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TABLE OF CONTENTS

Volume 5, Number 2 — 2000

Sorenson Best Paper Award 1

Articles

Sorenson Best Paper Award Recipient

Marketing to Female Business Travellers 3
Fariba Alamdari and Julian Burrell

A Fuzzy Approach to Overbooking in Air Transportation 19
Matteo Ignaccolo and Giuseppe Inturri

Determinants of Price Dispersion in U.S. Airline Markets 39
Gerald N. Cook

Strategic Alliances of Airlines and Their Consequences 55
Ruwantissa I. R. Abeyratne

The Determinants of Domestic Air Travel Demand
in the Kingdom of Saudi Arabia 72
*Abdullah O. Ba-Fail, Seraj Y. Abed, and
Sajjad M. Jasimuddin*

Morris Air: A Successful Startup 87
Albert Schultz and Erika Schultz

University Flight Operations Internships with
Major Airlines: Airline Perspectives 111
David A. NewMyer, Jose R. Ruiz, and Ryan E. Rogers

Book Review

Flying Too Close to the Sun: The Success and Failure of the
New-Entrant Airlines 130
Thomas C. Lawton

Index of Past Issues 134

Guidelines for Manuscript Submission 136

Order Form 140

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Dr. Brent Bowen is Director and Professor, Aviation Institute, Department of Public Administration, University of Nebraska at Omaha, and the University's Director of Aviation and Transportation Policy and Research. Bowen attained his doctorate in Higher Education and Aviation from Oklahoma State University and a Master of Business Administration degree from Oklahoma City University. His Federal Aviation Administration certifications include Airline Transport Pilot, Certified Flight Instructor (Gold Seal), Advanced Instrument Ground Instructor, Aviation Safety Counselor, and Aerospace Education Counselor. Dr. Bowen's research on the development of the national Airline Quality Rating is regularly featured in numerous national and international media, as well as refereed academic publications. Dr. Bowen has in excess of 200 publications, papers, and program appearances to his credit. His research interests focus on aviation applications of public productivity enhancement and marketing in the areas of service quality evaluation, forecasting, and student recruitment/retention in collegiate aviation programs. He is also well published in areas related to effective teaching and has pioneered new pedagogical techniques. Dr. Bowen has been recognized with awards of achievement and commendation from the American Marketing Association, American Institute of Aeronautics and Astronautics, Federal Aviation Administration, Embry-Riddle Aeronautical University, W. Frank Barton School of Business, Travel and Transportation Research Association, World Aerospace Education Association, and others.

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SORENSEN BEST PAPER AWARD

The *Journal of Air Transportation World Wide* is proud to present the Sorenson Best Paper Award, named in honor of Dr. Frank E. Sorenson. This award gives recognition to the author(s) with the best literary and scholarly contributions to the field of air transportation. The Editor, on the basis of reviewer rankings during the review process, grants the Sorenson Award. The manuscript with the highest overall score is awarded the Sorenson Best Paper Award. This is considered a high recognition in the aviation community.

Dr. Frank E. Sorenson was a pioneer in the field of aviation education since its early beginnings in the 1940s. A renowned educator and prolific writer, Sorenson contributed not only education texts to the field, but also served as a consultant and innovator throughout the expanding realm of aviation education and research.

Dr. Sorenson's aviation impact and potential were recognized early on by the National Aeronautics Association when he received the Frank G. Brewer Trophy in 1946 for the most outstanding contribution to the development of youth in the field of education and training. In 1958, the University Aviation Association honored him with the William A. Wheatley Award in recognition of outstanding contributions to aviation education. These were the first of many awards and citations he would earn on a local and national level as he continued his active involvement in the field of aerospace education up until his death in 1977.

Through his involvement with the University of Nebraska–Lincoln Teachers College, Dr. Sorenson generated some of the earliest teaching materials for aviation education and textbooks for military aviators during World War II. Throughout the course of his career, he contributed over forty articles and publications related to the field of aviation education. His efforts guided the way for extensive aerospace research and scholarship from the grassroots to the global level through his participation in Civil Aeronautics Association, the World Congress on Air Age Education, and UNESCO. He has served as chairman of the Air Force Associations Aerospace Council, the Aerospace Education Forum at the First World Congress of Flight, the U.S. Air Force Air Training Command, the Men in Space book series, and NASA's Aerospace Education Advisory

Committee. As a result of his visionary involvement and development of the Link Foundation, the organization has gone on to provide grants now totaling over a half million dollars a year to support and advance aerospace education and training in aeronautics.

Dr. Sorenson's continuous involvement in aviation education and research laid the groundwork for many of the advancements currently taking place in the industry. His ceaseless research and educational outreach demonstrated how one person can make a difference not just today but well into the future.

Currently, several awards exist that are representative of his achievement in aerospace education and research. These include the Frank E. Sorenson Award for Excellence in Aviation Scholarship, representing the highest scholarly honor in aviation education, presented annually by the University Aviation Association; the Frank E. Sorenson Pioneers in Nebraska Aviation Education Award presented annually by the University of Nebraska at Omaha Aviation Institute, as well as a memorial lecture fund and scholarship fund.

Sorenson Best Paper Award Recipient
**MARKETING TO FEMALE BUSINESS
TRAVELLERS**

Dr. Fariba Alamdari
Bedford, U.K.
and
Julian Burrell
London, U.K.

ABSTRACT

Business passengers are the most profitable segment of the market for airline industry. Airlines have put an enormous amount of effort into improving the quality of service offered to business travellers. However, a fast growing sub-segment of the market, female business passengers, appears not to be receiving any special attention from airline product planners. In the U.S. it was predicted that female travellers will represent 50 percent of the business travel market by the turn of the century (Equality, 1996). Such growth in this segment of the market raises a few questions. Do airlines view this sub-segment valuable enough to divert special effort to meet the passenger requirement? Do the requirements of female business travellers differ from those of male business travellers? Does the airline industry meet the travel needs of this sub-segment of the market? How can airlines increase their share of such a growing sub-segment of the market? To address these questions surveys of both airlines and female business travellers in Europe and the U.S. were carried out. The findings indicate that the airlines view the growth of this sub-segment as important. However, only a few carriers have devoted resources to address female business travel needs. Although the needs of the female business travellers are in many ways similar to those of the male business traveller, there are differences in certain areas such as concerns over airport security, advice on safety and better washrooms. Clearly these requirements must be accommodated if airlines wish to increasingly attract this growing sub-segment of the market.

INTRODUCTION

For the majority of scheduled carriers, revenues earned from business class passengers represent a significant amount of income and create a significant proportion of profits earned. Therefore, in order to maintain

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competitive advantage, it is vital that airlines continuously address the requirements of the business class passenger and update their related market intelligence.

As can be seen on Table 1, it is only the business class cabin that tends to generate profit for airlines. However the revenue generated from first and economy class do not cover the associated costs, as the actual load factor in both cabins are below the load factor required in order to break-even. This is not to say that all airlines are facing the same situation but it illustrates that on average business class cabin is the profitable side of airline operations.

Table 1. Passenger Results by Class of Service, 1997

		<i>First Class</i>	<i>Business Class</i>	<i>Economy Class</i>
Passenger load factor achieved	%	40.80	54.30	76.20
Operating expenses per ASK	USc	13.87	9.74	05.18
Yield per RPK	USc	24.61	21.62	06.63
Load factor to cover expenses	%	56.40	43.80	78.20

Note: Available Seat Kilometre (ASK); Revenue Passenger Kilometre (RPK); U.S. currency (USc).

Source: IATA Airline Economic Task Force, 1998

However, the business class passenger is no longer a one segment issue. It is the growth and gradual establishment of a specific sub-sector of business class—the female business flyer that requires special attention. Traditionally being viewed as an employee working in the less elevated ranks of corporate life, the female is now starting to break through into higher managerial positions. This development has led to some sectors, typically those that have focused on the male business traveller, adjusting to a tremendous growth in the numbers of female business travellers. The hotel industry, for instance, can be viewed as one such sector, which has realised the need to adapt the services and facilities offered, in order to better accommodate its new customers.

In the U.S. it was predicted that female travellers will represent 50 percent of the business travel market by the turn of the century. In the U.K. women represent 30 to 40 percent of business travellers. This is a dramatic increase since 1980 when they accounted for only four percent (Equality, 1996). Travel Weekly (1999) reported that a study by Travel Research Centre, indicated that the percentage of female business travellers on long haul routes from France and Germany has increased from six percent in 1989 to 22 percent and 26 percent, respectively, in 1999. Such trends in the growth of the female business travellers market raises several questions.

- Do airlines realise the potential of female business travellers market?
- Do airlines offer any specific services targeted at the travel needs of female passengers?
- What are female business travellers' needs?
- Are there opportunities for airlines to capture market share by improving the business travel experience for women?

It is the aim of this paper to address the above questions by carrying out a survey of both airlines and female business travellers in the U.S. and Europe. The reason for this specific geographical focus lies primarily in the fact that these are already acknowledged as having the main growth markets in the sector (Equality, 1996).

FEMALE BUSINESS TRAVELLERS

The growth in the number of business women could provide a clear explanation for the growth in female business travellers. It is evident that as the percentage of women in the labour force continues to increase, it is more likely that they will reach a level within the company at which business travel becomes more frequent. Compounding this, is an increase in the number of females taking up business related courses at the level of higher education.

Fundamental changes in the industrialised world during the past twenty years has encouraged more women to enter the labour force. In the 1950s in the United Kingdom, for instance, women only made up one-third of the labour force. However, in the 1990s this proportion has risen to around one-half (Hansard Society Report, 1990).

Goffee and Scase (1985) believe that there are two major phenomena that account for this dramatic shift. The first has to do with demographic changes. As women now tend to live longer, marry later and have fewer children, they are increasingly able to take up work. The second is possibly more fundamental. This has to do with the restructuring of women's psychological expectations, shifting their motivations and self-identities from one which has previously been marriage-related to one which is far more work-related. Research in this area has shown that the percentage of women engaged in professional occupations has leapt from 16 percent in 1991 to 20 percent in 1997 (Webb, 1998). In addition, female membership of the Institute of Directors has risen by 60 percent since 1994.

In addition to the evidence of the increase in the number of business women as a whole, further statistics are available to support the growth in female business travellers activity. As can be seen from Table 2 there has

been a growth in the number of female business travellers using the London Airports (Heathrow, Gatwick and Stansted) between 1983 and 1996.

Table 2. Percentage of Female Business Travellers, 1983-1996

<i>Airport</i>	<i>1983</i>	<i>1987</i>	<i>1993</i>	<i>1996</i>	<i>%increase 1983-96</i>
Heathrow	12%	14%	15%	20%	66%
Gatwick	15%	19%	20%	20%	33%
Stansted	13%	16%	13%	16%	23%

Source: CAA, 1996

It appears that a number of airlines have recognised the growth in female business travellers market and have started a few initiatives. Some examples are provided below.

In terms of offering safety advice, Delta airlines have designed an executive women's travel page on their website. This provides general advice on safety issues relevant to the female, but is not destination specific.

Research undertaken by United Airlines indicated that female business travelers are sometimes mistaken to be leisure flyers and are not treated in the same manner as male business flyers. Based on their findings, their flight attendants are trained with the emphasis on the importance of treating female business flyers with the same degree of respect and value as their male business passenger counterparts (United Airlines, 1998).

In a study commissioned by Midway, it was found that women tended to spend three times longer in the bathroom than men. Every aircraft in the Midway fleet now has a women's only restroom and a unisex lavatory. The restroom has a carpeted floor, a full-length mirror, flowers and automated sanitary toilet seat covers. Japan Airlines (JAL) decided to introduce their 'Ladies Elegance Rooms' on its domestic fleet in 1996. As a result of their findings that 35 percent of their domestic passengers are female, JAL introduced separate restrooms which have additional features such as an extra back mirror and a range of cosmetics (Kahn, 1997).

The Hotel Industry Experience

The hotel industry has already noted and reacted to the changing structure of the business travellers. Previously the male business traveller was the prime customer for whom most of the facilities and services were provided. However, with the steady growth in the number of female business travellers, many hotel chains have found it necessary to re-market themselves by offering a more personalised service as well as additional

facilities. This is in order to better accommodate the female who, it has been discovered, has different wants and needs compared to the male.

One area of prime importance to the female is her personal safety. In a survey of women frequent travellers by Chambers Travel (Bevan, 1996), it was found that 95 percent of its respondents stressed safety as being highly significant. Research commissioned by Barclaycard revealed that car parks were singled out by many women as places in need of safety improvements (Chetwynd, 1998). Some hotels such as the Renaissance and Choice groups both reserve spaces near the hotel entrance for women. Copthorne has a policy of escorting female travellers to and from its less well-lit car parks.

Several hotels in Tokyo have dedicated check-in desks for female business travellers and include amenities in rooms which are more suited to women. They also have tried to alleviate female's concern over security in hotels by offering women rooms nearer the lift so that they do not need to walk through long hotel corridors. A survey by Swallow hotel group, on the more important considerations for female travellers, has led them to devise a women's charter (Travel Trade Gazette, 1998). As a result of various surveys on female business travellers by the hotel industry, an independent hotel booking agency, Expotel, recently launched the "Woman Aware Initiative." Based on their scheme hotels are classed as "Woman Aware Hotels" if they meet certain criteria based on the survey of 1,000 female business travellers carried out by the agency (Anderson, 1999).

RESEARCH METHODOLOGY

In order to address the questions raised in the introductory section, two types of surveys were carried out.

One was a supply side survey that consisted of a postal questionnaire survey of 44 airlines in North America and Europe with a 33 percent response rate. The airlines included in the survey were all major scheduled carriers with business class operation.

The other was a demand side survey that included a postal survey of 175 female business travellers resident in North America and Europe. The potential respondents were contacted through personal contacts and "Women in Business," which is a club whose members are business women. In addition to the postal survey, interviews with 15 female business travellers in executive lounges at London Heathrow airport were carried out. The reason for the face-to-face interviews was to gauge female business passengers needs while they were actually travelling. Therefore, a total of 190 female business travellers were surveyed with a 34 percent response rate.

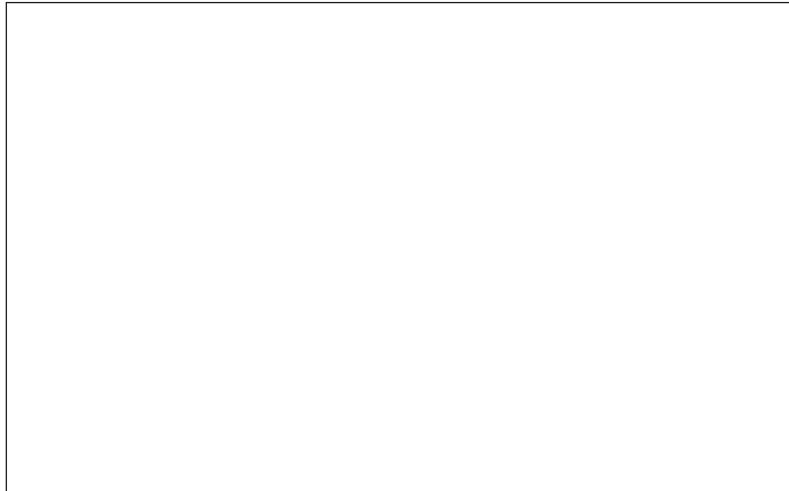
The Airline Survey

A primary objective of the airline supply side survey was to obtain information from airlines based in Europe and North America about their current and future marketing activity aimed at the female business travellers. With this objective in mind, the survey was designed to obtain information in the following general question areas.

- On average, what percentage of 'Business Class' passengers are female, for both short haul and long haul flights?
- Is the female business traveller becoming an important market for airlines? If so, can airlines forecast the growth of this segment?
- Do airlines currently focus specific services on the female business travellers? If so, what are they?

Questionnaires were sent to 44 airlines based in U.S. and Europe. An above-average response rate of 33 percent was achieved.

In contrast to the non-U.S. airlines, the respondent U.S. carriers indicated an above-average percentages of females, over 20 percent and 24 percent, using their business class services on both short and long haul routes, respectively. This may suggest a greater acceptance of women in the higher ranks of corporate institutions in the U.S. business environment. It appears that on average 28 percent of business passengers of respondents airlines operating from the U.S. are female. The corresponding figure for the European carriers is 22 percent, as shown below.



The survey results also indicated an overwhelming proportion of respondent airlines (80 percent) believe that the female business travel market is valuable and is transforming into a new prominent segment within business class.

Having received such a positive response, it was intriguing to gain further insight into the significance of this segment by asking the airlines whether they had forecast the percentage growth in the number of female business travellers by the turn of century.

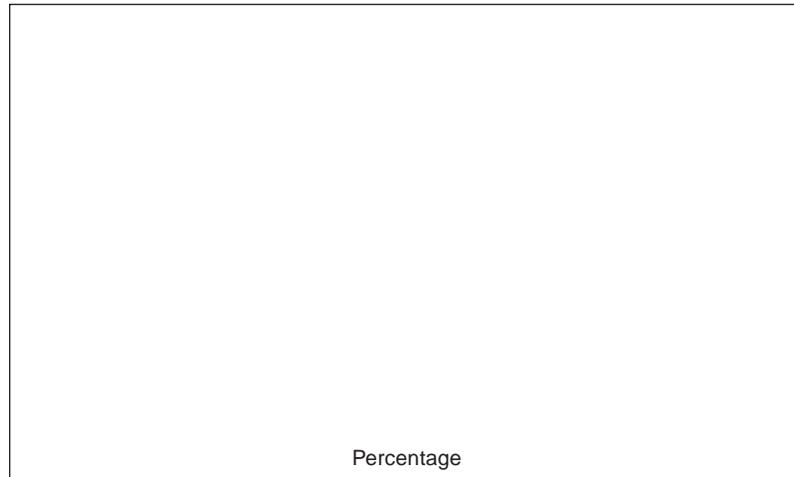
Only half of the respondent airlines indicated that they had projected the short term growth of female business travellers segment. The results indicate a plausible average growth figure of 10 percent over the next two years.

Considering that 80 percent of all respondents view the growing female business travellers market as important, it was interesting to see whether airlines are already focusing some of their attention on the female business travellers by offering specific services and facilities for the female flyer, or if they intend to do so in the future. Clearly, very little is being offered at present as only 7 percent of carriers stated that they are currently dedicating some of their resources to the female business travellers. However, what is encouraging is that more airlines indicated an intention to do so in the future (see Figure 2).



The results in relation to current services offered specifically to female business travellers is illustrated in Figure 3.

In summary, the respondent airlines gave a clear indication that they view the growth of female business travellers as important for their airline. However, it appears that the majority of airlines have not yet devoted any resources or formulated any policies to address any possible requirement of female travellers. A few airlines have begun to take notice of the growing



female travellers market by offering special services to them.

A number of larger global airlines drew attention to the fact that, even though they were currently not offering any specific services for the female business travellers, they may well decide to do so in the future. Having identified the frequent business women traveller as a key new market, a few implied that they were now in the information gathering stage and are currently trying to identify new products for the female business travellers market.

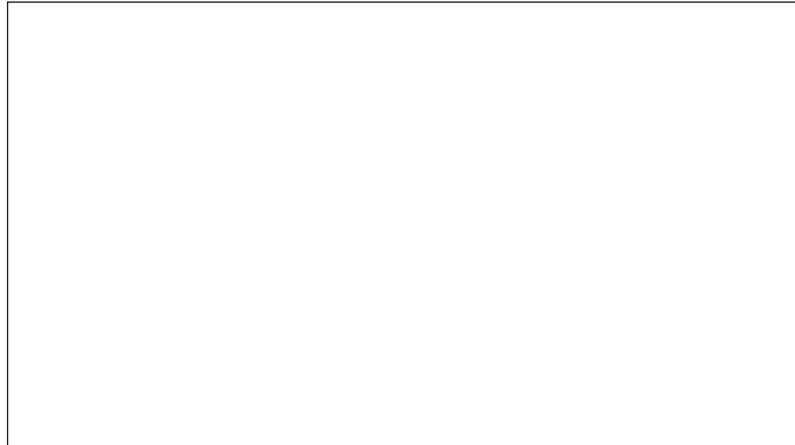
Female Business Travellers Survey

A total of 175 questionnaires were sent to female business travellers in North America and Europe. In addition to that 15 face-to-face interviews with female business travellers were made possible by permission of two airlines, in their executive lounges at London Heathrow airport. The results that are presented in this section are based upon a sample of 50 female business travellers who participated in the questionnaire survey and 15 face-to-face interviews. Although this is a relatively small sample, it highlights several issues which could be of interest to marketing and product development managers in the airlines industry.

The Characteristics of Female Business Traveller

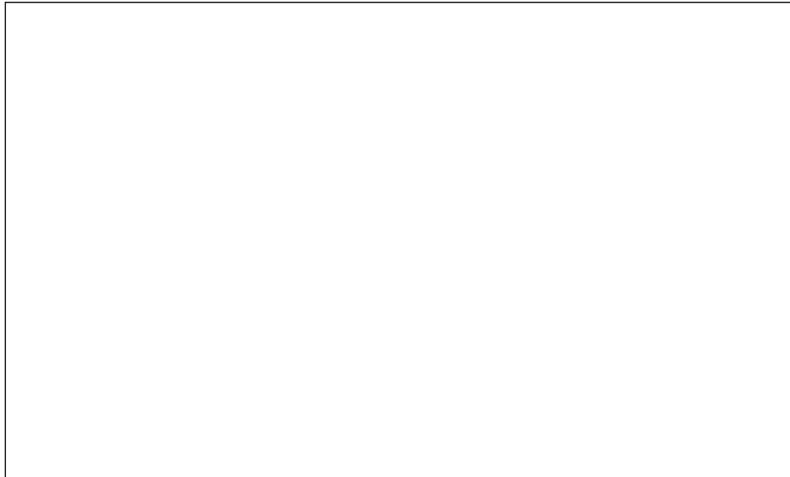
Based on the surveyed sample a large proportion of the female business travellers are between 25 and 49 years of age (see Figure 4). These results are supported by a survey undertaken by Plog Research, Inc. (1996) that the percentage of female business travellers is higher in the younger age

groups. In addition, their research identified an interesting correlation between age and future travel plans. This stated that 31 percent of those under the age of 44 plan to travel more in the future, while only 23 percent of travellers over the age of 55 share that expectation. This indicates, therefore, that as the female business travellers of today tend to be young, it can be expected that they will travel even more on business in the future.



A large proportion of female business travellers (67 percent) are employed by a company as opposed to being independent or self-employed. Clearly, as illustrated in Figure 5, there is a tendency for female business travellers to be in a position of authority. Indeed, this accounts for over one-third of all females questioned. Some 27 percent of the respondents stated that they are either a director or a vice president of a company. However, there are still only a handful of females who are at the head of companies with only 12 percent working as Chief Executive Officer or Managing Director. This could be interpreted as suggesting that the female is becoming more business orientated. As stated in the introductory part of this paper the most popular university courses amongst females in the U.K., as well as in America, are those relating to business and financial issues (Office for National Statistics, UK, 1988-1995 and U.S. Department of Education, 1996). Ultimately, this may have the effect of steering even more females into a business environment, where flying may become increasingly a necessity.

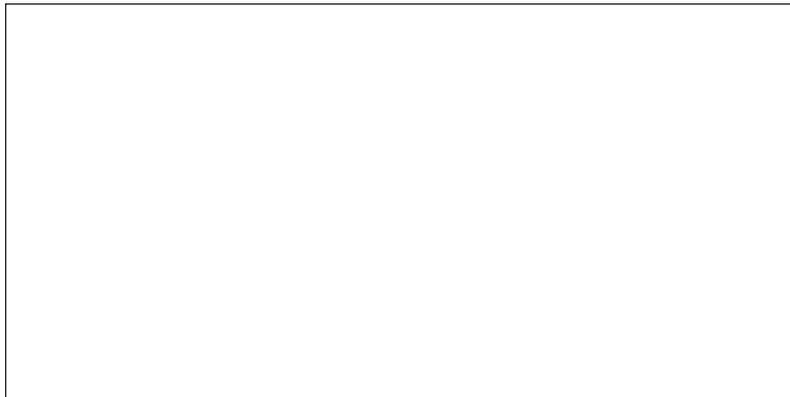
Only 4 percent of respondents earn less than US\$20,000 per year while nearly two-thirds claimed that they earn an annual income between US\$40,000 and US\$80,000. Four percent received US\$80,000 to US\$100,000 a year, while 13 percent stated that they earn above



US\$100,000 a year. This illustrates that although the females represent a smaller proportion business travellers market the majority has senior position with a relatively high income compared to average earnings in U.S. and Europe.

Nearly one-half of the respondents fly over 10 times a year on business purposes, with around 20 percent flying over 20 times per annum (see Figure 6). Considering that at present the female business travellers only makes up around 20 percent of the whole business travel segment, those female business passengers travelling more than 20 times a year represent only a very small proportion of the overall business travel market.

The majority of respondents (73 percent) indicated that they are the primary decision-maker regarding the choice of airline. The class to be



flown is usually dependent on travel policy, with the duration of trip being the deciding factor.

The Female Business Travellers' Requirements

Having identified female business travellers' characteristics in the previous section, in this part of the study female business travellers attitudes in relation to airline services are discussed. The survey obtained information in the following general questions areas.

- What factors are important when choosing an airline?
- How does the female business traveller feel about the level of service she is offered in comparison to their male counterparts?
- What are the particular requirements of the female when travelling on business?

The results of the survey indicates that the majority of female business travellers are loyal airline customers, as 62 percent of respondents stated, they fly with their most preferred airline when possible. The importance of the main factors which affects their choice of airline is shown in Figure 7.



As would be expected, it is the frequency of an airline's flights that are seen as most important. This provides for a certain flexibility when travelling. Comparing this results with those of OAG Business Travel

Survey (1998)¹ it appears that female business travellers are more price conscious than their male counterparts.

A large proportion of female business travellers appears to be happy with the level of service they receive from airlines, in comparison with those received by their male counterparts. However, the 21 percent of respondents who claim to be treated unequally state that it is the airline staff who are most commonly responsible for this. They believe that airline staff is male orientated, mentioning that "Airline staff always take a male as serious business, but not the female." It is not just flight attendants who are seen as causing this situation though. Ground staff, especially female ground staff, are implicated too.

Although the majority of female business travellers are happy with the service they receive from airlines, nearly 40 percent believed that female business travellers have different travel needs compared to male business travellers (see Figure 8). Despite that, it is apparent that the majority of respondents (85 percent) do not wish airlines to offer them a separate female business travellers service policy. This could be that a separate service policy would tend to offend because it could be interpreted as being patronising. Indeed, the majority of female business flyers want to be treated in the same manner as the male traveller.

Of the factors important to female business travellers, airport security appears to be a very important requirement to a large proportion of



¹OAG survey (1998) indicated that factors influencing business passengers choice of airline, in terms of priority, are: most convenient schedules; reputation for safety; punctuality; comfort; FFP; efficient check-in; advance seat allocation; friendly cabin staff; cheap fares; lounges; food and drink.

respondents. It once again underlines the fact that safety is the biggest concern for female travellers. Many hotel chains have begun to address this area by installing surveillance cameras in their car parks, or by accompanying female customers to their vehicles. The Total Research Corporation (1998) also found airport security to be of prime concern. They conclude that it is not security on the aircraft that is the problem, but rather when female business travellers arrive at their destination airport. Many complain of arriving late and finding that security is lax and transport non-existent. They feel that it is the airline's responsibility to provide proper security until they leave the airport premises.

Respondents have stated a preference for female washrooms on long haul flights. These could provide the passenger with a washbasin and large mirrors in a room designed for changing. Japanese Air Lines have installed these on their domestic aircraft and this has been found to be very successful.

Safety advice is also very important to nearly 40 percent of respondents. However, what safety advice entails is unclear. Some qualitative answers include advice on what public transport to use in order to get to certain areas in a safe way, where and where not to go in a city, safe areas to walk in, and taxi companies to use. Concern about female safety should be treated as being of vital importance by airlines. One suggestion put forward by a respondent was that passengers be offered destination-specific information pamphlets during the flight which would include advice about



the aspects discussed above. Not only would this be an added service, but by treating safety as a serious issue, the airline's image would also be enhanced.

Suitable amenity packs, assistance with luggage, friendly airline staff and more personal input to seat allocation is also important to over one-quarter of the respondents. As discussed in the airline survey, only four respondent airlines claim to offer female amenity packs.

In relation to airline staff, female business travellers are not looking for special treatment, but as one respondent stated, "just 'equal' treatment by the attendants would be a step forward." In light of the fact that 70 percent of respondents tend to choose their own airlines, a small improvement in staff attitude could conceivably make a large difference to female business flyers loyalty.

While separate female business travellers seating areas in either an executive lounge or on board an aircraft would not be very popular, a more personal input into seat allocation would be welcome. It is evident that for short haul flights female business travellers are not very concerned about whom they sit next to, but when flying long haul they would prefer to be seated next to another female. In anticipation of sleeper cabins that may be introduced on long haul aircraft in the future, it was interesting to ask the question whether female business travellers would be happy to share a cabin with another male passenger. It has become clear that 85 percent would find this unacceptable. In addition, more than 60 percent stated that they would not be prepared to pay extra in order to have a private cabin. The majority of female business passengers would, therefore, see such facilities as complementary.

CONCLUSIONS

Female business travellers are becoming an important and growing sub-segment of business passenger market. Almost 28 percent and 22 percent of the U.S. and European airlines business passengers are female. The majority of respondent airlines recognise the potential of female business travellers market but have not yet developed any specific policy geared towards female travellers. Only a few airlines (7 percent of respondents) have started to take notice of this segment of market by offering female specific services.

The hotel industry appears to be ahead of airline industry as many major hotels have already formulated policies targeted at satisfying female travel needs.

The survey of female business travellers, 50 postal questionnaire surveys and 15 face-to-face interviews, clearly indicated that while they are

generally happy with airline services (nearly 80 percent), they would like to see some improvements in certain areas. These included improvement in advice on safety, security at airport, better washrooms on board an aircraft, provision of female amenity packs and assistance with luggage. Security at airports appears to be one of their prime concern.

The majority (82 percent of respondents) do not wish to be treated differently by airline employees but would like to be treated in the same manner as male business travellers. It appears that satisfying such a requirement does not require large financial investments. Instead, an airline's staff must be trained to be more attuned to a female's special needs, and realise not all female travellers are leisure passengers or are male business passengers companions.

Considering that female business travellers tend to be young, have management positions and are loyal to their favourite airlines, they are expected to travel more and for a long period on business in the future. Any airline showing interest in their travel requirements will certainly position itself in female business travellers' minds as service orientated and caring. Clearly, such positioning would have a positive impact on market share and profit.

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A FUZZY APPROACH TO OVERBOOKING IN AIR TRANSPORTATION

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ABSTRACT

A high load factor is important for airlines trying to maximise their profits without alienating customers. The loss of revenue caused by empty seats cannot be recaptured. The aim of this paper is to propose a method that minimises the unused seats and the denied boarding at the same time for every single flight. This can be achieved by monitoring the booking process during the days before the departure and by using an Inference Fuzzy System as an easy decision support system to assist the revenue management analysts.

INTRODUCTION

A flight, like most services, is produced by an airline company while supplying and cannot therefore be stored. If an aircraft takes off with some empty seats, there is a loss of revenue that cannot be recaptured.

The marginal revenue of an extra passenger occupying a seat which otherwise would have not been sold, is very large, while the additional supported costs are very small. For this reason it is very important for the airlines to reach a high load factor of the aircraft.

The problem is that even if a flight is sold out, that is, the aircraft capacity matches exactly the number of booked seats, it is almost sure that the aircraft will leave the gate with some empty seats. This happens because some passengers do not appear to claim their seats the day of the departure and some cancel their reservation too late to allow the company to sell the seats again.

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To reduce these effects most airlines overbook their scheduled flights to a certain extent in order to compensate for no-shows. As a consequence, some passengers are sometimes left behind or bumped as a result. By bumping passengers from an oversold aircraft, an airline can incur costs ranging from nothing, if the excess passengers can be rebooked with the same airline on a later flight that day, to meals, hotel rooms, vouchers for free flights, and the cost of transportation on another airline, not considering the potential loss of customer goodwill.

Overbooking and automated reservation systems are today an important chapter of the yield management, which has become a basic tool for the survival of the airlines in the air transport market, increasing today more and more in competitiveness and complexity. It has been evaluated that in the period from 1989 to 1992 American Airlines have saved through yield management about 50 percent more than its net profit for the same period (Davis, 1994).

Generally airlines accept reservation requests up to a booking limit, if the number of initial reservations is less than the booking limit, and decline the reservation requests otherwise.

As the number of no-shows is a stochastic variable, it is possible that the passengers that show up are more than the available seats for the flight, thus producing the opposite problem of the seat spoilage, that is, a number of denied boarding. These may be voluntary, if a passenger with a confirmed reservation accepts some kind of refund to abdicate the flight (money, hotel accommodation, meals, etc.), otherwise is an involuntary denied boarding, causing damages to the company image and additional costs.

Selling more seats than the aircraft's capacity might be seen as an incorrect behaviour, but the airlines sustain that without the balancing factor of an overbooking policy, the load factors of the flight would be lower than the actual one, thus producing an inevitable increase in the average fares.

The problem we want to face in this paper is what kind of booking policy should an airline adopt in the days before the departure in order to reduce the double risk of empty seats and denied boarding. In other words the company should establish what is the optimal authorisation level at any given time before the take-off, that is, the optimum number of reservations to be accepted.

The aim of this paper is to propose a method which minimises the spoiled seats and the denied boarding at the same time for every single flight. This can be achieved by monitoring the booking process during the days before the departure and using an Inference Fuzzy System as an easy decision support system to assist the revenue management analysts. This allows an understanding of any unusual event or action taken by

competitors for each flight from the opening of the reservations to the take-off.

REVIEW OF THE EXISTING MODELS

Several models had been proposed in these last four decades based on different approaches to match the objectives of the airline companies.

The cost minimisation model (Beckmann, 1958 and Kosten 1960 in Holm, 1995) finds the optimal authorisation level as the one which determines the minimum expected total cost of overbooking, calculated as the sum of the cost due to denied boarding (that increases with the number of accepted bookings) and the spoilage due to empty seats (that is reduced instead).

In 1961, Thompson proposed a model to limit the probability of denied boardings calculated as the area of a standard normal distribution of the number of show-up passengers exceeding the aircraft capacity (Holm, 1995).

A similar approach was used by Taylor (1962), which takes into account the ratio of denied boarding over the number of booked passengers as a constraint not to be overcome, while Rothstein & Stone (1967) maximises the expected revenue of the flight under the limit of an acceptable pre-set risk of denied boarding.

The model made by Gerbracht (1979) for Continental Airlines selects the optimum level of booking to maximise the expected net revenue as a result of the revenue obtained from the passengers actually carried, and also the penalty arising from the number of passengers with denied boarding. Since the number of no-shows varies randomly for each flight, if the probability distribution of no-shows is given, the statistical expected net revenue can be maximised. As it is much more expensive to have a denied boarding than to spoil an empty seat, the optimum booking levels are always shifted toward low overbooking values with regard of the average no-shows.

Alstrup (1986) considers different booking policy for different classes of passengers (and fares) and models the booking process as a non-homogenous Markovian chain. The aim is to find the optimal level of booking to be adopted for each class and for each time interval.

Andersson (1989) treats the case of an aircraft with a flexible cabin divided into fare classes, with different priority in respect of denied boardings.

Dunleavy (1994) uses a classical probabilistic overbooking approach to the determination of the marginal fare for a group and the unconstraining of origin-destination fare level data within a seamless, bid-price environment.

Reviewing the different overbooking models used by the airlines, we note that they try to arrange a compromise between the aim of maximising the net revenues with the need of assuring a more competitive level of service, avoiding the denied boarding as much as possible. However most of the proposed models are focused on determining the expected number of no-shows in terms of probability distributions.

The ratio of denied boardings per 1,000 boarded passengers is often used as an overbooking performance index. Although the airlines are interested in keeping a fixed level of service, the basic aim is the revenue maximisation. This is why it is becoming critical to monitor the booking process in real-time in order to counterbalance changes and shifts from the expected values of the process output variables (i.e., the mean show-up rate). In fact the show-up rate is probabilistic, therefore uncertain, and besides is the aggregate result of the available historical data. So a perfect hit on every flight cannot be achieved on a probabilistic base. This why often the airlines allow the intervention of a booking analyst that overrides the automated system's overbooking advice in order to embody common feeling and human judgement in unusual situations.

Whatever is the method adopted, we believe that for a given flight the limits of the authorisation level cannot be evaluated through static considerations owing to the tightly dynamic nature of the booking process, which requires a continuous check and change of these limits, in order to suit the unpredictable passenger behaviour, which becomes more and more changeable as the day of the take-off approaches.

Fuzzy Logic represents a very promising mathematical approach to model a process characterised by subjectivity, uncertainty and imprecision. The linguistic information expressed by a booking analyst is a subjective knowledge which can hardly be incorporated in a classical mathematical model. In the next section the basic fuzzy logic theory assumptions are presented.

WHY USE FUZZY LOGIC

Introduction

Why should the fuzzy logic be applied to perform an optimal booking policy for a flight?

If we ask a revenue management analyst how he settles the level of booking authorisation to be adopted in the days before the aircraft take-off, he probably would say that if he finds a low booking level, he makes the decision to authorise a level of reservations which is more than the aircraft's capacity to compensate for the expected no-show passenger. If we ask him what he means by a low booking level, he could say that this

depends on many factors, such as the type of flight, the season, the ratio between business passenger and leisure ones, but anyway, less than 50 percent of the aircraft capacity ten days before departure might be seen as a low booking level. The question is if he will use a different overbooking policy with a booking level of 51 percent. Actually he thinks that 50 percent is a limit for unequivocally saying that an over-sale of seats must be done, but for a lower level as well as for a higher booking level, an overbooking of seats must be accepted.

In other words we see how this kind of problem requires that the variables controlling the system must shift from a mathematical and deterministic formalism to a linguistic representation based on fuzzy sets.

Actually fuzzy systems suit very well in modelling non-linear systems. The nature of fuzzy rules and the relationship between fuzzy sets of different shapes provides a powerful capability for the description of a system whose complexity makes traditional expert system, mathematical, and statistical approach very difficult.

The problem is now to manage the experience of the expert and to transform it in a set of inference fuzzy rules expressing the dynamics of the system we want to model. As Lotfi Zadeh (1973) said, “when the complexity of a system increases, our ability to make precise and yet significant statements about its behaviour diminishes until a threshold is reached beyond which precision and significance become almost mutually exclusive characteristics (Cox, 1994, p.2)”. The basic idea underlying the *Fuzzy Logic* is that when we try to describe a system by a traditional model we use mathematical variables, which represent the state of the system as existing or not existing. If we represent the state of the system in terms of *fuzzy sets*, and not in terms of discrete symbols and numbers, we can obtain a representation of the system closer to human reasoning and the transition from a system state to the next is more gradual.

Fuzzy Sets and Membership Functions

According to *Fuzzy Logic*, when a system is characterised by an incomplete knowledge, the hypothesis is not only true or false, but are true or false by a certainty factor.

The Fuzzy Set is a function indicating to what degree (between 0 and 1) the value of a variable belongs to the set. A degree of zero means that the value is not in the set, while a degree of one means that the value is completely representative of the set. A membership function maps to what degree of confidence each value belongs to the fuzzy set. It is important to outline that the degree of confidence we are talking about is not to be interpreted as a probability but as a degree of truth, that is, a measure of compatibility of the value of a variable with an approximate set, and not the

occurring frequency of that value.

Formally, if X is a set of elements indicated as x , a fuzzy set \mathfrak{f} of X is a set of paired values as shown below:

$$\mathfrak{f} = \{(x, \mu_{\mathfrak{f}}(x)) : x \in X\}$$

$\mu_{\mathfrak{f}}(x)$ is called membership function and it associates a degree of confidence m to each value of x in \mathfrak{f} . For instance the curve of Figure 1 can be seen as the degree of membership of each value of the booked seats of an aircraft to the set “High booking level”. In this example, 50 percent and 150 percent are the limits of the so called interval of confidence.

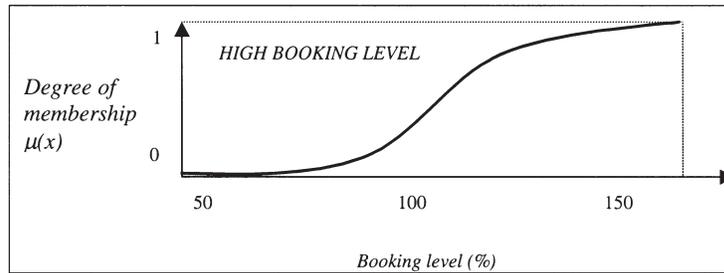


Figure 1. Fuzzy set of the booking level as percent of the aircraft capacity.

Using the Fuzzy Set Theory it is possible to approximate the behaviour of complex and non-linear systems, which otherwise would require a high level of computational resources. At the same time it is possible to have a model of the system very close to the human way of reasoning and to the way experts themselves think about the decision process, while many traditional expert and decision support systems lose fast comprehension as the complexity of the system increases because they persist in applying dichotomised rules with artificial and crisp boundaries.

We are talking of approximate (or possibilistic) reasoning, that is the way the experts think. So trying to perform an optimal booking policy during the period elapsing from the opening of the reservations of a flight till the departure day, a revenue management analyst would give us suggestions such as: *if the booking level is low, and the rate of cancellation is high, then the number of no-show passengers will be quite high*. Actually, the expert of the problem shows a knowledge of the system through concepts without a well defined pattern, based on his sensations, experience and intuitions, more than on precise data. Now the fact is that fuzzy systems are able to directly manage these kind of imprecise recommendations, reducing the distance that lies between the idea expressed by an expert and the one coded in a conventional model.

Another basic difference between a conventional expert system and a fuzzy system is that the former has a series of statements which are executed serially and is carried out with algorithms that reduce the number of rules examined, while the second has a parallel processing and activates all the rules at same time.

Fuzzy Rules

The *fuzzy rules* are the building blocks of a fuzzy system. A fuzzy rule is a conditional proposition that settles a link between the fuzzy sets. Each rule is appraised for its degree of truth and shares to the final output set.

The proposition has the general form,

if w is Z then x is Y

where w and x are scalar values and Z and Y are linguistic variables, i.e., fuzzy sets.

In this example w is the “process state”, while x is the “control action”.

The meaning of the statement is then,

x is a member of (the fuzzy set) Y to the degree that w is a member of (the fuzzy set) Z.

The final solution fuzzy space is created by the collection of correlated fuzzy propositions, called rules of inference, each contributing with its degree of truth.

The main methods of inference used in fuzzy systems are the *min-max method* and the *fuzzy additive method*.

The min-max rules of implication

By this method, the contribution of the antecedent part to the consequent fuzzy region is restricted to the minimum, that is, to the smaller value of the grades of inputs, while the final output region is obtained as a maximum, that is, by summing the fuzzy sets region corresponding to each rule.

The fuzzy additive rules of implication

The fuzzy additive compositional operation is a slightly different approach as the output fuzzy region is bounded by $[1,0]$, so that the result of any addition cannot exceed the maximum truth value of a fuzzy set.

Both methods reduce the level of truth of the output fuzzy region activated by the relevant rule of inference

Methods of decomposition and defuzzification

Using the general rules of inference, the evaluation of a proposition produces one fuzzy set associated with each model solution variable. To find the actual scalar value representing the solution, the method of

defuzzification is used. It is the final step of the fuzzy reasoning. As shown in Figure 2, this is obtained through an aggregation process that produces the final fuzzy regions, which have to be decomposed using one of the defuzzification methods.

There are different defuzzification functions, some computing the centroid of the output sets, some averaging the maximum points of the output sets. However, each of them inevitably results a compromise between the need to find a single point outcome and the loss of information that such process produces, by reducing to a single dimension the output region solution.

FUZZY INFERENCE SYSTEM

Building a Fuzzy Inference System

There are five main steps that must to be carried out to build a Fuzzy Inference System (FIS):

1. to choose the system variables (control variables for the input and solution variable for the output);

2. to define the fuzzy sets (number, shape and confidence intervals of the membership functions);
3. to write the relationships between the input and the output (inference rules);
4. to defuzzify to get the value of the solution;
5. to run a simulation of the model.

Choose the system variables

One of the most difficult parts to achieving a good formulation of the problem is identifying the data which influence the operation of the system and those which represent the output value of the model.

In this paper an overbooking fuzzy model has been constructed by selecting as control variables (input) the following:

- the booking level (BL) at a given time, that is, the difference between the total number of people who had booked a seat from the opening of the reservation period and the one who had cancelled it (in percent of the aircraft capacity); and
- the rate of cancellation (CR) at a given time, that is, the ratio between the number of people who had cancelled their reservation and those who had booked.

The number of no-show passengers (NS) in percent of the aircraft capacity is assumed as the solution variable (output).

A scheme of the proposed model is shown in Figure 3.

Figure 3. Fuzzy Inference System.

Define the Fuzzy Sets

The shape of the fuzzy set is quite important, but most models do not show a very wide sensitivity to it. Triangular, trapezoid or bell curves are often used. Neural networks models have been used to find natural membership functions in the data and thus automatically creating fuzzy surfaces.

It is convenient to use a wide and elastic domain rather than a restrictive one.

To obtain a smooth and continuous control of the output variable a suitable degree of overlap of each fuzzy set should be assured.

Write the Inference Rules

The rules that activate the same solution fuzzy set are grouped together. The application of a rule of inference that gets the shape of the consequent (output fuzzy set) as a result of the implication of the antecedent is reported in Figure 4. The implication form used is a minimum function, called an implication of Mamdani.

Figure 4. Application of an inference rule.

Aggregation of the Rules

The application of each rule determines an adjusted fuzzy set of the consequent part. The final conclusion is then derived by summing the fuzzy sets of the conclusion of each rule, by a process called *determining MAX* (maximum) deriving from the application of the inference rules

Defuzzification

This step selects the expected crisp value of the solution (output) from the fuzzy region resulting from the aggregation of the fuzzy sets each activated by all the rules applied in parallel.

There are several methods of defuzzification, but the most widely used is the method of the centroid, where the abscissa of the centre of gravity of the output fuzzy set region represents the balance point of the solution.

THE AIRLINE BOOKING PROCESS

The booking process, from an airline company point of view, is rather complex. From a microeconomic point of view it is an economic interaction between the consumer (the potential air traveller) who tries to maximise his utility function under some given factors (travel dates, price, service and restrictions) and the airline trying to maximise its profit.

In the weeks before the departure many reservations are made for each type of fare. As the time of departure approaches some cancellations are added to the new reservations. Moreover at the day of departure there are additional complications due to travellers who show up without a reservation (go-show), travellers who fail to show-up (no-show) and travellers who are inserted in a waiting list. Furthermore there are many external factors which affect the booking process, such as different fare levels for each class, flight frequency, season or type of aircraft.

When the spaces corresponding to a certain fare class are filled, the request of travel is denied, but the airline (or the reservation agent) can try to recapture the traveller on a different class or on a different flight in the requested fare class. Nevertheless the actual number of boarded people depends also on the level of authorisation which has been adopted during the booking process.

A typical flow chart of a booking process is shown in Figure 5.

The result of the economic interaction between potential customers and the airline is a certain number of reservations and cancellations in each class on each flight.

Without any specific mathematical effort, a Fuzzy Inference System is able to incorporate all these factors, affecting the problem, as they are perceived by an expert (marketing specialist).

The booking process is divided into N time intervals of unequal length, that is, the duration each interval decreases as the departure date approaches.

Most airlines keep a record of some data describing the evolution of this process. A large number of such intervals is computationally impractical, while a small number allows no adjustment for differences between forecast and actual bookings as the booking history for each flight develops. Alitalia Airline holds an historical flight database where the booking process is photographed by 13 pictures. Pictures with their relevant time intervals are indicated in Table 1. Time intervals have a

Table 1. Pictures of the Flight, as Used by Alitalia Airline Booking Process

<i>Picture</i>	<i>Days to Departure</i>
1	342-90
2	89-60
3	59-43
4	42-23
5	22-13
6	12-7
7	6-5
8	4-4
9	3-3
10	2-2
11	1-1
12	0-0
13	check in

decreasing width. This is why airlines need to improve the monitoring resolution of the booking process, because, as the day of departure approaches, the possibility of managing the variability of the process is reduced.

In details, Alitalia reservation data contain company, flight number, origin and destination, day of the week, type of aircraft, compartment (i.e. top, business, economy), booking class, picture number (from 1 to 13), event code, date of departure, and value of the event.

The events recorded for each picture are

B = actual booked passengers, that is, the difference between reservations and cancellations;

C = cancelled passengers;

N = No-Show at departure, booked at the relevant picture; and

G = Go-Show are the total passengers appearing at the departure (picture 13) without reservation.

The effective number of boarded passengers is the minimum between the physical compartment capacity and the term $(B+G-N)$.

A typical example of average historical booking flight data is shown in Figure 6.

The Booking Level is the cumulative sum of B relevant for each picture. The Cancellation Rate is the ratio of the cumulative sum of the total cancelled seats to the reserved ones. The falling down of the booking curve at the 13th picture is the effect of passengers who do not show up at the day of departure.

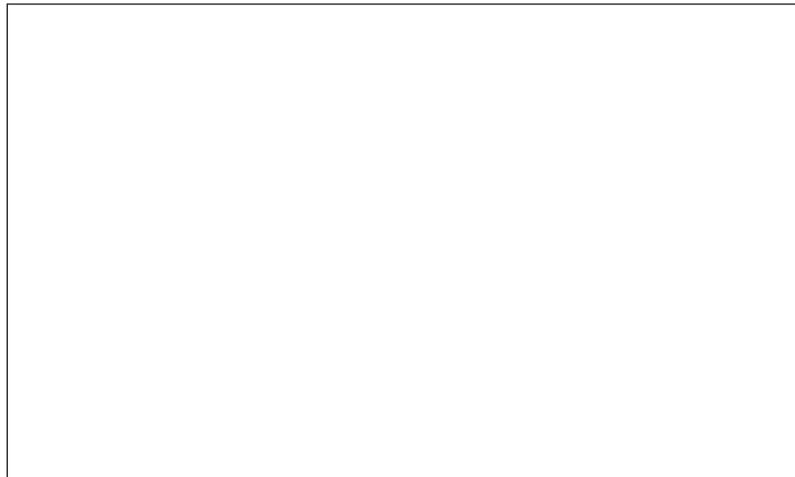


Figure 6. Average of historical booking database.

The shape of the booking curve for a specific class on a given flight depends on several factors. In fact, it is important how early before take-off the reservations are made. Leisure travellers usually book early, while business men late. Furthermore it is important to know that a large amount of cancellations occurs as a consequence of discouraging penalty for lower fare classes or as a consequence of the high cancellation rates and no-show rates observed for the higher fares.

The slope of the curve is steeper near a restriction expiration for lower fares and near the very last few days for higher fares. The booking limits tend to flatten the curve and the airline loses information about the shape of the real curve based on unconstrained demand

The fact that, occasionally in the example shown, the average overbooked seats coincide with the average no-show level is scarcely meaningful, as it might be the average result of flights with many denied boardings and flights with many empty seats. The goal for a effective forecasting policy is to get the “perfect fit” for each flight.

THE FUZZY INFERENCE OVERBOOKING MODEL

Following the Fuzzy Inference System concepts, a Fuzzy Inference Overbooking Model has been built. The experience coming from the historical data of a flight reservation process that has been incorporated to construct the membership functions and writing the rules as previously discussed. The No-Show Level as a function of the Cancellation Rate and as a function of the Booking Level are plotted respectively in Figure 7 and in Figure 8, for a set of historical data of a typical booking process. The chart's data include 33 flights and 12 pictures per flight. All data are

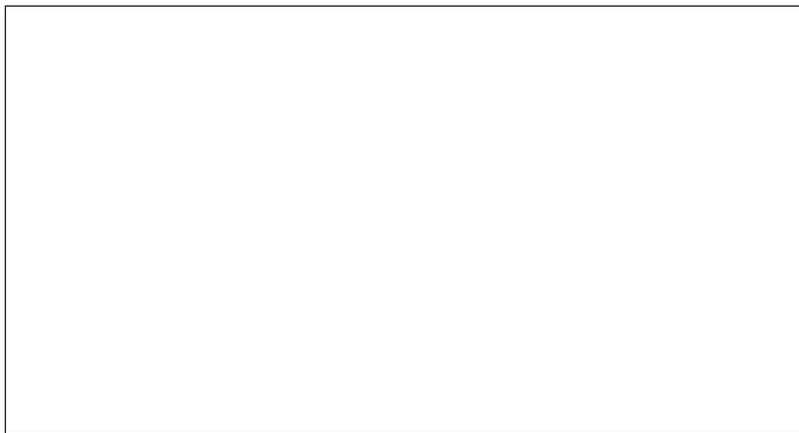


Figure 7. No-Show Level as a function of the Cancellation Rate.

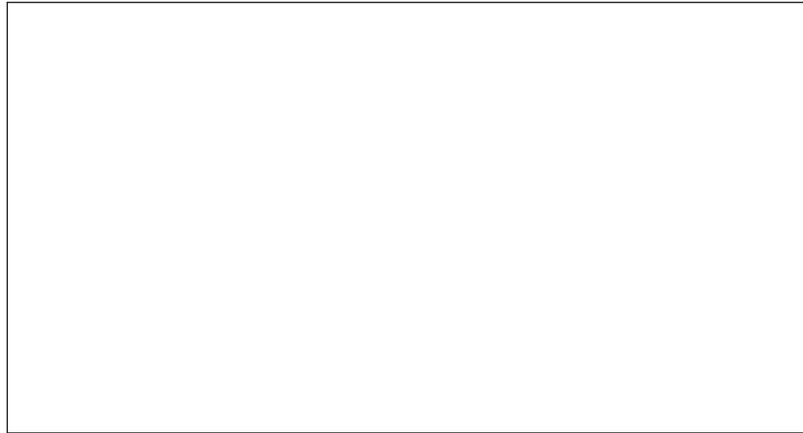


Figure 8. No-Show Level as a function of the Booking Level.

referred to the Roma-New York Alitalia link and range from April to December 1993.

As shown by these charts, there is a substantial growth trend of the No-Show Level both with the Booking Level and with the Cancellation Rate. The number of no-show, as percentage of the cabin capacity, seem to be a function of how much the cabin is engaged and how much passengers tend to reject their reservation. This means that the evolution of the booking process depends fundamentally on the state of the process, described by the Booking Level and by the Cancellation Rate, while the dependency from the time is weak.

For the modelling of the system the following input control variables has been chosen: the booking level (BL) at any time before departure, as the total reservations made up to that time minus the total cancellations (in percent of the aircraft capacity); and the cancellation rate (CR) at any time before departure, as the ratio of the number of people who had cancelled their reservation to those who had booked (C/B for each picture).

The number of no-show passenger (NS) in percent of the aircraft capacity is the solution variable (output).

Hereby follow the nine rules of the Inference Fuzzy System, as they could be suggested by a booking process expert:

1. If (Cancellation Rate is Low) and (Booking Level is Low) then (No-Shows Level is Low)
2. If (Cancellation Rate is Low) and (Booking Level is Medium) then (No-Shows Level is Low)
3. If (Cancellation Rate is Low) and (Booking Level is High) then (No-Shows Level is Medium)

4. If (Cancellation Rate is Medium) and (Booking Level is Low) then (No-Shows Level is Low)
5. If (Cancellation Rate is Medium) and (Booking Level is Medium) then (No-Shows Level is High)
6. If (Cancellation Rate is Medium) and (Booking Level is High) then (No-Shows Level is High)
7. If (Cancellation Rate is High) and (Booking Level is Low) then (No-Shows Level is Medium)
8. If (Cancellation Rate is High) and (Booking Level is Medium) then (No-Shows Level is High)
9. If (Cancellation Rate is High) and (Booking Level is High) then (No-Shows Level is High)

In Figure 9 the input and output fuzzy sets activated by the parallel action of each rule with the corresponding aggregated fuzzy regions are shown, while the final solution is obtained as defuzzification with the centroid method. It can see how a Cancellation Rate of 75 percent and a Booking Level of 120 percent do not activate the rules from 1 to 4 and rule 7, while the remaining four rules contribute to the final result. Only the fuzzy set high in the No-Show level is activated in the output variable and applying the defuzzification procedure we obtain the final crisp result which is a No-Show level of 14.4 percent. All the percentages in the horizontal axes are referred to the aircraft seat capacity, while the vertical axes indicates the level of activation of the relevant rule.

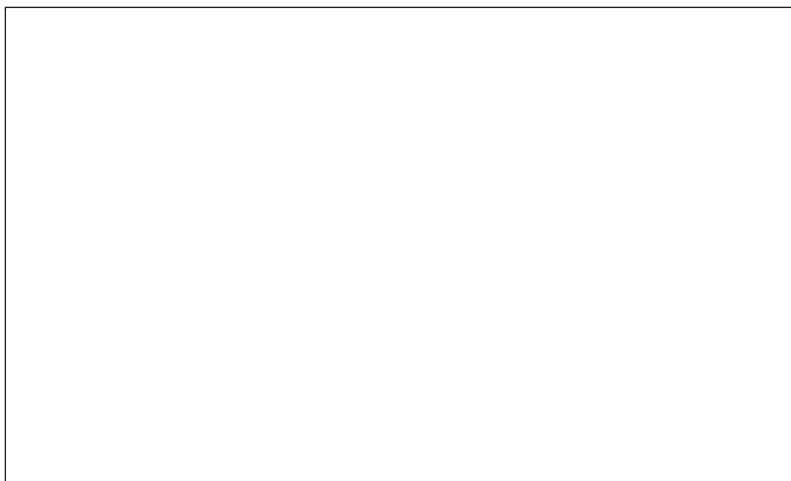


Figure 9. Application of the FIS rules.

Finally Figure 10 shows the surface representing a three dimensional view of the overbooking model. It represents the outcome of the application of the FIS rules for each combination of the input variables.

The model has been constructed using the software *Fuzzy Logic Toolbox*, which is an extension of the MATLAB software application.

Using this fuzzy model an optimal booking policy can be adopted, by dynamically modifying the booking limit for the reservations that can be authorised in each time interval of the booking process. The authorisation level to be adopted for each picture is the sum of the cabin capacity and the number of no-show as calculated by the fuzzy model.

NEURO-ADAPTIVE FUZZY INFERENCE SYSTEMS

As already said, the fuzzy sets (number, shape, range and overlapping) and the fuzzy rules are built by the co-operation of an expert and a fuzzy engineer, which traduces the experience into the fuzzy model. Otherwise it is possible to automate the process using a procedure based on the neural networks, such as the ANFIS function, contained in the Fuzzy Logic Toolbox of MATLAB. This is a Neuro-Adaptive Fuzzy Inference System essentially constituted of a fuzzy inference system, whose rules and membership functions are derived by a back-propagation algorithm based on some collection of input-output data. By this way the fuzzy system is able to learn from the example data, applying some optimisation routines to reduce the error between the data and the fuzzy system output.

To carry out this learning procedure a fuzzy inference system has to be specified, or alternatively, if no supposition can be made on how the initial membership functions should be, it is possible to use the command *genfis1*,

which will examine the training data set and then generate a FIS matrix based on the given numbers and types of membership functions. The membership functions of the input variables are uniformly distributed in the range of the training data. Of course this procedure requires that a large amount of historical data are available.

A Neuro Adaptive Fuzzy Inference System has been built using the Alitalia reservation database for the flight Rome-New York in 1993. A simple program has been written in the internal MATLAB language to demonstrate that a fuzzy inference system can be adopted to simulate the booking process of a flight. Two main aspects can be pointed out: it can be easily and rapidly built; and it is a good approximation of the intrinsic complexity of the problem.

The program is reported in the Appendix.

As it can be seen in Figure 11, using a set of training data, ANFIS is able to approximate the booking process, showing a clear growth in the No-Show Level for increasing values of the Booking Level and of the Cancellation Rate.

CONCLUSIONS

A fuzzy approach to the overbooking problem in air transportation has been presented.

The aim is to show that a complex system, such as the booking process, can be better controlled in terms of fuzzy sets than crisp numbers and mathematical models.

The underlying idea is that the notion of high booking level or low no-show level may change from day-to-day, flight-to-flight, airlines-to-airlines, season-to-season, but the logic is always the same and is contained

in the inference rules. Therefore the method can be easily tuned just shifting the fuzzy sets averages or the intervals of confidence.

It has been shown the capability of the function ANFIS, contained in the Fuzzy Logic Toolbox of MATLAB, as a simple instrument to build an adaptive fuzzy inference system. When you try to approximate a function with an adaptive fuzzy inference system, there are several parameters that you can vary, some relevant to the fuzzy system, such as number and shape of the membership functions, or the method of inference and defuzzification, some relevant to the training method, such as the number or the sequence of the training data. It would be worthwhile to carry out some analysis to find out which is the best configuration of these parameters to obtain the best approximation.

The model has been built considering only a fare class of passengers, while in reality it would be better to extend the forecast of total bookings for each fare class.

A problem that should be investigated with more detail is the consequence of setting limits on the number of seats that can be sold. As a result, the airline companies can only evaluate the accepted demand, while no observation can be made on the demand that was turned away.

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APPENDIX

```

% function overb(dati,numMf,epochs,outputfile)
%
% dati = input matrix + output (last column)
% numMf = number di membership functions for the input (i.e. [3 2 4])
% epochs = number of iterations
% outputfile = name of the output file with .fis extension
%
function overb(dati,numMf,epochs,outputfile)
    data=dati;
    y=data(:,size(data,2));
    NumInput = size(data,2) - 1;
    TrainData = data;
    NumMfs = numMf;
    MfType = str2mat('trapmf');
    for i=1:NumInput-1,
        MfType = [MfType' str2mat('trapmf')'];
    end
    NumEpochs = epochs;
    StepSize = 0.1;
    InputFismat = genfis1(TrainData, NumMfs, MfType);
    close all;
    for i = 1:NumInput;
        subplot(NumInput, 1, i);
        plotmf(InputFismat, 'input', i);
        xlabel(['input ' num2str(i) ' (' MfType(i, :) ')']);
    end
    title('Initial fuzzy sets');
    OutputFismat = anfis(TrainData, InputFismat, [NumEpochs nan StepSize]);
    yy = evalfis(data(:,1:NumInput), OutputFismat);
    figure;
    plot(1:size(y,1),y,'o',1:size(y,1),yy,'x');
    legend('real','simulated');
    title('Real system vs. simulated system');
    figure;
    for i = 1:NumInput;
        subplot(NumInput, 1, i);
        plotmf(OutputFismat, 'input', i);
        xlabel(['input ' num2str(i) ' (' MfType(i, :) ')']);
    end
    title('Final fuzzy sets');
    writefis(OutputFismat,outputfile);
end

```

DETERMINANTS OF PRICE DISPERSION IN U.S. AIRLINE MARKETS

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ABSTRACT

Although a well recognized and unpredicted post deregulation development, the complex airline fare structure has received relatively little research attention. This paper develops a multiple regression model measuring the relationship of several market variables to the degree of ticket price dispersion observed in the 200 largest U.S. airline markets during the third quarter of 1995. A wide range of ticket prices is evident on most routes. The results show that ticket price dispersion on some given route increases with the number of competitors, with service by a combination of non-stop and connecting flights, when a low-cost airline competes with other major carriers, and when the capacity of one of the airports is limited by regulation. The model explains 41 percent of observed ticket price dispersion.

INTRODUCTION

Two air travelers discover in casual conversation that one paid several times more for her ticket than did the other, not an uncommon experience. The great assortments of ticket prices available for a given flight, along with the perplexing purchase restrictions attached to all but the highest fares, confuse and frustrate many passengers. This paper employs a regression analysis to estimate the relationship between the degree of price dispersion on the 200 largest U.S. airline markets and several market variables. While the results generally confirm those of the seminal studies of airline price dispersion, the introduction of two new independent variables greatly increases the explanatory power of the regression.

LITERATURE REVIEW

The complexity of airline ticket prices is a major and completely unanticipated development which followed the deregulation of domestic airline industry in 1978. During 40 years of economic regulation, the Civil Aeronautics Board (CAB) approved domestic fares based on a simple,

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mileage-based formula which cross-subsidized short and low density routes from high density, long haul markets (Levine, 1987). Although rare, limited price competition gradually emerged. Capital Airlines' introduction of coach fares with high density seating and few amenities in the late 1940s was quickly matched by other carriers. In the 1950s, the San Francisco-Los Angeles market grew rapidly after regulated carriers were allowed to match the fares offered by unregulated intrastate carrier Pacific Southwest Airlines (Cross, 1995). In response to the threat of non-scheduled airlines offering low fares and Spartan service in high density markets, the CAB approved American Airlines' Super Saver fares in 1977 at discounts approaching 50 percent of the existing fare. The success of the Super Saver in attracting price sensitive passengers led to speedy approval of similar discount fares by other carriers and accelerated the process of deregulation (Petzinger, 1995). Over the next few years, American became ever more adept in segmenting business from leisure passengers, charging each a price which maximizes revenue. By the early 1980s, American successfully defended its markets against encroachment by a spate of new entrants, low-cost carriers, most notably People Express.

Ever more sophisticated software programs designed to optimize revenue, generally known as yield management systems, are now employed by every major carrier and considered essential to financial success. By continuous comparison of current reservation levels for each future flight against historical booking curves, the yield management system dynamically allocates the number of seats available at various prices (Brumelle & McGill, 1993; Harris, 1995; Smith, Leimkuhler, & Darrow, 1992).

The highly complex fare structures which have evolved from the implementation of yield management systems surprised deregulation proponents. Pointing to then existing unregulated intrastate airlines as exemplars, deregulation advocates predicted an industry characterized by high flight frequency along linear route systems with low, simple fares (Bailey, Graham, & Kaplan, 1985; Borenstein, 1992; Kahn, 1988; Levine, 1987). Rather than a simple system of peak and off-peak fares like those pioneered by former intrastate carriers such as Southwest Airlines (Petzinger, 1995), passengers face a bizarre array of fares on any given flight.

Post deregulation changes in airline marketing, route structure, concentration, and average fares have received extensive research attention. Most studies confirm an aggregate improvement in consumer welfare; however, the benefits are not uniformly distributed. Service increases and real price reductions in major markets are balanced by the opposite result in many low density routes. Hub and spoke route systems provide increased

frequency but at the cost of fewer non-stop flights (see Morrison & Wintson, 1995, for a review). Although the dramatic changes in ticket price structure are well recognized, fare dispersion has attracted relatively few researchers. Evans and Kessides (1993b) present data showing the ratio of 90th to 10th percentile yields (ticket price per mile) increased 76 percent in the ten years following industry deregulation. Ratios of other percentiles show a similar but less striking increase. Perhaps as interesting, they also report greater range of ticket prices for established carriers than for new entrants. The established carriers charge higher prices at the 90th percentile and lower prices at the 10th percentile. These data show, as Evans and Kessides and others have suggested, that established carriers effectively employ price discrimination to compete with new entrants.

Borenstein and Rose (1994), analyzing domestic airline price data from the second quarter of 1986, find expected absolute difference in fares between two passengers on a route is 36 percent of the airline's average ticket price. Consistent with models of monopolistically competitive price discrimination, competitive routes exhibit more price dispersion; however, higher market density and concentrations of tourist passengers reduce dispersion. (Borenstein, 1985; Gale, 1993; Holmes, 1989) Other results show dispersion in an airline's ticket prices on a route varies directly with average fare and carrier dominance of airport endpoints. Borenstein and Rose's multiple regression analysis accounts for less than 20 percent of the observed price variance inviting further exploration.

In a similar more recent study, Hayes and Ross (1998) find competition from premier low-cost carrier Southwest Airlines reduces route price dispersion. Unfortunately, the large number of independent variables employed in their regression yields ambiguous and conflicting results for other measures of market power, structure, and cost.

MODEL

The model regresses ticket price dispersion computed for each route between airports serving the largest two hundred U.S. airline markets. Because several cities are served by more than one airport, the sample includes 338 individual routes. The dispersion statistic is coefficient of variation (DISP), the sample standard deviation of ticket prices divided by the sample mean price. Borenstein and Rose (1994, p. 655) use a somewhat more complex measure of dispersion (Gini coefficient) but note similar results with other dispersion statistics including the coefficient of variation.

The regression equation to be estimated is:

$$\text{DISP} = B_0 + B_1\text{HERF} + B_2\text{NONSTP} + B_3\text{LOCSTtr} + B_4\text{ALTLOCST} + B_5\sqrt{\text{DIST}} + B_6\text{HUB} + B_7\text{SLOT} + B_8\text{VAC} + e.$$

The independent variable hypotheses discussed next are also summarized in Table 1.

Table 1. Summary of Regression Variables for Price Dispersion in U.S. Airline Markets

<i>Dependent Variable</i>	<i>Abbreviation</i>		
Ticket Price Dispersion	DISP		
<i>Independent Variables</i>	<i>Abbreviation</i>	<i>Predicted sign</i>	<i>Relationship</i>
Distance	$\sqrt{\text{DIST}}$	+	Square root
Concentration	HERF	-	Linear
Non-stop competition	NONSTP	+	Parabolic
Direct low-cost competition	LOCSTr	+	Parabolic
Indirect low-cost competition	ALTLOCST	+	Linear
Hub dominance	HUB	+	Linear
Capacity controlled airport	SLOT	+	Linear
Vacation route	VAC	-	Linear

Route Concentration (HERF)

Though the industry is intensely competitive, many product attributes differentiate individual airline flights. The literature suggests: (a) the number and timing of flights in each market; (b) routing whether non-stop, direct (no change of plane), or connecting; and (c) frequent flyer programs are important attributes, particularly for business travelers. Others include airport facilities, ground and in-flight service, reputation and image, type of aircraft, and geographical dominance of computer reservation system (Abramowitz & Brown, 1993; Borenstein, 1991, 1992; Levine, 1987). Because passengers will value these attributes differently, they can be expected to display varying degrees of brand loyalty. An airline with high brand loyalty of one or more passenger segments may decide to meet competition by lowering its prices more for passenger segments with higher cross elasticity than for other segments, thus increasing ticket price dispersion. Therefore, an inverse relationship between market concentration and price dispersion is anticipated.

The Herfindahl index (HERF), a commonly employed metric in airline economic studies, was computed from the raw data as the measure of

market concentration. This statistic is the sum of the squared market shares of all carriers operating on a route. For example, the Herfindahl index of a route with three carriers each capturing an equal market share is:

$$(1/3)^2 + (1/3)^2 + (1/3)^2 = 0.3333 \text{ or}$$

$$\sum_{i=1}^N S_i^2, \text{ where } S_i = \text{market share of } i^{\text{th}} \text{ carrier.}$$

Proportion of Non-stop Flights (NONSTP)

The hub and spoke route structure common to all major carriers except Southwest Airlines obliges an airline to connect most of its markets with a stop at its hub(s). Although the majority of flights to and from the hub(s) will operate non-stop, an airline can also choose to operate non-stop flights for competitive advantage in some markets.

Because passengers value the time savings and convenience of non-stop flights, carriers operating non-stop flights in competition with carriers requiring a connection should enjoy a competitive advantage reflected in higher ticket prices. Likewise, carriers offering connecting flights may have to offer lower fares to optimize revenues. Price dispersion, therefore, should be related to the proportion of passengers traveling on non-stop flights. Because this relationship has not been previously employed in the literature, peak dispersion is hypothesized to occur when competition is most intense with 50 percent of passengers traveling on non-stop flights while the remainder connect through a hub airport. The variable NONSTOP was computed equal to the sample proportion of passengers traveling non-stop minus this proportion squared. This parabolic function should be positively correlated to price dispersion.

Competition from Low-cost Airline (LOCSTr)

Windle & Dresner (1995) and Dresner, Lin, & Windle (1996) find a substantial and sustained decrease in average ticket price with the entry of a low-cost carrier on a route. They also showed a significant, though smaller, effect from low-cost carrier operation on a competing route. Because incumbent major carriers are likely to meet such competition by lowering discount fares more than unrestricted fares, a positive correlation of competition from a low-cost carrier and price dispersion is anticipated. On the other hand, low-cost carriers, particularly Southwest, dominate many routes enjoying a monopoly on some. Because high route concentration is expected to reduce price dispersion, the overall relationship between low-cost carrier market share and price dispersion should be a parabolic

function of the form: $LOCST - (B)(LOCST^2)$ where LOCST is the market share of the low-cost competitor. A preliminary regression established the coefficient B at 1.68. Final regression results employed the transformed variable $LOCST_{tr}$ equal to $LOCST - 1.68(LOCST^2)$.

As used in this research, a low-cost carrier is a post-deregulation interstate airline competing primarily on the basis of price. Table A1 of the Appendix lists those carriers meeting this definition in 1995.

Low-cost Competition on Competing Routes (ALTLOCST)

In some cities, low-cost carriers have not been able to obtain access to the area's major, and frequently preferred, airport, but offer competing service from a secondary airport. In Chicago, for example, O'Hare International Airport has only one low-cost carrier, but several low-cost carriers, including Southwest Airlines, operate from Midway Airport. ALTLOCST is the market share of the low cost carrier(s) on a directly competing route. Its coefficient should be positive.

Square Root of Distance (\sqrt{DIST})

The shorter the route, the more viable are automobile and other surface transportation as substitutes for air travel. As the direct and imputed cost of the traveler's time increases with distance, however, both business and time-constrained leisure travelers find few substitutes for air travel. Surface transportation substitutes, therefore, should constrain the range of ticket prices in both the leisure and business segments on shorter distance markets with rapidly diminishing effect as distance increases. The square root of the distance in hundreds of miles is taken as the predictor variable. The coefficient of distance should be positive.

Hub Airport as an Endpoint (HUB)

Many studies show that major carrier hub dominance is related to higher average fares to and from the hub airport, a result generally attributed to a premium charged to business passengers traveling on the dominant hub carrier (Bailey & Liu, 1995; Berry, 1990; Borenstein, 1989, 1990, 1991; Brueckner, Dyer, & Spiller, 1992; Evans & Kessides, 1993a; Kahn, 1993). If the hub carrier extracts a premium business fare, ticket price dispersion should be higher on routes with a hub airport as an endpoint. HUB is a dummy variable with a value of 1 if either the origin or destination (an endpoint) is a hub airport of a major airline.

Capacity Controlled Airport (SLOT)

Due to airport congestion and air traffic control limitations, the Federal Aviation Administration allots a limited number of takeoff and landings (slots) to air carriers at four major U.S. airports: New York LaGuardia and Kennedy, Washington National, and Chicago O'Hare. To this list, Los Angeles Orange County Airport, which is similarly restricted by local government, has been added.

As would be expected, previous studies have shown higher average fares on routes to or from capacity controlled airports (Abramowitz & Brown, 1993; Morrison & Winston, 1990). These airports, however, only operate at capacity during peak demand hours, typically early morning and late afternoon. Fares for flights during these hours will be higher than at airports with excess capacity. During other hours, however, airlines can add flights to accommodate the leisure elastic demand market segments. As a result, price dispersion is expected to be positively correlated to this variable. SLOT is dummy variable with a value of 1 if either the origin or destination is a capacity controlled airport and 0 otherwise.

Vacation Destination (VAC)

Leisure passengers predominate on routes to and from vacation destinations. The low proportion of business travel on these routes limits the revenue potential of higher unrestricted fares generally purchased by business passengers. Following Windle and Dresner (1995), vacation routes are defined as those with an endpoint in Florida, Nevada, Hawaii, or Puerto Rico. The coefficient of VAC is hypothesized to be negative. VAC is a dummy variable with a value of 1 if either the origin or destination is predominately a vacation or leisure travel location.

Table A2 of the Appendix lists the origin/destination airport characteristics employed the regression.

DATA

The data are a ten percent random sample of U.S. airline domestic passenger tickets for the third quarter of 1995 drawn from the U.S. Department of Transportation's Origin and Destination Survey, Databank 1A (DOT, 1996). The data include: (a) origin, destination, and intermediate stop(s), if any; (b) airline; (c) one-way ticket price or half of round-trip fare and number of passengers traveling at each fare; and (d) total itinerary distance and direct distance between origin and destination. The database was filtered to obtain: (a) the top 200 domestic origin and destination markets but excluding airport pairs within these markets of less than ten sample passengers; (b) single carrier tickets excluding connections

between airlines; (c) domestic itineraries excluding international and domestic portion of international travel; (d) coach tickets excluding first class; and (e) tickets of more than \$10 excluding those of lesser amount presumed to be frequent flyer or other promotional fares.

By examination, fares for one route, Dallas Love Airport to Los Angeles International, were judged not representative of the population and excluded from the analysis because of large directional fare disparity.

RESULTS

Descriptive Statistics

Descriptive statistics, presented in Table 2, confirm Borenstein and Rose's (1994) finding of substantial ticket price dispersion. The mean of the coefficient of variation across all routes is 21 percent ranging from a high of 58 percent on the New York Kennedy to Palm Beach, Florida, route to a negligible variance on the route from Chicago's Midway Airport to Indianapolis, a Southwest Airlines monopoly. Notably, of the 20 routes with the lowest price dispersion, Southwest served all but two and enjoyed a monopoly or faced only insignificant competition (average Herfindahl index of 0.995). Twelve of these twenty routes originated from Southwest's home field, Dallas Love Airport.

The mean of the Herfindahl Index is .58 or the equivalent of 1.72 carriers serving the average route. Sixty-five of the 338 routes have a Herfindahl index of 0.9 or greater indicative of either monopoly or insignificant competition. Fifty-four routes have an index of less than 0.33 or the equivalent of three or more carriers with equal market share competing on the route. Of the eleven routes with an index of 0.2 or less, ten are routes from New York or Washington, D.C.

Just over 25 percent of all passengers traveled on low cost carriers; 142 of the 338 routes had no low cost competition. Seventeen routes were low cost carrier monopolies; low cost carriers held more than a 90 percent market share on 49 routes.

Hub, capacity controlled, and vacation airports accounted for 60 percent, 33 percent, and 23 percent of all routes respectively.

Regression Results

The results of the regression are presented in Table 3. The regression equation and four of the eight independent variables are highly significant ($F = 30.64$, $p = 0.0000$; $HERF$, $T = -6.4$, $p = .0000$; $NONSTP$, $T = 3.3$, $p = .0011$; $LOCSTr$, $T = 3.1$, $p = .0019$; $SLOT$, $T = 3.6$, $p = .0003$). The signs of the coefficients for the significant variables are as predicted. The

Table 2. Descriptive Statistics of the Determinants of Price Dispersion in U.S. Airline Markets, 1995

Stat	DISP	DIST	HERF	NONSTP	LOCSThr	ALTLOCST	HUB	SLOT	VAC
Mean	0.21523	27.4637	0.57691	0.06292	-0.0848	0.18568	0.60947	0.33136	0.22781
Std Error	0.00652	0.58249	0.01365	0.00383	0.01342	0.01932	0.02658	0.02564	0.02285
Median	0.20515	24.8293	0.50595	0.03517	0	0	1	0	0
Mode	#N/A	17.2047	1	0	0	0	1	0	0
Std Dev	0.11984	10.7089	0.25093	0.07043	0.24663	0.35526	0.48859	0.4714	0.42004
Sample Var	0.01436	114.68	0.06297	0.00496	0.06083	0.12621	0.23872	0.22222	0.17643
Kurtosis	-0.1134	-0.5731	-0.9751	8.9E-05	1.17307	0.72015	-1.8075	-1.4908	-0.3021
Skewness	0.42811	0.63244	0.47409	1.03705	-1.622	1.58113	-0.4508	0.71974	1.30373
Range	0.58041	42	0.84716	0.24989	0.82881	1	1	1	1
Minimum	0.00064	10	0.15284	0	-0.68	0	0	0	0
Maximum	0.58105	52	1	0.24989	0.14881	1	1	1	1
Sum	72.7472	9282.73	194.995	21.267	-28.658	62.7615	206	112	77
Count	338	338	338	338	338	338	338	338	338

DISP- Ticket price dispersion

DIST- Distance

HERF- Concentration

NONSTP- Non-stop competition

LOCSThr- Direct, low-cost competition

ALTLOCST- Indirect, low-cost competition

HUB- Hub dominance

SLOT- Capacity controlled airport

VAC- Vacation route

equation explains 41 percent of the total ticket price variance(adjusted $R^2 = 0.413$).

The standardized beta coefficients provide a measure of the relative influence of each independent variable on ticket price dispersion. These coefficients are -.36, .23, .18, and .14 for HERF, NONSTP, LOCSTtr, and SLOT, respectively, and show the route concentration has the greatest explanatory power.

Table 3. Regression Results of Determinants of Price Dispersion in U.S. Airline Markets, 1995

Multiple R	.64733				
R Square	.41904				
Adjusted R Square	.41206				
Standard Error	.09189				
Analysis of Variance					
	DF	Sum of Squares	Mean Square		
Regression	4	2.02792	.50698		
Residual	333	2.81155	.00844		
F =	60.04655	Signif F =	.0000		
————— Variables in the Equation —————					
Variable	B	SE B	Beta	T	Sig T
HERF	-.172539	.024749	-.361293	-6.972	.0000
NONSTP	.390133	.075838	.229289	5.144	.0000
LOCSTtr	.090745	.024936	.184272	3.639	.0003
SLOT	.035049	.011042	.137872	3.174	.0016
(Constant)	.286105	.016630		17.204	.0000
————— Variables not in the Equation —————					
Variable	Beta In	Partial	Min Toler	T	Sig T
DIST	.028528	.025163	.451974	.459	.6468
ALTLOCST	-.059301	-.074116	.649533	-1.354	.1766
HUB	.026490	.031069	.573348	.566	.5715
VAC	.046463	.059465	.623918	1.085	.2785

DISCUSSION

The inclusion in this research of market variables for low-cost carrier and non-stop flight competition add insight and explanatory power to Borenstein and Rose's seminal study of airline ticket price dispersion. Although Dresner et al. (1996) have demonstrated the powerful effect of low cost carrier competition in lowering average ticket prices, the effect on price dispersion had not been previously estimated. Likewise, the non-stop

variable has not heretofore been included in the airline pricing literature. Though the results generally confirm those of Borenstein and Rose, the explanatory power of the regression equation is doubled.

Competition and Price Discrimination

Markets typically embody the ideals neither of perfect competition nor of pure monopoly but are instead imperfectly competitive lying somewhere between the two poles. Along this continuum, classic microeconomic theory suggests that price discrimination decreases with increased competition. Instead, the results confirm the theoretical work of Borenstein (1985), Holmes (1989), and Gale (1993) and Borenstein and Rose's (1994) empirical findings that price dispersion under imperfect competition increases with competition. In the research sample, the Herfindahl index of route competition is the most robust indicator of price dispersion. Airlines appear to respond to increased competition with aggressive passenger segmentation and pricing. Although ground and in-flight amenities serve to differentiate products, segmentation is primarily achieved with purchase restrictions while seat inventory is dynamically controlled by yield management systems. The theory and findings suggest a similar pattern may be found in other service industries which practice some form of yield management and may well generalize beyond the service industries.

Because the regression model does not include any measurements of marginal cost, finding substantial and widespread ticket price dispersion does not prove price discrimination. On the other hand, airline yield management systems allocate seat inventory on the basis of forecast demand without regard to cost. Price discrimination is, therefore, implied by the existence of large price dispersion for a product with only minor within-carrier attribute differences (the sample does not include tickets of first class passengers).

Product Differentiation

The regression results show that the presence of low-cost carrier competition and/or a combination of non-stop and connecting flights on a route increase price dispersion. Since both these predictor variables are product attributes, these results suggests that increased product differentiation leads to increased route price dispersion. Although neither variable was employed by Borenstein and Rose, the finding is intuitively appealing—differentiated products should sell for differing prices.

The non-stop variable (NONSTP) is a parabolic function of non-stop flight market share which peaks with an equal number of passengers traveling on non-stop and connecting flights. Carriers offering non-stop

service can apparently extract a premium for superior service. Although airline marketers are certainly aware of this advantage, the premium pricing flows directly from the operation of the yield management system.

The low-cost carrier variable (LOCST_{tr}) is also a parabolic function which peaks at a 30 percent route market share for low-cost carriers. This finding suggests traditional incumbent carriers can sustain a price premium for the business passenger segment up to this market share. Given earlier research showing that the presence of a low cost carrier substantially reduces the average fare (Windle & Dresner, 1995; Dresner et al., 1996), at low cost carrier market shares above 30 percent, this premium can no longer be extracted and price dispersion and average fare both fall.

It is also interesting to note that price dispersion is low in monopoly markets, many of which are controlled by preeminent low cost carrier Southwest Airlines. At least as of the third quarter of 1995, Southwest did not appear to practice yield management and, by extension, price discrimination.

Production Constraints

Some proxy for airport capacity limits is generally used in airline pricing studies. Not surprisingly, most studies show that these limits raise average fares. The findings confirm those of Borenstein and Rose that capacity constraints also increase route ticket price dispersion. This result may hold in other settings as well provided that periods of lower demand exist when production capacity is not a constraint. Flights are limited at capacity constrained airports only at the peak demand times in the morning and evening. At other times, airlines are relatively free to add flights. This dynamic appears to result in higher fares at times of peak demand than would be the case without production limitations. At other periods, however, fares are competitive with non-constrained routes.

Insignificant Predictors

Hypothesized relationships with predictors variables for (a) vacation routes, (b) competition from low cost carriers on directly competitive routes, (c) hub airports, and (d) route distance proved not significant. Using a somewhat more sensitive proxy for vacation routes, Borenstein and Rose (1994) found that a concentration of leisure travelers decreased price dispersion. Lack of confirmation of their result may be due to the coarseness of the VAC variable based solely on a route endpoint being a vacation destination. Price dispersion would be expected to increase with heterogeneity of consumer demands; thus routes with either a high concentration of business or leisure passengers should display low price

dispersion. Some sort of parabolic function, similar in concept to the NONSTP variable, would best capture the relationship.

Low cost carrier competition on a competing route had not previously been tested. The insignificance of the variable suggests that traditional carriers respond more aggressively to competition on the same route than on a competing route. This result is somewhat surprising in light of Dresner et al. (1996) finding that low cost carrier competition on competing routes substantially lowers average fare.

Likewise, major carrier hub airport as an endpoint also proved insignificant as a predictor of price dispersion. Previous studies have consistently shown that average prices on tickets originating at hub airports exceed those on comparable routes from non-hub originations. Borenstein and Rose (1994) do not test directly for this effect; Hayes and Ross (1998) report conflicting results, so no firm conclusion can be reached.

Finally, the square root of the route distance is insignificant. The $\sqrt{\text{DIST}}$ variable, however, is highly correlated with the proportion of non-stop flights on the route concentration (NONSTP) ($p = .72$). The collinearity with the NONSTP variable renders distance insignificant.

CONCLUSION

This study should interest both scholars and practitioners. The results support recent theoretical developments predicting an increase in price discrimination as markets move from monopoly to limited competition. Students of price determination may find these results generalize to other industries. While the literature suggests a similar pattern of price dispersion exists elsewhere, confirmation awaits future research. Immediate candidates are other transportation industries such as trucking, railroads, and shipping. Beyond the transportation industries, other service industries, for example, entertainment and lodging, are beginning to use yield management system and should prove interesting candidates for pricing studies.

While airline marketers are certainly aware of the critical role of yield management to profitability, the model adds to the understanding of price variances across markets. It suggests that low cost carriers will encounter significantly less competitive response from established incumbents by targeting secondary airports in major markets. Finally, the airline history and study results point to the substantial benefits accruing to companies introducing or improving yield management in other service industries.

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APPENDIX

Table A1. Low Cost Carrier Listing, 1995

1. Air South	8. Midway
2. Air Tran	9. Morris Air
3. American Trans Air	10. Reno Air
4. Carnival	11. Southwest
5. Frontier	12. Spirit
6. Kiwi	13. Sun Jet
7. Mark Air	14. Tower Air
	15. ValuJet

Source: DOT, 1996; Dresner, Lin, & Windle, 1996

Table A2. U.S. Airport Endpoint Variables, 1995

Airport	Code	Hub	Slot	Vacation	Airport	Code	Hub	Slot	Vacation
Atlanta, GA	ATL	X			Minneapolis MN	MSP	X		
Boston, MA	BOS	X			New York, NY, Kennedy	JFK		X	
Charlotte, NC	CLT	X			New York, NY LaGuardia	LGA		X	
Chicago, IL, O'Hare	ORD	X	X		Newark, NJ	EWR	X		
Cincinnati, OH	CVG	X			Orlando, FL	MCO			X
Dallas, TX	DFW	X			Palm Beach, FL	PBI			X
Dayton Beach, FL	DAB			X	Phoenix, AZ	PHX	X		
Denver, CO	DEN	X			Pittsburgh, PA	PIT	X		
Detroit, MI	DTW	X			Reno, NV	RNO			X
Ft. Lauderdale, FL	FLL			X	Salt Lake City, UT	SLT	X		
Ft. Meyers, FL	RSW			X	San Juan, PR	SJU			X
Honolulu, HI	HNL			X	Sarasota, FL	SRQ			X
Houston, TX	IAH	X			Seattle, WA	SEA	X		
Jacksonville, FL	JAX			X	St. Louis, MO	STL	X		
Las Vegas, NV	LAS			X	St. Petersburg, FL	PIE			X
Los Angeles, CA John Wayne	SNA		X		Tallahassee, FL	TLH			X
Memphis, TN	MEM	X			Tampa, FL	TPA			X
Miami, FL	MIA	X		X	Washington, DC National	DCA		X	

Source: Windle & Dresner, 1995

STRATEGIC ALLIANCES OF AIRLINES AND THEIR CONSEQUENCES

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ABSTRACT

This article will examine the semantics of strategic airline alliances and the manner in which such alliances overcome bureaucratic obstacles to gain access to open competition. The conclusion will address the issue of aviation safety, which has been inextricably linked by some to the proliferation of air transport activity envisioned in the near future.

INTRODUCTION

Today's commercial competition has transcended the past era, where dominant markets protected their established market shares. Most mega commercial activity was then the purview of governmental control under instrumentalities of State which were mostly cumbersome bureaucracies at best. Perhaps the best analogy is the biggest commercial market—the United States—which had, until recently, extensively regulated larger commercial activities pertaining to energy, transportation and telecommunications.

Happily, over the past decade, commercial air carriers have broken the shackles of rigid regulation to form strategic alliances among themselves. These alliances have been formed in the realization that the performance of an airline can be affected by two factors: the average performance of all competitors in the airline industry; and whether the airline concerned is a superior or inferior performer in the industry. Michael Porter¹ encapsulates these two factors in the single premise that any business achieves superior profitability in its industry by attaining either higher prices or lower costs than rivals. Curiously, in the airline industry, it is the latter—lower costs—which has been the cornerstone of strategic alliances.

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The reason for airlines banding together is to share an otherwise wasted market which is still regulated by bilateral governmental negotiations. This unfortunate state of affairs has been brought about by a lacuna in the Convention of International Civil Aviation² (Chicago Convention) which leaves the absolute prerogative of allowing air carriers to carry passengers, cargo and mail into and out of their territories to States.³ This privilege has encouraged the protective instincts of States to ensure that their national carriers obtain optimum market share *belonging* to them, based on a now antiquated belief that all passengers, cargo and mail destined to a particular State or leaving that State, is the birth right of the national carrier of that State. This stifling phenomenon has encouraged airlines to think more strategically over the past two decades, resulting in the pursuit of improved operational effectiveness in their activities.

The seminal response of most strategic airlines to the interference of governments was to *share* each others' resources, including air traffic rights, thus gaining access to what was disallowed under bilateral governmental agreement. Recently, airlines have become more aware than ever that they are becoming an increasingly capital intensive industry and have a compelling need to reduce costs in order to survive. The end result has been an array of commercial arrangements between airlines—from statements of common interests to block space arrangements, code sharing and coordination of frequent flyer programmes—to name just a few.⁴

This article will examine the semantics of strategic airline alliances and the manner in which such alliances overcome bureaucratic obstacles to gain access to open competition. The conclusion will address the issue of aviation safety, which has been inextricably linked by some to the proliferation of air transport activity envisioned in the near future.

THE PHILOSOPHY OF STRATEGIC ALLIANCES

Arguably, the most spectacular strategic airline alliance so far is the "Star" Alliance, which was launched in 1997 by Lufthansa, SAS, United Airlines, Thai Airways International and Air Canada. Brazilian carrier Varig joined later, and it is expected that Ansett Australia and Air New Zealand would join the alliance in 1999. Recently, Singapore Airlines signed a commercial agreement with SAS—one of the "Star" Alliance members—which will bring Singapore Airlines inextricably close to the alliance itself.⁵ It is evident that the carriers of North America, Europe and the Asia Pacific regions, which form the Star Alliance have skillfully maneuvered their dominance of the regions they represent. The direction in which the alliance is heading, with the possible future membership of Japan's All Nippon Airways (ANA), is incontrovertibly to assert its

presence in the burgeoning Asia Pacific market, in particular the Pacific Region.

The underlying philosophy of the airline alliances, typified by a “Star” Alliance, is not so much an emphasis on the more effective use of resources such as labour, capital and national resources (which are inevitably important factors) but rather an overall reliance on the strategy of location, where the sharing of locations represented by the various airlines have enabled them to produce their goods and services in a consistent manner, thus achieving the status equivalent to a cartel, while still retaining their individual identities.

Airlines have developed both a corporate strategy and a competition strategy to cope with competition. Both these strategies are becoming increasingly complementary rather than being mutually exclusive, which they were at the inception of airline competition 50 years ago. As airlines began to compete with each other across the borders, they acquired the ability to locate themselves overseas—creating a compelling need for commercial airlines to be fully acquainted with locational strategy and competitive advantages of various locations. Very early in the game, giants such as Pan Am and TWA began to realize that even the strongest company with an established position in the airline industry unthreatened by competition from new entrants or smaller airlines, would start losing business if they faced a better or lower cost product. The threat of new entrants, the bargaining power of supplies and customers and the superior quality or low cost of substitute products were arguably the underlying reasons for established airlines to begin experiencing a downturn in the sixties, which was exacerbated through the seventies and eighties. These threats could not be effectively circumvented or overcome by the established carriers, partly because of the sustained circumscription of market entry imposed by Article 6 of the Chicago Convention.

The genesis of airline alliances therefore was a contrived symbiosis or coexistence between the new entrants or new competitors—who had the clout of resources but not the dimensions of a larger carrier—and the larger carrier itself who had an established product to offer. Together, these two types of carriers could eradicate such obstacles as product differentiation (which was a distinct disadvantage to carriers which did not have an established brand); capital requirements (which again was a disadvantage faced by a smaller carrier); economies of scale (which forced a smaller carrier to compete on a large scale); and government policy (which affected both types of carriers—particularly the larger carrier which had the resources to operate air services but not the market access to a given region).

Another type of commercial alliance is the *mega* alliance referred to earlier in analogy typified by the Star Alliance. The precursor to this type of alliance could have been the modest *pool agreement* between two carriers operating third and fourth freedom traffic, that is, traffic purely originating and ending in each others' territories. The pool agreement was written into a bilateral air services agreement between two States in order to ensure equal enjoyment of market share between their carriers in the route between their States' territories. This notion gave rise to an extension of the principle of pooling, which was to share locational traffic on a fifth freedom, that is, traffic which is picked up at intermediate or beyond points on services between two States, and, more importantly, sixth freedom—traffic to which a carrier had no right but could operate under the air traffic rights of another carrier, through a commercial arrangement such as a code share agreement signed by and between the carriers.

SOME TYPES OF STRATEGIC ALLIANCES

Airline alliances, particularly code sharing agreements, add destinations to a route network and offer more frequencies of service to customers. With such arrangements, an airline can add on flights using its code sharing partners flight entitlement and operate to additional destinations without adding any resources. Of course, such an arrangement would create a duopoly, depriving customers of the benefit of competition, pricing, etc., if the airlines concerned were in competition on a given route. Code sharing not only affects passenger traffic, but influences the consolidation of cargo carriage as well, as was seen in the Swissair-Delta Airlines cargo alliance across the Atlantic.⁶

In Europe, the *open skies* concept, introduced by the European Union as legislator, in 1977, was meant to open competition between European carriers in Europe in order to offer competitive airline services to customers. However, this has not had the desired effect, owing largely to airlines forming alliances under the umbrella of the open skies legislation. In particular, the four alliances, headed by British Airways, Lufthansa, KLM and Swissair, have vigorously entered into alliances with smaller carriers under franchising agreements in order to gain access to markets they have not obtained in their air services agreements.

There are approximately 1,200 scheduled air carriers in the world. It is estimated that there are approximately 10,000 aircraft in the air at any given moment. Excluding China and the countries of the former Soviet Union, approximately 380,000 civil aircraft are registered in International Civil Aviation Organisation (ICAO) States. Of these, 45,000 are used by commercial operators.⁷ Forecasts of the number of passengers carried on

scheduled services in nine intercontinental route groups show the transpacific and Europe-Asia markets as the fastest growing, at 8 percent and 7.5 percent per annum, respectively, for the forecast period through to the year 2003.⁸ International scheduled passenger traffic is forecast to grow at an average rate of 6.5 percent per annum compared with 4 percent per annum for domestic traffic.⁹ These rapidly evolving trends will no doubt be accommodated by equally rapidly developing technology and economic norms of the airline industry. Incontrovertibly, code sharing and computer reservation systems (CRS) are at the helm of this process.

Although technically, code sharing and functions of computer reservations systems are two different activities of the air transport industry, they become inextricably linked to each other when two air carriers who share each others' codes may wish to have their shared flights displayed in each of their CRS. The placement of a code-shared flight in one CRS of a code sharing partner, differently from the system of the other, would make no commercial sense both to the air carrier concerned and the consumer. Thus, multiple listings of the same flight may appear in CRS and airline schedules, often misleading the potential passenger, but certainly drawing an identifiable link between the two systems. Both activities, therefore, which have undergone a significant exponential growth over the past few years, warrant a close analysis in view of their inextricable link to each other and joint quest for commercial credibility and consistency. An inexorable implication of this symbiosis is the impact the two activities may bring to bear on the principles of the law of contract. This paper will discuss code sharing and CRS against the backdrop of contractual liability principles of air carriers and CRS users obtaining at international law and common law jurisdictions as they relate to the carriage by air of persons.

Code Sharing

Code sharing between two airlines is essentially two different airlines posing as one, sharing or rotating aircraft crew and responsibility.¹⁰ It has been called a little more than a glorified interline agreement which occurs when one airline operates a flight but both its and another carrier's codes are used.¹¹ Thus, for example, a passenger who contracts with airline A to travel from Canada to Australia may find himself in the same aircraft with a passenger who contracted with airline B for the same journey.

The United States Department of Transportation (DoT) uses a somewhat technical definition for code sharing which it calls, "...a common airline industry marketing practice where, by mutual agreement between cooperating carriers, at least one of the airline designator codes used on a flight is different from that of the airline operating the flight."¹² The DoT then classifies code sharing under this definitive structure into

two types: the first being the typical international airline operation where two or more airlines each use their own designator codes on the same aircraft operation; and, the second enunciating the domestic code shared flight where the code on the passenger's ticket is not that of the operator of the flight, but where the operator does not offer the service in his own name. DoT goes on to bifurcate international code sharing, where, in the first category, only one segment of the journey—which usually involves a connection—operates under two different codes, one used by an airline for its local traffic, and the other used by its partner for the entire journey, and in the second, the entire journey is advertised and displayed under the codes of the two airlines which share the flight concerned.¹³

The marketing benefits of code sharing have been identified as the ability of airlines to: coordinate schedules; transfer baggage easily; maintain common marketing activity by the sharing air carriers; use through fares; use single check-ins; share airport lounges; share frequent flyer programmes; and, agree upon exactly which airline is legally responsible for the passenger's whole journey by air. American Airlines, one of the early proponents and participants in the code-sharing concept, adds the safeguarding of traffic rights to this list, where it is claimed that a stronger carrier in the market could be forced to code share with a weaker national carrier, thus spreading commercial benefits on a given route among two carriers equitably.

One of the most scathing attacks on code sharing is that it seeks to create the illusion that interline connections between code sharing partners are the equivalent of on-line connections, which is not so. It is claimed that this alleged illusion is successfully carried out because passengers prefer on-line to interline connections by a ratio of approximately four to one, fooling them to believing that a code-share is an on-line service. Robert Crandall, Chairman, American Airlines, is of the view that allowing foreign carriers to deceive consumers into believing that a domestic code-shared service is really an extension of an international service of a foreign carrier, effectively precludes genuine carriers from building strong, dependable on-line services.¹⁴ Crandall also believes that code sharing is an anti-consumer marketing activity in that it causes multiple listings of the same flights in computer reservations systems and printed multi-airline schedules, thus debasing the quality of the information available to consumers.¹⁵

Code sharing really gathered momentum with the introduction of computer reservations systems. Major United States airlines found it attractive to engage in code sharing in relation to CRS as it provided them a better exposure on the CRS screen. Although a code shared flights may not yet appear on a computer screen in its pristine form to be identified as such,

code shared flights now appear in CRS as on-line connections and are thus given priority over interline connections, giving them an overall higher profile in the CRS and making them more likely prospects for booking by a travel agent.¹⁶ These code-shared flights which appear as connections with aircraft change on the screen would enable such flights to appear at least four times on the same screen. Some countries therefore view code shared agreements as efficacious marketing tools and dissociate the concept entirely from the issue of traffic rights.

In January 1995, United States' Secretary of State for Transportation, Federico Pena announced the International Aviation Policy Statement of the United States which primarily endorsed code sharing as a cost efficient way for carriers to enter new markets and expand their systems.¹⁷ Earlier, in December 1994, the U.S. Department of Transport had released its report on international code sharing which it had commissioned from Gellman Research Associates.¹⁸ Secretary of State Federico Pena referred to the study as follows:

This study fully supports the department's international aviation policy statement. It demonstrates that the movement towards globalization and transnational alliances through code sharing and liberalized bilateral arrangements delivers benefits not only for United States consumers but for the United States airline industry as well.¹⁹

One of the issues that emerged from the study was that the critical factor in code sharing is not whether it is good or bad, but whether it has certain undesirable effects that need to be addressed by policy makers. Based on an econometric consumer choice model that was applied to certain code sharing agreements, as against non-code shared flights, the study concludes that the negative impact on consumers as a result of potential deception is inconsequential as any impact of such misleading practices would be cushioned by existing DoT safety nets. The GRA study's findings were also consistent with the overall DoT perception that all international traffic will ultimately be restructured into long haul services linking inter continental hubs, with intra regional spokes feeding traffic—leading to the proliferation of airlines and the expansion of code sharing.²⁰

The study concluded that benefits to consumers, estimated at \$37.4 million were minuscule compared to approximately \$10 billion that passengers spend each year on transatlantic tickets. Even if one were to assume, as the study suggests, that the number should be doubled, a gain of around \$75 million was comparatively inconsequential. Another conclusion was that consumer benefits of code sharing was not so much quantifiable in fiscal terms but rather in terms of higher convenience, higher quality of airline service, and time savings generated through the faster elapsed time offered by code shared flights.

Computer Reservation Systems (CRS)

Airline computer reservation systems is one of the most rapidly developing industries today. This development is being driven in part by the enormous strides made by industrial technology. Traditionally, airlines have been at the helm of computer usage and their sustained use goes back 30 years. In the sixties, the airlines inaugurated high speed real-time reservations systems, and today, these systems use some of the most sophisticated computer software in the world. CRS, which began as a simple means of placing an order for a seat on a plane, has now developed to add various new dimensions to the carriage of persons and goods from one point to another by air—such as hotel reservations, car rentals authorization of credit facilities to customers and theatre reservations—all of which cumulatively make CRS an effective marketing tool.

Inevitably, from progress and development emerges the immutable fact that while some may benefit from the whole process of development, others may feel left behind, even to the extent of being run out of business. One of the corollaries to the phenomenal growth and development of the CRS process is the plight of airlines and travel agents who do not have the ability to participate actively in sophisticated and widespread CRS programmes.

A travel agent usually gains access to a CRS through a terminal consisting of a key board and a visual display unit. The first step is usually to enter the key data—such as the departure and arrival points relating to an air journey. The system then responds by reflecting on the screen various flight options called upon by the system according to the requested data and time of travel and adjusted according to the priority criteria used in the reservations system concerned. Although CRS have the capacity to list all possible flight options between city pairs concerned, they usually display merely a small number of options, necessitating a search for others. In view of pressures brought upon time and other resource constraints, the tendency is usually to settle for what is displayed on the screen. Needless to say, this process effectively precludes those options offered by airlines enjoying less priority than others from being made known to the prospective airline customer.²¹

The importance of code sharing in this process becomes all the more significant, since, a flight jointly served by two airlines who share each other's codes would have the leverage of both those airlines in the CRS to be displayed more prominently than a flight which is served by a single carrier. In other words, it is claimed that code sharing by airlines may ipso facto aggravate any imbalance that may already exist in the CRS in favour of those airlines which are prioritized in the systems for other commercial reasons. Barry Humphreys observes: "The exclusion of an airline's services

or the failure to show its correct fares or seat availability status can have a disastrous effect on its ability to compete effectively, and numerous cases have been documented to show that these are not merely hypothetical examples of anti-competitive behaviour.”²²

Franchising

One of the more recent marketing initiatives to emerge in the airline industry is franchising. In its contemporary business garb, franchising has permeated a wide spectrum of businesses, introducing a sophisticated business relationship between two parties, thereby creating a contractual relationship. The franchisor, who develops a unique and individual way of conducting business, permits the franchisee to make use of the franchisor’s business name and use his business methods in the franchisee’s business, subject to controls imposed by the franchisor.

The application of the principles of franchising fits in well with the modern exigencies of airline business, where the personality developed and projected by a highly successful airline has become of increasing importance to passengers, thus making an airline’s image a marketable quantity. Some major airlines have indeed capitalized on this commercial possibility by developing much vaunted and attractive consumer based brand personalities and using them as key marketing tools towards attracting potential franchisees from whom they derive independent income by selling their names and business methods.

A fundamental advantage offered by franchising is the attraction for airlines to allow them to protect and extend their brand to routes (which are otherwise commercially unviable) without actually operating air services to such routes. This is done by getting a franchisee to operate on such routes while using the name and livery of the franchisor, whereby the latter skillfully avoids the risk of capital investment but still derives income in the shelter of a franchise agreement.

A notable example of franchising in the airline business can be seen in Europe in British Airways which had six franchising agreements in the year ending March 1996.²³ The six franchisees, most of whom operated under the name British Airways Express (with the exception of two who operated under the name British Airways) carried in 1996 a combined capacity of 3.4 million passengers to 80 destinations. The franchisees paid British Airways a fixed fee for the use of services they were obliged to use—such as reservations systems—and a fixed royalty for the use of the brand of the airline.²⁴ The franchisees could also offer their passengers air miles on British Airways in the latter’s frequent flyer scheme.

Extending its franchising agreements to international operations outside of Europe, British Airways has also signed an agreement with Comair of

South Africa, which has been obliged under the franchise provisions in the agreement to repaint its livery in British Airways' livery, outfit its cabin and customer service staff in British Airways uniforms who would offer a typical British Airways in-flight service on Comair's franchised flights. In addition, Comair agreed to transfer its reservations systems to British Airways' systems and offer its passengers membership in the British Airways frequent flyer programme.²⁵

The other large British carrier, Virgin Atlantic, has also been reported to consider the extension of its short haul franchise operations to longer routes. In 1994, Virgin Atlantic was operating two extremely profitable franchised flights between London and Athens and London and Dublin respectively, where the two routes were operated by independent carriers which used the Virgin brand name and livery on their aircraft.²⁶

Another significant example of franchising agreements in the airline business is the one signed by Air France and BritAir—when BritAir placed its entire staff and 23 aircraft under the brand name of Air France²⁷—in exchange for Air France granting a dozen of its routes to BritAir which operated 150 daily flights on these routes. Encouraged by the commercial efficacy and profitability of this agreement, Air France has been seeking additional franchising accords with smaller airlines in order to maximize the passenger flow into its hub at Roissy Charles de Gaulle Airport in Paris.²⁸

In October 1996, Lufthansa entered into a unique franchising agreement with Augsburg Airways, forming a partnership named *Team Lufthansa* whereby Augsburg Airways operated, at its own cost, three German domestic routes with Lufthansa flight numbers and under quality control by Lufthansa.²⁹

One of the compelling reasons for franchising to emerge as a marketing tool in the airline industry, particularly in Europe, is the European air travel market's polarization between scheduled and unscheduled (charter carriers). European charter carriers have grown prolifically in the last two decades as a backlash to increasingly high scheduled fares. In 1996 it was reported that in the United Kingdom alone, 14 million persons used charter flights on their vacation.³⁰ The growing disparity between the fares of scheduled carriers and the low package fares offered by charter carriers have released in Europe the franchisee—hybrid carriers in the form of a compromise between scheduled and unscheduled carriage—where a small airline can offer competitive fares under the ever important brand name of a large, prestigious carrier. The franchised flight therefore offers the traveling public a *via media*—of a comparatively low fare for a customized flight under the brand name of a large carrier.

The major concern caused by franchising is that major airlines use the services of smaller airlines to carry out franchise services by using a mix of franchise-code share agreements in order to obviate the necessity for operating on revenue losing routes themselves, while retaining their presence on these routes through the franchisees' operations. The European Union has claimed that, by using franchising agreements in the above manner, major airlines have retained their unprofitable routes and also the valuable slots that go with such operations.³¹

Franchising, which as frequently been described as "one of the greatest inventions of western capitalism..."³² [and the] "...dominating force in the distribution of goods and services"³³ is perhaps best described as the only form of business organization, which, by its very nature, creates business units providing new entrepreneurs, new jobs, new services and new export opportunities.³⁴ The symbiotic relationship forged between the franchisor and the franchisee blends harmoniously to form a mutually convenient commercial arrangement between the parties: "Franchising has provided the means for merging the seemingly conflicting interests of existing businesses with those of aspiring entrepreneurs in a single process that promotes business expansion, entrepreneurial opportunity and shared cost and risk."³⁵ Be that as it may, one of the most serious shortcomings of the commercial relationship established by the franchise contract is the oft-experienced imbalance in the power between the franchisor and the franchisee in favour of the former, and the lack of information exchange between the parties to the contract. These factors have given rise to the suggestion that the traditional freedom of contract principles which obtain at common law be modified to accommodate the franchise phenomenon. This call for modification of contract law principles to accord with the synergic relationship created by a franchise agreement is primarily based on the concern that the time and money invested by a franchisee in the promotion of the franchisor's trade name and trade marks can be jeopardized, and even forfeited by, the arbitrary action of the franchisor.³⁶

In the context of franchise agreements between airlines, the personality of the franchisor, who lends his goodwill to the franchisee, plays a key role. The traditional view that goodwill is retained by, and belongs to, the franchisor also applies in the commercial aviation context where the franchisee simply acquires a right to participate in a business system for a term and in a manner prescribed by the franchise agreement. The franchisee usually does not retain a right to assign the franchise to a third party; have the agreement reviewed on termination; or demand compensation upon non-renewal of the contract. However, there have been instances, particularly in the United States, where courts have been favourable towards protecting a franchisee's investment from forfeiture

through the arbitrary and capricious action of a franchisor.³⁷

The observation of Lord McNaughten in 1901 about goodwill, that it is a thing very easy to describe, but very difficult to define,³⁸ applies even today to the personality of an airline which is franchised.

The goodwill which is traded in a franchise agreement is essentially the benefit and advantage derived from the use of a good name, reputation and connections of a business. Goodwill or personality of an airline is the one attractive force that brings in customers and clientele. In the same case Lord Lindley added that goodwill includes: "Whatever adds value to a business by reason of situation, name and reputation, connection, introduction to old customers and agreed absence of competition, or any of these things, and there may be others which do not occur to me."³⁹ One of the salient features of a franchise agreement is that goodwill or personality, which is the pivotal ingredient and the main attraction which draws in money to the franchisor, does not act to the benefit of the franchisee at the termination or non renewal of a franchise agreement. In other words, the franchisee airline cannot claim compensation from the franchisor for goodwill accrued to the latter during the period of the franchise agreement due to the operation of services by the franchisee. This traditional view was confirmed in the 1989 Australian case of *Kanoa Ply Ltd. V. BP Oil Distribution Ltd.*⁴⁰ Where the Court held that an oil company franchisee had no right of compensation for good will lost when a service station lease and dealer trading agreement were not renewed. It was the Court's view that on expiry of the Statutory tenure there was no further obligation to renew the contract and no requirement to pay compensation in respect of goodwill acquired by the oil company through non renewal of the franchise agreement. Lockhart, Wilcox and Grammon JJ held:

Under the general law, in the absence of any special covenant and any other applicable statute, upon the tenancy of the appellant coming to an end, the benefit of any goodwill of the character described above would ensure to the benefit of the first respondent as lessor... Where a franchisor elects to grant a new lease the franchisee has the benefit of continued exploitation of the goodwill of the site... But where a franchisor elects not to grant a new lease, the franchisee is turned from the site without compensation for any goodwill which it may have developed during its period of occupancy. A franchisee, such as the appellant, may regard this result as harsh, the harshness being exacerbated if it should be the case-we do not know whether it is so-that franchisors are more likely to decide themselves to operate sites to which substantial goodwill attaches. But if this result is harsh, it is a product of the circumstance that the law does not require the franchisor who elects not to renew to pay any compensation to the franchisee.⁴¹

CONCLUSION

Strategic alliances of the airline industry is but a natural corollary to the exponential growth of international air transport as an industry. The concept itself is based on the theory that with rapid demand for air transport, requiring a doubling of the 16,000 world aircraft fleet by the year 2015, these would be a compelling need for new connections between points and more frequencies to serve these connections. There is no stopping this trend, which has already swept the aviation industry. There is, however, one point of caution. The fundamental postulate of air transport has been, and remains to be, safety of passengers. The proliferation of aircraft in the skies may challenge airline safety, if parallel measures are not set in motion to ensure the safe passage of the thousands of aircraft in the sky.

In 1997, the total scheduled international flights operated by the 705 carriers of the 185 Contracting States of ICAO carried a total of approximately 1,448 million passengers and 26 million tonnes of freight. In the same year, there were an estimated 16,993 operational aircraft (each carrying more than a maximum take off weight of 9,000 kg), which was a 59 percent increase from 10,712 aircraft operating a decade ago. Also, in 1997, 1,309 jet aircraft were ordered (as against 1,003 in 1996) and 674 were delivered in the same year.

If this were not sufficient to reflect the gigantic proportions to which international air transport has grown, more daunting figures loom ahead. For instance, it is estimated that the worldwide jet transport fleet will double through 2015. With the current aircraft accident rate at 1.76 accidents per million departures—which is the safest statistical record of accident rates in all modes of transportation—there are aggressive calls to reduce this rate by half, to 0.88 accidents per million departures by the year 2015. Moreover, the Gore Commission of the United States has bettered this figure by calling for an 80 percent reduction in fatal aircraft accidents.

In 1995, 19 Western built jet aircraft were totally destroyed in air crashes, which killed 383 passengers and 39 crew members.⁴² Although this rate of loss has been steady for the past 10 years, there were three major losses in 1996—the famous ValuJet and TWA aircraft in the United States and the world's worst midair collision in history near New Delhi, India, where a Saudia Boeing 747 with 312 persons aboard collided with a Kazak aircraft carrying 37 passengers and crew. All on board were killed. More recently, in early 1998, the loss of a Swissair MD 11 aircraft off the coast of Nova Scotia in Canada reiterated with monotonous regularity the enormity of the problem posed to aviation safety and brought to bear the compelling need for the international community to continue to take energetic and

vigilant measures to curb the problem, if not totally eradicate it. International dimensions of aviation safety are all encompassing, and are not limited to attacks on aircraft but include the management of airspace in order to prevent accidents caused by inadequate air navigation systems or human error. It is therefore prudent to address aviation safety within all its parameters, particularly in the context of the crowding of airspace brought about by the proliferation of aircraft movements.

In order to address the issue of aviation safety, the Council of the International Civil Aviation Organization (ICAO) convened in Montreal, from 10 to 12 November 1997, an international conference for Directors General of Civil Aviation to review the ICAO Safety Oversight Programme and to consider its expansion.⁴³ Almost simultaneous with this event, ICAO released its preliminary accident and security statistics for 1996, which reflect that scheduled air carriers from the 185 ICAO Contracting States reported 23 fatal aircraft accidents in 1996, compared with 26 in the previous year.⁴⁴ Although the incident rate declined in 1996, the number of passenger deaths reported rose dramatically in 1996 to 1,135, compared with 710 in 1995.

The Conference concluded *inter alia* that ICAO should continue to fulfil its leading role with a view to making the safety oversight programme more assertive and effective; that there should be a harmonized approach in conducting safety audits; and that the ICAO safety oversight programme should be expanded to other technical fields at the appropriate time, initially to include air traffic services, aerodromes, support facilities and services⁴⁵.

Although the above figures portend a certain perceived gloom, the silver lining comes with the awareness of the enormity of the problem and identification of contributory factors to the aircraft accident rate. These factors include: underdeveloped aviation infrastructure; poor airline operating practices; inadequate national aviation oversight at varying degrees; poor air traffic control capability; lack of navigational aids and radar coverage; and substandard airport equipment. Unsatisfactory meteorological facilities have also been identified as possible causes of aircraft accidents.

For its part ICAO, through its Air Navigation Commission, completed within the period from 1995 to 1998 the development of a framework which encapsulates the seminal ICAO activities in pursuit of aviation safety. The Commission created a comprehensive document which encompassed a Global Aviation Safety Plan (GASP) which aims at giving ICAO leadership to gain a commitment from States and the industry to enhance aviation safety worldwide.

Safety is the primary concern of the world aviation community at the present time. It is not only because the fundamental postulates of the Chicago Convention of 1944⁴⁶ call for the safe and orderly development of international civil aviation⁴⁷ and mandate ICAO to insure the safe and orderly growth of international civil aviation throughout the world⁴⁸ but also because the aviation world faces a critical era where, in the words of Dr. Assad Kotaite, President of the ICAO Council: "...the international aviation community cannot afford to relax its vigilance...ICAO would continue to take timely action to ensure safety and security standards are in effect, and that deficiencies are properly and efficiently addressed."⁴⁹

The compelling need for higher standards in aviation safety was formally recognized when the ICAO Council adopted ICAO's Strategic Action Plan on 7 February 1997. The basic strategic objective of the Plan is to further the safety, security and efficiency of international civil aviation. ICAO plans to accomplish this task by assisting States in identifying deficiencies in the implementation of Annexes to the Chicago Convention, in particular these words contain provisions which ensure safety in aviation.

One of the core elements of ICAO activity on safety, according to its Strategic Action Plan, is to carry out assessments by teams of experts of the capacity of participating States to control effectively the level of safety for which they have responsibility—ICAO's safety oversight programme, which would implement this activity, extends to personnel licensing, operation of aircraft and aircraft airworthiness. ICAO may, in the foreseeable future, extend ICAO's Safety Oversight Programme to cover areas such as air traffic control and the operation of airports.

ENDNOTES

1. Michael E. Porter, *On Competition*, Harvard Business Review Series: U.S.A. 1996 at p. 4.
2. Convention on International Civil Aviation, signed at Chicago on 7 December 1944, hereafter referred to in this article as the Chicago Convention. See ICAO Doc 7300/7, Seventh Edition: 1997.
3. Article 6 of the Chicago Convention provides: No scheduled international air service may be operated over or into the territory of a Contracting State, except with the special permission or other authorization of that State, or in accordance with the terms of such permission or authorization.
4. See Russel Miller, International Airline Alliances ? A Review of Competition Law Aspects, *Air & Space Law*, Vol. XXIII, No. 3 1998 at p. 125.
5. *ITA Press*, 16–31 October 1998 at p. 4.
6. Robert Koenig—Swissair; Delta Raise Trans Atlantic Cargo Status, *Journal of Commerce*, 2 June 1998 at p. 8A.

7. Outlook for Air Transport to the Year 2003, *ICAO Circular 252-AT/103* (1995), Chapter 2 at 5.
8. *Id.* Chapter 1, at 2.
9. *Id.* Chapter 5 at 37.
10. Code Sharing: If Its Tuesday, This Must be Aeroflot, *Airways*, January/February 1995 at 19. See also, Is Airline's Gain, Consumer's Loss? *The Avmark Aviation Economist*, Vol. II, No. 8 October 1994 at 13.
11. Coded Warnings, *Airline Business*, January 1995 at 26.
12. *The Avmark Aviation Economist*, October 1994 at 16.
13. *Ibid.*
14. See Robert Crandall, Chicago's Legacy,, Barriers to Multilateral Liberalization, *Viewpoint*, Vol. 2, No. 1, 1999, 6 at 12. Mr. Crandall cites the example of the British Airways-USAir code sharing agreement which allegedly allows British Airways access to nearly six times as many world city-pair markets as are available to American Airlines. He further claims that since British Airways now has the ability to gather passengers from almost anywhere in the United States and fly them across the Atlantic, and since it has created pseudo-hubs in the United States to connect with its real hub at London Heathrow, neither the British Government nor British Airways would have any incentive to let American Airlines or any other US carrier to compete with British Airways for any substantial portion of the traffic flowing across Heathrow from countries around the world to and from the United States. *Ibid.*
15. *Ibid.*
16. See Jan Ernest C. de Groot, Code Sharing—U.S Policies and Lessons for Europe, *Air and Space Law*, Vol. XIX No. 2 April 1994 62 at 64.
17. Coded Warnings, *Airline Business*, January 1995, at 26.
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20. *Ibid.*
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28. See Air France Chairman seeks more Franchises, *Air Letter*, Friday, 17 January 1997, No. 13,661, at p. 2.
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32. U.S. House of Representatives Committee on Small Business, *Franchising in the U.S. Economy: Prospects and Problems*, U.S. Government Printing Office; Washington D.C. 1990 at p. 1.
33. *Ibid.*
34. See *Franchising in the Economy*, 1983-1985, U.S. Department of Commerce: Washington D.C. 1985 at p. vi.
35. U.S. House of Representatives Committee on Small Business, *supra*. Note 10. At p. 12.
36. See By Rau, Implied Obligations in Franchising: Beyond Terminations 1992, 47 *The Business Lawyer* at p. 1053.
37. See *Shell Oil Co. v. Merinello*, 63 N.J. 402, also 307 A.2d. 598(1973). See also Pitegoff, *Franchise Relationship Laws: A Minefield for Franchising*, 1989, 45 *The Business Lawyer*, at p. 289.
38. *Inland Revenue Commissioners v. Muller and Co's Margarine Ltd.* (1901) AC 217 at p. 223.
39. *Id.* At p. 235.
40. (1989) 91 ALR 251.
41. *Id.* At pp 257-258.
42. *1997 Britannica Book of the Year*, Encyclopaedia Britannica Inc; Chicago 1997, pp 372 and 58.
43. ICAO DOC. P10 16/97 at p. 1.
44. ITA Press 284, 01-05 April 1997 at p. 10.
45. See Directors General of Civil Aviation Conference on a Global Strategy for Safety Oversight, Montreal, 10-12 November 1997 *DGCA/97*, Conclusions and Recommendations.
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THE DETERMINANTS OF DOMESTIC AIR TRAVEL DEMAND IN THE KINGDOM OF SAUDI ARABIA

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ABSTRACT

For an airline, analyzing and forecasting air travel market is a part of its corporate planning process. This paper addresses the determinants of domestic air travel demand in the Kingdom of Saudi Arabia. Here an attempt is made to develop models for domestic air travel demand in the Kingdom with different combinations of explanatory variables utilizing stepwise regression technique. The model, which has the total expenditures and population size as the explanatory variables, is the most appropriate model to represent the demand for domestic air travel in the Kingdom. The rest of the models discussed suffer from multicollinearity. The model selected may be used to identify and measure the relations between domestic air travel demand and the economic and demographic forces in the Kingdom.

INTRODUCTION

Air traffic forecast is one of the major inputs for fleet planning, route development and preparation of the annual operating plan. Analyzing and forecasting air travel demand help reduce the airlines' risk by objectively evaluating the demand side of the air transport business. Forecasting of traffic should not be considered purely as rigid lines on charts that dictate

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airline's future. Instead, it should be used dynamically to help an airline to evaluate strategies (BCAC, 1993).

Several different methods are appropriate, ranging from time series techniques to econometric modeling, for analyzing and forecasting the air travel market. Time series approaches are the most common methods for forecasting the traffic demand. These methods are handicapped by their inability to identify the causes of market growth and to link the future growth with expected developments of causative factors. They cannot, for example, assess the impact of a reduction in fares, the introduction of new aircraft, an economic recession, or the uncertainties with regard to future regulatory conditions. Such questions can only be answered if the forecaster has specified and calibrated a formal model that shows the influence and interaction of all the relevant variables and not just one variable (i.e., time). The time series approach assumes that the traffic demand has behaved according to a specific pattern in the past and this pattern will continue in the future. While weekly, daily, and hourly variations can most easily be produced by using time series models, econometric models are more appropriate for long-range forecasting (Howard, 1974).

Because of the complex nature of the air transportation industry with continuous changes in the environment, the past records of air traffic forecasters (using mostly trend extrapolation) have not been impressive. In recent years, therefore, the trend has been to develop causal models that not only predict air traffic but also determine the impact of changes within the economic and operating environment on air traffic. This paper aims at developing econometric models that link future growth in domestic air travel demand in the Kingdom of Saudi Arabia with expected developments of causative factors.

The remainder of this paper reviews other studies on the air travel demand and highlights the sources of data. Domestic air travel in the Kingdom is described next followed by a discussion of the determinants of air travel demand in Saudi Arabia, the presentation of the model, and analysis of the empirical results. Some policy observations are also included in the conclusion.

LITERATURE REVIEW ON AIR TRAVEL DEMAND

During the last three decades, large scale studies have examined various aspects of analyzing and forecasting air travel demand (Alperovich and Machnes, 1994; Poore, 1993; Ghobrial, 1992; Saudi Arabian Bechtel Company, 1979; Abed, Bafail, and Jasimuddin, 1998).

The study of Alperovich, and Machnes (1994) increased the understanding of multiple dimensions of air travel. The principal findings of their analysis are that (1) air travel to all foreign destinations is highly elastic in income and inelastic in price and (2) there is no difference in demand elasticity between financial and non-financial assets and that both are inelastic.

Poore (1993) attempts to test the hypothesis that forecasts of the future demand for air transportation offered by airplane manufacturers and aviation regulators are reasonable and representative of the trends implicit in actual experience. The tests compared forecasts provided by Boeing, McDonnell Douglas, Airbus Industry and the International Civil Aviation Organization, with actual results of a baseline model of the demand for Revenue Passenger Kilometers (RPKs). The model is a combination of two equations describing RPKs demanded by the high- and the low-income groups respectively. Variations in RPKs demanded by the high-income group are related to changes in income per capita. Variations in RPKs demanded by the low-income segment are related to changes in population size. The model conforms to the assumptions and conditions for appropriate use of regression analysis.

Another study, conducted by Ghobrial (1992), presents an econometric model that estimates the aggregate demand for an airline. The demand is expressed in terms of airline network structure, operating characteristics and firm-specific variables. Model formulations with various combinations of explanatory variables are estimated using a two-stage least-square procedure. The results indicate that 'airline aggregate demand' is elastic with respect to yield, and inelastic with respect to network size and hub dominance.

Saudi Arabian Bechtel Company (1979) conducted a study to update traffic forecasts and planning assumptions for New International Airport at Riyadh. Four economic variables related to air traffic activities, namely, gross domestic product, government appropriations, project appropriations and import of goods and services were chosen for the study. Each variable was correlated with annual domestic and international passengers at the old Riyadh Airport. In case of international passengers, the correlation coefficient varies between 0.970 and 0.993 and the best results were obtained with the imports cost, insurance & freight (C.I.F). For domestic passengers, the correlation coefficient varies between 0.936 and 0.997 and the best results were obtained with government appropriations.

Abed, Bafail and Jasimuddin (1998) developed several models for analyzing and forecasting the long-term demand for international air travel demand in the Kingdom of Saudi Arabia with different combinations of explanatory variables using stepwise regression technique. They

recommended a model, which has the total expenditures and population size for the explanatory variables, as the most appropriate model to represent the demand for international air travel in the Kingdom.

The literature review indicates that few studies refer to determinants of the travel demand. There is no study on the determinants of air travel demand in the Kingdom of Saudi Arabia. This paper aims at developing models to analyze and forecast the long-term demand for the air travel in the Kingdom by exploring the determinants of domestic air travel demand.

DATA SOURCES

Since the econometric model is an invaluable tool for increasing the understanding of the way an economic system works and for testing and evaluating alternative policies, it is preferred for developing macro traffic forecasts for air travel in the Kingdom. However, the most sophisticated forecasting tools are useless if they operate on poor quality historical data or faulty knowledge of the causative factors underlying traffic growth and airline market share (BCC, 1987).

The availability of a consistent data set allows the use of annual data for the period 1971 to 1994. The data used in the estimation of the model originate from a variety of sources. Economic and demographic data of the Kingdom have been taken from various issues of Achievements of the development plans published by Ministry of Planning (Kingdom of Saudi Arabia, 1992); data on GDP, GDP growth rates, real effective exchange rates, imports and interest rates are from the International Monetary Fund's International Financial Statistics Yearbook 1994; and data on Saudi air travel are from PCA Statistical Yearbooks published by Presidency of Civil Aviation, 1970 (Kingdom of Saudi Arabia, 1992). When interpreting economic data it is important to distinguish between the effects of inflation and changes in the real level of economic activity. To convert collected data from the current prices to real or constant prices, consumer price index at 1988 constant prices was used.

FACTORS THAT AFFECT DOMESTIC AIR TRAVEL MARKET IN SAUDI ARABIA

Fortunately the Kingdom of Saudi Arabia is endowed with numerous natural opportunities for air travel because of its geographical location, being the site of the two holy mosques, its vast land area spreading from Showrurah in the south to Tabuk in the north, its rapid development in all spheres of life and its friendly relations with the world community. The Kingdom has a strong base for air travel (Siddiqui, 1994). The Kingdom is among the top 10 exporting and importing countries and among the top 20

tourism business generating countries.

Air transportation in Saudi Arabia has also undergone considerable expansions and developments. There are 25 international and domestic airports in the Kingdom. The number of passengers (arriving and departing) handled by all airports in the Kingdom has increased at an average annual rate of 15 percent, rising from 1.6 million in 1970 to 33.0 million in 1994 (Ministry of Planning, 1992; 1991; 1970). Table 1 shows the total number of passenger movements on domestic flights in the Kingdom of Saudi Arabia from 1971 to 1994. The high air traffic growth rate percentage between 1971 and 1994 may reflect growth in Saudi economy in this period.

Table 1. Year-wise Passengers Movements on Domestic Flights in Saudi Arabia (in million)

<i>Year</i>	<i>Number of Passengers</i>
1971	0.402
1972	0.526
1973	0.614
1974	0.756
1975	0.999
1976	1.959
1977	3.347
1978	4.444
1979	5.534
1980	6.828
1981	6.625
1982	7.270
1983	7.986
1984	7.940
1985	7.357
1986	6.861
1987	6.896
1988	6.717
1989	6.383
1990	6.803
1991	6.439
1992	7.625
1993	8.145
1994	8.009

Source: PCA statistical yearbook Presidency of Civil Aviation at the Kingdom of Saudi Arabia, (various issues).

Saudi Arabian Airlines (Saudia) has a monopoly in the domestic air transportation market of the Kingdom. Over the past years Saudia has coped with the needs of air travel and played a vital role in the development of the Kingdom. This process has resulted in formation of a huge base of operations, including facilities, ground and flight equipment, and trained

personnel. Saudia currently has an active fleet of 52 aircrafts for scheduled operations. Saudia has made a vital contribution to the development of the country by linking the widely-separated centers of population in a country which is as large as Western Europe and thus facilitating social and economic cooperation between the various regions. Moreover, its industrialization has benefited greatly by the speedy transportation of foreign and Saudi workers on both Saudia's international and domestic routes. The current Saudia network consists of 63 stations (of which 25 are domestic and 38 international stations). Average flights segments per day are 265 with an average of 33 departures per day from international stations and 232 departures per day from domestic stations. Saudia has to have knowledge about the impacts of changes in economic forces on domestic air travel demand in the Kingdom.

There are many factors affecting the air travel demand; each factor is composed of elements that can stimulate or constrain air travel growth. For air travel demand forecasting purpose, these factors are more conveniently classified into two broad groups, those external to the airline industry and those within the industry itself. The external environment includes those factors that are outside the control of the individual airline and even the entire airline industry. These basically include long-range economic, social, demographic, and political trends. For example, the historical development of a country, the age and income distribution of its population, its ethnic and cultural ties to other nations, and its international business linkage are all powerful influences on airline growth (BCAC, 1993). Similarly, short-term conditions such as inflation, interest rate and currency exchange rates can have a strong effect on the growth potential of both individual airlines and the total industry. The major task is to predict the future development of the first group (the external forces) so that the airline can make the most intelligent decision on the second group.

The first task of this study is to determine the explanatory variables of the econometric model for domestic air travel demand in the Kingdom of Saudi Arabia. Reviewing and gathering information relevant to the characteristics of the relationship as well as the studies already published on the subject by other researchers has helped to make the following list of the economic and demographic factors.

1. Oil Gross Domestic Product
2. Private Non-Oil Gross Domestic Product
3. Government Non-Oil Gross Domestic Product
4. Total Non-Oil Gross Domestic Product
5. Total Gross Domestic Product
6. Consumer Price Index
7. Per Capita Income

8. Import of Goods and Services
9. Exchange Rate (Saudi Riyals/Special Drawing Rights—SDR)
10. Exchange Rate (Saudi Riyals/US\$)
11. Population Size
12. Total Expenditures
13. Private Consumption Expenditures
14. Government Consumption Expenditures
15. Total Consumption Expenditures
16. Yield

DISCUSSION

The most important step in attempting to study the relationship between variables is to express this relationship in mathematical form, that is, to formulate or specify the model with which the economic phenomenon may be explored empirically. Since the correlation matrix (Tables 2) shows a high correlation between private non-oil GDP (0.93), government non-oil GDP (0.93) and their total (0.93), the components of the non-oil GDP are excluded and only the total was taken into consideration.

It is also observed from the correlation matrix that there is a low correlation between the demand for domestic air travel and the oil GDP (0.21). This can be explained from the findings of El-Masri (1982) in which he pointed out that in the Kingdom the oil revenue accrues directly to the government and the non-oil GDP is indirectly influenced by the government oil revenue through mainly government expenditure. Khalid Abdelrahman (1987) also state that the oil sector's contribution to the labor force is very low since the oil revenue goes directly to the government. Moreover, the oil sector's income has been fluctuating sharply during the last years. Therefore, it is logical to disregard the oil sector from the model for the demand for domestic air travel in the Kingdom.

The correlation matrix (Table 2) shows a high correlation between private consumption expenditures (0.96), government consumption expenditures (0.94) and their total (0.96). It is also found that there is comparatively low correlation (-0.33) between the domestic air travel demand and the yield that represents the cost of air travel. So yield variable was also excluded from the model. From the above analysis, the following list of variables relevant to the demand for the domestic air travel in the Kingdom are considered.

- Total Non-Oil Gross Domestic Product (X_4).
- Consumer Price Index (X_6)
- Import of Goods and Services (X_8)

Table 2. Correlation Matrix for All Candidate Explanatory Variables and Domestic Air Travel

Y	X1	X2	X3	X4	X5	X6	X7	X8	X9	X10	X11	X12	X13	X14	X15	X16
Y	1															
X1	0.21	0.93	0.93	0.93	0.8	0.9	0.89	0.96	0.09	-0.27	0.81	0.92	0.94	0.96	0.96	-0.33
X2	1	-0.01	0.13	0.05	0.71	0.32	0.33	0.24	-0.34	-0.72	-0.14	0.48	0.18	0.06	0.12	-0.32
X3		1	0.98	1	0.7	0.82	0.7	0.88	0.36	-0.02	0.96	0.76	0.96	0.99	0.98	-0.22
X4			1	0.99	0.79	0.85	0.71	0.88	0.36	-0.1	0.94	0.8	0.99	0.98	0.99	-0.28
X5				1	0.74	0.84	0.71	0.88	0.36	-0.05	0.96	0.78	0.97	0.99	0.99	-0.24
X6					1	0.8	0.72	0.79	0.02	-0.52	0.58	0.87	0.81	0.74	0.78	-0.39
X7						1	0.81	0.86	0.05	-0.46	0.71	0.91	0.86	0.83	0.85	-0.67
X8							1	0.93	-0.34	-0.44	0.49	0.93	0.76	0.77	0.78	-0.31
X9								1	-0.1	-0.26	0.73	0.91	0.91	0.93	0.93	-0.26
X10									1	0.47	0.57	-0.2	0.25	0.26	0.25	0.04
X11										1	0.13	-0.5	-0.16	-0.1	-0.1	0.7
X12											1	0.57	0.89	0.92	0.91	-0.16
X13												1	0.97	0.81	0.83	-0.44
X14													1	0.97	0.99	-0.29
X15														1	0.99	-0.21
X16															1	-0.24

Where

- Y = Demand for domestic air travel
- X1 = Oil-GDP
- X2 = Private Non-oil GDP
- X3 = Government Non-oil GDP
- X4 = Total Non-oil GDP
- X5 = Total GDP
- X6 = Cost of Price Index
- X7 = Per Capita Income
- X8 = Import of Goods and Services
- X9 = (Riyals/SDR)
- X10 = (Riyals/US Dollar)

- Per Capita Income (X_7)
- Population Size (X_{11}).
- Total Expenditures (X_{12}).
- Total Consumption Expenditures (X_{15}).

Per Capita Income is the gross domestic product divided by the population size. Because of their direct relation, gross domestic product and per capita income may not exist together as explanatory variables of the same model. The same thing can be said about population size and per capita income. Total expenditures, total consumption expenditures and gross domestic product have strong relations between them. Total consumption expenditures is the total expenditures excluding investment expenditures. Also, gross domestic product provides detailed analysis of total spending. It measures, according to category of spending, consumption, investment and net export. Based on the above discussion, the model that represents the demand for domestic air travel may consist of a subset of one of the following groups of variables.

Group I: (X_4, X_6, X_8, X_{11})

Group II: (X_7, X_6, X_8)

Group III: (X_{12}, X_6, X_{11})

Group IV: (X_{15}, X_6, X_{11})

In the previous section, a long list of economic and demographic factors, which may influence domestic air travel demand in the Kingdom has been drawn up. At this step, from each group of the explanatory variables, a subset of the group's variables that appear most relevant to the demand for domestic air travel are determined. A sequence of regression equations is computed by using different combinations of the group's variables through stepwise regression procedure for selecting independent variables. At each step, an independent variable is either added or deleted until the prediction of the dependent variable Y does not significantly improve. There are several methods available for adding and deleting variables. The criteria for entering or removing an independent variable can be stated in terms of reduction of the error sum of squares, partial correlation coefficient, or the F statistics. These models or regression equations were developed using SPSS. The SPSS output shows the relevant variables in every group that best specify the model as follows.

Group I (X_4, X_6, X_8, X_{11}): the subset of the group's variables which appear most relevant and best specify the model is (X_4, X_6, X_8)

Group II (X_7, X_6, X_8): the subset of the group's variables which appear most relevant and best specify the model is (X_6, X_8)

Group III (X_{12}, X_6, X_{11}): the subset of the group's variables, which appear most relevant and best specify the model is (X_{12}, X_{11})

Group IV (X_{15}, X_6, X_{11}): the subset of the group's variables which appear most relevant and best specify the model is (X_{15}, X_6, X_{11})

From the SPSS output, the least-squares lines of these models are as follows (the estimated t -values are in parentheses).

$$(1) \text{ Demand for domestic travel} = Y = f(X_4, X_6, X_8) \\ Y = -1.299821 + 0.011111 X_4 + 0.023004 X_6 + 0.025649 X_8 \\ (3.343) \quad (2.463) \quad (5.295)$$

$$(2) \text{ Demand for domestic travel} = Y = f(X_6, X_8) \\ Y = -1.6082 + 0.033608 X_6 + 0.035039 X_8 \\ (3.087) \quad (7.164)$$

$$(3) \text{ Demand for domestic travel} = Y = f(X_{12}, X_{11}) \\ Y = -2.961205 + 0.027701 X_{12} + 0.368102 X_{11} \\ (12.067) \quad (7.436)$$

$$(4) \text{ Demand for domestic travel} = Y = f(X_{15}, X_6, X_{11}) \\ Y = 0.0398 + 0.029538 X_{15} + 0.028203 X_6 - 0.273172 X_{11} \\ (2.771) \quad (2.595) \quad (6.429)$$

where

Y : Number of Passengers in Millions.

X_4 : Total Non-Oil Gross Domestic Product in billion SR.

X_6 : Consumer Price Index

X_8 : Import of Goods and Services in billion SR.

X_{11} : Population Size in Millions.

X_{12} : Total Expenditures in billion SR.

X_{15} : Total Consumption Expenditures in billion SR.

Testing Hypotheses. A frequently tested hypothesis is that there is no linear relationship between X and Y that the slope of the population regression line is zero. The statistic used to test this hypothesis is t statistics. The t statistics and their two-tailed observed significance levels are displayed. If α is set at 0.05 or 5 percent level, the two-tailed critical t value is about 2.093 for 19 degrees of freedom ($d.f.$) If α is fixed at 0.01 or 1 percent level, the critical t value for 19 $d.f.$ is 2.861 (two-tailed). The output indicates significant linear relationship between the dependent and independent variables in all the models since calculated t values exceed critical t values.

The R-squared Coefficient. The coefficient of determination, R^2 , tells the proportion of variance in the dependent variable that can be explained

by the independent variables. As shown in Table 3, R^2 and adjusted R^2 indicate that, for all the models, most of the observations fall on the regression line. This means that a strong linear relationship exists between the dependent variable and independent variables.

Table 3. R^2 and Adjusted R^2 for Domestic Air Travel Demand Model

<i>Models</i>	R^2	<i>Adjusted R^2</i>
$F(X_4, X_6, X_8)$	0.969	0.964
$F(X_7, X_6, X_8)$	0.9508	0.954
$F(X_{12}, X_{11})$	0.96	0.955
$F(X_{15}, X_6)$	0.961	0.955

The F-test for Overall Significance. The F -test allows us to test the significance of the overall regression model to be able to answer the statistical question. Is there a significant relationship between the dependent variable and the independent variables? Table 4 shows that F values are high for all the models and the observed significance level is less than 0.0005. The findings indicate that there is a significant relationship between the dependent variable and the independent variables.

Table 4. F -values for Domestic Air Travel Demand Model

<i>Models</i>	<i>F-value</i>
$f(X_4, X_6, X_8)$	$F = 192$
$f(X_6, X_8)$	$F = 184$
$f(X_{12}, X_{11})$	$F = 226$
$f(X_{15}, X_6, X_{11})$	$F = 150$

Measures of Autocorrelation. The Durbin-Watson d statistics is used to detect autocorrelation, i.e., to indicate whether there is any no correlation between members of observations ordered in time. If computed d value is closer to zero, there is evidence of positive autocorrelation, but if it is closer to 4, there is evidence of negative autocorrelation. And the closer the d value is to 2, the more the evidence is in favor of no autocorrelation. The

Table 5. Computed d values for Domestic Air Travel Demand Model

<i>Models</i>	<i>d-value</i>
$f(X_4, X_6, X_8)$	1.02
$f_6(X, X_8)$.80
$f(X_{12}, X_{11})$	1.31
$f(X_{15}, X_6, X_{11})$	1.43

computed d values for domestic air travel demand models are shown in Table 5.

Measure of Collinearity Collinearity refers to the situation in which there is a high multiple correlation when one of the independent variables is regressed on the others, that is, there is a high correlation between independent variables. The tolerance of a variable is commonly used to measure collinearity. The tolerance of a variable is defined as $1 - R_i^2$, R_i is the multiple correlation coefficient when the i th independent variable is predicted from the other independent variables. If the tolerance of variable is small, it is almost a linear combination of the other independent variables. The variance inflation factor (VIF) is closely related to the tolerance. As the Variance inflation factor increases, so does the variance of regression coefficients. The SPSS output shows that high correlation exists between the independent variables of the domestic air travel models:

$f(X_6, X_8)$, $f(X_{15}, X_6, X_{11})$ and $f(X_4, X_6, X_8)$ model. The model

$f(X_{12}, X_{11})$ does not suffer from multicollinearity. However, multicollinearity may arise because there is a tendency of economic variables to move together over time.

RESULTS

There are various ways of reporting the results of regression analysis, but here the following format is used. The first fact to note about the regression results is that all the coefficients have the signs that are expected by economic theory. For instance, the population size has a positive effect on domestic air travel demand—holding other things the same, as the population size goes up by 1.000 percentage point, on the average demand for domestic air travel goes up by 0.368 percentage points. Likewise, if the total expenditure goes up by 1.000 percentage point, on the average demand for domestic air travel goes up by 0.027 percentage points, holding the other things same.

In Table 6, the figures in the first set of parentheses are the estimated standard errors of the regression coefficients and those in the second set of parentheses are the estimated t -values computed from the expression under the null hypothesis that the true population value of each regression coefficient individually is zero. Hence, the two-tailed t -test can be used to test whether such a null hypothesis stands up against the (two-sided) alternative hypothesis that each true population coefficient is different from zero. The degrees of freedom are 19, which are obtained by subtracting the number of parameters estimated, which are 3 in the present instance from n (=22). If α is set at 0.05, the two-tailed critical t value is about 2.093 for 19 d.f. If α is fixed at 0.01 or 1 percent level, the critical t value for 19 d.f. is

Table 6. The Determinants of Air Travel Demand in the Kingdom of Saudi Arabia (Least square coefficients with standard errors and absolute t-values in parentheses)

<i>Independent Variables</i>	<i>Domestic Air Travel Demand Model</i>	<i>International Air Travel Demand Model*</i>
X ₁₁ : Population Size in million	0.368102	0.39522 0
Se	(.049504)	(.041881)
T	(7.436)	(9.437)
X ₁₂ : Total Expenditures in billion	0.027701	0.021314
Se	(.002296)	(.001942)
T	(12.067)	(10.975)
Constant	-2.961205	-2.2566
Adj- R ²	0.955	0.959
N	22	22
F	226	244
DW	1.309	2.016

*Study results of Abed, el. al. (1998), An econometric Analysis of International Air Travel Demand in the Kingdom of Saudi Arabia.

2.861 (two-tailed). Looking at the *t*-values presented in Table 6, partial regression coefficient is statistically significantly different from zero at the 1 percent level of significance.

What about the overall significance of the estimated regression line? That is, can the null hypothesis that the partial slope is simultaneously equal to zero or, equivalently $R^2 = 0$ be accepted? This hypothesis was tested with the help of an *F*-test. The *F* value has an *F* distribution with 2 and 19 d.f. If α is set at 0.05, the *F* table shows the critical *F* value of 4.38. The corresponding value at $\alpha = 0.01$ is 8.18. The computed *F* of 226 far exceeds either of these critical *F* values. Therefore, the null hypothesis that the partial slope is simultaneously equal to zero or, alternatively $R^2 = 0$ is rejected. Collectively and individually the two explanatory variables influence the dependent variable (domestic air travel demand). Since the computed *d* value in the model is closer to 2, the evidence is in favor of no autocorrelation as shown in Table 6.

The previous analysis shows that all the developed models for domestic travel demand are well fitting. However, these models, except the $f(X_{12}, X_{11})$ model, suffer from the existence of multicollenerity. This is clear because most of the independent variables have small tolerance and high variance inflation factor (VIF). This means that they are almost linear combinations of the other independent variables and indicate high variance of the regression coefficients. The correlation matrix shown in Table 2 also support this evidence.

CONCLUSION

Here domestic air travel demand in the Kingdom of Saudi Arabia through identifying its determinants have been analyzed. Air transportation in the Kingdom of Saudi Arabia has undergone considerable expansions and developments during the past years. There was a high air traffic growth rate percentage between 1971 and 1992, which reflects the growth in the Saudi economy during this period.

The statistical analysis of the past travel trends and the variables that may have an impact on it has also been undertaken. The analysis indicates the existence of high correlation between the economic variables. This might arise because there is a tendency of economic variables to move together over time. The statistical analysis shows a strong relationship between the air travel demand and the economic activity in the Kingdom.

An empirical examination of the determinants of domestic air travel demand in the Kingdom of Saudi Arabia has been presented in the paper. Econometric models were attempted to forecast domestic air travel demand in the Kingdom of Saudi Arabia in the previous sections. Through the models the statistical relationship between selected demand-influencing factors and the corresponding level of traffic is developed. From the statistical measures for evaluating the models as discussed earlier, the following model is found to be the most appropriate model to represent domestic air travel demand in the Kingdom of Saudi Arabia.

$$\text{Domestic air travel demand (Y)} = -2.961205 + 0.027701 X_{12} + 0.368102 X_{11}$$

where

Y : Number of passengers in millions

X₁₁: Population Size in millions.

X₁₂: Total Expenditures in billion SR.

This model is very good in terms of *Goodness of Fit* measures and does not suffer from multicollinearity. The rest of the developed models suffered from severe multicollinearity which reduce the forecaster's ability to draw inferences about the significance of individual variables and cause the estimators to have large variances. However, since the goal of the study is to use the model to predict the future data of the dependent variable (i.e., the number of passengers in million), collinearity per se may not be bad.

This proposed model may help determine future demand for domestic air travel in the Kingdom. The study may also provide a policy guideline to civil aviation authority in studying the proper sizing of airports facilities

such as gate requirements, apron size, terminal capacity, etc., through coordination with airport consultants. The airlines could utilize the model for long term forecasting of the demand for domestic air travel in the Kingdom. Based on the air traffic forecasts determined through the model, they can develop a corporate plan that may reflect the present situation, capacity utilization, manpower requirements and training plans, financial projections for the operating capital projects, and other projects.

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THE CASE OF MORRIS AIR: A SUCCESSFUL STARTUP

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ABSTRACT

Morris Air, which began scheduled operations in 1992, provides an example of a start-up airline that succeeded during the dark days of U.S. commercial aviation in the early 1990s. Morris Air benefited from a favorable regulatory climate for start-ups but owed most of its success to innovations in cutting costs and to its discipline in filling a well-defined market niche. When Morris Air began to hurt the operations of the major airlines, particularly Delta's hub at Salt Lake City, it began to suffer from aggressive responses that could be considered predatory. Morris Air was sold to Southwest Airlines at the end of 1993, resulting in substantial capital gains for its shareholders. There is evidence that Morris Air's founder anticipated a sale to Southwest from the time she incorporated the airline.

INTRODUCTION

This paper examines an unusual case, that of a start-up airline that achieved competitive and financial success in the early 1990s, a particularly difficult time for commercial aviation in the United States. The aim of the paper is to identify factors that contributed to the firm's success. Understanding the conditions under which the airline operated and the way it responded may be useful to future start-ups, particularly if they begin operations during a period of industry downturn. No broad policy recommendations are made in this paper; although the reader may come to his or her own conclusions regarding how regulatory agencies can assist start-ups based on the case.

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In early summer 1992, regulators at the U.S. Department of Transportation (DOT) received a complaint from an unnamed competitor about a small charter operator and bulk fare contractor based in Salt Lake City.¹ The regulators did not remember having heard of the operator before.² They checked their records and found that it began operations in 1984 flying one charter flight a week, was a division of a travel agency, was duly registered as a separate charter operator in 1987³, and had accumulated only seven customer complaints over the previous five years.⁴ In 1991 the company offered about 300 flights (about 40,000 seats) per week throughout the western United States and took in about \$80 million in revenues. Its charters were flown by Ryan International Airlines and Sierra Pacific, to which the company subleased 11 Boeing 737s that it itself had leased from International Lease Financing Corporation, Polaris, and other aircraft leasing companies.⁵

The competitor accused the company of deceptively holding itself out as a scheduled carrier. The competitor claimed that the charter staffed its own ticket counters and curbside baggage service at several airports; painted its livery on some of Ryan's aircraft; developed its own computer reservations system; and allowed passengers to pay for tickets by credit card, cash, or money orders made out to its name. Under DOT regulations, payments to a charter company must be by check or money order made payable to an escrow account.⁶

Subsequent investigation by the DOT found that the company's radio, television, and newspaper advertisements gave the impression that it was a regularly scheduled airline offering service between many city-pairs with connecting flights and a business class program. There was no indication that the flights were charters, and the direct air carrier was either not identified or its identity was printed in small inconspicuous type.⁷ Among the evidence pointing to violation of the rules was a proposal to the Postal Service for mail carriage as a certificated air carrier.⁸ The company had also published a flight schedule.⁹

The DOT assessed a \$200,000 fine against the company at the beginning of November 1992. One half of the fine was to be paid immediately, and the other would be waived if the company changed its practices. The company agreed to the terms, "...to forestall costly legal fees..." and without admitting guilt.¹⁰

The company also agreed quickly because of a decision it had made when it learned of the competitor's complaint: it had decided to seek a DOT certificate for scheduled service.¹¹ Resolving the complaint allowed the certificate petition to go ahead.¹²

The company's decision to seek a scheduled service certificate also derived from its observation that the DOT and the Federal Aviation

Administration (FAA) were uncomfortable with a non-airline company which had obtained operational control of a large number of aircraft, as it had with its leases. In addition, the company had experienced some difficulty arranging for aircraft leases because it lacked an airline certificate. In one case involving a 737-300, a lender indicated that it would not close the loan until the company obtained a certificate.¹³

DOT issued the company a 401 certificate at the beginning of December 1992.¹⁴ The company was Morris Air.

WHO WAS MORRIS AIR?

In 1970 Lorna June Mayer Morris, then 40 years old, founded the travel agency that would later begin the charter flights that would later become Morris Air. Although the formal connection between the agency and the charter service would be severed when June Morris sold the agency to employees in 1987, Morris' experience as an agent and her established client base would serve her well as the head of an airline. When the now-scheduled Morris Air incorporated in December 1992 as a Delaware S Corporation, June Morris and her relatives retained control of the closely held, family-owned company. June served as CEO and her son Richard Frendt as Chairman of the Board. Other Directors were David G. Neeleman (also appointed as President), Mitch Morris (June's husband), Michael Lazarus (her banker), and Martin Hart. Usto Shulz served as Vice President and General Manager and Kent H. Collins as General Counsel.¹⁵

The mix of executives turned out to be a good one. Neeleman, a 23-year-old college dropout and failed travel business proprietor when he joined Morris, was the rambunctious ideas man. Frendt, an MBA, was the numbers man and incessant cost cutter. Shulz was brought on board for his operational experience and knowledge of the Federal regulatory bureaucracy. Collins and Frendt shared the role of corporate spokesman. Behind all was the presence of June Morris, who gave the company its direction and reined in the others when their ideas went beyond common sense.¹⁶

The firm was capitalized at \$14,750,000 issued in convertible preferred stock.¹⁷ Morris Air relied on this money, reinvested profits, and long-term debt financing throughout its existence, although continued expansion later made it difficult to not consider going public or using the services of a venture capitalist.¹⁸

THE BATTLEFIELD

Morris Air entered the industry at a distinctly inauspicious time. The preceding years had been the worst in the history of the American civil

aviation business. The airlines' problems could not fail to be noted even by those who paid little attention to the industry. In 1991, Pan Am, Eastern, and Midway folded. America West filed Chapter 11. The following year, TWA went into Chapter 11.¹⁹ Between 1990 and 1993, return on investment (ROI), net profit, and net profit margins were all negative across the industry. Airlines were suffering the effects of a recession, higher oil prices, and fear of terrorism because of the Persian Gulf War.²⁰ Demand was softening, particularly among high yield business travelers. Corporations were laying off managers and cutting travel budgets.²¹ In addition, there was a surge of cost consciousness among all consumers, business and leisure.²² The decision to enter the business at that time, said June Morris, "...took a little corporate courage, or being a little nuts."²³

COBELLIGERANTS

There were apparently a lot of nuts in the airline business. According to then-Transportation Secretary Federico Pea, more than 100 start up airlines sought approval to fly in the year before May 1993.²⁴ Some of those that were approved, apart from Morris, were Carnival, Casino Express, Kiwi, LeisureAir, MarkAir, Reno, Spirit, Sun Country, Tower, and UltrAir.²⁵

The new entrants faced several economic advantages over the first wave of new airlines that formed shortly after deregulation in 1978. First, many markets were uncontested.²⁶ Second, public sources of capital abounded.²⁷ Third, there was a glut of commercial jets available for sale or lease. About 650 jets were on the market at the end of 1992, about three times as many as in the late 1980's.²⁸ Lastly, cutbacks at the majors left a huge number of experienced personnel unemployed and desperate for work. Between 1990 and 1992, more than 50,000 industry employees lost their jobs.²⁹ According to Wall Street airline analyst Candace Browning, the "new entrant carriers [could] hire 20-year experienced pilots for \$50 an hour, which means that they would earn less than \$50,000 per year."³⁰ Upstarts were thus able to avoid unionization and exact significant concessions from their employees.³¹

The new airlines also shared a strategy. At least initially, they tried to stay in a niche to avoid the wrath of the majors and to avoid growing too fast.³² According to the then General Accounting Office (GAO) Director of Transportation and Telecommunications Issues, the startups tended to offer high frequency, low frills, point-to-point service, and focus on low costs. This allowed them to charge much less than established airlines.³³ The new companies also tended to forego yield management: they sold only unrestricted fares and sometimes only coach class tickets.³⁴

HELP FROM THE FEDERAL GOVERNMENT

The upstarts also benefited from a policy of active support on the part of Clinton Administration transportation officials. After the Reagan and Bush Administrations paid little attention to new airlines, the new Administration tried to guide them through regulatory hurdles and protect them from predation. Referring to one case in which the Transportation Department successfully intervened when Northwest began flying to Reno in retaliation for Reno Air's opening of a new route to Northwest's Minneapolis hub, then-Secretary Federico F. Pea said that "we will do whatever we can to make sure fledgling carriers have a fair shot."³⁵ And again, "DOT's staff assists new entrepreneurs in forming new airlines. And we have sent a clear signal to the industry that this Administration will not allow large carriers to compete unfairly against the new entrants."³⁶ Indeed, there is evidence that the relatively small fine imposed on Morris Air for its charter violations was a direct result of the Administration's policy of encouraging new entrants.³⁷

THE STRATEGIC IDEA

June Morris and her key executives defined the characteristics for their new company. It would be a low cost, low frills, low price, short haul (average stage length 483 miles³⁸), point-to-point jet carrier. In contrast to the majority of the new startups, it would offer low frequency service (an average of only two departures daily).³⁹ Those characteristics, particularly the last, defined a niche, a market, and a strategy for the company: Morris Air would create new business by getting leisure travelers who otherwise could not afford it to fly. As June Morris put it, "...we're taking people off the road and getting people who otherwise might not go anywhere at all."⁴⁰ "Our competition is really the automobile."⁴¹

In formal economic terms, Morris Air would exploit the income effect of lower prices. When a company establishes prices, which are lower than those of its competitors, it benefits from two effects on the behavior of customers. First, customers will be drawn from the competitors because the relative price is lower than theirs is. Second, customers will be able to save money, afford more of the good in question, and buy more of it. This is called the income effect.⁴²

Since businessmen's travel is generally little affected by the income effect,⁴³ Morris was giving up one of the most lucrative segments of the market. It instead would concentrate on leisure and visiting friends and relatives (VFR) clients. According to Frenndt, We specialize in getting grandkids and grandparents together. We're not trying to get the business flyer; we handle mostly leisure travelers.⁴⁴

Morris reckoned that appealing only to the low end of the market would allow the company several advantages. First, Morris Air could cut costs beyond other carriers without risking complaints about receiving unaccustomedly bare service. The airline would have to offer only a few departures a day because leisure travelers, as opposed to business travelers, plan on leaving on a particular day rather than at a particular hour.⁴⁵ Second, the strategy would keep Morris Air out of the sights of the bigger carriers. It was banking on the assumption that the big lines would rather lose a tiny bit of market share than absorb the high cost of driving the newcomer from the market.⁴⁶

Throughout its existence, Morris Air would remain true to its vision. This discipline earned it praise from airline industry analysts like Dan Hersh: They know what they are and what they aren't. You won't see them flying to New York or Boston or pushing a frequent flyer program.⁴⁷ Even competitors like Delta spokesman Clay McConnell respected it: "[Morris] has been extremely successful because they [sic] have stayed in a niche. Some other low-cost carriers have not done that, and they've failed miserably."⁴⁸ Surveying a battlefield littered with dead and dying air carriers, June Morris herself was very conscious of treading carefully: "We want to do it in a very controlled way, and not get in a big uproar here."⁴⁹

AXING COSTS

To keep prices down and appeal to bus travelers, Morris Air needed to make its costs the lowest in the business. Morris executives had lots of ideas to keep cost down so that the company could offer the lowest fares. The company decided early on that it would contract out most operational functions, lease aircraft and crews, not participate in computer reservation systems (CRS)⁵⁰ (saving \$2.25 per flight segment⁵¹), fly only one type of aircraft (the Boeing 737-300) to simplify training and maintenance, fly no route longer than 2-1/2 hours (to avoid serving hot meals), and offer only one class of service.⁵² To boost economies of scale on each flight, Morris decided to stuff 143 passengers into its 737-300s, 15 more than specified by Boeing in its promotional literature about the aircraft's capabilities.⁵³

In addition, Morris employed the following tricks to pare costs:

- Use plastic boarding cards
- Use laser bar code readers on luggage
- Limit traveling executives to \$25 for meals per day
- Offer premiums to employees who stayed with relatives or friends when traveling⁵⁴

- Fly at off times to avoid congestion⁵⁵
- Wrap in-flight magazines in plastic to extend their life and discourage pilferage.⁵⁶

Morris also enjoyed the cost savings due to the airplane and labor glut that other startups experienced. Like Southwest Airlines, Morris benefited from less time on the ground and better aircraft utilization rates because of its choice to fly at less congested times and point-to-point instead of through hubs.⁵⁷

These factors, along with others discussed below, gave Morris the lowest costs in the industry. In 1993 the U.S. airline industry's operating cost per available seat-mile (ASM) was 10.5 cents. Southwest pushed its ASM down to 7.03 cents. Morris' ASM was 6.0 cents.⁵⁸

Lessened Startup Costs

Although a new carrier, Morris was able to escape many of the startup costs, which upstarts have to face. A new entrant generally must assemble financing; gather management and operational personnel; secure office space and equipment, aircraft, ground equipment and services, airport gates, and maintenance facilities.⁵⁹ Morris had already done these things when it was a charter. In the city-pairs it already served as a charter, it did not have to pay ramp up costs of marketing the service, generating consumer familiarity with the carrier, and establishing patronage.⁶⁰

Fleet

Morris achieved additional cost savings by hewing to its decision to fly only one type of aircraft, the Boeing 737-300. This aircraft is relatively inexpensive (roughly \$35 million new compared to \$170 million for a 747), employs relatively new technology yet is well proven (over 1,000 ordered), and has performance characteristics appropriate for the short-hop service envisioned by Morris Air.⁶¹

More important than the choice of aircraft was the discipline to stick to one type. Southwest estimates that it saves up to 25 percent in maintenance, parts inventory, and training by using only one airframe—the same 737-300.⁶² Morris accrued additional savings by leasing a majority of its aircraft, mostly from International Lease Finance Corporation.⁶³ Although Frendt said in 1992 that Morris' goal was to achieve a 50-50 mix of owned and leased aircraft,⁶⁴ that goal was never achieved. Morris only ever owned three aircraft, out of a fleet of 21.⁶⁵ Morris also contracted out for its maintenance. Pemco Aeroplex performed routine maintenance, modifications, and painting work.⁶⁶

Morris Air's leasing policy allowed it to maintain one of the youngest fleets in the industry; the company's average aircraft was 6 years old.⁶⁷ Other upstarts of the period owned aircraft of vintages more suitable to wines than passenger-carrying jets. Laker's planes dated from 1968 and 1969, Key's from 1965 to 1972, and Kiwi's from circa 1974.⁶⁸ The fleet's youth had important, positive effects on Morris' safety record. The airline never suffered an accident.⁶⁹

Labor

Morris took full advantage of the depressed air transport labor market discussed above to hire pilots, flight attendants, ticketing agents, and other personnel on the cheap. There was never a successful attempt to organize at the airline, so Morris was able to avoid the confrontations with unions, which paralyzed the rest of the industry in 1993 (the year of the four day walkout by American flight attendants broken only by the intervention of President Clinton).⁷⁰

June Morris instituted an innovative program to reduce labor costs in areas, which required few skills or training: she hired students. College students primarily staffed the company's telephone reservation and ticket sales lines. For even less demanding jobs, such as tagging baggage, high school Go Getters were hired at \$5 per hour.⁷¹ The high school students took the jobs because they saw them as a way to get early experience in the business world.⁷² Morris Air thus had access to additional cheap labor in the summer, when leisure travel is at its peak.

Ticketless Travel

The most interesting cost-cutting innovation, which Morris had, and the most important for the future of the industry was the invention of ticketless travel. David Evans, Vice President of Information Systems for the carrier, first came up with the idea.⁷³ Morris saved the cost of paper, printing, postage, and labor amounting to about \$2 for each of the 12,000 tickets it issued a day and spared passengers the frustration of long lines at ticket counters and the possibility of losing a ticket.⁷⁴

The innovation was initially fiercely resisted by travel agents who saw it as yet another sign that Morris was trying to cut them out as middlemen between the airline and its customers and because the new system would disrupt their accounting and reporting practices.⁷⁵ While Morris officials touted the new system as the wave of the future, others in the industry either did not understand it or ridiculed it. Chris Chiames, a spokesman for the Air Transport Association, asked, "Will you be tattooed instead?" A Delta spokesman said that ticketless travel "may have a place in the future, but it's not the future yet."⁷⁶

MARKETING

Routes

Domestically, Morris operated exclusively in the western United States. It limited itself to this area because its experience in the West as a charter and because the West was less congested so that it could serve secondary markets without bumping up against the majors. Salt Lake City served the carrier as a de facto hub despite Morris' declared point-to-point strategy. About half of Morris' flights involved Salt Lake.⁷⁷ Morris likely could not resist taking advantage of its monopsony power at the airport to negotiate favorable gate, landing, scheduling, financial, and other terms. In March 1993, Morris share of origin and destination traffic at the airport was 24 percent.⁷⁸ Its portion of total enplanements was even higher. Tucson, which was the city with the most flights after Salt Lake, formed a mini hub.⁷⁹ The rest of Morris' 22 city net was point to point.

Morris also offered summer seasonal service to popular vacation spots in and out of the U.S. Domestically, it serviced Orlando from Salt Lake and Fairbanks from Seattle. It occasionally flew to Hawaii as well. Internationally, it flew to Ontario and to the Mexican resort communities of Puerto Vallarta, Cancun, Mazatlan, and Cabo San Lucas. The flights to Mexico began in December and ended around Easter.⁸⁰

Pricing

With its costs well below the rest of the industry, Morris was ready to offer its services at low prices to the low budget market. The best way to show Morris' impact is to compare the unrestricted round trip fares that it offered in various city pairs to the next cheapest airline. This is shown in Table 1.

Table 1. Cost of Unrestricted Round Trip Fares of Morris Air and Competitors, 1992

<i>Route</i>	<i>Morris Air</i>	<i>Competitor</i>
Los Angeles-Salt Lake City	\$178	\$258 (Delta)
Oakland-Seattle	\$178	\$820 (Alaska)
Oakland-Portland	\$178	\$760 (Alaska)
Phoenix-Salt Lake City	\$178	\$720 (Delta)
Seattle-Salt Lake City	\$178	\$258 (Delta)

Note: All fares from early May 1993.⁸¹

True to income effect theory, passenger traffic exploded in response to Morris' prices in the markets it served.⁸² For example, when Morris began flights between Seattle and Spokane, competing with Alaska, which flew 43,000 passengers per quarter, the market more than doubled to over

90,000.⁸³ Not all this increase went to Morris. To combat the new company, majors serving the same markets dropped their fares by 50 percent and in some cities (such as Denver) offered double frequent flier miles.⁸⁴

Still, many budget-minded passengers continued to favor Morris because of its lack of restrictions. A single day round trip flight from Denver to Salt Lake in May 1993 cost \$141 on Morris Air; United wanted \$525 because there would be no Saturday stay-over.⁸⁵ Indeed, Morris' only restrictions had to do with penalties for cancellations and premiums for 14-day advance booking. Although the airline primarily offered one class of coach service, in some markets it offered a business class as well, which allowed cancellations without penalties and offered pre-assigned seating.⁸⁶ Morris also experimented with companion fares where one person flew at full price and a companion at a reduced fare.⁸⁷

Morris' low prices and lack of restrictions had their intended income effect. Frendt said, "People love to fly. If the fare's right, the market is incredibly elastic."⁸⁸ The airline's planes, painted white with a blue tail, soon filled up with new air travelers: "Morris Air carries a mix of passengers that looks familiar to anyone who has traveled on either Greyhound or Amtrak... Lots of denim and polyester; not a briefcase or a power suit in sight."⁸⁹

One unanticipated, positive result of going after the low end market was a large number of advanced bookings allowing more certainty about maximizing the output of each flight without using complicated and confusing yield management techniques. Frendt reported, "The people who book in advance really are the price-conscious ones. I would guess our advance bookings are stronger [than the competition] because the reason you book in advance is because you really care about every dollar."⁹⁰

Morris' low cost, low frequency strategy guaranteed high load factors, 85-95 percent, at a time when the industry average was 62 percent.⁹¹ Morris was not afraid to tell customers that it had sold out a flight-which would only confirm customer perceptions that the airline's fares were a good deal. Load factors determined how Morris increased its frequencies in given markets. "Load factors will build up to 90 percent, and then they'll add a second flight, let that build to 90 percent and then add a third," according to one Morris observer.⁹²

Stuart Thatcher, Morris Director of Marketing, supplemented the airline's low cost, few restrictions strategy with two additional innovations. First, building on the charter company's experience, he introduced ski packages with interchangeable ski lift tickets included in the fares. The packages were so successful that Morris thrived after big snowfalls in the Rockies: skiers flew into the Rockies and snow-weary Utahns flew out.⁹³ Second, Thatcher experimented with selling tickets via the Home Shopping

Network in certain markets. The initiative was aimed at impulse buyers, “people who will spontaneously decide to go visit Aunt Mabel in Oakland.”⁹⁴

Apart from gimmicks like these, Morris did not strive to build brand loyalty on the basis of amenities. Besides its low prices, Morris offered only one feature, which set it apart from other budget carriers. It served big, fluffy Costco muffins. They gave Morris a cult following of sorts.⁹⁵

Reservation System

Morris decided to eschew participation in Computer Reservation Systems (CRSs) to save money. Explaining the decision, Frendt said that the airline saved \$2.50 per segment by not participating “It’s kind of a Catch 22 situation, because we need travel agents so bad, but it’s so darn expensive. Every decision we make is based on keeping our cost low. Our long-term survival depends on it.”⁹⁶

Morris’ non-participation meant that its flights, but not its fares, were listed in the CRSs. More importantly, agents could not book passengers automatically (they could however validate bookings and drive a ticket). The agents had to call the airline, which then manually input ticket information into a computer.⁹⁷ Fortunately for Morris, passengers could book their own tickets directly by using the same method. Throughout Morris’ existence, about 60 percent of its tickets were sold directly to customers. The rest were sold to agents who called the airline or to a few, high-volume agents with a special system. For the latter, Morris installed a direct data link, via inexpensive PCs and printers, for free.⁹⁸

Morris Air’s decision not to participate in a CRS brought it into a controversy with System One Corporation, the fourth largest U.S.-based CRS. Since System One displayed partial data on Morris, it requested a payment of \$0.50 per segment every time a ticket was printed. Other partially displayed carriers, Aeroflot, Air Quebec, American Trans Air, Arizona Airways, and Chicago Express, all agreed to pay the fee. Morris, along with Southwest, refused.⁹⁹ System One decided to cancel the \$0.50 fee.¹⁰⁰

Failure to participate in a CRS got Morris into bigger trouble with some travel agents. Agents who booked a substantial amount of Morris fares lost money because the transactions were not recorded in their productivity contracts, which formed the basis of their automation pricing. Such firms had to make complicated arrangements with both Morris Air, to receive faxes summarizing daily sales, and a CRS, to apply Morris bookings toward their monthly productivity thresholds.¹⁰¹

These problems led two travel agents, both Association of Retail Travel Agents (ARTA) board members, to call for a boycott of Morris Air. Jack

Stults of Joplin, Missouri and Susan Bruno of Los Altos, California, said that they would discontinue selling fares for the airline until it fully participated in System One and discontinued marketing programs, which were intended to bypass travel agencies. They accused Morris of trying to get direct bookings.

The two based their actions on ARTA objectives 9 and 4. Objective 9 stated, "Agency bypass is a major problem in our industry. Agents and suppliers must work together to structure marketing and advertising programs to support rather than avoid the travel agent distributions system." Objective 4 stated, "ARTA urges all airlines that wish to receive full benefits of the agency distribution system to fully participate in all CRS systems." The boycott came to naught because of antitrust concerns. Neither Stults nor Bruno had consulted their lawyers who would have told them that their status as ARTA board members made their actions legally problematic.¹⁰²

COMPETITION

This section cannot be called *Competition and Cooperation* because Morris went it alone. It did not participate in any alliances, interline or code sharing agreements. Passengers with connections to other airlines had to fend for themselves and their luggage.¹⁰³

As the price leader, Morris initially suffered little from price competition. On the other hand, Morris did hurt the code-sharing partners of the majors at their vulnerable hubs.¹⁰⁴ In addition, Morris also adversely affected the plans and profits of two majors, Alaska Air Group and Delta.

Alaska

Put simply, Morris devastated Alaska Airlines and Horizon, both subsidiaries of the Alaska Air Group, in the routes served by Morris. Horizon was overpriced and Alaska was excessively overpriced. Alaska took pride in having won the first J. D. Power award for regional airline excellence in 1992.¹⁰⁵ The readers of Conde Nast Traveler Magazine had also elected it the best U.S. carrier for the fifth consecutive year.¹⁰⁶ It had obtained these distinctions by offering the some of the best amenities and service in the industry. The amenities sometimes went to excess: two linen tablecloths per service tray, three pieces of French toast per breakfast, etc. These extravagances combined with the high costs of doing business in the state of Alaska made the airline's operating cost per seat mile 11.5 cents.¹⁰⁷

The recession of the early 1990s and consequent cost consciousness of air travelers hurt Alaska: its flights averaged load factors of just above 50 percent in 1992–1993.¹⁰⁸ The company lost a staggering \$85 million in

1992¹⁰⁹ and \$30 million in 1993.¹¹⁰

Alaska recognized that about half of its losses were due to competition from small start ups, and it singled out Morris as the most threatening. Harry Lehr, Alaska's Vice President of Planning, said that pressure from low cost upstarts, bottom feeders in his words, was building and that Morris was a trying opponent: "[June Morris] is a very sharp lady. She knows what she's doing. They're picking a niche, they're strong in it, and they're doing very well."¹¹¹ Alaska finally matched Morris' fares in an effort to stop diversion of passengers to the smaller airline.¹¹² It was clear, however, that Morris' cost structure would allow it to sustain a fare war for much longer than Alaska, which was not willing to sacrifice the reputation for superior service, which had become so important to it.

Delta

Morris faced much stiffer competition from Delta. Initially, the big airline ignored Morris Air. Overlooking the upstart was a mistake the major would one day publicly regret. Delta's Vice President of Marketing, Robert W. Coggin, said, "We were so chagrined about not being more aggressive with Morris Air in Salt Lake, we were going to be very aggressive [with other low cost carriers]."¹¹³

Delta's indifference changed when the upstart threatened its dominance at its Salt Lake City hub, used primarily for connecting flights. Delta had already invested almost \$2 billion at Salt Lake and had 4,300 employees working there.¹¹⁴ The major also planned to establish its second largest reservations center at the city and begin long-haul service from Salt Lake to London's Gatwick Airport.¹¹⁵ Delta could not ignore competition, which threatened its long-range plans for Salt Lake. According to Delta spokesman Neil Monroe, "Inroads have been made [into Delta's market share] by Morris. We have a tremendous investment in Salt Lake City, and in order to continue that hub's success, we have to retain local market share."¹¹⁶

At the time, Delta had suffered worldwide losses, which probably contributed to its determination not to be upstaged by little Morris. Delta had an operating loss of \$450 million in 1991, a \$675 million loss in 1992, and a \$563 million loss for the first nine months of 1993.¹¹⁷ The financial toll and necessary countermeasures were wrenching to an airline, which had always considered itself superior to the competition in morale, customer service, and financial performance.¹¹⁸

Delta finally responded to Morris' growth at the end of 1992 by slashing its fares by 50 percent and offering double frequent flyer mileage on flights involving Salt Lake City. Morris was little affected however; as its fares remained lower than Delta's, up to 35 percent lower on some routes.¹¹⁹

Delta finally decided to match Morris' fares out of Salt Lake in May 1993.¹²⁰ By then Morris had established itself in the market and did not get knocked out. Near the end of Morris' existence, however, Delta became even more aggressive. In December 1993 it announced low fare service to Albuquerque from Salt Lake. Morris had been planning to enter that market at a higher fare at the beginning of 1994.¹²¹ It was unclear how much longer the new entrant could survive Delta's attention.

Predation

Delta supplemented its aggressive (some would say predatory) pricing and frequent flyer bonuses with one additional trick: market share travel agent overrides. In testimony before the National Commission to Ensure a Strong Competitive Airline Industry, Morris President David Neeleman appealed for an end to the practice in which airlines paid travel agents cash incentives when the agents increased the airline's proportion of total tickets sold. Neeleman noted that the overrides make it difficult for travel agencies to support a start-up carrier for fear of losing the incentives.

In Morris' case, Neeleman stated that all major Utah travel agencies had overrides based on market shares with Delta, and the agencies had told him privately that they could not support Morris aggressively because of the incentives.¹²² After making these remarks, Neeleman was approached by Department of Justice officials for additional information. A few months later, the Department launched an investigation of Delta's "marketing practices that may be used to maintain hub dominance."¹²³

The bonuses were common in the industry. A 1992 Travel Weekly survey found that 69 percent of agencies had received them and that two-thirds of the agencies reported that the bonuses were sometimes or usually a factor in which airlines they chose for customers.¹²⁴ Although the Department of Justice later widened its probe to include TWA, Continental, United, American, USAir, and Northwest,¹²⁵ Delta remained a focus of the investigation.

It was discovered that Delta sent a memo to Utah travel agents in summer 1993 reminding them of their obligation to report Morris Air ticket sales to the Airline Reporting Corporation (ARC). The ARC usually serves as an industry clearinghouse for tickets, but Morris was not fully included because of its reservation system discussed above. The Delta memo had a chilling effect on agents who worried about losing their overrides: after the memo, Morris Air's travel agent bookings dropped 20 percent.¹²⁶ Justice made no determination in its probe of Delta while Morris was in existence.

THE END OF MORRIS AIR

In October 1993, Morris Air approached Southwest Airlines proposing a buyout. Shortly afterward, June Morris and her husband had dinner with Herb Kelleher, Southwest's chairman, to explore the possibility. Negotiations began, and Southwest purchased Morris on December 14, 1993.¹²⁷

June Morris cited several reasons for her decision to seek a buyout: "...unspecified future business concerns," a desire to reduce her schedule after a lifetime of hard work, and a desire to spend more time with her husband.¹²⁸ David Neeleman later revealed that June Morris had started to feel ill as well. She was diagnosed with inflammatory breast cancer at the beginning of December, an ailment from which she eventually recovered after a grueling battle.¹²⁹

The sale was accomplished by a stock swap in which no cash changed hands. Southwest acquired 100 percent ownership of Morris by giving its owners 3.6 million shares of newly-issued common stock valued at a total of \$133.8 million on the last day of 1993 when the transaction took place. Former Morris Air owners ended up controlling about 2.5 percent of the bigger company's stock.¹³⁰ June Morris was elected to the Southwest Board on January 20, 1994, and received options to purchase 10,000 shares of Southwest common stock at \$36.625 per share, the value of the stock at the time.

FINANCIAL RESULTS

Their investment in Morris Air paid off handsomely for the owners of the airline. Although Morris was never a public company, and thus did not have to report its results, it is possible to reconstruct a picture of its financial status through comments made by Morris officials and investors. In 1992, Morris made a profit of \$10 million, a 7 percent margin on operating revenues of \$142 million.¹³¹ By comparison, the charter service had revenues of \$82 million in 1991.¹³² The company projected revenues of up to \$200 million in 1993,¹³³ but it had only achieved \$116 (with a profit of \$5.3 million) by the end of the third quarter of that year.¹³⁴ By then, Morris had accumulated \$50 million in long-term debt, and shareholders' equity was \$27.5 million.¹³⁵ Thus the debt to equity ratio was about 2:1, relatively low for an airline during the early 1990s.

A measure of the capital gain on the company's share can be taken from a statement by one of its owners, the Weston Presidio venture capital company. Weston Presidio stated that it had invested \$2 million in the company's initial private placement in December 1992. When its stake was sold in 1993, Presidio made 2.5 times its money.¹³⁶

A HIDDEN AGENDA?

It would be easy to accept the public statements about the motives that Morris had to seek a buyout by Southwest at face value. But there is evidence that supports a different interpretation of the story of the airline: that June Morris considered an eventual sale to Southwest from the beginning. Morris' integration into Southwest went exceptionally smoothly since the two airlines were so similar. They both offered low frills, low cost, short-haul, point-to-point service, in the same, single type of aircraft.¹³⁷ Neither participated in a CRS or code sharing agreement, assigned seats, or served meals.¹³⁸ Kelleher stated, "You couldn't put two carriers together that are more alike than Morris Air and Southwest Airlines."¹³⁹

June Morris modeled her new airline on Southwest, and the airline's incorporation only followed discussions between her and Kelleher's management teams.¹⁴⁰ She deliberately tailored Morris' route system so that it would dovetail nicely with Southwest's¹⁴¹ (while the two airlines flew to eight of the same cities, they did not compete in any city-pairs).¹⁴²

June Morris would have needed to make her airline as appetizing and easily digestible as possible. Southwest's only previous acquisition, of Muse Air in 1985, was a disaster.¹⁴³ Southwest had lost its appetite for acquisitions. At the time, Kelleher said, "Morris Air is a very special situation to us. This does not signify that Southwest Airlines has caught the acquisition mania. If Morris Air were not the special situation that it is, we would not even have considered Morris Air."¹⁴⁴ In 1995, he repeated, "We expect all of our growth to be internal. Morris Air was a very special situation...[It] had used us as its role model."¹⁴⁵

Is it possible that June Morris, a very sharp lady, constructed her airline with an eye to quickly selling it to Southwest for a lot more money than she had put into it? The timing was perfect: Southwest was planning to expand in the western U.S. just as she approached Kelleher.¹⁴⁶ In a telling statement, which gives the lie to public stories of the need to sell, Morris spokesman Tom Kelly said, "This is not something that had to be done. If Southwest had not had any interest, I don't think we would have continued [to look for a buyer]."¹⁴⁷

CONCLUSION

As we have seen, Morris benefited significantly and throughout its existence from being under the watchful eye of the DOT. The Department's notice that it would not tolerate predatory practices, backed up in Morris' case by the investigation into Delta's travel agent overrides, protected the new airline from obvious attempts on the part of the majors to do away with it.

In terms of government action, Morris had little to complain about. When David Neeleman testified before the National Commission to Ensure a Strong Competitive Airline Industry, apart from discussing agency overrides, he only wished for less taxation and less reporting requirements.¹⁴⁸ This latter point brought Morris once again into conflict with the majors.

On July 1, 1993, Morris Air asked DOT to keep its traffic, capacity, and market data (included in T-100 reports) confidential from other carriers for a period of three years. Morris argued that as a new entrant, it faced unusual competitive pressures from established carriers whose “mere size...makes the identification and tracking of smaller air carriers’ fleet operations an essential part of their competitive tools.”¹⁴⁹ Delta and United objected to the request, particularly its singling out new entrants for preferential treatment, as inconsistent with the basic deregulation principle of equal treatment for all airlines.¹⁵⁰ Morris’ request was denied,¹⁵¹ rightly in our opinion. The story of Morris Air shows what an upstart can do on a level playing field under deregulation. Morris did not need the government to favor it, just to let it compete.

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**APPENDIX
FACTORS THAT CONTRIBUTED TO
THE SUCCESS OF MORRIS AIR**

ENVIRONMENT

- Many uncontested markets available
- Buyer's market in jets
- Employer's market in labor
- Federal support for start-ups

STRATEGY

- Low frequency of service
- Avoid congested airports and schedules
- Fly only short routes
- Create new air travelers
- Discipline in adhering to strategy

COST CUTTING

- Use only one kind of airframe
- Lease planes and crews
- Contract out services
- Eschew computer reservation systems
- Low seat pitch
- Leverage charter brand, experience, and investments

INNOVATION

- Ticket less travel

UNIVERSITY FLIGHT OPERATIONS INTERNSHIPS WITH MAJOR AIRLINES: AIRLINE PERSPECTIVES

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ABSTRACT

This study examines the partnership between U.S. airlines and aviation-oriented universities that facilitates flight-oriented internship programs. Through the use of a literature review and phone survey, the researchers investigate the similarities and differences between the top twelve airlines' internship programs. Additionally, the researchers work to dispel some of the myths surrounding these programs and reveal the tangible and intangible benefits to the participant, the sponsoring airline and the university.

INTRODUCTION

Major U.S. airlines and aviation-oriented universities have worked together on flight-oriented internship programs for over fifteen years. For example, the FedEx internship program dates back to the early 1980s. These internship programs are advantageous to both interning university students and the airlines. Students enjoy the educational benefits of working in a major air carrier's flight operations department, while earning

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college credit for their experiences on the internship. Airlines benefit from the free or low-cost, semi-skilled workforce the internship program provides. In addition, airlines have the opportunity to “get an early look” at some of college aviation’s top students and future flight officer candidates. In 1988, United Airlines issued an unpublished internal report that discusses their reasons for developing and maintaining internship agreements with university aviation flight programs (Spencer, 1988). These reasons are as follows:

1. Develop additional resources for high quality flight officer candidates;
2. Improve the supply of qualified flight officer candidates;
3. Increase the number of qualified minority and female flight officer candidates; and
4. Take advantage of the college and university system as a resource for the pilot of the future.

As flight operations internships were integrated into the major airlines, they became a more significant opportunity for university students seeking employment as airline pilots. However, no one has cataloged major airline flight operations internship programs in an attempt to present their size, scope, benefits, limitations and intent.

PURPOSE

The purpose of this study is to present the results of a telephone survey conducted in August and September 1997 targeting the top twelve major U.S. airlines based on gross annual revenue as reported by the Air Transportation Association’s 1997 Annual Report. The goal of the survey was to gauge the size, scope, benefits, limitations and intent of the flight operations internship programs at these airlines. In the course of collecting survey data, a variety of issues related to airline flight operations internships were identified. As a framework for examining these data, four common student perceptions associated with airline flight operations internships were discussed from the perspective of the data collected from the airlines:

1. Interns are actively involved in aircraft operations;
2. Interns are paid a salary;
3. All airlines offer interns travel passes; and
4. All airlines interns are guaranteed a post internship pilot interview.

Definitions

Before proceeding with this research, it was important to define the terms “internship” and “cooperative education”, especially as they relate to aviation.

In general terms, academic or experiential internships are project-oriented experiences that can be taken for academic credit. Internships involve spending a pre-arranged period of time working in a field of study or interest.

The 1998 Southern Illinois University at Carbondale (SIUC) Undergraduate Catalog defines an aviation occupational internship as “...an unpaid internship position...performing duties and services in an instructional setting as previously arranged with the sponsoring work-site supervisor” (p. 159).

A flight operations internship adheres to the basic principles associated with other internship programs, with emphasis on airline flight operations. For example, the Northwest Airlines-SIUC Internship agreement reads, “The purpose of this agreement is to establish an Internship Program by which students at SIUC will be given an opportunity to enhance their education through work assignments at Northwest” (Mallory, 1997, p. 1).

The National Commission for Cooperative Education (1999) describes cooperative education this way.

Cooperative education is a structured educational strategy integrating classroom studies with learning through productive work experiences in a field related to a student’s academic or career goals. It provides progressive experiences in integrating theory and practice. Co-op is a partnership among students, educational institutions and employers, with specified responsibilities for each party. (p. 1)

The primary difference between an internship and a co-op is that internships are usually unpaid work experiences, while co-ops are salaried. Also, co-ops typically require that the student alternate between multiple periods of pre-arranged work assignments and semesters of traditional on-campus academic learning.

LITERATURE REVIEW

There is limited material in aviation-related refereed journals that address the subject of university-airline flight operations internships. Non-refereed sources, including aviation-specific magazines, periodicals and industry publications, do contain general information related to aviation internships. These sources discuss such areas as aviation maintenance and management and may have some application to airline flight operations internships.

The University Aviation Association (UAA) reports that “the civil pilot training (CPT) program of World War II served as a foundation for partnerships between colleges and the aviation industry” (Kiteley, 1997). Kiteley goes on to say that internships and co-ops are just one form of partnership between universities/colleges and airlines. Other types of university and college partnerships with the airlines can include internships for faculty, service on advisory committees, and using airlines as sources of guest lecturers/adjunct faculty (Kiteley, 1997).

An article on a potential pilot shortage explains the need or rationale for aviation internships in general. [O]ne of the keys for bridging the experience gap among young pilots is to develop closer cooperation between industry and schools, including establishing internship and work/educational cooperatives (Bradley, 1997, p. 80).

With regard to aviation-related internships and co-ops, a University Aviation Association (UAA) sponsored study (Schukert, 1993) reported that 31 UAA member institutions participated in over 60 aviation-related cooperative educational programs within their non-engineering aviation degree programs. According to Schukert, the federal government serves more aviation-related co-op students than any other agency/organization.

The role of aviation-related co-ops and internships has been addressed by several authors.

The success and popularity of co-op is largely attributable to the fact that all three players benefit. In addition to increasing graduate placement, schools become privy to the public and private sector needs that their curricula should address. Employers gain access to committed, knowledgeable, temporary, and low-cost help, plus an opportunity to groom full-time employees. The participating students get a unique opportunity to experience the real world in their chosen profession. Co-op programs usually provide pay and/or academic credit, and students gain a “foot in the door” with a familiar post-graduate employment prospect. (Kiteley, 1997, p. 1).

Another view is presented by Turney (1997).

More specifically, aviation employers can look forward to the following benefits of starting an intern program: Highly motivated and enthusiastic employees; short term commitment; meeting immediate staffing needs; providing a diverse population; freeing professional staff; and facilitating entry-level recruitment (p. 2).

An article in the November 1996 issue of *Flight Training* notes an important rationale for an aviation internship from a student’s perspective.

Simply stated, an internship or cooperative education program (co-op) is an opportunity for a college student to combine traditional on-campus academic learning with professional work experience in a chosen field. These programs allow students in a large number of collegiate aviation programs to bridge the gap between the classroom and the real world. (Phillips, 1996, p. 44)

This article also discusses airline internships at United, Delta, TWA, USAir, and FedEx. The author mentions numerous benefits associated with these internships, including being hired for full time jobs at United and FedEx, potential for being hired at Delta, free simulator time, some travel benefits, and jump seat flights for interns (Phillips, 1996).

With regard to airline internships specifically, an article in the October 1991 *Collegiate Aviation Review* reported that three airlines (United, Northwest and Eastern) had a total of six university or community college “partners” including three airline-university intern agreements (NewMyer, 1991). It was noted that these partnerships were a response to the airline industry’s need for qualified, quality pilots. This article also noted that as a result of an internship connection between United Airlines and Southern Illinois University at Carbondale (SIUC) nineteen former interns from SIUC had been hired by United as flight officers as of the fourth year of the United-SIUC agreement. The article mentioned that, “United Airlines doesn’t use this agreement as a primary source of pilots. Rather, it is a supplement to its regular flight officer employment process” (NewMyer, 1991, p. 16).

One of the strongest statements in support of airline internships, which also provides an interesting corporate philosophy, is the opening statement from the Southwest Airlines Internship Program Guidelines.

Southwest Airlines recognizes the importance and benefits of an official, company-wide internship program. By having young, talented and educated people from the aviation community come work for us, Southwest will be more efficient and productive than ever. In return, the interns will gain hands-on experience in the day-to-day operations of an airline. (Self, 1996)

In general, the available literature points to the benefits of aviation and airline internships to both the airline and the student. The literature also contains some descriptive material that discusses airline flight operations internships and mentions that such programs exist at five major airlines. However, the reviewed literature contained no industry-wide comprehensive information about flight operations internships at all major airlines.

METHODOLOGY

This study investigates the size, scope, benefits, limitations and intent of the flight operations internship programs at twelve major U.S. airlines (based on gross annual revenue as reported by the Air Transportation Association’s 1997 Annual Report). (See Table 1).

This was accomplished by contacting internship coordinators representing the twelve major U.S. airlines and surveying them by

Table 1. Top Twelve Major U.S. Airlines, Based on Gross Annual Revenues, 1997

Alaska	American	America West	Continental
Delta	FedEx	Northwest	Southwest
TWA	United	UPS	US Air

Source: Air Transportation Association, 1997

telephone. The instrument was qualitative in design. Each question contained either a structured response list or elicited an open-ended response. Kaufman and English (1979) suggested that a prepared list of items may erode creativity, however, a prepared list does provide comprehensive data when validated by expert opinion.

The researchers developed the survey instrument with the assistance of a focus group composed of aviation management and flight department faculty members. The focus group discussed the objectives of the study, and consensus was eventually gained on questionnaire design and composition. The effort to use a focus group is supported in the literature. "By conducting one or more focus groups before initiating a survey, both sponsors and researchers can sometimes get a better grasp of the problem and formulate the research questions more accurately" (Alreck & Settle, 1997, p. 393). Another view, presented by Morgan (1997), is that "focus groups...can be used to generate survey questionnaires or to develop the content of applied programs and interventions" (p. 3).

The survey instrument used in this study is composed of ten question areas, as listed below. (See Appendix A .)

1. How many students does your airline intern per semester?
2. How many colleges/universities does your airline work with?
3. Are interns paid a salary? If so, how much are they paid?
4. Does your airline offer benefits other than a salary?
5. Does your airline offer post internship benefits?
6. What locations/stations are interns assigned to?
7. What departments are interns assigned to?
8. What qualifications/qualities does your airline desire in an intern?
9. What is the most important learning experience your airline provides the intern?
10. What do you believe the internship program brings/contributes to your airline?

A telephone contact list of the twelve survey airline's flight operations internship coordinators was developed. In most instances, the contact person was known. In those instances where the contact person was not known, inquiries were made to the flight operations departments of those airlines.

Telephone calls were made over a period of three weeks in August and September of 1997. Airline internship coordinators were asked to react to survey questions and to expand upon their response to the extent necessary. For example, the majority of participants answered in great depth to survey question 10: "What do you believe the internship program brings/contributes to your airline?" In contrast, research questions 4, 5, 7 and 8 required "yes" or "no" responses to predetermined sub-components of a question. For example, the question: "Does your airline offer benefits other than a salary?" Sub-components to that question included jump seat privileges, travel passes, simulator use, etc.

A telephone survey was selected as the most appropriate method of data collection for this study. Carstenson, Sluti and Luedtke (1996) note:

...several advantages of gathering data by telephone are: one can contact a widely dispersed group of individuals or sites; no field staff are required, as may be necessary when conducting personal interviews; this method has a relatively low-cost per contact; also, that interviewer bias is more controllable; it is a rapid means of collecting data; and the response rate is much higher than mail surveys. (p. 5)

Follow-up calls were made to confirm the data received and to assure a commonality of response made for each question. To increase validity, a new researcher was utilized to conduct follow-up telephone interviews.

Table 2. Number of Interns per Semester at Twelve Major U.S. Airlines, 1997

Alaska	2-7
America West	3-4
American	22
Continental	10-16
Delta	3-12
FedEx	5-8
Northwest	20-30
Southwest	3
TWA	30
United	30-40
UPS	2
USAir	5-7

RESULTS

The response to question 1, which asked “How many students does your airline intern per semester?”, is important to reveal the scope of flight operations intern programs (see Table 2). Four airlines (American, Northwest, TWA and United) serve 20 or more students per semester in flight operations internships. The remaining eight airlines (Alaska, America West, Continental, Delta, Fed Ex, Southwest, UPS and US Airways) serve less than 16 students per semester. Overall, the twelve airlines, as a group, serve 135 to 181 students per semester, or an average of 11.3 to 15.1 students per semester per airline.

Another important scope/size determinant was question 2, “How many colleges/universities does your airline work with?” A total of 103 colleges and universities maintain internship agreements with the airlines surveyed. University-airline partnerships ranged from 1 to 22, with an average of 8.7 for all twelve airlines. Four airlines (American, Northwest, TWA and United) work with 15 or more universities (see Figure 1). The remaining eight airlines work with 7, or fewer, universities. Some of the universities most frequently mentioned were Embry-Riddle Aeronautical University (both Daytona Beach and Prescott campuses), Louisiana Tech University, Southern Illinois University Carbondale and the University of North Dakota.

Figure 1. Number of university and/or college partner by airline, 1997.

In an effort to ascertain the compensation component of the airline internships offered, question 3 asked if the internships were paid (by salary or wage), and if so, how much per month. Only two of the twelve major airlines surveyed offered paid internships, salaries range from \$1,500 to

\$2,000 per month (since the completion of this survey, a third airline now pays its flight operations interns).

Since only two airlines pay their interns, it was important to discover what other benefits the airlines offer their interns. Question 4, addressed benefits other than pay options. A key benefit offered at ten of the airlines surveyed are “jump seat” or “observer member of crew” (OMC) privileges. This benefit allows an intern to occupy an observation seat located in the rear of aircraft flight deck during a regularly scheduled flight. This is a tremendous educational experience for the student as they are allowed the opportunity to observe a flight crew “in action”, as well as obtain a first hand view of airline operations. Several of the airlines surveyed limit this privilege to a certain number of flights during the internship period, or as specified by the intern’s supervisor.

Another benefit provided by several airlines is the travel pass. Seven of the twelve airlines surveyed offer this benefit (see Figure 2). The airlines allow interns a limited number of passes that are valid for various periods of time and cost to the student. Travel passes are limited to domestic U.S. destinations, with one exception; U.S. Airways also allows international travel (see Appendix B).

Another key educational benefit to flight operations interns is the use of full motion simulators during their internships. Ten of the twelve airlines

Figure 2. Benefits other than pay offered by airline internship programs at twelve major U.S. airlines, 1997.

offer this benefit. Several airlines encourage simulator use by flight operations interns. Interns at those airlines can receive as much as 50 to 100 hours of simulator “flight time” in one semester in a variety of aircraft including, the MD-80, DC10, B-737 and B-747.

In contrast, Flight Engineer training is only offered by one airline as an internship benefit. This is possibly due to the scarcity of three-person crew training at some airlines and the cost of such a benefit at most airlines.

Finally, all airlines offer tours of major airline facilities as a key benefit of the flight operations internship. Tours of the maintenance facilities are offered by ten of the twelve airlines. Tours of major airline facilities expose students to the complexity and scope of airline operations. Aircraft manufacturing plant tours are also provided by seven of the twelve airlines. Aircraft manufacturing plant tours not only allow interns the opportunity to view the intricacies of the aircraft manufacturing process, but also expose the intern to procedures involved in delivering aircraft for airline service.

Another educational benefit that airline flight operations internships provide is the opportunity for the student to experience learning in an industry setting. Three of the airlines surveyed offer seven or more intern assignment locations, three offer two locations and the other six airlines offer only one location. Among all twelve airlines, a total of 27 separate geographic locations are offered coast to coast (see Appendix C).

Intern duty assignments can vary widely by airline (see Figure 3). Two airlines, America West and Fed Ex, focus their internship effort in airline dispatch or ground-based, flight coordination support functions. These two airlines do not assign interns to their flight training academies or domicile chief pilot offices. Ten of the twelve major airlines do offer internships at their flight academies, while only six of the twelve offer them at domicile chief pilot offices around the nation. A key benefit of being in a flight

Figure 3. Intern duty assignments offered at twelve major U.S. airlines, 1997.

training academy for an internship is that the assigned intern gains an understanding of the process used to train an airline pilot, including the professional expectations demanded of a person in that profession. An additional benefit is that the student gains access to flight training personnel, flight simulators, flight training devices, human factors training and other airline-oriented training experiences. These experiences can be invaluable in a student's career. Seven of the twelve airlines surveyed offer flight operations internship assignments at airline headquarter locations and airline flight safety offices. Finally, two airlines offer flight operations internships in the pilot recruitment area of the airline.

Post internship benefits are also offered by some airlines. Travel pass privileges are offered to students by six of the twelve airlines after successful completion of the internship. The possibility of earning a flight engineer certificate during the course of an internship is offered by only one airline. A key benefit to some students is a guaranteed interview for a pilot position. This benefit is offered by five of the twelve airlines. However, several airlines mentioned that while they do not guarantee an interview, good work during the internship will very likely get the student a letter of reference from the airline, which will help when the student applies later for pilot employment. Of those offering guaranteed interviews, four limit an intern to either one or two interviews. One airline reported that over 200 former interns have been hired as pilots at that airline alone.

Another aspect of the airline flight operations internship programs is the qualifications that the airlines are looking for when they select their interns (see Figure 4). In the area of flight qualifications, five airlines require the Federal Aviation Administration Commercial Pilot Certificate with the Instrument Rating. Two of these five airlines also require the multi-engine rating. None of the 12 airlines surveyed required a flight instructor's

Figure 4. Intern qualifications for twelve major U.S. airlines, 1997.

certificate. In one case, an airline required only a Private Pilot Certificate, with all other certificates and ratings listed as “preferred”. Another listed the Private Pilot Certificate as “desirable”. Others indicated advanced ratings as “nice to see”. Several airlines stated that eligibility requirements were based on decisions made by the universities during their on-campus screening process.

With regard to the grade point average (GPA) of intern candidates, five airlines reported a 3.0 (on a 4.0 scale) intern selection minimum, while one reported a 2.5 minimum GPA. The other six either had no requirement, had a “preferred” GPA, or considered GPA as one of several selection factors but with no specific identified level. Finally, in terms of flight hours, two airlines reported that they wanted their interns to have 200 or more flight hours of experience. The other airlines had no hour requirement, but a few looked at this as a selection criterion combined with several other factors but at no specified hour amount.

At the conclusion of the telephone survey, airline flight operations internship coordinators were asked two questions to elicit opinions about the value of the airline flight intern programs:

1. “What do you believe is the most important learning experience your airline provides the interns?”
2. “What do you believe the internship program brings/contributes to your airline?”

These were the open-ended questions, which resulted in a wide variety of responses. However, central themes did emerge when all of the airline’s answers were tabulated as a group.

In terms of what the airlines provide to the interns, six airlines mentioned that the interns get a “total company perspective” or “what an airline really is and really does.” That is, the interns are exposed to the “amount of detail, the amount of regulation” involved in keeping an airline operating on a daily basis. Three airlines mentioned the importance of the internship in preparing university students for a position in the airline industry. As one airline put it, it provides “exposure to what they might be doing later on.” Finally, another three airlines mentioned “the specific involvement with an airline flight operations environment,” or “real hands-on experience” in airline flight operations as the key advantage given to the interns.

As far as the value of the internship to the airline, it was interesting that seven of the twelve airlines mentioned “enthusiasm” as one of the things that interns bring to the airline. Several airlines put it this way: They bring enthusiasm!” “A shot of energy!” “Enthusiasm and hard work—it’s a trade

off, we (the airline) get some hard work and fresh ideas in exchange for what we give to the interns. Another airline mentioned that in addition to enthusiasm, interns are a "morale booster" to regular airline employees.

Three airlines mentioned that interns "take the load off" of regular employees. That is, interns frequently work on projects that regular employees simply do not have time for. One airline commented on the specialized skills students bring to an internship, "Interns bring skills that not only reflect computer literacy, but aviation literacy as well. That combination simply is not available from any other source."

Finally, a contribution mentioned by two airlines was the connection between the intern program and future employment at the airline. As one airline put it, "the internship program helps us identify and, hopefully, select good, solid employees and pilots." Another stated: "This is an opportunity to screen possible future employees. This gives us a base to choose from since we generally hire from within."

CONCLUSIONS

In conclusion, the size, scope and benefits of the airline flight internships at the top twelve major U.S. airlines are as follows.

1. These programs serve 2 to 40 interns per semester per airline, or overall, 135 to 181 students per semester (all airlines).
2. The 12 airlines work with a total of 103 colleges and universities, with partnerships ranging from 1 university per airline to 22 universities per airline.
3. Two of 12 airlines pay their flight operations interns (although a third airline added pay after this survey was completed).
4. A majority of airlines reported offering the following benefits other than pay: Airline headquarters tours; Jump seat privileges; Simulator training; Airline maintenance facility tours; and Airline travel passes.
5. A total of 29 separate geographic locations for flight operations internships were reported by the 12 airlines, with 6 of the airlines offering more than 1 location.
6. A total of 6 of 12 airlines offered post-internship travel pass privileges.
7. Five of 12 airlines offered guaranteed pilot employment interviews to those students successfully completing flight operations internships.

This study has also served to dispel four student misconceptions typically associated with airline flight operations internships.

1. “Interns are actively involved in aircraft operations.”

This is certainly not the case. Interns are assigned to a variety of support positions, but are only allowed on the flight deck in an “observer member of crew” capacity.

2. “Interns are paid a salary.”

Two of the 12 airlines surveyed pay interns a salary according to survey results, with a third airline adding pay in 1999. However, all the airlines surveyed offer some type of non-salary benefit(s) to interns.

3. “All airlines offer interns travel passes.”

Seven of the 12 airlines surveyed offer interns travel passes. Conditions and limitations are associated with the dispensing and validity of these privileges.

4. “All airline interns are guaranteed a post internship pilot interview.”

Five of the 12 airlines surveyed provide guaranteed pilot interviews as a post internship benefit. Several of airlines that do not offer this benefit mentioned that, while not guaranteed, it is likely an intern will receive a letter of recommendation for employment with the airline.

Flight operations internship programs provide a broad range of learning opportunities and professional growth experiences for the interns. As we have illustrated throughout this study, the nature and variety of learning experiences to which the intern is exposed vary among the airlines. Travel benefits, guaranteed pilot interviews, jump seat privileges and other internship benefits also vary among airlines. However, all airline internship programs mentioned in this article do share one common objective—contributing to the professional growth of the student and subsequently securing the future of the aviation industry.

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APPENDIX A

**Characteristics of Flight Operations
Intern Programs at Major US Airlines**

Name and position of airline representative being interviewed:

1. How many students does your airline intern per semester? _____
2. How many colleges/universities does your airline work with? _____
3. Is the internship paid? Yes No
If paid, how much? _____
4. Benefits—other than pay:

Jump seat privileges	Yes	No
Travel pass privileges	Yes	No
If so, how many? _____		

Restrictions/limitations?

- | | | |
|-----------------------------|-----|----|
| Simulator use | Yes | No |
| Flight Engineer Certificate | Yes | No |
| World headquarters tour | Yes | No |
| Maintenance facility tour | Yes | No |
| Manufacturing plant tour | Yes | No |
| Other benefits, specify: | | |

5. Intern assignment locations, i.e., Chicago, Dallas/Fort Worth, Atlanta, etc.

6. Intern duty assignments:

Flight Training Center/Academy	Yes	No
Domicile Chief Pilot Offices	Yes	No
Airline Headquarters	Yes	No
Flight Safety Offices	Yes	No
Other, specify:		

7. Post Internship Benefits:

Pass Privileges	Yes	No
Flight Engineer Certificate	Yes	No
Guaranteed Pilot Interview	Yes	No
Limit on number of interviews	Yes	No
If so, how many allowed?		

8. Desired intern qualifications

Class rank:	sophomore	junior	senior
Certificates/Ratings:			
Commercial		Yes	No
Instrument		Yes	No
Multi-engine		Yes	No
CFI (A)		Yes	No
CFI (I)		Yes	No
GPA:			
Flight hours:			
Other, specify			

9. What do you believe is the most important learning experience your airline provides the intern?

10. What do you believe the internship program brings/contributes to your airline?

APPENDIX B**Travel Pass Privileges****United:**

One 95% discount on ticket for each 30 days worked, for intern and spouse (round trip).

American:

One round trip for each month worked up to 90 days & some service fees—transferable to parents/spouse—limited access.

Delta:

No privileges.

Continental:

Four non-revenue round trips—useable up to six months after the internship.

TWA:

One travel pass with minimum of two weeks service, space available—useable up to six months after internship.

Southwest:

Offer privileges, but no listing of requirements.

Northwest:

One round-trip pass for every 30 days worked—no overseas.

USAirways:

For each 40 hours worked—one domestic travel pass or international travel pass for 80 hours worked.

American West:

No privileges.

Alaska:

No privileges.

UPS:

No privileges.

FedEx:

No privileges.

APPENDIX C

Internship Locations



BOOK REVIEW

GUDMUNDSSON, S. V. (1998). *Flying Too Close To The Sun: The Success and Failure of the New-Entrant Airlines*. Aldershot, Hants/Brookfield, Vermont: Ashgate. Pp. xvi + 259. ISBN 1-84014-366-5. Price \$79.95, hard cover.

REVIEWED BY THOMAS C. LAWTON, Royal Holloway University of London

Set in the wake of the 1979 deregulation of U.S. air transport, *Flying Too Close To The Sun* endeavours to explain the complex issues that led to the almost total failure rate of the first-wave new entrant airlines. This is an interesting and highly relevant topic and the book succeeds in providing an objective and impartial analysis of a period in U.S. aviation history that evokes considerable passion among those directly involved. It is strong on empirical data that charts the emergence and subsequent decline of new entrant U.S. airlines during the 1980s. This is one of the few books to address this important subject. Also, in considering corporate strategy and market competition, Gudmundsson moves beyond the narrow cost or operational focus of many such works.

Sveinn Gudmundsson has significant knowledge of the industry as an academic researcher based both in the U.S. and Europe. He is Assistant Professor in the Faculty of Economics and Business Administration at the University of Maastricht, the Netherlands. He was previously Principal Lecturer in Transport at London Guildhall University. Dr Gudmundsson gained his Ph.D. in Air Transport Management from Cranfield University in the UK and has also studied at the School of Aeronautics and the School of Management at Florida Institute of Technology in the U.S.

The book is structured in two parts. Part one examines the theory, strategy and policy behind the success and failure of U.S. new entrant airlines. The four chapters in this section look at the nature and development of U.S. new entrant airlines and consider the market and industry environment in which they operate. Part Two assesses the success and failure of new entrant airlines. The five chapters advance evidence that explains how and why most new entrants fail(ed) to attain and sustain competitive advantage.

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Turning to a chapter-by-chapter critique, Chapter 2 considers the operating environment and tackles an important misconception among airline analysts and practitioners: that economies of scale do not exist in the industry, making it easier for new entrants to emerge. This may be the case but as Gudmundsson argues, incumbents have erected other, equally effective entry barriers. Moreover, the industry's structure and market/political environment contrive to create infrastructure barriers that have adversely affected the survival prospects of many new entrants.

The chapter proceeds to develop a list of these barriers that can disproportionately hurt new entrants relative to incumbents. These include code-sharing, computer reservation systems (biased in favour of the owners), volume incentives to travel agents, access to landing slots at congested airports and restricted access to airport facilities. Significant empirical evidence is provided to sustain these arguments. However, some confusion seems to exist as to what constitutes a genuine entry barrier to new entrant airlines and what factors are simply competitive challenges to all airlines. For instance, quality of service, restriction of airport expansion and environmental impact restrictions are all cited as entry barriers to new entrant airlines. It is not clear why such factors would disproportionately affect new entrants. It may be argued that they are simply challenges that affect all competitors in the industry. Overall, this is a very readable and informative chapter.

Chapter 3, *The Anatomy of a New Entrant*, provides an interesting and insightful look behind the scenes of the new entrant airlines. In considering the people and personalities behind the companies, Gudmundsson argues that charismatic and autocratic leaders can be important in launching an airline (but may become a liability as the airline increases in size). Evidence is also provided to illustrate that most airline start-ups are led by people with considerable prior experience of the airline industry. A further important element of new entrants *human dimension* is the employee-company relationship. In order to deter unionisation, maintain low salary levels and encourage higher efficiency levels, most new entrant airlines operate profit-sharing and stock ownership programmes. As the author points out, this system can prove very effective when times are good but can be extremely disruptive during lean/low profit periods.

Chapter 3 also considers the finance and profitability of new entrants. It concludes that one of the problems besetting many such airlines is their inability to turn a profit in their early years. This makes them vulnerable to adverse conditions in the economy and low periods in market demand. Gudmundsson further argues that the advantage accrued to new entrants through lower cost structures is offset by incumbent yield management systems, which facilitate price cuts. This is a tenuous assumption, as

sophisticated yield management systems operated by established airlines can be negated or even trumped by efficient load factor management on the part of new entrant airlines. Granted, managing load factors is not enough to ensure profitability. The issue is rather one of relating the average load factor to the break-even load factor. Improving this equation is the objective of every airline and could prove a better system than yield management for new entrant airlines. Sveinn Gudmundsson appears preoccupied with yield management systems (see also Chapter 2 and entry barriers). However, lessons from European new entrants such as Ryanair and easyJet illustrate that the yield management approach need not be of relevance to U.S. new entrant airlines.

Chapter 4 on *Competition Strategy* is largely derived from economics, hence offering a framework in line with authors such as Michael Porter. Some relevant non-economics-based literature such as Henry Mintzberg's conceptualisation of strategic positioning is noticeable by its absence. Despite this omission, this chapter provides a lively and accurate analysis of the competitive dynamics and strategic options that surround an airline attempting to establish market presence.

In the fifth chapter, Gudmundsson considers the question of success or failure. This is an interesting and reflective chapter that traces the various factors contributing to the market success or failure of a company. As you might imagine, the list of variables includes financial, marketing, management, organisational, operations, strategy and environment determinants. These are then individually broken down to examine the sub-categories of causes. An interesting point raised here is that success can lead to failure. By this the author means the cause of a specific predicament is the inertia caused by the positive strokes of success, leading to resistance to change.

In brief, the main arguments advanced in this chapter are first, there is a correlation between a firm's novelty and likelihood of bankruptcy; second, there also appears to be a relationship between macroeconomic variables such as interest rate, deregulation of industries, recession and increased competition intensity, with failure; and third, management appears to be the main contributor to the failure of firms. I think that this just about covers all relevant factors.

Chapter 6 lays out the empirical findings of Gudmundsson's research and Chapter 7 develops the notion of failure or distress prediction models. These are weaker chapters, relative to what came before and add little value to the overall analysis and argument. Chapters 6 to 8 (inclusive) are shaped exclusively by economic theory and characterised by the crunching of considerable data. This is done in a methodical and efficient manner. However, it is not always accessible to the reader lacking in econometrics

training. Much of this section is densely written and difficult for the non-economist to read and digest.

In the conclusions controlled growth is identified as an important ingredient for the non-failure of new entrants. As the author correctly points out, very fast growth places great demand on an airline's resources that eventually leads to inefficiencies plus strategic alterations that cause serious adjustment problems for the airline.

It is further argued that whilst comparatively low fares are important (especially during entry), these must be backed by a comparatively high service quality if advantage is to be sustained. This is an accurate and very important point. As Gudmundsson indicates, service quality does not mean service features such as frequent flyer programmes or free inflight meals. It simply means ensuring that the customer is satisfied with the basic product provided.

The book's final conclusion is that no prescription exists for success or the avoidance of failure due to the dynamism of the airlines' interaction with its environment. Nonetheless, Gudmundsson does advance six critical factors that new entrant airlines should be aware of. These include high relevant quality, high relative aircraft utilisation, controlled growth and resourceful innovation. This is sound advice.

Flying Too Close To The Sun should prove of interest to many JATWW readers and contains much that is both stimulating and original.

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