals both on management policies and on institutional reform in the air transport market by extracting the structural and institutional problems that are restricting implementation of free management policy, and by analyzing these problems from the economic perspective.

(5) The analysis methods of this research are comprehensive in a way that it focuses on simulation analysis as a core, along with other sources such as papers and articles, other economic analyses, and interviews with various professionals including airline company personnel and policy makers in and outside Japan.

Though there is room for further research into some future challenges presented in the final chapter, this thesis must be the first comprehensive study that discusses the successful establishment factors of the LCCs in Japan through a wide scope of analyses, deeper considerations of detailed elements, and diversified analytical tools.

[Page intentionally left blank]

Chapter 2 Current Low-Cost Carriers (LCCs) in the World and Growth Factor Analysis

Introduction

Airline companies have been experiencing harsh business circumstance since the 1990s, affected by the worldwide economic stagnation as well as by sudden events including the 2001 terrorist attacks, the Iraq War, and the SARS epidemic. In such circumstances, the air transport market in the world is seeing the two following major trends.

The first trend is the so-called "global alliance," a partnership between airline companies across borders. Currently, most of the traditional Legacy Carriers (LCs) which are providing services on international routes have joined the global alliance. In Europe, LCs join one of the three major partnerships: "Star Alliance" led by Lufthansa, "One World" lead by British Airways, and "Sky Team" lead by Air France. These three major groups, through strong partnership, are partnered with LCs in the United States for establishment and expansion of a global network. In Japan, ANA joined Star Alliance, and JAL, which had been out of the alliance for a long period, joined One World in 2007.

The second trend is expansion of market share by Low-Cost Carriers (LCCs). With the development of global alliance, LCs are trying to survive the trend of global deregulation and intensified competition, but are falling in financial trouble caused by the sudden events as described above. In contrast, LCCs, which are competing with low cost and with low fares, are expanding their market share without joining the alliance. The LCCs, such as Southwest Airlines and Ryanair, compete against LCs by enhancing their low-cost structure, and are rapidly growing in North America, Europe and Asia.

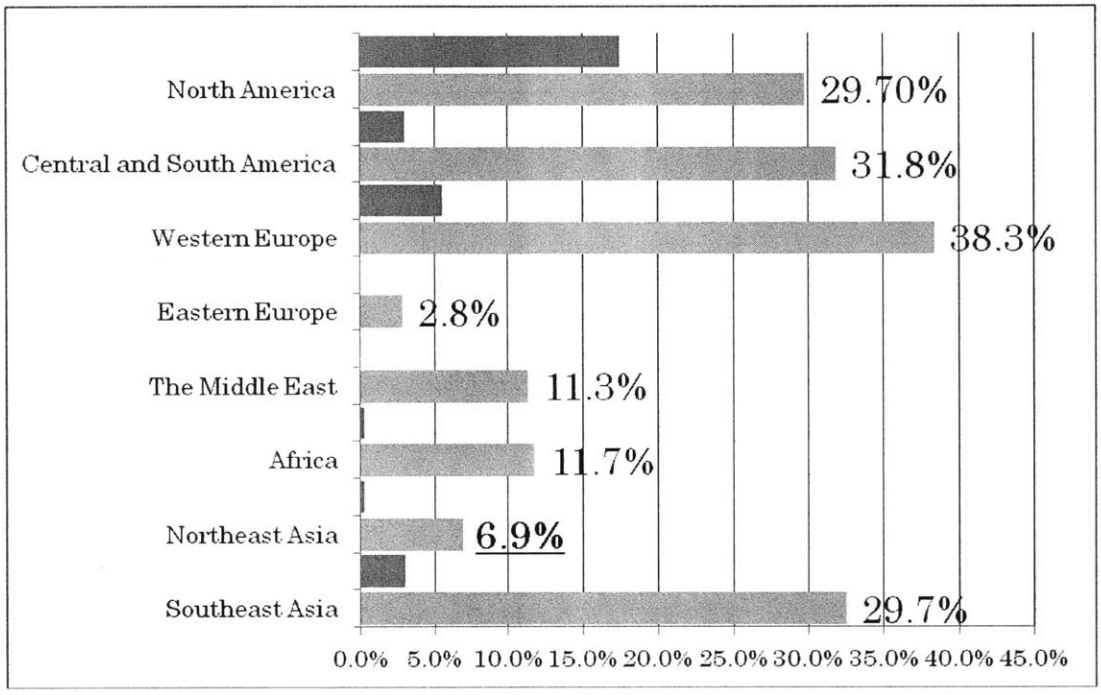
Nowadays, the major LCCs in the world are as listed below in Figure 2-1. Development and overview of LCCs are listed in Figure 2-2. Among LCCs, some, like Southwest Airlines and Ryanair, have done better than some of the legacy carriers, or LCs, in the number of passengers they carry, as shown in Figure 2-3.

The purpose of this chapter is to outline the current status of LCCs in the United States, Europe and Asia by studying their business models, to obtaining common factors in the LCCs which continue to grow as well as the market environment of LCCs, required for the analysis of the

reasons for sluggishness of new emerging airline companies in Japan to be conducted later.

Figure 2-1 Share of world Low-Cost Carrier (LCC)

- In northeast Asia including Japan, it is share around 7% of LCC
- On the other hand, the use of LCC advances in North America, Europe; around 30% of shares



(LCC share according to the area ※Seat kg base)

※Northeast Asia : Japan, Korea, China, Taiwan, Mongolia

Source: Created by the author based on CAPA Centre for Aviation HP (May 2013)

Figure 2-2 The Number of Passengers of LCCs over the World

Ranking of LCCs (passengers, 2011)

International

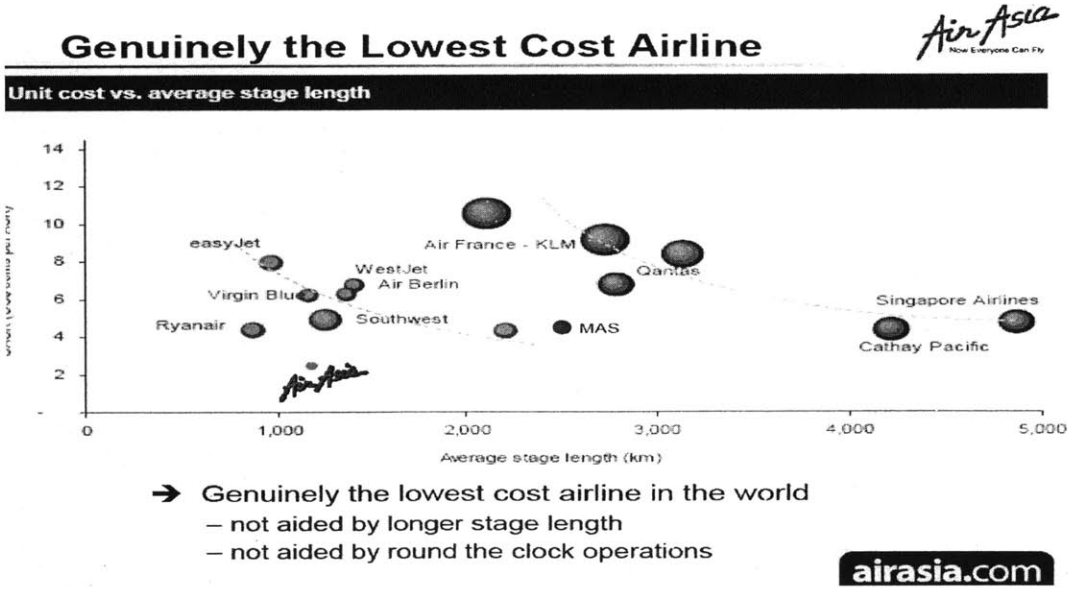
	Airline	Passenger (thousand person)
1	Ryan Air	76,422
2	Lufthansa	49,755
3	Easy jet	42,028
4	Emirates	32,730
5	Air France	32,597
6	British Airways	29,307
7	Air Berlin	25,825
8	KLM	25,066

Domestic

	Airline	Passenger (thousand person)
1	Southwest	76,422
2	Delta	49,755
3	China Southern	42,028
4	American	32,730
5	US airways	32,597
6	China Eastern	29,307
7	China International	25,825
8	United	25,066

Source: Created by the author based on Each Airline Website (May 2013)

Figure 2-3 Genuinely the Lowest Cost Airline



Source: Created by the author based on Each Airline Website (May 2013)

There is room for dispute in defining LCCs, but in this thesis the broad definition of LCCs is given as follows: the unconventional airlines that have a relatively short history of the business model that has been established on the principle of offering low fares compared to LCs through pursuit

of cost reduction. It may be slightly misleading to define such an airline corporation as Southwest Airlines as "a new airline company" since it was established in 1971 and has grown to be the 6th largest airline company in the United States. This company, however, is still undoubtedly "unconventional" because of its business model, contrasting to the models adopted by the LCs. Therefore, it can still be called "a new corporation" in a relative and historical sense.

The histories and development of these LCCs will be explained in the following sections.

2-1 United States LCCs

1.1 Development of LCCs in the United States Airline Industry

American LCCs' business models have been developed as part of the deregulation process. By September 2006, the share of LCCs reached 30% of the American aviation market. Southwest Airlines, a renowned LCC, now grows to the scale of other LCs.

1.1 The United States Aviation Market in the 1980s and New Entries

Since 1978, when the Airline Deregulation Act was established under the Carter administration, other regulations regarding price and new entries were abolished. This political trend encouraged LCCs to enter the market. LCs have significantly lowered productivity as a result of long-term protection under regulation. The LCCs, by taking advantage of the difference in productivity, entered the market with low personnel costs and low fares, and intensified competition against LCs over fares. To stay dominant over the intensive competition, LCs tried to expand their market share by mergers, active use of hub and spoke systems by LCs, implementation of CRS-based yield management (pricing method that maximizes profits per flight) and attracting customers through Frequent Flyers Programs (FFPs).

From the 1980s to 1990s, many LCCs (or new airlines or cheap airlines, as they were called at that time) could not survive in the competitive market, confronted with new business strategies by LCs, and hence went into bankruptcy. As in the case of bankruptcy of People Express Airlines, bankruptcy of LCCs was caused by the facts that LCCs lost customers by frequent accidents and disruption of flight schedules.

People Express Airlines, is a typical example of an LCC that went into bankruptcy as a result of losing customers by accidents and disruption of schedules, control by LCs over the hub airport

through maximized use of hub and spoke systems, its poor capital strength that failed to cover the cost for introducing IT measures such as CRS, and by the successful lock-in of customers by LCs through FFPs.

When LCCs entered the routes shared by LCs, the LCs set their fare at the same price or lower than the fare of LCCs, and stayed competitive over price by covering deficits from the routes with the surpluses of the other routes. This resulted in shutting out new entries.

In other words, People Express Airlines could not attract customers by FFPs, lacked network and delayed in applying CRS. Cheap fare was its only marketing point. Therefore, confronted with price competition by LCs, the company, also lacking initial funds, could not survive the market.

As a result of the competition, American Airlines, Delta Airlines, Northwest Airlines and United Airlines, the four major companies that were established through a large scale of mergers, reached 60% of share in the market in the 1900s. Restructuring of these companies was conducted in accordance with their new strategies including expansion of network through hub and spoke systems, and was focused on a company's location of hub airports and the number of gates it occupied. Under such circumstances, most of the small LCCs could not survive except for a few, such as Southwest Airlines.

1.2 Re-Development of United States LCCs at the End of the 1990s

Despite these business strategies, LCs reduced their competitiveness starting at the end of the 1990s. Furthermore, most of them reported loss in the term of the fourth quarter in 2000. The reasons were as described below.

(1) Due to the fall of airline demand resulting from economic recession after the collapse of the dot-com bubble, targeted business customers were switching to choose cheaper seats from high-yielding seats due to cost saving measures implemented by the companies they are working for.

(2) LCs, during the competition over share expansion against their competitors, excessively invested in cabin facilities, services, FFPs, yield management and systems for customer data management in order to maintain and raise demand by high-yielding customers. This caused the companies to lose their management power.

(3) LCs, which had already been under pressure of high personnel cost by their workers trying to keep their vested rights, had to suffer an even higher cost structure by further increase of salaries based on the labor-management agreement concluded in 1991 and high pension savings.

(4) Hub and spoke systems raised demand in the market, but also caused congestion and flight delays at the hub airports as well as inconvenience in connecting flights. These circumstances made customers unsatisfied.

(5) Customers, through IT development that simplified information gathering and transmission, are now able to compare prices and services among airlines.

(6) Fuel became more expensive.

In addition to these factors, the terrorist attacks on September 11, 2001, the Iraq War, the SARS epidemic and the steep rise in jet fuel cost further damaged LCs financially. As a result, United Airlines and US Airways went into bankruptcy in 2002. In 2005, Delta Airlines, the third largest American airline, and Northwest Airlines, the fourth largest, filed Chapter 11 (See Figure 2-4). As shown in the below table, four of the seven LCs went under Chapter 11 protection. In 2005, US Airways exited Chapter 11 by merging with LCC America West Airlines.

Figure 2-4 LCs which Filed Chapter 11 After 2000

	Year	Chapter 11
American Airlines	2011	Filed
United Airlines	2002	Filed
Delta Airlines	2005	Filed
Northwest Airlines	2005	Filed
Continental Airlines	1990	Filed
Southwest Airlines	-	-
US Airways	2004	Filed

Passenger kilometer = One passenger kilometer refers to a kilometer traveled by a passenger

Source: Created by the author based on Each Airline Website (May 2013)

Behind this situation under which LCs were struggling, LCCs again became active in the market. The main active LCCs in the United States in early 2007 were Southwest Airlines, America West Airlines, ATA Airlines, JetBlue Airways, Air Tran, Frontier Airlines, and Spirit Airlines. These LCCs, compared to those in the 1980s, have high cost competitiveness, with strong financial ground, and often dominate the competition over the LCs in the same route. The market share occupied

by LCCs reached 30% in 2010, and is expected to reach 50% by 2010.

It is yet necessary to note that some LCCs were facing financial troubles. For example, in 2005, ATA Airlines and Southwest Airlines received relief. In 2006, Independence Airlines, which was seeking capital investors or buyout under protection of Chapter 11, went into compulsory liquidation only eighteen months after its business started.

In addition, LCCs established by LCs as their affiliates for competing against other LCCs were also facing financial troubles. For example, Song, an LCC established by Delta Airlines, was reabsorbed by Delta in May 2006 only three years after its own business started. This was partly due to its failure to reduce personnel cost by using Delta's flight crew for operations.

Below is the overview of current status and strategies of Southwest Airlines and JetBlue Airways, which are demonstrating remarkable growth, in contrast to other low-performing businesses in the entire air transport market in the United States, which are under intensified competition and confronted with various external factors.

2 Major LCCs in the United States

2.1 Southwest Airlines

Southwest Airlines, which is taken as a typical example of an LCC business model, was established in Dallas, Texas, in 1971, seven years before domestic liberalization of aviation policies in the United States. It may be slightly misleading to define such an airline corporation as Southwest Airlines as "a new airline company" in that sense. The company survived in the market, while many of the other LCCs in the 1980s failed, and grew to be the second largest airline company in the world in the number of passengers in 2005.

The main characteristic of Southwest Airlines' business model is its execution of six strategies to differentiate it from the LCs as follows.

The first differentiation strategy is high-frequent operations of direct and short-distance routes. In the 1980s, LCs attempted to penetrate the market by focusing on expanding their network through hub and spoke systems as business strategy, reorganization of the industry by mergers and acquisitions, increase in distribution of aircraft and personnel and use of multiple types of

aircraft. Southwest Airlines, on the other hand, positioned point-to-point strategy as its main strategy to differentiate itself from the LCs. The strategy refers to providing services with low fares in convenient, high-frequent and direct short-distant routes using secondary airports in large cities, which the LCs were not serving well. With this strategy, Southwest Airlines successfully concentrated its resources to enhance profitability rather than expanding its market shares and thus distinguished itself from LCs. While many of the LCCS in the 1980s fought straightforwardly against LCs by entering major long distant routes, Southwest Airlines focused on short-distance domestic routes in limited areas, avoiding expansion of the network. Even at the beginning of the year 2006, both the average flight distances and flight lengths were short compared to those of traditional LCs, and 80% of its flights were short-distance trips that frequently connected two cities directly. The company's high-frequent operation is offering a sense of reassurance to customers, compared to the other LCCs, the operation schedule of which is frequently disrupted.

The second differentiation strategy is proactive use of secondary airports. Southwest Airlines began and developed services on routes from Love Field Airport, which is located adjacent to the city, but not at Dallas Fortworth Airport, which is the city's hub airport. It uses secondary airports instead of hub airports which are used by other airlines, because secondary airports have fewer crowds, have higher availability of arrival and departure slots and charge lower airport facility usage fees. It also extended operating time by minimizing time on the ground and increased the average number of operations per day, both of which contributed to cost reduction.

The third differentiation strategy is pursuit of rationalization and cost reduction through use of B737 aircraft only and service on short-distance routes. The 513 aircraft now possessed by the company are all B737s. Use of single type of aircraft saves cost for training for crew members, requires a single type of maintenance manual only, reduces repair parts inventory, and enhances efficiency in parts procurement. The company can receive large discounts from aircraft and engine manufacturers by purchasing supplies from them by bulk. No-frills service, which is made possible by short-distant flight, also contributes to cost reduction and thus provision of low fares. Another cost reduction effort was to apply a sales system dealing directly with passengers but not via CRS, networked by travel agents.

The fourth differentiation strategy is establishment of corporate identity (CI). Both associates and cabin attendants on duty wait on customers with casual outfits and a friendly manner to achieve

high customer satisfaction. The company is also successful in penetrating CI through the teamwork called "Southwest Spirit." Southwest employees develop a sense of such teamwork by working beyond job description. All types of employees including pilots, cabin attendants and mechanics are collaborating together by working beyond their job descriptions as necessary. Understanding each other's responsibilities contributes not only to development of a high sense of teamwork but also to achievement of cost reduction.

The fifth differentiation strategy is building employees' loyalty to the company through penetration of CI based on this Southwest Spirit concept. Loyalty is also developed by the company's concept, which can be described as "Customer satisfaction comes from employee satisfaction." Southwest Airlines, which was ranked as top of the "100 best companies to work for" by *Fortune*, has been renowned as a company with high Employee Satisfaction (ES). The company announced that it would value its employees from management policy point of view and in salaries. Based on its management policy, high employee satisfaction is achieved by providing them with an enjoyable working environment that will eventually be passed to passengers, and will ultimately contribute to customer satisfaction and enhanced productivity. In order to enhance teamwork explained above, the company's Chair Kelleher sometimes protects his employees from unreasonable complaints from customers. This is called Southwest Airlines' "Employees first, customers second" rule. This may sound paradoxical from a customer satisfaction point of view. It is, nevertheless, based on a concept that, if a company cannot block its employees from customers' unreasonable behavior, employees will not feel comfortable in fulfilling their job responsibilities. This is a rational approach if ignorance of such complaints and behaviors by the management will eventually lead to low customer satisfaction.

The sixth differentiation strategy, which is also related to establishment of CI, is penetration of the company's social role to its employees. Southwest Airlines popularized air transport. The company then made clear its position to its employees that popularization of air transport is part of the company's management policy and social role. True employee satisfaction is developed through the employees' understanding of company's social role and thus of significance of their job to the society. This will eventually leads to customer satisfaction.

The successful airline is also impacted by the recent steep rise in oil price. As was discussed previously no it wasn't, the company is rich in liquidity in hand and in fuel hedging (approximately 80%) compared to other airliners, so the impact of the rise in oil price was

relatively small. Nevertheless, the company is struggling to shift the steep rise of fuel price to airfare. As a result, 3% of the flights were shifted from short-distance routes to long-distance routes. Also, it began implementing profit increase measures such as charging for in-flight entertainment systems.

The following are recent remarkable facts about Southwest Airlines. In 2011, Southwest Airlines made a management plan that emphasizes the following strategies: (1) AirTran integration, (2) All-New Rapid Rewards® frequent flyer program, (3) the increase of Boeing 737-800s, (4) fleet modernization, and (5) replacement of its reservation system. First of all, Southwest Airlines said that taking these actions would drive more revenue, reduce unit costs, and improve its financial performance. Among these measures, the acquisition of AirTran and the addition of new aircrafts (including fleet modernization) are remarkable facts that may lead to challenges as follows.

AirTran was acquired by Southwest Airlines in 2012, and the latter succeeded in extending their network. However, AirTran principally provides the hub and spoke service, rather than the point-to-point service, and approximately half of AirTran's operation route is originating from Atlanta, Georgia, even though Southwest Airlines mainly provides point-to-point service. According to the Southwest Airline's management plan, the company will maintain operating its point-to-point route service for customers' convenience in terms of reducing the duration time. Therefore, the author focuses on how Southwest Airlines absorbs AirTran's hub-and-spoke style network and combines it with its point-to-point style network.

Or Southwest Airlines may develop a new style of service in the near future. Secondly, regarding the increment of aircraft, Southwest Airlines owned 694 aircraft in 2012 whereas they owned 537 aircraft in 2009 (includes leasing aircraft). In more detail, in 2012, the number of Boeing 717-200s was 88, Boeing 737-300 was 20, Boeing 737-500s was 128, Boeing 737-700s was 424, and Boeing 737-800s was 34. In contrast in 2009, it had only three models of aircraft: 172 Boeing 737-300s, 25 Boeing 737-500s, and 340 Boeing 737-700s. Southwest Airlines basically utilizes only Boeing aircrafts. However, it has added types of aircrafts such as the B717-200, which was caused by acquisition of AirTran, and the B737-800. This may raise the maintenance costs. Thus, when a company expands its business, its networks and assets including equipment will be diversified and complicated, even though they had been striving to reduce the cost. This is an unavoidable issue if Southwest Airlines seeks to continue expanding its business.

Southwest Airlines has been used as a great business model of LCCs and leading the LCC market. It provides low-priced airfare and shortens the duration by holding the basic strategy of LCCs such as unifying the types of aircrafts, operating point-to-point routes by taking advantage of the secondary airports, and implementing no-frills service. As a result, it has improved the benefits of the customers and expanded its business successfully. However, Southwest Airlines has grown as big as other airline companies, and it may have to reconsider its business strategy.

For instance, Southwest Airlines has introduced a frequent flyer program (FFP). This strategy was developed by major airlines, and it basically does not work for LCCs. If the company uses this strategy in a wrong way, it may get a significant damage in its business, as Pan American World Airways and JAL did. The structure of the strategy is to categorize customers and manage each individual, and it may cost more. Therefore, it is a rare case that an LCC like Southwest Airlines has introduced the FFP, and it will be a hot topic in the aviation industry and related fields.

In addition, it seems like there is a certain limit for the effectiveness of the point-to-point strategy. Point-to point-operation is useful for the large-demand routes. In contrast, hub-and-spoke operation is supposed to be beneficial to the small demand routes. Accordingly, if Southwest Airlines continues to extend its operation routes by using the point-to-point strategy, it may meet a limitation at some point. Acquisition of AirTran, for instance, seems a case where its business strategy exceeded the limitation. It will be noteworthy to see how Southwest Airlines handles point-to-point strategy even after the integration.

The author conducted a SWOT analysis of Southwest Airlines below. All the information come from Southwest Airlines' website. It describes almost the same things that the author discussed above.

Strengths:
Reasonable Valuation: The company carries a price to earnings ratio of only 14.10, which by nearly all standards is relatively cheap.

Widespread Reach: As of the end of 2011, the company serviced 72 cities in 37 states, stretching across the entire United States, and its AirTran acquisition now extends its reach into international skies, mostly over Mexico and the Caribbean islands; so the company's operations are by no means concentrated in a specific region.

Dividend: The company currently pays out quarterly dividends of $0.01, which annualized the company's dividend as yielding 0.44%; while this dividend may seem unimportant and insignificant, it is still almost half of a one-year CD rate

Modest Sales Growth: Year after year, sales growth has been in the double. However, the company's growth is projected to slow to the still modest high single digit rate into the future.

Established Brand: Much of an airline's success is due to its reputable brand, as fliers flock to more established and distinguished companies with track records of safety, and having an established brand is a major advantage.

Weaknesses:
Debt: The company is estimated to possess $361 million of debt on its balance sheet, and until it pays down these debts, they will drag significantly on their business.

Mounting Operating Expenses: The average cost per gallon of fuel from 2005 to 2011 grew 182.30%, the consumer is constantly demanding added services and amenities to their flights, and the unions are viciously battling for more money for their members; at the end of the day the company does not have much money left over (net profit margin is 1.14%).

Relative Expensive Price of Product: While Southwest is known for offering great values, it still is a very costly endeavor to buy a ticket on an airplane, and in times of economic downturn people simply do not have extra money.

Opportunities:
Expansion: Just in 2011 the company added Charleston, South Carolina; Greenville-Spartanburg, South Carolina; and Newark, New Jersey to the list of cities the company services, and further expansion is probable.

Gaining Market Share: Recently, American Airlines has appeared in the news in a negative light, with loose seats and massive layoffs; with this comes an opportunity for Southwest to capture the business American Airlines once had.

Acquisitions: On May 2, 2011 Southwest acquired AirTran, and further acquisitions are undeniably a possibility, especially with Southwest being relatively large.

Threats:

Weather Uncertainty: As we have seen most recently with Hurricane Sandy, natural disasters can cause major losses in business for the airlines, and because Mother Nature is so unpredictable, there is always major uncertainty revolving around the company.

Immense Competition: The airline industry is incredibly competitive, and the race to get the consumer's business often leads to margin contraction.

Vulnerability to Rising Oil Prices: When jet fuel prices rise, airline companies are faced with the decision of passing the pain onto their customers and possibly losing business, or swallowing the costs and ruining their margins.

Exposure to Shaky American Economy: The company operates mainly in the United States of America, and thus any economic slowdown exclusive to the American economy could drastically hurt Southwest's business, while other international companies possess the ability to weather the storm.

This company is a major example of LCCs to be presented due to its success stemming largely from its unique business model, which is used by many other LCCs as a reference. Its history is as shown below in Figure 2-5.

Figure 2-5 History of Southwest Airlines

	History
1971	Began service between Houston, Dallas, San Antonioin Texas
1977	"LUV" listed to New York Stock Exchange
1979	Implemented self-check-in machines to 10 cities
	Began service to cities outside Texas (Dallas-New Orleans)
1981	Purchased B737 aircrafts
1982	Began service to San Francisco, Los Angeles, San Diego, Las Vegas and Phoenix
1983	Passed 9.5 million passengers
1984	Selected as "No.1 Customer Satisfaction" for four consecutive years
1985	Launched "Just Say When" campaign (to become a more convenient airliner providing point-to-point service)
1987	Selected as "No.1 Customer Satisfaction" for six consecutive years
	Began weekend fun package service (Package including a round-trip flight ticket and hotel stay)
1988	Launched "New Friends" campaign (Partnered with Sea World in Texas, and

	manufactured aircraft painted with an orca motif)
	Achieved first triple crown in "On-Time", "Baggage Handling" and "Customer Complaints"
1989	Began new service to routes using Oakland International Airport as a base
1990	Marked earnings of 1 billion dollars, and took in the ranks of major airliners
1992	Achieved annual triple crown for the first time in the American airline industry
1994	Aquired Morris Air. Implemented ticketless service
	Began service to seven pacific northwestern cities (Seattle, Spokane, Portland, and Boise).
1996	Started online ticketless service
1997	Began service to its 51st destination (Mississippi).
1999	Began service to New York.
2002	Implemented self check-in system to approximately 250 airports
2003	Partnered with a television network
	Selected as Airline of the Year by *"Air Transport World"* magazine.
2004	Began online boarding ticket service
	Began service to its 60th destination (Philadelphia), resulting in 2,800 flights to U.S. destinations.
2005	Began code share with ATA Airlines
2007	Remained in surplus for thirty-four consecutive years
2008	Won three first-place Freddie awards for its Award Redemption, Best Award, and Best Customer Communication.
	37th Anniversary
2009	Ranked as No. 7 on its list of the World's Most Admired Companies in Forbes magazine
2010	Began the new nonstop service between Denver and Boston Logan; Denver and Spokane; and Denver and Reno/Tahoe.
	Recognized as the top airline with their annual Air Cargo Excellence Survey in *Air Cargo World* magazine.
	Net income $459 million—$450 million excluding special items, 88,191,322 Passengers carried, 1,114,451 trips flown in 2010.
2011	Began service to South Carolina through Greenville-Spartanburg (GSP) and Charleston (CHS).
	Confirmed that shareholders of AirTran Holdings, Inc., the parent company of AirTran Airways (AirTran)
	40th Anniversary
	Began new service to Atlanta (ATL) bringing greatly reduced fares and new flexibility for both business and leisure customers.
2012	Issued Single Operating Certificate to Southwest Airlines and AirTran Airways by FAA Launched its first international flight from Denver International Airport with new service to Cancun Began service to Key West International Airport

Source: Created by the author based on Southwest Airlines' website. (May 2013)

2.2 JetBlue Airways

JetBlue Airways has continued to grow rapidly since its establishment in 2000.

It has used several business strategies that are different from those of a typical LCC.

The company's first strategy is to target business passengers, who normally use LCs. This strategy is different from a Southwest Airlines business model, which aims at cost reduction by no-frills service. With "Value for Money" as its catch-phrase, it is marketing by focusing on offering high-quality services (such as IT-based functions, leather seats, satellite television for each passenger) with a relative low fee or "value price". The company is also focusing on developing human resources for providing such high-quality services under the "High Tech & High Touch" slogan.

The second strategy is use of hub airports. Instead of using secondary airports or focusing on short-distance routes, as were done normally by typical LCCs, the company has been based at John F. Kennedy International Airport, a hub airport in New York, since its business started. It is focused on high-demand and long-distance routes between New York and major west coast cities (Los Angeles, Seattle), and between New York and Florida. With this strategy, the company was successful in establishing a system of securing stabilized revenue by attracting business passengers, who frequently use flights and who bring stabilized revenue to the company. This was made possible by its sufficient initial funds of $160 million inclusive of funding from George Sorros.

The third strategy is its wide IT system benefiting by the funding mentioned above. The company is implementing a wide range of IT measures, including "paperless cockpit (In the cockpit of JetBlue Airways, both the pilot and the co-pilot have notebook computers, and the pilot gets access to the central computer system installed at the headquarters so that they can establish the most efficient flight plans within a limited time by inputting and calculating the weight and balance of the airplane.) The company is using IT technology to minimize time and procedures for processes from reservation and sales of tickets to check-in and handling of baggage at low cost. The 600 virtual call center operators working from home wait on customers using Voice over-IP (VoIP) connection for ticket reservations by phone. The company is also using IT technology to shorten check-in wait time as well as for establishing a baggage tracking system by use of electronic tag. Its intensive use of IT technologies outlines the company's CI, and contributes to branding and differentiation. IT technologies are also applied for enhancing security measures. This was promoted in the aftermath of the terrorist attacks on September 11, 2001, when passengers became highly concerned about security. Some examples are the

installation of monitoring cameras in the cockpit so that the ground staff can monitor the cockpit via satellites and the installation of hidden cameras inside the cabin. Even more sophisticated is the introduction of biometrics applications (such as detection of fingerprints) at terminals.

The fourth and final strategy is use of "cost per ASM (Available Seat Mile)" as an index for management efficiency, which contributes to reduction in operation cost. Currently, its cost is less than 7 cents, which is approximately 25% lower than the average of LCs.

JetBlue is also implementing strategies commonly applied by other LCCs as seen in a Southwest Airlines business model. Some examples are use of only A320s for reducing operation cost, application of direct sales model for selling seats directly to clients and not with travel agents, and application of ticketless method for all reservations.

On the other hand, JetBlue some have been critical about JetBlue's management policy focused on its short-term efficiency, without costing redundancies. In winter 2007, when a cold wave hit the East Coast including JFK Airport where JetBlue is based, the company revealed its poor management system, so a large number of flights were cancelled. However, lack of such ability can be seen even in legacy carriers, so this might not be an issue only in LCCs.

According to JetBlue's annual report, it sells vacation packages through JetBlue Getaways™, a one-stop, value-priced vacation website and service designed to meet customers' demand for self-directed packaged travel planning. JetBlue Getaways™ packages offer competitive fares for air travel on JetBlue, along with a selection of JetBlue-recommended hotels and resorts, car rentals and attractions. It also offer à la carte hotel and car rental reservations through its website which generates ancillary service revenues. Thus, JetBlue does focus on both business travelers and vacation travelers. The historic distribution of its available seat miles, or capacity, by regions is shown in the following Figure 2-6. According to the figure, it has a large share of flights to leisure resort areas such as Florida and the Caribbean.

Figure 2-6 JetBlue's capacity Distribution (available seat miles) by region

Capacity Distribution	2012	2011	2010
East Coast – Western U.S.	32.1%	32.4%	34.5%
Northwest – Florida	30.6%	32.2%	31.4%
Medium – haul	3.9%	3.2%	3.3%
Short – haul	7.2%	7.5%	7.6%
Caribbean, including Puerto Rico	27.2%	24.7%	23.2%

Total	100.0%	100.0%	100.0%

Source: JetBlue's annual report in 2012

2.3 Affiliate LCCs of LCs

To compete against LCCs, LCs in the United States began to establish their own LCCs. However, they are overall facing challenges in managing their LCCs.

The affiliated LCCs are following Southwest Airlines' business strategies that include no-frills services, savings in maintenance cost and training cost by use of a single type of aircraft, and savings in personnel cost through employment of non-union workers. Despite its effort, these measures are not working well, and are not resulting in cost reduction. The reason for this is that the existing labor contract of the leading LC cannot be changed even when it becomes affiliated, so it does not simply lead to personnel cost reduction. Another reason is that the affiliate's management system is taking over the old-fashioned management system of its parent company.

2-2 European LCCs

1 Development of LCCs in the European Air Transport Market

Most of the LCs in Europe grew by benefiting from protection and preferential treatment as national corporation under governmental regulations. However, deregulation had been promoted gradually since 1987 under the process of EU integration. Airfares and market accessibility were liberalized in 1993.

In 1997, transport between three countries in EU including deregulation of cabotage (the rights to operate in domestic routes) was permitted. With this complete liberalization policy, the EU airline companies were then able to operate freely within the EU area. In conjunction with this deregulation process, the aviation industry was restructured. Major airline companies were then able to expand services on routes mainly using hub airports but across borders. This move promoted entry of LCCs.

Internationally, an aviation agreement was closed between EU and the United States which promotes Open Sky (liberalization of international airlines). Partnership between the European and United States airline companies on Atlantic routes is being developed.

Impacted by the severe management environment since 2000, the European aviation industry has been seeing continuing restructuring and consolidation. National and formerly-national LCs based in a country with a small domestic airline market are seeking ways of partnering with LCs such as Lufthansa, British Airways and Air France. The first example of management merger between airline companies across borders was by Air France and KLM (Koninklijke Luchtvaart Maatschappij) in 2004. Alitalia is planning on joining "Air France=KLM". Swiss International Airlines, which merged with bankrupted Swissair, has decided on partnering with British Airways. This partnership movement between the airline companies in Europe is linked to the world-wide alliance formation. In Europe, as previously described, all airlines are partnered in one of the three major alliances, embodied by Lufthansa, British Airways, and Air France respectively.

While these LCs are under restructuring process, LCCs are actively penetrating the market by taking advantage of the system that allows cabotage or transport between three countries. A large number of LCCs are now operating in the current European air transport market: Ryanair and easyJet, the two major LCCs, provide service on high-frequent and short- and mid-distance routes with low fares and use secondary airports in the suburbs by following the Southwest Airlines business model. Other LCCs include Air Berlin in Germany, Sterling in Scandinavia, and Bmybaby, a British traditional mid-ranked airline company British Midland Airways' affiliate company. LCCs accounted for 20% of the European airline market in early 2006, and 30% in 2007, a similar growth rate in the U.S. market. The share was expected to reach 50% in 2010. Ryanair and easyJet occupied a total of 42% of the entire airline passenger transport in 2004 on a specific route between Dublin and London. This was threatening the market share of LCs. Competition between LCCs is intensified as well. In 2005, Ryanair announced the start of service from to Luton airport in London, a hub for easyJet. Below is the overview of the business model of Ryanair and easyJet, the two major European LCCs.

2 Major LCCs in Europe

2.1 Ryanair

Ryanair's history is as shown in Figure 2-7. The core of Ryanair's management policy is an intensified version of cost reduction measures in the Southwest Airlines business model. The company, which had been in competition against Aer Lingus, was able to avoid bankruptcy with the support of the Irish Aviation Authority. Since then, the company has been steadily growing in

scale and enhancing its profitability. It is also taking advantage of EU integration as an opportunity to expand its services in the entire European market.

The company is focusing on the Southwest Airlines' low-cost strategies that include savings in landing fee by using secondary airports in the suburb, minimization of in-flight service and charge food and drinks and newspaper, sales dealing directly with customers and not with travel agents, focus on ticket sales via the Internet, and request of discount to manufacturers by ordering a large amount of single type of aircraft in a bulk.

In addition, the company is implementing more radical cost reduction measures not seen in Southwest Airlines such as employee paying its own uniform and training cost and no refundable ticket. In recent years, the company discontinued blinds and reclining seats to shorten time for preparing for takeoff, and secured revenue from baggage fees by increasing baggage weight limit. The company is investigating also charging for in-flight entertainment and in-flight gambling to increase revenues.

LCC's strategy of using secondary airports in the suburbs attracted passengers also from other areas. This also contributed to the development of the area surrounding the airport. The operating bodies of secondary airports and adjacent cities have provided subsidies to invite LCCs. For example, Charleroi Airport in Belgium, which has been used by Ryanair as secondary airport, appraised Ryanair's achievement of providing service to one million passengers, and provided subsidies of 3.4 million Euros.

In 2005, the EU committee has decided on banning local subsidies as shown in the above case of Charleroi Airport based on its fundamental policy to minimize involvement of government in the market. The measures, which have been working in favor of LCCs to survive the competition against the LCs, are now geared in the reverse direction as the share of LCCs in the market expanded. This circumstance explains the growth of the European LCCs, but is also of a concern for the future of LCCs.

Ryanair, by anticipating the boom in tourism to Europe by Chinese travelers, is seeking for the possibility of partnering with Air Macau in view of entering the Chinese market. If Ryanair begins service between Europe and China, it means that the company is going to modify its business model with short- and mid-distance and high-frequent flights. This is considered to be

one of the measures to be taken by LCCs that can no longer anticipate rapid growth.

Ryanair's financial report of 2012 said that it achieved a 25% increase in full year profits to €503m at the end of year 2012. Revenue increased 19% to €4,325m as traffic grew 5% and average fares rose 16%. Unit costs rose by 13% due to a 30% increase in fuel costs and a 6% increase in sector length. Excluding fuel, sector length adjusted unit costs were flat. At the end of 2012, Ryanair performance profits growth of 25% to €503m, traffic grew 5% to 76m. It has 294 aircrafts and over 1,500 operation routes.

Due to rise in oil prices and the recession of the EU, some airlines such as Malev, Spanair and Cimber Sterling, have closed their operation. Despite this condition, Ryanair will expand its business operation by opening a new base in Budapest. In addition, they seem to expanding bases in Spain, Scandinavia and provincial UK in order to promote the benefit of local consumers.

Figure 2-7 History of Ryanair

	History
1985	Inaugural flight between Waterford and Gatwick.
1986	Began service between Dublin and Luton at half the price of airfare of the LCs
1987	Leased jet airplane. Increased to 15 networks
1990	Became the first European LCC which followed and restructured the Southwest Airlines' low-fare model
1991	Moved base from Luton airport to Stansted airport
	Achieved profits of 293,000 pounds in spite of impact from the Gulf War
1992	Reduced routes from 19 to 6
	Passed 100,000 monthly passengers for the first time in Ryanair's history
1993	Passed 1 million annual passengers
1994	Operated in first B737 aircraft
	Began service between Dublin and Manchester, Dublin and Prestwick
1995	Achieved passenger transport performance between Dublin and London that exceeded performance of LCs
1996	Began service between Stansted and Prestwick
1997	Began service between Dublin, London, Paris and Frankfurt
	The U.K. Civil Aviation Authority praised its on-time operations between Dublin and Luton.
1998	Selected as "Airline of the Year" and"Best Managed National Airline".
1999	Selected as "Best Value Airline" in the U.K.
2000	Implemented"ryanair.com", an online reservation system.
2001	Selected Brussels' Charleroi Airport as a base for European routes.
	Passed 1 million monthly transport passengers
2002	Ranked top for customer service in Europe
2003	Acquired Buzz for operation at half airfare
	Exceeded British Airways in the airline market in the number of monthly transport passengers

2004	Ranked as the top airline in a Google web poll
2005	Ranked as the third airline, following AF/KLM and Lufthanza in the number of passengers in international routes
2006	Carried a record of 42.5 million passengers in the year Accepted delivery of Ryanair's 100th Boeing 737-800 Launched the Web check-in service to check-in online across entire route network.
2007	Opened 201 new routes and 3 new UK bases: Bournemouth, Birmingham and Belfast.
2008	Opened 223 new routes and 4 new bases (Alghero, Bologna, Cagliari and Edinburgh).
2009	Opened 8 new bases in Bari, Brindisi, Faro, Leeds Bradford, Oslo Rygge, Pescara, Porto and Trapani
2010	Took delivery of a further 40 new aircraft as Ryan's fleet rose to 272 Boeing 737-800
2011	Opened 6 new bases at Baden, Billund, Budapest, Paphos, Palma De Mallorca and Wroclaw, as grown to 50 bases and over 1,500 routes.

Source: Created by the author based on Ryanair Website (May 2013)

2.2 easyJet

easyJet entered the market in 1996 by providing high-frequent and short- and mid-distance services from Luton, a secondary airport in London, and Liverpool, Aberdeen, Nice, and Barcelona. The company was targeting tourists from London in its early days. easyJet in principal follows Southwest Airlines' and Ryanair's low-fare, high-frequent point-to-point operation and no-frills strategies. The company's characteristics are as listed below.

The first characteristic is its rapid business operation expansion strategy. easyJet ordered twelve B737-300s in 1997 as part of business expansion strategy. In 2001, the company began service from Amsterdam to Belfast, Edinburgh, Gatwick, and Nice, and used Amsterdam as a hub. Then, in 2002, the company acquired GO, an LCC affiliate company of British Airways, for expanding routes. Its achieved high-density network in the entire Europe area is attracting to business customers. The company is switching its gears from penetrating the niche market with tourists to business passengers.

The second characteristic is its diversified business operation. In 2004, easyJet partnered with Hotelopia to enter the hotel business market. It has also partnered with a rental car company, and is expanding into other businesses closely related to the air transport market.

easyJet emphasizes its no-frills characteristic by a "not-so-sophiscated" advertising method, as shown on its aircraft with its painted reservation phone number and company logo in large size

rather than a sophisticated image like that JetBlue Airways uses by introducing IT.

easyJet operates on over 600 routes across 30 countries with its fleet of over 200 aircraft. It employs over 8,000 people including 2,000 pilots and 4,500 cabin crew members. In 2012 easyJet flew over 59 million passengers. easyJet's combination of airports and range of destinations mean it has broad network across different geographies and customer types. In fact, over half of its sales now originate from outside the UK. Getting passengers to their destinations on time is a key focus for easyJet. Every three months easyJet updates the web page with its most recent punctuality numbers.

Other fact about easyJet are shown in Figure 2-8.

Figure 2-8 History of easyJet

	History
1996	Began service between Luton and Aberdeen
	Began service between Luton and Nice, and between Luton and Barcelona
1997	Opened a website "easyJet.com", which provides flight information, etc
	Ordered B737-300 aircrafts
1998	Began online reservation service at "easyJet.com"
1999	TEA changed its name to easyJet Switzerland, and located headquarters to Geneva
	Selected as "Best Low Cost Airline" in a readers' poll by a business magazine
2000	John Quelch, President of London Business School, became part-time director
	Launched website section in Spanish
2001	Began service from Amsterdam to Belfast, Edinburgh and Nice
	Began service between Geneva and Barcelona
	Began service between Amsterdam and Gatwick
	Achieved online sales of a total of ten million seats
	Began service from Gatwick to Barcelona, Edinburgh, Malaga, Mallorca and Zurich.
2002	Began service between Paris and Liverpool, London, and Nice.
	Began service between Gatwick and Athens.
	Announced acquisition of GO.
2003	Began service between Paris and Barcelona, Marseille, Milan, Nice and Toulouses
	Began service of confirmation and change of reservation on the website
2004	Began service between New Berlin, Liverpool, and London
	Began service between Bristol and Valencia
	Expanded routes to Italy
	Began hotel business operations through partnership in Hotelopia
2005	Ranked 6th in the number of passengers among international airlines
2006	Introduced Speedy Boarding, giving passengers greater choice over their seating arrangements.
2007	Completed acquisition of GB Airways, a London Gatwick-based airline operating to destinations across Southern Europe and North Africa

2008	Opened its 19th base at Paris Charles de Gaulle.
2009	Operated over 400 routes with over 175 aircraft in 27 countries.
2010	Reached 500 routes and had the highest number of passengers flown for the second year in a row. Voted best low-fares airline for tenth consecutive year.
2011	Confirmed orders for 15 additional Airbus A320 planes.

Source: Created by the author based on easyJet Website (May 2013)

2-3 Asian LCCs

1 Development of LCCS in the Asian Air Transport Market

The Asian air transport market is characterized by its rapidly growing market scale in conjunction with the growth of upper class and middle class growth provoked by the Asian economy's growth. The market in China and India, where a large scale of middle class is expected to grow, is expected to grow to a large extent.

Many of the Asian airline companies, as in Europe, were under governmental regulations and protections as national corporations. The domestic Asian airline markets other than the Japanese market are small, especially in Southeast Asia. The share of international airline markets in the country is larger. The international airline market is under governmental regulation. Route entries are determined by bilateral aviation agreement, and vested rights of existing national flag carriers have been protected for a long period. Also, there are a very limited number of secondary airports in large cities, which are normally used by the LCCs in North America and Europe as a base for development.

However, under the stream of recent global deregulation, Asian airline companies, especially in Southeast Asian countries like Malaysia, Singapore and Thailand, have also been placed in a competitive environment. Especially, the Open Sky movement under bilateral aviation agreement and deregulation in entries of foreign airline companies are stimulating entry of LCCs, of which a selling point is low-fares.

Air Asia's rapid growth in Malaysia, by providing low-fare services, has proven that the market can provoke uses of air transport by passengers from an economic class, who have never used aircraft before. Air Asia's success has influenced Malaysia's neighboring countries, and brought Asian LCCs' dramatic growth. The company is providing services both to Malaysia's domestic

routes and between three countries by using its affiliate companies that were established in the base country. The company continues to grow as an LCC not only in Malaysia but in the entire Southeast Asian area.

The reason for this is that LCCs in Southeast Asia are forced to penetrate the international route market because domestic airline markets are small in the area. In this sense, the closing of Open Sky agreements by Southeast Asian governments as described above expanded LCCs' opportunity to enter the market.

Governmental policies and infrastructure plans supporting development of LCCs are also playing a critical role in the expansion of LCCs in the market. For example, LCC-exclusive terminals are under construction at existing major international airports in Singapore and Malaysia. Thailand, in conjunction with construction of a new airport, is investigating the possibility of converting Don Mueang Airport to an LCC-exclusive airport.

In 2007, LCCs in Asia hold 10% of the market share approximately. With governmental support as described above, an existing study forecasted that the share would reach 20% or more in 2010.

A detailed analysis of the strategy of Air Asia, the major leading LCC in Asia, will be discussed next. The current status of Singapore, Thailand, Indonesia, India and China will be overviewed.

2 Major LCC in Asian Countries

2.1 Malaysian LCC: Air Asia

Air Asia, which began service in December 2001, provoked the LCC boom in the Asian market, and grew to become the largest LCC in Asia.

Air Asia began its service based on a LCC business model, similar to that of Ryanair or Southwest Airlines, which includes low-fee and no-frills services, charging for in-flight food and drink services and Internet reservations. The company, with remarkable growth, expanded its services to 57 routes as of November 2005. The total number of passengers reached 1.1 million in November 2005, four years after its start of business. While other airlines fell into financial difficulties, the company is growing by two digits both in sales and profits.

The five strategies of Air Asia are provoking potential demand, rapid expansion of international routes by establishment of affiliate companies in other countries, full-scale cost reduction measure, brand differentiation, and hands-on policy as explained below.

2.1.1 Provoking Potential Demand

One of Air Asia's goals has been to provoke demand of a potential group of customers. The company provides airline services with low fares, even compared to the fares of long-distance buses, to passengers of a certain economic segment, who have never used air transportation due to the high fares.

Air Asia's domestic routes are directly competing with Malaysia Airlines. Instead of competing straightforwardly against the major airliner and taking its customers away, the company is aiming at differentiation with Malaysian Airlines by creating a new niche market through providing potential passengers, who had been disregarded by Malaysia Airlines, with low-fare ticket, and by expanding scale of the air transport market. Its logo "Now Everyone Can Fly" clearly explains it strategy. The fact that the number of domestic airline passengers in Malaysia increased from 9 million to 13 million in December 2001, when Air Asia began its service, demonstrates that its management policy has expanded the entire Malaysian air transport market.

2.1.2 Rapid Expansion of International Routes by Establishment of Affiliate Companies in Other Countries

Air Asia was operating only on domestic routes initially, but has recently expanded its network to international routes. In January 2006, the company started international service to Thailand, Indonesia, Macau, Singapore, China, Philippines, and Cambodia. Considering the small scale of the Malaysian domestic airline market, the company is expected to expand its service on international routes.

In 2004, Air Asia established Thai Air Asia in Thailand as its affiliate company jointly with Shin Corporations (Air Asia with 49% of shares). Thai Air Asia started services both on Thai domestic routes and international routes to and from Bangkok and Phuket. This affiliate company has achieved high load factor (76%) in a short period of time, and recorded surpluses in November 2005.

In 2005, Air Asia also acquired AW Air International, an Indonesian commercial airline, and

established PT Indonesia Air Asia with 49% of shares. The associate carrier is providing services to Indonesian domestic routes to and from Indonesia. It is expected to expand its operation scale, focusing on the high-demand Bali route.

In the same year, Air Asia signed a memorandum with Phu Yen Province Committee in Vietnam to agree on both international and domestic flights from Tuy Hoa Airport as a base for penetrating the Vietnamese market. The company, however, announced that it would not start operations on the route between Singapore and Kuala Lumpur route because Indonesia Air Asia was not able to obtain authorization for the Jakarta-Singapore route from the Singaporean aviation authority.

In late 2008, Air Asia established "Air Asia X" as a separate company focusing on long-distance routes. With its logo "everyone can fly extra long", the separate company is aiming at developing routes to East Asia including Japan, Australia and Europe. Future expansion plans included routes from Kuala Lumpur to London, Tianjin and Hangzou in July 2007.

Air Asia uses both Kuala Lumpur International Airport (KLIA) and Johor Bahru Airport as hub airports. It uses Don Mueang Airport in Bangkok, its affiliate Thai Air Asia's hub, as a base for expansion on international routes. Johor Bahru Airport, adjacent to Singapore, is regarded as a secondary airport of Singapore Changi Airport.

2.1.3 Cost Reduction Measures

Air Asia's cost per ASK (Available Seat km) is 2.41 U.S. cents, which is the lowest in the airline companies worldwide. Cost per ASK excluding fuel cost accounts for 1.4 U.S. cents, which demonstrates its staggering cost structure (Both data were announced by the company in November 2005) . This means that the cost per flight is as little as 150,000 JPY if an Air Asia's B737-300 aircraft flew the distance between Tokyo and Osaka at a seat occupancy rate of 80%. The reasons for such low-cost achievements will be studied here based on limited published material.

(1) Operation Cost (Fuel Cost, Pilot Personnel Cost)

Operation cost accounts for the largest in an airline company's cost structure. Air Asia is reducing operation cost through the following measures:

The first measure is avoidance of fuel price risk by procurement of fuel cost hedging transaction procurement and non-use of air conditioner during landing. Fuel cost was hedged in 2005 by 50% and 100% in 2006. This measure worked effectively against the steep rise of fuel cost.

The second measure is use of the paperless cockpit, as JetBlue Airways does. Under this system, the pilot inputs data on a load sheet and calculation of cost into the computer.

The third measure is effective use of aircraft through various procedures including strict punctuality on check-in and boarding time, punctuality improvement by minimizing boarding time and by non-reserved seats, shortening of grounding time, and use of galley space as seats enabled by providing no food service.

The forth measure is the use of single type of aircraft, which saves cost for aircraft purchasing and maintenance, and general maintenance cost and training for crew members, as seen in Southwest Airlines and Ryanair. The company initially used a 149-seat B737-300. It is now planning on purchasing a 180-seat and fuel-efficient A320 in large quantities. In 2005, the company ordered 100 A320s (40 of them are optional) from Airbus, and some of them have already been used for operation. The Boeings are expected to be replaced by Airbuses.

(2) Maintenance Cost (Maintenance, Mechanic Personnel Cost)
Outsourcing is considered to be one of the effective measures for reducing maintenance cost, etc. New Japanese airlines increased their cost by outsourcing aircraft maintenance. Air Asia is promoting cost reduction by either outsourcing or in-house, depending on the aspects of its business. Engine maintenance and repair as well as circulation parts are outsourced. Air Asia's successful development largely lies on the fact that an independent aircraft maintenance company is located in the area, so it needs to ferry aircraft. Air Asia is now providing airport handling service not through outsourcing but in-house, resulting in an 82% cost reduction compared to last fiscal year.

(3) Passenger Services (In-Flight Service, Cabin Attendant Personnel Cost)
Air Asia does not provide food or drink service. Malaysian domestic routes are low in necessity of in-flight service because they are short- and mid-distance routes. Limiting in-flight service is a cost reduction measure which is symbolic and highly-noticeable to customers. Satisfaction of passengers after a flight is proportional to their expectation before the flight. This highly-

noticeable cost reduction is part of Ryanair's business model. Namely, passengers will be satisfied if they received services to some extent but did not expect much in in-flight service before boarding. Effective use of cabin attendants is also characteristic in Air Asia. By simplifying in-flight service, the company reduced the number of flight attendants from six to three. When DRB-HICOM was its parent company, the number of cabin attendants per flight was six. Simplification of in-flight service cut back the workload of cabin attendants. As a result, cabin attendants are working six flights per day, and can be more focused on in-flight sales, etc.

(4) Airfare Structure and Ticket Sales Expense

Air Asia sells one-way tickets only to simplify the business. Airfares, depending on how early the ticket is purchased, consist of eight different types. Also, as in LCCs in North America and Europe, the company is saving fees to pay travel companies by use of the Internet. Compared to North America and Europe, payments by credit card or Internet reservation are not common in Malaysia. Therefore, some point out that this factor hinders new LCCs from entering the market. However, Air Asia is successful in processing 45% of reservation via the Internet, where only 18% of the Malaysians regularly use the Internet (2003). This is because various incentives are provided to customers using the Internet, and also because young passengers are using the Internet on a regular basis. This indicates that the key for an airline company that uses IT is to encourage its targeted customers to use the Internet, regardless of how much the Internet is regularly used in the country they are living in. This needs discussion from a business strategy or management effort point of view.

2.1.4 Brand Differentiation

Another selling point of Air Asia other than low fares is a branding strategy to achieve differentiation with Malaysia Airlines, through its "Cheap, but also young and stylish" brand.

To emphasize "youth", Air Asia is using red as a color for image strategy. For example, cabin attendants wear bright read uniforms, while Malaysia Airlines attendants wear uniforms inspired by Malaysian's traditional costumes. In 2005, the company signed an exclusive contract with Manchester United F.C., a British football team, for the purpose of demonstrating that it is in the pursuit of becoming a "stylish" airline, and is not simply a low-fare airline.

Also, by maximizing exposure of the company's CEO Fernandez (who is from music industry) to the media, and by consciously overlapping his image with that of Richard Branson, chairman of

Virgin Atlantic Airways, the company is creating an image of "young, active and free" Air Asia to differentiate itself from Malaysia Airlines with its traditional image, and which is protected by the government. Air Asia is focusing on imaging itself as "young" and "high-tech" because it is targeting students as its potential customers.

2.1.5 Hands-on Policy

Air Asia, in order to emphasize its commitment to the company's"hands-on policy", has built its head office within Kuala Lumpur international airport. This provides frequent opportunities for contact between the employees and the management, and develops as a result a sense of unity as a company. This effort does not directly lead to cost reduction, but it is aimed at developing a company-wide effort in working on problems on punctuality of flight schedule operation by letting employees directly handle passengers who complain about flight delays. This effort is also considered to raise company-wide awareness of "cost and culture".

2.1.6 Government Preferential Treatment

Air Asia grew rapidly not only by its corporation effort. Low personnel cost and benefits from the government's policies on development of LCCs and aviation infrastructure also contributed to its growth.

Currently, the Malaysian government is conducting repair work on runways at Kuala Lumpur International Airport to be compatible with A380 aircraft. In addition, the largest LCC-exclusive air terminal in the Southeast Asia is under construction (five times larger than the Changi LCC terminal in Singapore), with some exemption of facilities usage fee.

Air Asia has been receiving various government preferential tax treatments. The company was given exemption for capital investment tax, which is 70% the amount of taxable revenue, from the Malaysian government for five years starting in 2004.

In conclusion, what is remarkable in the Malaysian market is that both measures for LC as well as measures for promoting LCCs' development have been implemented.

2-4 Characteristics of LCCs and Common Factors in the Market in the World

Development and successful factors LCCs in North America, Europe and Asia (other than Japan)

were overviewed and analyzed. As the analysis shows, major LCCs such as Southwest Airlines and Ryanair in North America and Europe and Air Asia in Asia share a large number of common factors in their business models and market environment.

1 Deregulation of the Industry

The common element to be nominated first is that these LCCs used difference in cost between LCCs and LCs as the means to fight against them. While deregulation was going on and the airline industries were growing, the past protectionism was regarded as harmful to the productivity of the LCs.

Many Asian countries are behind European and North American countries in deregulation of the air transportation market. Also, the existence of national flag carrier as part of the government measures, places LCCs in a disadvantageous competition environment.

Asian countries are indeed behind European and North American countries in deregulations of the air transportation market. The recent trend of deregulation in the aviation industry however is also spread to Asia, which brought LCCs'growth in the market. There is now a growing recognition in Asian countries that liberalization of aviation policies rather than protection of national flag carriers contributes to further economic development in Asia.

In Malaysia, for example, former Prime Minister Mahathir positioned aviation industry as the key industry for the nation's development. Under the vision of promoting development of Malaysian economy by positioning Kuala Lumpur International Airport as a future hub in Asia, the government is implementing an expansion plan of airport facilities to a scale that significantly exceeds Malaysia's current air transport demand. At the same time, the plan also includes proactive LCC promotion measures such as construction of LCC terminals or exemption of capital investment tax for Air Asia.

In addition, the existence of a national flag carriers highlights the reason for the existence of LCCs. Major Southeast Asian airline companies are renowned to be low-cost, but they are merely relatively low-cost, compared to airline companies in North America, Europe and Japan. In the Southeast Asian market, they are considered to be high-cost.

As for international routes in Asia, it is pointed out that "the aviation market's framework is not based on Open Sky policy but on bilateral aviation agreements in Asian countries. Therefore, LCCs providing service on international routes cannot enter the Asian market[1]." In reality, the Open Sky policy is being applied in Southeast Asian countries within the frameworks of bilateral agreements. LCCs such as Air Asia and its affiliates acquired international routes based on these bilateral agreements.

The Asian airline industry has experienced the same process that airlines in North America and Europe have gone through. In this process, the cost-incurring nature of LCs, which had been nurtured by protectionism, encouraged the appearance of LCCs along with the deregulation. Yet the speed of the process was different in Asia and in North American and European countries.

The difference, as LCC promotion measures by Mahathir described above demonstrate, is that government policies are strongly supporting LCCs in Asia (other than Japan), compared to North America and European countries. Air Asia, for example, started its business after it acquired Tune Air, a government-affiliate company. The company is said to have acquired Tune Air with the amount of 160 million JPY approximately out of Tune Air's debts of 4.3 billion JPY approximately. If this is true, it can be said that Air Asia was established with strong government support. One cannot overlook the fact that these LCC promotion policies have largely contribute to Air Asia's rapid growth. Recent construction of LCC-exclusive terminals in Asian countries can be regarded as part of the governmental LCC promotion measures.

In sum, the market in Asian countries (other than Japan) is placed in a slightly more disadvantageous situation than those in North America and Europe. However, LCCs have developed to the same extent as those in North America and Europe through governmental LCC promotion measures.

2 Common Factors of Business Model

The second common factor is the business model and market environment (other than deregulation) that enhance LCC's competitiveness.

The factor consists of cost competitiveness elements and differentiation elements.

[1] Williams (2000)

Competitiveness elements include low-cost measures such as full-scale no-frills services, use of a single type of aircraft, and high accessibility to operational resources. Differentiation elements include establishment of CI, fare structure according to market needs, and proactive use of as secondary airports. Some elements such as proactive use of secondary airports are attributable to both elements.

2.1 Cost Reduction Measures

The common factor for many of the successful LCCs is cost reduction through high-frequent flights by use of a single type of aircraft on a specific route, savings in airport usage fee and other fees by use of secondary airports, no-frills in-flight service and use of IT for reducing operation and sales cost. The differences between LCCs and LCs in personnel cost is getting smaller in the United States by the productivity enhancement effort made by the LCs. Competitiveness of the LCs over LCCs in this sense is in decline. The gap in personnel cost in Europe and Asia, on the other hand, still contributes to LCC's low-cost structure. Another productivity enhancement measure implemented in many LCCs is involvement of flight crew and cabin crew in cleaning or in sales.

LCCs must enter the route with high-density demand if they wish to increase profit ratio by improving efficiency through effective use of aircraft on short- and mid-distance routes with high-density. In other words, the common LCC factor is to enter "a profitable" route. This simple goal was achieved by liberalization. In this regard, LCCs in Europe with small domestic markets and in Asian countries (other than Japan) with underdeveloped markets tend to seek international high-density routes instead of domestic. Therefore, global aviation liberalization will be the key factor in their growth and expansion.

2.2 Factors Contributing to Low-Fares

The common factor of LCCs in terms of differentiation with the LCs in service is low fares resulting from low cost. Some factors other than low cost are competition level in the entire market and customers who prefer low fares. These factors are discussed here, although they are not totally related to discussion of the business models.

2.2.1 Market Competition Level

As for low fares, when the competition level is low in a market, LCs can compete against LCCs with the same low fare as LCCs' on the same route by taking advantage of their effective large

network as well as monopoly power on other routes. The reason why many of the LCCs in the United States in the 1980s disappeared was that the LCs enhanced productivity under the protection of Chapter 11. As a result, LCCs could no longer compete with a low-fare policy to which only the difference in personnel cost is reflected. LCs were successful in competing with counteractive fare against LCCs. In contrast, LCCs have been active again since the late 1990s despite of the measures on enhancing productivity implemented by the LCs because the competition in the entire market, including competition between the LCs, became more intensified.

In this sense, the competition level that deregulation progress brings into the market will be an important key for a fair price competition. In Europe, though not to the degree in the United States, liberalization policies within EU are encouraging competition within the area. In Asian countries, liberalization within the frameworks of bilateral agreements is raising competition level. Some countries in Asia (including Japan), however, are still under protectionism. Therefore, liberalization in these countries has not progressed as far as in Europe.

2.2.2 Low-Fare Market

Next, we can expect that LCCs' offer of low fares will further generate new demand, but the same efforts should be made by all airlines. In Malaysia, Air Asia acquired passengers who used to travel on long-distance buses and automobiles through the drastic discounting of its airfares. The company eventually successfully obtained its own niche market. In Thailand, passengers of LCCs are found to have lower incomes than passengers who travel on large airlines. This means that the cheap airlines can establish their domestic operation even in small regions where the demand for air transportation is limited because of the relatively short distances between major cities -- if the substitute methods for existing transportation are offered at a reasonable cost. This means that the LLC model is viable, depending on price and availability of mode of transport, even in a domestic airline market with low air transport demand due to short distance between cities.

The above is also applicable in developed countries. The airline industry has the option of acquiring passengers from low cost long-distance buses, and Ryanair and easyJet are obviously targeting these low-income passengers who usually prefer bus travel. In the United States, Europe and Asia (except for Japan), roadways rather than railways are the major means of transportation, and LCCs in these areas can commonly expect a shift in transportation from roadways to airlines. In Japan, where the share of railroads is larger, different tactics may be

required to target railroad passengers. However, as some Skymark passengers switched from long-distance buses, it is still reasonable to expect some passengers to switch from the roadway transportation.

2.3 Differentiation by Using Secondary Airports

As proven by many of the cheap airlines in the United States that appeared during the 1980s and then disappeared, it has become difficult for LCCs to survive only by offering low fares. It has become necessary for them to differentiate themselves in something other than airfare.

Some of the most conspicuous instances are those of Ryanair, easyJet, and Southwest Airlines, which successfully differentiated themselves from legacy airlines by using secondary airports. They adopted secondary airports as a differentiation tactic corresponding to differences in territorial spheres. It was also adopted to target those passengers who complained about overcrowded hub airports and the loss of time due to congestion. The use of secondary airports also leads to the cost reduction by promoting competition between airports and to the development of the areas around the airports. Moreover, secondary airports could be no-frills airports, different from those of legacy airlines equipped with too many features (for those passengers who expect low-cost travels), which again will lead to cost reduction as well as differentiation.

In Asian countries, the use of secondary airports is not very easy and, in this respect, LCCs are facing disadvantages in Asia compared with LCCs in Europe and in North America, although Air Asia, for example, is using Johor Bahru Airport in Malaysia as its secondary airport next to Changi Airport in Singapore. In Asia, however, many new airports are being constructed and there is a chance that some older airports, such as Kimpo Airport in Korea, could be used as secondary airports to a new one such as Yinchen Airport. Having witnessed the remarkable development of LCCs, major terminals (not only in Asia) are planning to construct no-frills terminals exclusively for LCCs, and this overall trend is expected to be favorable for LCCs.

2.4 Establishing CI

Successful LCCs, therefore, have been making efforts at differentiating themselves not just from LCs but also from other LCCs. Southwest Airlines, for example, has established its corporate image as "a corporation friendly both to the customers and the employees," while Air Asia adopted IT and uniform designs that are nouveau and stylish. As shown in the advertisements of

Virgin Atlantic Airways and Air Asia, whose core of operations is inseparable from the uniqueness of their charismatic chairmen, Sir Richard Charles Nicholas Branson and CEO Fernandez, we cannot overlook those LCCs that established their brand images and CI during the earliest stages of their business by conveying explicit messages to the passengers.

On the other hand, some LCCs like JetBlue Airways, offer high-quality "frilled" flights (IT-equipped cabins, genuine leather seats, and individual satellite TVs, etc.) for relatively low fares as part of their promotion tactics, while many LCCs commonly offer "no-frills" flights. This contributes to differentiation with other LCCs. Also, this refers to counter-differentiation against LCs which no more offer pillows and blankets and even charge crew meals. The image of "LCC = Cheap air" now has a negative image.

2.5 Expansion of Service to Long-distance Routes

LCCs are recently penetrating the long-distance market, which has not been the focus for almost 20 years, with an exception of Virgin Atlantic Airways. The four companies in North America and Europe including Astraeus Airlines began service to north Atlantic routes. Air Asia established its affiliate company for service to long-distance routes. Oasis Hong Kong Airlines began service between London and Hong Kong. This trend does not apply to the conventional LCC business model with short- and mid-distance routes using small-sized aircraft.

The four companies in North America and Europe set all seats of their 220-seat B-757 or B-767 aircraft as business class, and have secured an exclusive terminal or lounge in order to differentiate themselves from conventional LCCs. Also, they offer low fares (30 to 60%) that can compete with the fares of LCs' business class by reducing cost. As the Silverjet's website says, this is because no assistance is required for competitive and cheap economy class. This is a new low-cost strategy, and is a differentiation strategy. The four companies are mainly using secondary airports. This means that they are still applying part of the conventional LCC business model.

3 Operational Resources and Availability of Funds

In regard to LCCs in North America and in Europe, the ease of access to operational resources is not different from the case of new enterprises in other industries. The technical challenges of launching of an LCC are not so different from the efforts to establish a new bus company or a

truck company. Entrepreneurs in Europe, not to mention those in the United States, can easily access operational resources in neighboring countries if they cannot access the domestic resources.

It is likely that the above situation was created in these regions because the air transportation industry in these regions has developed not only in terms of the operations of regular flights but in the areas of general aviation (geometrical surveys and photographing) and in a variety of transportation businesses, including chartered flights and air taxis under deregulation, which has already has thirty years of history and has made the competition in the industry as normal affairs. The competitions were normally going on in the industry.

In Asia, the situation is different from that of North America and Europe. Some claim that the hardware aspects of the market, which support new entries into airline transportation, such as the number of independent maintenance companies, are immature in Asia. It is undeniable that the industry in Asia lags behind those in Europe and North America in this respect; however, some independent maintenance companies do exist in some places in Asia, and have been partly supported by governments with the aim of protecting the industry. Air Asia, for example, is outsourcing its maintenance to companies abroad. The company compensates for the insufficiency in the domestic and independent maintenance facilities through international co-operations. It is fortunate for those Southeast Asian countries that each nation -- Malaysia, Indonesia, Singapore and Thailand - is geographically close to the others.

In Europe, North America, and in Asia (except for Japan), an LCC is considered to be a lucrative business if it is successful as exemplified by JetBlue Airways, a corporation that entered the industry with abundant capital. In addition, there is an avid desire for investment in new enterprises in Asia, where rapid economic growth has recently taken place. In some Asian countries, the government is actively supporting the growth of LCCs, and the government's stance is making it much easier for entrepreneurs in the airline industry to obtain the funds to launch a business.

2-5 Summary of Common Factors of Successful LCCs

In this chapter, the development process of LCCs in the United States, Europe and Asia (other than Japan) was outlined and analyzed. As a result, the following common factors were found in

LCCs which continue to grow in the LCC markets:

(1) Removal of institutional barrier by deregulation

(2) Cost advantage in labor productivity over LCs

(3) Cost advantage through management strategy concentrating on limited routes using the same aircraft

(4) Low-cost measures through no-frills service or IT

(5) Low airfare resulting from the above (2) to (4)

(6) Differentiation from LCs using secondary airports in the same city

(7) Marketing strategy according to targeted group of customers

(8) Avoid creation of "LCC = Cheap airline" image

(9) Establishment of Corporation Identity (CI) from an early stage

(10) High availability of management resources and funds

The above factors differ to some extent in the United States, Europe and Asia, and are not shared by all LCCs. It can be said, however, that these are the factors that apply to many LCCs regardless of where they are based on.

In the next chapter, the reasons for sluggishness of new Japanese airline companies will be studied by comparing these success factors of LCCs in the world.

In this chapter, success factors of LCCs in the world are analyzed only from the result of observation of these LCCs from outside. No detailed analysis of financial statements or analysis from the viewpoint of business leader's qualities or management organization has been conducted. The purpose of this thesis is to analyze management of LCCs in the world by

presenting both management policies and aviation policies critical for development of new Japanese airline companies. The purpose of this chapter was to outline characteristics of LCCs in the world to obtain major findings required for the study to be conducted later. Therefore, a detailed study of the above factors is to be conducted at another opportunity.

Chapter 3 Current Status of LCCs in Japan and Factor Analysis for Sluggishness

Introduction

In Japan, four LCCs, Skymark, Air Do, Skynet Asia Airways, and Star Flyer, have entered the air transport market since 1998. Even after that, the oligopoly structure of the three LCs (later two) remained. The JAL Group and the ANA Group, the LCs, hold 48% and 47% of the domestic share (based on passenger kilometers), respectively. The total share of Skymark, Air Do, and Skynet Asia Airways is only around 6%.

In this chapter, an overview of the current status of the Japanese LCCs will first be presented. Then, the reasons for their sluggishness compared to LCCs outside of Japan will be analyzed from a management policy point of view by including a comparison with successful factors of LCCs outside of Japan. The problems of the LCCs are determined as follows: (1) high-cost structure due to small business size and lack of resource procurement ability; (2) intense airfare competition against LCs depending only on lowering fares; (3) unclear customer target; (4) inappropriate route setting; (5) concentration of use of hub airports; (6) inconvenient operations; (7) lack of management policies and corporation identity (CI); and (8) dependency on public funds.

Next, negative structural and institutional factors that caused management problems will be presented. These restrictions are being eased, compared to the 1990s when the first LCCs entered the market. The difference in labor costs with the LCs is large. Therefore, my hypothesis is that there is room for development of the LCCs even in the Japanese market, if certain conditions including the following are met: certain scale of business size; high productivity that leads to low airfares; proactive use of secondary airports; free setting of routes and number of flights including expansion of services to international route; procurement of sufficient funds; and differentiation through unique marketing. This will be the basis for a business model, which will be presented in the next chapter.

The significance of the discussion developed in this chapter is, even though it is based on existing studies in several related fields as well as interviews with Skymark and Administrative Reform Committee personnel, that the problems from the management policy and aviation policy point of view are discussed in a comprehensive manner.

3-1 Current Status of LCCs in Japan

1 History of LCCs Prior to New Entry

Before discussing the current status of the Japanese LCCs, it is necessary to understand the Japanese market, especially changes made in its legal system. Study of the deregulation process in Japan and its problems and comparison with Europe and the United States will be discussed in detail later. Here, a brief explanation of the beginning of the LCCs will be presented.

In Japan, based on the concept that the air transport industry must be developed under the protection and support of the national government, a measure for protecting scheduled airline companies was implemented for a long period after the end of WWII. This meant that no new entries were allowed. According to the Civil Aeronautics Act, which specifies that "aviation capacity must not significantly exceed demand for air transport volume since the start of business,"[2] entry of an airline company involved supply and demand adjustment for the start of business, setting routes and numbers of flights, and distribution of arrival and departure slots at the airport. Domestic airfares were to be authorized by the Transport Ministry, and its standard was for guaranteeing profits and not causing price competition. Under this regulatory philosophy, until the so-called "45/47 structure" was abolished in 1986, the market was compartmentalized with JAL on international routes and ANA and JAS on domestic routes. The airlines maintained high profitability due to high pricing with no competition.

Even after the abolishment of the "45/47 structure" in 1986 and the so-called "New Aviation Policy"[3] coming into effect, market adjustment was eased among the three LCs, but new entries

---

[2] Chapter 101.2 in Civil Aeronautics Act before amendments in 2000.

[3] "New Aviation Policy" is based on a report submitted by Transportation Policy Council to Transport Ministry in 1986 on "Future Operation Structure of Airline Companies." The contents included:

1. Approve entry of multiple companies for operating international scheduled flights. Abolish the "45/47 structure," which allowed JAL's exclusive operation of international scheduled flights.
2. Set licensing criteria for domestic routes, which approves entry of the second company to the route with annual demand of more than 700,000 passengers (Double track) or entry of third company to the route with annual demand of more than 1 million passengers (Triple track). This prevents excessive competition in the major domestic routes, which have been exclusively operated by JAL and ANA, operating flights more than users' demand. Competition will be promoted within the above framework, and

were still not allowed. The fare authorization system remained effective. The standard cost system introduced in 1990 enhanced artful regulation of airfares. In 1995, a system was established in which airlines reported discounted fare [within of up to?] 50% as well as special discount fare for flights with low utilization factors. In 1997, the scope of the fare system, which liberalized regular fares within a 25%-range of standard cost, was implemented. There were few opportunities for the airlines to use the system until new entries were approved, however.

Given the global deregulation trend, the Deregulation Subcommittee of the Administrative Reform Committee advised abolishment of supply-and-demand adjustment. With this advice and from the fact that LCCs entered the market with half-price airfares, drawing attention of the entire society, LCCs were allowed to enter the market 50 years after the war. In September 1998, Skymark began service between Haneda and Fukuoka, and Air Do began service between Haneda and Shin Chitose in December of the same year. As for airfares, after tenacious negotiations by Skymark, introduction of half-price fares was approved. Amendments made to the Civil Aeronautics Act in 2000 changed the pricing system from "authorization" to "reporting in advance." Airline companies could then determine airfares on their own.

2 Current Status of LCCs

2.1 Skymark

2.1.1 Start of Business and Inaugural Flight

Skymark was established in 1996 with abundant capital of HIS, a discounted overseas travel agency. In 1988, after two years of preparation, the company started its service between Haneda and Fukuoka. By then, the company's capital totaled 2.575 billion JPY as a result of several allocations of new shares. The company was given arrival and departure slots only for three flights at Haneda. It operated three round-trips with one aircraft. However, it acquired a large number of passengers by offering an airfare of 13,700 YPY, which was half the price of that of LCs. The company saw a remarkable seat occupancy of 86% by February 1999.

2.1.2 From Start of Business to Record of Surplus

3. Privatize JAL, and abolish protection from the government. In 1992, the criteria above were changed to annual demand of 400,000 passengers for double track and annual demand of 700,000 passengers for triple track (500,000 and 800,000 respectively for routes with airport restrictions). The criteria were abolished for existing domestic routes.

Skymark, with a successful start, suffered in deficit because, six months later, the three LCs lowered their airfare to its level. The main factors for the company's financial difficulties were high outsourcing costs of maintenance at the initial stage, restrictions of arrival and departure slots, and the fact that the three LCs set the same discounted fare as Skymark. Nevertheless, cost reduction measures such as self-management of maintenance, ticketing, and training of pilots became effective, and the company recorded surplus both in business profitability and current profits in the eighth and ninth accounting period of 2004 and 2005, respectively.

Skymark expanded its service on routes from Haneda to major cities in other regions. The initial Haneda-Fukuoka route was switched to Fukuoka-Itami and Itami-Shin Chitose. It repeated entries and exits, and eventually expanded operations through trial and error including routes to Kagoshima, Tokushima, Aomori, and Okinawa. As of 2007, it was operating Fukuoka, Kobe and Sapporo routes. In July, a new route between Kobe and Naha was scheduled to open.

In 2007, Skymark used six B767-300ERs and two B737-800s. The company initially applied a European and US business model to reduce the costs for training and maintenance by using a single type of aircraft. Currently, the type of aircraft is selected according to the demand of the route. The company had a strong relationship with ANA at the start of business, but now has strong partnership with JAL. It is now under codeshare agreements with JAL.

Skymark had been in a close relationship with HIS, a discount travel company. But it was also aiming at becoming an airline company appealing to business passengers because most of the passengers using its major Haneda-Fukuoka route use it for business. As a result, they are not under a no-frills service policy. Instead, they offer free towels, drinks and snacks, and a "super seat" for business passengers (Cygnus Class) as part of in-flight services. Their unique service, not offered by foreign airlines, is a seating section exclusively for women. As of 2007, they continued to offer services including response to flight cancellation and in-flight drink and services.

2.1.3 Radical Change in Route Structure

Skymark started to exploit international charter routes in 2002. It operated two flights every weekend between Haneda and Seoul, but had to cancel the route because of poor convenience and load factor. The company is planning on operating scheduled Haneda-Incheon flights, under the precondition that they would be assigned an arrival and departure slot for short-distance

international routes after completion of the airport. If implemented, it will be the first LCC in Japan to launch scheduled international flights. (See Figure 3-1)

In November 2005, in conjunction with route restructuring starting in February 2006, Skymark undertook a significant change in its fare system. Various new prices under this system include sizable discounts in normal fares or bargain and limited-time fares of 5,000 JPY. Their management policy is to emphasize advantages and differentiation in airfares to compete with LCs.

In spring 2006, Skymark focused on routes with high passenger demand. The company increased the number of flights for its major route between Fukuoka and Haneda. Also, it began service between Shin Chitose and Kobe, Haneda and Kobe and Haneda and Shin Chitose. The Kobe Airport opened in February 2006. Air Do announced a counteractive reduced airfare for the Haneda-Shin Chitose route. Competition between LCCs is expected to become more intense. On the other hand, the company discontinued operations between Haneda and Itami, and Tokushima and Kagoshima. Instead, it used its arrival and departure slot in Haneda for a new route. Such drastic route structure reform may be regarded as a "second start of business." It is clearly focusing on major routes. Operating performance of its Kobe-Haneda route is high partially because the number of flights of the two leading companies is low. This proves that entry to the Kobe-Haneda route will play a key role in the simulation results presented in Chapter 4.

As for sales systems and the introduction of IT, Skymark merged with a system development department of Zero Group, an Internet service provider, in 2004. This was to proactively promote IT for the purposes of cost reduction and improvement of customer convenience. The IT reform will include improvement of the in-house system environment, such as the ticketing system.

Skymark Airlines is planning to introduce A330-200 (89 seats of premium economy class, 242 seats of economy class), and applying it for main domestic routes such as Kobe-Haneda. With regard to expanding new operation routes, it was planned to operate a Sendai route in July of 2012. However, it has been suspended due to rapid extension of new operation routes from Narita and Kansai against the new LCCs. On the other hand, it is considering opening new routes to Matsuyama according to its medium-term management plan. In addition, it may increase the

number of flights in Haneda and Okinawa routes if operation hours are extended. There is also a possibility to operate international flights from Kobe Airport by utilizing the newly introduced A380.

Skymark was a price leader in the domestic aviation market before Skymark was directly influenced by the emergence of other new LCCs. For instance, Skymark offered a ticket for Haneda-Sapporo route at the price of 16,000 JPY whereas JAL and ANA offered them at normal price of 34,000 JPY. However, due to the emergence of other LCCs in 2012, the company's high annual average of load factor rapidly decreased from 80%, and Skymark run a deficit in the first quarter of 2012. (See Figure 3-2)

In addition, Skymark is facing another challenge: The fact that there will be no increase in the number of arrival and departure slots of Haneda Airport. Haneda routes support growth of Skymark and brings the company a competitive advantage to other LCCs. However, increase in the number of domestic arrival and departure slots is completed in March of this year in association with construction of the fourth runway. It means that the growth of Skymark seems to peak out in the domestic market.

As a countermeasure against this situation, Skymark Airlines is planning to introduce A330-200 (89 seats of premium economy class, 242 seats of economy class), and applying it for main domestic routes such as Kobe-Haneda. By replacing to larger A330 aircrafts with 2 class seating, Skymark can enhance its capacity.

Sources say that Skymark will open a new international route between Narita and New York by using A380. The Airbus A380 is a double-deck and four-engine aircraft. Although this aircraft provides seating for 525 people in a typical 3-class (First, business, and economy) configuration, Skymark will provide business and premium economy only for 380 people in total and no economy class.

The aviation industry pays a great deal of attention to this strategy because this is a unique business model which has not been successful in the world aviation history. Originally, LCCs including Skymark are good at operating short-distance routes. In the past, although some LCCs tried to operate an Atlantic Ocean route, almost all of them failed. The reasons for failure were (1) operations by used aircrafts, (2) high-cost structure due to small size business equipped

with 4-5 aircrafts, and (3) no alternative plan in case of failure because they were operating the Atlantic Ocean route. In light of the lessons learned from the above, Skymark will use the following strategies:

A380, a brand-new, super-sized and fuel-efficient aircraft, is introduced to reduce cost per seat. It is said that cost per flight between Narita and New York is 25 million JPY. It means, some profit is obtained if a company can operate at a load factor of 60% with 120 thousand JPY one-way. Skymark plans to provide premium economy class at the price of 240 thousand JPY and over and business class at the price of 300 thousand JPY level. Considering that JAL and ANA provide business class at the price between 500 thousand and 1,000 thousand JPY with load factor of 80% in the same route, there is a sufficient potential passenger demand for Skymark. Skymark seems to attract customers away from major airlines.

Thus, Skymark Airlines tries new challenges, based on LCC's concept by changing its original business model such as use of single type of aircraft, short-distance routes and single class.

Figure 3-1 History of Skymark

	History
1996	Established with capital of 150 million JPY.
1998	Began service between Haneda and Fukuoka.
1999	Began service between Fukuoka and Itami, and Itami and Shin Chitose. Capital of 3.589 billion JPY as a result of allocation of new shares to a third party.
2000	Listed to Tosho Mothers. Capital of 3.83905 billion JPY. Reached a total of 1 million passengers in March.
	Discontinued operations between Fukuoka and Itami, and Itami and Shin Chitose. Began service of 12 flights between Haneda and Fukuoka.
2002	Began service between Haneda and Kagoshima. Started international Haneda-Seoul charter flights.
2003	Began service between Haneda and Aomori, and Haneda and Tokushima. Discontinued between Haneda and Aomori route.
2004	Merged with Zero Group
2005	Began service between Haneda and Kansai. Started 10 seasonal flights per week between Haneda and Naha. Capital of 3.66 billion JPY as a result of allocation of new shares to a third party. Discontinued between Haneda-Okinawa route
2006	Began service of 7 flights between Haneda and Kobe. Discontinued operations between Haneda-Kansai, Haneda-Tokushima and Haneda-Kagoshima. Began service of 10 flights between Haneda and Shin Chitose.

	Changed business name to Skymark Airlines Inc.
2007	Began to issue inflight magazine "SKYMARK"
2008	Began service of 6 flights between Haneda and Asahikawa Capital of 4.77 billion JPY as a result of allocation of new shares to a third party Moved main office to Haneda Airport Began seasonal service between Fukuoka and Naha
2009	Began regular service of 4 flights between Fukuoka and Naha Began self training by a full flight simulator equipped at headquarters
2010	Began regular service of 4 flights between Kobe and Fukuoka
2011	Concluded purchase agreement of A380 with Airbus Opened Kobe office at Kobe Airport
2012	Began service of 4 flights between Narita and Fukuoka Began service of 4 flights between Narita and Kobe Closed service between Kitakyushu and Naha, and between Haneda and Kitakyushu

Source: Created by the author according to Skymark's website (May 2013)

Figure 3-2 Revenue operating profit margin (%, FY2011)

Skymark (FY 2012 expected)	11.8
Skymark (FY 2011)	19.0
Air Asia	26.8
Ryanair	14.3
Southwest	4.4
Lufthansa	2.9
British Airways	5.2
Delta	5.6
Quantas	1.7
Cathay Pacific	5.6
JAL	17.0
ANA	6.9

Source: Created by the author based on each airline annual report (May 2013)

2.2 Hokkaido International Airlines (Air Do)

2.2.1 Start of Business and Inaugural Flight

Air Do began service in December 1998, followed by Skymark, between Haneda and Shin Chitose, one of the high-demand routes operated by the LCs. This is one of the airline routes of maximum scale in the country, recording 9 million annual passengers per year. (See Figure 3-3)

Figure 3-3 History of Air Do

	History
1996	Established with capital of 140 million JPY.
1998	Began service between Haneda and Shin Chitose with daily three round-trip

	flights.
2000	Began service between Haneda and Shin Chitose with two aircraft with six daily round-trip flights.
	Passed 1 million passengers in December.
2002	Passed 2 million passengers in March.
	Filed civil rehabilitation proceedings at Tokyo District Court and submitted rehabilitation plan. According to the rehabilitation plan, capital was reduced by100%. Capital was increased to 2 billion JPY as primary rehabilitation process.
	Closed outsourcing contract with ANA on operation as well as agreement for joint operation of domestic routes.
2003	Started firs domestic code sharing with ANA between Haneda and Shin Chitose
	Began service with 3 aircraft between Haneda and Asahikawa.
	Passed 3 million passengers in August.
2005	Began service with 4 aircraft between Haneda and Hakodate.
2006	Haneda-Memanbetsu inaugural flight
2007	Began service with five aircraft.
2008	Reached 10 million passengers flown. Began service with 7 aircraft between Sapporo and Sendai
2009	Began service with 8 aircraft between Sapporo and Niigata Began service with nine aircraft between Sapporo and Fukushima, Toyama, Komatsu
2011	Began service with ten aircraft between Sapporo and Tokyo
2012	Introduced reserve aircraft and held 12 aircraft totally.

Source: Created by the author according to Air Do's website (May 2013)

By the time the company launched its inaugural flight, its capital had increased to 3.58 billion JPY. Air Do initially listed a large number of corporations and individuals in Hokkaido as shareholders. This was based on a concept for establishing an airline company as the "Wings for Hokkaido" with close connection with Hokkaido in order to use this as an opportunity to boost Hokkaido's economic revitalization. Air Do was given only three arrival and departure slots. It started operations between Haneda and Shin Chitose with one aircraft for three daily round-trip flights. The fare was 16,000 JPY instead of 25,000, which was offered by the leading companies. This low-cost fare drew attention, and a 90% load factor was achieved initially.

However, the company's limited scale of operations with only three daily flights and low convenience did not attract business passengers, as was the case of Skymark. Also, several incidents demonstrated its limited experience in the airline industry; for example, it was ready for its inaugural flight after it closed a lease contract for its first aircraft. The company still had to pay a monthly aircraft lease fee of 100 million yen for the first six months. In addition to poor management problems, Air Do, as Skymark did, suffered both counteractive airfare and distribution of management resources concentrated on the leading companies. In 1999, LCs set

a "special discount" airfare for their flights operating between Air Do's flights. In addition, JAL raised its outsourcing aircraft maintenance fee by slightly over 10%. As a result, Air Do faced counteractive airfares presented by LCs and cost increases, and began to lose its management vitality.

Another problem Air Do faced was its poor financial base. The capital at the start of service was larger than that of Skymark, but its financial ground was weak. As a result, it tended to depend on public subsidies and loans. For example, when the company started business in 1998, it was loaned approximately 1 billion JPY by the Prefectural Office of Hokkaido as a deposit on its aircraft lease and 300 million JPY by the City of Sapporo. In December 2000, when the company faced a financial crisis, it was again loaned 1.7 billion JPY and 500 million JPY, respectively by the Prefectural Office and the City of Sapporo. It also received an additional 2 billion JPY of subsidies, but its cumulative deficit reached 7.53 billion JPY, also due to the steep rise of aviation insurance costs in the aftermath of the terrorist attacks in September 2011, resulting in its seeking court protection under the Civil Rehabilitation Law in June 2002. Its capital that had been increased to 7.2 billion JPY, was reduced by 100%, and 90% of the claim was cut.

However, we cannot simply conclude that Air Do failed just because customers left them behind. Average load factor from inaugural flight to bankruptcy accounted for 71.6%, a relatively high level for an airline company. Sales at the closing of fiscal year 2000 at the time of bankruptcy (11.97 billion JPY) showed an increase of 23% compared to the previous quarter. Operational cost (14.53 billion JPY) also showed an increase of 14%, resulting in a current-account deficit of 2.9 billion JPY (Figure 3-4). This demonstrates that Air Do was operating under a high-cost structure with 2.9 billion JPY of deficit despite the fact that it demonstrated a 70% load factor. Its high-cost structure built by the outsourcing maintenance fee to be paid to JAL, which accounted for one-quarter of sales (3 billion JPY annually), aircraft lease fees and its dependence on public loans and subsidies contributed to management moral hazard.

Figure 3-4 Air Do's Management Index (million JPY)

	6th Period	7th Period	8th Period	9th Period	10th Period	11th Period
Fiscal year	March 2002	March 2003	March 2004	March 2005	March 2006	March 2007
Operating revenue	11,973	11,356	18,544	22,252	29,553	29,920
Current profits	Δ2,918	Δ1,635	1,476	1,678	2,171	Δ344
Current net earnings	Δ824	1,251	430	1,801	2,255	Δ741

Source: Created by the based on to Air Do's website (May 2013)

2.2.2 After Bankruptcy

Air Do received full support of ANA for rehabilitation after it went into bankruptcy. After the merger of JAL and JAS, the number of flights between Haneda and Shin Chitose reached 25, by combining JAL and JAS flights. ANA finds advantage in partnership with Air Do from the fact that they will be able to provide a total of nineteen flight services together. As of 2007, under ANA's assistance, Air Do was operating three routes to Shin Chitose, Asahikawa (since July 2003) and Hakodate (since March 2005) from Haneda. It started operations in February 2006 between Haneda and Memanbetsu. All flights are code-shared with ANA. In March 2007, the company was operating with three B767-300s and two B737-400s.

As for in-flight service, the company offers "partial" no-frills services, targeting business passengers. A limited choice of services including drinks is offered for cost-reduction purpose. However, because of its small scale of operation, the company is low in efficiency due to high cost. It is also low in flexibility: routes are limited to fly from Hokkaido under the company's philosophy of "Wings of Hokkaido." Also, a route exploitation strategy must be developed under the framework of ANA's management. Therefore, the company cannot expand services to other routes on its own. Also, route development must follow ANA's strategy.

Air Do, after seeking court assistance under the Civil Rehabilitation Law, received an allocation of shares from an investment fund established by the Development Bank of Japan. With business alliance with ANA such as temporary staffing service and purchasing 50% of seats, the company has turned a profit both in fiscal year 2004 and 2005.

As a recent fact, in January 2013, Air Do announced its management plan during the term of 2013-2015, "Mid-term Management Plan: Rolling Plan," in order to improve revenue. According to the plan, Air Do will hold a total of fourteen aircraft (four B767-300s, five B737-700s and five

B737-500s) by the end of 2013. Air Do plans to open new three operation routes (Haneda-Kushiro, ShinChitose-Okayama and ShinChitose-Kobe), and increase the number of flights for an operation route (ShinChitose-Sendai) in 2013. Thus, Air Do will enhance its operation network and improve passengers' convenience. Additionally, it will expand its operation network by introducing new B737-700 aircraft. In addition, Air Do is aiming at raising load factor through stronger partnership with sales agents, but commission charges to agents have pressed management. Air Do fell into a vicious circle by raising airfare to make up for the loss, and as a result lost passengers.

2.3 Star Flyer

Star Flyer was established on November 17, because this was the day when the Wright brothers first flew. In March 2006, it launched operation of 24 daily flights between Haneda and Shin Kitakyushu in conjunction with the opening of the New Kitakyushu Airport that same month. In November, they discontinued operations of two round-trip flights, one leaving Haneda early in the morning and the other arriving at midnight, because the utilization factor was decreased due to problems such as poor accessibility to the airport. Thus, they operated twenty-two round-trip flights per day. They were the first start to enter the market since Skynet Asia Airways. Capital was approximately 3.9 billion JPY. Considering high business needs in Kita Kyushu, they targeted business passengers. They use four A320-214s. They applied the marketing strategy of JetBlue Airways by applying leather seats, and expanded space between seats. They operated early in the morning, leaving at 5:30 and arriving at 07:05, and late at night leaving at midnight and arriving at 01:35 a.m. This 24-hour schedule was targeted for business passengers, but the ratio of use was not as high as was expected maybe because business passengers in Kyushu did not like one-day business trips. Airfare for adults was set at approximately 25,000 JPY, compared to 30,000 yen by leading airlines.

2.4 Affiliate LCCs of LCs

In March 2012, ANA established an LCC subsidiary company (airline baby), called Peach. Simultaneously, it established another airline baby merging with Air Asia, and began running its operation in July 2012. On the other hand, JAL, which had negative feelings about launching an LCC, established an LCC by merging with Jet Star in July 2012.

The airline babies have been operating only a few routes so far. Their business has been stable, but it may take several years to become as developed as the US LCCs. The airfare is almost as

same as the LC's special fare or its early reservation discount if all of them are under the same situation, whereas, it may be less than half of the LC's special or early reservation fare comparing them under the no-frill condition.

The author is afraid about Japanese LCs launching airline babies.

Since the end of the 1990s when the LCCs appeared globally, many LCs have established airline babies; however most of them have gone. One of the reasons could be that it is difficult to carry out their business following the customs of their parent companies such as employment environment with the budgets as little as those of independent LCCs.

If an airline baby is still be able to continue its business, it might either be using completely different routes from the parent company, the parent company itself is remarkably productive, or its finance or human resource management is highly independent. As long as airline babies are dependent from their parent companies, they will not succeed in the business.

The only successful airline baby, Jetstar, the parent company of which is Qantas Airlines, highly maintains its independence of human resources and financial management and it is even invading its parent company's market. Jetstar is much more popular than Qantas Airlines, and the customers regard it as an independent airline company. The affiliate's strategy of standing out more than its parent is considered to be the key for its success.

Customers might not regard the airline baby as an LCC as long as they see its parent's brand in it. This means that the consumers may not use the baby airline for cheap airfare. In contrast, such low-cost affiliates may have the risk of ruining the prestige brand name of their parents.

If so, the parent company must found its baby airline abroad and not reflect the color of the company (i.e., they do not send any employees from the company). The parent ought not to be involved in framing the marketing plan for the subsidiary company.

It is questionable whether there is a benefit for the baby airline being subsidized.

As mentioned above, the parent company ought to have a baby airline abroad. However, there would be a matter of regulation in Japan; due to regulations on foreign capital (which must not

exceed one-third of the entire capital) and regulations on cabotage in Japan, a foreign-based affiliate cannot operate domestic routes in Japan. Foreign capital company is prohibited to run domestic routes. In addition, even though these regulations are abolished, restrictions by labor law must also be eased so that foreign employees are allowed to work within Japan.

Considering these elements, baby airlines established by the two LCs have less than one-third of the foreign capital. In the case of Peach, the parent company makes efforts to stay neutral by minimizing the number of transferred employees from ANA or transferring them completely. The relation between ANA and Peach is well known, and their success will be a matter of how each of them keep its originality and independence. (See Figure 3-5)

Figure 3-5 Summary of Japanese LCC Companies

Company name	Peach Aviation	AirAsia Japan Co., Ltd	Jetstar Japan
Capital (Incl. reserve)	15 billion yen	2.5 billion yen	9.6 billion yen
	ANA 38.7%	(increasing the capital to 5 billion yen sequentially)	(increasing the capital to 12 billion yen in future)
	First Eastern-Aviation Holding Limited 33.3% Innovation Network Corporation of Japan 28.0%	ANA 67% AirAsia 33%	Qantas group 33.3% JAL 33.3% Mitsubishi Corporation 16.7% Tokyo century lease 16.7%
Base Airport	Kansai International Airport	Narita International Airport	Narita International Airport
Aircraft	Airbus A320-200	Airbus A320-200	Airbus A320-200
Operation route	Domestic airline) Kansai = Sapporo, Fukuoka (March 1, 2012) Kansai = Nagasaki (March 25, 2012) Kansai = Kagoshima (April 1, 2012) Kansai = Naha (October 18, 2012) International airline) Kansai = Inchon (May 8, 2012) Kansai = Hong Kong (July 1, 2012) Kansai = Taipei (October 16, 2012)	Domestic airline) Narita = Sapporo, Fukuoka (August 1, 2012) Narita = Naha (August 3, 2012) International airline) Narita = Inchon (October 28, 2012) Narita = Pusan (November 28, 2012)	Domestic airline) Narita = Sapporo, Fukuoka (July 3, 2012) Narita = Naha,Kansai (July 9, 2012) Kansai = Sapporo, Fukuoka (August 24, 2012) Kansai = Naha (October 28, 2012) International airline) Short-range international routes such as China, Korea(During 2013)

Source: Created by the author based on Each Airline Website (May 2013)

Both Jetstar Japan (established by ANA and Jetstar), Air Asia Japan (established by ANA and Air Asia other than Peach), also limit the percentage of foreign capital to one third, which meets the capital requirement as a Japanese airline company under Japanese regulations. Also, by partnering with the leading LCC, the companies are reaching a goal of becoming a domestic LCC

with high efficiency by using its partner's management know-hows. With this method, the strong capital power of the LCs will not have a negative impact on them.

On the other side, the problem of hiring foreign employees for operation of domestic routes still remains. Also, if the Japanese capital power of the parent company does not affect its affiliate, then it is questionable if it is worth establishing an affiliate. It may be less harmful for parent LCs to keep a little control over the LCC market by providing some capital.

This halfway method of coping with the existing regulations might be effective in making these regulations lose their significance. However, the most ideal situation for the aviation industry is a world in which anyone can establish a company freely and anyone can choose an airline company he likes.

It takes time in changing the investors' non-risk-taking attitude, which had been cultivated by the Japanese social climate and delays in deregulations. In order to improve the market effect and increase social surplus, let the winners enter Japan and the Japanese market, instead of wondering why new Japanese LCCs cannot be successful in the market.

The three major institutional factors, from the above viewpoint, which prevents establishment of airline company with efficiency, are: international aviation agreements, restrictions on foreign capital and restrictions on cabotage. In the current world where investment on LCCs is active, by easing the regulations on foreign capital investment for the airline companies, including Asian capital, which sees rapid growth, so that the airline companies can procure funds from across the world.

To add, the reasons why regulation on foreign capital and cabotage must be abolished are for improving consumer interests and is that these measures are necessary and effective for the LCs to proactively use LCCs, and for offering the Japanese airline companies with a broader choice for revitalization.

It would be important and effective for the advancement of LCCs to abolish the regulations on foreign capital than implementing policies on promoting LCCs.

In addition, it is necessary to abolish the regulation on restriction of use of LC's affiliates to

particular airports and allow them to use the airport freely so that they can demonstrate their maximum efficiency.

3 Summary of Study of Factors Hindering Development of LCCs

As can be seen above, legal factors inhibiting entry into the market by LCCs have already been eliminated. Currently, however, development of Japanese LCCs is quite low, compared to those in Europe, the United States or Asia.

Before verifying the factors and measures to be taken in detail in Chapter 5, a list of factors inhibiting development of the LCCs that can be derived from each company's history and current status will be presented here as a summary for further discussion.

(1) In the Japanese air transport market, there is a high concentration of passengers on the routes from Tokyo and Osaka. However, the scale of the airports in the Tokyo metropolitan area is quite small (total of five runways in Narita and Haneda. Arrival and departure slots are full both in Haneda and Narita[4]). Most of these arrival and departure slots are occupied by LCs. Under such circumstances, it is difficult for LCCs to increase the number of flights, even though they have increased the potential demand by lowering fares. They are in a disadvantageous position in the competition.

(2) Leading airline companies have higher advantage in competition on other routes. Therefore, they temporarily lower the fare to match the fare of the LCCs or to a lower level (predatory price) for the purpose of shutting out LCCs.

(3) Due to distribution of management resources concentrated on the LCs, they may be put at a disadvantage in outsourcing for maintaining aircraft and training crew members.

(4) There is a small number of airports both in the Tokyo metropolitan area and in regions that can be utilized as secondary airports. Therefore, it may be difficult for LCCs to reduce costs or

[4] Utilization factor of Haneda Airport of all domestic passengers is approximately 60%. The factor will reach 80% if the factors of Itami Airport and Kasai Airport are added to it. Also, one of the two runways of Narita Airport is 2180 meters long, and has ten runways. Cities with much less population than in Tokyo have airport capacity as follows: three airports and nine runways in New York, three airports and eight runways in London, and two airports and six runways in Paris.

perform differentiation as is normal practice in Europe and the United States.

These factors will be studied in detail later.

3-2 Analysis of Problems of Management Policy

Approximately ten years have passed since LCCs entered the air transport market in Japan. The market has not yet seen a rapid expansion of share as has been seen in the European and the US markets. The reason for this is often explained by the Japanese institutional problem, which will be studied in this chapter.

Problems in management policy of the Japanese LCCs, however, have also contributed to their sluggishness. Here, by reviewing the current status of the Japanese LCCs previously discussed, the management policy problems derived from deficit operations of the LCCs that lasted for a long period will be analyzed and studied. This study will demonstrate that these problems have been derived also from aviation policy problems.

1 Cost Structure Problem

1.1 Problems due to Minimum Scale of Operation

The forecast and actual data of Skymark's revenue and cost before and after flight operations are the following. The company's forecasted load factor was 60%, and its actual was 57.7%. With the difference of only 2.3%, its forecast was quite accurate. In contrast, the difference between forecast and actual cost is large, accounting for 5 billion JPY. This may be due to the cost structure typical of an airline company.

The costs of airline companies consists of fixed costs and variable costs. Fixed costs include office and branch rental charge and general administrative expenses. Some variable costs are completely proportional to production volume, while some are not. Examples of variable costs proportional to production volume include fuel cost, airport usage fees (such as landing fee and aeronautical navigation aid usage fee, etc.). Examples of variable costs not necessarily proportional to various costs, at least for a short term, include depreciation cost, lease expense, maintenance cost, advertising expense, rental charge of airport facilities or ground handling cost. Fixed costs and common expenses such as variable costs that are not proportional to

production volume obviously become a factor that elevates cost per unit of the Japanese LCCs, which started operations using one aircraft. Also, price per aircraft can be lower if purchased in quantity. Lease expense per aircraft can also be lower if leased in quantity.

The same can be said for maintenance costs. Skymark initially outsourced aircraft maintenance to ANA, and was paying an outsourcing fee of more than 3 billion JPY annually. As the company started in-house maintenance in 2002, maintenance cost per aircraft was reduced. However, such cost reduction has not contributed to the company's efficiency, compared to that of the leading companies, because it possessed only a few aircraft. Therefore, its maintenance cost per aircraft remains high.

This situation can bring out a presumption that, though Skymark was initially planning on starting operations with three to four aircraft, it could not increase the number of aircraft early enough because it could not obtain enough arrival and departure slots, and as a result, it had to start operations with average cost that ended up much higher than expected.

Skymark's ground handling cost and airport ground facilities usage fee are also significantly higher than those of the three leading companies. Skymark was initially operating three round-trip flights per day, which meant it was using the airport counter only three times a day. Obviously, this highly elevates its cost per passenger. If CRS, categorized as sales advertising cost, is to be implemented, its cost will become high because components of CRS must be purchased at one time by bulk, and will elevate cost per passenger if the company cannot secure a large number of passengers. The LCs, on the other hand, need only one computer system to manage a large scale of operations because they operate a large number of flights.

It is generally viewed that the air transport market has no or less economy of scale. However, as described above, economy of scale works effectively when an LCC enters the market and until it grows to a certain minimum scale. Therefore, based on the lesson learned from the experience of Skymark, which started operations with only one single aircraft, the simulation model in Chapter 4 will study viability of establishment of LCCs by using a corporate model which conducts operations with fifteen aircraft since the start of business, which is one of the factors that yields a positive result.

1.2 Lack of Resource Procurement Ability at New Entry

LCCs in North America and Europe have lowered their cost by outsourcing part of their business operations such as aircraft maintenance. What is characteristic about the Japanese LCCs, as Skymark admits, is that they can reduce cost rather by self-management of training for crew members and maintenance.

In the Japanese air transport market, management resources are dominantly distributed to the LCs. Therefore, an LCC, due to lack of negotiation power and limited choice in outsourcing companies, must outsource its production facilities including aircraft maintenance to the LCs, which result in high outsourcing costs. This is a circumstance specific to Japan. In order to avoid this, LCCs need to establish an in-house system even though its cost will be still higher than that of LCCs in North America and Europe. It requires a certain amount of time until such system is established, so it needs to continue paying outsourcing fees meanwhile.

When looking at the procurement cost, which is essential in business operations of airline companies, Air Do procured B767-300ER aircraft by lease. This fee was 100 million JPY per month, which was double the amount the leading companies are paying for leasing.

The company had to sign the lease contract at such high cost because the number of aircraft to be leased was small. This refers to the problem of management scale as described above. Additional reasons include lack of past performance and low credibility. These elements were unavoidable in the early stages of new entry.

As for maintenance cost, all of the LCCs outsourced part of their business operations to the LCs. Therefore, maintenance cost per unit was extremely high. Air Do paid JAL 3 billion JPY as outsourcing fee. Skymark also paid ANA 3 to 4 billion JPY annually as outsourced maintenance fee. The company reduced cost as a result of implementation of in-house aircraft maintenance system, which was started in 2002. This measure reduced maintenance cost, but has not yet reached the standard of the leading companies.

The reason there is sizable disparity in ground handling cost or ground facilities usage fee between LCCs and the three LCs is due to the LCC's management scale and its weak negotiation power. Taking the example of Skynet Asia Airways, which entered the market in summer 2002, the company had to pay JAL's affiliate company 5 million JPY as a monthly check-in baggage fee at Miyazaki Airport. If it could handle this procedure in-house, it could reduce the cost to 2.6

million JPY, which accounts for one-tenth of its outsourcing fee. However, its only choice is to outsource the procedure to JAL because baggage belt conveyors at the airport are owned by JAL.

Air Do did not implement a reservation/sales operation system because it could simply not afford it. This would require a significant amount of time for notifying sales agents of airfare pricing and schedule. Also, it would be difficult to study customers' utilization characteristics.

As seen in the example of ramp buses operated at Haneda Airport, the differences between new and leading companies will become small if businesses totally independent from the three leading companies exist in every business field including maintenance service and ground service operations at airports.

1.3 Inconsistent Management Effort for Cost Reduction

Another reason for high cost is LCCs' lack of management effort, compared to LCCs in North America and Europe, as explained below.

1.3.1 Non-Use of Single Type of Aircraft

It is essential from a managerial point of view for airline companies, especially LCCs, to use only a single type of aircraft for the purpose of saving cost such as pilot training cost and maintenance cost. This is obvious as seen in the examples of LCCs in North America and Europe. On the other hand, in Japan, as previously seen in the example of Air Do, it procured aircraft of different types by lease as a result of its ad hoc management policy. Other LCCs including Skymark used the same type of aircraft.

1.3.2 Inconsistent Provision of No-frills Service

In-flight service plays an essential part in cost reduction effort. Many of the LCCs in North America and Europe and Air Asia sell no-frills service as LCC's unique characteristics. Ryanair is known to have penetrated the LCC's low-cost concept to passengers in Europe through its consistency in providing no-frills service.

On the other hand, Japanese LCCs such as Skymark and Air Do, seem to have a halfway policy on no-frills service. They provide a limited choice of services including food and drinks. The main reasons for this are that Japanese customers are not used to no-frills service and that the companies have not chosen any targeted customer segment. As a result, they are treating both

tourists and business passengers equally.

1.3.3 Sales System Problems

LCCs in North America and Europe and Air Asia, for the purpose of reducing sales cost and other costs, focus on building online their sales network. On the other hand, Japanese LCCs do not possess their own IT-based sales network. For example, Skymark depends on HIS, a travel agency, due to their close mutual relationship. Air Do and Skynet Asia Airways depends on ANA's own sales system "able" due to their close relationship with ANA.

2 Competition problem between LCCs and LCs

Skymark's entry to the Haneda-Fukuoka route caused intensive airfare competition between new and the three LCs. When Skymark entered the market, it set its normal fare to 13,700 JPY for three of its round-trip flights. The fare was approximately half the airfare of the three LCs, which was 27,400 JPY. Air Do began service between Haneda and Shin Chitose with an airfare that was 40% lower than that of the three leading companies. This indicates that the LCC played a role as a price leader. As the problems of aviation policy and competition policy will be discussed in detail later, a study from corporate management point of view will be discussed here, including the history of competition between Skymark and the three leading companies. Also, only the airfare levels will be discussed here, and airfare structure will be discussed later.

The three leading companies competed against the LCCs by lowering the fare to their level. Both Skymark and Air Do entered the market in September 1998 with half to 60% of the fare of the three LCs. The leading companies were in the wait-and-see mode at first. Then, a total of seat occupancy of the two LCCs exceeded 70%, while that of the LCs was less than 60%. As was explained in this chapter, JAL launched airfare that was half the price of a flight with adjacent route of the LCCs in March 1999. Of course, the airfare introduced by JAL was not normal fare, but a discount fare with restricted use. Such a fare was not actually applied. Airfare for the six JAL flights operating between Skymark's and Air Do's schedule was actually lowered.

JAL's "strategy of lowering fare of flights of adjacent route to that of LCC" was criticized by the media by calling it JAL's bullying. However, because the other two leading companies followed JAL's strategy, JAL had to lower airfares of flights of routes adjacent to those of Skymark and Air Do as well as of the other leading companies. JAL's such action was followed by the other two

companies, so as a result of this mutual action, approximately three-quarters of airfares of all flights of all companies were lowered to the same level. The discount fare of LCs was set in 1996 for Haneda-Shin Chitose and Haneda-Fukuoka route, both operating a large number of flights. Discount rate from normal fare differed by term, route and time period, and the discounted fare was set by considering competitive relationship or demand for each route and flight. The discount fare for flights between Haneda and Fukuoka (average of 19,200 JPY) of the three leading companies before the entry of Skymark was limited only to flights with low demand such as in early morning or at night.

Skymark lost its passengers by the increase of flights with special discount fare and blocking of entry to competition by lowering special discount fare. Facing financial difficulties due to the decrease in number of passengers, the company had to lower its airfare. In July, its normal fare was lowered to 16,000 JPY. In July 2000, a special discount fare was set for all flights between Haneda and Fukuoka. Skymark, with inferiority in number of flights and name recognition, began to lose passengers it once took away from the leading companies.

Skymark worked on several measures for fare setting such as round-trip flight airfare setting and Sky value airfare. However, the three leading companies followed it in each case. The repeated cycle of counteractive airfare pricing by the three leading companies, loss of passengers, decrease in revenue, and rise in airfares were major factors that forced Skymark to face financial difficulties. Air Do suffered similarly from such strategies by the three leading companies.

What the history of airfare competition signifies is, firstly, that LCCs can be competitive against leading companies if their airfare is discounted to approximately 40% if other conditions are favorable and when it comes to airfare levels. The individual cost (cost which is not accrued unless a particular flight was operated) of the route from Haneda of LCs' accounts for 60 to 65% of their normal fare. It is not easy for them to further reduce their fare. Therefore, it is important for LCCs to maintain airfare at 60% of that of leading companies.

The competition explained above signifies, secondly, that it is difficult for an LCC to compete only with low fares if it can deal with elements other than airfare levels. Key elements include conditions that hinder LCCs from increasing their number of flights due to arrival and departure slots and measures for airfare structure as discussed below, and differentiation by factors other

than airfare.

Third is the problem of market contestability, which will be discussed later in detail. If the market is contestable, and competition progresses to a certain extent in other markets, LCs cannot set predatory fare lower than the level described above. Competition in the domestic market at the time of new entry had not progressed yet. Therefore, LCs had more opportunity to gain excess profit from the routes not selected by Skymark and Air Do. This put both companies in a disadvantageous situation.

3 Problem of Unfocused Customer Target and Airfare Structure

The problem in business strategy of Japanese LCCs is that they are not focused on any customer segment. The LCCs in other countries focus on their own selected targets. Southwest Airlines focuses on a class of passengers who are susceptible to fare levels. JetBlue Airways focuses on business passengers. Air Asia focuses on mid-to-low income passengers who do not regularly travel by air.

In contrast, Japanese LCCs such as Skymark and Air Do, despite their low airfare, tried to deal with all segments of customers including tourists, travelers and business passengers without selecting any targets, and competing only with low fares. Japanese LCCs, similar to cheap airlines in the United States in the 1980s, did not target any customer segment and had no selling points except for low fares. Therefore, they could not keep their customers once their low airfare lost its competitive aspect.

A remarkable example is Star Flyer, which began service in 2006, and launched a management policy of targeting business passengers for Kitakyushu-Haneda round-trip flights. It applied the marketing strategy of JetBlue Airways by selecting routes set at early morning or midnight that allow passengers to use their time effectively, with seats equipped with TV, and by applying leather seats.

This indicates that if LCCs cannot offer low-cost airfare on a constant basis, or special discount fares, they must investigate targeting a customer segment with low price elasticity.
Differentiation by focusing on a certain group of customers and according to price elasticity of the demand is effective in air transport services.

Another factor to study is competition with other transportation systems. Japan has a highly-developed railroad network including the Shinkansen. Railroad service becomes another major competitor in addition to LCs. Airline companies are especially exposed to intensive competition against the Shinkansen in short-distance routes with high demand in regard to fare and time. Moreover, competition against road transportation is unavoidable with the development of the highway network. Examples include Air Asia and Skymark, which attracted customers away from the long-distance bus market when it entered the airline market.

While the main competitor of LCCs in North America and Europe is road transportation, Japanese LCCs need to offer cheap fare that competes with high-speed bus and Shinkansen fare for adjacent routes by considering competition against road transportation and the Shinkansen in order to increase demand.

4 Problem of Route Structure

The route structure of Japanese LCCs soon after they entered the market was unfairly assigned. Haneda-Shin Chitose and Haneda-Fukuoka routes were not an issue. The second Skymark aircraft was assigned to the Itami-Shin Chitose and Itami-Fukuoka routes of low demand. Such route structure prevented airlines from operating aircraft efficiently. Moreover, resources cannot be allocated mainly on a particular station, resulting in cost decrease due to the unnecessary increase in the number of stations.

In contrast, LCCs in North America and Europe can focus on specified routes and conduct high-frequent operations. The difference in cost and ability of attracting customers is obvious between Japanese and the Western airliners.

Such poor route structure hindered new entries. This is not a management policy problem but an institutional problem. Japanese LCCs do not break into international markets to seek routes that work to their advantage as European LCCs and Air Asia do, except for Skymark, which finally penetrated into the charter market. This is an institutional problem, reflected by the protectionist characteristics of Japanese international aviation policy.

5 Inconvenient Operation

It is generally accepted that both Skymark and Air Do could not attract passengers because they had to start operations at low frequency of three round-trip flights with only one aircraft. It indicates that a company would be placed in a disadvantageous situation both cost-wise and revenue-wise, as previously mentioned, unless it started on a certain scale. Needless to say, this was due to restrictions of arrival and departure slots by Haneda, which is also an institutional problem. With lessons learned, Skynet Asia Airways operated its Haneda-Miyazaki route at high frequency with two aircraft and six daily round-trip flights. The company eventually had to seek assistance from Revitalization Corporation, but the problem did not lie in its high-frequent operation strategy itself. The Industrial Revitalization Corporation also stated that Skynet Asia Airways' "provision of low fare and convenient airline passenger services from Haneda to an airport at a long distance is appropriate for a fundamental business operations strategy," implying that its direction itself was not wrong. Skynet Asia Airways' bankruptcy was due to its problem in cash management, the steep rise insurance cost in the aftermath of the terrorist attacks in September 2011, the decrease in demand, and the fact that it started operation in 2002, when the aviation industry was under harsh circumstances.

6 Concentrated Use of Hub Airports

What is characteristic about Japanese LCCs is that their initial route originates from Haneda Airport, which is an existing hub airport. Examples of this include the Haneda-Fukuoka route by Skymark and Haneda-Shin Chitose route by Air Do,

In contrast, one of the success factors for leading LCCs in North America and Europe such as Ryanair and Southwest Airlines is use of secondary airports. The reasons for using secondary airports, which are true especially for large cities, are listed as follows:

(1) Demand for secondary airports is superior to that of hub airports used by LCs due to higher accessibility.

(2) Management bodies of secondary airports are proactively working on marketing to airlines for the purpose of competing against hub airports through implementation of measures such as reduced usage fee. In addition, secondary airport facilities can focus on LCCs and do not have to provide quality that applies to all customer segments as is done by hub airports. Cost reduction

through this strategy will lead to reduction of airport usage fees for LCCs.

(3) LCCs will not be directly compared with the luxurious facilities and large-sized aircraft of LCs.

(4) Secondary airports are not crowded, which attracts passengers and airline companies seeking such advantage.

Needless to say, the above does not deny the use of hub airports. However, as the use of secondary airports will contribute to differentiation and low cost, LCCs must investigate the proactive use of secondary airports. It is also necessary, on the other hand, to study the institutional problem in the Japanese market, which restricts the use of secondary airports. The use of secondary airports is limited in Japan because there is only a small number of secondary airports, and their use is prohibited from institutional reasons.

7 Lack of Business Policies and Corporate Identity (CI)

Similar to any business operation, both visionary business leaders with expertise as well as clear management policy and CI play an important role in management of airline companies. In this aspect, Japanese LCCs lack in establishing CI. In other words, airline names such as Skymark, Air Do, and Skynet Asia Airways are associated only with low fare. In the past, there existed an airline company even in the United States such as People Express, of which the CI was only "low-fare." Airline companies with such philosophy were not able to keep attracting passengers. Positioning of cost reduction itself as the company's business objective built images such as concern over safety, restructuring and job cuts, resulting in worsening corporate image and negative impacts on employee morale.

In contrast, it is widely known that Southwest Airlines became successful not only because of its low fare but also because of its family-oriented and humorous services. Air Asia, with the goal that "Now Everyone Can Fly" is successful in cost reduction in various aspects, while penetrating a "young and energetic" and "high-tech" image and brand. It is important for a company to achieve cost reduction, while establishing a target with social value and through differentiation of company brand.

The partnership between LCCs and LCs is now getting stronger. Examples include the partnership with ANA and Air Do, targeting revitalization with ANA's support, the partnership of Skynet Asia Airways with ANA, and code sharing between Skymark and JAL since 2005. This trend may play a negative role in LCCs' business strategy in emphasizing originality and differentiation.

8 Dependence on Public Funds

What is characteristic of Japanese LCCs other than Skymark is that they receive public assistance from local public authorities. Examples include the support by the Prefectural Office of Hokkaido for Air Do and support by the Prefectural Office of Miyazaki for Skynet Asia Airways. Local public authorities deliver subsidies to LCCs and support them directly by measures such as low-interest loans. Air Do received financial aid and representation at the Prefectural Office of Hokkaido as a member of directors. However, injection of public funds without clarifying management responsibility can cause management moral hazard. The bankruptcy of Air Do in spite of spending over 5 billion yen of public funds is a typical example of this. It is not by chance that Skymark was the only company of all the new Japanese airliners that avoided bankruptcy and recorded surplus in recent years. This problem, however, shows that fund procurement is a challenge in new Japanese transport market, as shown in the example of Skynet Asia Airways of which one of the reasons for bankruptcy was poor procurement of funds. Study of effective measures will be discussed later.

9 Summary for Institutional Problem Study

The study here has demonstrated that the reasons for sluggishness of Japanese LCCs are (1) high-cost structure; (2) intense airfare competition against LCs depending only on lowering fares; (3) unclear customer target; (4) inappropriate route setting; (5) concentration of use of hub airports; (6) inconvenient operations; (7) lack of management policies and corporation identity (CI); and (8) dependence on public funds.

As for high-cost structure, the problem lies also in the lack of effort of LCCs on cost reduction. Therefore, companies must make substantial efforts on implementing cost reduction measures. It is important to note, however, that an institutional problem also contributes to high-cost structure.

As for airfare competition, counteractive airfare reduction by LC is a threat. This indicates the need for investigating the competition level of the entire market. Problems of route structure and number of flight setting are categorized as an institutional problem due to the restriction of arrival and departure slots.

Unfocused customer target, use of hub airports instead of secondary airports, lack of management policy and CI, and dependence on public funds are categorized as management policy problems, which must be worked on by LCCs themselves. Of these problems, non-use of secondary airports is due to institutional and physical factors. Dependence on public funds is derived from Japanese managerial characteristics. These institutional problems will be discussed next.

3-3 Analysis of Problems of Aviation Policy

In the previous chapter, the reason for the sluggishness of new Japanese LCCs compared to European LCCs was discussed from the point of view of business strategy.

The management policy problems, however, are also influenced by institutional restrictions. For example, it is best from a business point of view to lower the price of a commodity. But if its price is fixed due to a pricing regulation system, lowering the price cannot be an option. Also, even if there is no pricing regulation, some systems or market structures in the past have had an impact on pricing. Therefore, it is necessary to discuss not only managerial improvements, but also whether management decision-making is hindered by governmental policies or systems, and if they are, if such policies and systems are viable or not, or how they should be reformed.

The Japanese air transport market was under strict governmental entry and pricing policies for a long period after the end of World War II. Finally in 2000, supply-and-demand regulation was abolished because the Civil Aeronautics Act was amended. Basically, entry into the market, number of flights, and airfare are now liberalized. But system-wise, regulation policies that lasted for half a century and the oligopoly structure of the market shaped by these regulation policies are continuing to influence the current market. In my opinion, this has significantly restricted the development of Japanese LCCs.

The main focus of this chapter is to analyze the aviation policy problems from the above

viewpoints essential in discussing the factors for development of new LCCs. Prior to that, for readers who are not familiar with aviation policies, the discussion below will explain why such system restrictions did not become a barrier in the development of US and European LCCs, but did in Japan, by comparing the history of Western and Japanese deregulation measures. Next, the validity of deregulation and competition promotion measures will be discussed; feasibility of contestability will then be investigated; and finally the aviation policy problems will be covered.

1 History of Aviation Deregulation in Japan and the West

1.1 United States

Deregulation of the air transport market started in the United Kingdom and the United States, and spread on a global scale. While deregulation in the United Kingdom had been promoted gradually since the 1970s within its regulation system, deregulation in the United States was implemented at once by the change in the regulation system according to the regulation in 1978. In the United States, however, the State of California had experience in liberalization at a state level before it was implemented on the federal level. Also, whether to have regulation on air transport or not had already been discussed since the 1970s.

Full-scale development of worldwide commercial airline companies was not seen until the end of World War II. In the United States and Europe, between the end of WWII and the 1970s, it was taken for granted that the air transport business could benefit from governmental protection measures from the infant industry protection viewpoint or because railway business had historically been under strictly protective regulation as the major transportation system. Therefore, new entrants suffered strict regulations from safety, technical and economic aspects, including strict regulation on new entry and price. In the United States, such strict regulations also controlled the number of flights and services. The Civil Aeronautics Board (CAB) was established as an independent board for monitoring such economic regulations. (See Figure 3-6)

Figure 3-6 Domestic Deregulation Process in the United States

Month/Year	Deregulation
October 1978	Airline Deregulation Act was enacted
December 1981	Liberalization of entering/exiting the market
January 1983	Fare liberalization
January 1985	Civil Aeronautics Board (CAB) was dissolved

Source: Created by the author

Beginning in the second half of the 1960s, this situation, however, started attracting increasingly louder criticism and disputes on the inefficiency caused by the anti-competitive regulations to control supply and demand, including the significance of the existence of CAB. By that time, the airline industries had demonstrated steady growth from their infancy. Consumer-oriented dogma and movements as well as criticism against anti-competitive control over supply and demand were heated. The contestable market theory was developed for introducing competition policy into the market. Air transport within the state where liberalization had already been implemented showed fine performance.

The Airline Deregulation Act was enacted in October 1978, followed by the abolition of control over charter planes. With the Deregulation Act, several deregulation measures were implemented. The Act implemented, except for safety regulations, complete liberalization of new entries and liberalization of pricing in a phased manner. In 1985, the deregulation process led to the dissolution of CAB as a full-scale reform in deregulation. As we have seen here, "abolition of regulations" rather than "easing of regulations" had been implemented in the United States.

With this liberation policy, the first-generation LCCs were established. These first-generation LCCs took advantage of the gap in productivity between the major airline companies of high-cost structure as a result of being protected by regulations for a long period. The LCCs entered the market with low fares as a result of cost difference, and stimulated the airline industry to a large extent.

Since then, there has not been a significant change in deregulation policy in the United States. As a result, only competitive airlines remain in business, which is true in any industry. The LCs have survived by applying various management measures including survival through bankruptcy or by utilizing FFP or CRS with its strong network as an advantage. Confronted with such productivity improvement measures implemented by major airline companies, many of the so-called "cheap airline companies," which were cheap-fare oriented, went out of business. In fact, as was analyzed in Chapter 2, the only remaining LCC among those that entered the market in the 1970s and 1980s is Southwest Airlines.

Therefore, the US air transport market can be featured as a market with a continuous wave of new entries. In the U.S. air transport market with no more supply and demand adjustment controls, entering and exiting the market is liberalized. Pricing is completely free as well. There

is no administrative intervention by the government. With strict antitrust laws, newly entered companies are under open competition with the LCs. Some companies exit, and then some LCCs enter the market. These trends, which have been repeated since the beginning of liberalization of the air transport market, have promoted the development of both LCs and LCCs, and have vitalized the market.

1.2 Europe

In Europe, deregulation was promoted by the United Kingdom and Holland. In Europe, where domestic airline markets are small, the pressure for deregulation and for freedom targeted international airline transportation within the European continent, and such bilateral airline transportation agreements concluded between the United Kingdom and Holland and between the United Kingdom and Belgium opened the new era of freedom. New entries could now begin operating, and this freedom spread to the other countries in Europe. Thereafter, the deregulation of the airline industries was led by the EU since this was regarded as one of the most important steps toward the integration of Europe.

As a result, free policies were adopted commonly for the interest of the airline industry before the beginning of the1980s in the United Kingdom, Holland, and Belgium and in other countries ahead of deregulation. The other countries in the EU also took the same stance by the beginning of the 1990s, although the deregulation of the entire airline industry in the EU was achieved as late as 1997. By that year, the European airline industry had exceeded that of Japan by far, giving chances to such LCCs as easyJet and Ryanair to participate in the industry, which again created a potentially huge demand for the industry in Europe. In Europe, however, the power of the LCs was strong compared to the United States, with the result that LCCs were concentrated in the routes and areas in the United Kingdom where liberalization was promoted. On the other hand, differences in productivity between the LCs remain significant compared to those between the leading companies and LCCs in the United States. This means that there is still room for development of LCCs in the market.

1.3 Japan

Despite its fame as a developed nation, Japan is an exception in Asia. While the history of its airline industry is similar to those in the United States and Europe, in the 1970s Japan alone failed to follow the global trend toward deregulation. While the United States and the United Kingdom already began gradually working on deregulation in the 1970s, Japan's intention was

to protect the air transport industry through complete market compartmentalization in the field of scheduled air transport services under the so-called "45/47 structure." (See Figure 3-7)

Figure 3-7 Domestic Deregulation Process in Japan

Year	
1952	Civil Aeronautics Act enacted
1972	45/47 structure established
1986	45/47 structure abolished, control over supply and demand adjustment continued
1996	Scope of fare system implemented
1998	Skymark and Air Do entered the market
2000	Civil Aeronautics Act amended, control over supply and demand adjustment, Fare authorization system abolished

Source: Created by the author

As was explained previously, the "45/47 structure" was a protective governmental policy that prohibited even mutual entries of the airline companies. It is true that this protective policy played an important role in the development of airline companies in Japan, which were small at that time compared to the worldwide level. The problem, however, was that control over supply and demand adjustment remained the same, while the air transport industry was seeing significant development. This resulted in delay in implementing deregulation policy, compared to Europe and the United States.

Upon receiving the report of the Council for Transport Policy in 1956, the "45/47 structure" was finally abolished. Nevertheless, strict control over supply and demand adjustment continued to be effective in Japan, in contrast with the deregulation trends in the United States and Europe.

As for domestic routes, airline companies could then apply double/triple track, a governmental policy to rescue airline companies (i.e., JAS), which were forced to operate flights under the "45/47 structure." However, they still could not determine the number of flights and fares on their own. All companies had to apply the same fare standard for the same route, and competition over the number of flights was not allowed either.

In 1994, a registration system for part of the discounted fares was established. Also, a scope of the fare system for regular fares was established in 1996, and this led to deregulation to some extent. Both the Transport Ministry and the LCs, however, had a negative attitude toward the

possibility of accepting new entries for the reason of restriction of arrival and departure slots at crowded airports.

Japan finally showed a movement toward deregulation, marked by the enactment of the revisions made to the Aviation Acts in 2000. This change was realized by the support of the administration reform committee as well as pressure from public opinion and from two new corporations that were ready to participate in the industry. With the revisions made to the Aviation Acts, the control over supply and demand was abolished in principle, and pricing by airlines no longer required governmental permission. Only reporting the prices to the authorities was still mandatory. The deregulation of the airline industry in Japan lagged more than twenty years behind that of United States, where the regulations were abolished in 1978.

The revisions made to the Aviation Acts in 2000 have:
(1) Changed the fare pricing system so that airline companies may report fares in advance. The authorities may order changes of fares only when the fare is too expensive or is aimed at dumping for the purpose of shutting out competitors.
(2) Abolished supply and demand adjustments to routes. Airline companies may now set routes or increase/decrease the number of flights only by reporting this to the authorities.
(3) Abolished the licensing system for each route and selected a system that assesses the business management capabilities.
(4) Abolished captain's licensing that was conducted for each route.

With these changes, airline companies can now determine routes, number of flights, and fares on their own, in principle at least. From a legal point of view, liberalization at the same level as that of the United States was achieved. The chronological events regarding deregulation of control over supply and demand adjustment and pricing regulation are as listed below.

1.4 Difference between Europe and Japan in Deregulation

As was discussed above, deregulation in Japan was delayed compared to that in Europe and the United States. While, as a result, LCCs in Europe and the United States have developed know-how through experience in their history of liberalization over 20 years, the two LCCs in Japan have entered the market with almost no management experience. This trend is still reflected in the management policy of Japanese airline companies. Welcoming LCCs to the market was also a new experience for both regulatory authorities and LCs. They dealt with new entries with no

experience with designing a market system to effectively manage competition.

Another major difference between Japanese and the Western deregulation policies is that implementation of Japanese policy was delayed and its level was low. Controls over supply and demand were indeed abolished, but the current Japanese deregulation policy that still allows regulatory authorities to control airline companies must have played a negative role in the development of airline companies new to the Japanese market.

2 Significance and Viability of Deregulation and Promotion for Competition

2.1 Reason for Control over Supply and Demand in the Past

Control over supply and demand adjustment is also called quantitative business regulation. This refers to regulation that controls the number of suppliers and quantity of supply. As mentioned earlier, after the end of World War II and before deregulation was introduced, the air transport market was under control over supply and demand adjustment for a long period. The reasons for such control over supply and demand adjustment were as follows:

(1) To develop and protect an infant industry.

(2) To avoid destructive competition in the industry with large economy of scale.

(3) To secure resources that internally subsidize underperforming routes considered to be necessary from the standpoint of social needs.

Also, the various economic regulations were implemented in conjunction with control over supply and demand adjustment because, if completion was inhibited by such adjustment, price might be determined in a monopolistic manner and quality of services might be degraded. In addition, businesses tend to perform non-price competition under pricing regulation. In order to prevent this, several service regulations were implemented. Therefore, the air transport industry was not considered appropriate for competition. As a result, control over supply and demand adjustment, pricing regulation, and qualitative regulations have hampered not only new entries, but also competition between LCs.

2.2 Problem of Control over the Supply and Demand

2.2.1 Protection of Infantile Industry

"Infant industry" refers to an industry in its developmental stage with a high degree of uncertainties. Such an industry is considered to have potential social effectiveness, but its future

is uncertain. Therefore, there may be no proactive investor if the industry has to go through the market mechanism. In some cases, such an industry will be protected by public subsidies or competition-inhibition policies.

At the early developmental stage, the air transport industry needed a significant amount of funds. It did not have know-how either. With uncertainties in investing in the industry, there were a limited number of investors. Therefore, protection and development of the air transport industry led by government had significance. Protection and development measures have been implemented in several countries by way of inhibiting competition or capital participation of government for airline companies. As the air transport industry grew, however, the idea of protecting it and inhibiting competition became inappropriate. It is unrealistic to regard today's air transport industry as an infant industry.

2.2.2 Economy of Scale

The airline industry had traditionally been regarded as having economy of scale. This viewpoint has also played a role in implementing competition inhibition through control over supply and demand adjustment.

Different from railway transportation, however, in the air transport industry, lower structures such as airport facilities are not managed by airline companies. Therefore, the cost ratio of stationary facilities is low. Most existing studies point out that revenue stream is almost consistent, or slightly higher even, with economy of scale.

Also, as previously mentioned, at an early stage of the air transport industry, cost for aircraft was relatively high and the capitalization ratio was also high. As the industry grew, it became common to utilize used or leased aircraft, so the fixed cost ratio as well as sunk cost was lowered. This enabled airline companies to easily enter or exit the market, which led the industry to be more adaptable for competition. The level of sunk cost due to destructive competition became low.

Needless to say, this does not deny the fact that running a business by operating with a certain amount of aircraft is effective from a management point of view. The reason for this is that, in addition to economy of scale, both economic efficiency of transport density or network are functional in the pure sense. What needs to be discussed here is whether economy of scale is

large enough to justify control over supply and demand adjustment. A large scale of social loss is expected when a free market competition is led to destructive competition under the control over supply and demand and then to sunk cost of a bankrupted entity. In this regard, the competition style of a corporation remains competitive in the market as a result of making products with scale merits.

In the case of the air transport industry, scale of economy is not large enough to justify regulation of new entries, because scale merits can be small enough to be written off by productivity. This method may be regarded as one of the management tools.

If in any case a route with small demand does not result in entries of multiple airline companies because a certain scale of business management is required, control over supply and demand adjustment for regulating entries does not need to be implemented. Instead, if we let market forces play out, an effective corporation will survive. A corporation that does not survive will have sunk cost that is about the same level as that of any other industry, as discussed earlier. Also, even with no new actual entries, a potential threat of new entries will prevent LCs from setting monopolistic fares.

The study on the contestability of the entire market in this regard will be discussed later.

2.2.3 Maintaining Underperforming Routes by Internal Subsidies Due to Social Needs

Similar to other public-utility industries, air transportation companies have to subsidize the cost for underperforming routes to remote islands or rural areas using the excess profits from the profitable departments of the company. One of the reasons for implementing control over supply and demand adjustment was said to make LCs cover the deficit of such underperforming services.

Continuing operations of underperforming routes must be performed as a means of income redistribution. The effectiveness of subsidies coming from particular resources, however, is low compared to general income transfer between regions. Also, use of internal subsidies can have an adverse impact on income distribution unless users of performing routes are always of higher income than users of underperforming routes. Therefore, it is inefficient to distribute income using particular resources by internal subsidies.

Also, under supply and demand adjustment, competition productivity becomes low because

competition will become inactive. On the other hand, with competition, efficient airline companies such as LCCs or commuter airline companies will enter the market. LCs will then improve productivity under competitive pressure. As a result, an underperforming route may well be converted into a performing one.

2.2.4 Advantages of a Competitive Market

As discussed above, there is no longer a reason for implementing competition-inhibition policy by control over supply and demand adjustment as in the past. In addition, it is important to promote competition in the Japanese air transport market from the governmental policy point of view because the productivity of airline companies has significantly deteriorated due to a long-term competition-inhibition policy. This has resulted in high airfares and inflexible services.

There is no room for discussing general advantages of deregulation. To give a specific example, the Economic Planning Agency estimated annual average user profit ratio of two routes of Skymark and Air Do to be 2.36 billion yen. If we add profits derived from lowering airfares of the leading airlines, which operate at ten times the size that of the LCCs, to the two companies' profits, customer benefits will more than double. This must be the result of control over supply and demand adjustment due to long-term protective measures for the industry not considering consumer benefits.

3 Contestability of Air Transport Market and Fare Competition

As discussed above, the air transport market is in theory adaptable for competition. Nevertheless, the share ratio of LCCs in the Japanese domestic air transport market is not as high as it is supposed to be. This could be partly due to poor management or institutional problems of the LCCs. Before studying its institutional problems (or parts of institutional problems), we need to study if the market itself is contestable. I mentioned previously that economy of scale is not large in the airline industry. If a market with economy of scale is contestable, no particular market regulation policy will be necessary. Below is an analysis of the competition status of the Japanese air transport market with new entries, focusing on the competitive relationship between the LCs and the LCCs and studying whether the said Japanese market is contestable or not. This will be a prerequisite for discussing competition policy.

3.1 Contestable Market Theory

A contestable market can be defined as a market that allows easy and free entry as well as easy exit with low sunk cost because fixed cost can be recovered. A contestable market allows effective competition between new entries and LCs. As known already, with the traditional market model, market competition can be explained as follows: The resistance reaction of the LC to the new entries is a precondition. Market price goes down with new entries. As a result, the price and production volume will change. On the other hand, with contestable theory, market competition is studied by considering both actual and potential entry.

To explain, potential new entries have the same competitiveness as that of the LCs in the market. If entry and exit are liberalized, the market is maintained at an ideal state even without actual entry. Even though the market is monopolistic due to economy of scale, monopolistic prices cannot be set because of the threat of potential entry through "hit-and-run strategies." Whether the entry/exist cost is high depends concretely on the amount of sunk cost. Even though fixed cost was high at the time of entry, it can become low if remaining value is high. This stimulates the willingness of LCCs to enter the market. Also, in a contestable market, the Bertrand-Nash hypothesis is applied. Under this hypothesis, LCs cannot immediately lower prices, so the time for taking such a countermeasure is delayed.

According to these hypotheses, the seven conditions for establishing a complete contestable market are as follows (according to Murakami et al. in 2006):

(1) Both LCCs and LCs produce similar resources, and consumers can purchase any of their resources.

(2) Production cost of LCCs and of LCs is the same.

(3) Companies are ready to enter price competition.

(4) No cost will be accrued for switching to another competitor.

(5) Entry/exit is free, and no sunk cost will occur.

(6) There is a time lag in setting price by the LCs.

(7) No excess demand or excess supply will occur in the industry.

Now, is the Japanese air transport market contestable? Each of the above conditions will be studied with the actual status in Japan to find out.

3.2 Study of the Market of Domestic Airline Companies

3.2.1 Similar Resources

The quality of the LCCs and the three LCs, including in-flight services, is about the same. There was a large difference in the number of flights and availability of airport facilities between new entries at the initial stage and LCs for institutional reasons, but this problem has been solved recently. In conclusion, there is no such difference anymore. Therefore, Condition (1) is met.

3.2.2 Similar Cost Function

As noted previously, the cost difference among LCCs and the three leading companies is large. Condition (2) is not met.

3.2.3 Price Competition

As mentioned previously, both LCCs and LCs can set prices on their own. As competition over fares is intense, fare is obviously a key competition parameter. Therefore, Condition (3) is met. It is necessary to note, however, that there is a large difference in the number of flights for the LCCs at an initial stage for institutional reasons. Also, this competition was under special circumstances in which new entries were not allowed to increase their transportation capacity.

3.2.4 Consumers Restricted in Selecting Company

Even in the case of discounted fares under certain conditions, such as for selected flights only or with advance purchasing option, customers can choose another airline next time. No passenger will be restrained by any airline. Therefore, Condition (4) is generally met. Development of FFP is questionable under this condition, however.

3.2.5 Sunk Cost

Discussion of sunk cost is rather complicated. In the air transport business, a large portion of resources including aircraft can be outsourced, so sunk cost is low. Needless to say, however,

leasing cost can be a sunk cost. Initial expenditure adding up to 5 billion yen cannot be ignored by small new entries. High-cost outsourcing can be reduced by self-management of training for crew members or maintenance, but the cost in this case will be categorized as sunk cost. Also, after control over supply and demand adjustment was abolished, certain routes could not be discontinued due to protests by the local residents. This can delay an LCC from discontinuing service on such a route because it depends on public funds. To conclude, sunk cost is not necessarily high from a technical point of view. The problem lies in the market environment in which management resources are concentrated in the LCs. Also, sunk cost becomes high due to the problem of the capital procurement market, in which companies depend on public funds.

3.2.6 Time Lag of Airfare Change by LCs

As mentioned previously, the three LCs changed fares on the same day as Skymark and Air Do did. Condition (6) is not met.

3.2.7 Excess Demand and Excess Supply

Many of the routes entered by the LCCs are bound from Haneda Airport. It depends on time and season, but such routes had experienced excess demand by the time Skymark and Air Do entered the market. This is more of a problem of airport capacity or airport policies, however. Also, with the recent expansion of airport capacity, excess demand on domestic routes is being eased.

3.3 What the Study Results Signify

The above study shows that the Japanese domestic air transport market is not a completely contestable market.

This does not, however, deny promotion of competition or suggestion of regulation again. The reason for this is that, of the Condition (2) and (6), Condition (2) is the result of an institutional restriction. Therefore, an institutional reform for solving this problem is required. Condition (2) also results from the lack of effort of new companies to reduce costs. These management and institutional problems can be solved if worked on at the same time. After institutional reform, the companies should basically let the market forces play out, and implementing after-the-fact regulation is desirable.

It is too early to conclude if the air transport market is contestable because there are some

factors (such as impacts of strategies through FFP, CRS hub & spoke systems developed by LCs) that must be discussed at another opportunity. With such factors or gray zones in the above study, it is risky to simply regard a market as completely contestable. After-the-fact regulation must be conducted in principle, but some sort of asymmetric regulation that supports new entries is necessary.

Below is the study on how a long-term competition-inhibition policy weakened contestability of the Japanese domestic air transport market and hindered development of airline companies.

4 Problem of Current Aviation Policy and Impact on LCCs

As was discussed earlier, in the Japanese air transport market, amendments made to the Civil Aeronautics Act in 2000 abolished control over supply and demand adjustment system-wise. The impact of long-term regulation policy, however, was strong when the LCCs entered the market, and still remains to some extent. There are two reasons for this. Firstly, because deregulation was delayed compared to the worldwide trend, the spirit of liberalization has not yet infiltrated either the authorities or the industry. Secondly, this is one of the reasons why deregulation was delayed. Authorities who were in charge of deregulations were not in favor of deregulation. Deregulation was implemented only by pressure from outside the ministries. Therefore, the pro-regulation ideas may still exist among the authorities concerned and in the industry. This thesis will study the actual impact of such points on the LCCs.

4.1 Delays in Deregulation

The fact that pro-regulation ideas still remain strongly among the regulation authorities or in the industry can be seen in the process of the start of services by Skymark and Air Do, which are the latest LCCs. Until fall 1996, when Skymark and Air Do declared entry into the market, the Transport Ministry was not positive about fare deregulation. Such an attitude on the part of the authorities concerned, however, is said to have changed when the new entry of Skymark and Air Do became public. The mass media covered this story almost every day. Confronted with public opinion, the Transport Ministry became serious about discussing authorization of new entries. They decided that it was not in their best interest, in the long term, to be against public opinion. This must have resulted in working on the entry of Skymark and Air Do proactively.

But the trend was promoted just by the support of new entries and encouraging competition.

The Transport Ministry officials may not necessarily welcome liberalization. If they lose a wide range of their privileges to regulate price and entry, this will mean that the existence of the Japan Civil Aviation Bureau in the ministry will be questioned. On the surface, system reform was implemented for orienting deregulation, and amendments made to the Civil Aeronautics Act in 2000 abolished supply and demand adjustment provisions, but many of the privileges of the authorities concerned remained.

This caused both a direct and indirect impact on the development of Japanese LCCs. The authorities concerned have put all sorts of pressure on the LCCs starting at their license application stage. Also, indirectly, various competition inhibition policies shown in the problem of airport arrival and departure slots or maintenance ability were disadvantages to the LCCs. (Indirect institutional impact will be discussed later.) Negative attitudes toward deregulation by the authorities concerned are indeed a burden to LCCs.

It is not fair, however, to introduce only the opinions of new entries regarding pressure. It is necessary to listen to the opinions of the regulation authority side as well. In fact, when an LC, which once accepted outsourcing of maintenance of an LCC, later refused, the Ministry of Land, Infrastructure, Transport and Tourism issued a statement that the leading company should accept it. When Skynet Asia Airways entered the market, the authorities issued an order prohibiting lowering of fares by leading companies. The authorities, thus, have demonstrated their stance in favor of the LCCs.

Therefore, I would like to simply state here that, in any market, a new entrant must be a challenger and must deal with non-cooperative governmental services. Challenging is hard, but not impossible. Actually, both Skymark and Air Do procured licenses with the spirit of challenge essential as new entrants and obtained approval from the Transport Ministry of half-price or nearly half-price fares, resulting in abolishment of the lowermost regulation. It is too early to conclude that we cannot see development of LCCs in the market just because of the attitude of the authorities concerned.

As discussed above, the passive attitude of the regulatory authorities, which might be the legacy of competition inhibition policy, can be a secondary problem, even though it is a challenge for LCCs. On the other hand, the market's institutional and structural restrictions are more of a serious problem for LCCs. Verification of the problems of the Japanese air transport market

confronted by LCCs is shown below.

4.2 Limited Airport Capacity

4.2.1 Importance of Capacity of Airports in the Tokyo Metropolitan Area

Two-thirds of the Japanese domestic air transport volume is supported by the demand in the Tokyo metropolitan area or Haneda Airport. With only a few exceptions, Haneda is substantially the only airport of all airports in the Tokyo metropolitan area in which operations of domestic routes are allowed. Therefore, for LCCs, the key for their operation is whether they can operate routes in and out of Haneda and secure the same number of flights as the LCs. Haneda Airport, however, is a very busy airport with insufficient capacity. Also, the existing arrival and departure slots have already been occupied by the LCs. Most of the increased slots by Haneda's offshore expansion work have already been assigned to the LCs. As a result, when Skymark and Air Do entered the market, they obtained only three flights each.

Below is the study on what kind of management problem was caused by distribution of arrival and departure slots at Haneda as essential facility to LCCs. This will be followed by a study of ideal distribution. Next, the negative impacts on LCCs in including lower airport capacity caused by delay in the development of secondary airports will be explored.

4.2.2 Arrival and Departure Slots of Haneda as an Essential Facility

Essential facility refers to the essential productive factors and facilities in the industry. If a particular company monopolizes essential facility, competition will be restrained, and LCCs cannot enter the market.

In an industry with long-term regulation policy, LCs to which monopoly was allowed by a regulation system often occupy essential facility. In the field of telecommunications, the former Dendenkosha company monopolized telephone wire rights. In the field of electric power, a local monopolistic electric power company monopolized transmission and distribution facilities. Therefore, even after deregulation, past privileges remain active, and major facilities are under a particular former monopolistic company. In this case, entry of a company is approved by abolishment of control over supply and demand adjustment. Such a new entrant is restricted from using facilities and from actual entry itself unless a new system with access rights for the essential facility is designed. In the case of the air transport market, protective policies over the three LCs have been maintained for a long time, and various human and material management

resources are unevenly allocated to the LCs. This is becoming a huge barrier to new entrants. The most important resources that can be described as part of the essential facility problem are arrival and departure slots at Haneda Airport, which accounts for two-thirds of domestic air transport volume. Vested rights were granted to LCs to occupy arrival and departure slots on a first-come-first-served basis. With no redistribution of arrival and departure slots, entry of LCCs can be difficult. Competition with LCs will be impeded.

As mentioned previously, Skymark and Air Do, the first two companies that entered the market as new firms in 1998, were initially only given three routes each in and out of Haneda. Therefore, they could not expand their operation size. The three LCs were operating ten flights each from Haneda to Fukuoka and from Haneda to Shin Chitose. The LCCs with restricted numbers of arrival and departure slots could not compete with the LCs by increasing the number of flights because the system did not allow them to do so.

Under these circumstances, both Skymark and Air Do decided to compete with lower airfares, 50% by Skymark and 50-60% by Air Do. They demonstrated a load factor of more than 80% in the first six months when their fare standard remained at a level before the company entered the market. After March 1995, however, when JAL, followed by the other two LCs, lowered fares, the new entrants suffered financial difficulties.

The problem of arrival and departure slots brought Skymark inefficient use of its second aircraft and increased the company's deficit. Based on proper management policy, its second aircraft should have been flying between Haneda and Fukuoka, but this was impossible. The company was forced to choose the Itami-Shin Chitose and Itami-Fukuoka routes, which were minimally profitable.

Moreover, the company had to compete with the Shinkansen on its Itami-Fukuoka route. As the route is short, their aircraft were used as an alternative transport option to ferries. The yield of the route between Itami and Shin Chitose is low, because it is oriented to tourists. In addition, it could not become competitive because it was the only flight the company had. Also, the fact that the company had to open two stations (Haneda and Fukuoka) and two additional stations (Itami and Shin Chitose) within a short period of time became a burden.

In 1998, when Skymark and Air Do entered the market, the distribution of arrival and departure

slots was quite disadvantageous for the LCCs. As previously mentioned in this chapter, economy of scale does not function in the air transport market, but a constant scale of operations is necessary. It is known from experience that businesses with a number of flights that exceeds the flight ratio have disadvantages in being selected by consumers. It is also obvious that the management wished to increase the number of flights. It is clear, however, that restrictions of arrival and departure slots impeded the management to do so.

The LCCs were later given some prioritized slots, but the barrier caused by the lack of arrival and departure slots at their initial stage not only weakened Skymark and Air Do financially, but also created the sentiment that the LCCs would not survive, and discouraged investors' motivations. These aspects caused a negative impact on the development of the Japanese LCCs.

4.2.3 Problem of Distribution Method of Arrival and Departure Slots

The deregulation subcommittee of the Administrative Reform Committee pointed out that arrival and departure slots at Haneda would be the key for achieving effective competition of Japanese domestic airlines, including LCCs. At the end of 1996, before the entry of Skymark and Air Do, the same committee made a recommendation on the problem of arrival and departure slots. They suggested that the distribution method, which was on a "first-come-first-served" basis, must be abolished and that slots must be redistributed. The distribution method they recommended was to promote competition under airport capacity restrictions and to select "competition tendering or its alternative, objective and highly-transparent arrival and departure slot distribution method."[5] In order to stimulate airline companies to improve productivity. This eliminates arbitrary and discrete arrival and departure slot allocation and allows for implementation of free management policy with no control by regulatory authorities that distribute arrival and departure slots.

To cope with this advisory, the Transport Ministry also began study of a new distribution method. On March 2000, slots were reallocated according to this method. The Transport Ministry selected a point rating method, by which the ministry assigns slots based on evaluation items predetermined by the ministry.

Redistribution conducted in March 2000 can be appraised from the fact that the increase in the number of slots was approved for LCCs. Later, prioritized slots were assigned to new entries.

[5] Administrative Reform Committee (1997)

Both Skynet Asia Airways and Star Flyer can now set their desired number of flights. Currently, LCCs do not have to encounter the adverse circumstances that Skymark and Air Do initially did.

The fact that the ministry selected a point rating method means that free setting of the number of flights may become difficult. In a point rating method, the concerned authority, who is the evaluator, can rate the airliners arbitrarily by placing desired emphasis on desired evaluation items. This also means that the authorities concerned can still control airline companies through distribution privileges. In this way, supply and demand adjustment has not yet completely been abolished. Free setting of routes and number of flights has not yet been completely implemented.

4.2.4 Passive Attitude toward Development of Secondary Airport

In order to expand airport capacity for a short term, it is essential to maximize utilization of the existing facilities. One of the policies is to use secondary airports in the Tokyo metropolitan area, namely, to share use of military airports and to utilize small airports located in various districts of this large urban area. The experience of leading European and the US LCCs such as Ryanair and Southwest Airlines shows that proactive use of secondary airports plays an important role in the management strategy of the LCCs. In Japan, on the contrary, secondary airports have been seldom used. This is one of the negative factors in the development of LCCs.

The first reason for this is that the difference between primary and secondary airports is small. The second reason is that Japanese aviation policy is focused more on development of scheduled flights or protective measures. There is no governmental policy for general aviation as seen in Europe and the United States. Therefore, Japan has never developed a plan for using secondary airports. As a result, there are only a few secondary airports, and they are small compared to those in Europe and the United States. This becomes a serious bottleneck in promoting competition in the air transport market.

Nevertheless, new construction of airports such as Kobe Airport with a domestic hub as a secondary airport of Itami and Kansai Airports in the Kansai area, which is considered second to the Tokyo metropolitan area in terms of size, as well as Kitakyushu Airport as secondary airport of Fukuoka, Japan's third hub, will contribute to the development of LCCs.

It is highly possible that new airports will be constructed in large urban areas or existing

secondary airports will be utilized. Government policies determine the roles of airports in Okadama, Komaki, and Hiroshimanishi with their respective new airports in the area. Only commuters can use the airports, but there is potential use of small/mid-sized jet airplanes. Also, there is potential use of airports including Okegawa Airport with airport facilities but not accepting scheduled flights, or, military airports such as Yokota, Atsugi, Iruma, and Hyakuri, which are not currently accepting commercial flights. These airports may be used as long as there is no system change. New secondary airports may be built even within the Tokyo metropolitan area, based on the example of the airport built in London Docklands. It is essential to use secondary airports in order to solve the problems of preferential treatment of LCs, aviation policy focused on scheduled flights, and unfair government airport policy. This could lead to the development of LCCs.

It is also to be noted that participation of the local community where the airport is based is an important factor in use of secondary airports. For example, development of Ryanair was boosted by the support of secondary airports used by the company as well as by the local government.

The EU Committee is questioning such support from the point of view that subsidies given to a particular airline company may lead to unfair competition. In Japan, different from Europe where secondary airports have been proactively utilized since World War II, use of secondary airports has been limited as part of governmental policy. When considering the historical background, special measures such as subsidies from the local community for the time being may be an option.

4.3 Problem of Uneven Distribution of Operational Resources (Especially, Maintenance Capability)

4.3.1 Uneven Distribution of Operational Resources and Limited Choice of Self-Management

As mentioned above, the most important resources as essential facility in the case of air transport are arrival and departure slots at the airports. They are not the only resources that are unevenly allocated. Uneven distribution of maintenance capabilities and facilities cannot be neglected.

As was analyzed in Chapter 2, the European and the US air transport markets have a number of flight companies and saw development of the aviation industry (non-scheduled flights or

general aviation) in fields other than scheduled flights. On the other hand, the Japanese commercial airline market has kept governmental policy prioritized in scheduled flights for a long period. Therefore, development of the aviation industry outside of scheduled flights has been delayed. Also, even in the scheduled flight transport market, various management resources including facilities, labor and know-how, are unevenly allocated to the LCs. New entries in Europe and the United States have a larger selection in procuring management resources, except for resources possessed by public institutions such as arrival and departure slots, from bankrupted airlines to non-scheduled airlines and general airlines. Japan is in a totally different environment. With larger choice, mutual competition will be promoted and price will be optimized. Uneven distribution of management resources is disadvantageous to new entrants. Resources such as airport arrival and departure slots, irrigation facilities, airport counters, and labor resources including crew members, flight attendants, mechanics, and ground staff, are unevenly allocated. As a result, management know-how including use of buses within the airport area are also unevenly allocated to LCs.

These problems, including the attitude of the Transportation Ministry as previously mentioned, can be true for new entries in any industry to some extent. Skymark could deal by itself with problem of buses or gates. Uneven distribution of management resources is destiny for new entrants. As challengers, management of LCCs must develop a management strategy to overcome these problems.

4.3.2 Issues in Maintenance Capability

Companies can deal with inadequacies in such areas as human resources or aircraft by themselves to some extent, but not with maintenance facilities and maintenance capability. When Skymark and Air Do entered the domestic market, maintenance service was available only by the three LCs. Therefore, LCCs would not be able to enter the market if they could not outsource maintenance services to the three leading companies.

One possible option is to outsource maintenance services outside of Japan such as to Hong Kong or Singapore, which have excellent maintenance companies and airline companies with maintenance capabilities. This is technically viable. For LCCs with only a few aircraft, however, it is unrealistic to leave the aircraft non-operating for a long period and to send them outside of Japan with fuel for maintenance. In addition, businesses outside of Japan might not be serious about a maintenance contract with an unknown new Japanese airline company. Therefore, as for

maintenance and under circumstances very specific to Japan, some sort of measures such as "warning," which was undertaken by the Fair Trade Commission to LCs in order to protect new entrants at the initial stage are needed.

Such a "warning," however, must be limited to within the initial period of LCCs, based on the fact that Skymark, which entered the market a few years ago, has grown to have its own maintenance capability. After the initial stage, it is desirable to monitor action taken by LCs that accept maintenance to judge if such action will be regarded as unfair competition and to implement countermeasure as necessary.

4.4 Problem of Predatory Pricing

4.4.1 Confusing Predatory Pricing with Fair Price Competition

Traditional competition-inhibition policy still remains and impedes the development of LCCs. Predatory pricing by the LCs is a problem that needs to be addressed as one of the important investigation issues.

It is sometimes said that LCCs in Japan are struggling for development mainly because LCs are trying to shut out LCCs by setting the same low fares. JAL was criticized for this reason when it reduced its fare on a similar route as that of an LCC six months after the LCC entered the market. The Fair Trade Commission made a statement that the commission would watch the market with warning.

The media covered the news when Air Do became affiliated with ANA due to financial trouble by reporting that Air Do went out of business due to lowering of fares by leading airliners or Air Do went out of business because it was bullied by leading companies.

If an LCC exits the market as a result of fair competition and regular price competition, then it is considered to be a normal consequence. It simply means that an inefficient supplier exited the market.

If the leading companies control a non-competitive market, and they compete only against the new companies by setting a differential fare lower than their cost in the market, the fare is regarded to be so-called predatory pricing and causing unfair competition and inappropriate

resource distribution.[6] It is unavoidable for an LCC to exit the market under fair competition. On the other hand, if the LCC exits the market due to predatory pricing by a leading company, this will have a negative impact on public welfare. It is essential to investigate if the price set by an LC is predatory.

4.4.2 History of Initial Fare Competition between LCCs and LCs

If an LC can, with its monopoly power as background, set a predatory price vis-à-vis new companies, it means that LCCs cannot expand their production volume and the existing businesses have monopoly power in a market other than the market entered by the LCC. In the United States, where the domestic routes are completely liberalized, competition exists in the market other than the one with new entry. Therefore, if an LC, which set a predatory price in a particular market, cannot make up the deficit resulting from the particular market in another market, then what happens?. Also, as in the United States, if airline companies can determine entry and number of flights on their own, new entrants can increase production volume to survive with their current routes, and can also add other routes.

In contrast, at the time in Japan when Skymark and Air Do entered the market, the market with no new entry was under supply and demand adjustment regulation. Price competition barely existed. In addition, the LCCs only had three arrival and departure slots each, so they could not expand supply by increasing the number of flights. They did not have room to lower their fares. This led the LCs to set predatory prices.

The details of price competition are as previously described. In summary, to highlight the problems, Skymark and Air Do entered the market in September 1998 with fares that were 50%-60% of those of LCs. JAL first counter-responded in March 1999 by reducing fares of similar routes to half. The mass media strongly criticized this action. The two other leading companies, however, immediately followed suit. As a result of such mutual reactions, approximately three-quarters of the fares of the flights of all of the companies, including routes similar to those of Skymark and Air Do, were lowered to the same level. Under such circumstances, JAL's strategy of reducing airfare to a similar flight's level of LCCs could no longer be regarded as predatory pricing. In fact, the Fair Trade Commission stated that a warning

[6] Predatory pricing refers to the price system in which one uses its superiority in the market structure (such as monopolistic position) by setting high price in a market advantageous to him and low price lower than the cost in a competitive market for the purpose of shutting out competitor. It is prohibited by the Antitrust Law as a kind of "dumping."

would be necessary for JAL when it announced the reduced fare because it had the potential to be unfair competition, but the commission ended up watching the situation.

4.4.3 Definition of Predatory Pricing

Given the above background, it will remain unrealistic to set a predatory price by reducing a fare for a particular flight for the purpose of shutting out new entrants. An LC, however, can still set a predatory price as a result of setting the same low fare for the same route as the LCC's and of increasing fares of other routes. Therefore, predatory pricing will be defined before forecasting future circumstances. Generally speaking, predatory pricing can be defined when the following conditions are both met:

(1) Difference between price in a particular market with competitors and price in the market other than the said market is large.
(2) Monopoly price can be set in another market.

Regarding Condition 1, from the point of view of economics, predatory price can be defined on the basis of whether the unjustifiable difference in price is lower than the individual cost (or average variable cost) or not in the market.[7] If the fare for a particular route exceeds the individual cost of the route, the price can be justified both from management and resource distribution point of view. Needless to say, airline companies set the prevailing fare at a level that exceeds individual cost. Prevailing price of the fare of the LCs are set to approximately 60% of the normal fare. On the other hand, their prevailing price of the fare between Haneda and Fukuoka at the time when Skymark entered was said to be set to the minimum level at which individual cost could be recovered. Therefore, a price of a particular route cannot be defined as predatory unless it becomes less than half.

As for Condition 2, predatory price is determined according to the level of price competition between the LCs on a route with no new entries.

[7] This is known as the AT rule in the US. Individual cost refers to additional cost or avoidable cost incurred only with particular services. Individual cost for a particular route in air transport is not incurred unless this particular flight is being operated. Individual costs include fuel cost, airport fee, aeronautical navigation aid usage fee, and cost related to in-flight services. On the other hand, common expenses include expenses incurred even without operating a flight such as company expense, interests or depreciation cost. In case of a LC such as JAL, personnel cutback cannot be performed easily. Personnel cost is included in common expenses because crew members do not always fly the same route.

4.4.4 Future Fare Competition Perspective and Possibility of Predatory Pricing

The previously mentioned JAL strategy for reducing airfare for flights similar to those of LCCs motivated the other two leading companies to become involved in fare competition, and, as a result, promoted competition among the three leading companies. Route competition with no new entries progressed and discounted fares were applied to other routes. The trend to less discounted fares in exclusive routes is still present, but slow expansion of application of discounted fares was presented by the Fair Trade Commission (2001). Therefore, it is now difficult to set a cheap fare for a route with new entries and make up the deficit by monopolistic excess profit from a route with no new entries. By considering the above-mentioned Condition 1 for predatory pricing, it is not easy for an LC to set a price for a monopolistic route at more than double the fare of a competitive route.

In addition, it is important to note that current restrictions of arrival and departure slots and of number of flights are eased compared to the time when Skymark and Air Do entered the market. Therefore, if competition between LCs continues at the same standard, survival of LCCs might not become a serious problem from the predatory pricing point of view as seen at the time when Skymark and Air Do entered the market. This is the idea presented by Nakajo (2005). According to Nakajo, it cannot be said that the fares set by leading companies were predatory. Therefore, in a competitive air transport market, the possibility of predatory pricing is much lower. Therefore, before-the-fact regulation must not be implemented.

Certainly, it is unrealistic to assert that the bankruptcy of Air Do was caused by bullying of the leading companies by competing low fares, as reported by mass media. If the lowered fares set by LCs cannot be determined as predatory, Air Do's financial trouble must simply be a result of competition, and should not be described as an elimination process due to "bullying." Study of the current status of the air transport market reveals that the problem of predatory pricing must be dealt with by after-the-fact regulation. Implementing asymmetrical regulation by before-the-fact regulation could lead LCCs to depend more on public aid. Therefore, I agree with the idea of dealing with the problem basically not by before-the-fact regulation but with after-the-fact regulation.

I do not agree with Nakajo (2005), however, on the following point. Although the monopolizing powers of LCs are on the wane, there are still considerable numbers of monopolized routes. In

addition, there is a sizable disparity in the financial strength needed to survive price competition between LCCs and LCs. Also, as was covered in this chapter, Japanese LCCs struggle until they grow to a certain size. They are also weak in securing funds. It would incur a loss in the market in the long run if some LCCs quit before constructing their operational ground. Also, as mentioned previously, the fact that the airline market is not necessarily contestable must be taken into consideration.

In conclusion, I support the Fair Trade Commission, when Skynet Asia Airways entered the market, in prohibiting the leading companies to match fares (LCs lowered fares by matching the fares of the LCCs) as before-the-fact regulation. The situation must be in principle be dealt with not by before-the-fact regulation, but by after-the-fact regulation. The effects of long-term competition must be appreciated by restricting the setting of counteractive fares only until a small LCC with small funds grows.

4.5 Capital Market Problems and Dependency of LCCs

The above analysis shows that the situation of LCCs is significantly improved, compared to the situation when Skymark and Air Do entered the market. From this point of view, the reason why Skynet Asia Airways, which entered the market later, was not successful will be discussed here.

4.5.1 Importance of Initial Capitals

Skynet Asia Airways, different from Skymark and Air Do, was not exposed to restrictions in arrival and departure slots. Therefore, the number of flights in Haneda-Miyazaki route was more than those of the two leading companies. Also, the company was not exposed to the threat of predatory pricing thanks to intervention of Fair Trade Commission, which prohibited fare matching by the LCs.

Needless to say, the company could have improved its management performance if it could have reduced cost by using secondary airports or by self-management of maintenance. These were nevertheless not the factors that led the company to go bankrupt. The main reasons for bankruptcy were lack of management ability, high dependence on local government, and lack of funds that could enable it to survive its initial investment cost and deficit for a certain period of time after the start of business.

When Skynet Asia Airways entered the market, Air Do the predecessor had bankrupted, and

Skymark had not recorded a surplus. It was then difficult for the company to emphasize advantages of the industry and to motivate investment to the industry. Skynet Asia Airways could have avoided filing a bankruptcy-reorganization plan if it had attracted more investors that were risk takers. This example indicates that a new entrant needs high fund procurement ability to survive competition for a certain period of time until it settles down in the market. This is more of a problem in management policy of the company, which could not attract investors, as previously mentioned.

In contrast, in some Asian countries, high-risk LCCs are starting business with sufficient funds. To explain, it is typical in Japan that the required amount of funds cannot be procured from general investors. Investors tend to be reluctant to invest in businesses with no performance in the past. The social economic background of Japan in public funds that will be discussed later or foreign capital restrictions that restricts investment from outside of Japan, that is typical in air transportation market, may also contribute to this circumstance.

From a legal perspective, airline companies are allowed to use one-third of foreign capital. However, this does not appeal to foreign capital investors with no management rights with no controlling interest in the company. Improvement in Japanese social economic characteristics counteracting with venture capital and abolishment of foreign capital restrictions will lead to improvement in capital procurement restrictions to a large extent.

4.5.2 Dependence of LCCs on Public Funds

Some point out that Japanese investors' behavior, which is strict on new venture and new entrants' behavior in depending on public resources without taking a risk themselves come from Japan's social economic characteristics. It is true that Skymark survived the market with its uninterrupted business attitude, but Air Do and Skynet Asia Airways, which depended on public subsidies, were not successful. One of the reasons for that is the dependence of companies on public assistance derived from social economic characteristics as well as the attitude of the public sector, which offered them help.

Air Do was a company in Hokkaido, which was supported by local, non-public and powerful human resources. However, after the first president's sudden death, it lost power and became independent of the Prefectural office of Hokkaido. It could even be called a publicly-owned airline. Prefectural subsidies and remedies to Skynet Asia Airways might have caused a negative

impact on the company's competitive spirit.

It is true that Japanese LCCs need public support to some extent and have to survive to be competitive for a long period. Otherwise, the oligopoly by JAL and ANA will continue. It is not this thesis's role to discuss this matter in detail. Here, I would like to simply conclude that companies must be warned with full attention so that they will not be highly dependent on public aid.

4.6 Necessity of Global Airline Industry Liberalization

LCCs in Europe, the United States and Asia (other than Japan) tend to exploit the international market when they do not find sufficient demand in their domestic markets. In Japan, exploiting the international market of LCCs is limited for charter flights. This contributes to its inappropriate route structure. This also partially depends on management decisions and on the difference of degree of freedom in Japan and foreign countries.

The Japanese international aviation policy still has some protectionist aspects,[8] while international aviation has a global and Open Sky trend [have you defined this before?]. The international aviation framework is basically established by bilateral agreements. Japan's bilateral agreements with foreign countries are based on protectionism, except for the one with the US. Although this is not true only for Japan, foreign airline companies cannot commercially operate on domestic routes in another country (prohibition of cabotage). Foreign capital must not exceed one-third of the entire capital.

In the past, when the air transport industry was under low development both on a domestic and in a worldwide scale, the fact that an airline company in one's country was competing in the international market was effective in many aspects such as national prestige, foreign currency acquisition and national defense. However, these aspects can now be seen in a field other than aviation. National defense has in some aspect lost its importance. It is hence desirable to promote and expand competition for improving consumers' profit and for recovering competitiveness of the Japanese air transport industry by placing it in the global competitive environment.

[8] Under bilateral aviation agreements between Japan and another country, in general, the number of routes, flights and airline companies must be the same between the two countries. Airfares need authorization from both countries.

In this sense, current bilateral agreements must be oriented for liberalization. Opportunity of entry into the market must be given to foreign capital airlines. Reform must include no restrictions in the number of entries or number of flights and free fare setting. In the long run, such measures must be led to agreement between multiple countries. This is a measure to be taken by Japan to follow the global Open Sky trend.

In addition, restrictions on foreign capital and cabotage to foreign companies must be abolished so that foreign airline companies and foreign capital can enter the Japanese domestic market. In the era when entry into almost any field including manufacturing industry and service industry to the markets between multiple countries is possible, there is no reason for air transport market to have exceptions in order to protect competition.

Abolishment of foreign capital restrictions and liberalization of international air transport will allow a larger choice of routes by LCCs. Degree of freedom will be increased in business fields such as fund procurement in conjunction with abolishment of foreign capital restrictions. In fact, the result of simulation analysis in Chapter 4 demonstrates that expansion of services to international routes by LCCs is a reasonable option.

3-4 Summary for Simulation Analysis

In this chapter the situation of LCCs in Japan was overviewed. The reasons for their sluggishness were analyzed by exploring these issues: (1) high-cost structure due to small business size and lack of resource procurement ability, (2) intense airfare competition against LCs depending only on lowering fares, (3) unclear customer target, (4) inappropriate route setting, (5) concentration of use of hub airports, (6) inconvenient operations; (7) lack of management policies and corporation identity (CI), and (8) dependence on public funds.

As most of the above problems exist with the management of the LCCs, LCCs can solve these problems if they make efforts to the extent of those made by those LCCs in Europe and in North America.

However, institutional and market structural factors hinder development of the airline companies, and thus corporate efforts alone might not be able to overcome the above problems. The institutional and/or market restrictions that may be inhibiting the development of LCCs

that were studied, comparing the situation in Japan with those in Europe and in North America. Studies have found that, at the time when LCCs started operations, the below institutional factors existed as the remnants of policies that had protected some airline companies for a long time.

(1) The human and material resources for aviation have been unevenly allocated to LCs, which raised the cost of acquiring resources for LCCs compared to that for LCCs in Europe and in North America. In particular, the number of arrival and departure slots at hub airports and the accessibility to the maintenance facilities set strict restrictions for LCCs at the time of entry.
(2) It is difficult to use secondary airports in major cities.
(3) Although LCs did not set fares to prevent new entries, LCCs are still likely to face disadvantages in price competitions against LCs because the domestic competition has not been as active as in the European and in North American markets.
(4) The availability of funds is limited.
(5) Entry to international routes has not been liberalized.

The above restrictions, however, have been mitigated to a larger extent since the time when LCCs first entered the market.

As for the number of arrival and departure slots, the LCCs are now given some prioritized slots, although problems remain concerning the slots in terms of resource distribution in the air transport market. As for the maintenance of airplanes, some LCCs have begun self-management of maintenance. As for predatory pricing, it will not, impede development of LCCs to a large extent, if at all. Problems with other resources are expected to be solved through the efforts of LCCs, although some issues are still under the influence of remnants of aviation policies in the past.
However, development of LCCs may be hindered by the facts that use of secondary airports, selection of routes (including international routes) fund availability are limited. As for predatory pricing, after-the-fact regulation must be applied, but no consideration for counteractive fare is necessary.
In conclusion, it is estimated that LCCs can develop in Japan to the extent of LCCs in Europe, North America, and Asia (except for Japan) under the following conditions: (1) size of operation above a certain level, (2) high productivities that enable low fares, (3) proactive use of secondary airports, (4) choice in the number of flights and the routes (including international

routes), (5) availability of sufficient funds, and (6) differentiation through marketing is realized --and if no market or institutional regulations prohibit the realization of these elements.

Therefore, a simulation will be performed in Chapter 4 for viability of business establishment of the LCCs by using concrete samples of the said airlines that meet the above conditions. What is implied in the simulation result will be compared with the conclusion in Chapter 3 to leads to the final conclusion.

Chapter 4 Simulations for the Successful Establishment Factors for New Low-Cost Carriers (LCCs): Financial Analysis Using Corporate Model and Risk Analysis Using Monte Carlo Method

Introduction

Japanese LCCs are not yet successful compared to North American and European LCCs. In this chapter, factors that interrupt the healthy growth of Japanese LCCs are identified and are analyzed by using successful factors of LCC models of other countries as references. As a result, it comes to a conclusion that if certain conditions are fulfilled, there will be a possible successful establishment of Japanese LCCs, as in North America, Europe, and other Asian countries other than Japan.

In this section, the observations are further examined from the empirical perspective. First, a business model of an LCC is constructed using the success factors and criteria that are identified in the previous chapter Next, the model is verified with corporate simulation models for its validity. Finally, the investigation results of the business model and the results from simulations are combined and examined as successful establishment factors.

One of the significant values of this research is that air transportation business was analyzed for using a business analytical tool. The second value is adding the risk analysis on financial simulations of the corporate model. Most of the previous studies only focus on fixed data. However, new aviation companies such as LCCs have higher risks compared to existing businesses. Therefore, the uncertainty, not just profitability, has to be verified with appropriate methods. In this section, the Monte Carlo simulation is applied for the risk analysis, including the sensitivity analysis for critical indexes of business balances, in order to investigate the possibility of new business conditions from multiple perspectives. The third value is the implementation of comprehensive empirical corporate model simulation after considering the outcomes of business model based on the analysis results in the previous sections. The fourth value is its corporate model. These are the features of the model:

(1) There are many variable numbers that have significant effects over the result for the management of aviation and transportation industry, (2) it is able to calculate the number in the financial sheets and management indexes rerated to consider the risk analysis and profitability,

and (3) it is constructed to assume the result easily because it is corresponding to the variable numbers. The model is very versatile with flexibility to changes in factors and can be translated easily in the use of other industries.

4-1 Assumption of the Business Model

Prior to simulation, this section revisits the strategies of successful overseas LCCs, and further discusses what hypothesis of a business model is used for an assumption of the LCC.

1 Hub Airports

All Japanese LCCs use Haneda Airport as their starting base for deploying routes. In other words, Haneda can be described as their "hub." However, Haneda has very strict arrival and departure slots and will not increase the number of slots dramatically, even after its offshore expansion work is completed. In contrast, as described earlier, Ryanair and easyJet avoid using crowded Heathrow Airport in London. Instead, and they utilize secondary airports such as Stansted Airport and Loughton Airport as main hubs. This business model enables their growth in Europe.

Potential airports that can take over the role of the alternate secondary airports to Haneda Airport in the Tokyo area are the US military airports such as Yokota and Atsugi. However, currently using these airports as alternative airports for Haneda Airport is unrealistic. Hyakuri Airport, a Japanese Self-Defense Force airport, will be converted to a military-civilian airport in the near future. Yet the airport is very far from Tokyo. Considering these conditions, this research assumes the location of the LCC's hub airport to be Kobe Airport. Kobe Airport, established in 2006, is located in the second largest metropolitan area where is Osaka in Japan after Tokyo. And Kobe Airport has already proven its high routes demands in the market.

With a 2,500m runway, Kobe Airport can accommodate mid-distance international flights, including core routes in Asia. Unlike Kansai Airport, Kobe has much better access to the Kansai area; it is only 8km away from Sannomiya Station, a railway station located in the district of Kobe, one of the major cities in the area. The airport's high accessibility to downtown Kobe is attractive to passengers from the western and central parts of the Kansai area. This new airport does not have any vested interests from existing LCs, and is not restricted for available slots and the operating hour regulations for both passenger and cargo operations. Furthermore, the landing

fee of Kobe is much lower than those at Itami and Kansai Airports. The airport usage fee is lower, because Kobe Airport is a Type III airport in Japan, which is a municipal airport for which the usage fees and other rules can be settled individually. What is more, these conditions make Kobe Airport very attractive and competitive for LCC business. By collaborating with airport operators, LCCs may be able to negotiate and settle the cheaper airport usage fees with the airport operators and contribute in the further airport development.

Based on these advantages, this study chooses Kobe Airport as an assumed secondary airport. In the verification processes of using the corporate model in later sections, these are the advantage of Kobe Airport: cheaper airport usage fees than a hub airport like Kansai Airport, and settling the number of flights more freely or flexibly than Itami airport. In addition, LCs have already established their bases and facilities at Kansai Airport and Itami Airport. They do not have any plan or vision to expand their facilities into Kobe Airport due to operational and financial issues. In fact, the JAL group has already withdrawn their business from Kobe. These factors make Kobe Airport more attractive for LCCs to operate as a hub.

2 Route Selections

For the route selections, a typical LCC model operates short- and mid-distance routes from the hub using small aircraft and increases the frequency of its operations.

From Kobe Airport, the LCC can choose two different strategies for the route deployments: the first one is to start with routes of lower demand and then switch the route from a route with lower demand to a route with a higher demand. The second one is to compete against LCs in high-demand routes from the beginning. But the selection of high- or low-demand is a relative issue. For LCCs, it is critical to operate in high-demand routes at higher frequency. Of course, if the hub airport is located in the Tokyo metropolitan area, the low-demand routes there become relatively higher-demand routes in Kobe. And choosing such routes may accommodate the above two strategies together. However, in the case of Kobe Airport as a hub, the size of demand in the Kansai area is dramatically smaller than in the Tokyo area and it is difficult to secure the benefits from choosing relatively smaller routes from Kobe.

Therefore, as a conclusion, the new LCC only has a choice of selecting higher demand, then expanding to lower demand routes, if Kobe Airport is chosen as its hub for route deployment.

If the appropriate high-demand routes are not found in the domestic market, the LCC needs to expand its perspective to international routes as well. Traditionally, Japanese LCCs' routes have been limited to the domestic market; however, many LCCs in North America, Europe and Asia have expanded their routes to the international market. If that is more effective, a new business model based on the assumption of active deployment of the international strategy may become critical. With this assumption, simulations in later sections show the combined results of domestic and international cases.

Additionally, the route selection is structured with direct routes (point-to-point) only and excluding connecting routes, in order to save marketing and station costs. Skymark, as described in the earlier analysis, suffered from the inefficiency of expensive marketing and station costs at the time of its foundation. This occurred due to the restrictions that forced the company to have multiple stations despite its small operations. From the above, the new LCC in this study limits its route selection to direct flight only.

3 Target Customers, Operations, and Aircraft Type

When considering the high-demand routes from Kobe Airport, short- and mid-distance routes become the core. In addition, for the same reason, the customer strategy should focus on business passengers as a main target. Thus, two conditions need to be considered. First, the critical decision factor for business customers who use short- and mid-distance flights is the highly frequent operations. Secondly, as described in the Chapters 1 and 2, a large number of successful LCCs operate smaller aircraft with high frequency than larger aircraft. Adding the estimated demand size of relatively high-demands flight routes from Kobe on the above, deploying 100–150 seats aircraft with high frequency operations is the appropriate selection.
After examining these conditions, a 150-seat Boeing 737 aircraft is selected for the business model.

4 Airfare

Most of LCCs in North America and Europe offer low airfare by taking advantage of low operation cost. In this study, the new LCC targets on businessmen who travel frequently and offers low airfare based on the low cost operations. Based on the analysis result of the previous section, it is

clear that LCCs need to set the airfare around 60% of LCs' normal fare. If the airfare goes below 60%, it is obvious that the fare goes below the profitable level. This is applicable for both LC and LCC cases. As for new entries to the market, the goal is to go under 60% of the normal fare and strive to save the costs. Compared to the less competitive local routes, LCCs intend to maintain the airfare at the level of 50%. In addition, these high-demand major routes tend to have lower unit costs compared to those of local routes.

To set up an appropriate international airfare, a new Japanese LCC has to consider not just domestic LCs as its competitors but also more competitive foreign carriers. The price is a key point for the business model to be set up at the same level: the so-called "cheap airfare," which is a 40-50% discount of IATA's normal airfare, in order to maintain its profit at the feasible level. With these assumptions, this is the basic strategy that LCCs use for an approximately 40% discount for the small-demand and 50% discount for the high-demand, feasible routes. This study settles the LCCs' airfare discount rate at 50% and 62% for the LCs' normal fare. The 62% rate is chosen to match up the LCs' online discount sales, while travel agencies offer cheaper airfare package rates for consumers, even though the LCCs are able to offer maximum 50% of the normal airfare. Furthermore, offering the same rate makes LCCs' rate structure clear and attractive. This approach makes LCCs' flights almost full from their launch, and continues to maintain a consistent demand curve.

5 Composition of Aircraft and Operation Rate

Low cost must be achieved, if low airfare is a competitive element while maintaining high-frequency operations by smaller aircraft. The LCC in this model utilizes the below measures for the realization of low cost.

First, it is a common sense in the aviation industry that the use of a single type of aircraft model directly relates to cost reduction. Successful LCCs emphasize the cost reduction. Since this concept is a common factor of successful LCCs, adopting "use of single type of aircraft" for saving training and maintenance cost is an essential part of business model. Because of the night-shift operations restriction at local airports in Japan, the aircraft operation rate cannot be higher than that of European and North American LCCs. Practically, Japanese LCCs' operation rate is not much higher than that of LCs. Therefore, it is proper to settle 8 hours of operations per day, which are slightly longer operation hours than the LCs'.

6 Sales Cost and In-Flight Service Cost

Adopting the sales methods used by successful LCCs, such as Southwest Airlines in the earlier analysis, increased use of IT-based ticket sales ratio is emphasized. To apply this, the handling fee may be 5% of its passenger sales which is lower than that of LCs. In regard of the in-flight service, traditional LCCs offer no-frills service, and relatively short-distance flights from Kobe Airport do not need to offer high value-added services. Thus, the new LCC starts with simple and inexpensive no-frills service at the cost of 100 JPY per passenger.

7 Personnel Cost and Maintenance Cost

Next, it is a critical challenge for LCCs to increase the productivity of pilots and cabin attendants, while reducing personnel cost. As described earlier, the study has to consider that the aircraft operations rates cannot be kept higher, and thus personnel operations rate remains restricted in Japan. Meanwhile, the labor productivity and personnel cost are interdependent, so it is easier to calculate one number if the other one is fixed.

In this business model, the productivity is fixed at the same level of LCs, while personnel cost is set at similar level of existing LCC level (15M JPY for pilots and 3.5M JPY for CAs), which is much lower compare to LCs.

Training of pilots and maintenance capabilities are unevenly distributed to LCs. This is the main factor that Japanese LCCs, Skymark and Air Do, struggled with their in business management.

Considering the above, for the long-term cost savings, pilots' training ought to be implemented within its own company. Of course, at the early stages, hiring retired, experienced pilots and foreign pilots who do not require basic training is a necessary step to learn the methods and develop the company's own training system. However, house-trained personnel data is used in the simulation to avoid confusion. With the limited number of aircraft types and route selections, the internal training cost is considered much lower compared those of to LCs. The set training cost for an LCC pilot for this simulation is 50 million JPY, using data extracted from existing temp services and other LCCs.

Prior analyses used the assumption on maintenance cost from large-sized LC data, such as that from Japan Airline companies and All Nippon Airways' maintenance expenses. But the actual cost to LCCs is much higher than the ones for LCs, since LCCs are outsourcing maintenance services to LCs' facilities with special prices. This exceeds the assumption of the financial simulation in the past.

Meanwhile, maintenance repair and overhaul facilities (MRO) have become popular in Asian countries, thus lowering the overall maintenance cost. This co-founded outsource concept is going to be adopted by Japanese LCCs' effort in the future. This simulation uses the same cost level as LCs' maintenance cost.

8 Operations Size at Launch and Financing

Both Air Do and Skymark started their business with just one aircraft. But, as analyzed in Chapter 3, an airline may continue growing its business until the new entry in the aviation industry reaches a certain size of operations. Therefore, it is desirable to start relatively larger-size operations that cover the scope of demands. It is also difficult to prepare a large number of aircraft from the establishment of operations. With the available fund of 9.5 billion JPY as a realistic restriction, 15 aircraft is the maximum size to start.

For this simulation, the above realistic number is applied for the business model: a 9.5 billion JPY fund with 15 aircraft. Furthermore, a certain number of passengers has to be obtained to maintain this operation size. This means that the LCC has to deploy the operations with a certain number of routes. With a 15-aircraft fleet, the LCC needs to operate 14 routes at once to fulfill this requirement. Even at the initial preparation stage of the simulation, the provisional calculation obviously shows that operating only few routes cannot reach the profitable goals.

On the other hand, even if the LCC starts a small fleet such as 4-5 aircraft, a large amount of funding is required at the launch. JetBlue Airways started with $160 million of the initial funding and succeeded in its business, while SkyNet Asia Airline companies struggled with a fund shortage. Therefore, one of the key success factors for a LCC is obtaining an enormous fund at the foundation of business.

In this study, the simulation indicates the required cost of launching a new LCC is approximately

9.5 billion JPY. This amount, analyzed in Chapters 2 and 3, is the least amount for running a business; both Skymark and Air Do started business with 3 to 3.5 billion JPY initial funds and struggled with financial management later.

To summarize the business model of the assumed LCC above, the requirements include securing an ample initial fund, utilizing Kobe Airport, a secondary airport of the metropolitan area as a hub, deploying mid-distance point-to-point services radially from the hub, focusing on no-frills services on smaller aircraft with high frequency, as an airline company of high productivity and low cost. In addition, this LCC has an innovative vision to expand its business to international and air cargo segments with freer and more flexible route selections.

The next section is about the successful establishment condition for the new LCCs based on the sample business models above. Furthermore, the hypothesis will be proven by simulation analysis of the corporate model, putting the numbers and substituting the cases with more realistic input values that are applied to the corporate model.

Yet a number of restrictions and regulations exist in the Japanese aviation industry. In order to optimize the simulation result, some of the conditions are reflected for that purpose. For example, highly-regulated and crowded Haneda Airport is replaced with Kobe Airport.

However, within the restrictions on policies and market structures, LCs' aggressive discount rate is not included in the condition. This is based on the result of the analysis in Chapter 3, that LCCs can survive with offering around 60%-level of LCs' normal airfare. But the assumption of such aggressive price offering from LCs is not realistic. Regarding bilateral agreements on international flights from Kobe Airport and the difficulty of raising funds, the simulation of the condition of these will be improved. These issues related to the market structure and aviation policies are discussed after the simulation results are drawn.

4-2 Structuring of Corporate Model, Case of Simulation and Input Data

In Section 1, a corporate model is structured in line with the business model in the previous section. The structure of a corporate model, calculation process and classification of input data and factors are explained. In Section 2, details of input data and factors are explained.

1 Structure of Corporate Model, Calculation Process and Classification of Input Data

1.1 Structure of Model

A calculation flow chart of corporate model is shown in Figure 4-1. Main input data, calculation formula and calculation results are indicated in the following three categorized sheets of Excel.

(1) COST sheet

Fundamental data such as exchange rate is in this sheet. Cost is calculated and results are indicated.

(2) DEMAND sheet

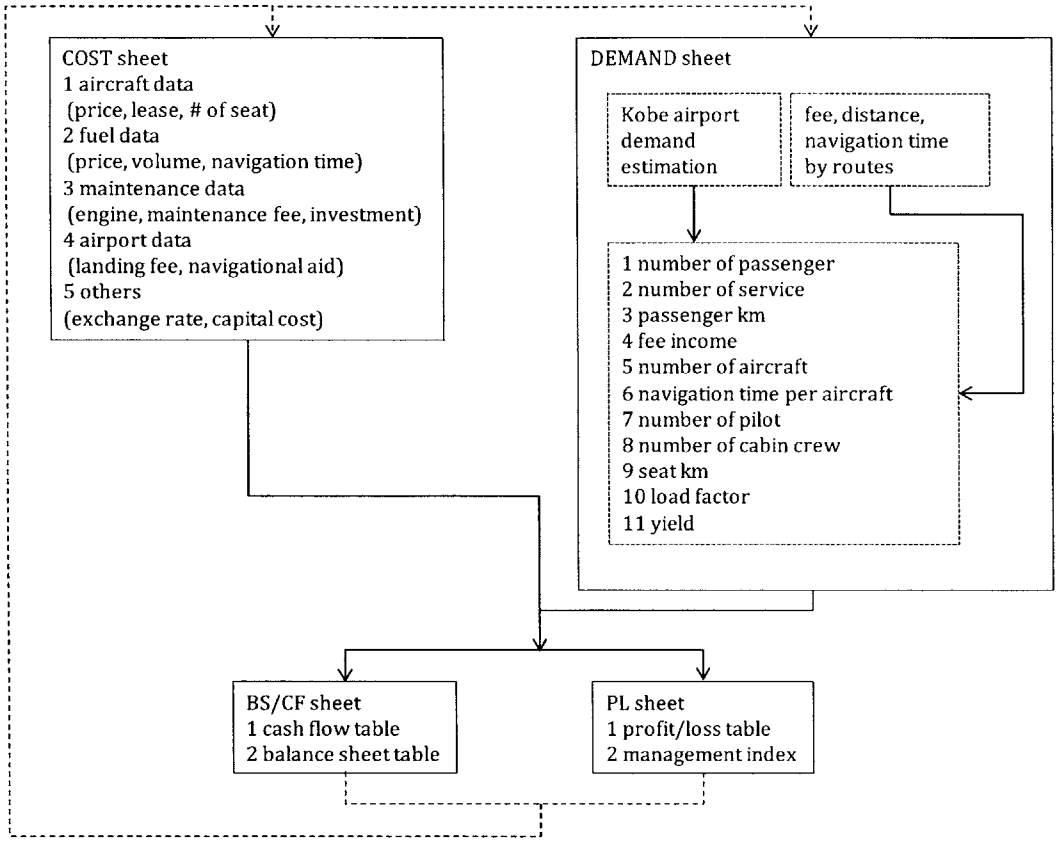
According to airfare, distance of routes, aircraft operation house and demand (number of passengers), routes are mentioned. Based on data related to demands, such as the number of passengers by routes, the number of service by routes, Revenue Passenger Kilometer (RPK) by routes, Available Seat kilometer (ASK) by routes, income by routes, the necessarily number of aircraft and cabin crews, load factor and yield, calculation for demand, are implemented.

(3) BS, PL and CF sheet

Based on calculation results of COST and DEMAND sheets, balance sheet (BS), profit and loss (PL) and cash flow (CF) are calculated. Also, primary management index is calculated and indicated in this sheet.

If one of the variables for input conditions is changed, the data related to financial statement and/or management index is changed accordingly.

Figure 4-1 Structure of Corporate Model and Calculation process



1.2 Categorization of Input Data and Definition of "Base Value"

Input data and result data are shown in Figure 4-2. Detailed explanation of the data will be discussed in the next section. In this section, a general categorization of data and "base value" is explained. "Base value" is provided for efficient simulation. Input data of the beginning step of calculation is summarized in the four following categories.

(1) Fixed input data

1) Data (ex. airport cost, fuel cost, exchange rate)

The value of data is fixed exogenously and unambiguously.

2) Data (ex. airport and aircraft to be used)

The value of data is fixed unambiguously and completely based on results of the study of the business model in previous section. No other choice is taken into consideration (i.e., sample airports or sample aircraft).

The reason the value of these input data is fixed is described in the explanation of business model

in the previous section and the next subsection. In addition, a part of fixed input data above will be treated as probability distribution data for calculation in Section 4 although these are still fixed data for the risk analysis calculation in Section 3. The author will describe which types of data are used for probability distribution in Section 4.

Figure 4-2 Input Data and Result Data List

Figure 4-2-1 Data Relating to Aircraft

Price (USD)	Maximum takeoff weight (t)	Number of seat (seat)	Property tax rate (%)
Insurance (%)	Lease cost (JPY/month/unit)		

Figure 4-2-2 Data Relating to Fuel

Unit price (USD/gallon)	Fuel consumption per flight hour (kl/hour)	Fuel tax (JPY/kl)	Unit price of oil (JPY/kl)
Oil consumption per flight time (kl/hour)			

Figure 4-2-3 Data Relating to Maintenance

Maintenance cost per navigation time (JPY/hour)	Periodical inspection cost (JPY/year/plane)	Investment to maintenance facility (JPY)	Cost of component (JPY/year/plane)

Figure 4-2-4 Data Relating to Airport

Landing cost for domestic airport (JPY/time)	Exceptional landing cost for Okinawa airport (JPY/time)	Landing cost for Taipei airport (Taiwan dollar/time)	Landing cost for Inchon airport (Won/time)
Landing cost for Pusan airport (Won/time)	Landing cost for Hong Kong airport (HKD/time)	Landing cost for Chinese airport (USD/time)	Control tower cost for Chinese airport (USD/time)
Domestic aviation support facility (JPY/time)	Control tower cost for Japanese airport (JPY/time)	Control tower cost for Korean airport (Won/time)	Control tower cost for Taiwan airport (Taiwan dollar/time)
Domestic airfield parking cost (JPY/day/plane)	Outsourcing cost of Kobe Airport (JPY/month)	Outsourcing cost for other airport (JPY/month)	Hong Kong airfield parking cost (HKD/time)
Ground rent of Kobe Airport (JPY/month)	Ground rent of other airport (JPY/month)	Number of staff for Kobe Airport (person)	Number of staff for other airport (person)

Figure 4-2-5 Data Relating to Personnel Cost (Except Pilot and Cabin Crew)

Number of officers (person)	Personnel cost for officers (JPY/year)	Personnel cost for general staffs (JPY/year)

Figure 4-2-6 Data Relating to Navigation

Normal passenger airfare of major airline company by routes (JPY)	Distance by routes (km)	Navigation duration time by routes (minute)	Aircraft navigation hour (hour/day/plane)
Periodic training cost for pilot (JPY/person)			

Figure 4-2-7 Others

Rate of administration cost (%)	Rate of sales charge (%)	Owned capital cost (%)	Initial investment cost (JPY)

Figure 4-2-8 Exchange Rate

China (JPY/USD)	Korea (JPY/Won)	Taiwan (JPY/Taiwan dollar)	Hong Kong (JPY/HKD)
United States (JPY/USD)			

(2) Variable and decidable (by management) input data

1) Data (ex. capital amount, receiving rate)

It is easy to guess the level of data determined by minimum conditions leading a company to be in the black and by common and reasonable judgments according to result of study of the business model in the previous section. But, as a confirmation, an alternative case and simulation are conducted.

2) Data (ex. Operation routes, level of airfare, operation with or without cargo)

Even though the level of data determined by minimum conditions of moving into the black and by common and reasonable judgments according to result of the study of the business model are examined in the previous section, it is still important to compare the date within a certain range. Some patterns of data are prepared as input.

According to the data categorized as (2) above, the author conducted a large number of combinations of calculations by assuming various values and patterns including useless cases at the preparation level or at the beginning stages of calculation. However, if the overall results are mentioned here in this thesis, it may look very complicated and difficult to comprehend the indication. Therefore, in this thesis, passengers' demand and discount rate of airfare will be the focus of the discussion.

In the following subsection, the definition of conditions for input variables, and calculation process and results on the way of calculation will be described.

Figure 4-2-9 Variable and Decidable Input Data for Management

Authorized capital (JPY)	Discount rate of domestic airfare (%)	Discount rate of international airfare (%)	Initial training cost for pilot (JPY/person)
Personnel cost for pilot (JPY/year/person)	Personnel cost for cabin crew (JPY/year/person)	In-flight service cost (JPY/person)	Airfare receiving rate (%)

In this simulation, discount rate of both domestic and international airfare among above data is considered as variable for case study. Other data is set as fixed for the simulation.

(3) Output Data as Calculation Results

Figure 4-2-10 shows a part of output data (data related to flight operation) from a calculation by using a corporate model. Among a variety of types of data, total yield per year and available seat kilometer (ASK) are the most important indexes to manage in the airline business. Moreover, 90 items of calculation results are indicated on the Excel sheet, including the data shown in Figure 4-2-10. Calculation items and results of financial terms are described in detail in Section 3.

Figure 4-2-10 Output Data of Calculation

Passenger kilometer by routes and by year (passenger km)	Number of flight by routes and by year (roundtrip/day)	Number of aircraft by year (plane)	Flight duration by routes and by year (hour)
Annual number of pilots needed (person)	Annual number of cabin crews needed (person)	Passenger airfare income by routes and by year (JPY)	The number of seats provided by routes and by year (seat)
Domestic yield by year (JPY)	International yield by year (JPY)	Total yield by year (JPY)	Available seat kilometer (JPY)
Cost per passenger kilometer (JPY)	The number of staffs by year (person)	Sales charge (JPY)	

In addition to the above, a corporate model can provide output data of financial statement and principal management indexes.

2 Detail Explanation of Simulation Case and Input Data

In this section, the simulation case and input data using for a corporate model are discussed.

2.1 Operation Route

Kobe Airport is selected as a hub airport. The route structure is the radiating networks from Kobe Airport. Both domestic and international flights are operated simultaneously. When Kobe Airport is considered as a hub airport, a large demand, which can be customers for the new LCCs, exists in each route from Kobe Airport. Especially, for the demand on the international routes, the LCCs should not promote their sales and marketing like major LCs. There is more space to be profitable for LCCs to promote their business and cultivate customer via a web-based online sales system.

Currently, according to the conclusion of bilateral aviation agreements, although other countries request Japan to increase the number of flights, the Japanese side cannot comply with the request. Therefore, a chronic situation of excessive demand continues, and Japanese airline companies are able to sell their air tickets at high fares. If the new LCCs' operation network is constructed only inside Japan, the new LCCs does not compete with major airline companies because they may be able to issue a large number of cheaper airline tickets. Whereas, by constructing both domestic and international flights, the gateway function of Kobe Airport can be enhanced and foreign passengers can reach final destinations via Kobe Airport. Considering a trend of passengers from Korea, Taiwan and China, it can be expected that the number of passengers or aircraft using Kobe Airport, which is more convenient to transfer to the next destination rather than other airports (Narita or Kansai), will increase if the airlines provide appropriate information on the Website.

As a result, LCCs can attract customers away from major airline companies. Operation routes are selected based on the large number of passengers. Figure 4-3 shows the number of passengers in current aviation market. According to Figure 4-3, operation routes for this study are selected as shown in Figure 4-4.

In this study, as explained above, the reason the new LCC has operated both domestic and international routes since the first year is that it is necessary to have a certain size of business (at least 3 or 4 routes). A provisional simulation analysis indicates that only one route is not

enough for operation of the new LCC. Furthermore, discussion of the number of aircraft in a later subsection also shows that 1- to 2-route operation is not sufficient to stabilize its business.

Figure 4-3 The Number of Passengers by Major Operation Route

Route	The number of passengers (thousand person)
Haneda (Tokyo area - 3 airports in Kansai)	6,818
Shin-Chitose (Sapporo - 3 airports in the Kansai area)	2,041
Fukuoka (Fukuoka area – 2 airports in the Kansai area)	920
Naha (Naha – 2 airports in the Kansai area)	1,559
Kagoshima (Kagoshima – Itami)	891
Miyazaki (Miyazaki – Itami)	551
Kumamoto (Kumamoto – Itami)	524
Sendai (Sendai – Itami)	921
Nagasaki (Nagasaki – Itami)	368

Figure 4-4 List of Operation Routes Considered

Domestic			
Kobe – Haneda	Kobe – Shin Chitose	Kobe - Sendai	Kobe - Fukuoka
Kobe – Naha	Kobe - Kagoshima	Kobe - Miyazaki	Kobe - Kumamoto
International			
Kobe – Seoul	Kobe - Shanghai	Kobe - Beijing	Kobe – Hong Kong
Kobe – Taipei	Kobe – Pusan		

2.2 Figures Related to Cost

(1) Aircraft

In this study, Boeing 737 is assumed to be introduced to the new LCC's business. Usually, the LCC uses Airbus 320 in many cases because its aircraft have the same specification of cockpit and common parts. In Japan, however, many airline companies have introduced Boeing, in accordance with a plan of the Ministry of Economy, Trade and Industry.

The LCC, in this study, does not provide cargo services because existing major airline companies have already provided the services without any problems. Since handling of cargo is unnecessary,

it is better to introduce Boeing 737 aircraft without Unit Load Device (ULD). Therefore, in terms of efficiency of maintenance service, it is advantageous and rational to introduce Boeing 737.

The price and main specifications of Boeing 737-800 are shown in Figure 4-5. In case of procurement of aircraft, the assumption is set at the straight-line method with 17 years and 10% of residual value regarding depreciation of aircraft. The annual property tax rate is assumed as 1.4% of procurement price. In case of leasing aircraft, the author assumes that leasing cost (operational lease) per month is 0.9% of the price of procurement.

Figure 4-5 Cost Data of Aircraft

Price of aircraft (million USD)	43
Price of aircraft by JPY (million JPY)	3780
Maximum takeoff weight (t)	63
The number of seats (seat)	150
Annual lease cost (million JPY)	408
Annual depreciation cost (million JPY)	200
Aircraft property tax rate (%)	1.4
Aircraft insurance rate (%)	1.14

(2) Fuel Cost

According to various reports regarding fuel consumption of Boeing 737s, it is assumed that the average fuel consumption per hour is 2.31 kiloliters. Fuel price is US$94 per barrel. Fuel cost is calculated by the following equation:

Fuel cost = operation hour x fuel consumption rate x fuel price.

Additionally, a tax of 26,000 JPY for domestic flight is imposed on fuel cost. Data of fuel and oil are listed in Figure 4-6.

Figure 4-6 Data of Fuel and Oil

1 barrel = 42 gallon (USD)	94
1 barrel = 42 gallon (JPY)	8,460
Fuel price (JPY/kl)	53,200
Oil price (JPY/kl)	3,000
Fuel tax (JPY/kl)	26,000
Consumption of fuel (kl/hour/plane)	2.31
Consumption of oil (kl/hour/engine)	0.5
Consumption of oil (kl/hour/plane)	1.0
Fuel and oil cost for domestic flight (JPY/hour)	189,898
Fuel and oil cost for international flight (JPY/hour)	122,908

(3) Maintenance cost

Maintenance cost of aircraft has commonly been estimated by referring to the data of major airline companies (i.e. JAL and ANA). However, in the actual cases of LCCs, a large number tend to spend a tremendous amount of money for fuel, which is comparatively higher than the estimation. It could say that this huge aircraft maintenance cost is an obstacle for many LCCs to sustain their business. Thus, one of the keys for the sustainable development of LCCs is to reduce the fuel cost.

Recently, there is a growing movement to establish a Maintenance, Repair and Overhaul (MRO) service company in Japan. It seems like it may happen in the near future. If so, it will be a significant reduction of aircraft maintenance costs for all the airline companies and a benefit for the middle and small companies to create more jobs in Japan as well. It is assumed that maintenance cost will be reduced by outsourcing of maintenance service to MROs anywhere in Japan because:

- By using only a single type of aircraft, the maintenance procedure will be simplified and standard parts can be procured in a bulk. It is possible to obtain Parts Manufacturer Approval (PMA) parts at bargain prices.
- Personnel cost of MRO service company will be more competitive than those of major airline companies.
- MRO service companies can provide onboard maintenance which is not provided by major airline companies at this stage.

Maintenance cost per aircraft is shown in Figure 4-7.

Figure 4-7 Maintenance Cost

Engine Overhaul cost (JPY/hour)	18,571
Aircraft Overhaul cost (JPY/hour)	8,333
Duration inspection maintenance cost (JPY/hour)	10,000
Periodic inspection cost (million JPY/year/aircraft)	10
Cost of components (million JPY/year/aircraft)	20

(4) Airport Cost

Landing cost and airfield parking cost for Boeing 737s based on maximum takeoff weight are shown in Figure 4-8. Cost for aviation support facility is shown in Figure 4-9.

Figure 4-8 Airport Landing Cost and Parking Cost (JPY/flight)

Japan	Domestic Naha	78,866
	Domestic Others	94,640
	International	83,000
	Parking cost for Kobe Airport (JPY/day)	5,040
Korea	Incheon	36,900
	Pusan	21,482
Taiwan	Taipei	28,099
China	Hong Kong	56,762
	International	60,750

Figure 4-9 Cost for Aviation Support Facility (JPY/flight)

Japan	Kobe – Shin Chitose	105,210
	Kobe – Naha	26,302
	Kobe - Other airport	74,340
	International	180,000
Other routes		74,340

Regarding other costs, rental cost of Kobe Airport is set to be 1 million JPY per month and outsourcing cost for Kobe Airport is set to be 20 million JPY and that for other airport is set to be 2 million JPY.

(5) Marketing Cost and In-flight Service Cost

Marketing cost including selling charge for agents and call centers cost is assumed to be 5% of passenger revenue. In-flight service cost means cost of beverage, newspapers and magazines. Also, considering that traditional LCCs offer no-frills service, in-flight service cost is assumed to be 100 JPY per passenger in this study.

(6) Personnel Cost

Personnel cost (million JPY per person per year) by occupation is assumed as follows:

Board member	20
Ground worker	5
Pilot	15
Cabin crew	3.5
Training cost for pilot	50

(7) Capital

According to previous failures of LCC businesses in the past, it is desirable to start an LCC business with sufficient funds. Then, the LCC will be established with 9.5 billion JPY in capital.

(8) Other conditions

Other input conditions are set as follows:

Dividend rate 10%

Initial expenses2 billion JPY

Corporate tax rate 35%

And, exchange rate is shown in Figure 4-10.

Figure 4-10 Exchange Rate (JPY/each currency)

USD	90	Hong Kong dollar	7.7993
Chinese RMB	8.277	Korean Won	0.126
Taiwan dollar	3.48		

2.3 Data Relating to Demand

(1) Airfare receiving rate, passenger airfare level, discount rate of airfare

It is possible to obtain data related to existing operation routes from the Kansai area (Itami airport and Kansai Airport). Based on such data, the author selected the candidate of operation routes, and estimated the divided numbers of passengers. Then, the author estimated the share of the new LCC.

First, the number of passengers for each route from Kansai area (Itami and Kansai Airport) was researched based on information from the Ministry of Land, Infrastructure, Transport and Tourism (MLIT). The selected routes have more than 700,000 passengers and more than 500 km route distance as candidates.

Second, based on the empirical assumptions, the number of domestic passengers for each zone is strongly correlated with the population of each zone and the amount of whole sales of tickets. The number of domestic passengers is estimated by the following equation. After that, the number of domestic passengers from Kobe Airport including the numbers by each route is estimated.

The Kansai area consists of six prefectures (Shiga, Kyoto, Osaka, Nara, Wakayama and Hyogo) and is distributed to the zone by each city as basic unit. The area of influence of Kobe Airport is the entire Hyogo prefecture excluding Itami city, Amagasaki city and Takarazuka city. In addition, since the number of arrivals and departures of Itami airport is limited to 200 flights per day, excess of the limit of Itami airport is included in the number of passengers of Kobe Airport.

$$Y_i = 0.5P_i + 0.5W_i$$

i zone (i=1 to n) (n is the number of zones for whole Kansai area)

Y_i the number of passengers of arrival and departure in zone of i

P_i the population in zone of i

W_i sales amount of whole in zone of i

As a result, the share of domestic routes of Kobe Airport is estimated to be 35% of the Kansai area.

Finally, the author discusses the share of the new LCC. As defined in previous section, (1) the airfare of the new LCC is on the lower level compared with other major airline companies and

LCCs such as Skymark, and (2) it is difficult to follow the low price of major airline companies and other LCCs, due to intense scrutiny from the Fair Trade Commission as well as the progress of competition in the domestic aviation market. Therefore, the new LCC can be estimated to occupy one-third of demands even if the other two major airline companies enter the market. According to the above, it is estimated that the share of major routes is 30% and the share of local routes is 40%, because it is difficult for major airline companies to enter the local routes. The share rate of Haneda route is estimated to be 10%.

On the other hand, the international route is selected in accordance with the process as follows. Since there is no public information related to the number of passengers of Kansai Airport by route, the author focuses on existing airline companies which operate five flights per day to nearby Asian cities, and estimates the number of available seats based on the number of flights and aircraft type. Then, the author estimates the number of passengers and selected candidate operation route (i.e., the route to Pusan becomes a candidate because many Korean residents live in the Kansai area). After estimation of share for the new LCC, the author selected the routes which can be expected to achieve more than 55% of load factor even if it is only one flight per day. Secondly, 40% share of Kobe Airport is estimated on the condition of sharing routes with Kobe Airport and 35% share of domestic routes. Finally, the author estimates the share of the new LCC. As discussed in the previous section, international airfare of the new LCC is expected to be at the competitive level against other foreign airline companies or discounted tickets. Considering the entry of foreign companies and two additional Japanese major airline companies, it is expected the new LCC can gain 20% of its share at least.

Taking into consideration the discussion above, data is summarized in Figure 4-11 and 4-12.

Figure 4-11 Distance, Duration and Airfare for Domestic Flight

Route	Distance (km)	Duration (minute)	Basic airfare (JPY)
Kobe-Haneda	514	65	16200
Kobe-ShinChitose	1235	105	30500
Kobe-Fukuoka	535	70	15850
Kobe-Naha	1370	125	24800
Kobe-Kagoshima	613	70	19650
Kobe-Miyazaki	544	65	17400
Kobe-Kumamoto	540	60	17400
Kobe-Sendai	716	55	14400

Figure 4-12 Distance, Duration and Airfare for International Fight

Route	Distance (km)	Duration (minute)	Basic airfare (JPY)
Kobe-Seoul	979	115	52000
Kobe-Shanghai	1600	150	78000
Kobe-Beijing	2027	210	106000
Kobe-Hong Kong	2868	255	91000
Kobe-Taipei	1968	180	87000
Kobe-Pusan	657	95	46000

In this study, discount rate of airfare is focused on and two case studies are conducted as shown in Figure 4-13.

Figure 4-13 Case Study

Case No.	Routes composition	Discount rate of airfare
1	Domestic and international	38.3%
2	Domestic and international	50.0%

(2) The number of passengers by route

In Japan, the number of passengers is assumed unchangeable and this phenomenon is based on special conditions of Japan. One of the major reasons is that there is no margin in slots at main airports, such as Haneda, Narita, Itami, Fukuoka, Shin-Chitose, Naha, and Kobe. Therefore, the

volume of service cannot be increased. Moreover, another reason shows that the current situation is hardly ever changed due to high load factor since LCCs are popular among individual customers. Thus, in this simulation study, the author decided to contain the uncertainties such as events or annual climate conditions, and carry out simulations without considering the growth rate.

Figure 4-14 The Number of Landing by Route of Kobe Airport

	ANA	SNA	ADO	SKY
Haneda	2	-	-	5
Ibaraki	-	-	-	2
Shin-Chitose	2 (3)	-	2	2
Naha	-	3	-	3
Sendai	-	-	-	NA
Matsuyama	-	-	-	NA
Nagasaki	-	-	-	4
Kagoshima	-	NA	-	2

On the service track record of LCCs in the past, no vacancy continues from the time the service started, and there is almost no change after that. Therefore, in this analysis, after planning the number of flights by routes, the demand of passengers is estimated by a calculation formula. Load factor and operation rate are estimated as 77% and 98%, respectively. The number of passenger demand is calculated by the following equation:

No. of flights per day x no. of seat x load factor x 365 x operation rate

Therefore, planned number of passengers becomes as follows with the number of flights per day. It is a marketing strategy of LCCs to just secure the number of customers corresponding to the number of flights and seats supplied for each route. The actual LCC tends to conduct the service like this proactively.

Figure 4-15 Passenger Demand to be Calculated

The number of flight a day	The number of passenger a year (person)
2	83,000
4	166,000
6	249,000
8	332,000
10	415,000
12	498,000
14	581,000
16	664,000
18	747,000

Based on the formula above and Figure 4-15, passenger demand which should be acquired is calculated in the following Figure 4-16. The domestic route of Kobe-Haneda is the largest one compared with other routes, and the passenger demand is 747,000 passengers. The passenger demand for each route is similar to actual data in 2013.

Figure 4-16 Passenger Demand by Domestic Routes

Route	Flight per day (flight)	Passenger Demand (passenger)	Actual data in 2013 (passenger)
Kobe-Haneda	18	747,000	765,000
Kobe-ShinChitose	8	332,000	317,000
Kobe-Fukuoka	6	249,000	240,000
Kobe-Naha	6	249,000	251,000
Kobe-Kagoshima	4	166,000	188,000
Kobe-Miyazaki	4	166,000	125,000
Kobe-Kumamoto	4	166,000	128,000
Kobe-Sendai	6	249,000	214,000

In the same way, Figure 4-17 shows passenger demand for each international route which is calculated by the formula described above. For example, if the flight number of Kobe-Seoul route is set up as six flights per day, the number of passenger demand is calculated by the formula as

249,000 passengers.

Figure 4-17 Passenger Demand by International Routes

Route	Flight per day (flight)	Passenger Demand (passenger)	Actual data in 2013 (passenger)
Kobe-Seoul	6	249,000	251,000
Kobe-Shanghai	4	166,000	155,000
Kobe-Beijing	4	166,000	135,000
Kobe-Hong Kong	4	166,000	161,000
Kobe-Taipei	4	166,000	160,000
Kobe-Pusan	2	83,000	73,000

The former LCCs sought a scheme to establish a network and increase flights if the demand increased. At the stage of holding smaller numbers of aircraft, if an LCC added one aircraft in its operation, it needed to increase five round-trip flights at once. It tended to be an excessive investment because there was no heavy demand.

In this analysis, the new LCC does not apply for the strategy to increase flights with following the flexibility of demands, because an LCC operates only routes of large demand passengers. There is no surplus of slots in the airports, and increasing the number of flights does not become a reality if Civil Aviation Bureau (CAB) does not instruct a reallocation of slots. In addition, in the slightly large demand routes, attribution of passengers whom LCCs ought to acquire is limited and it impossible to change the competitive situation with existing airline companies.

Travelers in Japan, in general, are not good at planning travels and reserving air tickets and accommodation. Most of them are more likely to participate in package tours called "inclusive tour charter (ITC)" conducted by travel agencies or group tours conducted by companies or associations. If the new LCC desires to acquire these passengers, it is necessary to own larger aircraft and have a strong sales structure.

The basic strategy of LCCs is to support individual travelers, and not focus on a group of passengers. Therefore, they need to be cautious in expanding flights. According to the results of the financial simulation, cumulative ordinary profit for ten years is a useful index to make a decision about expansion of new routes and increase of the number of flights. It is appropriate to

make a decision when the LCC is sufficiently funded. If the new LCC will increase the number of flights or expand its business to a new route, it is necessary to introduce a new aircraft, train additional employees including pilots, co-pilots, maintenance engineers, ground staff and introduction of the grand support equipment (GSE), etc., and consider whether the cost could be supplemented by initial reserves and make its decision.

(3) The number of flight and passenger kilometer by routes

The size of demands in the number of flights is already captured by each route, and the LCC could lead its number of flights aiming in gaining the range of 10 to 50% of the route. Simultaneously, the amount of passengers per LCC is depending on the number of flights. This condition works only for the following situation: all the customers of LCC are able to plan their own excursions and book air tickets and accommodation by themselves. However, LCCs could gain the demand for all the routes. This is because most Japanese passengers cannot organize tour plans and make reservations by themselves, and thus, they usually choose package tours. It can be concluded by analyzing demographics of passengers that the number of passengers increases with the number of flights.

Originally, LCCs gain profits from specific types of passengers. Therefore, the size of market as denominator must be large. To achieve this goal, LCCs operate their flights on huge-demand routes between large cities or on routes around the large cities as a secondary option. In this analysis, the routes which meet the following conditions were selected: (1) there are a large number of passengers from the Kansai area and (2) the LCC can earn profits if it has taken part of the demand. Therefore, LCCs determine the number of flights not by the basic passenger demands but by the flexible availability of aircraft, rather than by the size of passenger demand to achieve maximum efficiency.

If an LCC decides to set up two round-trips per day, there already exists a certain amount of demand. In this case, most load factors are fixed. Additionally, LCCs need to make an effort in selling tickets and collaborating with the local communities to gain support from them, which will be explained in a later section. Thus, the route's demand is determined by the number of flights, then to lead the number of passengers by assuming the accurate load factors. The demand of passenger is slightly changed annually by various factors, such as typhoon, earthquake, and commercial events. In this simulation, these factors are included by probability distribution.

According to discussion above, passenger kilometer is calculated by multiplying the number of passenger by distance. Seat kilometer is also calculated by multiplying the number of flight by distance and the number of seat of aircraft. Figure 4-18 and Figure 4-19 show passenger kilometer and seat kilometer by domestic or international routes, respectively.

Figure 4-18 Passenger Kilometer and Seat Kilometer by Domestic Routes

Route	Passenger kilometer (million passenger kilometer)	Seat kilometer (million seat kilometer)
Kobe-Haneda	383	506
Kobe-ShinChitose	410	540
Kobe-Fukuoka	133	175
Kobe-Naha	341	450
Kobe-Kagoshima	101	134
Kobe-Miyazaki	90	238
Kobe-Kumamoto	89	118
Kobe-Sendai	178	235

Figure 4-19 Passenger Kilometer and Seat Kilometer by International Routes

Route	Passenger kilometer (million passenger kilometer)	Seat kilometer (million seat kilometer)
Kobe-Seoul	243	321
Kobe-Shanghai	265	350
Kobe-Beijing	336	443
Kobe-Hong Kong	476	628
Kobe-Taipei	326	430
Kobe-Pusan	54	71

2.4 The Number of Aircraft Required and Crews

(1) Aircraft required

Operation hours of each airport, which are discussed in this study, are summarized in Figure 4-20.

Figure 4-20 Operation Hour by Airport

Airport	Open	Close	Operating hours
Kobe	7:00	22:00	15:00
Haneda	-	-	24:00
Shin-Chitose	-	-	24:00
Sendai	7:30	21:30	14:00
Fukuoka	-	-	24:00
Naha	-	-	24:00
Kagoshima	7:30	21:30	14:00
Miyazaki	7:30	21:30	14:00
Kumamoto	7:30	21:30	14:00

Japanese major airports (Haneda, Shin-Chitose, Fukuoka, Naha) and foreign airports, which are connected to Japanese airports, operate 24 hours by constructing a network around Kobe Airport. Kobe Airport and Itami airport operate for 15 hours and 14 hours, respectively even though Kansai International Airport operates for 24 hours. Additionally, no airline companies can divert to airports operating around Kansai International Airport. Therefore, it is expected that Kobe Airport is open for 24 hours and passengers can have access to it for 24 hours in the foreseeable future. In terms of alternative airports, Naha Airport and Shin-Chitose Airport are assigned as alternative airports for international lines of Kansai International Airport. Thus, if Kansai international airport recovers enough capacity for aircraft, aircraft would arrive from these alternative airports again.

For all of these reasons, it is likely that network around Kobe Airport expands operation hours of equipment. In terms of human resources, current operation introduces 2-shift system. Some workplaces require 3-shift system, including outsourcing in order to materialize 24 hour operation. As a result, it is likely to take 3,900 operation hours of aircraft from 3,500 operation hours.

Therefore, the number of aircraft required is calculated by the following equation:
number of aircraft required
= (total flight hours of all routes + turnaround hours) / average of operating hours

where average of operating hours is 10.5 hours.

Based on the discussion above, the number of aircraft required for domestic routes is eight and that for international routes is seven. Figure 4-21 shows the number of aircraft required and flight hours per aircraft.

Figure 4-21 The Number of Aircraft Required and Flight Hours per Aircraft

	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Aircrafts required	15	15	15	15	15	15	15	15	15	15
Aircrafts hold	0	0	1	1	1	2	2	3	4	5
Increase	0	0	1	0	0	1	0	1	1	1
Lease	15	15	14	14	14	13	13	12	11	10
Flight hour per aircraft	3491	3596	3516	3516	3516	3516	3516	3516	3516	3516

(2) The number of pilots and cabin crew members required
When flight hours of aircraft are calculated, the number of pilots and cabin crew can be calculated. According to the discussion of Section 4.1 with experimental data of existing airline companies, the number of pilots and cabin crews for one aircraft are two and three, respectively. It is assumed that monthly operation hours per cabin crew are 70 hours with 10% of allowance ratio. In this study, the number of pilots is 148 and the number of cabin crews is 205. As the number of aircraft is not changed during ten years, the number of pilots and cabin crew are not changed either.

4-3 Results of Financial Simulation by Using Corporate Model

1 Outline of Case Study and Cumulative Ordinary Profit

Following the calculation on Figure 4-1, financial simulation of corporate model is executed on Excel by requisite parameters in Section 4-2.

In Section 3 and 2, the financial statement and calculated result of principal management index are shown and analyzed. In Section 1, only cumulated ordinary profit is analyzed in order to

consider the result of financial simulation and mention the methods of calculation and analysis.

In this study, two cases of simulation are examined as shown in Figure 4-22.

Figure 4-22 Outline of Case Study

Case No.	Routes composition	Discount rate of airfare
1	Domestic and international	38.3%
2	Domestic and international	50.0%

A projected result of cumulated ordinary profit is mentioned in Figure 4-23.

As considered in the business models, from the Figure 4-23, the 40%-50% discount rate of both domestic and international routes are indicated to be inevitable to compete with other airline companies' airfares. In both cases the cumulative ordinary profits are positive. The cumulative ordinary profit of Case 1 is 96,137 million JPY and that of Case 2 is 22,157 million JPY.

Figure 4-23 Discount Rate of Airfare and Cumulative Ordinary Profit

Case	Discount rate		Cumulative Ordinary Profit (million JPY)
	Domestic	International	
Case 1	38.3%	38.3%	96,137
Case 2	50.0%	50.0%	22,157

Comparing Case 1 with Case 2, naturally, the cumulative ordinary profit of Case 1 is better than that of Case 2. The cumulative ordinary output of Case 1 is more than four times larger than the one of Case 2. This result comes from the better revenue of passenger airfare against the same cost of operation. Case 2, of course, is still a positive value. It means that LCCs can run its business properly if the level of 50% discount rate is maintained.

2 Simulation Results of Financial Statement

The financial statements for Case 1 and 2 are indicated in Figure 4-24 and Figure 4-25, respectively.

Figure 4-24 Financial Statement for New LCC (Case 1)

Figure 4-24-1 Profit and Loss for Case 1 (million JPY)

	2012(PRE)	2013	2014	2015	2016	2017	2018	2019	2020	2021
domestic passenger traffic income	0	22,201	22,201	22,201	22,201	22,201	22,201	22,201	22,201	22,201
International passenger traffic income	0	18,966	18,966	18,966	18,966	18,966	18,966	18,966	18,966	18,966
cargo service income	0	0	0	0	0	0	0	0	0	0
Oerating income	0	41,167	41,167	41,167	41,167	41,167	41,167	41,167	41,167	41,167
navigation expense										
cockpit	0	2,205	2,220	2,220	2,220	2,220	2,220	2,220	2,220	2,220
pilot training	1,500	5,850	50	0	0	0	0	0	0	0
fuel	0	8,291	8,360	8,360	8,360	8,360	8,360	8,360	8,360	8,360
maintenance	0	2,082	2,140	2,096	2,096	2,096	2,096	2,096	2,096	2,096
aircraft depreciation	0	0	0	200	200	200	400	400	600	800
aircraft lease	0	6,120	6,120	5,712	5,712	5,712	5,304	5,304	4,896	4,488
aircraft property tax	0	0	0	0	47	41	36	77	66	102
landing fee	0	2,617	2,617	2,617	2,617	2,617	2,617	2,617	2,617	2,617
aviation support facility fee	0	2,387	2,387	2,387	2,387	2,387	2,387	2,387	2,387	2,387
airfield parking fee	0	16	16	16	16	16	16	16	16	16
depreciation	0	270	270	270	270	270	270	270	270	270
aviation insurance	0	650	650	650	650	650	650	650	650	650
airport support fee	0	576	576	576	576	576	576	576	576	576
cabin attendant fee	0	714	717	717	717	717	717	717	717	717
other service fee	0	332	332	332	332	332	332	332	332	332
depreciation of initial expense	0	400	400	400	400	400	0	0	0	0
selling and administration cost										
sales charge	0	2,058	2,058	2,058	2,058	2,058	2,058	2,058	2,058	2,058
officer's salaries	100	100	100	100	100	100	100	100	100	100
general clerk salaries	200	1,910	1,910	1,910	1,910	1,910	1,910	1,910	1,910	1,910
Kobe airport rental charge	0	120	120	120	120	120	120	120	120	120
domestic airport rental charge	0	96	96	96	96	96	96	96	96	96
oversea airport rental charge	0	72	72	72	72	72	72	72	72	72
others	0	217	217	217	217	217	217	217	217	217
operating expenses	1,800	37,083	31,428	31,126	31,173	31,167	30,554	30,595	30,376	30,204
operating profit	-1,800	4,084	9,739	10,041	9,994	10,000	10,613	10,572	10,791	10,963
nonoperating expenses	0	0	0	0	0	0	0	0	0	0
total expenses	1,800	37,083	31,428	31,126	31,173	31,167	30,554	30,595	30,376	30,204
ordinary profit	-1,800	4,084	9,739	10,041	9,994	10,000	10,613	10,572	10,791	10,963
corporation tax	0	0	3,408	3,514	3,497	3,500	3,714	3,700	3,776	3,837
profit after tax	-1,800	4,084	6,331	6,527	6,497	6,500	6,899	6,872	7,015	7,126
devidend	0	0	950	950	950	950	950	950	950	950
undevided profit	-1,800	4,084	5,381	5,577	5,547	5,550	5,949	5,922	6,065	6,176
cumulative profit	-1,800	2,284	7,665	13,242	18,789	24,339	30,288	36,210	42,275	48,451

Figure 4-24-2 Balance Sheet for Case 1 (million JPY)

	2012(PRE)	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
assets											
liquid assets	2,700	7,454	13,505	16,372	22,989	29,609	32,848	39,840	43,595	47,861	52,642
aircraft	0	0	0	3,380	2,980	2,580	5,560	4,760	7,340	9,520	11,300
other properties	3,000	2,730	2,460	2,190	1,920	1,650	1,380	1,110	840	570	300
total properties	3,000	2,730	2,460	5,570	4,900	4,230	6,940	5,870	8,180	10,090	11,600
deferred assets	2,000	1,600	1,200	800	400	0	0	0	0	0	0
total assets	7,700	11,784	17,165	22,742	28,289	33,839	39,788	45,710	51,775	57,951	64,242
capital liabilities											
debt balance	0	0	0	0	0	0	0	0	0	0	0
capital	2,000	9,500	9,500	9,500	9,500	9,500	9,500	9,500	9,500	9,500	9,500
legal capital surplus	0	0	0	0	0	0	0	0	0	0	0
surplus	-1,800	2,284	7,665	13,242	18,789	24,339	30,288	36,210	42,275	48,451	54,742
total capital	200	11,784	17,165	22,742	28,289	33,839	39,788	45,710	51,775	57,951	64,242
capital and liabilities	200	11,784	17,165	22,742	28,289	33,839	39,788	45,710	51,775	57,951	64,242

Figure 4-24-3 Cash Flow for Case 1 (million JPY)

	2012(PRE)	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Financing											
Brought forward	0	2,700	7,454	13,505	16,372	22,989	29,609	32,848	39,840	43,595	47,861
Capital	9,500	0	0	0	0	0	0	0	0	0	0
Gain listed	0	0	0	0	0	0	0	0	0	0	0
Undevided profit	-1,800	4,084	5,381	5,577	5,547	5,550	5,949	5,922	6,065	6,176	6,291
Aircraft depreciation	0	0	0	400	400	400	800	800	1,200	1,600	2,000
Initial expence depriciation	0	400	400	400	400	400	0	0	0	0	0
Other depreciation	0	270	270	270	270	270	270	270	270	270	270
Total financing	7,700	7,454	13,505	20,152	22,989	29,609	36,628	39,840	47,375	51,641	56,422
Initial expenses	2,000										
Investment in aircrafts	0	0	0	3,780	0	0	3,780	0	3,780	3,780	3,780
Investment in others	3,000	0	0	0	0	0	0	0	0	0	0
Repayment	0	0	0	0	0	0	0	0	0	0	0
Purpose of funds	5,000	0	0	3,780	0	0	3,780	0	3,780	3,780	3,780
Excess and deficiency	2,700	7,454	13,505	16,372	22,989	29,609	32,848	39,840	43,595	47,861	52,642
Eebt	0	0	0	0	0	0	0	0	0	0	0
Carried forward	2,700	7,454	13,505	16,372	22,989	29,609	32,848	39,840	43,595	47,861	52,642

Figure 4-25 Financial Statement for New LCC (Case 2)

Figure 4-25-1 Profit and Loss for Case 2 (million JPY)

	2012(PRE)	2013	2014	2015	2016	2017	2018	2019	2020	2021
domestic passenger traffic income	0	17,990	17,990	17,990	17,990	17,990	17,990	17,990	17,990	17,990
International passenger traffic income	0	15,369	15,369	15,369	15,369	15,369	15,369	15,369	15,369	15,369
cargo service income	0	0	0	0	0	0	0	0	0	0
Oerating income	0	33,359	33,359	33,359	33,359	33,359	33,359	33,359	33,359	33,359
navigation expense										
cockpit	0	2,205	2,220	2,220	2,220	2,220	2,220	2,220	2,220	2,220
pilot training	1,500	5,850	50	0	0	0	0	0	0	0
fuel	0	8,291	8,360	8,360	8,360	8,360	8,360	8,360	8,360	8,360
maintenance	0	2,082	2,140	2,096	2,096	2,096	2,096	2,096	2,096	2,096
aircraft depreciation	0	0	0	200	200	200	400	400	600	800
aircraft lease	0	6,120	6,120	5,712	5,712	5,712	5,304	5,304	4,896	4,488
aircraft property tax	0	0	0	0	47	41	36	77	66	102
landing fee	0	2,617	2,617	2,617	2,617	2,617	2,617	2,617	2,617	2,617
aviation support facility fee	0	2,387	2,387	2,387	2,387	2,387	2,387	2,387	2,387	2,387
airfield parking fee	0	16	16	16	16	16	16	16	16	16
depreciation	0	270	270	270	270	270	270	270	270	270
aviation insurance	0	650	650	650	650	650	650	650	650	650
airport support fee	0	576	576	576	576	576	576	576	576	576
cabin attendant fee	0	714	717	717	717	717	717	717	717	717
other service fee	0	332	332	332	332	332	332	332	332	332
depreciation of initial expense	0	400	400	400	400	400	0	0	0	0
selling and administration cost										
sales charge	0	1,667	1,667	1,667	1,667	1,667	1,667	1,667	1,667	1,667
officer's salaries	100	100	100	100	100	100	100	100	100	100
general clerk salaries	200	1,910	1,910	1,910	1,910	1,910	1,910	1,910	1,910	1,910
Kobe airport rental charge	0	120	120	120	120	120	120	120	120	120
domestic airport rental charge	0	96	96	96	96	96	96	96	96	96
oversea airport rental charge	0	72	72	72	72	72	72	72	72	72
others	0	198	198	198	198	198	198	198	198	198
operating expenses	1,800	36,673	31,018	30,716	30,763	30,757	30,144	30,185	29,966	29,794
operating profit	-1,800	-3,314	2,341	2,643	2,596	2,602	3,215	3,174	3,393	3,565
nonoperating expenses	0	0	0	0	0	0	0	0	0	0
total expenses	1,800	36,673	31,018	30,716	30,763	30,757	30,144	30,185	29,966	29,794
ordinary profit	-1,800	-3,314	2,341	2,643	2,596	2,602	3,215	3,174	3,393	3,565
corporation tax	0	0	0	0	0	910	1,125	1,110	1,187	1,247
profit after tax	-1,800	-3,314	2,341	2,643	2,596	1,692	2,090	2,064	2,206	2,318
devidend	0	0	0	0	0	950	950	950	950	950
undevided profit	-1,800	-3,314	2,341	2,643	2,596	742	1,140	1,114	1,256	1,368
cumulative profit	-1,800	-5,114	-2,773	-130	2,466	3,208	4,348	5,462	6,718	8,086

Figure 4-25-2 Balance Sheet for Case 2 (million JPY)

	2012(PRE)	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
assets											
liquid assets	2,700	56	3,067	3,000	6,666	8,478	6,908	9,092	8,038	7,496	7,469
aircraft	0	0	0	3,380	2,980	2,580	5,560	4,760	7,340	9,520	11,300
other properties	3,000	2,730	2,460	2,190	1,920	1,650	1,380	1,110	840	570	300
total properties	3,000	2,730	2,460	5,570	4,900	4,230	6,940	5,870	8,180	10,090	11,600
deferred assets	2,000	1,600	1,200	800	400	0	0	0	0	0	0
total assets	7,700	4,386	6,727	9,370	11,966	12,708	13,848	14,962	16,218	17,586	19,069
capital liabilities											
debt balance	0	0	0	0	0	0	0	0	0	0	0
capital	2,000	9,500	9,500	9,500	9,500	9,500	9,500	9,500	9,500	9,500	9,500
legal capital surplus	0	0	0	0	0	0	0	0	0	0	0
surplus	-1,800	-5,114	-2,773	-130	2,466	3,208	4,348	5,462	6,718	8,086	9,569
total capital	200	4,386	6,727	9,370	11,966	12,708	13,848	14,962	16,218	17,586	19,069
capital and liabilities	200	4,386	6,727	9,370	11,966	12,708	13,848	14,962	16,218	17,586	19,069

Figure 4-25-3 Cash Flow for Case 2 (million JPY)

	2012(PRE)	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Financing											
Brought forward	0	2,700	56	3,067	3,000	6,666	8,478	6,908	9,092	8,038	7,496
Capital	9,500	0	0	0	0	0	0	0	0	0	0
Gain listed	0	0	0	0	0	0	0	0	0	0	0
Undevided profit	-1,800	-3,314	2,341	2,643	2,596	742	1,140	1,114	1,256	1,368	1,483
Aircraft depreciation	0	0	0	400	400	400	800	800	1,200	1,600	2,000
Initial expence depriciation	0	400	400	400	400	400	0	0	0	0	0
Other depreciation	0	270	270	270	270	270	270	270	270	270	270
Total financing	7,700	56	3,067	6,780	6,666	8,478	10,688	9,092	11,818	11,276	11,249
Initial expenses	2,000										
Investment in aircrafts	0	0	0	3,780	0	0	3,780	0	3,780	3,780	3,780
Investment in others	3,000	0	0	0	0	0	0	0	0	0	0
Repayment	0	0	0	0	0	0	0	0	0	0	0
Purpose of funds	5,000	0	0	3,780	0	0	3,780	0	3,780	3,780	3,780
Excess and deficiency	2,700	56	3,067	3,000	6,666	8,478	6,908	9,092	8,038	7,496	7,469
Eebt	0	0	0	0	0	0	0	0	0	0	0
Carried forward	2,700	56	3,067	3,000	6,666	8,478	6,908	9,092	8,038	7,496	7,469

Figure 4-26 Case Comparison of Principal Management Index (Case 1 and Case 2)

Principal Management Index	Case 1	Case 2
Cumulative Ordinary Profit (Million JPY)	96,137	22,157
NPV (Million JPY)	55,930	10,471
Cumulative EVA (Million JPY)	54,742	9,569
Revenue Operating Profit Margin (%)	23.35	6.64
Revenue Ordinary Profit Margin (%)	13.30	2.87
ROA (%)	21.2%	9.1%
ROE (%)	21.2%	9.1%
Average Capital Ratio	1.00	1.00
Domestic Flight Yield (JPY/km)	12.9	10.4
International Flight Yield (JPY/km)	11.2	9.0
Domestic Flight Load Factor (%)	72.0	72.0
International Flight Load Factor (%)	75.8	75.8
Cost per Passenger-km (JPY/km)	9.21	9.09
Cost per Seat-km (JPY/km)	6.80	6.71
Single Year Deficit Cancellation Point (Year)	2013	2014
Cumulative Years Deficit Cancellation Point (Year)	2013	2016

3 Discussion of Simulation Results of Principal Management Index

In the following analysis, major economic figures, yield, available seat km (ASK) and cost per passenger km will be discussed.

(1) NPV

Net Present Value (NPV) means Present Value (discounted net cash flow) that cash flow that is expected to be generated by a company is divided by Weighted Average Cost of Capital (WACC).

NPV is determined as follows;

$$NPV = \frac{CF_1}{(1+WACC)} + \frac{CF_2}{(1+WACC)^2} + \cdots + \frac{CF_n}{(1+WACC)^n}$$

CF_t: Net Cash Flow in t year

$WACC$: Weighted Average Cost of Capital

n: period of project (the last year includes terminal value)

Discounted net cash flow in the final year includes terminal value discounted by WACC. A

company can gain more cash flow if the value of NPV is large. NPV>0 means that a project is feasible.

In this simulation, shareholder's equity is assumed to be 9.5 billion JPY. The condition of NPV<0 is not insolvent unless it generates loss of 9.5 billion JPY in present value. Both Case 1 and Case 2 are positive in NPV. Actually, in both cases from 2013 to 2022, the cash flow figure indicates that free cash flow tends to increase. Eventually, NPV in Case 1 will be 55,930 million JPY which is five times larger than the size of equity and NPV in Case 2 will be 10,471 million JPY which is almost the same size as equity capital. The company can purchase aircraft without debt loans in 2015, 2018, 2020, 2021 and 2020, because of this sufficiently free cash flow.

In studies prior to this study, the author has tested many cases, which include various cases of the capital structure consisting of capital and liability. The results of the case studies showed that a large fund size is required even if starting a small-fleet LCC with several aircraft. Therefore, in this simulation, the case is examined under the condition of preparation of the initial fund such as 9.5 billion JPY considering without debt loan. Nevertheless, it is necessary to continue discussing case studies with debt loans.

(2) EVA®

Economic Value Added (EVA) is defined by Stern Stewart. It indicates management index of returns to shareholders. The value is generated when operating profits exceed the capital costs. EVA is considered an important index by managers and shareholders, because ROE which has been considered as important index is not enough in order to demonstrate intrinsic corporate value. EVA is calculated by following equation.

EVA = EBIT (Earnings before Interests and Taxes) – Capital costs (capital costs is calculated by weighted average shareholder's equity costs and borrowing costs).

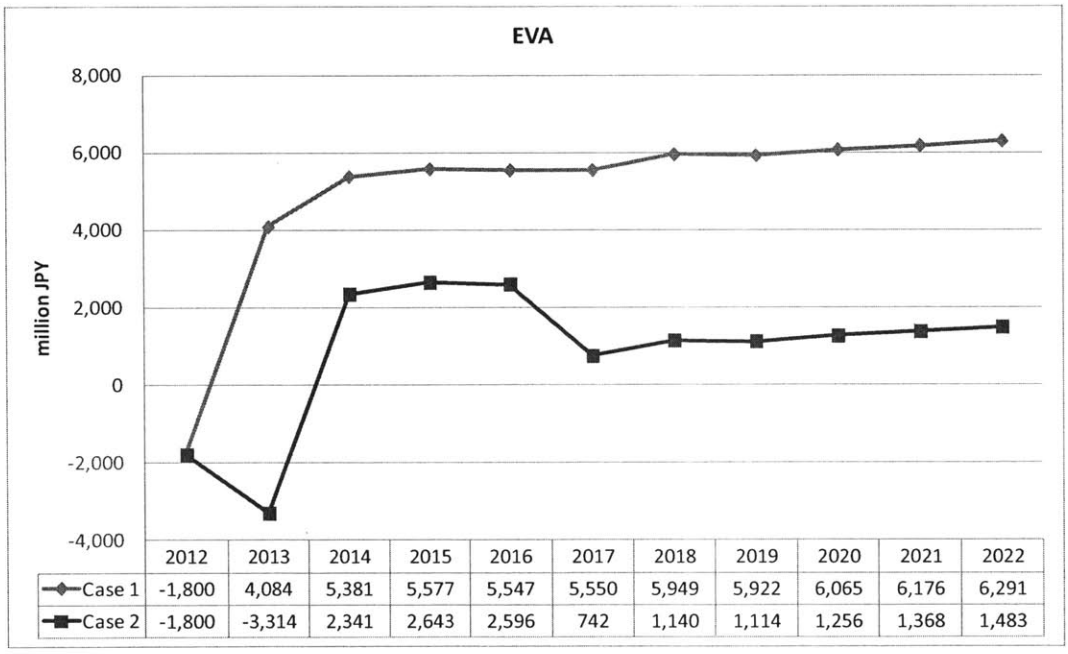
Figure 4-27 shows both EVA of Case 1 and Case 2. In Case 1, EVA becomes positive from 2013. In Case 2, EVA becomes positive from 2014. The absolute value of Case 1 becomes larger than Case 2 because of the good receiving rate of airfare. EVA of Case 2 is temporally decreasing in 2017, because a payment of corporate tax begins from this point.

In Case 1, since the first year, the value of EVA is positive. This means that the new LCC business

became more valuable than the shareholders expected. The amount of value is accumulated as surplus. In the further study, analysis of the case in which such surplus is reinvested for business expansion.

During the ten years of business operation in this research, it may occur that some aircraft needs to have heavy maintenance. Simultaneously, the new LCC ought to have several reserve aircraft, a surplus of aircraft to be used in case of immediate needs for active aircraft. A fleet of the aircraft in the initial period is introduced for operations at the same time, so the timing for maintenance will be the same. Thus, having reserve aircraft is effective. Shortly, the new LCC will have to consider the operation of reserve aircraft and rational composition of aviation network, when it makes decisions about increasing the number of aircraft.

Figure 4-27 Transition of EVA



	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Case 1	-1,800	4,084	5,381	5,577	5,547	5,550	5,949	5,922	6,065	6,176	6,291
Case 2	-1,800	-3,314	2,341	2,643	2,596	742	1,140	1,114	1,256	1,368	1,483

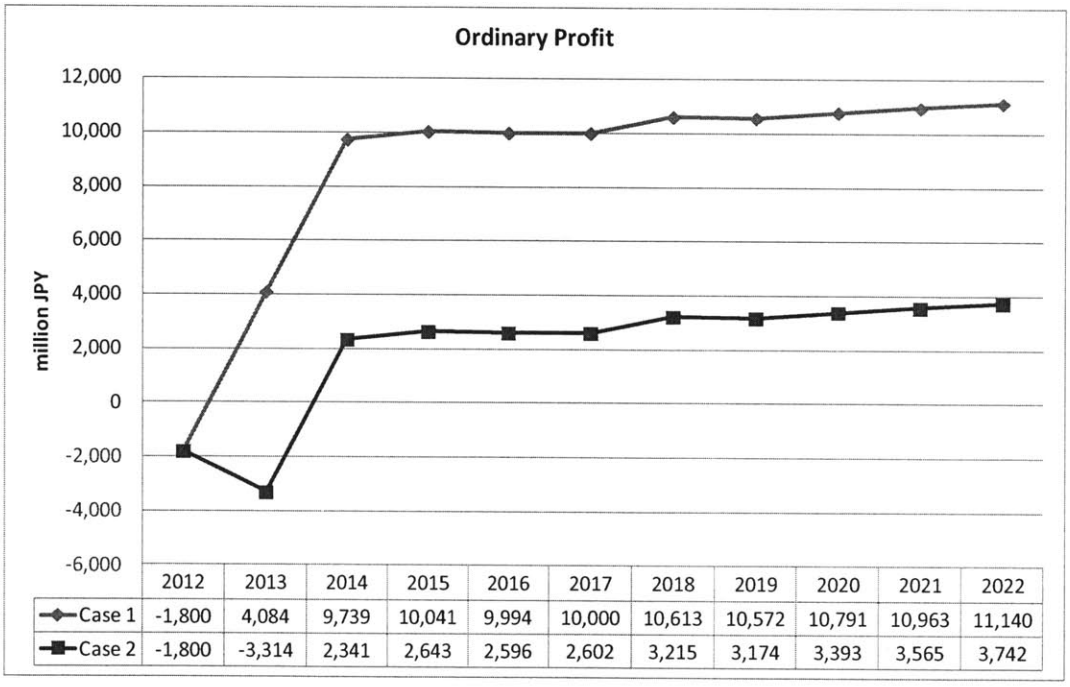
(3) Ordinary Profit

Transition of ordinary profit of each case is demonstrated in Figure 4-28. In Case 1, ordinary profit will be positive from 2013 (the starting year). Case 2 will be temporally negative in 2013 because an initial training cost is occurred in 2013 transiently. In both cases ordinary profit continues to be stable after 2014. In this study, revenue stays constant through the year from 2013 to 2020. Therefore, ordinary profit is influenced in the cost greatly. Fuel cost becomes the

largest expense among compositions of cost after 2014. Fuel cost is influenced by the price of fuel per barrel and currency exchange rate. It is important to pay attention to these two external factors. The second largest expense is lease cost. Lease cost is reduced depending on the number of leased aircraft the company has.

Generally, financial institutions such as banks tend to strongly pay attention to ordinary profit because ordinary profit expresses the result of ordinary activity of its business without extraordinary profit or loss. In Case 1 and 2, ordinary profit transits to a sufficient level and is slightly increased after 2014. Therefore, this will become a decision-making factor when the new LCC negotiates a bank loan.

Figure 4-28 Transition of Ordinary Profit



	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Case 1	-1,800	4,084	9,739	10,041	9,994	10,000	10,613	10,572	10,791	10,963	11,140
Case 2	-1,800	-3,314	2,341	2,643	2,596	2,602	3,215	3,174	3,393	3,565	3,742

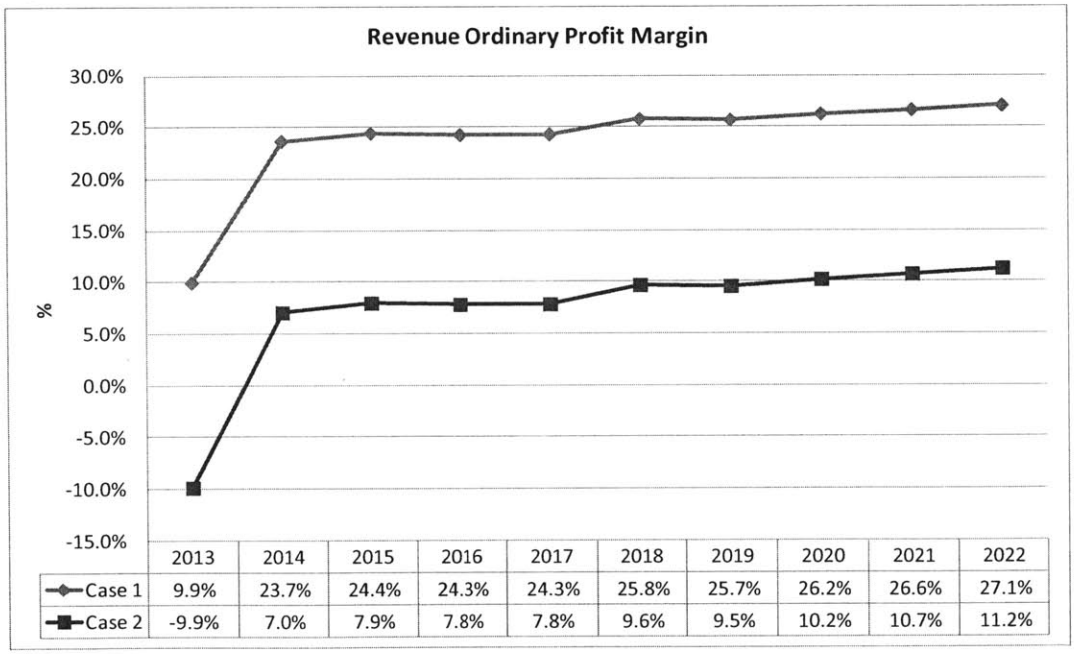
(4) Revenue Ordinary Profit Margin

In each case, transition of revenue ordinary profit margin is demonstrated in Figure 4-29. In Case 1, revenue ordinary profit margin has become positive since the starting year and has kept at the level of approximately 25%. On the other hand, in Case 2, revenue ordinary profit margin has become positive in the second year, but stayed at a low level such as almost 10%. In both cases, the values of revenue ordinary profit margin increase slightly from 2017 to 2018 because depreciation for initial expense is completed in 2017 and lease cost of aircraft is decreased in

2018.

Research on the Japanese aviation industry shows that the average revenue ordinary profit margin is 5%. Comparing this value with those of Case 1 and 2, the values of both Case 1 and Case 2 are higher than the average. The reason for this is the that new business is of low cost and has a highly profitable route structure. Regarding the maintenance cost, the new LCC can outsource maintenance services in order to reduce its cost and cut down 2 billion JPY annually. Furthermore, the new LCC selects an appropriate route structure with a high demand of passengers in order to lower ASK to 6.8 JPY. By taking such strategies, the new LCC can run a profitable business. As a result, revenue ordinary profit margin of the new LCC is 5 times as large as the size of average of aviation industry in Case 1 and twice as large as the size of the average in Case2.

Figure 4-29 Transition of Revenue Ordinary Profit Margin



	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Case 1	9.9%	23.7%	24.4%	24.3%	24.3%	25.8%	25.7%	26.2%	26.6%	27.1%
Case 2	-9.9%	7.0%	7.9%	7.8%	7.8%	9.6%	9.5%	10.2%	10.7%	11.2%

(5) ROA

Return On Assets (ROA) is an indicator of how profitable a company is relative to its total assets. It gives an idea as to how efficient management is at using its assets to generate earnings. It is also an index to analyze how efficiently managers utilize capital from creditors and shareholders. ROA is calculated by following equation.

ROA = Net income/Net Assets

(Generally, net assets is the average between the previous year's and the current year's capital. However, in this simulation, yearend capital in each year is used.)

According to Figure 4-30, ROA of Case 1 and Case 2 are 21.2% and 9.1%, respectively.

In Case 2, from the years 2013 and 2014, the value of ROA goes from negative to positive. This is the reason why operating profit is negative in the first year in 2013 but becomes positive in the second year in 2014. Therefore, the value of ROA becomes positive in the second year.

A typical Japanese airline company's ROA is almost 4%-5%. Comparing this with the simulation results, the value of both Case 1 and Case 2 sufficiently exceeds 4%-5%. On the other hand, ROA functions as a standard of returns to investors because ROA is equal to ROE in this study. The author sets 10% of capital cost as a precondition. The values of ROA in Case 1 exceed 10% over the entire period. Also, in Case 2, the values exceed 10% during the entire period compared to its first year in 2013. Therefore, the new business can reach a sufficient level in terms of ROA analysis.

4-4 Risk Analysis by Monte Carlo Simulation

1 Steps of Risk Analysis

In Section 2 and Section 3, profitability of new LCCs was analyzed and compared to the management indexes in each case by simulations based on the corporate model. However, uncertainty is accompanied with the future environment of management. In addition to profitability, analysis of risk is essential to evaluate project value of new LCCs.

In Section 4, main variables, which are fixed in the simulation in the previous sections, are put into the corporate model as random variables. Then, Monte Carlo simulation is implemented in order to analyze risks.

Risk analysis by Monte Carlo simulation is based on Value at Risk (VaR) in financial engineering.

VaR is used to calculate the probability of how much losses are expected statistically under the situation of the assets having some risks. For instance, "99% VaR" indicates that the probability of losses is 99% in case the losses are below specific level, such as 1 million JPY. In other words, the probability that the losses will be more than 1 million JPY is less than 1%.

In the simulation of analysis of risk, firstly, input data (i.e., demands on individual routes, currency exchange rate) that impact the principal management indexes, such as NPV, EVA, revenue ordinary profit margin, etc., are put in as random variables on the corporate model, which was made in Section 2. Secondly, Monte Carlo simulation is conducted about 10,000 times. Finally, numbers, which accompany random variables on principal management indexes, are calculated.

In the simulation in Section 3, the above input data are fixed. These input data are put as variables of probability distribution, output data, which are calculated from now, and can be distributed probability, and then management indexes, which are calculated at the last step, can also be distributed probability. For example, when currency exchange rate is put as a probability variable in the simulation models, numbers, such as prices of aircraft, cost of fuel, and airport fees in foreign countries can be distributed probability. Eventually, not only total costs are distributed probability but also various management indexes are distributed probability.

In the next step, the cut-off rate is set on individual principal management indexes. And then, a risk probability less than the cut-off rate is generated from the results of the Monte Carlo simulation. Corporate managers can determine whether specific projects should be implemented, by analyzing the risk probability that Principal Management Indexes become less than the cut-off rate.

Throughout Monte Carlo simulation, project risks are evaluated to be high-risk and high-return or low-risk and low-return. In other words, corporate managers can make decisions about investment by considering both the results of profitability from Section 3 and the results of risk analysis (the probability that principal management indexes become less than the cut-off rate).

2 Prerequisite condition of Monte Carlo Simulation

In Monte Carlo simulation, the variables in Figures 4-36, 4-37 and 4-38, which are fixed by simulation of Section 3, are put as variables of probability distribution.

Figure 4-36 Probability Distribution of Exchange Rate

Value Driver	Distribution Model	Mode	Minimum	Maximum
Currency Exchange Rate (JPY/USD)	Triangular	90	85	95

There are two reasons why the above variables are chosen as variables of probability distribution. Firstly, these variables are indexes that significantly influence management issues. Secondly, these variables are [fundamental but uncertain indexes to management of airline companies. In addition, numbers, which are calculated from now, are variables of probability distribution. The variables in Figure 4-36 are set to be followed by triangular distribution, which is usually introduced in order to calculate changes of these types of variables. Mode, minimum, and maximum in case of triangular distribution are set by referring to current data. In terms of mode, the past 6 months mean is introduced as mode. In terms of minimum and maximum, the past 6 months difference between actual maximum and actual minimum is calculated. The MIN and MAX value here was calculated as follows: The balance between the actual MIN value of the index data for six months and the mean value was calculated. Next, the balance between the actual MAX value of the same index and the mean value was calculated. Then, the greater value of the two was deducted from the mean value. This will be the MIN value. The greater value of the two was added to the mean value. This will be the MAX value. This means that the gap between the likelihood and the MAX value equals the gap between the likelihood and the MIN value. This is because it is unknown in which direction these indexes will go; plus or minus.

On the other hand, the LCC has to take the marketing strategy of increasing the number of individual customers as customer acquisition. As this is not the evaluation target of a financial simulation, the load factor is fluctuated by simulation.

Probability distribution (triangular distribution) of demand of domestic routes and international routes are indicated in Figure 4-37 and Figure 4-38, respectively. Among factors related to demand, there are many uncertain factors influencing performance of management. Factors of demand, rather than factors of costs, have influence on the performance of management. Terrorism, such as the September eleventh attack, and aircraft accidents decrease demand significantly, and the worldwide events, such as the Olympics, increase demand. Therefore, annual demand on individual routes (the number of passengers) is calculated with the probability distribution in the simulation of Section 4 to analyze risks. Demand on domestic and

international routes are followed by triangular distribution in each year.

Generally, if normal distribution is introduced to the simulation, the following equations are used:

Normal distribution $$f(x,\mu,\sigma)=\frac{1}{\sqrt{2\pi}\ \sigma}e^{-\frac{(x-u)^2}{2\sigma^2}}$$

Cumulative distribution $$F(x)=\int_{\min}^{\max} f(x)dx$$

min = minimum, max = maximum, μ = mean, σ = standard deviation

This study employs triangular distribution as explained in the previous section. Considering the probability distribution of passenger demand in this study, the minimum value is set based on 67% of the load factor of each route and the maximum value is set based on 87% of the load factor of each route.

Figure 4-37 shows probability distribution of passenger demand by domestic routes. Only large-demand routes of more than 700,000 passengers from the Kansai area and routes of more than 500 km are selected to conduct the simulation as discussed in Section 1. In the same manner, the distribution model for international routes is set as in Figure 4-38.

Figure 4-37 Probability Distribution of Demand by Domestic Route

(Thousand persons)

Route	Distribution Model	Mode	Minimum	Maximum
Kobe - Haneda	Triangular	747	648	837
Kobe - Shin Chitose	Triangular	332	288	372
Kobe - Fukuoka	Triangular	249	216	279
Kobe – Naha	Triangular	249	216	279
Kobe - Kagoshima	Triangular	166	144	186
Kobe - Miyazaki	Triangular	166	144	186
Kobe - Kumamoto	Triangular	166	144	186
Kobe - Sendai	Triangular	249	216	279

Figure 4-38 Probability Distribution of Demand by International Route

(Thousand persons)

Route	Distribution Model	Mode	Minimum	Maximum
Kobe - Seoul	Triangular	249	216	279
Kobe - Shanghai	Triangular	166	144	186
Kobe - Beijing	Triangular	166	144	186
Kobe - Hong Kong	Triangular	166	144	186
Kobe - Taipei	Triangular	166	144	186
Kobe - Pusan	Triangular	83	72	93

3 The calculated result of Monte Carlo Simulation

The following principal management indexes are calculated as numbers of probability distribution by Monte Carlo simulation: 1) NPV, 2) Cumulative EVA, 3) Cumulative Revenue Ordinary Profit, 4) Revenue Operating Profit Margin, 5) Revenue Ordinary Profit Margin and 6) ROA.

These indexes of both Case 1 and Case 2 from the Monte Carlo simulation are indicated from Figure 4-39 to 4-50. The mean, the standard deviation, the range of 99.99% (= 4.1σ), and the range of 95% (= 1.96σ) are indicated under each figure. The range of 99.99% is calculated by

average ±4.1 x standard deviation. The range of 95% is calculated by ±1.96 x standard deviation.

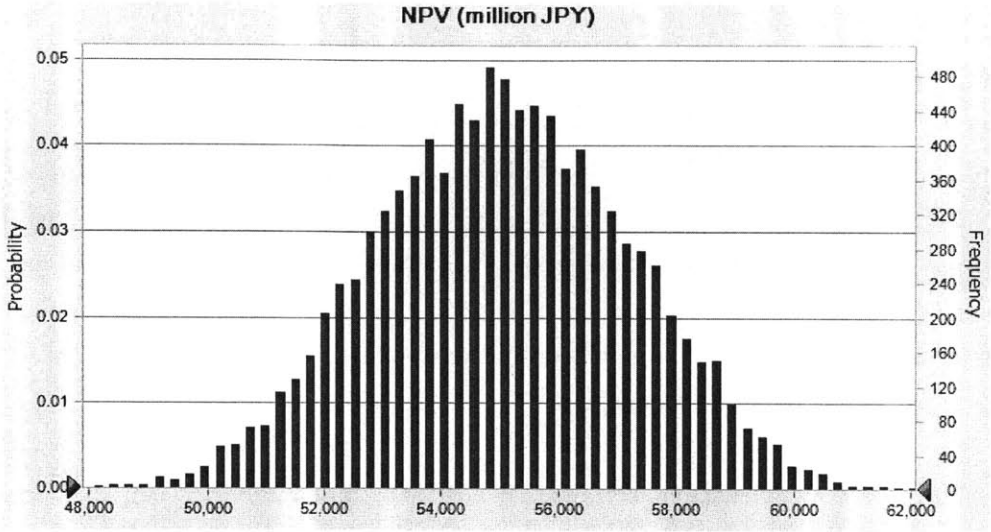
The reason why both the range of 99.99% and the range of 95% are indicated is that generally the range of 95% is used while the automatic output data of "Crystal Ball" simulation tool is the range of 99.99%. However, both of them are indicated for investors who prefer risks or for managers to provide information. The range of 99.99% means almost 100% secure for investors. For example, in the financial industry, the range of 99.99% is introduced to thoroughly calculate the expected value of VaR. Thus, the range of 99.99% is perhaps useful for Japanese financial institutions, which are interested in new LCCs' business. On the other hand, the range of 95% is useful for risk-taking investors and mangers.

For instance, there are management indexes, which have differences between the range of 99.99% and the range of 95%. In Case 1, the minimum value of cumulative ordinary profit for 99.99% probability is 83.888 billion JPY, whereas that for 95% probability is 88.085 billion JPY. There is the range difference of 4.2 billion JPY as a minimum range. Therefore, risk-taking investors may be interested in this investment within the range of 95% even if thorough Japanese investors do not make a decision to invest within the range of 99.99%. This claim leads to issue of the last chapter of this thesis: A company should ask foreign investors to invest in it. To enable them to do so, regulation to foreign investors should be removed.

(1) NPV (Case 1, Case 2)

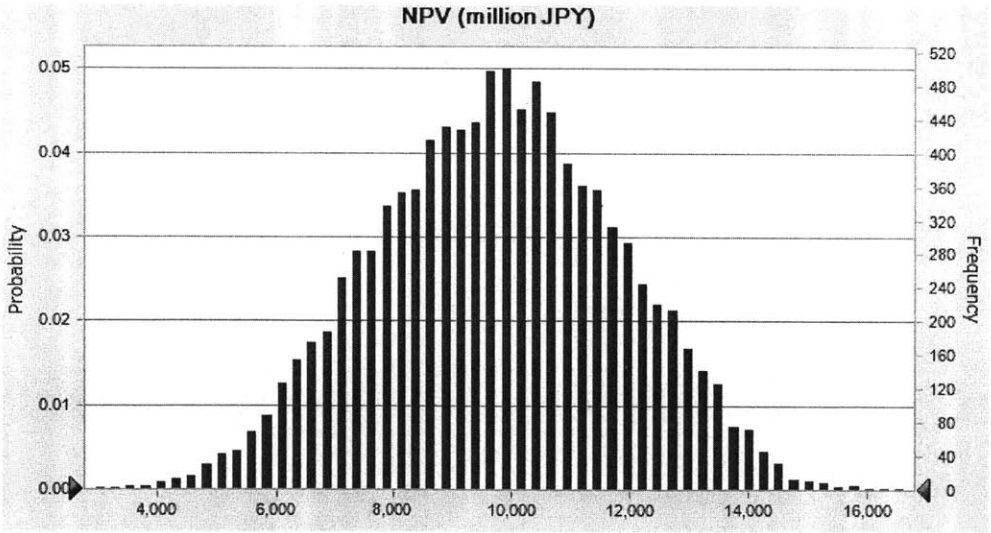
Figure 4-39 and 4-40 show probability distributions of NPV of both Case 1 and Case 2.

Figure 4-39 Probability Distribution of NPV for Case 1



Mean	55,930
Standard Deviation	2,166
Range of 99.99%	48,216 - 62,070
Range of 95%	50,864 - 59,164

Figure 4-40 Probability Distribution of NPV for Case 2



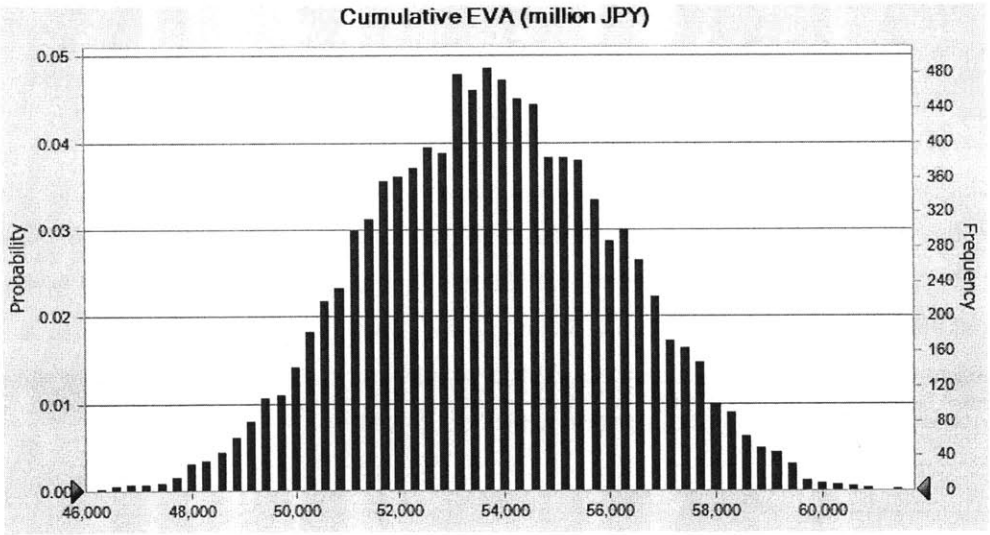
Mean	9,750
Standard Deviation	2,075
Range of 99.99%	3,158 - 16,013
Range of 95%	5,806 - 13,670

It is necessary that NPV must be a positive number basically as discussed in the previous section. According to the results of the simulation, the NPV of both Case 1 and Case 2 indicate a positive number. Even in Case 2, the minimum limit of the 99.99% range shows 3.158 billion JPY. There is almost the same value of standard deviation between Case 1 and 2, whereas there is a large difference in each value of mean, 55.93 billion JPY and 9.75 billion JPY, respectively. It implies that Case 2 has a more significant risk than Case 1. In other words, a 38% discount rate of airfare is set as main direction, but the discount rate can be increased up to the level of 50% depending on circumstances such as competitor's activity.

(2) Cumulative EVA (Case 1, Case 2)

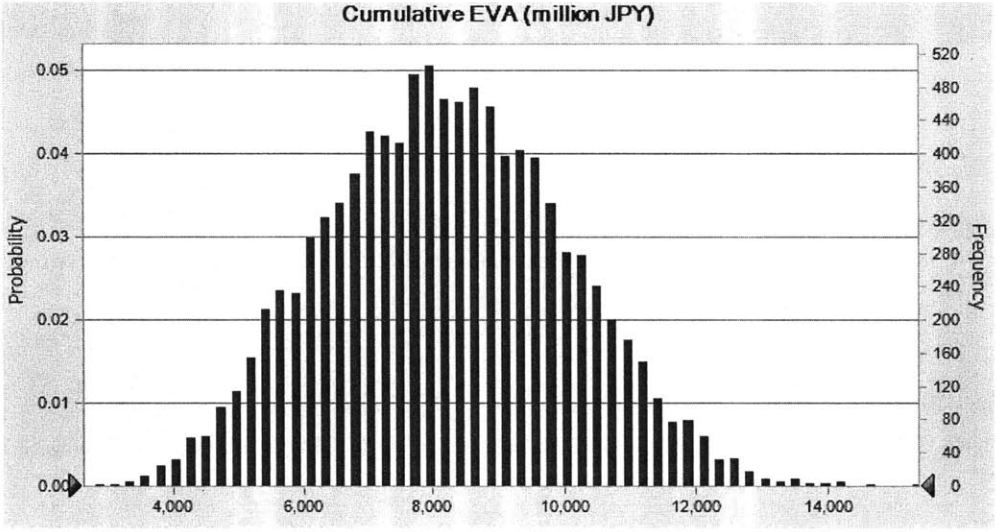
Figure 4-41 and 4-42 show probability distributions of cumulative EVA in Case 1 and Case 2, respectively.

Figure 4-41 Probability Distribution of Cumulative EVA for Case 1



Mean	53,742
Standard Deviation	2,393
Range of 99.99%	46,222 - 61,671
Range of 95%	49,143 - 58,270

Figure 4-42 Probability Distribution of Cumulative EVA for Case 2



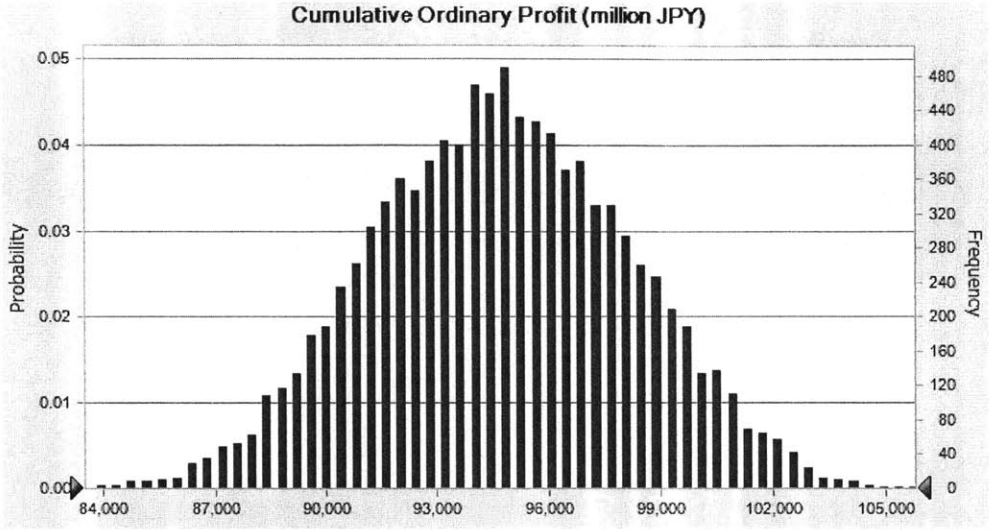
Mean	8,175
Standard Deviation	1,837
Range of 99.99%	2,749 – 14,447
Range of 95%	4,723 – 11,717

According to Figure 4-41 and Figure 4-42, the same tendency as the results of NPV is indicated. In Case 1, the mean of cumulative EVA is 53.742 billion JPY and its standard deviation is 2.393 billion JPY. This leads the lower limit of probability of cumulative EVA to be 46.222 billion JPY (range of 99.99%). On the other hand, in Case 2, the mean is 8.175 billion JPY and the standard deviation is 1,837 billion JPY. In a way, Case 2 is recognized as a risk scenario case, but the lower limit (range of 99.99%) is 2.749 billion JPY, which is still positive.

(3) Cumulative Ordinary Profit

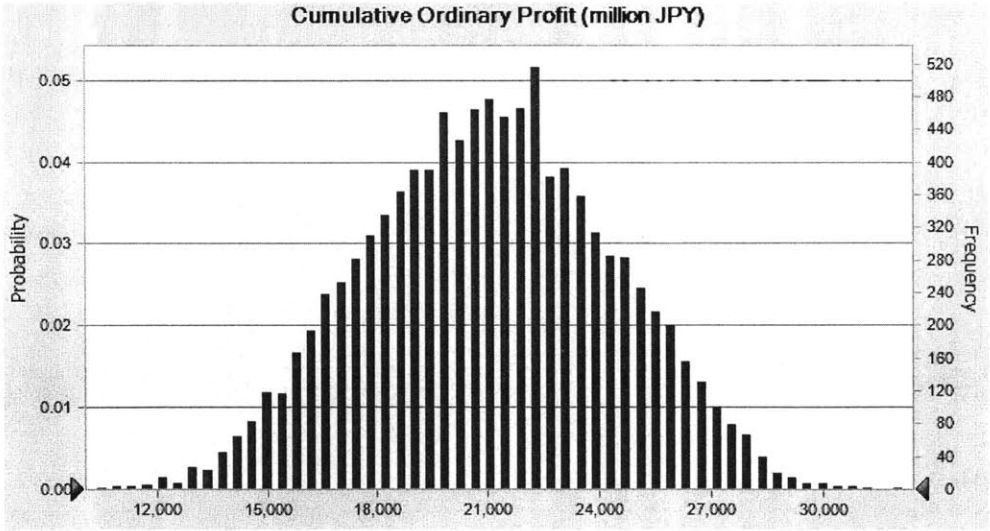
Figure 4-43 and 4-44 show probability distributions of cumulative ordinary profit in Case 1 and Case 2, respectively.

Figure 4-43 Probability Distribution of Cumulative Ordinary Profit for Case 1



Mean	94,711
Standard Deviation	3,487
Range of 99.99%	83,888 – 106,404
Range of 95%	88,085 – 101,332

Figure 4-44 Probability Distribution of Cumulative Ordinary Profit for Case 2



Mean	21,005
Standard Deviation	3,315
Range of 99.99%	10,734 - 30,989
Range of 95%	14,705 - 27,283

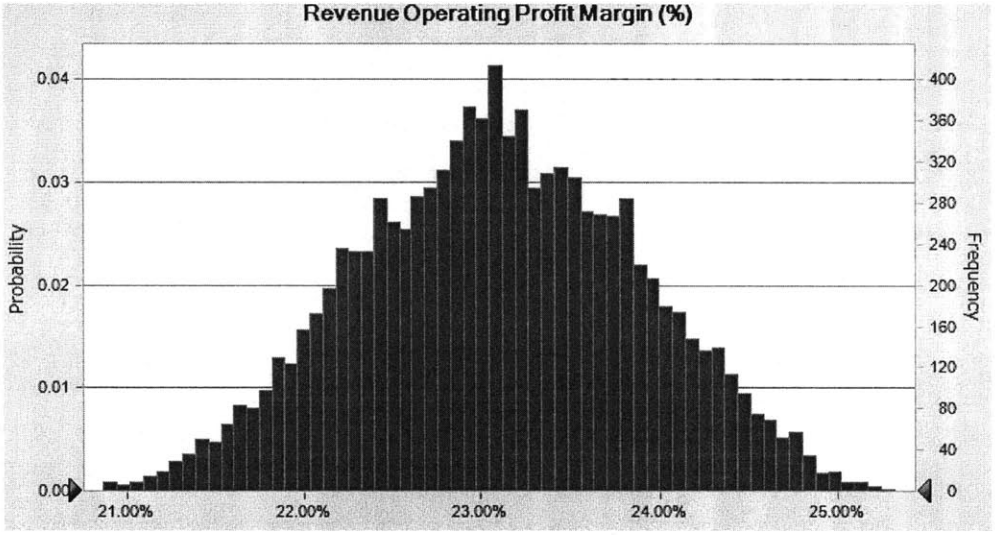
According to Figure 4-43, the mean is 94.711 billion JPY and the standard deviation is 3.487 billion JPY.

By comparing Case 1 with Case 2, it is indicated that Case 2 has a larger amplitude relatively because of almost the same standard deviation despite the different means between Case 1 and Case 2.

(4) Revenue Operating Profit Margin (Case 1, Case 2)

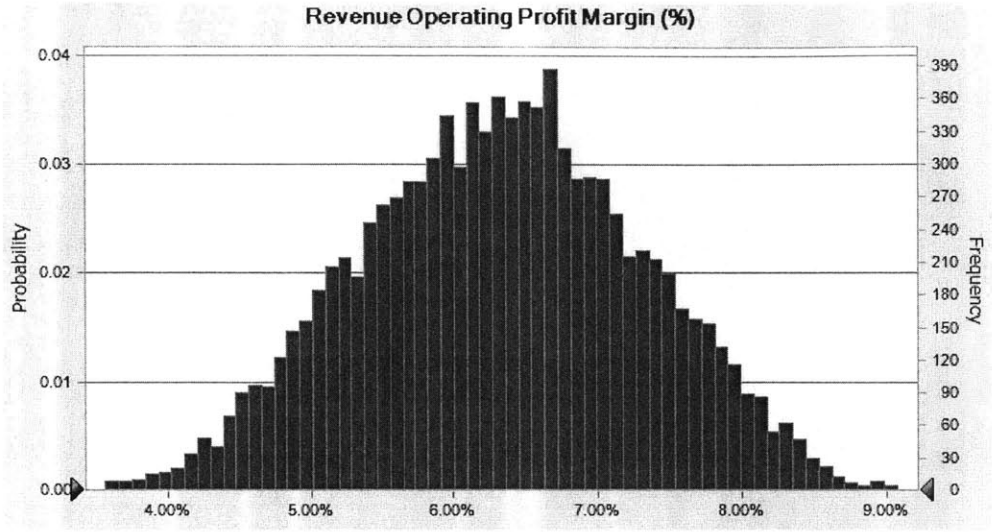
Figure 4-45 and 4-46 show probability distributions of revenue operating profit margin in Case 1 and Case 2, respectively.

Figure 4-45 Probability Distribution of Revenue Operating Profit Margin for Case 1



Mean	23.10%
Standard Deviation	0.80%
Range of 99.99%	20.72% - 25.64%
Range of 95%	21.58% - 24.59%

Figure 4-46 Probability Distribution of Revenue Operating Profit Margin for Case 2



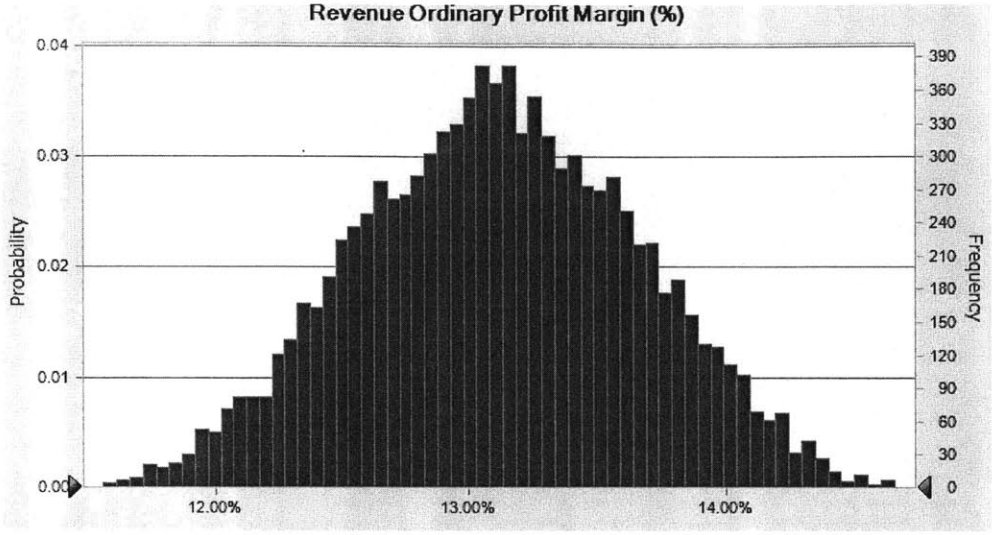
Mean	6.32%
Standard Deviation	0.98%
Range of 99.99%	3.29% - 9.17%
Range of 95%	4.45% - 8.18%

In Case 1, the lower limit of the range of 95% is 21.58% and that of the range of 99.99% is still 20.72%. It is indicated that the LCC can operate its business steadily with high performance in Case 1. On the other hand, in Case 2, the lower limit is 4.45% for the 95% range or 3.29% for the 99.99% range. In this case, opinions may be split on whether these values are regarded as satisfying enough for stakeholders such as managers or shareholders.

(5) Revenue Ordinary Profit Margin

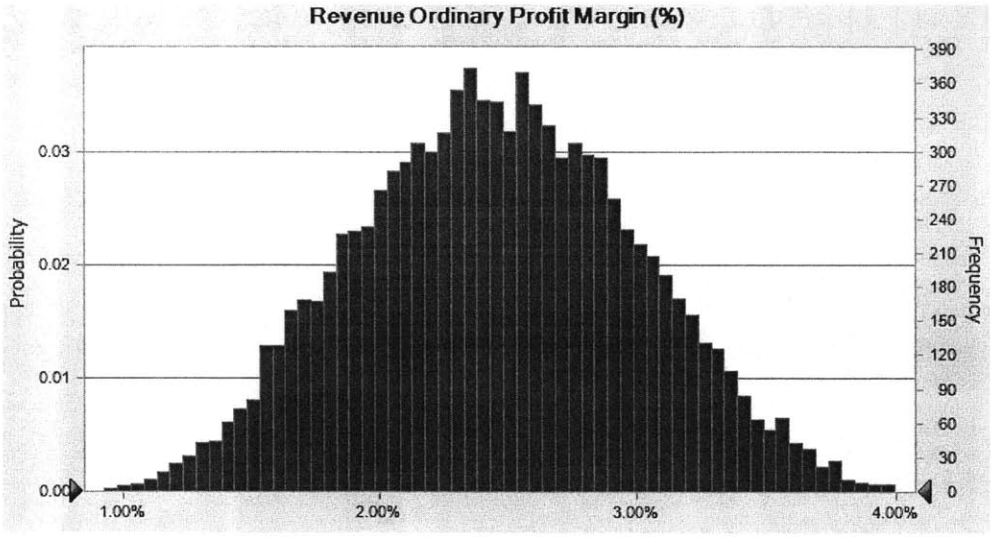
Figure 4-47 and 4-48 show probability distributions of revenue ordinary profit margin in Case 1 and Case 2, respectively.

Figure 4-47 Probability Distribution of Revenue Ordinary Profit Margin for Case 1



Mean	13.11%
Standard Deviation	0.55%
Range of 99.99%	11.43% - 14.86%
Range of 95%	12.50% - 14.60%

Figure 4-48 Probability Distribution of Revenue Ordinary Profit Margin for Case 2



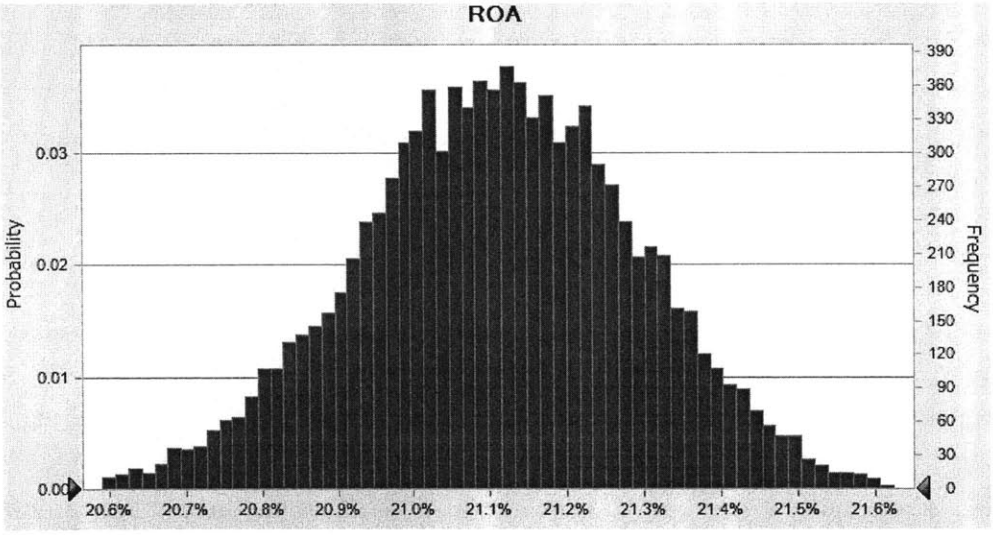
Mean	2.46%
Standard Deviation	0.55%
Range of 99.99%	0.83% - 4.29%
Range of 95%	1.42% - 3.52%

In Case 1, the lower limit of the range of 95% is 12.50% and that of the range of 99.99% is still 11.43%. On the other hand, in Case 2 the lower limit is 1.42% for the range of 95% or 0.83% for the range of 99.99%. In general, it is considered desirable for revenue ordinary profit margin to exceed 2% at least. Even in Case 2, so to speak, the worst case, the mean of revenue ordinary profit margin is 2.46%, which exceeds general expectation. Further discussion on this will be considered in the cut-off rate analysis as described later.

(6) ROA (Case 1, Case 2)

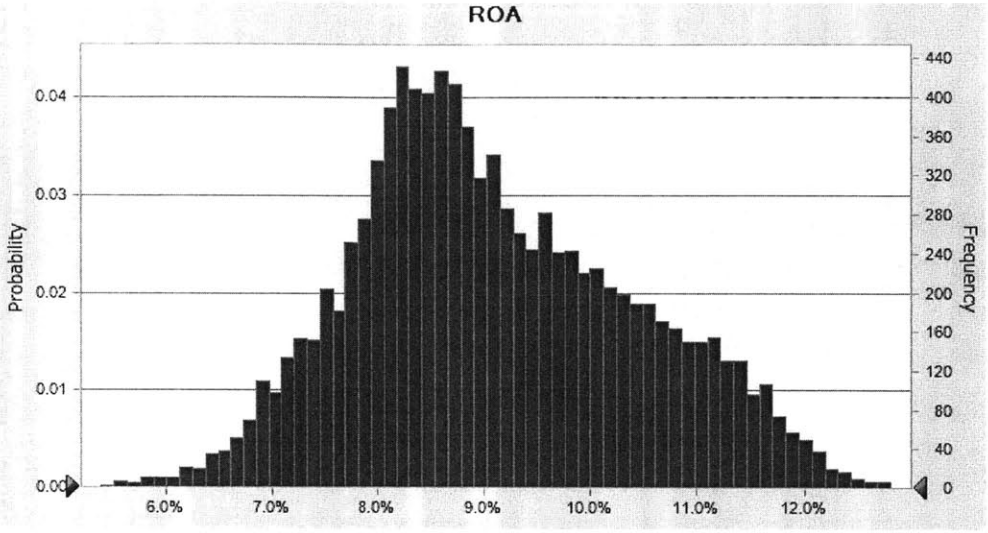
Figure 4-49 and 4-50 show probability distributions of ROA in Case 1 and Case 2, respectively.

Figure 4-49 Probability Distribution of ROA for Case 1



Mean	21.1%
Standard Deviation	0.2%
Range of 99.99%	19.8% - 21.8%
Range of 95%	20.7% - 21.5%

Figure 4-50 Probability Distribution of ROA for Case 2



Mean	9.1%
Standard Deviation	1.3%
Range of 99.99%	5.1% - 13.5%
Range of 95%	6.8% - 11.8%

According to Figure 4-49 and Figure 4-50, the standard deviation of Case 2 is 1.3% whereas that of Case 1 is 0.2%. This means that Case 2 is a larger uncertainty situation relatively compared to Case 1.

In other words, ROA is expressed as the following equation:
ROA = profit margin on sales x turnover of total capital

That is, if ROA indicates good figures, either profit margin on sales or turnover of total capital, or both of the two factors will be good figures. In contrast, if ROA is worse, either one of these two or both of them must be worse. Considering the results of this simulation, in Case 1, ROA (as mean) is 21.1% and revenue operating profit margin (as mean) is 23.1%. Therefore, turnover profit can be calculated roughly as 0.9, which is almost the same level as the average of the aviation industry. Similarly, in Case 2, given that the mean of ROA is 9.1% and the mean of revenue operating profit margin is 6.32%, turnover profit is estimated roughly as 1.43. Therefore, especially in Case 1, if profits are reinvested to expand the business such as increasing the operation routes, turnover profits may be improved.

4 Results of Risk Analysis by Setting Cut-off Rate

In this part, six indexes as evaluation factors for risk analysis on investment decision are chosen. Then, probability to be less than the cut-off rate is calculated by setting the cut-off rate to each index. By doing this, information to analyze the risk of investment is following.

4.1 Risk Analysis of Management Index

The cut-off rate is set as shown in Figure 4-51. In terms of decisive factors for the level of the cut-off rate, being positive on cumulative ordinary income and NPV is an absolute condition, and being positive on cumulative EVA is requisite for investors.

Figure 4-51 Cut-off Rate of Management Index

Decision Index	Cut off Rate
Cumulative Ordinary Profit (Million JPY)	0
Cumulative EVA (Million JPY)	0
NPV (Million JPY)	0
Revenue Operating Profit Margin (%)	4
Revenue Ordinary Profit Margin (%)	3
ROA (%, 10 year average)	3

On management indexes, such as revenue ordinary profit margin and ROA, the level of the cut-off rate is different from the values of managers and the business environment. Additionally, profitability is different in different industries. [In this part, eventually, the rate of revenues from major airline companies (only listed companies) for the past 5 years by considering financial data is from not only Japanese airline companies but also successful LCCs in foreign countries.

Probability to be less than the cut-off rate is calculated by the next EXCEL functions.
=NORMDIST (X, average, Standard deviation, 1)
X = cut-off rate, 1 = the number of cumulative distribution

Normal distribution $$f(x,\mu,\sigma)=\frac{1}{\sqrt{2\pi}\ \sigma}e^{-\frac{(x-u)^2}{2\sigma^2}}$$

Cumulative distribution $F(x) = \int_{\min}^{C^*} f(x)dx$

min = minimum, C^* = Cut-off rate, μ = mean, σ = standard deviation

Figure 4-52 shows the probability to be less than the cut-off rate by Monte Carlo simulation.

Figure 4-52 Results of Risk Analysis of Cut off Rate

Decision Index	Cut off Rate	Case 1	Case 2
Cumulative Ordinary Profit (Million JPY)	0	0.00%	0.00%
Cumulative EVA (Million JPY)	0	0.00%	0.00%
NPV (Million JPY)	0	0.00%	0.00%
Revenue Operating Profit Margin (%)	4	0.00%	0.52%
Revenue Ordinary Profit Margin (%)	3	0.00%	83.32%
ROA (%, 10 year average)	3	0.00%	0.00%

According to Figure 4-52, the probability that NPV becomes negative is 0% in both cases. As mentioned in the previous sections, this simulation model is set in a 10-year project period. From this point of view, it could be considered that evaluating NPV is difficult because the duration is too short. It is considered that ordinary profit may be appropriate for managers and EVA may be appropriate for investors. As shown in Figure 4-52, the probability that both cumulative ordinary profit and cumulative EVA become negative is 0% in Case 2 as well.

On the other hand, there are some differences on revenue operating profit margin and revenue ordinary profit margin between the two cases. Whereas the probability that revenue operating profit margin of Case 1 becomes less than 4% is 0.00%, the probability of Case 2 is 0.52%. Simultaneously, the probability that revenue ordinary profit margin becomes less than 3% is 83.32% in Case 2, whereas it is still 0.00% in Case 1. Regarding ROA, the probability that ROAs become less than 3% of both Case 1 and Case 2 is 0.00%.

In Case 1, all of the indexes satisfy the standard, and the project is feasible with minimum risks. Moreover, Case 1 is significantly attractive business because the revenue can be stabilized. On the

other hand, in Case 2, indexes related to financial margins (i.e., revenue ordinary profit margin, revenue operating profit margin) show certain risks despite the indexes of cumulative profit (i.e. NPV, cumulative EVA, and cumulative ordinary profit) being positive. It is considered that if the discount rate of airfare can be kept in the lower level (ex. 30%) the LCC business can be carried out sustainably. Negatively, if the discount rate of airfare is forced to increase, not only may business profits decrease but also uncertainty relevant to financial indexes may increase.

4.2 Parametric study for cut-off rate

To conduct further analysis of risk by cut-off rate, a parametric study is implemented. In the previous sub-section, the cut-off rate is set up with just one value for each management index. Generally, it is difficult to decide a cut-off rate itself. Therefore, the managers may require seeing the results of risk analysis against various cut-off rate simulations.

Figure 4-53 shows the results of various cut-off rate simulations summarized in a matrix. According to the matrix, Case 1 shows 0.00% against any cut-off rate conditions. On the other hand, Case 2 shows that value at risk increases as each cut-off rate increases. For instance, the VaR may be 0.00% under the condition that the cut-off rate of ROA is 3%. However, if it is under the condition that the cut-off rate of ROA is 6%, the VaR increase to 0.32%.

In this simulation, as shown in Figure 4-52, the value of cut-off rate is based on general numbers of typical industries including the aviation industry, whereas, in terms of considering new LCC business, which is a relatively high-risk business, it may be necessary to simulate more cases and analyze the results. Although a parametric study is conducted as a supplementary in this study, it may be necessary to simulate cases with various cut-off rate conditions for various purposes in the future.

Figure 4-53 Results Matrix of Cut off Rate and Risk Analysis

Decision Index	Cut off Rate and Risk Analysis			
Cumulative Ordinary Profit (Million JPY)	0	4000	8000	12000
Case 1	0.00%	0.00%	0.00%	0.00%
Case 2	0.00%	0.00%	0.00%	0.13%
Cumulative EVA (Million JPY)	0	2000	4000	6000
Case 1	0.00%	0.00%	0.00%	0.00%
Case 2	0.00%	0.00%	0.53%	12.67%
NPV (Million JPY)	0	2000	4000	6000
Case 1	0.00%	0.00%	0.00%	0.00%
Case 2	0.00%	0.00%	0.32%	3.29%
Revenue Operating Profit Margin (%)	3	4	5	6
Case 1	0.00%	0.00%	0.00%	0.00%
Case 2	0.00%	0.52%	9.53%	37.52%
Revenue Ordinary Profit Margin (%)	2	3	4	5
Case 1	0.00%	0.00%	0.00%	0.00%
Case 2	21.75%	83.32%	99.81%	100.00%
ROA (%)	1	3	6	9
Case 1	0.00%	0.00%	0.00%	0.00%
Case 2	0.00%	0.00%	0.32%	52.04%

As shown in Figure 4-53, the author analyzed the results as follows:

(1) Cumulative Ordinary Profit

The value of the cut-off rate of this index is changing depending on the type of the project and years of a cumulative ordinary profit. In this calculation, considering that the calculation result of cumulative ordinary profit by a corporate model, which is used for fixed data calculation, is almost 100 billion JPY, the maximum cut-off rate was set to 12 billion JPY for this management index. This is one-tenth of the cumulative ordinary profit, which is 100 billion JPY. It indicates that the amount of ordinary profit for one year is set up as the cut-off rate. In addition, in Case 2, since cumulative ordinary profit is almost 200 billion JPY, this indicates that the volume of ordinary profits for six years is set as the input data.

As a result, in Case 1, value at risk (VaR) is 0.0% against any cut-off rates. On the other hand, in

Case 2, the VaR of the cut-off rate for 12 billion JPY is 0.1%, whereas the VaR is 0% for each cut-off rate of 0, 2, 4 and 8 billion JPY. This explains that it is hard to obtain a cumulative ordinary profit of 12 billion JPY for as short as ten years in an unprofitable project like Case 2. However, although the rate is not 0%, the rate of 0.13% is not significant enough to compare the cut-off rate. In short, it could say that this project doesn't have high risks if it is analyzed by NPV index by reviewing from a conservative viewpoint.

(2) Cumulative EVA

As discussed in the previous section, EVA is an index indicating the returns to shareholders. There is no specific recommended value for this index other than that the value must be greater than 0. Therefore, in this parametric study, the author adopts a value of from 0 to 6,000 which is half of those for the NPV analysis. In comparison, the value of cumulative EVA is 54.157 billion JPY in Case 1 in the corporate model, and 6 billion JPY is almost one-tenth of it.

According to these results, in Case 1, VaR is 0.0% against any conditions of cut-off rates. On the other hand, VaR is 0.53% against 4 billion JPY and VaR is 12.67% against 6 billion JPY, which are relatively large numbers, whereas VaR is 0.0% against both 0 million JPY and 2 billion JPY of cut-off rates. This means that if the stakeholders require 4 billion JPY as cumulative EVA, the credibility may be decreased. [However, originally, this index is the cumulative value of undivided profits for shareholders. Therefore, it is not a major problem if the value exceeds 0.

(3) NPV

In the same way, the author set from 0 million JPY to 6 billion JPY as the cut-off rate for NPV. For comparison, the value of cumulative NPV is 55.930 billion JPY in Case 1 by the corporate model, and 6 billion JPY is almost one-tenth of it.

According to the results of the cut-off analysis of NPV, all the VaR is 0% for any cut-off rates in Case 1. In Case 2, if the value of the cut-off rate is 4 billion JPY, the VaR becomes 0.32%. The VaR increases to 3.29% when the value of the cut-off rate is 6 billion JPY. For the same reason as EVA, this index is used to evaluate whether the project is feasible or not. The only absolute condition for this index is that NPV is positive. From this point of view, VaR for "NPV=0" is 0% in both Case 1 and Case 2, and this can be a qualified uncertainty in NPV evaluation.

(4) Revenue Operating Profit Margin and Revenue Ordinary Profit Margin

In the research for the Japanese aviation industry, the average revenue operating profit margin is almost 5.4% and the revenue ordinary profit margin is 5.0%. Therefore, based on these facts, the cut-off rate for revenue operating profit margin is settled from 0% to 6%, and the cut-off rate for revenue ordinary profit margin in this study is settled from 0% to 5%.

According to the results, VaR is 0% for each cut-off rate of both revenue operating profit margin and revenue ordinary profit margin in Case 1. On the other hand, regarding revenue operating profit margin, the results indicate that VaR becomes 0.52% against the cut-off rate of 4%, 9.53% against the cut-off rate of 5%, and 37.5% against the cut-off rate of 6%. Regarding revenue ordinary profit margin, VaR becomes 21.75%, 83.32% and 100% for cut-off rates of 2%, 3% and 5%. This means, in Case 2, that revenue ordinary profit margin does not exceed 5% at all.

(5) ROA

The ROA of a typical Japanese airline company is almost 4.5%-5.0%. It also could say said that ROA may be the returns to investors because ROA is equal to ROE in this study. In addition, this study focuses on new LCC business, and the risk is exposed to is not small. Therefore, in this cut-off rate analysis, 0-9% is adopted for cut-off rates as input parameters.

The results of Case 1 indicate that VaR is 0% for each cut-off rate. In Case 2, VaR are 0.32% and 52% for cut-off rates of 6% and 9% respectively. Applying the value of 4.5%, which is the average of the Japanese aviation industry, it is estimated that VaR will be around 0.1%. It may be said that a VaR of 0.1% is relatively low for new LCC business. In this research, in which a capital cost of 10% is assumed as a condition, a VaR of 52% may seem a relatively high risk to investors. In the further study, it may be worth conducting an analysis on cut-off rates of ROE and ROA by reviewing fund procurement methods.

To summarize the results of the parametric study above, in Case 1, which is a good scenario, [even if conservative cut-off rates are considered because VaR is 0%. It is important to confirm the results of VaR by setting up higher value of cut off rate, in terms of evaluating the project's risk more severely. Even such case of higher value of cut off rate, VaR is still 0%. This means that the business is rarely exposed to serious risks. It confirms that the business is stable and the strategy is fully justified. It indicates that a basic strategy of the business is fully justified. On the other hand, in Case 2, which is a worse scenario, it indicates that VaR of revenue ordinary profit margin is high but others are not. Therefore, it can be said that it is highly possible to obtain

profits by the strategy of a 30% discount of airfare basically with the additional strategy of a 50% discount of airfare depending on the situation.

4-5 Comprehensive Consideration of Results of Simulation

In this section, the simulation results of financial statement in Section 4-3 and the simulation results of risk analysis are presented, and the results of both will be analyzed in a comprehensive manner.

1 Examinations of Each Case

Simulation results in the two case studies are shown in Figure 4-54.

Figure 4-54 Case Comparisons by Each Principal Management Index (re-indicated)

Principal Management Index	Case 1	Case 2
Cumulative Ordinary Profit (Million JPY)	96,137	22,157
NPV (Million JPY)	55,930	10,471
Cumulative EVA (Million JPY)	54,742	9,569
Revenue Operating Profit Margin (%)	23.35	6.64
Revenue Ordinary Profit Margin (%)	13.30	2.87
ROA (%)	21.2%	9.1%
ROE (%)	21.2%	9.1%
Average Capital Ratio	1.00	1.00
Domestic Flight Yield (JPY/km)	12.9	10.4
International Flight Yield (JPY/km)	11.2	9.0
Domestic Flight Load Factor (%)	72.0	72.0
International Flight Load Factor (%)	75.8	75.8
Cost per Passenger-km (JPY/km)	9.21	9.09
Available Seat km (JPY/km)	6.80	6.71
Single Year Deficit Cancellation Point (Year)	2013	2014
Cumulative Years Deficit Cancellation Point (Year)	2013	2016

(1) Case 1 (Discount Rate of Airfare with 38%)

In this case, the LCC operates its business with a 38% discount rate of airfare. The decrease of cost for maintenance and the securing of stable demand may help to increase its business profits, and each number of the principal management index seems successful. If the shareholders are

willing to invest 9.5 billion JPY at the initial stage, they might be interested in the project when the cumulative EVA is more than 54.700 billion JPY. Yields are 12.9 JPY/km for domestic flights and 11.2 JPY/km for international flights. As discussed in Section 4-3, compared to major overseas LCC's yields are lower by almost 9 JPY/km, and Case 1 is competitive.
Meanwhile, the index of available seat km (ASK) in Case 1 is slightly higher than or almost the same as foreign LCCs'. If it is compared with other Japanese LCC"s case, the result of this simulation is more productive and competitive.

(2) Case 2 (Discount Rate of Airfare with 50%)
In Case 2, the LCC operates with a 50% discount rate of airfare. Generally, they tend to have less income and less effective numbers of each principal management index comparing to Case 1. If the cumulative EVA is only 9.569 billion JPY, the investors may not be interested in this project. However, the Case 2 indicates the lowest-level scenario to maintain business in terms of discount rate of airfare. Yields are respectively 10.4 JPY/km for domestic flights and 9.0 JPY/km for international flights. These numbers are almost the same level as other receding LCCs. On the other side, the available seat km (ASK) of Case 2 is 6.71 JPY/km, which is lower than that of other Japanese LCCs. Thus, even if the discount rate of airfare is increased, the business model of this study seems to be strongly effective.

2 Consideration by Management Factor

(1) Airfare
It is well known that the airfare of LCCs tend to be more economical than major airline companies'. However, if both major airline companies and LCCs sell the discount tickets under the same condition including airfare, flight schedule, and grade of the seat, consumers tend to choose the major airline companies' tickets arising from the superior invisible goodwill of major airline companies and the comparatively cheaper price. This phenomenon is more likely to occur in Japan. Major airline companies' marketing strategy for the online sales is that they adopt the price fluctuation system and offer a wide range of airfares, and strive to develop more passengers who have an ability to search for flights by themselves online.

The strategy of airfare of the new LCC is simple; the new LCC offers a discount of 40%-50% off the LC's normal airfare. Compared to Skymark's fare, for example, the new LCC can offer a better price for domestic operation routes such as Kobe-Haneda (the new LCC: 8,000JPY,

Skymark:10,000JPY, ANA:12,670JPY) and Kobe-Nagasaki (the new LCC:9,430JPY, Skymark:10,000JPY, ANA:19,800JPY [Itami-Nagasaki]). As discussed in Section of 4-2 of this thesis, the airfare of the new LCC is on a sufficiently lower level compared with other major airline companies including Skymark. In addition, regarding international routes, Skymark has not entered the market so far. According to this, it is estimated that the LCCs' share of major routes is 30% and the share of local routes is 40%. The share rate of Haneda route is estimated to be 10%. With regard to international operation, although Skymark has not started operation yet, considering the competition by the entry of other foreign companies and the two existing major Japanese airline companies, it is expected that the new LCC can gain 20% of its share at least.

Under this strategy, it is determined that the receiving rates of the route between Haneda and Shin-Chitose Airport, with Haneda being the world's largest passenger arrival destination, is only 30% of the profitability rate, which means that most of the passengers applied for the package tours for which the profitability rate is lower. The occupancy of a round-trip airfare within a package tour is less than 60% of the price of one-way trip normal airfare tickets, and the rest of the expense, which is approximately 40%, is mainly for the accommodation. This explains that the cost of a normal one-way air ticket could be countervailed with the costs of round-trip air tickets and accommodations, and the airfare itself is extremely low. According to the instruction of the Civil Aviation Bureau, the discount rate of airfare is 30% and most airline companies sell the tickets to the wholesalers or travel agencies with 30% discounts.

To sell air tickets in competitive prices, the following sales structure should be introduced. An LCC sells air tickets online, which means that the company is not required to pay any commission fees to travel agencies. Actually, some airline companies have stopped cooperating with travel agencies and focused more on online sales. A Computer Reservation System (CRS) is being adopted with the Aeronautical Radio Incorporation (ARINC) or the Society of International Telecommunications of Airline (SITA). In destination marketing, the collaboration with LCCs and local governments and economic organizations around the airport may induce further business for both sides.

(2) Operating Route Structure

LCCs usually gain profits from the specific categorized group of passengers. Therefore, it is necessary that the size of its market is significantly large. To achieve this goal, LCCs operate their

flights on either huge-demanded routes between large cities or sub-routes near large cities as a secondary option.

In this analysis, the routes with a large number of passengers from western Japan and the portion of these involving LCCs, which are able to maintain the profitability of business, were selected. Therefore, LCCs are not required to change the number of flights depending on the number of passengers, and these are only required to operate all the services by using the flexibility of aircraft and the fundamental demand from the passengers. For instance, if an LCC operates only 2 round-trips per day, the route should have a larger number of passengers. In this case, almost all load factors are fixed; additionally, LCCs have to make more efforts in selling tickets and asking for more support from the local communities.

(3) Maintenance Cost

In referring to the data of major airline companies (i.e., JAL and ANA), it is clear that the maintenance cost of aircraft was estimated. However, in the actual cases of LCCs, a large number of them tend to spend a tremendous amount of money for aircraft maintenance, which is comparatively higher than the estimation. This could mean that this large aircraft maintenance cost is an obstacle for many LCCs to sustain their business. Thus, one of the keys for the sustainable development of LCCs is to reduce this cost.

In this section, the two conditions stated below were used to consider the possibility of successful business while holding down the expense of maintenance for aircraft:

- Entrusting aircraft maintenance service to MRO, and
- Introducing Boeing 737 aircraft, which is one of the most popular aircraft in the world.

The results of these simulations indicated that the business of LCCs will prosper if the maintenance cost is held down by the strategies mentioned above.

The high cost of maintenance is a peculiar problem especially in Japan. It arises from the components of aircraft being expensive and minor airline companies have to outsource the maintenance service because the aircraft maintenance business is the monopoly of the major airline companies.

It was an obligation for airline companies to maintain their aircraft by themselves. Nonetheless, airline companies petitioned for the Civil Aviation Bureau of Ministry of Land, Infrastructure,

Transport and Tourism (MLIT) to abolish the regulation, and they became eligible to entrust the service to providers outside of their company.

As a remarkable movement for deregulation, the Civil Aviation Bureau of the MLIT announced the "Update Program," which is reconsidering the aviation standard security for the purpose of enhancing competitiveness in the airline industry and emphasizing the social needs of airports renovations (i.e., expansion and renovation of Haneda and Narita airports), the Asia Gateway Plan, and liberalization of entry into airports including local ones for LCCs. The "Update Program," additionally, includes the relaxation of regulations, which leads to a reexamination of in-flight inspection and an introduction of approving the joint enterprises. Repealing the essential principles of the Aviation Act, it accelerated the trends of price competition without emphasizing safety, such as leasing of aircraft, maintenance outsourcing, and hiring more temporary employees. Within the maintenance department in the major airline companies, particularly, the plans of separation of departments and outsourcing were introduced, and entrusting to MRO company has becoming significantly popular since 2009. At the same time, some airline companies including popular ones argued about the negative effects of this advanced outsourcing as well. Taking an example of a major airline company, it has started to outsource the heavy maintenance services to Singapore and Amoi in China in search of cheaper labor forces.

Also, it will be less problematic for the major airline companies to ship an aircraft for two weeks via a sea route for maintenance; however it will be a huge disadvantage for LCCs due to their limited numbers of aircraft. Therefore, LCCs tend to maintain aircraft by themselves.

Although major airline companies entrust maintenance service to companies abroad, there are several problems remaining, such as lower quality of maintenance service, higher personnel expenses of Japanese technicians, and labor union issues. Recently, there is a growing movement to establish an MRO company in Japan. This is likely to happen in the near future. If so, it will lead to a significant reduction of aircraft maintenance costs for all the airline companies and benefit for the middle and small companies to create more jobs in Japan as well.

In short, it will contribute to the further development of the Japanese airline industry to establish domestic aircraft maintenance companies in Japan cooperating with several airline companies, because these may break the monopoly of the maintenance service business by the major airline companies and the entire airline market will be much more competitive. What is more, this

aircraft maintenance industry may boost the Japanese economy greatly by inducing relevant businesses domestically and abroad. This suggests that the establishment of domestic aircraft companies is a necessary condition for the Japanese airline industry to sustain its business and its further development.

(4) Aircraft Type

It is widely known that it is efficient for airline companies to use the aircraft made by Airbus, because all the Airbus's aircraft have the same style of cockpit and commonly used mechanical and electrical parts. In this simulation, B737 was selected as a model aircraft. A large number of LCCs in other countries generally tend to use A320. The reasons for using Boeing aircraft are the following: (1) the Boeing aircraft are recommended by the Japanese Ministry of Economy, Trade and Industry, and almost all the airline companies in Japan operate their services with them, (2) if the airline company buys B737s, the part of its expense is defrayed by the Japanese government, (3) in terms of efficiency of a maintenance services, it is advantageous and rational to introduce Boeing 737s because the airline companies can outsource the maintenance services to MRO. Therefore, it may significantly reduce the costs of equipment and training for technicians from LCCs' revenue.

The price of a Boeing 737 is 3.78 billion JPY (43 million USD) with a fixed depreciation of 17 years. The residual value is 378 million JPY (10%). This means the annual cost is estimated at approximately 205 million JPY. If the airline company must purchase aircraft, it is able to borrow money from banks with a 3% interest rate and the total interest cost is 116 million JPY.

The leasing cost, which depends on the number of aircraft leased, is estimated as the range of 0.9%-1.0% of the total amount per month. Thus, the leasing cost of aircraft will be 417 million JPY per year. This indicates that the lease cost is more expensive than its purchasing cost.

In short, comparing purchasing cost with leasing cost, purchasing for aircraft seems to be beneficial. In this simulation, however, the numbers of aircraft under lease and purchased would be a key factor for all the airline companies to decide their strategy of management policy. In this simulation, a total of 15 aircraft has been estimated under a lease from 2013; in 2020, these 10 aircraft will be still leased and the rest will be fully paid for under my calculated results.

(5) Customer Acquisition

In Japan, most airline companies have not focused on the market of air ticket sales, and travel

agencies became one of the biggest sellers of the tickets. By ITC, the cheap package tours collected consumers' attention, and travel agencies were sending these people to the airline companies automatically. These customers prefer to choose the travel agent-organized tours, and contribute to the sales of seats in the aircraft. The market of other passengers such as not those travelers had never been the main business target of airline companies. Generally speaking, a large number of Japanese travelers do not prefer to organize their own trips by themselves, and choosing a package tour from the limited choices is a main tendency, which is not popular among the western countries at all.

Since LCCs prioritized receiving the reservations from the individual customers, some sophisticated ones have bought air tickets through LCCs. Especially, the customers who are able to coordinate their own excursions have used LCCs' service and helped to increase the seat occupancy rate.

On the other hand, the major airline companies have conducted the seat up-grade service with adding some extra money as one of the strategies to take back the customers who have floated to the LLCs. Although there are competitions between the major airline companies and LCCs, these cannot be a trigger to change the customers' preference and LCCs have been earning more repeaters.

(6) Fund Raising

For the successful case of starting an LCC, JetBlue Airways, as an example, secured $160 million at the launch and continued to shift itself for the early IPO for stable stream of funds. In contrast, Japanese LCCs struggled with limited available funds to launch their businesses. And this tells us that the initial fund-raising became the key success factor for LCCs.

Usually, it takes a long time for new LCCs to list their stocks in the market. Securing funds from investors has become the major task for most of LCCs, as it is relatively difficult to convince the investors of the successful future of LCCs. It is also very important to maintain good and close relationships with the main banks for LCCs. The early IPO is another way to secure additional funds for stability as well as for the growth of business operations.

There are other measures to raise money, such as the utilization of the public funds. Air Do, for example, started its operation with private funding. Then as it faced the shortage of funds,

Hokkaido and Sapporo government provided 5 billion JPY as loans and subsidy. However, Air Do went out of business eventually. SkyNet Asia used Air Do's failure as a "lesson," and received 800 million JPY from Miyazaki prefecture as a subsidy as well as investment from local citizens and companies, before the launch. However, such easy dependence on public funds may cause moral hazard of the management and thus failure in business.

Air Asia Airways, a Malaysian LCC, took over the bankrupted airline company including its debt, stocks, and other assets such as aircraft and pilots. Putting its new business model as a cheap airline company up front, this LCC reconstructed the operations and increased the company stock values, and expanded the scale of its business. It also hired the former aviation director of Ryanair as an advisor and main stockholder, and captured the trust of investors with Ryanair's LCC business model.

Considering this example, this method of starting a new LCC by taking over an existing airline company including its assets, and transforming it with a new business model, may be the most appropriate approach instead of starting from scratch, because the new LCC is able to operate with a number of available aircraft. Especially from the cost effectiveness side, the most effective approach is to take over a bankrupted airline company as the Air Asia's case.

In addition, positioning the experienced management team for a new LCC has tremendous advantages. Air Asia is placing Ryanair's former executive in its management team. And one of the reasons JetBlue Airways successfully secured ample funds was its excellent business model and management team with a proven track record of establishing LCCs.

In Japan, the reason ANA rescued Air Do is said to be that its available slots were attractive. Securing management rights of LCs may relate to the launch of LCCs for obtaining the slots at Haneda and Itami as well. The aviation industry is still dominated by large-sized LCs in Japan.

Typically, in many analyses up to now, the annual loss is complemented by a loan in financial simulations. In reality, LCCs tried to do the same; however, the Japanese financial institutions didn't accommodate such requests. And LCCs failed to raise funds for continuing the business, and then eventually merged into large-sized LCs.
Airline companies hold large assets and have to maintain a high degree of safety. For that reason, a variety of preparation including training, maturity, and inspections, are necessary along with a

very large cost until the start of operations. Furthermore, it takes a long time to retrieve the revenue. In Japan, such revenue retrieving activities, including adjustment with credit card companies and other business entities, may take up to five months. With this business background, a new LCC will require enough funds to cover the first year's expenses plus six more months' worth of additional funds before receiving payments. Securing this much funds becomes the success factor of the LCC startups. Therefore an ample initial fund is required, and 9.5 billion JPY, as defined in this analysis, makes the stable operations for LCCs.

LCCs' failure in the past several years provides the recognition that the key to success for a new LCC is to start with securing ample funds prior to launching the business. In Japan, investors' behavior leans toward low-risk. Thus, a new LCC has difficulties raising enough funds for starting the business. Even after the launch, LCCs often spend so much effort securing loans that they cannot focus on managing the business. Japanese investors' evaluation on such operations comes up short, as they mainly look into the management infrastructures and business execution conditions. As a result, LCCs are not able to come up with additional funds, and then face the failure. All the failure cases of LCCs have followed this pattern.

These failed LCCs launched their business with the capital amount of less than 2 billion JPY. As a result, they had difficulties convincing investors with bright outlooks. The difficulties of fund raising efforts worsened, and LCCs relied on speculative investors. Eventually the management was taken over and sold to large-sized LCs.

Fuji Dream Airways (FDA) learned from the failure case of Japanese LCCs. They secured 20 billion JPY at the start and have continued their operations. With enough funds in their account, the management can focus on operations and avoid failure, instead of raising money during their busiest time. FDA started their service at Shizuoka Airport where not much demand was expected. Without worrying about operating funds, the management was able to shift its hub to Nagoya where a much larger demand existed. FDA's case demonstrates the good and flexible judgment of the management team.

In Japan, not just investors but also financial institutions have a tendency not to make their own investment decisions. If a large-sized financial institution is financing a business, other smaller institutions then follow and invest in the same business. With this trend, investing decisions of investors are depending on the evaluation of large-sized financial institutions.

This analysis' mission is to prove that the LCC business model is clearly a successful one if there is ample initial capital. As the external risks are included in the simulation, the assumption has been confirmed for the success of LCCs with ample available funds.

3 Management policy of LCCs

While analyzing performance of existing LCCs, management policy of LCCs needs to be reconsidered and reclaimed as follows:

(1) An LCC should obtain a certain amount of initial fund which the necessary expenses by its establishment and enough working capitals until its recovery

(2) If local airport such as Kobe Airport becomes a hub airport, it is more preferable to operate it as both a domestic and international airport.

(3) It is better not to operate cargo services in Japan.

(4) An LCC should utilize the outsourced maintenance service prepared by MRO

(5) Boeing 737 aircraft is the most suitable model in terms of maintenance efficiency in Japan.

(6) To improve its operation performance, LCCs ought to introduce the same aircraft type and specification including parts, unify the training of pilots and cabin crews for both domestic and international routes,

(7) If a discount air ticket is issued by both a major airline and a LCC, a passenger may choose the major airline's. It is a proper rate for LCCs to sell the tickets with 40%-50% discounts to the customers who are willing to buy a ticket at the last minute.

(8) LCCs should not deal with the passengers of package tours. They ought to focus on the passengers who are eligible to make their own travel itinerary, book air tickets, and find accommodations by themselves.

(9) An LCC should make a good use of devices like computers or mobile phones to promote ticketless services. This operation does not cost any commission fees for travel agencies.

(10) Destination Marketing is a useful tool for LCCs to compete with major airline companies. LCCs may gain more customers if they work with a local government and an airport and promote their landing locations such as providing local information (i.e., restaurants, accommodations, things to do).

4-6 Meanings of Analysis Result and Future Challenges of Methods

1 Suggestion for Successful Business Models

In conclusion, the preferable conditions and requirements of establishing new LCCs were identified by a various simulations. The following are key elements for establishing a successful LCC .

(1) Developing its own training systems of aircraft maintenance technicians and crews, or to outsource maintenance services

(2) Operating its business with a certain number of aircraft from the foundation such as more than 15 aircraft

(3) Utilizing leased aircraft and then starting to increase the purchase ratio gradually if its fund has enough extra funds.

(4) Setting up the discount airfare rate from the range of 40-50% for both domestics and internationals, and making the market more competitive.

(5) Combining both short- and mid-distance flights, and frequent use of the aircraft with 150 seats.

(6) Treating international routes.

(7) Having enough funds for operations from the time of establishment (Minimum 9.5 billion JPY).

(8) Utilizing the secondary airports as a hub like Kobe Airport

Firstly, it is necessary for a new LCC to develop its own maintenance department and employee training system. This still costs a significant amount for a new LCC; however, it is much less than outsourcing these services to LCs.

Secondly, the idea of economy of scale still exists until the business volume reaches a certain level, in the aviation industry, even if the economy of scale effect is a relatively small factor. As a result of simulations 2 and 3, it is more beneficial for a new LCC (2) to operate its business with a certain number of aircraft from the foundation such as more than 8 aircraft, and (3) utilize leased aircraft and then start to increase the purchase ratio gradually if its funding is enough.

The simulation also proves that the above effort of cost reduction enables (4) an LCC to compete against LCs with discount rates (40-50% off).

Furthermore, a number of flights and combination of routes become extremely critical factors in order to launch with above level starting point, to realize a higher rate of operations to reduce the cost and to capture higher yield by increasing convenience, as analyzed in the previous section. With the simulation, it becomes obvious that (5) highly frequently used smaller aircraft (150 seats) shows better results. In addition, (6) the combination of short- and mid-distance international and domestic routes shows better performance only in the domestic routes.

Lastly, the analytical results indicate (7) securing enough funding for starting at a certain size stabilizes the financial footing and provides an advantage on financing for business expansions. Therefore, an early stage financing is a critical and successful factor for a new LCC.

Additionally, other advantages are revealed in the simulation as (8) the secondary airport such as Kobe Airport is utilized as a hub. The first reason is the size of demand in the Kansai area is the second largest after the Tokyo Metropolitan area. And Kobe Airport is the secondary airport of the Kansai metropolitan area. On the condition of this business model in this simulation, Kobe Airport is selected for the following reasons: the Tokyo metropolitan area does not have an ideal secondary airport; Itami, a hub in the Kansai area, has tough restrictions for landing/taking off slot allocations and operation hours; and both Itami and Kansai Airports charge high airport usage fees. The advantages of using Kobe Airport include cheaper landing fees and freedom of flight volume selections. And the simulation clearly reflects these advantages to the result. These advantages are also general characteristics of utilizing secondary airports. Thus, some of these characteristics are also proven through the simulation. Other than the above results of simulations, the advantages of Kobe Airport's utilization for LCCs are also indicated in the previous analyses. Because of being the secondary airport, Kobe is expected to offer LCCs possibilities for differentiating factors against LCs and flexibility of the airport usage fee

structure.

2 Contribution of the Analysis Methods and Future Challenges

One of the important contributions of this study is providing the risk analysis using Monte Carlo simulation and the profitability analysis on the corporate model simulation. This model is a profitable model that can not only offer limited analyses including profitability and risk, but also combine a wide variety of factors necessary to simulate complicated cases.

The reasons why Japanese LCCs have been in the red for a long time are management policy issues and strict regulations in Japan. But this could mean that such LCCs have not implemented enough risk management analyses for their business. It is difficult to predict factors that include cost, external factors, and demands on the establishment of a new business.

Uncertain factors, such as a currency exchange rate with a daily fluctuation of 10%, for example, have to be handled as probability variables. If Monte Carlo methods are utilized, principal elements for the project decision-making can be obtained through such information as high-risk, high-return or low-risk, low-return. There are still some modifications required for its structure. However, the model's effectiveness is very high because this is verifying the investment's validity using profitability and risk analyses.

One of the challenges that needs to be improved is the data integrity. Cost data for the simulation is obtained from public data and interviews, and the numbers close to the actual ones were selected. However, some of the publically available information on the expenses data does not represent the scale of the actual airline companies. Therefore the result may vary for LCCs. It is difficult to reflect these factors in the models. However, a large number of improvements are required. In addition, the updates of latest information depending on the operations and environmental changes are also necessary.

Lastly, there are still challenges for the corporate model. As repeatedly mentioned, this universal model can accommodate a wide range of factors and variables. If modifications, development, and improvement of the model can be achieved considering the following issues, it will become even more effective for obtaining management policies.

(1) To construct a corporate model that reflects the behaviors of multiple airline companies and simulates game theory containing the competitive condition with other companies.

(2) To develop and improve the model to include the "Inverse Calculation Program," which can calculate the input variables, such as faire discount rates and available seat km, when the principal output goal values such as NPV and operating profitability are set up.

Chapter 5 Conclusion and Future Challenges

Introduction

In this study, after analyzing success factors of LCCs outside of Japan, the reason why their business models do not function in Japanese LCCs were studied in Chapter 3. Based on the study result, a new successful business model was constructed, and was verified through profitability analysis by financing simulation using a corporate model as well as risk analysis according to Monte Carlo Methods in Chapter 4.

This chapter, based on the analyses conducted in the previous chapters, will discuss management successful factors for establishing LCCs as well as proposals for reform in instructional and market structural restrictions in competition policies and aviation policies, which are related to the said management successful factors.

5-1 Conclusion for Management Policy

1 Building Low-Cost Structures

Cost reduction is a key element for LCCs to compete against LCs. From this aspect, the cost analysis in Chapter 3 revealed that Japanese LCCs are not operating under a low-cost effort.

The first reason for this is uneven distribution of management resources to the LCs in the Japanese airline market. While LCCs in Europe and North America operate at low-cost by outsourcing aircraft maintenance, training for crew members and sales, as they have a variety of choices for outsourcing and at low fees, new LCCs in Japan must face a peculiar situation that they must outsource the above resources to the rival LCs. Outsourcing cost will be high for new LCCs because they only have limited outsourcing choices and limited negotiation power. To avoid high-cost outsourcing, LCCs must establish their own self-management systems. However, self-management of such resources will be of high cost until the company is established and grows into a certain business scale. It must pay the high outsourcing fees until it establishes a self-management system. And now it becomes possible for LCCs to put their resources together to establish a co-founded maintenance facility to serve all of their aircraft at much lower cost. This new choice is reflected in the simulation. For the first time in this simulation, the maintenance

outsourcing cost is included. The simulation results shows that a new LCC can be established even by conducting maintenance and training for crew members on their own if other management factors are in fine condition. Therefore, new LCCs must aim at establishing a self-management system for management resources.

The second reason is because of the restriction of departure and arrival slots. Japanese LCCs had to start operation with only one aircraft. There is significantly small or no effect of economy of scale in the airline industry. At the time of launch, however, a reasonable size of fleet still benefits from the economy of scale, and, therefore, is able to lower the average cost. Thus, as indicated in the simulation results in Chapter 4, a new LCC must start with a business model utilizing a fleet of 15 aircraft. Prior to the start of business, the freedom of route selection and number of flights have to be guaranteed, and the problem for financing for the initial investments has to be solved.

Thirdly, the simulation results demonstrated that it is most efficient to launch an LCC with leased aircraft and then to purchase them as more funds become available. Still, leased aircraft are relatively expensive, and shifting to one's own aircraft at an early stage is needed to lower the mid- long-term cost.

Fourthly, New LCCs need to put even more effort into lowering costs, as institutional barriers are recently becoming less of a problem, though the institutional issues may still prevent the airline companies from lowering costs to some extent. In order to achieve such objectives, LCCs must learn from successful foreign LCCs' efforts such as use of single type of aircraft, simpler operations, selecting the most efficient route structure for maximizing the operation rate, and enforcing no-frills services.

Furthermore, as LCs still control sales resources such as the CRS system, LCCs need to put more effort into building online-based sales networks in order to simplify the sales process and lower sales costs, by referring to the successful examples of LCCs in North America and Europe or Asia.

2 Setting Up Appropriate Fare Levels and Fare Structures

The results for detailed analysis on the competition relationship between LCCs and LCs in Chapter 3 as well as the simulation results in Chapter 4 demonstrate that a new LCC in Japan must set its airfare at around 40% discount level compared to the normal fare of LCs, which is at the same as

the individual cost for each route of LCs.

The pricing, however, is affected by the competition conditions of other markets as well.

As analyzed in Chapter 3, competition has become more active in the airline industry in Japan compared to the time when the first LCC entered the industry, so it has become less likely for LCs to offer predatory prices. But a competition only through offering low fares has a limit, as shown by the failures of cheap airlines that initially entered the market in the United States.

Not to repeat the same failure, LCCs must specify and clarify their own customer target. Southwest Airlines, for example, focuses on a class of passengers who are susceptible to fare levels. JetBlue Airways focuses on business passengers. Air Asia focuses on mid- to low-income passengers who do not regularly travel by air.

In addition, LCCs must compete against railways and bus transportation. Whereas LCCs compete mainly against road transportation in Europe and in North America, Japanese LCCs must compete against both road transportation and the Shinkansen (bullet trains) by offering relatively low fares to compete with fares offered by highway buses and the Shinkansen for the competitive routes for increasing general demand.

LCCs also need to target a certain class among existing passengers whose price elasticity is relatively low in case the airline cannot offer low fares on a constant basis. In this sense, StarFlyer, a new LCC that has entered the Japanese market, is getting a high degree of attention for its strategy similar to that of JetBlue Airways. StarFlyer strongly focuses on business travelers as its target in order to differentiate itself from its competitors.

3 Choice of Route Structure and Number of Flights

The route structure plays a critical role in the airline company's productivity. Analyses and simulations in Chapter 2 indicate that a combination of mid-distant routes as well as high-demand and short-distance routes contribute to the operation rate of aircraft.

In addition, the simulation adopted 100-150 seat small aircraft on these mid-distant routes with high frequency operations under the conditions that the business passengers find more value on

high frequency on mid-distant flights, and successful LCCs commonly operate high-frequency flights with smaller aircraft than low-frequency flights with larger aircraft. The simulation obtained an excellent result.

LCCs in principle operate high-frequency flights with small aircraft. However, the first-generation LCCs in Japan had to operate according to a route structure and flight frequency determined by the restrictive and uneven institutional framework, including restriction in the number of arrival and departure slots. This was contrasted with the situation in Europe and North America, where LCCs were able to choose their own routes and operate frequent flights. Airline companies which have recently entered the market have more freedom to select routes compared to the time when the first-generation LCCs such as Skymark started operating. The degree of freedom in selecting routes, however, still remains as an aviation policy issue to be resolved, which will be discussed later.

Based on the results of the simulation, it is also clear that Japanese LCCs need to expand into the international market to obtain more profitable routes, as European LCCs and Air Asia have already been in practice. This is because it is more beneficial to LCCs if they can choose a large number of potential routes with relatively high demand and from larger options. In that case, considering not just domestic but also international routes results in more opportunity. Of course, international aviation policy has to be deregulated to make such changes possible.

4 Proactive Use of Secondary Airports

As described in Chapter 3, the use of secondary airports is the key for LCCs in entering the market with low fares when it comes to cost and differentiation from large airlines. Leading LCCs in North America and Europe, such as Ryanair and Southwest Airlines, have become successful by using secondary airports. This is a keen contrast to new Japanese LCCs that use Haneda Airport, an existing hub, as their launching location. The simulation in Chapter 4 utilizes Kobe Airport, a secondary airport with lower usage fees and less restriction on operations and slots, which became one of the key reasons for drawing a favorable result.

In the past, there were not many secondary airports in Japan, but today existing older airports are being made into secondary airports as new airports are being built. In addition, new airports have been built with the function of secondary airports, such as those in Kobe and Kita-Kyushu. New

LCCs, therefore, should consider more active use of secondary airports.

Although the number of secondary airports is increasing, their use is still restricted by regulations. The recommendation for changes in regulations is discussed later in this chapter.

5 Securing Sufficient Funds to Prepare for Launch and Support Early Stage of Operations

As discussed in "Building Low-Cost Structures," there is a minimum economic scale for an LCC to start operating, considering commonly required costs, including cost for maintenance facilities, airport-related expenses, and investment cost in IT systems for sales. As stated in the simulation in Chapter 3, it is desirable for an LCC to start operating with at least with 15 aircraft.

In order to start at a certain scale of operation, by securing the above said number of aircraft, the new LCC must plan a financial base for incorporation and prepare for survival during its initial years, when it is bound to accumulate deficit. One of the key success factors for an LCC is obtaining sufficient funds at the launch of business. This is obvious as JetBlue Airways started with $160 million, while SkyNet Asia Airlines struggled with a fund shortage. In this study, the simulation indicates the required cost of launching with 15 aircraft for a new LCC is approximately 9.5 billion yen, and this amount is four times as much as the sum that SkyMark needed at the beginning of their operations. Therefore, the challenge for the new LCC is how to secure this initial funding.

There are three scenarios for raising funds.

The first scenario is acquisition of an existing company. Referring to the case of Air Asia, the company acquired a controlling interest of a bankrupt company to start its business. For new LCCs, this is the most attractive scenario because all the existing assets such as aircraft and pilots can easily be reused for the new business model. This enables the new LCC to launch its service with a larger number of aircraft from the beginning.

The second scenario is the most standard method of raising funds by presenting investors with business plans, and receiving funds from them. As it takes a quite a long time for any airline to be publicly traded, a key issue is how to convince investors of the certainty of corporate profitability.

It is not an easy task to convince investors in Japan, who have witnessed the past experiences of LCCs, and who are not ready to take risks. It may be more promising to seek for funds in other Asian countries where LCCs in the area received funds mostly from local sources and where investors are risk-takers, and due to the development in the Asian airline market. There is quite a gap between the 95% and 99.99% scopes of management indexes. For example, the difference in the bottom limit of the accumulated operating profit becomes 4 billion yen. Cautious Japanese investors may not make a move unless it falls in the scope of 99.99%, while aggressive risk-taking overseas investors may feel comfortable at the 95% scope. Of course, the laws and regulations must be amended in order to accommodate foreign investments.

The third scenario is to seek subsidies from public sources as Air Do in Hokkaido Prefecture and Skynet Asia in Miyazaki Prefecture did. Although this is an easy option, it might incur moral hazards and might finally result in the impairment of the management.

The above management policy requirements are needed, in order for LCCs to succeed in Japan. In other words, a successful LCC in the Japanese market consists of the business model, which incorporates the following improvements:

(1) Improving efficiency and lowering costs by the use of single type of aircraft, emphasis on no-frills services, IT-enabled sales structure, frequent operations with smaller aircraft (100-150 seats), self-management of maintenance and training for crew members, and appropriate route structures with potential deployment of international routes,

(2) Differentiating by utilizing secondary airports in metropolitan areas and targeting specific customer segments, while maintaining a competitive edge against LCs by offering at least 40% discount from LCs' normal fares,

(3) Ability to launch its business with 15 aircraft operations size with 9.5 billion yen in capital, and

(4) An airline with a strong innovative mind which aggressively advances into the field of air cargo services.

6 Difference in Strategy between Skymark and LCC Business Model in This Thesis

Skymark has been actively expanding its domestic routes, with Kobe Airport and Haneda Airport as hub airports. As of December 2012, the company possessed 29 B737 aircraft, and operated 80 daily round-trip flights for 26 routes.

Skymark began service on the Haneda-Sapporo and the Haneda-Fukuoka routes as a hub, and targeted high-demand routes. However, the company could not be assigned a sufficient number of arrival and departure slots. As a result, it failed to increase sales. They were able to secure passengers on the Osaka-Sapporo or the Osaka-Fukuoka routes, but its sales problem was not solved because it had to compete against Shinkansen, and also because the cost per unit was low because they were touristic routes.

Now, it is planning on beginning service on international routes in 2014 with A380 on Narita-New York route. The existing flights have mono-class only, but the New-York route will be operated with two classes: Premium Economy and Business class.

The winning formula of Skymark is to attract customers away from major airlines by offering lower fare on the routes operated by major airlines. Skymark does not want to get involved in a grueling campaign such as low price competition with other LCCs any longer. Therefore, with regard to entering into the international market, Skymark targets operating on not short-distance Asian routes operated by LCCs, but long-distance international routes, which are stronghold of LCs.

Skymark is changing its strategy for not only international routes but domestic routes. The company will introduce larger A330 aircraft (300 seats for two classes in total) in the same year, 2014, to major routes between Haneda and Sapporo, and between Haneda and Fukuoka, which have the largest demand. Skymark operates Haneda route with incredibly high load factor, which was 94% in average in 2011. Although it was decreased in spring of 2012, it recovered to 90% level in October and November. It means every flight on this route is almost full. Currently, Skymark is operating a small type of aircraft, B737, with only 177 seats. As no airlines can expect to secure more arrival and departure slots of Haneda Airport, Skymark will replace B737 with larger aircraft (A330) to enhance its capacity.

However, there are some concerns on Skymark's strategy to anticipate expansion by introducing

two types of Airbus aircraft. The first concern is about the company's ability to attract more customers on international route to which A380 is applied. It is difficult to fill up at least 228 seats of business or economy class to exceed break-even point with a load factor of 60%. JAL or ANA can provide only 77 seats in business class and 46 seats in premium economy class at a maximum on New York route. Although Skymark will attract customers through domestic contracts with more than 1000 industrial clients and travel agencies, it is expected to face an uphill battle especially in the United States due to its low profile. Partnership in the United States may be necessary.

Secondly, with regard to domestic routes operated by A330, Skymark has 10% of share on Haneda-Sapporo route and 15% of share on Haneda-Fukuoka route, respectively. JAL and ANA have ignored such smaller portion of share because they can earn sufficient profit to provide seats of expensive price. However, if Skymark increases its share to 20%-30% level, major airlines will not ignore it and will offer a counteractive discount price.

The prominent concern is that the Skymark's challenge might significantly damage its finance if it ends in failure For instance, A380 is a super large aircraft and very expensive (28.7 billion JPY). Skymark has a preliminary agreement for the purchase of eight aircraft including purchase of three aircraft (almost 60 billion JPY). Skymark already paid 17 billion JPY for Airbus and have more than 26 billion JPY of cash to procure the remaining two. Although Skymark has 64% of equity ratio and its finance is very stable, this is indeed a large purchase for the company who earns profit less than 100 billion JPY with assets of 70 billion JPY.

Originally, Mr. Nishikubo, CEO of Skymark, who is not stereotyped and provides strong leadership like CEOs of foreign successful LCCs, mentioned with lessons learned from his experience in the IT industry, mentioned that the most important mission for his company is to maximize profits and low-cost is one of the measures. Major airlines in the world are still competitive despite LCCs' attack, because of the variety of their business. They have long-distance international routes, charter flight services, providing first and business class, therefore, any of those can make a profit. It is necessary for our company to add business variation and to break away from cost competition. Because we compete against not LCCs but major airlines, we can make profits."

Thus, Skymark Airlines take on new challenges by changing its original business model such as use of single type of aircraft short-distance routes and single class, which are LCCs' basic concept.

If a company does not continue to change its business model, it will not survive in future. Such a sense of crisis motivates Skymark to expand its business internationally and use larger size of aircraft.

The new LCC business model in this study incorporates many causes of the failure by LCCs, and differs from the Skymark's business model. Skymark began service on the Haneda-Sapporo and the Haneda-Fukuoka routes as a hub, and targeted high-demand routes. However, the company could not be assigned a sufficient number of arrival and departure slots. As a result, it failed to increase sales. They were able to secure passengers on the Osaka-Sapporo or the Osaka-Fukuoka routes, but its sales problem was not solved because it had to compete against Shinkansen, and also because the cost per unit was low because they were touristic routes. Skymark is now operating Kobe routes, but not international routes. As a result, it cannot secure transit passengers. As it is not fully securing passengers, its load factor sees no increase.

The new LCC model will use Kobe Airport as a hub, and will operate on routes with high-demand only. Also, by providing service on international routes, it will secure customers on the final destinations other than Kobe by maintaining the same demand, for increasing profitability. It also conducts web-based destination marketing, which is not applied by Skymark, and maintains expected demand. In mid- and long-term, the goal of the new LCC model is to attract customers who meet LCCs' original target, which means, a potential passenger who can plan his own trip. Skymark has not taken any concrete strategy regarding this point. The new model concentrates on routes with high demand, and constantly continues its operation without expanding for 10 years. Its fare structure is simple, by setting only 40% or 50% of normal fare. This way, the fare for Kobe-Haneda and Kobe-Nagasaki routes will be cheaper than that of Skymark. With this price setting, tickets can be sold directly via the web and not through travel agents. On the other hand, Skymark sometimes attracts customers by setting an unreasonably low price. The new business model, as a business cost reduction measure, will use only a single type of aircraft, a B737, to cope with the problem of maintenance cost, a problem that has been commonly shared by many LCCs. The model will minimize parts procurement cost as well. It will minimize maintenance cost by outsourcing maintenance to MRO, a co-founded maintenance company. As a result, the new model can maintain cost per ASK to a low level. ASK is an important management index for an airline company. As for initial funds, Skymark was established with 150 million yen, and increased its capital every few years. The new business model for this study procures the 9.5 billion yen of funds required prior to start of business. This is necessary as operating fund for

starting a business and to survive its initial stage. Therefore, with no funder, business will not be started. Many of the LCCs failed in Japan, but, the new business model, as was seen in this study, is targeted to an appropriate size, so it is highly profitable. Therefore, I believe initial funding can be procured by investors who support the LCC business model suggested by the study, which fully understands the LCC business.

Under these conditions, deregulation and European LCCs were analyzed and the results were incorporated into the business model to construct a corporate model. A simulation was conducted that suits establishment of LCC in 2013. Analyses of profitability and risk were conducted. As a result, a ten-year NPV totaled 96 billion yen. VaR was also within an allowable range as a new business company. To compare with Skymark, for example, cost per ASK was 9.4yen for Skymark, while 6.8yen for new LCC. Profit and cost structure was individually reviewed and these factors influence the simulation for improving the business' high validity.

5-2 Conclusion for Aviation Policy

As was discussed previously, a significant part of management policies is restricted by institutional barriers in Japan. The results of the simulation analysis in Chapter 4 were compared with analyses in Chapter 3 were combined to lead to suggestions from the competition policy and aviation policy points of view, as shown below, for reforming institutional and market structural factors, which hinder degree of freedom of management of LCCs,

1 Abolishment of Restrictions on the Market Structures and the Measures to Be Taken

As was discussed in Chapter 3, uneven distribution of management resources and the possibility of predatory pricing by the LCs were critical factors in the late 1990s when LCCs entered the market. These factors are no longer critical.

To solve uneven distribution of management resources, in the present improved institutional environment for new airlines, an action taken by an LC to hinder fair competition must be individually dealt with in principle by after-the-fact regulation policy.

It is also now becoming more difficult to set a predatory price, as was noted in Chapter 3. When

considering conditions for predatory pricing, it is not easy for an LC to set a price for a monopolistic route at more than double the fare of the competitive route.

Though the monopolistic power of large airline companies is decreasing, there is still a considerable number of monopolized routes. In addition, there is a sizable disparity in the financial strength needed to survive price competition between LCCs and LCs. As was analyzed in Chapters 3 and 4, new Japanese airline companies are vulnerable until they grow to a certain size. They are also weak in securing funds. It would incur a loss in the market in the long run if some new airlines quit before establishing their management base, considering the effect of long-term competition. Also, as mentioned previously in Chapter 3, the fact that the airline market is not necessarily contestable must be taken into consideration.

In principle, the situation must be dealt with not by before-the-fact regulation, but by after-the-fact regulation. Until a new and small airline company with small funds grows, regulations for restricting counteractive fares, however, must be implemented for obtaining a positive effect of long-term competition.

2 Complete Abolishment of Control over Supply and Demand Adjustment and Foreign Capital Restrictions

With the revisions made to the Aviation Act in 2000, it has been made legally possible for airline companies to choose routes on their own, but actually there are many traces of the past regulating policies that work as institutional obstacles to free operations of newly participating airlines, as was discussed in Chapter 3. In reality, control over supply and demand is still performed by regulatory authority.

Therefore, the following measures must be taken for completely free selection of routes and number of flights:

Firstly, it is vital that substantial supply and demand adjustment for arrival and departure slots at a crowded airport be abolished. New airline companies now receive prioritized arrival and departure slots, so they encounter no more serious problems at the time of new entry. Arrival and departure slots, however, are restricted in most hub airports. Regulatory authority can arbitrarily control the market through distribution of arrival and departure slots. Such circumstances lead to

the loss of the degree of freedom of management of the airline companies, and this will have a negative effect on the healthy development of the air transport market.

Secondly, in conjunction with liberalization in selecting routes and the number of flights, international aviation market must be liberalized. The results of the simulation analysis in Chapter 4 demonstrated that expansion of services to international routes will improve business profits. On the other hand, as was previously discussed in Chapter 3, Japan's international aviation policy can be characterized as protectionist in compliance with traditional bilateral agreements. This policy is restricting free expansion of services to international flights by airline companies. Such a system has adverse effects on the development of both LCCs in Japan and Asian LCCs.

Thirdly, it is important for LCCs to start at a certain scale and size by utilizing funds from risk-taking investors in foreign countries including Asia. This is an essential way for LCCs to procure funds and for vitalizing Japan's aviation market.

In Asian countries other than Japan, a total of 30 LCCs were or were to be established between 2000 and 2005, mostly by Asian capital. Abolishment of foreign capital restrictions is expected to lead to proactive utilization of Asian capital with active investors. Also, abolishment of foreign capital restrictions means to approve cabotage (domestic flight operations of foreign airline companies). Therefore, with abolishment of foreign capital restrictions, the current cabotage prohibition policy will lose its meaning, so the policy must be abolished as well. In addition, the contents of bilateral agreements must be liberalized.

Some might disagree, asserting that such measures might contribute to the development of foreign LCCs but not to the development of Japan's LCCs. Abolishment of foreign capital restrictions, however, will lead to entry of foreign airline companies into the Japanese market. Management improvement of airline companies, vitalization of the entire aviation market, and improvement of consumer profits stimulated by the measure will maximize public welfare. Introducing foreign capital means not only introduction of funds, but also introduction of new business approaches and management policies. Business know-hows and strategies developed in such a manner will stimulate Japanese businesses for regrowth. Examples for this can be seen in the manufacturing (Nissan) and service industries.

3 Promoting Proactive Use of Secondary Airports and Privatization of Airports

As shown in Chapter 3 and in the simulation results in Chapter 4, proactive use of secondary airports is a critical element in the development of the LCCs.

Currently, airports in the Tokyo metropolitan area other than Haneda and Narita include Okegawa Airport, Chofu Airport for commercial aircraft, and Yokota, Atsugi, Iruma and Hyakuri for military use. Airports in the other areas that are expected to play a role as secondary airports include Okadama in Sapporo, Komaki in Nagoya, Hiroshimanishi in Hiroshima, Kobe in Kansai, and Kitakyushu Airport in Kitakyushu.

Utilizing secondary airports is, as discussed previously in Chapter 3, an advantageous measure for LCCs because the airports are operated at low cost. New companies can differentiate themselves from the LC in use of airports. This also results in a wider selection of routes for users. Competition between LCCs and LCs as well as competition between airports will contribute to expansion of public welfare.

Of the airports mentioned above, Kobe, Kitakyushu, Okadama, Komaki, and Hiroshimanishi are operating for scheduled flights. The current regulation restricts use of airports to particular aviation services including commuter flights. With abolishment of the regulation for completely free entry to the market, these airports will function effectively as secondary airports.

As for the use of military airports, discussion with the U.S. military and Japan's self-defense forces is needed. With the end of Cold War era, and with no more urgent need for air defense of the Tokyo metropolitan area by the neighboring military bases, the possibility of joint military and civilian use of the airports must not be eliminated. There are already a large number of such airports in Japan.

In conjunction with the development of secondary airports, low-cost airport facilities and promotion of competition between airports are required. One of the reasons why worldwide LCCs utilize secondary airports is that the airport has low usage fees with simple facilities, rather than the high-level facilities seen in large airports with high usage fees. Also, standards for usage fees are set to promote competition between airports. Some large airports such as Changi Airport in Singapore and Kuala Lumpur International Airport have implemented a policy of attracting low-

cost airline companies by offering simple facilities for LCCs.

Such circumstances demonstrate that competition between airports plays an important role in the development of LCCs. To promote such competition, it is necessary to allow airline companies to freely set the number of flights and routes and have unrestricted use of airports.
Also, airport management bodies must improve customer-oriented policy by privatization of airports.

4 Significance of Entry of Skymark's in the Market

The reasons why the LCCs could not fully grow as LCC was due to the industry's bitter legacy. To overcome this, Skymark had given a major impact on the market from the three following reasons:

Firstly, Skymark took up the challenge on regulations.

Japan had not seen a trend of deregulation and competition promotion, and had been instead under strict regulations. In 1996, the scope of fare system was implemented. However, competition was inactive, and there was no drastic management strategy. Long-term studies said that the airline industry needed a company which would stir the market in order to vitalize the Japanese airline industry. Skymark did to some extent.

There is a misunderstanding that LCCs entered the market because of deregulation. It was actually the other way round. Skymark took on challenge on regulations, and eased the regulation. Promoted by Skymark's establishment, the Transport Ministry began study on authorizing entry of LCCs. This resulted in abolishing the lower limit of the fare. Initially, the ministry, which was against the new entries due to restriction on the departure and arrival slots, took a hundred-and-eighty-degree shift on the policy, also by receiving a great deal of public attention and expectation.

Secondly, Skymark demonstrated performance on deregulation process. Skymark's social role was that the airline market became competitive by its entry, and brought improvement of consumer benefits and recovery of competition in the industry. In fact, when Skymark entered the market, discount fare was introduced even on the routes with no new entry. From this point, it provoked competitiveness of the three LCs, and cost was reduced.

Thirdly, Skymark continues to fight against social climate and customs which are characteristic in Japan. The reason why new entrants do not perform well in Japan is because of the Japanese unique social climate. The society tends to work against new challengers, and focus on remedies. In fact, Japan's domestic air traffic volume is ranked third in the world. There is a limited number of challengers. This is due to the delay in deregulation process and failure of the new entrants, and also due to the Japanese social climate that does not welcome new comers. Under this structure, capitalists would not be willing to invest. New entrants needs fund procurement capacity to survive the fare competition until they are established in the market. However, there is no angel investor in Japan. It is therefore difficult to procure funds from the market. On the other hand, the irrational way by both parties, namely, the new airline and public sectors, of using the subsidy system is also an issue: New airline companies have a strong sense of dependence on the public sectors for assistance, and public sectors are willing to assist them with subsidies. This trend in policy for all industries including air transport industry, which allows an irrational way of using the remedy system, will encourage the new entrants to depend on subsidies with no rational reason. Development of LCCs was hindered by the facts that deregulation process was in delay, a long-term policy for the benefit of the three scheduled airline companies had lasted for a long period, no drastic measure for improving essential facility had been taken even though LCCs entered the market, and the government underwent an outdated policy of protecting LCs and rescuing LCCs. Skymark survived because it took its stand against regulation and continued to operate its business independent spirit.

The problems of aviation industry in Japan, as was discussed above, are not simply a problem of deregulation. The Japanese cultural background and social structure are woven in a complicated manner to have an impact on the problem. Deregulation process is being progressed to a certain extent by Skymark's new entry, so the market is almost ready. However, in Japanese culture, people tend not to welcome newcomers and do not appreciate one with an innovative and out-of-the box mind. Diversity as is seen in the United States is necessary also in the aviation industry. For a healthy market, both deregulation by the authorities and rising of awareness of people who will be involved in the aviation industry, including consumers, are required.

To conclude, Skymark contributed considerably to the market environment by the three aspects mentioned above: taking up the challenge on regulations, promoting deregulation process, and continuing to fight against the old-fashioned social climate. Unfortunately, on the other hand, the

company had to start its business in an environment in which new entrants will be placed in a disadvantageous situation, with a so-called first generation model but not a new LCC model, when a competitive system had not been fully developed.

Therefore, what is significant in this study is that a new business model suitable for 2013 was studied by constructing a model by considering these points as well as the circumstance in which a number of years have passed after deregulation and by incorporating analysis results of the LCCs in North America and Europe.

As a conclusion of this chapter, the following points from the competition policy and aviation policy points of view are presented as key elements for the establishment of LCCs:

(1) It is necessary to prevent unfair competition. The market should shift, however, from before-the-fact regulation to after-the-fact regulation in conjunction with the development of competition in the air transport market and for the purpose of encouraging LCCs to be independent from public financial support. (Regulations on counteractive fares must remain in effect.)

(2) It is necessary to abolish supply and demand adjustment at crowded airports, liberalize protectionist international aviation agreements, and abolish foreign capital restrictions for free setting of routes and number of flights. Abolishment of foreign capital restrictions is expected to contribute to procurement of initial funds and vitalization of competition.

(3) It is necessary to review airport policy in order to promote the proactive utilization of secondary airports that is essential for LCCs. Airports must be privatized so that airport functions will be simplified to fit the needs of low-cost airline companies and that competition will be promoted between airports, which will contribute to implementation of such measures.

5-3 Recommendation for Future Challenges

Firstly, this thesis focused on the simulation analysis and its results. Therefore, the main portion of the study is about LCCs' management policies including cost issues and pricing strategies. The study does include other management issues that are not appropriate for analysis. In particular, other important factors in the airline industry, such as services, corporate identity setting,

management quality, and customer-targeting, are not fully examined.

For instance, it is said that JetBlue Airways was successful in raising their initial investment from the fact that the management personnel had previous career experiences. Funding is only a partial portion of the company's successful business model. As are performed in any other industries, both visionary business leader with expertise as well as clear management policy and corporation identity play critical roles in management of airline companies. Japanese LCCs tend to be more focused on emphasizing low-fare as selling point. This marketing strategy is likely to relate to their sluggishness. Japanese LCCs must develop their outstanding characteristics and contrive to make their own company stand out from others, by referring to the examples of corporate identities such as "like-a-family" style by Southwest Airlines and "Now Everyone Can Fly" by Air Asia.

Secondly, some aspects of the change in air transport market must be studied. Analyses in this research are based on business growth of new LCCs outside of Japan and international aviation regulations. The aviation industry, however, seems very unpredictable, due to its fluctuating industrial nature. Concern to industrial trends and experiences alone are not sufficient resources. Additional considerations, described below, are essential to adjust to these changes and make continuous improvement.

LCCs' market share in North America and Europe has already become very large. This means that they are not able to increase their market share anymore by implementing the same measures based on the past trends and their experiences. LCCs took advantages of the management and operation struggles of large companies. By taking advantage of such opportunities, LCCs were able to conduct crew employment, aircraft lease and purchases, ground handling, and catering at low cost. As more new entries come in, however, LCCs will face difficulties to maintain lower costs, and therefore capital charges go up.

In the mid- and long-term, the new LCCs in North America and Europe will face other cost-related obstacles. Sluggishness of development is noticeable in the entire airline industry in North America and Europe. New LCCs will meet employment cost and labor union issues as their business expands, and system-related cost issues as their networks grow larger. LCCs' business transition to long-distance flight services and will require use of hub airports instead of secondary airports Furthermore, entering long-distance flight markets requires a wider variety of

type of aircraft. LCCs' business transition to long-distance flight services will require the hub-and-spoke model, instead of secondary airport utilizations. Furthermore, entering long-distance flight markets requires a wider variety of fleets. Mixing and maintaining a variety of aircraft types in the fleet will cost LCCs even more.

Next, LCs are also utilizing the same strategies and implementing lower-cost models, competing against rival LCCs. For example, LCs are implementing effective allocation of human resources and route networks to enhance their productivity and reduce cost. Some have affiliated LCCs, although success has not been achieved yet. In the near future, LCs will accelerate their strategy in discontinuing tourist routes and focusing on business routes, as seen in the example of JAL, which discontinued its route to Saipan in 2005. LCs will prioritize high-yield business passengers by offering them their advantage in transit and long-distance route.

Therefore, LCCs should consider new business strategies corresponding to future trends and possible volatility in this industry.

Thirdly, this thesis discussed the suitability of utilizing Kobe Airport, a secondary airport, as a launching hub, but did not analyze and compare the possibility of having military airports as hub airports. This comparison requires a considerable amount of additional analytical calculations. Such a comparison, however, will be an additional resource strongly and accurately supporting the benefit of using secondary airports.

Fourthly, there are some more issues to discuss regarding competition policy and aviation policy. In particular, further study is necessary on market contestability and side effects related to asymmetric regulation.

These challenges are upcoming topics to be explored and discussed further for development and healthy growth of the new Japanese airline companies.

It will be my pleasure if this thesis will contribute to the vitalization of the Japanese aviation industry.

References

Books and Articles

Administrative Reform Committee (1997), *New Japan Creating by Imagination*, Institute of Administrative Management.

Amram, Martha and N. Kulatilaka (1999), *Real Options: Managing Strategic Investment in an Uncertain World*, Harvard Business School Press.

Amram, Martha (2002), *Value Sweep: Mapping Corporate Growth Opportunities*, Harvard Business School Press.

Arthur, W. Brian, "Increasing Returns and the New World of Business", *Harvard Business Review*, Vol.74, Issue 4, 1996, pp.100-109.

Aircraft Value Analysis Company (AVAC) (2001-2005), *Aircraft Value Reference, Commercial Jet*, AVAC.

Bailey, E. and J. Panzar (1981), "The Contestability of Airline Markets During the Transition to Deregulation", *Law and Contemporary Problems*, No.44, pp.125-145.

Baba, Naohiko(2001), "Optimal Timing in Banks' Write-off Decisions under the Possible Implementation of a Subsidy Scheme: Real Options Approach", *Monetary and Economic Studies, Bank of Japan*, Vol.19, No.3, pp.113-141.

Barrett, Sean D. (2001), "Market Entry to the Full Service Airline Market – a Case Study from the Deregulated European Aviation Sector", *Journal of Air Transport Management*, No.7.

Barzagan, M. (2004), *Airline Operations and Scheduling*, Ashgate.

Bennett, R. and J. Craun (1993), "The Airline Deregulation Evolution Continues: The Southwest Effect", Office of Aviation Analysis, U.S. Department of Transportation, Washington, D.C..

Berger, P, E. Ofek and I. Swary (1996), "Investor Valuation of the Abandonment Option", *Journal of Financial Economics*, Vol.42, No.2, pp.257-287.

Bernstein, P. L. (1992), *Capital Ideas: The Improbable Origins of Modern Wall Street*, Free Press.

Bernstein, P. L. (1996), *Against the Gods*, John Wily & Sons.

Black, F. and M. Scholes (1973), "The Pricing of Options and Corporate Liabilities", *Journal of Political Economy*, No.81, pp.637-659.

Bookstaber, Richard,M. (1987), *Option Pricing and Investment Strategies*, Probus Publishing.

Boyle, P. (1977), "Options: A Monte Carlo Approach", *Journal of Financial Economics*, No.4, May, pp.323-338.

Brain S. Silverman (1997), "Profitability, Transactional Alignment, and Organizational Mortality in the U.S. Trucking Industry", *Strategic Management Journal*, No.18, pp.31-52.

Brennan, M. J. and E. S. Schwartz, (1985), "Evaluating Natural Resource Investments", *Journal of Business*, No.58, pp.135-57.

Brennan, M. and L. Trigeorgis, eds. (1998), *Flexibility, Natural Resources and Strategic Options*, Oxford

University Press.

Brown, J. (1997), *Seeing Differently: Insights on Innovation*, Harvard Business School Press.

Brueckner Jan K. (2003), "The Benefits of Codesharing and Antitrust Immunity for International Passenger, with an Aapplication to the Star Alliance", *Journal of Air Transport Management*, No.9, Pergamon, pp.83-89.

Cambell, J., A. Lo, and A. Mackinlay (1997), *The Econometrics of Financial Markets*, Princeton University Press.

Chang Zeph Yun, Wee Young Yun et al. (1996), *The Quest for Global Quality*, Addison Weley Longman Singapore Pte Ltd.

Chin, T.H., Anthony, and H. Jay Tay (2001), "Developments in Air Transport: Implications on Investment Decisions, Profitability and Survival of Asian Airlines", *Journal of Airline Transport Management*, No.7, pp. 319-330.

Christensen, C. M. (2000), *The Innovator's Dilemma: When New Technologies Cause Great Firms to Fail*, Harper Business.

Chujo, Ushio (2005), "Policy Issue of Low Cost Carrier", *Journal of Airline Transport Management*, No.1, pp. 12-19.

Copeland, T. E., T. Kotler and J. Murrin (1990), *Valuation: Measuring and Managing the Value of Companies*, John Wiley and Sons.

Copeland T. and V. Antikarov (2001), *Real Options: A Practitioner's Guide*, Texere LLC.

Cox, J., S. Ross and M. Rubinstein (1979), "Option Pricing: A Simplified Approach", *Journal of Financial Economics*, No.7, September, pp.229-263.

Dixit A. K. (2000), "Hysteresis, Import Penetration, and Exchange Rate Pass Through", *Quarterly Journal of Economics*, No.104, pp.205-228.

Dixit, A. K. and R. Pindyck (1995), "The Options Approach to Capital Investment", *Harvard Business Review*, May-June, pp.105-115.

Dixit, A. K. and K. Avinash and R. S. Pindyck (1994), *Investment under Uncertainty*, Princeton University Press.

Dixit, A. K. and K. Avinash, (1989), "Entry and Exit Decisions under Uncertainty", *Journal of Political Economy*, University of Chicago Press, Vol97, No.3, pp.620-38.

Doganis, R. (2001), *The Airline Business in 21st Century*, Routledge.

Dresner, M. and R. Windle (1999), "Competitive Responses to Low Cost Carrier Entry", *Transportation Research E*, No.35, pp.59–75.

Edwards, F. and C. Ma (1992), *Futures and Options*, McGraw-Hill.

Evans, J. R. and D. L. Olson (1998), *Introduction to Simulation and Risk Analysis*, Prentice Hall.

Faulkner, T. (1996), "Applying Options Thinking to R&D Valuation", *Research Technology Management*, May-June, pp.50-56.

Foster, R. N. and S. Kaplan (2001), *Creative Destruction: Why Companies That Are Built to Last Underperform the Market: and How to Successfully Transform Them*, Mckinsey & Company.

Francis, Graham, Alessandro Fidato and Ian Humphreys (2003), "Airport-airline Interaction: The Impact of Low Cost Carriers of two European Airports", *Journal of Air Transport Management*, No.9, pp.267-273.

Freiberg, Kevin and Jackie Freiberg (1998), *Nuts!: Southwest Airlines' Crazy Recipe for Business and Personal Success*, Broadway Books.

Froot, K. , DD. Scharfstein and J. Stein (1994), "A Framework for Risk Management", *Harvard Business Review*, November-December, pp.91-102.

Fujimura, Shuichi (2005), "Competition of Japanese and US LCCs and Business Strategy of All Nippon Airways", *Journal of Transportation and Economy*, Vol.65, No.5, pp. 35-41.

Gillen, David and William Morrison (2003), "Bundling, Integration and the Delivered Price of Air Travel: Are Low Cost Carriers Full Service Competitors? ", *Journal of Air Transport Management*, No.9, pp.15-24.

Grabowski, H. and R. Vernon (1994), "Returns to R&D on New Drug Introductions in the 1980s", *Journal of Health Economics*, No.13, pp.384-406.

Graham J. R. and C. R. Harvey (2001), "The Theory and Practice of Corporate Finance: Evidence from the Field", *Journal of Financial Economics*, Vol.60, pp.187-243.

Grenadier S. (ed.) (2000), *Game Choices*, Risk Waters Group Ltd.

Grenadier, S. R. (1996), "The Strategic Exercise of Options: Development Cascades and Overbuilding in Real State Markets", *Journal of Finance*, No.51, pp.1653-1679.

Grenadier, S. R. (1999), "Information Revelation through Option Exercise", *Review of Financial Studies*, No.12, pp.95-129.

Grenadier, S. and A. Weiss (1997), "Investment in Technological Innovations: An Option Pricing Approach", *Journal of Financial Economics*, Vol.44, No.3, pp.397-416.

Grinblatt, M. and S. Titman (1998), *Financial Markets and Corporate Strategy*, McGraw-Hill.

Gudmundsson, S. V. and H.L. van Kranenburg (2002), "New Airline Entry Rates in Deregulated Air Transport Markets", *Transportation Research*, Part E 38, pp.205-219.

Gudmundsson, Sveinn Vidar (1998), *Flying to Close to the Sun—The Success and Failure of the New-entrant Airlines*, Ashgate.

Hamel, G. (1997), "Strategy as Revolution", *Harvard Business Review*, July-August, pp.69-82.

Hamel, G. (1997), "Killer Strategies that Make Shareholders Rich", *Fortune*, June 23,pp.70-84.

Hanaoka, Shinya (2004), "Influence of Low Cost Carrier in the Aviation Industry - Example of Southeast Asia", *Series of Aviation Policy Research Association*, Vol.451, pp.13-38.

Harbison, Peter et. al (2002), *Low Cost Airlines in the Asia Pacific Region*, Center for Asia Pacific Aviation.

Harifah Mariam Syed Mansor (1997), *Malaysian Airlines and its Media in the "Visit Malaysia Year", Strategic Management in the Asian Context: A Casebook in Business Policy and Strategy*, John Wiley & Sons (Asia)

Pte Ltd.

Harvard Business Review (1999), *Harvard Business Review on Financial Engineering*, Harvard Business School Press.

Hufbauer, Gary Clyde, et. al (1996), *Flying High—Liberalizing Civil Aviation in the Asia Pacific*, US Institute for International Economics.

Hull, J. (1997), *Options, Futures, and Other Derivatives Securities*, 3rd ed, Prentice Hall Business Publishing.

Hull, J. (1998), *Introduction to Futures and Options Markets*, 3rd ed, Prentice Hall Business Publishing.

IATA (2000-2005), *Airport & Air Navigation Charges Manual*, IATA.

ICAO (2000-2005), *Financial Data - COMMERCIAL AIR CARRIERS / Cargo Tariff*, ICAO.

ICAO (2000-2005), *Financial Data - Commercial Air Carriers*, ICAO.

Jamieson, B. (2007), "More Flights: Is Discount Biz class Catching On?", *abc NEWS*, April 15, 2007.

Joaquin, D. C. and N. Khanna (2001), "Investment Timing Decisions under Threat of Potential Competition", *The Quarterly Review of Economics and Finance*, No.41, pp.1-17.

Jorin, P. (1997), *Value at Risk*, McGraw-Hill

Kanoh S. and H. Murase (1999), "On Land Price Formation: Bubble versus Option", *Japanese Economic Review*, No.50, pp.212-226.

Kogut, B. and N. Kulatilaka (1994a), "Options Thinking and Platform Investments: Investing in Opportunity", *California Management Review*, Winter, pp.52-71.

Kogut,B. and N. Kulatilaka (1997), "Capabilities as Real Options", *Proceedings of the Conference on Risk Managers, and Options in Honor of Edward Bowman, Reginald H. Jones Center*, Wharton School of Business, University of Pennsylvania.

Kole, Stacey R. and Kenneth M. Lehn (1999), "Deregulation and the Adaptation of Governance Structure: The Case of the U.S. Airline Industry", *Journal of Financial Economics*, No.52, pp.79-117.

Kulatilaka, N. (1995), "Operating Flexibilities in Capital Budgeting: Substitutability and Complementarity in Real Options", *Real Options in Capital Investments: Models, Strategies, and Applications. Ed.* Trigeorgis, L. 1995, Praeger, pp. 121-132.

Kulatilaka, N. and A. Marcus (1992), "Project Valuation under Uncertainty: When Does DCF Fail?", *Journal of Applied Corporate Finance*, Fall, pp.92-100.

Kulatilaka, N. and D. Lessard (1998), "Total Risk Management", Working Paper, Sloan School of Management, MIT.

Kulatilaka, N. and E. Perotti (1998), "Strategic Growth Options", *Management Science*, Vol44, No.8, pp. 1021-1031.

Lawton, C. Thomas (2002), *Cleared for Take-off: Structure and Strategy in the Low Fare Airline Business*, Ashgate.

Lewent J. and N. Nichols (1994), "Scientific Management at Merck: An Interview with CFO Judy Lewent", *Harvard Business Review, Jan.- Feb.*, pp.89-99.

Majd, S. and R.S. Pindyck (1987),"Time to Build, Option Value, and Investment Decisions",*Journal of Financial Economics*, No.18, pp.7-27.

Mason, Keith J. (2001), "Marketing Low-cost Airline Services to Business Travelers", *Journal of Air Transport Management*, No.7, pp.103-109.

Mauer, D. and S. Ott (1995), "Investment under Uncertainty: The Case of Replacement Investment Decisions", *Journal of Financial and Quantitative Analysis*, Vol.30, No.4, December, pp.581-605.

McDonald, R. and D. R. Seigel (1985), "Investment and the Valuation of Firms When There Is an Option to Shut Down", *International Economic Review*, No.26, pp.331-49.

Mcmillan, J. (1992), *Games, Strategies, and Managers*, Oxford University Press.

Merton, R. (1997), "Applications of Option-Pricing Theory: Twenty-Five Years Later", *Nobel Lecture*, December 9.

Milgrom, P. and J. Roberts (1991), *Economics Organization and Management*, Englewood Cliffs, Prentice-Hall.

Miller, Kent, D. (2003), "Knowledgelinventories and Managerial Myopia", *Strategic Management Journal*, No.23, pp.689-706.

Miller, Kent, D., and Waller H. Gregory, Scenarios (2003), "Real Options and Integrated Risk Management", *Long Range Planning*, No.36, Pergamon, pp.93-107.

Morrison, S. A. (2001) "Actual, Adjacent and Potential Competition: Estimating the Full Effect of Southwest Airlines", *Journal of Transport Economics and Policy*, No.35, pp.239–256.

Mun, Johnathan C. (2002), *Real Options Analysis: Tools and Techniques for Valuing Strategic Investments and Decisions*, John Wiley & Sons Inc.

Mun, Johnathan C. (2003), *Applied Risk Analysis: Moving beyond Uncertainty in Business*, John Wiley & Sons Inc.

Murakami, Hideki (2005), "Empirical Analysis of Low Cost Carrier's Influence in the U.S. Aviation Market – Case of Monopolyzed Aviation Market", *Journal of Transportation and Economy*, Vol.65, No.5, pp. 53-61.

Murakami, Hideki (2005), "Sustainability and Market Effect of the New LCCs: the Case of the U.S. Duopoly Market", *Journal of Economics & Business Administration*, Vol.191, No.4, pp. 85-95.

Myers, S. and S. Majd (1990), "Abandonment Value and Project Life", *Advances in Futures and Options Research*, No.4, pp.1-21.

O'Connell, John F. and George Williams (2005), "Passengers' Perceptions of Low Cost Airlines and Full Service Carriers: A case Study Involving Ryanair, Aer Lingus, Air Asia and Malaysia Airlines", *Journal of Air Transport Management*, No.11, pp.259-272.

Ota, Masaki (1979), *Feasibility Study of the New Tegucigalpa Airport Project*, JAICA.

Ota, Masaki (1983), *Feasibility Study of International Lesotho Airport Project*, JAICA.

Ota, Masaki (1986), *The Feasibility Study on the Development Project of JORGE CHAVEZ LIMA-CALLAO International Airport in the REPUBLIC of PERU*, JAICA.

O'Toole, Kevin (1999), "Reworking the Model", *Airline Business*, November, 1999, pp.78-83.

Pawlina, G. and P. M.Kort (1999), "Real Options in Asymmetric Duopoly: Who Benefits from Your

Competitive Disadvantage?" *Working paper*, Tilburg University.

Pindyck R. S. (2000), "Irreversibilities and the Timing of Environmental Policy", *Resource and Energy Economics*, No.22, pp.233-259.

Pindyck, R. (1993a), "Investments of Uncertain Cost", *Journal of Financial Economics*, No.34, pp.53-76.

Pindyck, R. and D. Rubinfeld (1998), *Econometric Models and Economic Forecasts*, 4th ed, New York: McGraw-Hill.

Quigg, L. (1993), "Empirical Testing of Real Options–Pricing Models", *Journal of Finance*, Vol48, No.2, pp. 621-640.

Reynolds-Feighan, Aisling, J (2001), "Traffic Distribution in Low-cost and Full-service Carrier Networks in the US Air Transportation Market", *Journal of Air Transport Management*, Vol7, No.5, pp.265-275.

Ross, S. (1995), "Uses, Abuses, and Alternatives to the Net Present Value Rule", *Financial Management*, Vol24, No.3, pp.96-102.

Sabbagh, K. (1996), *Twenty-First Century Jet: The Making and the Marketing of the Boeing 777*, New York, Scribner.

Sahlman, W. (1997), "How to Write a Great Business Plan, "*Harvard Business Review*, July-August, pp.98-109.

Sarkar, Sudipto (2003), "The Effect of Mean Reversion on Investment under Uncertainty", *Journal of Economic Dynamics & Control*, No.28, pp.377-396.

Sawada, Hideo (2005), *HIS – Adventure from Two Desks and One Telephone*, Nikkei Inc.

Schatzki, Todd (2003), "Options, Uncertainty and Sunk Cost: an Empirical Analysis of Land Use Change", *Journal of Environmental Economics and Management*, No.46, pp.86-105.

Scholes, M. (1997), "Derivatives in a Dynamic Environment", *Nobel Lecture*, December 9.

Schwartz, E. J. and L. Trigeorgis, eds (2001), *Real Options and Investment under Uncertainty*, The MIT Press.

Schwartz, E. and M. Moon (1999), "Evaluating Research and Development Investments", *Project Flexibility, Agency, and Competition — New Developments in the Theory and Applications of Real Options.* Ed. Brennan, M.J. & L. Trigeorgis. 2000, Oxford University Press.

Shiotani, Sayaka (2011), *Business Administration for Air Transportation Business*, Chuokeizai-sha, Inc.

Shiotani, Sayaka (2010), "Issues Regarding Japan's Aviation and Airport Policies with a Focus on Its 'Asian Gateway Vision' Initiative", J. F. Oberlin University Press.

Shiotani, Sayaka (2010), *Air Transportation as a Source of National Support in the Tourism Industry*, Doyukan, Inc.

Shiotani, Sayaka (2008), *Key Factors for the Success of Low-cost Carriers in Japan: Innovation in Business Models and Aviation Policy*, Chuokeizai-sha, Inc.

Shiotani, Sayaka (2007), *Contemporary Air Transportation Business*, Doyukan, Inc.

Shiotani, Sayaka (2007), "A Comprehensive Study of Key Aspects for a Successful Low-cost Carrier in Japan:

Using the Corporate Model and Real Options Analysis", Doctoral thesis, Waseda University.

Shiotani, Sayaka (2006), "Feasibility Study on a Newly-Entrant Freight Airline by a Corporate-Model Simulation with Risk Assessment Based on the Monte Carlo Approach", Japan Logistics Society.

Shiotani, Sayaka (2006), "Methods for Estimating the Value of Airports Toward Privatization and Several Aspects for Structural Reform: An Assessment Based on EV/EBITDA Method and Specific Conditions for Realizing Company Value", Japan Logistics Society.

Shiotani, Sayaka (2005), "Evaluating an Investment Decision to Expand New Air Routes for an Airline Company Based on the Real Option Approach", Japan Society of Public Utility.

Shiotani, Sayaka (2005), "Discussing Methods of Purchasing Aircrafts Using the Real Option Approach: Modeling the Most Appropriate Number of Aircrafts", Aviation Policy Research Association.

Shiotani, Sayaka (2004), "The Strategy and Business Plan of the "National Flag Carrier" of Developing Countries in the Era of Airline Liberalization: A Case Study of Malaysia Airlines", Japan Society of Transportation.

Shiotani, Sayaka (2003), "A Case Study of A New Entrant Airline into the Japanese Airline Market", Japan Society of Public Utility.

Shiotani, Sayaka (2003), "AirAsia's Market Strategy and Development in Malaysia: AirAsia's Implications of Asia's Budget Airlines and Its Lessons for Japan", Japan Logistics Society.

Silverman, S. Brain (1997), "Profitability, Transactional Alignment, and Organizational Mortality in the U.S. Trucking Industry", *Strategic Management Journal*, No.18, pp.31-52.

Sinclair, R. (1995), "An Empirical Model of Entry and Exit in Airline Markets", *Review of Industrial Organization*, Vol.10, No.5, pp.541-557.

Smith, J. and R. Nau (1995), "Valuing Risky Projects: Options Pricing Theory and Decision Analysis", *Management Science*, Vol. 41, April, pp.795-816.

Sudipto, Sarkar (2003), "The effect of Mean Reversion on Investment under Uncertainty", *Journal of Economic Dynamics & Control*, No.28, pp.377-396.

Terence-Gomez, Edmund and K. S. Jomo (1997), "Malaysia's Political Economy - Politics, Patronage and Profits", *Cambridge University Press.*

The Center for Asia Pacific Aviation (2003), "Asia Pacific Aviation Outlook, Post-Sars2003", The Center for Asia Pacific Aviation.

Titman, S. (1985), "Urban Land Prices under Uncertainty", *American Economic Review*, 75, pp.505-14.

Triantis, A. and J. Hodder (1990), "Valuing Flexibility as a Complex Option", *Journal of Finance*, Vo.45, No.2, pp. 549-565.

Tufano, P. (1994), "Enron Gas Services", *Harvard Business School Case*, No.294-076.

Tufano, P. (1996), "How Financial Engineering Can Advance Corporate Strategy", *Harvard Business Review*, January-February, pp.136-146.

Tufano, P. and A. Moel (2000), "Bidding for Antamina: Incentives in a Real Options Context", *Game Choices: The Intersection of Real Options and Game Theory.* Ed. Steven Grenadier, 2000, Risk Books.
Williams, George (2000), *The Airline Industry and the Impact of Deregulation*, Ashgate.
Williams, George (2001), *Airline Competition: Deregulation's Mixed Legacy*, Ashgate.
Windle, Robert and Martin Dresner (1999), "Competitive Responses to Low Cost Carrier Entry", *Transportation Research*, Vol.35E, No.1, pp.59-74.
Yi, C. (1997), "Real and Contractual Hedging in the Refinery Industry", *DBA dissertation*, School of Management, Boston University.

Corporate Publications (Annual Report, Press release, etc.)

Air Asia, *Air Asia Press Release 2003-2012*, n. d. Web. 11 April 2013.
Airbus SAS., *Document for in-house education for All Nippon Airways Co., Ltd employees*, Aug. 1989. Web. 10 April 2013.
Air Canada, *Annual Report 2000-2005*, n. d. Web. 11 April 2013.
All Nippon Airways Co., Ltd, *Annual Report 2000-2012*, n. d. Web. 12 April 2013.
All Nippon Airways Co., Ltd, *Securities Report 2000-2012*, n. d. Web. 10 April 2013.
American Airlines, *Operating Analysis 2000-2012*, n. d. Web. 15 April 2013.
British Airways, *Annual Report 2000-2012*, n. d. Web. 11 April 2013.
British Airways, *British Airways Facts Book 2005-2012*, n. d. Web. 11 April 2013.
EasyJet. *Easyjet Annual Report and Accounts 2003-2005*, n. d. Web. 11 March 2013.
Frontier Airline, *Annual Report 2000-2012*, n. d. Web. 15 April 2013.
Japan Airlines, *Aviation Statistics Handbook 2000-2005*, Japan Aeronautic Association, n. d. Web. 16 March 2013.
Japan Airlines, *Community@JAL Stockholder Communication*, n. d. Web. 2 April 2013.
Japan Airlines, *Currents 1999-2012*, n. d. Web . 3 April 2013.
Japan Airlines, *Public Relations Department 1999-2012*, n. d. Web. 29 March 2013.
Japan Airlines, *Recollection and the Prospects 2000-2012*, n. d. Web. 4 April 2013.
Japan Airlines, *Japan Airlines Annual Report 2000-2012*, Japan Airlines Company Ltd. and Consolidated Subsidiaries, n. d. Web. 25 April 2013.
Japan Airlines, *Securities report 2000 -2012*, n. d. Web. 1 April 2013.
Japan Airlines, *SKYWARD 2000-2012*, n. d. Web. 14 April 2013.
Jet Blue Airways, *Prospects 2003-2005*, n. d. Web. 6 April 2013.
Sky Mark Airlines, *Business Report 2002-2012*, n. d. Web. 10 April 2013.
Sky Mark Airlines, *Securities Report 2000-2005*, n. d. Web. 24 March 2013.
Sky Mark Airlines, *Statement of Accounts 2000-2005*, n. d. Web. 11 April 2013.

United Airlines, *Corporation Annual Report 2000-2012*, n. d. Web. 4 March 2013.

WestJet, *Annual Information 2001-2012*, WestJet Ltd, n. d. Web. 7 April 2013.

Website

Air Asia, (*http://www.airasia.com*)

Air Asia, Air Asia Corporate Information (Investors information),
(http://www.airasia.com/site/en/home.jsp)

Air Do, Co., Ltd, (http://www.airdo21.com/)

Air Do, Co. Ltd, (http://www.airdo21.com/company/info.html)

All Nippon Airways Co., Ltd, (http://www.ana.co.jp/)

All Nippon Airways, Co. Ltd, All Nippon Airways corporate information (Investors information),
(http://www.ana.co.jp/ir/index.html)

American Airlines, (http://www.aa.com/)

Center for Asia Pacific Aviation, (http://centreforaviation.com/)

Continental Airlines, (http://www.continental.com/)

Delta Air Lines, (http://www.delta.com/)

EasyJet, (http://www.easyjet.com/)

Japan Airlines Co., Ltd ,(http://www.jal.co.jp/)

Japan Airlines, Japan Airlines corporate information (Investors information),
(http://www.jal.com/ja/ir/)

Japanese Prime Minister's Office, (*http://www.kantei.go.jp/*)

Jet Blue Airways, Jet Blue Airways Corporate Information (Investor Information),
(http://investor.jetblue.com/ireye/ir_site.zhtml?ticker=jblu&script=2100)

Malaysian Airlines, (http://www.malaysianairlines.com.my)

Japanese Ministry of Land, Infrastructure and Transport, (*http://www.mlit.go.jp/*)

Northwest Airlines (http://www.nwa.com/)

Ryan Air, (http://www.ryanair.com/)

Ryan Air, Ryan Air Corporate Information (Investors information),
(http://www.ryanair.com/site/EN/about.php?page=Invest&sec=reports)

Southwest Airlines (http://www.southwest.com/)

Southwest Airlines, Southwest Airlines Corporate Information (Investor Information),
(http://www.southwest.com/about_swa/financials/investor_relations_index.html)

Skymark Airlines Co., Ltd, (http://www.skymark.co.jp/)

Skymark Airlines, Skymark Airlines corporate information (Investors information),
(http://www.skymark.co.jp/company/index.html)

Skynet Asia Airways Co., Ltd. (http://pc.skynetasia.co.jp/)

Skynet Asia Airways Corporate Information (Investors information),

(http://www.skynetasia.co.jp/company/group.html)

Star Flyer Inc., (http://www.starflyer.jp/mothercomet/mothercomet.html)

World Tourism Organization (UNWTO), (http://www2.unwto.org/)

United Airlines, (http://www.united.com/)

An airport, airline-affiliated Web site

Airbus , (http://www.airbus.com/en/)

Chubu Centrair International Airport, (http://www.centrair.jp/)

Fukuoka Airport, (http://www.fuk-ab.co.jp/)

Haneda Airport (Tokyo International Airport), (http://www.tokyo-airport-bldg.co.jp/)

IATA, (http://www.iata.org/)

Japan Aeronautic Association, (http://www.aero.or.jp/)

Japanese Ministry of Land, Infrastructure, Transport and Tourism, (http://www.mlit.go.jp/)

Japanese Ministry of Land, Infrastructure and Transport Traffic Bureau,

(http://www.mlit.go.jp/koku/koku.html)

Kansai International Airport, (http://www.kansai-airport.or.jp/)

Narita International Airport, (http://www.narita-airport.jp/)

One World, (http://www.oneworld.net/)

Star Alliance, (http://www.staralliance.com/)

Sky Team Airline Alliance, (http://www.skyteam.com/)

The Center for Asia Pacific Aviation, (http://www.centreforaviation.com)

Other Websites Concerned

Airline Comparison Site, (http://www.airlinequality.com)

Central Japan Railway Company, (http://www.jr-central.co.jp/)

Federal Reserve System, (http://www.ny.frb.org)

Flying Cheap ! European Bargain Aviation, (http://europe.s9.xrea.com/)

Government Accountability Office, (http://www.ntl.bts.gov/DOCS/rc9599.htm)

Japan Fair Trade Commission (JFTC), (http://www.jftc.go.jp/)

Kobe-city, Japan, (http://www.city.kobe.jp)

Mercer Management, (http://www.mercermc.com/)

Nippon Express Co., Ltd., (http://www.nittsu.co.jp/)

Sterne Stewart Corporation, (http://www.sternstewart.co.jp/)

Tax Navigator, (http://www.tax-navi.com/kokuzei/koukukinenryo/)

The Hokkaido Shimbun Press, (http://www5.hokkaido-np.co.jp/)

United Parcel Service (UPS), (http://www.ups.com/)

Yamato Transport Co., Ltd, (http://www.kuronekoyamato.co.jp/)