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A Study on the Aviation Safety Policy and Enhancement of Aviation Safety for Low Cost Carriers in Korea

한국의 저비용항공사 안전 향상을 위한 안전정책 연구

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Ⅰ. Introduction

Certain words like strategy alliance of major airlines, local airlines, and LCCs have become main interests since introducing Open Skies Policy around the world. The trend in local airlines in Europe and North America notably seem to favor M&A and are coming up with their own style. Unifying local airlines operation and the network of major airlines can be better for air transport industry in the long-run for airlines entering and leaving the market, also the possibility of failure in scheduled transportation and non-scheduled transportation can have much safer environment. The reason is that local communities demand consistent quality services and confidence in safety as well as competitive air fare. The unified system of major airlines and local airlines will especially make uncertain conditions clearer and provide passengers with the quality services by franchising airlines. From 1993 to 1996, a couple of years, it was estimated that eighty new local airlines emerged but about sixty of them failed and it showed local airlines of small business companies face hard time surviving in European air transport industry. In oder to get suggestions through aviation policies of advanced countries with regard to aviation safety, we have checked the U.S., the U.K., Australia and Japan aviation safety policies, and also LCC's states overseas LCC's safety policies in Korea, and aviation safety states as to aircraft accidents.

Since existing LCCs and new LCCs based in Korea have become the new concept, this new market for LCC has been booming recently. Around Southeast Asia, while there are some LCCs including Air Asia which is supported by the government of Malaysia with emphasis on safety, there are other LCCs, which have failed to achieve confidence in safety and led to aircraft accidents and further bad management, so we need to verify safety

of overseas LCC, try to improve and keep domestic LCCs in order to fly international routes and aid international aviation safety. LCCs have been increasing lately thanks to open skies policy and a wide variety of flights. Jeju air, Easter Airline, Air Busan, Jin Air are in service. new potential hazards probably could happen. Therefore it is necessary to take the initiative in charge of aviation markets inside and outside of Korea and the safety management of new LCCs should be taken more seriously than ever before. Among overseas aviation safety policies, we need to implement the FAA's Filght Plan which has a specific Business Plan. I hope this thesis will help improve aviation safety a little locally and internationally.

Ⅱ. Review over overseas aviation safety policies

1. The U.S.

The aviation safety policy of the U.S. has four main plans which are consistent and flexible. It reflects and focuses not only on the safety but also Technology Developments, Environments, and an organizing point of view. It has 'Next Generation Air Transportation System Integrated Plan' which is the next generation of air transport system combined with future technology, twenty years later, 'Department Of Transportation Strategic Plan' which is a 5-year plan for all transportation including aviation, above these plans plus a 5-year plan called 'flight Plan' by FAA and an annual report, 'Business Plan', which fall under a department of the FAA.

(1) Flight Plan

In the aviation field, it annually steps up the mid-term(5 years) plan called the 'Flight Plan' to carry out the FAA's plan systematically. It was first published in 2003 and the 4th 'Flight Plan for 2007-2011' in 2006. It shows the outcomes and missions, future plan of the entire personnel(about 4,400) The main strategy is to prepare a new form of aircraft such as the tilt-rotor aircraft, low-orbit spacecraft …, and help set up advert gridlock • a way to promote the national airspace system 'Required Navigational Performance (RNP)' 'Automatic Dependent Surveillance-Broadcast(ADS-B)' which are R&D for supporting the next generation air traffic system. 'Flight Plan 2007-2011' is a FAA's strategy plan and a blue print until 2011.

The mission of the plan is to make the safest and the most efficient aerospace system and keep the four goals; Increased safety, Greater Capacity, International Leadership and Organizational Excellence. Each goal has some objectives and there is a performance target for each objective. Each objective also has its own strategy and initiative.

(2) Business Plan

Depending on the objective and strategy of Flight Plan, its line of business and staff office promote to arrange the details of the plan annually, it was first published as 'Business Plan' in 2006.

It is divided into four organizations and each has its own business plans; Office of Airports(ARP), Air Traffic Oganization(ATO), Commercial Space Transportation(AST), Aviation Safety(AVS).

Under supporting departments; Aviation Policy-Planning and Environment (AEP), Civil Right(ACR), Communication(AOC), Financial Services(ABA), Government and Industry Affairs(AGI), Human Resources and Management (AHR), Information Services/CIO(AIO), Office Of The Chief Counsel(AGC),

Regions and Center Operations(ARC), Security and Hazardous Materials (ASH), each of them has its own business plans. Each business plan support the character of the annual plan, the performance target of Flight Plan or core business measure can be applied to its performance. Regarding the ongoing plans, it makes strategic activity if necessary, using the performance target to set up detailed objectives and then all ongoing plans are composed of four objectives; increased safety, greater capacity, international leadership, and organizational excellence. Most of the ongoing plans are related to international leadership, and organizational excellence.

(3) Objective and Target of safety plan

Among above four safety plans, the clearest plan is 'Flight Plan'.

The business plan of each department uses the objectives and the performance target. To obtain the four goals of the Flight Plan, necessary objectives are set up and then the performance target also is set in order to achieve the objectives.

If the business plan or the ongoing plan does not have quantitative index, each department adds the core business measure to the plan so the department promotes and estimates for itself.

(4) Performance Measure and Setting system

The FAA leads the aviation safety policies of the U.S. and the long-term (twenty years) plan for modernizing the next generation of air traffic system is taken and supported by the FAA's JPDO and IPT in substance. The Flight Plan and Business Plan which are related to the system fall under a department of the FAA.

The FAA estimates its personnel on their outcomes and provides a piece rate so it can motivate them to do better at work and participate in the

system. As to all the performance targets of Filght Plan, there is a close connection between achievements and a piece rate based on Organizational Success Increase(OSI).

The outcome should be at least over 90 percentage of OSI to get a reward.

The FAA's web site has put a banner to show how Flight Plan is going, and public relations to give access 24/7 for everyone to check. Through some views from all the parties concerned, it can keep improving the plans constantly and manage the agencies using the information that help monthly meetings and reports.

2. England

(1) SRG Safety Plan

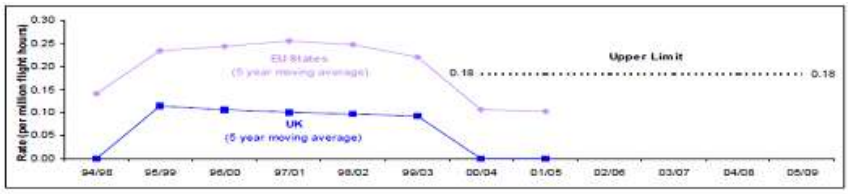
Safety Regulation Group(SRG) is the professional department that is in charge of aviation safety in the U.K. SRG is organized into the group of aviation professionals including aviation-operation, maintenance, control, and airport. SRG also cooperates with European Aviation Agency(EASA) regarding regulations of aviation safety, inspection of aircraft operation and maintenance, and service of various certifications including aviation workers, airport operation, and aircraft operation.

Futhermore SRG occupying 60% of CAA's staff, conducts the collection and analysis of data considered risky, researches and raises research funds, and operate safety programs and policies. SRG Plan focusing on the operation of safety regulation group plans to cut back each section (process of safety maintenance, heavy airline aircraft, airspace, airport, general-aviation, others supporting organizations)

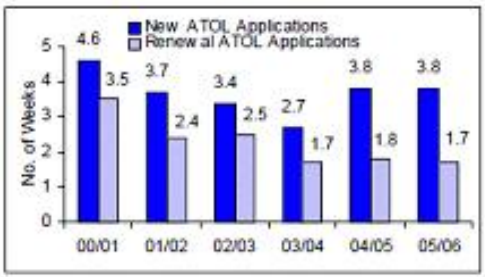
(2) The goal and directing post of the safety plan

There is no concrete plan and directing post about the enterprise. Furthermore only the deadline is decided. The possibility of delivery from the Corporate Plan within a schedule is applied to a concrete directing post but the index composed of service index and accident index is the tool wholly appraising the success or failure of the safety policy. The index of accident rate is obtained from the average of fatal accidents and airprox accidents that are classified under five types of aircrafts. The service index is obtained from the period and the number of workers issuing ATOL1) and the period and the number of workers issuing certification of aviation workers.

As <figure 2-3>, the index of the accident rate is divided into fatal accident rate of fixed-wing aircraft that are using airliners over 5700kg and less than 5700kg (five years average), fatal accident rate of fixed-wing aircraft that are using air freighters over 5700kg (five years average), and fatal accident rate of rotor aircraft that are using air transporters over 2730kg (five years average), fatal accident rate of general aircraft below 5700kg (five years average), and the number of airport accidents by airliners. Operation index is sorted over the period of issuing ATOL and aviation worker certification, the number of officers issuing ATOL and aviation worker certification reference to <figure 2-2> and <figure 2-3>. Besides these indexes, in order to evaluate the achievement, Corporate Plan (2006/07-2010/11) has assigned sixty key actions among operating businesses. For example, decrease of level bust and developing the principles of radiotelephony are decided and the process of the specific contents of these are appraised. Further it is evaluated whether each goal index of CAA Corporate Plan and the specific plan among the key actions have been achieved.

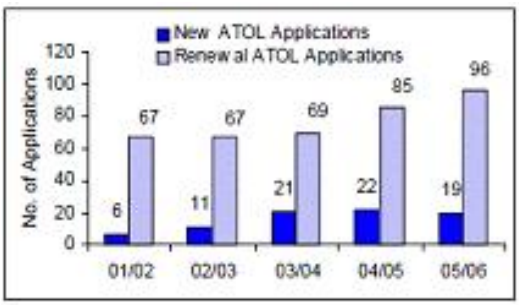


<figure 2-1> British accident ratio index (example: fixed wing-aircraft of airliner above 5700kg) the origin from : CAA, 2006



the origin from : CAA, 2006

<figure 2-2> CAA business index examples (ATOL demanded time of issuing)



the origin from : CAA, 2006

<figure 2-3> CAA business index examples (ATOL service person per issuing)

3. Australia

Corporate Plan for 2006-07 to 2008-09 established four goals which are achievement of safety effectiveness, improved efficiency, improved industry and stakeholder relations, and improved accountability. Every policy of Australia and the USA is pursuing the improvements that are related to safety, cooperation with other countries and agencies, and structure of organization. Although the USA pursues maximizing the quantity, Australia pursues efficiency of investment.

The top hierarchy guides the formation of Australia CASA strategy which is in the Civil Aviation Act 1988, and these govern the resources according to the strategy priority. The strategy priority of Corporate Plan for 2006-07 to 2008-09 is the passenger policy and that is to complete four aspects (goal) successfully and systematically.

(1) Achieving Safety Efficiency

To meet the general public's expectation and demand, specific strategies included in CASA's main policy, are as follows.

(2) Goal and Directing Post of Safety Plan

The safety plan of Australia decides the index and appraises the outcomes as occasion demands, and performance targets on the lines of enforcement tasks is promoted.

The goal of Corporate Plan index 2005-06 to 2007-08 written in 2005, is indicated as follows.

1) Improved aviation safety perfomance

① Accident rate of general-aviation per a hundred thousand hour operation

(quantitative index)

② Fatal accident rate of general-aviation per a hundred thousand hour operation (quantitative index)

③ Time table of revising aviation-law (evaluation on revision rate)

④ Capability of CASA 's research (evaluation on research activity)

⑤ Abillity of pilots and instructors (evaluation on training standard)

⑥ Participation rate of aviation-workers (quantitative index)

2) High level of public confidence in aviation safety

① Result of reliability research on aviation safety

3) A world-class regulator

① Response to the civil petitions (evaluation on handling time and official number for civil petitions)

② Improved rate of criterion for figures considered dangerous(evaluation from research of outside agency)

③ Observation of maintaining safety in businesses (the number of times investing in the tools to measure safety)

④ Interchange with overseas aviation authorities (evaluating the participation rate of events overseas)

4) A high performance organization

① Service standard provided by CASA (evaluation on performance and establishment of the service standard)

② Standard for establishment of all departments

③ Standard for cooperation with other authorities

④ Setting up employee strategy

(3) Measuring the achievement and promotion system

Promotion of CASA's strategy is executed by front-line function directly performing the service, and supporting function efficiently supporting the service.

The workers at the front supported by CASA, have the safety attitude, in particular on the passenger safety. Eventually the safety attitude in the business field has changed, and the accidents are reduced. As the strategy progresses, CASA considers the change in the attitude of business and obtains excellent results, such techniques are vital which includes training programs offering safety information and motives to enhance the safety-the will of operators, regulations to satisfy demand of supervisors, and to cancel licenses. Australia's performance is measured by both internal and external reports as appropriate for the purposes of the corporate plan and other details of establishing an index to judge whether the achievement of the indicators is done strategically.

The results measured by quantitative method, clearly determines whether the goal has been achieved. The points not achieved will be analyzed from the point of its contents and will be written for the next corporate plan. Performance measurement and reporting system in Australia.

4. Japan

(1) Aviation safety policy

1) Safety of aircraft operation

To secure aircraft safety, first is the strengthening of supervision system for air transport operators, taking into consideration that airlines are becoming more diversified and complex, to install a new audit organization to promote professionalism and strengthen the audit staff training. Second,

to switch to administration of preventive safety, placing importance on reporting duty to prevent the occurrence of accidents or serious problems, and improve the preventive administration by implementing safety measures and reviewing safety standards of safety through information gathering and analysis of safety for airlines. Also, to prevent human error, fundamental problem of aviation-workers through education and training system, was reviewed, so English Proficiency Test for Aviation was introduced for enhancement of pilots' communication. Third, to fulfill the ability of aviation-workers, as stable increase of pilots are expected in the future, a plan of securing pilots and self-training was implemented. And to lead the businesses, through implementation of appropriate medical aptitude to help understand the aviation safety information and increase the safety awareness at will, and to prevent accidents, manage daily health care of the flight attendants. Fourth, the enhancement of aviation security training, relocate and refurbish the University of aviation security.

Depending on the next generation-aviation security system, to review the training courses and curriculum to secure fidelity. Fifth, to take into account safety of overseas-aircraft, when a problem of foreign aircraft is discovered at arrival in an airport, notify foreign government and necessary action is to be enforced.

The sixth, reinforce the guide line for small aircraft to prevent accidents by observing laws and related regulations, to train operators of small aircraft operation and guide line for understanding the weather conditions. In addition, improve and promote the awareness of safety-related facts, and hold a safety-lecture held with the club of pilots to participate in the pilots of small aircraft and private-pilots. Seventh, establish a measure related to aviation-leisure. To follow the aviation safety through the leisure-aviation clubs like paragliding, skydiving, gliding, ballooning, and achieve the

aviation safety and release the information related to aviation safety, and hold events like (SKY.LEISURE.JAPAN) for fun. The eighth, through reviewing the safety standard of transporting dangerous good, internal standard is improved based on safety standard of transporting dangerous good from ICAO (International Civil Aviation Organization) and IAEA (International Atomic Energy Agency), and also training workers engaged in transporting dangerous goods to be reinforced. Ninth is strengthening investigation system of aviation accidents. Analyzing the aviation accidents and incidents training the examining staff, and interchanging information with investigation authorities, are required.

The tenth is the aviation-weather information related to air traffic. Establishment of database on airport information and pilots reports on weather information is required.

2) Safety of aircraft

First is the development of technical standards to secure safety of aircraft and equipment. On the basis of accumulated experiences and new technological development trends in the aircraft operation, the necessary technological standard has been developed. For gathering and analyzing of aircraft safety, speed is requested for giving out the data. Second is the completion of investigation system of aircraft, which includes investigations of suitability regarding new technology and training staffs at the evaluation center. Third is to complete investigation system of aircraft-maintenance. The training and execution manual for investigator of aircraft maintenance are required to enforce the investigation and supervision. Fourth is the collection of the cases and measures regarding aging aircraft to improve the measure of superannuated-aircraft.

3) Focusing on rescue activities

First, to restructure of search and rescue system, consolidate cooperation system with activation plan, drill, information collection, management system and related agencies. Second, to restructure fire fighting and emergency medical system, implement composite drill when it comes to large-sized fire fighting cars and replace the KOCHI Airport's chemical fire fighting cars, and so on, Airport Security and Prevention Training Center to implement Joint-Drill with related organizations in order to support Hakotate, Nigata, Oita, Kagoshima, Kumamoto, Miyazaki airport's annual replacement plan which place medical tools needed for airport rescue to improve fire crew's ability to work at a airport through the synthetical drill.

4) Perfection of R&D and Study

First, in order to run Research and Development regarding safety of air traffic, they try to secure the safety of air traffic through 「Research for evaluation of safety and extension capacity of airspace, air route」, 「Research about extension capacity of congestion airport」,「Research for enhancement of GPS」etc, and perform the research on airport engineering facilities like a runway to improve safety of aircraft operation by researching visual guidance system. Second, they run the composite research like decoding technology by using a simulation, FDR decoding, analysis technology of aviation materials, organization of accident's database, to run the composite study for finding causes of aviation accidents.

(2) The index and goal of safety planing

They have established the safety goals to prevent the safety problems ahead that str relate to aviation accidents. the quantitative safety goal aims at 'keeping annual fatality rate o', so there are no specific index of results.

Because there are no index for measuring specific results, it is difficult to measure the results, and it is limited, because it is measured by the number of cases of safety problems like a frequency of aircraft accidents, frequency of fatality and violation of ATC instruction, flight with altitude errors, human errors, etc.

Ⅲ. Recent accident state of accidents in international and domestic Low Cost Carriers

1. North America · Europe

(1) Scandinavian Airline(SAS)

Scandinavian Air's turbo-prop aircraft with 52 passengers and crew tried to belly land caused by landing gear damage at Billius airport in Lituania, but fortunately, all passengers and crew on board were safe. The representative of the airlines said there was something wrong with the nose and right main landing gears on the aircraft headed to west Lituania from Copenhagen, which departed early 1:48am. The pilot noticed this and decided to go to Bilius airport which has a long and wide runway. SAS also said, there were 52 people on board including 4 crews, they were rescued right after the emergency landing by emergency crews. It was the second time that accident occurred with the same fleet last 9th. There were 73 people on board the same fleet where one of landing gears broke during landing procedure with strong wind. The Bombardier marked the 3rd biggest aircraft manufacturer company has strongly recommended that all Q400 around the world should

be checked for its safety status.

(2) Horizon Air

Horison Air, the biggest company that uses Q400 more than any other companies are going to do an inspection on all aircraft of SAS after prohibiting flights because of the accidents that occurred twice during the last two days with SAS Q400. Now, the Q400 of Horizon Air have been replaced by CRJ or Q100 series, and Boeing 737 of Alaska Airline's. Further more, the problem of Q400 is likely to be getting more serious because of the Flybee and Austrian Arrows(Austrian air's reasonal subsidiary) that said, they intend to take part in prohibiting flight of Q400 until they find the cause of the problem at the time of the accident. The bombardier also mentioned that they will stop all production line of Q400 until the problem is founded. To look over the state Q400's flights, it has been operated by ANA, JAC, QANTAS, FLYBE, HORIZON, LUFTHANSA and etc, in 16 countries, 125 fleets. when it comes to accident records and on time rate, it has achieved zero percent on accident rate with Q400 and B777 during 762,000 hours of flight, more than 844,000 times of take-off and landing. except for the tail strike accidents that occurred three times during an approach, an on-time rate is similar to 97 ~ 98% of Boeing, Airbus jet fleets.

(3) Scandinavian commuter

On September 9th, 2007, Q400's landing gear of SAS commuter was damaged during landing at the Alburg, Copenhagen. There was an alarm that indicated something was wrong with the landing gear. During the emergency landing procedure, It leaned to one side and number 2 engines crashed on the ground as soon as landing gear touched the runway.

2. Southeast Asia.

(1) One-Two-Go airline, Thailand.

There was an accident with 88 fatalities at Pujet Airport, Thailand. the aircraft crashed into the ground and it's body was broken into two with fire. there were 123 passengers and 5 crews on board. according to the announcement of Transport Dep of Thailand and the Airline company, OTG(One-Two-Go)'s OG 269(MD-82) veered off the runway due to hazardous weather during the landing procedure, and crashed into the ground at 3:40pm. Asuwan, The director of aviation bureau in Transport Dep of Thailand, said " This happened because the pilot was trying to land with low visibility and strong wind, and abandoned the landing procedure, and tried to make the aircraft turn, it finally crashed into ground and the body was broken into two with fire" The Puket Airport was closed right after the accident. The One-Two-Go is a subsidiary of Orient Thai Air that is a representative airline among the low cost carriers in Thailand, it runs an airline service between Bangkok and Puket 6 times a week. Due to the accident at One-Two-Go airline at Puket airport, the safety problem among the low cost carriers in the Southeast Asia has become a problem. Recently, as the establishment of low cost carriers have been mushrooming in Southeast Asia, the aircraft accidents have occurred in succession. The One-Two-Go airline's aircraft(MD-82) which 130 passenger on board in Thailand, crashed into the ground and broken into two pieces with fire while it was trying to land on Puket airport at 3:40PM, 16th with 88 fatalities and 42 people were wounded. In Thailand, the Orient Thai and it's subsidiary One-Two-go, Nok Air have been on a fast track.

(2) OX-300flight of Orient Thai, Thailand.

There was fire in one of the aircraft's engine of Orient Thai's flight

OX-300 30 minutes after the take-off. the fire was automatically extinguished 10 second later with the automatic fire extinguishing system, but the pilot judged it could have been more serious,

so he decided to turn back to the Bankok airport after the fuel dumping procedure. Most of passengers were Korean. The Orient Thai is a holding company of One-Two-Go airline that crashed on 16th in Puket. According to the figures, Thailand has been marked as a third most visited country by Koreans followed by China and Japan. The representative of the airline company said that the reason for returning was because of the judgement of the PIC, "there was a problem with the fleet". consequently, the aircraft arrived at Incheon Int airport at 8:30PM on 13th, 12 hours later than it was scheduled. Orient Thai didn't mention why it happened, they just explained that there would be an appeal about the delay.

The representative of aviation safety administration said, "it is not an obligation to make a report to Korean government about the accident that happened in Korea" and also he said, "Thai government should have a responsibility on this aircraft investigation" Orient Thai has been petitioned by passengers due to delay of flights and frequent problems of aircraft, so that they had been inspected by aviation safety administration last Feb.

(3) Low cost carrier PMT Airline in Cambodia

Last June 25th, low cost carrier PMT Airline's An-24, where 22 were on board, 13 koreans crashed into jungle in Cambodia due to the hazardous weather while was flying to sihanoukville from Siem Reap airport, all the people on board were dead.

(4) Adam Air, the representative low cost carrier in Indonesia

The Adam Air's B737 crashed into the sea while it was heading to

Manido, north part of Sulawesi island, 2 hours away from Suribaya airport, Jaba Province in east Indonesia, 102 people were all dead including 96 passengers with 11 kids, 6 crews. Nothing has been regarding the cause of aircraft accident yet. The safety problem was mentioned such as inexperienced pilots, aircraft maintenance and safety rules etc. especially, Indonesia is composed of many islands and has adopted competitive system, there has been many low cost carriers established like Adam air, Mentara, Mandalla air since early 1990. Although it has become bigger just by looking, the low cost carriers had problems because of not enough qualified Agent and technology. Adam air's Boeing 737-400 which crashed into a sea had been in service for 17 years, and PMP Air's AN-24 was also know as "one of the aircraft that easy to happened an accident" like TU-134, TU-154 in Rusia. It is also pointed out that it is not easy to secure qualified pilots due to so many low cost carrier showing up in a short time. Most aviation experts said, "it is essential to secure most qualified pilots in order to keep up the safety with airline companies" growing. Another expert puts blame on the reason that aviation accident occurred because there is a problem on the whole. Patrick Smith, the expert of aviation in the U.S said "this guarantees that there's something wrong in the system like aircraft maintenance, observing the safety regulations, air traffic control activation" the present situation of aviation accident (since 2006)

<Table 3-1> the major aviation accident since 2006

Date	Summary of Accidents
2006.5.3	Armenia Air's Airbus A320, 113 all people on board were dead over the Black Sea
2006.7.9	Russia S7 Air's A310, it was veered off the runway during landing at Irkutsk airport, Russia, and 120 passengers on board were dead
2006.8.22	Russia Pulkovo Air's Tu-154, crashed 45km North of Donetsk in Ukraine, 170 all passengers on board were dead
2006.8.27	Comair CRJ-200 in U.S, crashed right after take-off from Rexington airport, Kentucky, 49 passengers dead, 1 survival
2006.9.29	GOL airline's Boeing 737, Brazil, it collided with small aircraft in the air while heading to Brazilia, 154 all of passengers and crew were dead
2006.10.29	ADC airline Boeing 737, Naigiria, it crashed near Abuja airport in Capital, 96 passengers and crew were dead, and 9 survivals
2007.1.1	Adam air KI-573, Indonesia, it crashed into a sea right after take-off from Surabaya airport, Zaba state in Indonesia, 102 all of passenger and crews were dead
2007.3.7	Garuda Air, GA-200 140 passengers on board, Indonesia, it crashed on the ground during landing at some airport in Jogjakarta, 21 people were dead, 8 missing
2007.5.5	Kenya Air Boeing 737-800 crashed in Cameroon, 114 all of passenger and crews were dead
2007.6.25	PMT Air AN-24, Cambodia, it disappeared 40 minutes after departing from Sien Reap airport, Cambodia, 22 people on board were dead
2007.7.17	TAM Air Airbus 320, Brazil, it crashed into Terminal building landinduring g at Congonhas airport. 199 people were dead

3. The situation of turbo-prop aircraft accident in the past (1997-2001)

In Jan, 1997 to October, 2001, the accident rate of the Turbo-prop airplane (24%) was lower than Jet airplane by 30%. This idea coming from the misunderstanding that customers think the turbo-prop is not safe. The Turbo-prop aircraft is also equipped with flight instrument, electronic devices, control unit etc, like the other Jet air craft, the only difference is that turbo prop uses propeller blades to take off the plane. On the contrary, turbo-prop aircrafts are more superior than other Jet air crafts. For example, in the case of turbo-prop aircraft, if its engine stopps, it can glide in the air, so it can make a safer landing than Jet aircraft. In addition, turbo-prop aircraft's accident rate during the Landing time is very low because of the turbo-prop's approaching speed is lower than Jet aircraft, so it turbo-prop aircraft guarantees safety.

<Table 3-2> Accident rate of Turbo-prop vs Jet (1997~2001)

(Unit: %)

Accident		Incident	
Turbo-prop	Jet	Turbo-prop	Turbo-prop
24	76	18	82

Source: NTSB

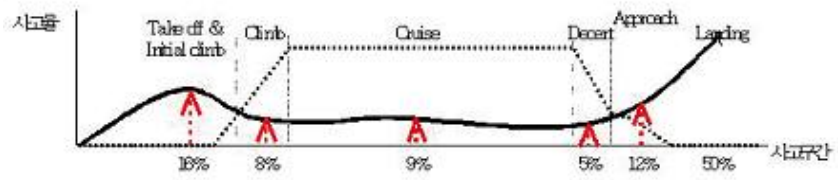
<Table 3-3> Accident rate by factors (1999~2002)

(Unit : %)

Pilot	Maintenance faulty	Defect of aircraft	others
65	12	5	18

Source : Embry-Riddle Aeronautical University

<Figure 3-1> Accident rate in flight segment



Source : Embry-Riddle Aeronautical University.

One of the most important factor when an aircraft makes a landing is cross wind. when the aircraft's performance endures the cross wind, there are good chances that the pilot can make a decision for safety, which means, a possibility of accident also could be reduced.

<Table 3-4> Aircraft's cross wind limitation

Classification	Fleet	Max cross wind
Turbo-prop arcraft	Q400	32kt
	Q 200/300	36kt
	ATR 72	30kt
	ATR 42	30kt
	F50	33kt
Jet aircraft	CRJ200	27kt
	CRJ700	30kt
	ERJ-145	30kt
	Boeing 737-400	29kt
	F-100	30kt

Sources: Bombardier Canada, ATR

Ⅳ. Present status of aviation safety for low cost carriers in Korea

1. Low Cost Carriers in Korea

Around the world, airline companies have increased with deregulation and open skies, and most of the new carriers apply the low cost structure model business. The model is the point-to-point type that flies abandoned routes used by conventional airline companies, and it is expected that there will be many joining this market in Asia, because of this, it is expected that they will push on new exclusive airports with the most interest in successive settlement and revitalizing low cost carriers. Especially, when it comes to low-cost carriers which operates in Incheon international airport, the results of transportation is not much, but its occupation rate has increased. Low cost carriers operating in Korea doesn't affect the major airlines, but if they keep supplying passengers with low cost, it is going to be competitive.

<Table 4-1> Low cost carrier's transportation results in Incheon int'l airport(late 2006, 1 year)

Country	Airline	Air Route	Passenger		Marketshare(%)	
			2006Y	Compare (%)	2006Y	Compare (%)
Philippine	CEB	Manilla	27,456	332.1	0.1	75
		Cebu	66,163	-4.6	0.24	-13.3
		Subic	13,560	-32	0.05	-59
Thailand	OEA	Bangkok	213,386	16.1	0.77	6.9
		Suvarnabhumi	17,783	-	0.06	100
		Fuguet	107,020	26.8	0.39	14.8
Indonesia	PRZ	Bally(Denpasar)	-	-100	0	-
Japan	Thai SKY	Bangkok	66,517	565	0.24	83.7

There are some possibilities that could cause problems when it comes to aviation safety and passengers protection, because many low cost carriers operate non-scheduled flight and the schedule is also irregular. And also, it is expected that there will be sharp competition between major airlines and low cost carriers, if low cost carriers start to operate the same routes in Korea, China, Japan. It is directly related to national airline's competitive power, and developing domestic aviation structure. By considering expansion of Japan's airport capacity and reorganization of airlines and national events in China, the competition will possibly start in 2010.

2. Jeju Air

(1) Safety Policy

Jeju Air aims to build a perfect safety management system that meets the standard safety, and provide the highest quality of transportation services at a low cost. All staff is required to prevent the accident beforehand by cooperating with divisions, communication, team work and employee training. In order to improve safety, security and quality, they will develop the new program, management and training system, and also, they will try to keep company essence such as not to over someone's fault as a just carelessness, but censure if it is intentionally to ignore the regulations or procedures. They will be the best airline company when it comes to safety, security and quality, and also will not make any compromise when it comes to the safety,

(2) Performance facts when it comes to airline safety.

Reviewing the process of ground training when it comes to landing and take-off performance with Turbo-prop and Turbo-jet aircrafts. it is implementing training regarding Turbo-prop aircraft's landing and take-off

performance during regular maintenance training.

When it comes to standard communication procedure implementation like calling-out and safety approach procedure

They state the roll of counterpart with Bombardier Aerospace which is a Q400 manufacturer for nominating a flight technician and Flight Operation Technique Division Service when it comes to considering the reviewing process of aircraft performance in setting up the company standard.

When it comes to making a concept of aircraft approach speed(Vapp) and landing reference speed(Vref), we implement crew training and rebuilding a concept of Q400 Vapp.

To consider a plan that makes crews access the aircraft operating manual, training manual, easily,

They have established a plan to supplement flight crews, when it comes to setting up the condition like flight time that could help flight crews to implement their duty for building flight safety system.

The examination of extended participation of crew in order to improve the professional Qualification Review Committee for evaluating qualification of flights, it improves professionalism by implementing the change in the operation manual of Qualification Review Committee, 2006 December, and constructing the director of Qualification Review Committee and 4 committees which are all part of flight crews.

V. Problems with Low Cost Carriers

1. Problems with safety and business

It has come to a conclusion that confidence in the low cost airline's safety

is decreasing caused by frequent accidents on the aspect of safety so, If this does not get better, the growth of low cost airlines will face limits. It would seem that the main reason for accidents of newly launched low cost airline are aircraft defects followed by negligence in maintenance and It is analyzed that the feature of airlines which had accidents is cause by cutting down on expenses in maintenance. and another problem could be that making flight schedules without alternative aircrafts when something is wrong with the aircraft, it cause a chain of additional suspension of air service. In the case of Jeju airline in 2006, suspension rate of air service caused by aircraft malfunction was 10.58%. It is 3 times more than that of major national airline's(korean airline 3.47%, asiana airline 3.58%) on the simple numerical value. And when this occurs they need to correspond services promptly for example by backing alternative service and offering accommodations to passengers but there are inexperienced with the procedures. From the managemental point of view, in the case of Jeju airline, the sales is higher than fixed expenses so, its dead loss is big and Hanseong airline's equity capital is in the condition of encroachment, and their serious financial difficulty and the right of management trouble causing discontinuing air service, endless controversies regarding the operation. In case of Jeju airline, they had launched service with 40 billions won on June 5th in 2006, and liabilities rate was about 328.1%(sales 11.8 billions Won, dead loss 14.2 billions Won) in 2006. In Hanseong airline, they launched service with 5.5 billions on August 31st in 2005, and they are in the state of encroachment(sales 5.4 billions Won, dead loss 5.7 billions Won) with 2006 sales result. To reference, Korean airline had △230% liabilities rate, Asiana airline had △295% liabilities rate.

View from a standard of insurance loss ratio, and comparison of safety of the foreign low cost airlines.

comparison of safety of the foreign low cost airlines.

Actually, there are many accidents in low cost airline in international lines, and reflects the insurance loss ratio during past 5 years. It is about 40% around the world on average but it is known that those of low cost airlines is more than that. International service has more exposure at the risk than domestic service, and accidents of international service have an effect on both credit rating and image of other airlines, international service takes into account high frequency of accidents, require adequate verification on safety of international service as well. In the event of international air accidents, it lead to a result of decreasing national air safety rating, increasing of a flight insurance bill, difficulty of putting on the new route, and increasing the number of flights and code share.

2. Training of human ability and period of security on suitability for international service.

The main reason of air accidents is caused by human factors, it requires enhancing the human factor, skills and knowhow of maintenance before launching an international services. According to Boeing, they announced that 56% of the air accidents are caused by human factor during the past 10 years and a defects of aircraft and weather conditions are followed by the air crew, human factor and 2-6% is caused by maintenance, air traffic controller etc. and maintenance is important for safety and to be on time, delay rate for domestic flights with more are frequent with 0.09%, it shows less figure than delay rate for maintenance of international flights with 0.25%. It could show that there is difficult in maintenance system of a long range route. moreover, it takes more maintenance time and efforts, to keep flying aging aircraft continuously, and because of increasing the number of

holding aircrafts and flights, lack of engineers could have excessive work, so it can cause increase in fatigue. They need a plenty of skilled pilots and trained engineers because, international service takes high level of risk, it requires a lot of necessary time for securing the human resources owing to present difficult condition of training and securing suitable human resources for international services. Like this condition of lack of human resource, in the event of increasing the number of holding air crafts and flights for launching international route, this can be a threatening factor to air safety, because shortage of pilots and engineers should cover accumulated services.

<Table 5-1> present condition of delay with relation of domestic maintenance(2006.1~2006.12)

	flight availability	Weather		connection of A/C		Maintenance		Handling of passengers		Mixed factor		Other	
		service	percentage (%)	service	percentage (%)	service	percentage (%)	service	percentage (%)	service	percentage (%)	service	percentage (%)
Domestic	243,758	745	0.31	3,650	1.50	210	0.09	108	0.04	12	0.00	582	0.24
International	166,149	400	0.24	2,563	1.54	418	0.25	174	0.10	20	0.01	1,070	0.64
total	409,907	1,145	0.28	6,213	1.52	628	0.15	282	0.07	32	0.01	1,652	0.40

Source : 2006 Aviation Statistics, Korea Airport Corporation.

3. Problems unsuitable for safe operation in the corporate culture

According to the latest survey on fatal accidents, although human factor, the main reason of air accidents, is the last step of accidents, there are many potential reasons on the other side. Most of potential reasons are existing factors with airman in the Organizational Context, in other words Organizational Factors. According to analysis of reason of accidents from NTBS, National Transportation Safety Board, factors affecting air accidents

such as human factors fall under an organization. Wrong decisions from managers (a short of capital, the wrong plans, lack of human resource, pressure of time with business or operation etc.) also affect work place through various structure route. so to speak, wrong decision from managers can create unsafe factors at a work place.

To make a defense mechanism for an organization threatening the forecasted air service, and there needs to be systematizing corporate of culture to show its ability, international service which has more risks needing adequate time of operation experience to form corporate culture which is closely related to safety, because corporate culture is created by progressing work in the organization in order to secure safe operation

<Table 5-2> main accident reason, according to analysis report from NTBS

classification	NTSB
human factor	- Pilot Other(Not Aboard) Other(Aboard) - Organizations
aircraft	- System/Equipment malfunction - Powerplant/Propulsion malfunction - Aircraft Structure defect - Flight Control System malfunction - Landing Gear malfunction (Fluid malfunction)
environmental factor	- Weather Condition - Object - Airport Facilities, Aids - Terrain Condition (Light Condition)

Sources: NTSB, 2004.

Ⅵ. Conclusion

On account of open skies policy, consumers can make their choices more widely such as reduction in airfare, multi-airline operation and local airport commission of foreign low-cost airlines. On the other side, as a result of low-cost competition between low-cost airlines and new low-cost airlines have been recreated. the local airlines based on local area and new low-cost airline market is increasing now. It is necessary that a long-term pilot training plan and to use of domestic employees having business pilot licenses because there is lack of stability in balance of pilot's supply-demand relation to a result of increase in the number of airlines and opportunities for employment from foreign airlines. In Southeast Asia, as previously mentioned, while there are low-cost airlines which is supported by government having reliance on safety; like a Air Asia in Malaysia, Some low-cost airlines decrease their reliance because of aircraft accidents. so domestic low-cost airlines need to increase safety reliance in order to prepare to go abroad and make a safety management plan for international safety. Also, because of open skies policy and diversification of air demand, low-cost airlines are being created more. Jeju airline are being operated in four routes. and Another Low Cost Carriers were served. International airline will be established. after these low-cost airlines are established, there exists a probability where airline accidents could occure continually. Therefore, new low-cost airlines need to strengthen their safety management to cope with air market changes and improve competitiveness in air industry. To improve safety and upgrade safety supervision system for domestic low-cost airlines, first, it is necessary to make a classification of AOC issue and standard of class safety supervision. Second, total inspection of safety supervision putting importance on system improvement first to be conducted continually. Third, new

low-cost airlines have to settle the safety supervision system and improve fundamental problems. Forth, low-cost airlines risk factor category should be obtained from SMS and concentration on supervision is required. For these things, as FAA subordinate business plan to flight plan in the United state's air safety policy, a detailed air safety plan is needed. Especially essential timetable should be decided to add a content of low-cost airline's safety regulation. For example, within 2010, to conduct a total inspection on the actual condition of safety supervision and a preparation of AOC standard safety supervision. or in the first half of 2010, obtain low-cost airline's risk factor category in SMS. and expand concentrative supervision content.

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Abstract

This study is to know the Enhancement of Aviation Safety for Low Cost Carrier in Korea through the long and mid term air safety policy. Especially, the aviation safety authorities of the developed countries in aviation establish action plans under the system plan of central government. Then the countries implement those plans systematically to the related aviation business so that they promote efficient air safety policy implementation. At this time, the Korean government should present the vision about an air safety and systematic strategic plan to cope with the future aviation industry change. Also, it is needed to establish a specific aviation safety action plan. Namely, an air safety master plan and long-term road map must be established. This paper deduces some implications through the abroad cases of aviation safety plan, and then tries to find the applying method of the implications to Korea in the rapidly changing aviation market in the 21st century. It is expected that this paper will help the Korean aviation industry to play a major role in the future. In oder to get suggestions aviation policies of advanced countries with regard to aviation safety, we have looked at the aviation policies of the U.S., the U.K., Australia and Japan, and also LCC's states overseas, LCC's safety policies in Korea, and aviation safety status. Since existing LCCs and new LCCs based in Korea have become the new concept, this new market for LCC has been booming recently. Around Southeast Asia, while there are some LCCs including Air Asia which is supported by the government of Malaysia with emphasis on safety, there are other LCCs, which have failed to achieve confidence in safety and have led to aircraft accidents and financial mismanagement, so we need to verify the safety of overseas LCCs, try to improve domestic LCCs in order to fly international routes and aid international aviation safety.

LCCs have been increasing lately thanks to open skies policy and a wide variety of flights.lines. Air Busan, Jin Air, Jeju air, Eastar Air are in service. so the risk of new potential hazards may increase. Therefore it is necessary to take the initiative in aviation markets inside and outside of Korea and the safety management of new LCCs should be taken more seriously than ever before.

Among overseas aviation safety policies, we need to implement the FAA's Filght Plan which has a specific Business Plan. I hope this thesis will help improve aviation safety locally and internationally.

Key Words : Aviation Safety , Aviation Safety Policy, Open Skies Policy, Low Cost Carrier,

초 록

한국의 저비용항공사 안전 향상을 위한 안전정책 연구

이 강 석*

항공안전에 대한 항공선진국의 항공안전정책을 통해 얻을 수 있는 시사점을 위해 미국, 영국, 호주, 일본의 항공안전정책을 살펴보았으며 외국의 저비용항공사의 현황 및 한국의 저비용항공사의 안전정책 및 항공기 사고에 따른 항공안전 현황을 살펴보았다. 기존의 저비용항공사와 이제 신규 저비용항공사가 지역을 기반으로 지역항공사의 개념으로 탄생함으로써 새로운 저비용항공사의 시장이 형성되고 있는 상황이며 인근 동남아 지역에는 말레이시아의 와 같은 안전의 신뢰성을 갖고 정부가 지원하는 저비용항공사가 있는 반면 항공기 사고로 인하여 경영이 악화되었거나 안전성에 대한 신인도가 추락된 저비용항공사가 산재되어 있어서 외국의 저비용항공사에 대한 안전성 검증과 함께 국내 항공사의 국제선 진출에 대비한 신뢰성 향상 및 국제적 안전성 확보를 위한 안전관리 대책이 필요하다. 또한 현재 항공자유화와 항공수요의 다양화로 저비용항공사 증가 추세에 있으며 최근 제주항공, 에어부산, 진에어, 이스타항공이 국내선 운항과 동시에 국제선 운항을 시작하였거나 준비하고 있는 상태이다. 본 논문은 최초 저비용항공사 출범 직후의 안전성에 대한 문제를 중심으로 연구를 진행하였으며 이후 이들 항공사 사고가 발생할 개연성에 대한 부분도 고려하였다. 따라서 국내외 항공시장의 환경변화에 능동적으로 대처하고 항공산업의 경쟁력 제고를 위해 신규 저비용항공사의 안전관리의 강화가 그 언제보다 필요한 시기라고 생각된다. 따라서 해외의 항공안전정책 가운데 미연방항공청의 Flight Plan 하위의 Business Plan처럼 구체적인 항공안전계획이 필요하다고 생각

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되며 본 논문이 저비용항공사의 항공안전 제고 노력에 미력이나마 도움이 되기를 바란다.

주제어 : 항공안전, 항공안전정책, 항공자유화정책, 저비용항공사