European Airline Deregulation: Evaluating an Investment in a Yield Management System for Alitalia

by

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Abstract

Yield management has been an important competitive factor in the evolution of the U.S. airline industry after 1978 deregulation. Several airlines, including People Express, were forced to bankruptcy because they did not adopt a Yield Management System, and they could not effectively compete on a market basis. The purpose of this thesis is to analyze how yield management could become a competitive factor in another important market which is currently deregulating: the intra-European market. In particular, this thesis addresses the strategic reasons for Alitalia (the largest Italian airline) to invest in this technology, and it develops an evaluation model to analyze the potential benefits of the system.

The first chapter explains what is Yield Management, why it can positively affect the economic performance of an airline, and how Yield Management techniques have been implemented by the major airlines. The second chapter examines the evolution of competition in the European airline industry with the forthcoming deregulation. The changes in the regulatory environment that will take place in Europe in the next four years will alter the way the major carriers compete. A reference point for this kind of analysis is to look at the evolution of competition in the U.S. domestic market after 1978 deregulation. The third chapter analyzes how yield management can contribute to the competitive strategy of an airline operating in a deregulated market. The fourth chapter evaluates the competitive position of Alitalia and proposes some strategic and operating guidelines that the company should implement, if it wants to survive in the deregulated European market. One of the most important changes to be implemented is the development of a Yield Management System. Regardless of what competitive strategy will be pursued by Alitalia, yield management is a necessary instrument to generate cash flows required for investment plans (in the case of a merger with another airline), or to target effectively the different market segments (in the case of a niche strategy). The fifth chapter provides Alitalia with a framework to evaluate the economic impact of the investment, as a function of some operating parameters. The sixth chapter provides the final recommendations.

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Introduction

Yield management has been an important competitive factor in the evolution of the U.S. airline industry after 1978 deregulation. Several airlines, including People Express, were forced to bankruptcy because they did not adopt a Yield Management System, and they could not effectively compete on a market basis. The purpose of this thesis is to analyze how yield management could become a competitive factor in another important market which is currently deregulating: the intra-European market. In particular, this thesis addresses the strategic reasons for Alitalia (the largest Italian airline) to invest in this technology, and it develops an evaluation model to analyze the potential benefits of the system.

The first chapter explains what is Yield Management, why it can positively affect the economic performance of an airline, and how Yield Management techniques have been implemented by the major airlines. The second chapter examines the evolution of competition in the European airline industry with the forthcoming deregulation. The changes in the regulatory environment that will take place in Europe in the next four years will alter the way the major carriers compete. A reference point for this kind of analysis is to look at the evolution of competition in the U.S. domestic market after 1978 deregulation. The third chapter analyzes how yield management can contribute to the competitive strategy of an airline operating in a deregulated market. The fourth chapter evaluates the competitive position of Alitalia and proposes some strategic and operating guidelines that the company should implement, if it wants to survive in the deregulated European market. One of the most important changes to be implemented is the development of a Yield Management System. Regardless of what competitive strategy will be pursued by Alitalia, yield management is a necessary instrument to generate cash flows required for investment plans (in the case of a merger with another airline), or to target effectively the different market

segments (in the case of a niche strategy). The fifth chapter provides Alitalia with a framework to evaluate the economic impact of the investment, as a function of some operating parameters. The sixth chapter provides the final recommendations.

Chapter 1
Yield Management in the Airline Industry

The need to develop mathematical models that can maximize the expected revenue of a certain flight comes from the intrinsic nature of the airline business. Airlines sell their product in the form of a seat on a scheduled flight from one point to another at a specified time in the future. However, as in the case of other products in the service industry, airline product is characterized by the following features [1]:

- The airline is working with a relatively fixed capacity;
- The product is sold in advance;
- Demand fluctuates substantially;
- Identical units of product can be sold in different ways according to different purchase conditions and complementary goods associated to the product;
- To some customers, the value of the unsold product (i.e. an empty seat) increases over time, as the desired departure time approaches;
- The product is completely perishable, since the unsold seat cannot be sold at any price after the aircraft departs.

For many years, airlines tried unsuccessfully to reduce the number of unsold seats by stimulating demand with discounted fares, while striving to keep the original full-fare traffic bases. As a matter of fact, many airlines have alternatively tried to maximize *yield* (i.e. revenue per passenger-mile of traffic carried), or *load factor* (i.e. number of seats actually sold over supplied capacity). The existence of a trade-off between those two aggregate performance measures (the higher the yield, the higher the average fare, the lower the number of seats sold, the lower the load factor) has often brought unsatisfactory economic results. Furthermore, with the emergence of *differential pricing* of seats that can

share a common aircraft cabin, the problem of maximizing revenues by selling the right seat at the right price at the right time has also emerged.

The purpose of this Chapter is to explain what is Yield Management, why it can positively affect the economic performance of an airline, and how Yield Management techniques have been implemented by the major airlines. The first section of this Chapter provides some formal definition of terms that will be widely used in this thesis. The second section explains the economic rationale of differential pricing and market segmentation. The development of this pricing practices has been the major cause of the development of Yield Management techniques. The third section gives a brief overview of the different mathematical approaches that have been developed. The fourth section examines the architecture of an Information System that implements the aforementioned mathematical models.

1.1 Definition of Yield Management

As mentioned earlier, airlines are widely adopting differential pricing as a marketing strategy. This policy is a direct consequence of the progressive deregulation in the industry which, by increasing the availability of discounted fares, has stimulated new demand. Differential pricing allows airlines to segment the air travel market. The most common method for an airline to segment its passengers is by offering several fare products. For the same seat in the coach cabin one can pay even 10 different prices for the same on board service.

As a matter of fact, the effective use of differential pricing is related to the ability of dividing the total demand into distinct market segments[2]. Airlines segment the market by differentiating fare products according to:

- Restrictions on the use of the ticket (advanced purchase, minimum and maximum stay, penalty on changing tickets, non-refundable tickets);
- Service amenities on the ground and on-board.

Passengers who belong to different market demand segments will place different values on each of these attributes of the fare product, and, therefore, will be willing to pay a different price. Furthermore, by imposing restrictions on fare products, airlines ensure that only the leisure travel segment purchases low-priced products and prevent the diversion of demand from higher fare levels. We must here remark that selling all the available seats at the lowest available fare (i.e. maximizing load factor) is not necessarily a desirable policy. As long as there are different fare products for the same seat, some empty seats must be protected to provide a "buffer" to accommodate potential high-fare passengers who change their travel plans at the last minute. Airlines must thus optimize their marketing policy by assigning capacity to the different fare products.

Yield Management (or *Revenue Management*) is the process of maximizing total passenger revenues on a flight by flight basis. It involves two distinct strategic components:

- Pricing different fare products through restrictions and amenities;
- Seat inventory control to limit the number of seats that are sold in lower revenue fare classes.

It should be noted that the term "Yield Management" is somewhat misleading, since revenue rather than yield should be maximized[3]. A more appropriate name should be

passenger revenue management, or simply seat inventory control, since pricing policies are dictated by the behavior of other airlines and the industry as a whole.

1.2 Economic Rationale of Differential Pricing

The economic reasons behind differential pricing, and therefore Yield Management, can be explained through a basic micro-economic analysis[4]. The airline industry is characterized by a large proportion of fixed operating costs. As a matter of fact, in the short run, when a flight has been scheduled, most of operating costs (fuel, crew and cabin attendant, landing fees, etc.) can be considered fixed. Therefore, the marginal cost (MC) of carrying an additional passenger is very low (the incremental activities are limited to additional reservation, baggage handling and meal service). The marginal profit ($M\prod$) of carrying an additional passenger is, therefore, almost equal to the marginal revenue (MR), which, in turn, is equal to the price. More formally:

$$MC \approx 0 \text{ implies } M\prod \approx MR = P \qquad (1)$$

According to micro-economic theory, it is convenient to supply additional product as long as marginal revenues exceed marginal costs, because it will contribute to the fixed costs of the flight. In this case, since marginal costs are very low, prices much lower than full-fare can be charged to attract incremental demand and increase total profit. It would be perfectly rational, from an economic standpoint, for an airline to charge $20 for a seat which is sure to remain unsold in a transcontinental flight. With this logic, total profit is maximized when MP = MC, where MP represents the "marginal" price that the incremental passenger is willing to pay.

However, assuming that there is a single class of service, that variable operating costs per passenger are constant and independent of the number carried (V), it might be that a single price charged for all seats based strictly on marginal costs will not cover the total operating costs of the flight[5]. We assume that for a single aircraft flight, with a capacity of Q identical seats, the demand for seats, q, is a linear function of the price asked per seat, P:

$$P = P_0 - aq, \quad \text{where } a > 0. \tag{2}$$

If the airline applies a single-price strategy at price p, the total revenue for the flight will be pq. Assuming that the fixed operating cost of the flight is FC, the total cost per flight is:

$$TC = FC + Vq. \tag{3}$$

The profit per flight, for a given level of demand (q seats), is:

$$\Pi = TR - TC = pq - (FC + Vq) = (P_0 - V)\, q - aq^2 - FC. \tag{4}$$

Profit is maximized for q such that $d\Pi / dq = 0$:

$$\frac{d\Pi}{dq} = (P_0 - V) - 2aq = 0, \qquad \text{hence } q^* = \frac{P_0 - V}{2a} \tag{5}$$

The optimal price, p^* is found from q^* and (2):

$$p^* = P_0 - aq = P_0 - a\frac{P_0 - V}{2a} = \frac{P_0 + V}{2} \tag{6}$$

Therefore, the maximum flight profit Π^* is:

$$\Pi^* = \frac{(P_0 - V)^2}{4a} - FC. \qquad (7)$$

The optimal q^* and p^* ensure that marginal cost is never higher than marginal revenue. However, we can note from (7) that, even in the best possible case ($q^* < Q$) when the capacity constraint is satisfied and the optimal supply can be performed, the optimal profit Π^* can be negative (for example if $P_0 = V$, and $FC > 0$). Figure 1 illustrates this, since the demand curve was drawn below the total cost per passenger curve to illustrate a case where no one price (P_4) can generate total revenues to cover total flight operating costs.

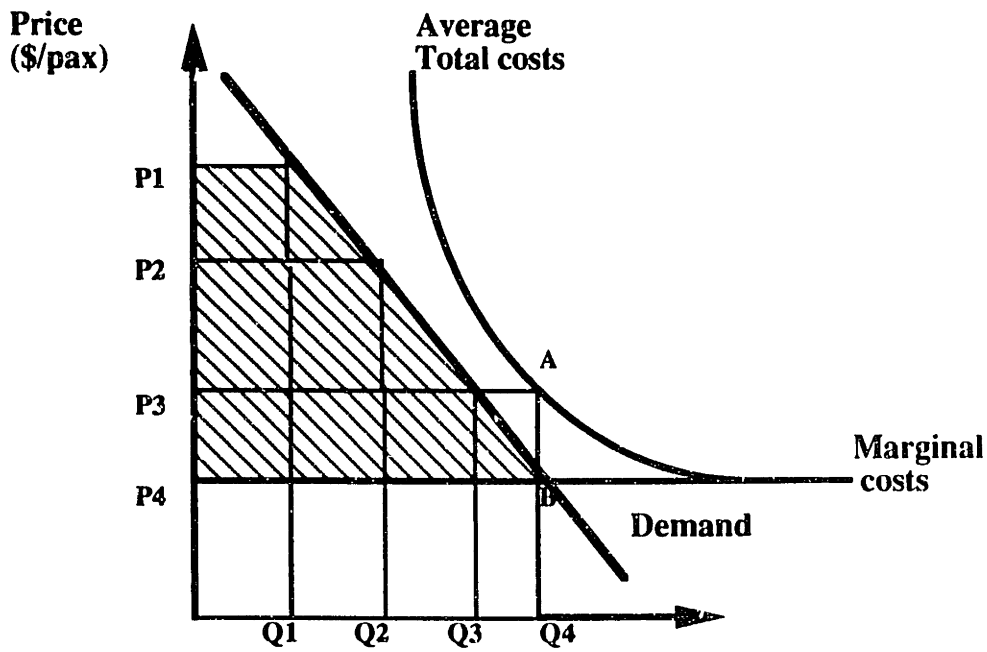

Figure 1: Differential pricing of airline seats: economic rationale*

Figure 1 also shows how differential pricing can enable the firm to cover total costs with total revenues, whereas strict marginal cost pricing would not. If price is set equal to marginal costs, and applied to all passengers, then Q_4 passengers will be carried, and the

* Source: Peter Belobaba, "Airline Travel Demand and Airline Seat Inventory Management", Flight Transportation Laboratory, MIT, Cambridge, Massachusetts 1987

total revenue will be the area of OQ_4BP_4. On the other hand, total operating costs are equal to the area of OQ_4AP_3, resulting in an operating loss equal to the area of P_4BAP_3. By charging different fares for different products, instead, an airline can increase its total operating revenues by capturing part of the consumer surplus. *Consumer surplus* is defined as the difference between what a consumer is willing to pay for a good and what he actually pays. To calculate the aggregate consumer surplus in a market, we simply calculate the area below the market demand curve and above the price line (shaded area in figure 1). With differential pricing, airlines can charge different segments of passengers what they are willing to pay for that service. As a result Q_1 passengers would pay P_1, Q_2 -Q_1 passengers would pay P_2, and so on. The total revenue is in this case the sum of the area of rectangles $Q_1 P_1$, $(Q_2 - Q_1)Q_1$, etc. In the case of infinite product fares, total revenues would be equal to the area below the market demand curve. The analysis shows that by segmenting the market and using differential pricing, airlines can reduce consumer surplus almost to zero (in the case of perfect differential pricing with infinite different fare classes) and increase their total operating revenues.

It should also be noted that, since airline markets are oligopolistic in most cases, differential pricing is economically desirable, since it can stimulate additional demand:

- The costs of taking an additional passenger are significantly lower than the average total costs per passenger;
- Incremental demand can be stimulated with lower prices;
- The additional demand segment is sufficiently elastic that reduced fares increase total revenues by more than the increase in total costs.

1.3 Mathematical Models for Yield Management

The objective of Yield Management (or Seat Inventory Control) as an optimization problem is revenue maximization. As mentioned above, too great an emphasis on yield can constrain low-fare demand and reduce potential revenues. Too great an emphasis on load factors can result in denial of high-fare demand and a loss of potential revenue. Yield Management models vary in sophistication, and they can be described with the following four characteristics[6]:

- Deterministic vs. stochastic: Deterministic models assume future demand for each fare class is known with certainty. Because of this simplifying assumption, deterministic models are usually easier to solve, but the failure to take into account uncertainty can lead to over-estimated demand and revenues. Probabilistic models, instead, use expected distributions of future demand to incorporate the probability of achieving each level of demand directly into the optimization process. Generally, in the airline industry, demand is assumed to follow a normal distribution.
- Static vs. dynamic: Static optimization models determine the optimal booking limits before departure, based on preliminary forecasts of future demand in each class of the flight. No further revision is done to take into account the actual booking pattern. Dynamic models revise the optimal booking limit on the basis of additional information coming from actual bookings, and improved forecasts of total demand of the flight. When addressing the dynamic problem, the value of accepting a current reservation relative to the decrease in expected total revenue from removing one item from the available inventory of the service can be evaluated.
- Distinct vs. nested classes: Fare classes within the shared fixed capacity can be considered to be either distinct or nested. Distinct fare classes provide separate inventories of seats for each fare class. For example, an airline might decide to sell 20

full-fare coach seats, 20 super-saver seats, and 20 max saver-seats. The concept of distinct fare classes is related to the classic aircraft design problem of where to locate partitions between classes, although in the case of Yield Management all capacity is shared. The booking limits for each class must sum to the aircraft capacity. This type of system sets aside a fixed amount of seats for each fare class and does not allow for the allocation of unsold lower-price seats to higher-paying passengers. With a nested system, on the other hand, a high-fare request will not be refused if inventory is available at a lower fare. Booking limits are binding for the lower fare class. For example (Figure 2), consider the hypothetical case of a 100 seat aircraft with four fare classes (ranked from highest fare to lowest fare). The maximum number of seats which could be sold at the highest fare class (1) is 100. This is referred to as the *booking limit.* After looking at relative price and demand, management might decide to protect at least 20 seats for this class. This is referred as the *nested protection level* . Next, if management wanted to determine the booking limit for class 2 passengers, the nested protection level of class 1 passengers would be subtracted from the booking limit for that class (100 - 20) and 80 seats would be the maximum number of seats which should be ever be booked for class 2, including class 3 and 4. The logic continues for all other fare classes.

- Single-leg vs. multi-leg: Some models exert control only on a single flight-leg basis. Thus if a passenger wants to travel from A to C, but must travel on two legs A-B and B-C, the itinerary is treated as two individual trips. The limit of this model stands in the arbitrary allocation of the expected revenue between the two individual flight-legs. Multi-leg models, instead, use mathematical programming approaches to control individual origin-destination itineraries. The objective is to maximize expected revenues over an airline's entire network of routes. This type of modeling allows, on one hand, better results, especially in the case of hub and spoke networks where origin-destination itineraries are usually composed of many connecting flights, but, on the other hand, significantly increase the computational complexity of the model.

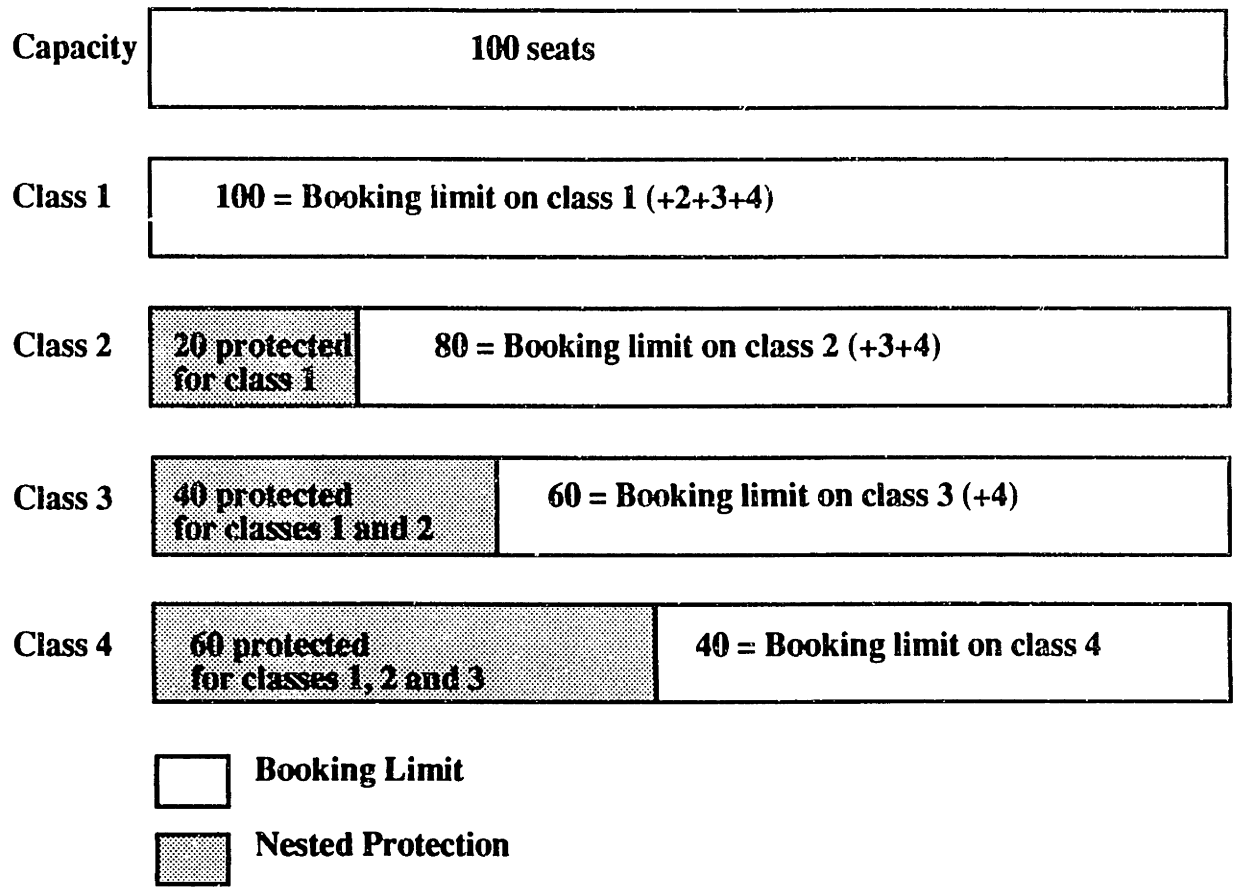

Figure 2: Booking limits in a Nested Reservation System*

The scope of this thesis does not include a detailed analysis of the different mathematical approaches (see [7, 8] for reference). However, most of the implemented versions of Yield Management models follow the expected marginal seat revenue (EMSR) approach developed by Belobaba. The objective of the model is to incorporate probabilistic demand into a seat inventory control method that could be applied to multiple fare classes in a nested reservation system. In the nested problem, the seat inventory problem is "to determine how many seats *not to sell* in the lowest fare classes and to retain for possible sales in higher fare classes closer to the departure day"[1]. The model is directed at finding protection levels for higher fare classes which they can be converted into booking limits for

* Source: Peter Belobaba, "Development of Airline Revenue Management", Flight Transportation Laboratory, MIT, Cambridge, Massachusetts 1991

lower fare classes. An airline should protect a certain number of seats for potential high fare demand, to the point at which the expected revenue from an additional protected high fare seat is equal to the actual fare level of the lower fare class. Demand is assumed to be normally distributed and demand densities for different fare classes are not correlated. The static EMSR approach has been applied to the dynamic problem by updating information over time. Additional information on requests at a given time are required, and basically the static model is applied repetitively over time with the revised input data. The model has also been applied in a multi-leg formulation[7]. The objective of this problem is to maximize revenue over the entire origin-destination network, subject to capacity constraints. Since EMSR is good with nested problems, but can handle only legs, and mathematical programming can handle multiple origin-destinations and side constraints, but cannot include nesting, a combination of the two approaches is proposed by Curry.

1.4 Architecture of Yield Management Systems

An airline Yield Management System must work in tandem with the airline Computer Reservation System (CRS). The typical present-day seat inventory control system is an off line system which obtains data from its reservation system and makes recommendations for CRS settings. Thus it is important that the Yield Management System recognize the constraints of the reservation system, as well as other (internal and external) constraints. The architecture of a Yield Management System reflects the level of sophistication of the system. A general architecture of a Yield Management System is presented in Figure 3.

- Input data: For each flight, the model takes as input the revenue data by fare class, the historical reservation data by fare class, the actual bookings by fare class (from CRS), and the historical no-show data by fare class.

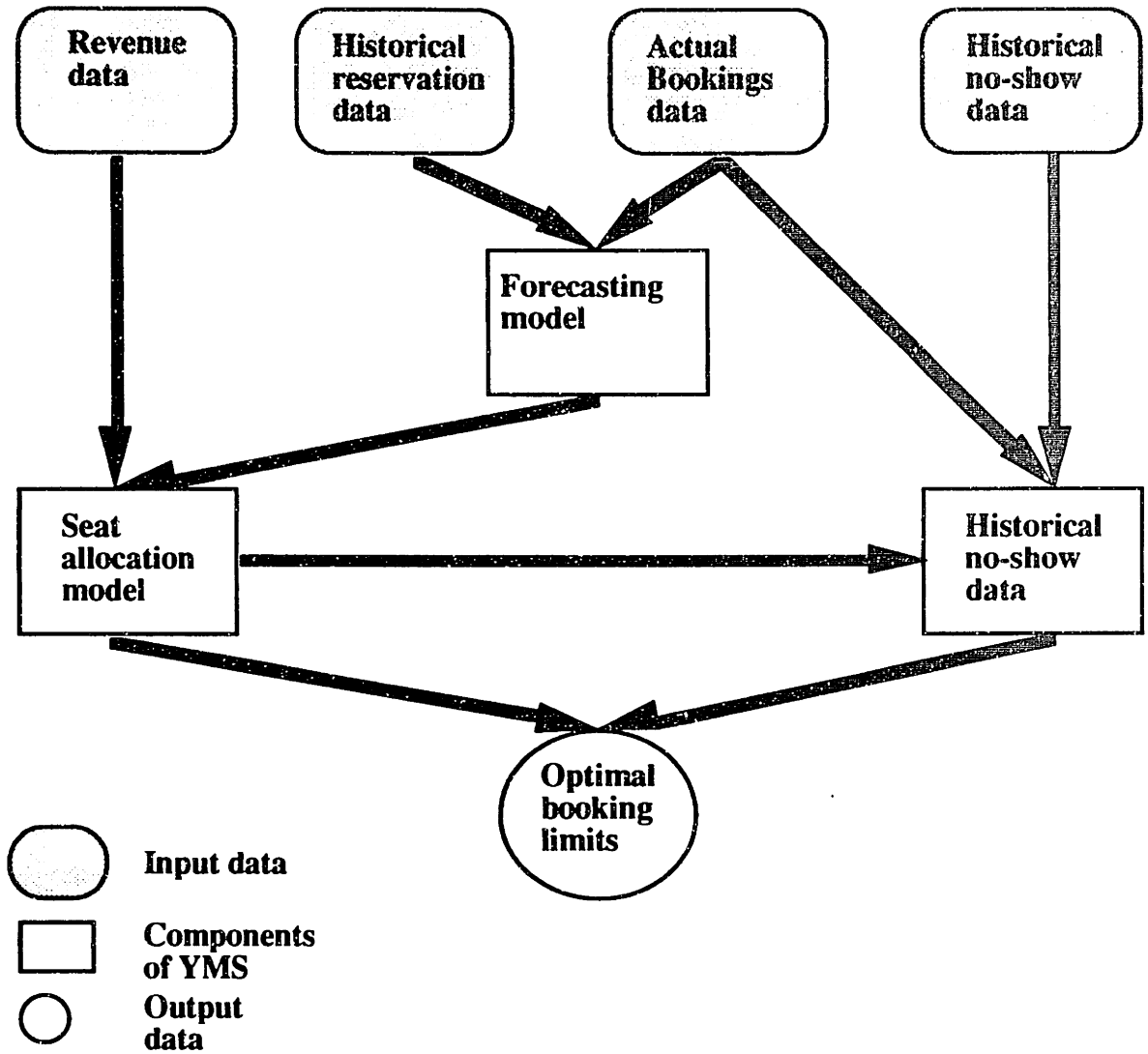

Figure 3: Architecture of a Yield Management System*

- Components of Yield Management System: The first component of the system is a *Reservation Forecasting Model.* This model receives historical and actual reservation data and produces estimates of expected future bookings on the basis of relationships between historical booking rates, actual booking on hand and trend/seasonal/day of the week variation. Forecast demand and revenue inputs are then used by the *Seat Allocation Model* (or Revenue Optimization Model) to find the optimal booking limits on each fare

* Source: Peter Belobaba, "Development of Airline Revenue Management", Flight Transportation Laboratory, MIT, Cambridge, Massachusetts 1991

class. A dynamic version of this model incorporates actual and historical booking rates into the booking limit calculations. The *Overbooking Model* adjusts the recommended protection levels and booking limits, provided by the Seat Allocation Model, by accounting for different no-show behavior among fare classes (no-show rate measure the number of passengers who fail to appear at departure time), as well as cancellations before departure day. This model also takes into account airline corporate policies in controlling denied boardings, minimizing spoilage and managing class upgrades. These three components of Yield Management System must be integrated both with each other and with the data retrieval, database management, and booking level monitoring functions.

- Output data: The system recommends specific fare class booking limits. Airline analysts can review the limits recommended by the system to adjust for different assumptions (e.g. if the last Thursday of November is Thanksgiving Day) and different input data values.

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Chapter 2
Competing in the Deregulated European Airline Industry

This Chapter examines the evolution of competition in the European airline industry with the forthcoming deregulation. The changes in the regulatory environment that will take place in Europe in the next four years will alter the way the major carriers compete. A reference point for this kind of analysis is to look at the evolution of competition in the U.S. domestic market after 1978 deregulation. The first section analyzes the competitive strategies adopted by the major U.S. carriers in response to the 1978 deregulation. All the major airlines have succeeded in creating barriers to entry by controlling scarce resources (like airport slots) and by exploiting economies of density through the hub and spoke network configuration. Airlines have also used information technology to create privileged distribution channels with the clients by implementing CRS, and they have achieved strategic marketing flexibility by developing YMS. The second section analyzes the structure of the European airline industry, by describing the major differences with the U.S. case, and by evaluating the performance of the eight major European carriers. The third section describes the deregulation pattern that is currently involving the European airline industry, and analyzes the effects that deregulation will have on future competition. The fourth section examines the strategies of growth that have been undertaken by the eight major European carriers in preparation for 1997 complete deregulation. Almost all the major airlines are involved in a massive acquisition program to strengthen their position and achieve economies of scale. Finally, the fifth section evaluates the strategic options available to the major carriers. Most of the airlines must cut labor cost and target more specifically the different segments of the market, especially the leisure segment where charters have a significant share.

2.1 Fundamental Economics of the Airline Industry

The airline industry has been widely analyzed by academic economists; those studies were a significant force in the movement towards deregulation in the U.S. domestic market in the early 1970s. Over the 15 years since deregulation, economists have continued intensive study of the industry, in part because of the unusual availability of reliable firm and transaction level data, and in part because of the rare opportunity to observe an industry as it evolves from strict economic regulation to fairly unimpeded competition and strategic behavior. The focus of economists is now shifting from the U.S. domestic market to the intra-European market. The objective of those studies is to predict, based on the evolution of the US market in the post-deregulation era, how the European airline industry will emerge from the progressive deregulation of the European market, and how certain negative aspects of the US deregulation (traffic congestion, bankruptcies) can be avoided.

For many economists, a cornerstone of support for airline deregulation was contestability theory, the reliance on the disciplining effect of potential competition[1]. This theory claims that competition in a market is neither dependent on the number of competitors nor on the internality of such competition (therefore, perfect competition is a particular case of contestability). Contestability assumes that firms, external to the market, may represent a potential threat to the firms that are currently competing in the market, and, therefore, induce them to behave according to the perfect competition theory. The necessary conditions regard entry and exit from the market:

- Market entry is free (no barriers to entry): Therefore a new entrant can replace an existing monopolist if he is not cost efficient;
- Market entry is absolute: The new entrant can enter into the market before the existing firm changes its price;

- Market exit is free (i.e. no sunk costs).

Deregulation supporters thought that contestability theory was applicable to the airline industry: aircraft were easily purchased, so no sunk costs, fare structures were extremely rigid, free entry was ensured by the availability of common resources, like airport gates and landing rights. Therefore, in their opinion, the market should have evolved toward increased competition with a growing number of firms in the market. The result was quite different from the expectations. Many studies have found that the number of airlines competing on a route has a significant effect on the price level. As a matter of fact, most of the pre-existing carriers adopted policies aimed at creating barriers to entry and to exit such as:

- Development of hub and spoke network configuration: This route configuration allows airlines to exploit economies of density and of scope. All major airlines now have one or more hubs at which many of their long distance passengers change planes. This approach has allowed carriers to fill a higher proportion of the seats on their aircraft, to increase flight frequency on nonstop routes between their hubs and other airports, and to use larger aircraft which have lower unit operating costs;
- Creation of information and transaction asymmetry costs: An existing carrier can count on brand loyalty of its customers which can be increased by marketing tools like frequent flyer programs and travel agent commission override programs. On the other hand, a new entrant must incur relevant advertising expenses (sunk costs) to build awareness among customers;
- Adoption of real time pricing capabilities: The availability of Computer Reservation Systems and Yield Management Systems, that are usually too expensive to be implemented by small carriers, is an important advantage in terms of pricing flexibility. Furthermore, CRS allows an incumbent to respond in price and quantity as quickly as a

new competitor can enter, then the incumbent has little incentive to respond in advance of actual entry by lowering prices;

- Control over scarce resources: The hub and spoke network is not only a source of increased production efficiency, but it is also associated with airport concentration and dominance of a hub airport by one airline. This airport dominance ensures a degree of protection from competition and control over price, and it has significantly altered airlines' strategies in the deregulated industry.

As a result, the U.S. domestic airline market is evolving to an increasingly concentrated structure. That may be the inevitable result of network economies, or of the development of marketing devices that give strategic advantages to larger firms and incumbents operating in a hub and spoke system. The lessons learned from the U.S. deregulation experience will be extremely valuable to the European airline industry which is facing a period of decreasing regulation and increased competitive pressure.

2.2 Structure of the European Airline Industry

The competitive environment in the European airline industry is substantially different from that in the U.S. To understand the impact of deregulation on the European airline industry and to see if some lessons from U.S. deregulation are applicable, one must first realize the differences between the European situation and the U.S. situation before deregulation. The factors determining this difference are:

- Geographical and historical factors: The distance between the biggest European markets is significantly shorter than that of the US markets. Furthermore, the existence of substitute transportation systems (high speed trains, highways, etc.), often subsidized by the local governments, has limited the growth of the market;

- Military control of routes: Many routes are controlled by military, and they are not available for commercial traffic. The limited availability of intra-European routes has caused problems of congestion. This has significantly affected competition in the intra-European market, since it has limited the free access of new carriers in the industry;
- Competition from non scheduled carriers: Given the relevant seasonal demand (mainly in the North-South direction) from leisure passengers, regular scheduled carriers are subject to the competition of non scheduled carriers (charter) that benefit from a less restrictive regulation with regard to price and service. Charter traffic represents almost 50% of the total intra-European traffic[2]. Charters can be compared with the low cost-no frills airlines (such as People Express) that emerged in the U.S. after deregulation;
- Market fragmentation: The fact that almost every European country has one national carrier contributes to make the European airline industry much more fragmented than that of the U.S. (prior to deregulation). Considering the importance of scale in competition after deregulation in the U.S., greater market fragmentation implies that large European airlines will not share the advantage held by large U.S. airlines upon market deregulation;
- European airlines as flag carriers: All the major European airlines are fully or substantially under the control of domestic governments (with the exception of British Airways and KLM which were recently privatized) which usually subsidize their flag carriers to prevent them from failing (usually for national pride, employment policy, etc.). Furthermore, regulations in most European countries have allowed only one international carrier for each country. As a consequence these carriers usually control other domestic or charter carriers and hold a monopolistic power in the domestic traffic.

It is difficult to conduct a quantitative analysis of the different airlines in Europe. First due to regulation, it is difficult to measure the performance of an airline in terms of market share and profit. Second due to the ambiguity of the definition of the airline product, it is difficult to measure the performance of an airline in terms of output (number

of passenger carried, number of passenger-kilometers carried, passenger revenues can all be used as different output measures with different results). Third, differences in accounting procedures in different European countries and foreign exchange fluctuations decrease the relevance of a comparison based on income statement or balance sheets. Nevertheless, a brief comparative survey of the eight major airlines is included below to provide a basis of understanding the competitive environment of the industry. Table 1 summarizes the scheduled airlines in Europe in 1991. This section considers a group of eight airlines which represent the primary international scheduled airlines in Europe (with more that 15 million passenger-kilometers performed in 1991). We will consider the trends over a period from 1987 to 1991.

Airline	Total RPK (million 1991)	Market share percentage	Intra-Europe passengers (million 1991)	Market share percentage
1 British Airways	62803	21.5%	12.2	17.0%
2 Lufthansa	42915	14.7%	9.5	13.3%
3 Air France	33709	11.6%	7.7	10.8%
4 KLM	27278	9.4%	3.5	4.9%
5 Iberia	20472	7.0%	5.8	8.1%
6 Alitalia	18921	6.5%	5.1	7.1%
7 SAS	15449	5.3%	7.3	10.2%
8 Swissair	15099	5.2%	5.1	7.1%
9 Sabena	11805	4.0%	2.1	2.9%
10 Olympic	7764	2.7%	1.6	2.2%
11 TAP	6835	2.3%	1.6	2.2%
12 UTA	6103	2.1%	0	0.0%
13 JAT	5383	1.8%	1.3	1.8%
14 Austrian Air	4717	1.6%	2	2.8%
15 Finnair	4709	1.6%	1.7	2.4%
16 Aer Lingus	3542	1.2%	3.2	4.5%
17 Malev	1994	0.7%	1.3	1.8%
18 Icelandair	1943	0.7%	0.2	0.3%
19 Luxair	140	0.0%	0.4	0.6%
Total	291581	100.0%	71.6	100.0%

Table 1: Primary international scheduled European airlines*

* Source: ICAO

Table 2 presents the relative market share and the percentage growth of eight European airlines - British Airways, Lufthansa, KLM, Alitalia, SAS, Swissair, Air France, Iberia - based on total passenger-kilometers performed by each airline from 1987 to 1991[3]. The first fact to notice is that the largest carriers (with the exception of Air France) are the ones which gained the greatest market share in the last four years. In other words, the industry is apparently concentrating, with the two major players (British Airways and Lufthansa) gaining more market share than anyone else.

	1987		1991		Growth
Airline	**RPK**	**%**	**RPK**	**%**	**1987-91**
British Airways	46253	23.96%	62803	26.61%	7.95%
Lufthansa	31755	16.45%	42915	18.18%	7.82%
KLM	21835	11.31%	27278	11.56%	5.72%
Alitalia	15343	7.95%	18291	7.75%	4.49%
SAS	13207	6.84%	15449	6.55%	4.00%
Swissair	13723	7.11%	15099	6.40%	2.42%
Air France	31550	16.34%	33709	14.28%	1.67%
Iberia	19402	10.05%	20472	8.67%	1.35%
Total	193068	100.00%	236016	100.00%	5.15%

Table 2: Market share and growth of major European airlines in 1987-1991 (total passenger traffic)*

Another way to look at the evolution of competition among these airlines is to concentrate on air traffic where the competition was most intense, that is, in the international market. Table 3 shows the relative market share and percentage growth for the eight airlines. The market trends are similar to these of Table 2. The two largest carriers (British Airways and Lufthansa) gained the most market share. It must be remarked, however, that British Airways closed a number of unprofitable routes and streamlined its operations in preparation for the privatization which occurred in 1987. It is therefore possible that some of the growth can be attributed to the expansionary strategy implemented

* Source: ICAO

after the privatization. In the same period, Air France lost more than 1.5% of market share, while Iberia shown a negative growth due to the restructuring of its international network.

Airline	1987 RPK	%	1991 RPK	%	Growth 1987-91
British Airways	44141	25.71%	60591	28.69%	8.24%
Lufthansa	29038	16.91%	38611	18.28%	7.38%
KLM	21831	12.71%	27276	12.92%	5.72%
SAS	10154	5.91%	12481	5.91%	5.29%
Alitalia	13532	7.88%	16233	7.69%	4.65%
Swissair	13519	7.87%	14902	7.06%	2.46%
Air France	24590	14.32%	26788	12.68%	2.16%
Iberia	14911	8.68%	14313	6.78%	-1.02%
Total	171716	100.00%	211195	100.00%	5.31%

Table 3: Market share and growth of major European airlines in 1987-1991 (international passenger traffic)*

Another way to look at competition among European airlines is to compare their operating results. Table 4 shows the load factor of total passenger traffic from 1987 to 1991. The first thing to notice is the remarkable difference in load factors achieved by the airlines; the most efficient airlines (British Airways, KLM) load factor was, on average, more than 7 percentage points higher than the less efficient airlines (Alitalia, Swissair).

	1987	1988	1989	1990	1991
British Airways	71.9%	69.6%	71.2%	71.7%	69.1%
Iberia	70.5%	70.8%	69.6%	69.3%	62.2%
Air France	69.6%	70.1%	70.5%	69.2%	66.8%
SAS	69.4%	67.0%	65.4%	64.6%	63.4%
KLM	68.9%	69.2%	71.6%	75.1%	71.6%
Lufthansa	66.5%	65.9%	66.2%	64.8%	61.5%
Alitalia	64.7%	63.9%	64.0%	64.6%	61.2%
Swissair	63.7%	63.6%	65.3%	65.1%	61.6%

Table 4: Load factor of major European airlines in 1987-1991 (total passenger traffic)*

* Source: ICAO
* Source: ICAO

If we analyze the data over the 1987-1990 period (1991 is not significant because of the contraction of international traffic due to the Gulf War), we notice that only KLM has been able to significantly improve its load factor, while SAS and Lufthansa show a considerable decrease.

If we focus our analysis of international traffic load factor (Table 5), we can express similar conclusions to those of Table 4. It is worth noting, however, that only four carriers (British Airways, Lufthansa, Alitalia and Swissair) achieved international load factors higher than their overall system load factors. For two of them (British Airways and Lufthansa) this is a proof of their ability to operate as effective competitors in the international market. They were able to achieve higher load factors in the international market, where competition is more fierce, than those in the domestic market where airlines usually benefit from monopoly power. For three carriers (Air France, Iberia and SAS), instead, total load factor is higher than the international load factor. This means that these carriers achieved higher load factors in the domestic routes where they benefitted from monopoly treatment. The competitive position of these carriers could significantly weaken in the future with the total elimination of any form of protection on domestic traffic.

	1987	1988	1989	1990	1991
British Airways	72.3%	69.9%	71.6%	72.1%	69.6%
SAS	69.5%	67.1%	65.3%	64.3%	62.9%
KLM	68.9%	69.2%	71.7%	75.1%	71.6%
Iberia	68.9%	70.4%	69.0%	68.7%	60.9%
Air France	68.0%	68.9%	69.6%	68.4%	65.5%
Lufthansa	66.9%	66.5%	67.0%	65.3%	61.9%
Alitalia	64.7%	64.1%	65.1%	65.0%	61.8%
Swissair	64.0%	63.9%	65.6%	65.4%	61.8%

Table 5: Load factor of major European airlines in 1987-1991 (international passenger traffic)*

* Source: ICAO

2.3 Changes in the European Regulatory Pattern

Traditionally in Europe, routes between two countries are operated only by the airlines of those two countries Prices, capacity and frequency are determined by the carriers operating those flights and the countries' national aviation authorities. The fares of the two airlines are identical and the airlines operate on a pooling arrangement, that is, the airlines share all revenue from the route in proportion to capacity. Theoretically, this results in a situation where there is little competition between the two airlines where neither airline cares which passengers they carry.

However, in December 1987 the EC Council defined a number of measures which gradually liberalize the intra-European market. The main changes, which were applied since January 1 1989, concerned:

- The relaxation of tariff rules allowing an airline to set deeper discount fares;
- Limits on capacity agreements between member States (up to 60/40 division of the market);
- Facilitation of market access, in particular by extending fifth freedom rights (i.e. the possibility for an airline of Country A to carry traffic from Country B to Country C if the flight originates or terminates in Country A).

The second stage of the deregulation process occurred in January 1993. The new rules provide[4]:

- Complete freedom to set fares on intra-EC flights. Predatory pricing or abuse of monopoly power are not allowed;

- The cabotage freedom (i.e. the ability for an airline of Country A to carry traffic between any two destination in a foreign country) is limited for the next four years to "consecutive" or continuing flights that originate in the home country of the airline and restricts passenger load to 50% of the capacity on the cross-border section. In other words, Alitalia can fly from Munich to Berlin (if the flight took off from Italy) and assign 50% of the capacity to those passengers who are traveling on this flight leg within Germany.

The EC package also eliminated any remaining capacity-sharing agreements on routes between member states and fully implemented carriers' fifth freedom rights. Carriers are now free to operate point-to-point routes originating from a hub not in the domestic country. Governments will be allowed to subsidize airlines only on those regional routes where a public transportation service is required. The access to airport slots has been regulated[5] to allow new carriers to enter markets currently controlled by mega-carriers. The current congestion of European airports, in fact, is a serious barrier to entry in the industry. Deregulation will be completed in April 1997, when cabotage restrictions will be totally eliminated and any foreign carrier will be allowed to carry in the domestic traffic of another country.

The likely consequence of 1993 deregulation is the increase on competition in those routes where traffic is highest. Effective January 3, 1993, Lufthansa has lowered by 50% the excursion fares on all its routes to Scandinavia and Netherlands. SAS and KLM immediately matched the new fares. The new price battle seems the beginning of the war to achieve the control of the European market. All the major airlines are changing their competitive strategies, and it is reasonable to foresee that competition will evolve in a similar way to that of the American industry with lower fares in those markets where competition is most fierce[6]. The next two sections examine the recent developments in

competition in the European market, and the strategic options available to carriers for the next decade.

2.4 Recent Developments in Competitive Strategies

This section analyzes the growth patterns and the strategy of growth in the international market of the eight major European airlines. Figure 4 shows the relative market share for each of the eight carriers versus the growth rate of traffic (measured in Revenue-Passenger-Kilometers) in the 1983-1987 period. The analysis confirms that the European airline industry is facing a concentration trend. The larger carriers are the one which are growing faster, while the smaller grow at a slower rate and lose market share.

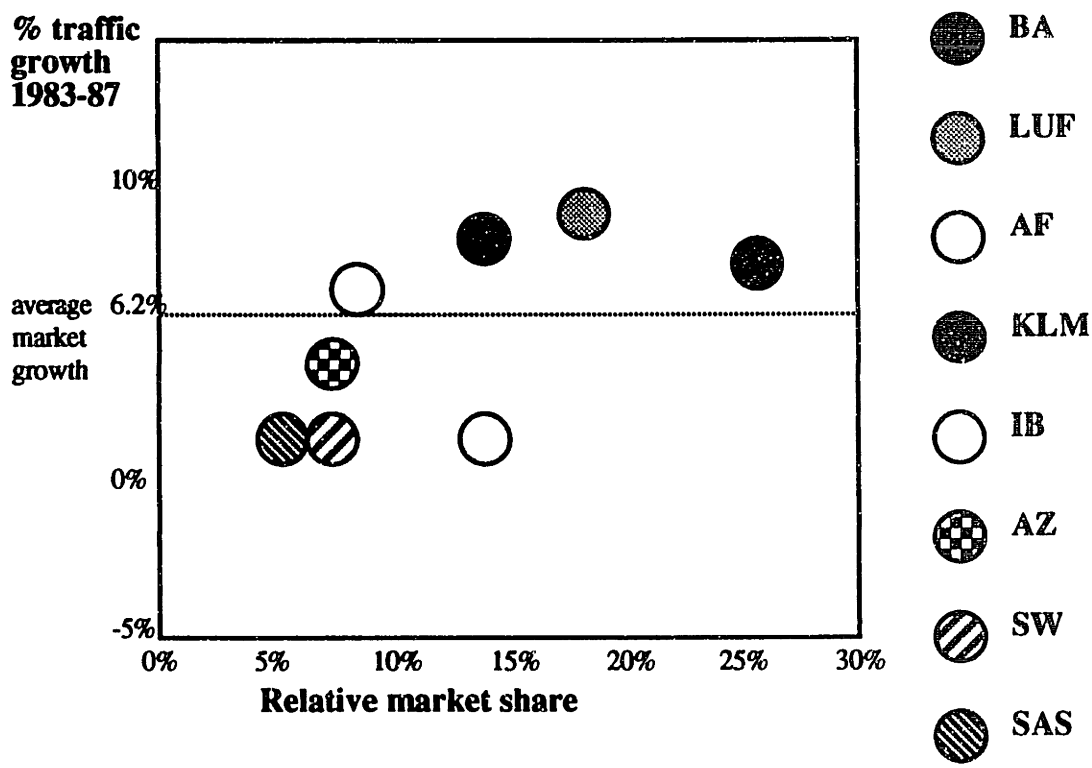


Figure 4: Market share and growth in international Passenger-Km for major European airlines in 1983-1987

The trend toward concentration in the European market has significantly increased in the 1987-1991 period. Figure 5 shows the relative market share for each of the eight carriers versus the growth rate in the 1987-1991 period. The alignment of the circles to the SW-NE diagonal shows the direct relation between relative market share and growth rate. It must be remarked, however, that Air France's figure does not take into account the acquisitions (Air Inter, UTA) that the French carrier has performed in the last four years. The inclusion of the acquisition effect would put Air France in a position similar to that of Lufthansa.

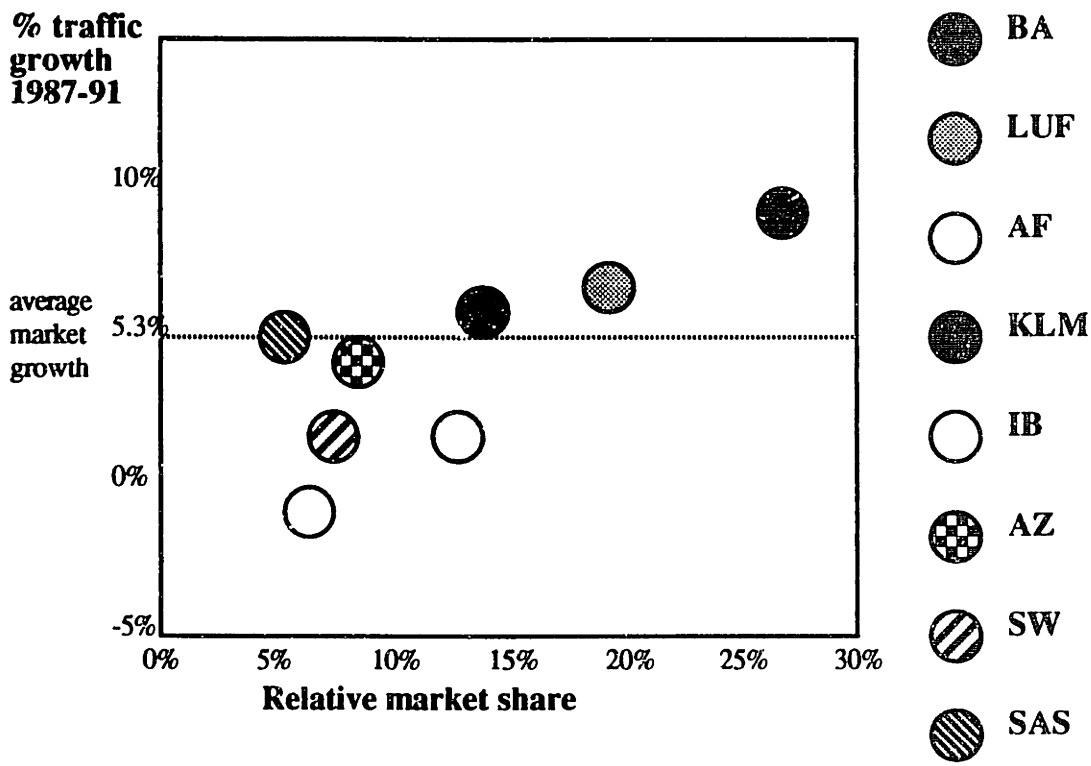


Figure 5: Market share and growth in international Passenger-Km for major European airlines in 1987-1991

Growth is not, per se, an indicator of superior operating performance. Even if there are significant economies of scale and of density in the production function of an airline, growth could be detrimental if it is obtained by an excessive increase in the supplied capacity. Figure 6 shows the growth rate versus the average load factor in the 1987-1991

period. British Airways and KLM, the only two carriers in the NE quadrant, achieved the best results with an average load factor above 70 percent and a growth rate above the industry average. British Airways's results, in particular, were remarkable because the carrier was able to have the highest growth rate without penalizing load factor. Lufthansa and SAS (SE quadrant), instead, achieved good growth rates with an average load factor below the industry average. This result was mainly due to the increase in the supplied capacity (both in terms of higher frequencies and new routes) that was higher than the increase in revenue-passenger-kilometers.

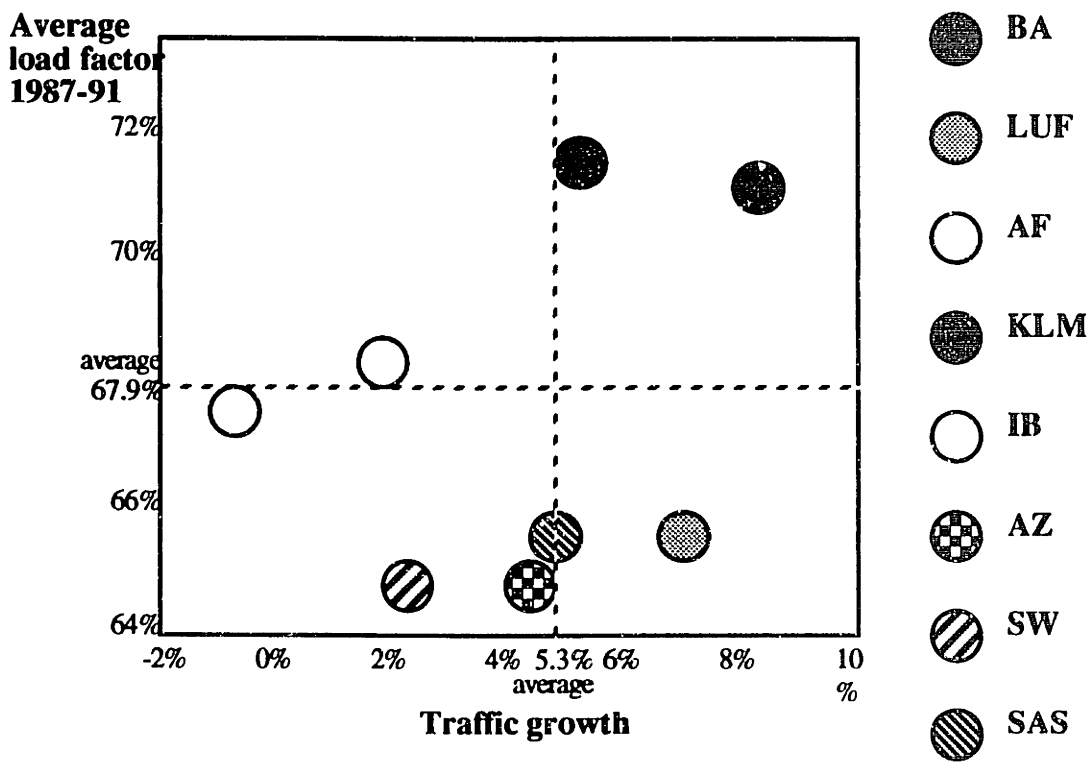
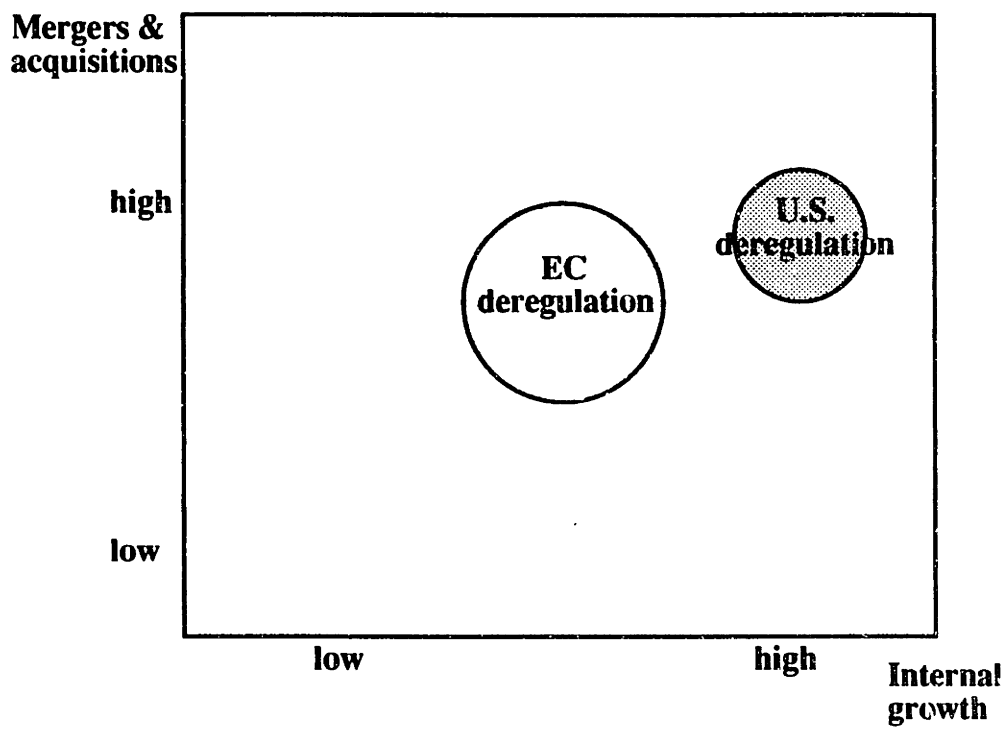


Figure 6: Average load factor and growth in international Passenger-Km for major European airlines in 1987-1991

One of the lessons of U.S. deregulation is the importance of scale in the airline industry. The airlines that took real advantage of deregulation are the ones that became mega-carriers. The airlines in the U.S. have grown either by mergers and acquisitions, or, internally, by lowering fares, stimulating traffic, or arranging the route network to divert

traffic from other airlines. Another way of growing, which has been widely used in the international market, is cooperation. Strategic alliances between airlines can be a powerful instrument of growth in the form of marketing alliances (for example in a frequent flyer program), or operating alliance (codesharing), or joint purchasing arrangements for aircraft, or even minority equity swaps.

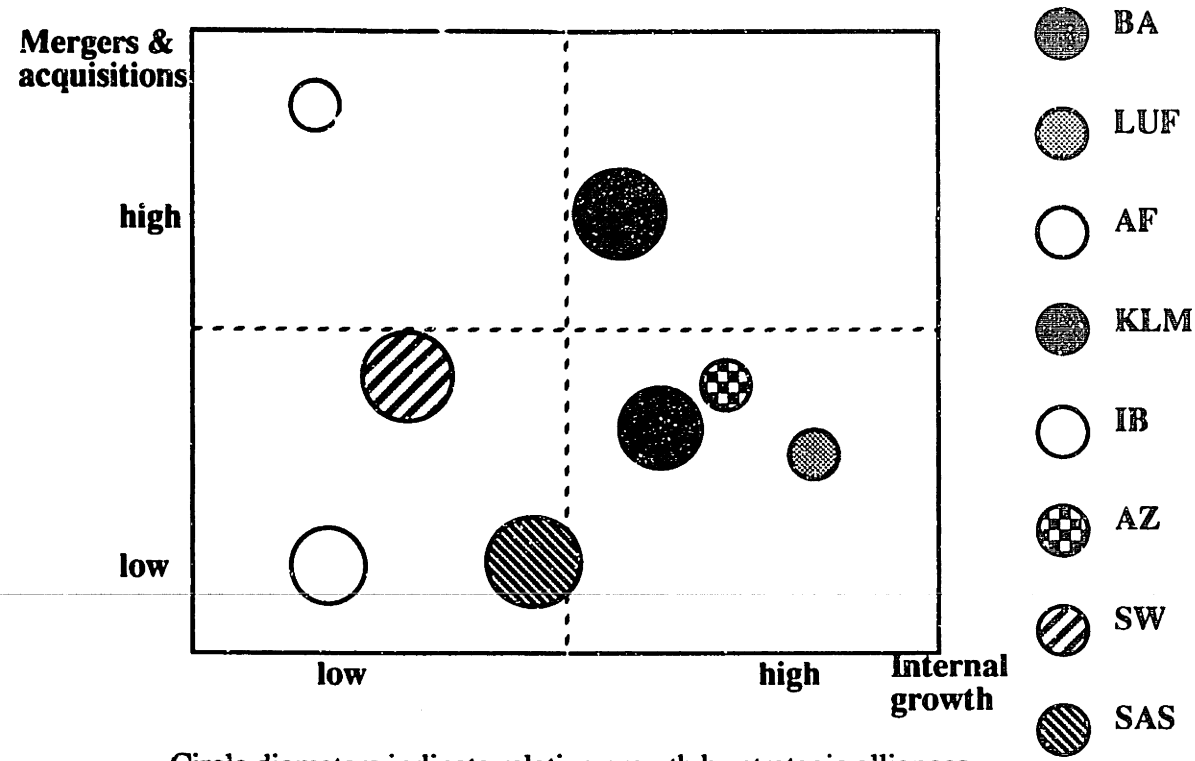
As illustrated in Figure 7, a company can grow along any one of the three dimensions of growth, internal, mergers and acquisitions and strategic alliances. The U.S. deregulation has seen companies grow mainly along two dimensions: internal growth (such as by Delta), and acquisitions (such as Continental).



Circle diameters indicate relative growth by strategic alliances

Figure 7: Conceptual picture of dimensions of growth in the airline industry

European deregulation, instead, has seen companies grow mainly along the three dimensions. Figure 8 provides a qualitative comparison of the growth strategies of the eight major carriers.



Circle diameters indicate relative growth by strategic alliances

Figure 8: Dimension of growth in the European airline industry

- Internal growth: In Europe, this strategy has been adopted by Lufthansa and Alitalia. A count of intra-Europe aircraft in service and on order indicated that Lufthansa and Alitalia are gaining in terms of medium-haul available capacity (Lufthansa climbed from third place to first by number of intra-Europe aircraft, while Alitalia jumped from fifth place to third). Both carriers are also building up new hub capacity (Berlin and Munich for Lufthansa, Milan and Turin for Alitalia) to expand both their fleet and capacity as soon as deregulation will be completed. Internal growth, however, has not proven to be particularly successful in the past in terms of capturing traffic from major competitors. Both Lufthansa and Alitalia, in fact, are among the worst performers in terms of international load factor.
- Growth by mergers and acquisitions: European airlines have invested massively in acquisitions in the last 6 years. Table 6 shows the acquisitions that have been performed

by the major European carriers since 1987. British Airways and Air France have been most active in the acquisition strategy, by expanding both in the domestic market (British Caledonian for British Airways, Air Inter for Air France) and in the international market (TAT and Dan Air for British Airways, UTA and CSA for Air France).

Acquiring carrier	Acquired carrier	Year	% of Capital
British Airways	British Caledonian	1987	100%
British Airways	Brymon Airways	1988	40%
British Airways	Birmingham European	1988	20%
British Airways	TAT	1992	49.9%
British Airways	Dan Air	1992	100%
British Airways	Delta Air	1992	49%
Swissair	Crossair	1988	34.8%
Swissair	Crossair	1991	10.9%
KLM	Air UK	1988	14.9%
KLM	Netherlines	1988	100%
KLM	Transavia	1989	40%
KLM	Transavia	1991	40%
KLM	Air Litoral	1991	35%
SAS	Airlines of Britain	1988	24.9%
SAS	Lyingflieg	1992	51%
SAS	Airlines of Britain	1992	15.1%
Air France	Alsavia	1989	14%
Air France	TAT	1989	35%
Air France	UTA	1990	54.6%
Air France	Air Inter	1990	34.8%
Air France	Aeromaritime	1990	100%
Air France	CSA	1991	40%
Air France	Sabena	1992	37.6%
Lufthansa	Interflug	1991	26.5%
Lufthansa	Luxair	1992	13%
Lufthansa	Aerolloyd	1992	100%
Alitalia	Malev	1992	35%

Table 6: Recent acquisitions in the European airline industry[7]

A more careful analysis of the acquisitions shows that the acquisition strategy of the European carriers has been substantially different from that of the U.S. carriers after deregulation. In the U.S. acquisitions have been mainly targeted to large airlines (Delta-

Western, Northwest-Republic) and they have often created mega-carriers, with weak cost structures and leveraged capital structures.

European carriers, instead, have been more careful in targeting their acquisitions. In the first stage, acquisitions have been limited to second-level airlines and charters. The scope was to reduce competition in the market by eliminating those carriers which could potentially compete in price in some selected intra-European destinations. Given the small dimension of most of the acquired airlines, this process of acquisitions has not created an excessive leverage in the acquirers' capital structures.

In the second stage, acquisitions have been targeted to expand the route network and achieve economies of scale by acquiring carriers with a strong network complementarity. This is the case of Alitalia-Malev and Air France-CSA acquisitions, where the acquiring company has significantly expanded its presence in that market where it was weaker (Eastern Europe), and where the acquired company was stronger. So far, except for the Air France-Sabena case, no acquisition was as large as those in the U.S. European airlines seem conscious of the potential dangers coming from excessively leveraging their capital structure because of large acquisitions;

- Growth by strategic alliances: In Europe, this strategy has been adopted by those carriers (SAS, KLM and Swissair) which cannot benefit from a considerable domestic market to sustain their market growth. In fact, the absence of a "protected" domestic market, which usually allows charging of monopoly fares and feeds international traffic, has forced those carriers to seek additional international traffic through a network of international alliances. As a result, the three carriers have acquired a minority ownership of U.S. carriers (SAS with Continental, KLM with Northwest, Swissair with Delta) and they have established marketing alliances through code-sharing and joint participation in frequent flyer programs.

Strategic alliances have not been extremely successful in the past. Marketing agreements are often difficult to implement, and cultural and managerial differences between the two

companies make this process even more difficult. Thus, it is very important that the alliance is set according to complementarity criteria. The two airlines must belong to different countries and have complementary route networks to gain the maximum benefit from a code-sharing agreement. This limits the number of strategic alliances that can be mutually beneficial. There is an advantage to the first mover to choose its partner and make a better deal. Airlines should also choose partners which offer products of the same type to increase their market share in the segment where they are already operating. An example of a potential successful alliance is the European Quality Alliance that SAS, Swissair, KLM and Austrian Airlines formed in 1988. The carriers have relatively small home markets, compared with some of their competitors, target the business segment, and have determined that strategic cooperation is necessary to meet their ambitions to offer a global route network.

2.5 Strategic Options Available

The current recession will be the last one of its type for Europe's airline industry. Future recessions will be much more severe, because they will take place in a fully deregulated environment, in which government aid for airline may prove impossible. With the exception of British Airways, the major European airlines have watched but not yet experienced the extremes of the deregulated recessionary environment. Before any merger or strategic alliance, each of the eight major carriers must address the two following problems:

- Reduce operating costs: Intra-Europe operating costs per available seat mile are considerably higher than the rest of the market (for example North Atlantic routes)[8]. These results partly reflect the economies of scale due to longer distances and traffic density., but also the lower level of competition between airlines in Europe. Labor and

other key cost components have not been reduced as was done by American carriers, which are now penetrating the European market because of their favorable cost structure. Most of the European airlines have tried, in the past, to reduce unit operating costs by increasing the rate of growth of traffic (and therefore by increasing productivity), rather than by making absolute reductions. This policy will not be possible in the future. The decreasing growth rate of traffic, the excess of capacity in the industry and the forecast fare reductions make it inevitable that costs will have to be reduced by eliminating redundancies.

- Increase revenues by specifically targeting different customer segments: The product supply in the intra-European market has been, in the past, quite undifferentiated. Most of domestic flights do not offer first class or business class fares, while only a small minority of international flights offer first class fares. On the other hand, in the leisure segment, the major carriers are facing a fierce competition from charters. European airlines are implementing strategies to increase revenues by specifically targeting the different customer segments[9]:

  To target the leisure segment: Major carriers must eliminate or reduce charter competition. Given that a considerable part of all intra-European traffic still flows on non-scheduled services, it seems that a prime source for market share shift comes from the non-affiliated charter carriers. Given an overall market that will grow slowly, if the major European carriers wish to expand faster they will have to gain market share from others. As already mentioned, part of the recent acquisitions in the industry are dictated by this reason. The major carriers are acquiring small charters to eliminate competition in the non-scheduled market. Similarly, the majors will have to become more aggressive and use their charter arms to gain substantial leisure-oriented market share.

  To target the business segment: Airlines must increase the brand loyalty of their passengers and, at the same time, diversify the product supply to charge business travelers the maximum they are willing to pay. The former point is already being

implemented through the introduction of frequent flier programs. The latter point, instead, is still far from execution. Airlines must differentiate their product supply in the domestic and intra-European flights by offering more fare classes for the same flight. Similarly, distribution channels have to be strengthened by participating in the development of a global Computer Reservation Systems, and revenue management has to be improved through the adoption of Yield Management Systems.

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Chapter 3
Yield Management Systems as Competitive Tools

Chapter 1 examined the economic rationale of differential pricing, which in turn represents the theoretical foundation of yield management, and described the operating usage of the Yield Management System. This Chapter analyzes how yield management can contribute to the competitive strategy of an airline operating in a deregulated market. The first section evaluates the strategic advantages of using Yield Management Systems as a support for decision making, and the managerial issues related to the usage of yield management by an airline. In many organizations, yield management represents a radical change in marketing procedures based on other evaluation techniques such as load factor and yield. Yield management implementation can be delayed by those groups which do not understand the new "marketing philosophy", or which are evaluated on a conflicting basis with yield management's objectives. Top management should be extremely careful to support the project, and to communicate to the organization the strategic relevance of this instrument. The second section deals specifically with the importance of yield management in a deregulated context. Yield management is an important instrument for growth in an environment characterized by constraints on the increase of supply, and it provides a hedge against pricing instability. The third section provides a brief list of the major European airlines that are employing yield management.

3.1 Pros and Cons of Using YMS to Support Strategic and Tactical Decision Making

A Yield Management System provides the tools an airline needs to lead the marketplace in structuring its product in terms of pricing and service, as well as reacting to the pricing policies of competitors. One can simulate many service and pricing options to

make decisions about the type of product to be provided in the market. Effective Yield Management Systems provide the airline with data that can be used for planning purposes. Possible strategic decisions that can evaluated by "what-if" analyses, based on Yield Management databases, include:

- Route network studies: Airlines are offering more and more connecting services using centrally located airports as hubs. Yield management can simulate the economic effect of changes in the network configuration, such as the substitution of a direct flight with a connecting flight through the hub.
- Frequency studies: Airlines can simulate what is the economic effect of increasing-decreasing frequency of service in a certain market. An increase in frequency is likely to create additional demand (market share in a market is a growing function of frequency share), and gives an airline the possibility to shift less time-sensitive demand (which is also usually more price sensitive and therefore books earlier) to less-full flights.
- Capacity studies: Airlines can simulate what is the economic effect of increasing-decreasing capacity by swapping aircrafts from contemporary flights. A similar analysis can be done to evaluate the effect of a movable curtain setting between two different fare classes on a same flight. Finally one can evaluate the impact of selecting a particular flight for cancellation.

Yield Management System can be used in a variety of ways to support tactic decision making. The possible uses that can be done is a short term context include:

- Group acceptance: Airlines must often deal with the reservation of groups of passengers, usually at a discounted fare. YMS can help in evaluating the impact of accepting a group at a certain price and, if unacceptable, which alternative flights or routings are available. It

is also possible, at any time, to compute the minimum acceptable price for a group of a given number of people;

- Marketplace modeling: Airlines often change their pricing policies to stimulate demand in a certain market (as it did American Airlines in the spring of 1992). Yield management, together with forecasting models, can help in assessing what is the optimal allocations to support the new pricing policies, and what is the expected impact of the new fare levels. It is also possible to evaluate the market or regional impact of a change in a forecast cycle.
- Price matching without price dilution: Price wars usually involve the use of deeply discounted fares to stimulate demand diversion in a specific market. Yield management allows the airline to match the pricing strategy of competitors by introducing in real time an additional fare class with the same characteristics of competitors' one. Furthermore, by optimally limiting the number of seats that are protected for superior fare classes, the airline can avoid any revenue dilution coming from the allocation of an excessive number of seats to the discounted fare class.

We have examined so far the strategic advantages that an airline can get from the use of YMS. However, yield management may give a firm a competitive edge, but it can also have other negative managerial implications:

- Loss of competitive focus: Since Yield Management Systems focus on maximizing revenues, airlines may develop an undue focus on short-term profits and ignore long-term profits which could result from managerial attention to strategic positioning and product development. The focus on efficient capacity use may take managerial attention away from customer service, and fundamentally change the service concept. The net result may well be a loss of passengers at a considerable financial cost.
- Employee morale problems: Yield Management Systems take much of the guess work out of how many items of inventory to sell at what price, but they also take some of the

judgment out of the jobs of yield management analysts. As any other Decision Support System, Yield Management Systems suffer acceptance problems from the end-users. The system must be properly structured to allow and stimulate people for some judgment;

- Incentive and reward systems: Yield Management Systems could also cause problems in the group sales department. Typically, salespeople are rewarded by the number of passengers they make. With a Yield Management System it might not be beneficial for the business to accept a group sale at a low rate when the block of inventory could be sold at a higher rate. Unless incentive systems are changed, and made consistent with to yield management objectives, sales workers might find that yield management works against them;
- Employee training: As with any new system, a Yield Management System will require extensive training of all employees. The employees must clearly understand the purpose of revenue management, essentially how it works, and how it affects their jobs. Top management cannot assume that revenue management will just happen: it requires careful planning and training;
- Top management commitment: Without a commitment from top management, the Yield Management System may be doomed to failure. Unless all the employees know that the Yield Management System is considered essential to the success of the company, they may be inclined to treat it less seriously than top management may prefer.
- Organization of yield management function: In terms of what department within the airline should be responsible for YMS, arguments for several departments (marketing, pricing, reservations, MIS) could be made. The seat inventory control process adopted by an airline is closely related to several other functions in its corporate structure. This fact alone suggests that the development and implementation of a system designed to make seat inventory control more systematic is constrained to some degree by the airline's organizational structure and operating procedures. In addition, given the relationship of seat inventory control to pricing, together with the effect of both strategies

on yield and, more importantly, total revenues, changes to seat inventory control practices can have implications for the airline's marketing policies and overall corporate philosophy.

3.2 Importance of YMS in a Deregulated but Supply Constrained Industry

Yield management has played a significant role in the competitive development of the U.S. airline industry after 1978 deregulation. In the European deregulated airline market, yield management will be even more strategically important. In Chapter 2, I have already emphasized how growth is the key factor of success in the European deregulated market, since it allows airlines to exploit economies of scale and of density. However, for an European airline in the post-deregulation stage, growth will be more difficult to achieve than in the U.S. case.

Lack of resources is a serious barrier to growth in terms of new flights and new routes. Many European airports (London Heathrow, Frankfurt, Zurich, Brussels, Milan) are currently operating above maximum capacity. Airport slots are becoming a scarce factor, and the EC decided, in the deregulation package, to regulate the access to airport slots to prevent incumbent carriers from predatory policies. Most of the European routes suffers from congestion problems, and schedule delays increased significantly in the last years.

It is, therefore, difficult for European airlines to support their strategy of internal growth by adding new services and new capacity in an already saturated market. In this situation, the role played by yield management becomes more important for the following three reasons:

- Yield management allows growth by better exploiting existing capacity: Exploiting economies of density is one of the major factors for success in the airline industry. The hub and spoke network configuration of the U.S. airlines is the result of the implementation of strategies aiming at achieving economies of density. In Europe, however, hub and spoke networks will be more difficult to implement. Given the current capacity constraints, and the EC regulation, it is highly unlikely that European airlines will achieve a level of dominance of their hubs comparable to that of U.S. airlines (in some hubs up to 70 percent of departures belongs to one airline). Thus, growth has to be achieved by exploiting the existing capacity. Yield management allows load factors to be increased without penalizing overall yields. Therefore, yield management can help exploit economies of density by a better marketing of the supplied capacity.
- Yield management is a hedge against uncertainty: If we look at the evolution of competition in the U.S. airline industry after deregulation, we notice that marketing practices became more short-term oriented, the number and variety of discount fares increased and prices became more volatile. In a same year, fares for the same class of a certain flight can fluctuate up to 80%, according to seasonal variation and competitors' moves. Fares variability will also characterize the deregulated European market. Airlines, thus, will have to deal with uncertain and dynamic market conditions more than in the past. It will become crucial for an airline to compete by adjusting pricing policies[1] in real time . A Yield Management System provides a hedge against market uncertainty by giving the company the necessary flexibility to anticipate or follow competitors' moves. Therefore, yield management has a double value for an airline: it reduces the exposure of an airline to market risk, and it provides marketing flexibility to implement new pricing policies. This flexibility is a significant competitive tool. The absence of capability to effectively control discount seat availability has contributed to the demise of several carriers in the years following deregulation in the U.S..

- Margins can be improved more by an increase in revenues than by a decrease in costs: Almost 70 percent of an airline operating costs are outside management control (fuel price, landing fees, handling, depreciation). Therefore, on the cost-cutting side, the two factors over which an airline has control are personnel and capacity utilization. All the major airlines have recently cut labor costs by reducing personnel (Air France by 5000 people, British Airways by 4600, Iberia by 6200, Lufthansa by 9000), renegotiating wages, and increasing productivity. Despite the recent labor cuts, European airlines are having difficulties to perform further tight cost control in countries where social networks are tight. To improve capacity utilization an airline has, therefore, only two options. It can reduce capacity, by grounding aircraft, if it cannot achieve more sales. However, this measure has a limited effect, because it has impact only on variable costs (fuel, on board service, landing), and it does not affect fixed operating costs (labor, depreciation) which represent a great component of total costs. The second option is to keep the present level of capacity but try to sell more seats. This can be achieved with yield management, by stimulating additional demand through promotional fares, without reduce the capacity assigned to high fare demand.

3.3 How YMS Has Been Used by Major European Airlines

In the previous section, we outlined the strategic importance that yield management will assume in the deregulated European market. Many large European airlines have understood the relevance of this tool, and they are already investing in developing Yield Management Systems to compete in the next few years. The following is a partial list of the accomplishments of the major airlines in terms of development and usage of yield management:

- Aer France: It is co-developing with Unisys a new release of ARE. This new version will include a forecasting module and optimization techniques.
- Aer Lingus: In 1985 it became one of the first European carriers to install a Yield Management System. In 1991, the company decided to take advantage of the advances in theory of yield management and in new computer technologies, and it began to design its own system;
- Austrian Airlines and Swissair: The airlines began implementing yield management in 1986. Technology was shared to improve the reliability of the system and keep the pace of theoretical improvements in this field;
- British Airways: The airline developed its own system COBRA (Capacity Optimization Bringing Revenue Advantages);
- Iberia: A yield management program was brought into the airline in 1985 and started up the following year. It was based on a Unisys ARE package, with modifications suitable for Iberia. The company claims that commercial management is now completely driven by yield management with "considerable results in terms of increase in yield"[2];
- Lufthansa: According to Mr. Juergen Weber, Lufthansa's CEO, "[Lufthansa's] load factor has been significantly lower than some of the major competitors because the firm has not a proper Yield Management System for selling empty seats"[3]. A new Yield Management System, which has been co-developed with Seabrook Marketing, will be in full operation this year after 3 years of implementation and tests. This system is expected to "help fill seats with last minute ticket buyers" and "forecast load factors for the next 12 weeks on every route worldwide";
- Sabena and KLM: KLM has developed its own system (SISCA) which has been fully implemented in 1992. Sabena bought the system from KLM and it is currently adapting the system to its specific requirements;

- SAS: It is currently developing the prototype of its own system. Given the particular feature of SAS route network (multi-hub), the system will be based on an Origin-Destination seat allocation model.

Reference

1. Barry Smith, John Leimkuhler, Ross Darrow, "Yield Management at American Airlines", American Airlines Decision Technologies, 1989

2. Air Transport World, 2, 1989

3. Aviation Week and Space Technology, March 8, 1993

Chapter 4
Evaluation of Alitalia's Competitive Position

The purpose of this chapter is to evaluate the competitive position of Alitalia and to propose some strategic and operating guidelines that the company should implement, if it wants to survive in the deregulated European market. One of the most important changes to be implemented is the development of a Yield Management System. Regardless of what competitive strategy will be pursued by Alitalia, yield management is a necessary instrument to generate cash flows required for investment plans (in the case of a merger with another airline), or to target effectively the different market segments (in the case of a niche strategy).

The first section analyzes the operating performance of Alitalia vis-a-vis its major European competitors. After taking into account for the differences in accounting policies and capital structure, it emerges that the operating performance of Alitalia is less positive than what is shown in the financial reports. The second and the third sections evaluate the competitive advantages and disadvantages of Alitalia. The major competitive advantage is the potential hub capacity that Alitalia could exploit to increase its market share in the intra-European market. The major disadvantages are the lack of financial resources to finance the expansion program and the poor brand image that seriously limit any attempt of pursuing a niche strategy. The fourth section evaluates the strategic options available to Alitalia together with the operating improvements that are necessary for the implementation of a new competitive strategy. The analysis suggests that Alitalia will have to merge with a carrier with a complementary network; in order to this, Alitalia must increase its profitability by cutting costs and reassigning capacity between domestic and international routes. The fifth section provides the rationale for Alitalia to implement a Yield Management System.

4.1 Alitalia and its European Competitors

As mentioned in Chapter 2, Alitalia was in 1991 the sixth largest European airline in terms of Revenue-Passenger-Kilometers. Although definitive traffic data for 1992 are not yet available, partial data indicate that Alitalia's traffic grew in the last year 10 percentage points faster than the average of the European industry[1]. However, Alitalia still remains relatively small compared to its major competitors (British Airways is more than three times larger, Lufthansa more than two).

After tax losses were 17 billion lire ($13 million) in 1992 compared to 35 billion lire ($28 million) in 1991. In both years the airline benefitted from extraordinary gains on aircraft, equal to 192 billion lire ($180 million) in 1992 and 172 billion lire ($165 million) in 1991. At first glance, it seems that Alitalia's performance was quite positive compared to that of many other European carriers (in 1991 Iberia, Lufthansa and Air France lost $344 million, $267 million and $107 million respectively, while British Airways, SAS and Swissair gained respectively $442 million, $152 million and $33 million respectively).

However, in order to better compare the profitability of different airlines, one must eliminate the effect of extraordinary components (such as the gain on sale of aircraft), differences in accounting policies, capital structure and taxation. Figure 9 evaluates the profitability of seven major European carriers (KLM data were not available) in terms of the ratio between EBITDA (Earnings Before Interest, Taxes, Depreciation and Amortization) and Sales.

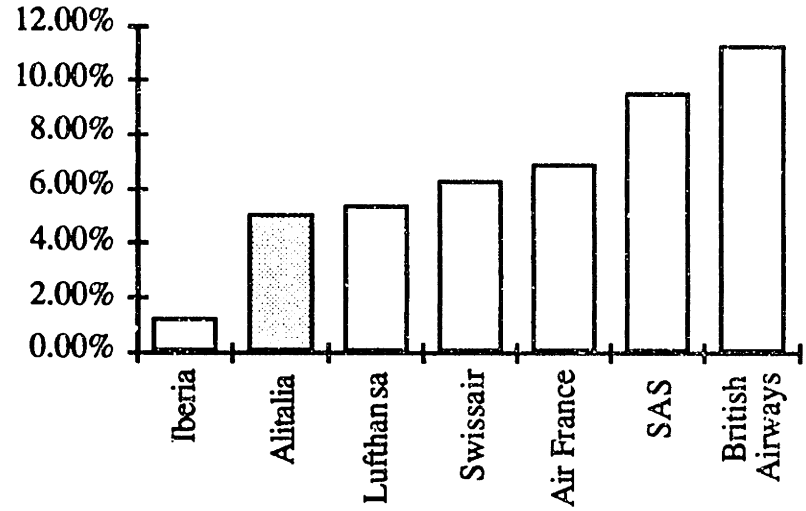

Figure 9: EBITDA / Sales for major European airlines in 1991*

The results of Figure 9 are quite different from a simple earnings comparison. Alitalia was, in 1991, second lowest in terms of operating margin as a percentage of sales with 5.1%, considerably less than the most profitable carriers of the industry (British Airways with 11.3%, and SAS with 9.5%). The reasons for this negative performance are three:

- Low yield because of poor passenger mix: Alitalia's yield for international traffic was considerably lower than that of the industry average. Poor passenger mix and the absence of automated and integrated yield management and overbooking procedures were among the major causes of this negative performance;
- Low load factor (Table 4 and 5): In addition to low demand and the excess of capacity allocated to international flights, poor capacity management and overbooking resulted in high seat spoilage and spill;

* Source: ICAO

- High operating costs (Figure 10: Alitalia's operating costs per Available-Seat-Kilometer were among the highest in the industry (13.6¢, lower only than these of Iberia, 16.2¢, and Swissair 14.5¢).

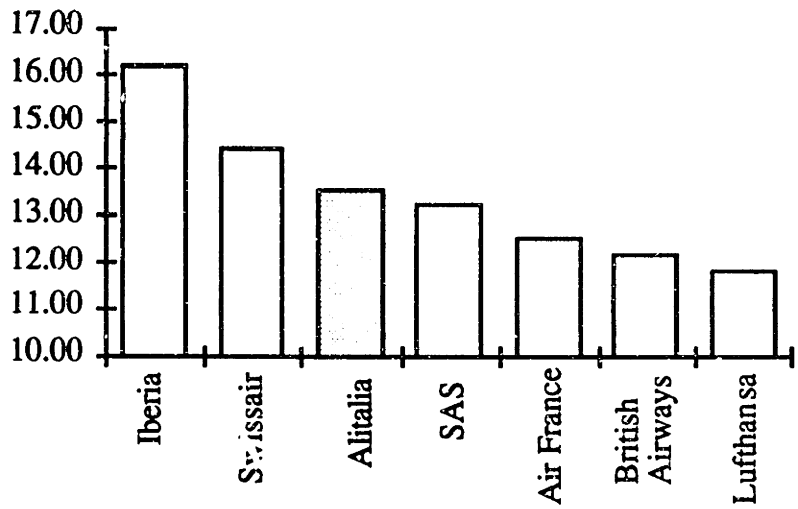

Figure 10: Operating costs per available seat mile (U.S. cents) for major European airlines in 1991*

4.2 Competitive Advantages

- Potential hub strength: One of the main competitive advantages of Alitalia is the potential of its hubs in Rome, Milan and Turin. Rome-Fiumicino airport was constructed far away from Rome and, since enough land was appropriated, the possibility to expand its capacity remains open. By 1997, Fiumicino is expected to double its capacity with the construction of a new international terminal. Rome is probably too far south to serve as an adequate intra-European hub, but it could become an intercontinental traffic collection point (especially toward Africa and Middle East). For intra-European hubs, Alitalia could

* Source: Il Sole 24 Ore

use the airports of Turin, which is currently underutilized, and Milan, when the new international terminal will be built. The availability of hub capacity represents a major advantage for Alitalia if traffic continues to grow in Europe as other airports reach saturation with little room for expansion (e.g. London-Heathrow).

- Integrated global Computer Reservation System: European airlines have started implementing integrated Computer Reservation Systems later than U.S. airlines. In the past, given the strict regulations that caused imperfect competition both in the domestic and in the international market, it was not convenient for a European airline to invest millions of dollars to develop an integrated CRS. As a result, each airline developed its CRS which was not linked to the ones of the other airlines, and the distribution network was quite narrow. With the coming deregulation, on the other hand, it will become more and more important to have a privileged distribution channel to customers through an integrated reservation system that can reach thousands of selling points around the world. European airlines, thus, started implementing integrated reservation systems in preparation for the deregulated market. However, the need of reducing development costs (which can be up to several hundreds million dollars), reducing implementation time, and achieving the largest possible distribution network has forced European airlines to cooperate among themselves and to establish marketing alliances with the major U.S. carriers. The first two large systems that decided to cooperate were SABRE (owned by American Airlines) and Amadeus (owned by Air France, Lufthansa, SAS and Iberia) in 1990. However, the integration of the two systems failed in the last October because of "philosophical divergence"[2], leaving the European carriers without the technological background, which was provided by American Airlines, after they spent more than $300 million for developing costs. The second two large systems that decided to cooperate were Covia (owned by United Airlines) and Galileo (owned by British Airways, Swissair, KLM and Alitalia). The integration seems to be more successful than the previous one, and the two controlling companies decided to merge in March 1992. The

new system, Galileo International, will be the largest CRS in the industry and it will reach 25,000 selling points around the world. Alitalia, which owns 8.7 percent of Galileo International, will benefit from the enlarged distribution network in addition to the profits coming from the system's operation.

- Acquisition of Malev: With the acquisition of the Hungarian airline Malev, Alitalia has achieved an important gateway to penetrate the Eastern-Europe market. Unlike most of the recent mergers between Western European and Eastern European carriers, which resulted in heavy losses for the Western European carriers (as in the cases of Lufthansa with Interflug, and British Airways with Aeroflot), the Alitalia-Malev merger seems to promise good results for the future. Malev has been one of the few profitable Eastern European airlines in the last three years, its fleet is technologically superior to those of other Eastern European carriers and Alitalia will not need to invest several hundred million dollars to restructure it. Furthermore, with the integration of the two route networks, Alitalia will be able to use Budapest as a hub for East-West traffic, and to feed its intercontinental traffic with passengers coming from Eastern Europe.

4.3 Competitive Disadvantages

- Capital structure: The airline industry is very capital intensive, and almost all the carriers must use debt financing to expand their fleets. On the other hand, the industry is very cyclical (in the last three years IATA carriers shown a cumulative loss of $6 billion) and an excessive leverage can negatively affect the economic performance of an airline, and limit its investment programs. Therefore, it very important to compare the capital structure of the different competitors in order to understand which airlines have the financial capabilities to pursue an expansion program either by expanding the fleet, or by acquiring another airline. However, the capital structure of different airlines is often difficult to compare because of the different accounting policies and regulations in the

European countries. Figure 11 shows the financial leverage of seven major European airlines (KLM data were not available) by measuring the ratio between long-term debt and equity capital (including retained earnings and the different operating reserves). All data are book value, since many European airlines (Air France, Iberia, SAS) are not publicly traded.

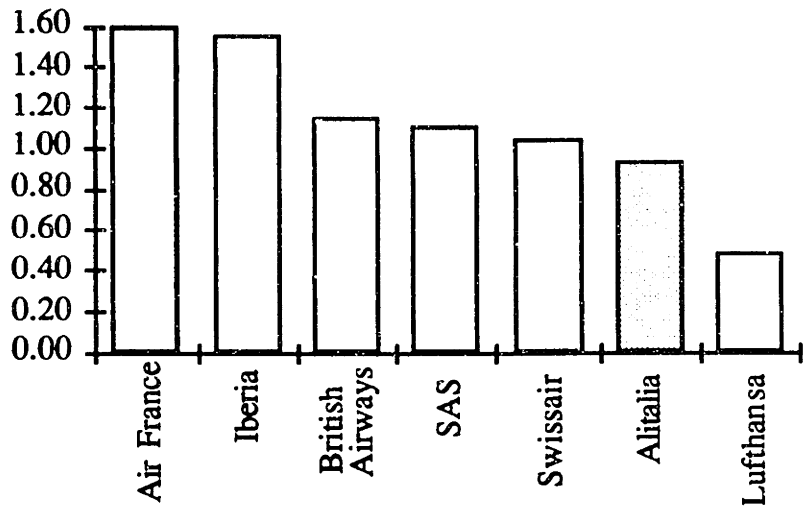

Figure 11: Debt / (Equity + Reserves) of major European airlines (book value) in 1991*

Until 1991, Alitalia had a capital structure less leveraged than the rest of the industry, with a Debt to Equity ratio of 0.93, compared with 1.60 of Air France and 1.55 of Iberia, but far from the 0.49 of Lufthansa.

Another important measure to evaluate the expansion capabilities of an airline is interest coverage. In fact, this gives a sense of how much the operating cash flow of an airline is devoted to interest payments, and how much can be used for capital investments without requiring additional debt. In this case too it is important to isolate the effects of different accounting policies (such as the different depreciation time for the fleet). Figure 12 shows

* Source: ICAO

the interest coverage of the seven major European airlines by measuring the ratio between EBITDA and interest payments.

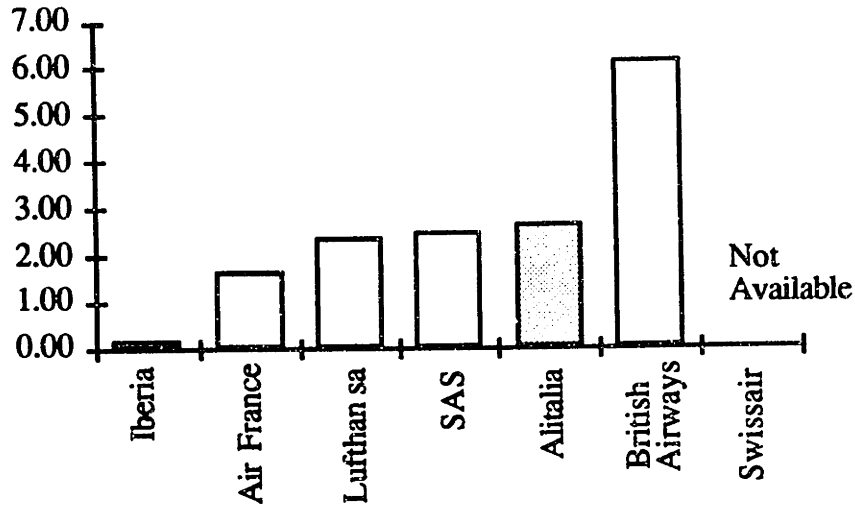

Figure 12: EBITDA / Interest expense for major European airlines in 1991*

In 1991 Alitalia had a 2.64 interest coverage, almost the average of the industry, considerably better than 0.18 of Iberia, and 1.63 of Air France, but still lower than 6.16 of British Airways.

However, in 1992 both the capital structure and the operating cash flow availability of Alitalia have significantly worsened. Long-term debt to equity ratio increased from 0.93 to 1.45, and interest coverage plummeted from 2.64 to 1.82. The financial situation of Alitalia is exacerbated by the illiquid position of IRI, the Italian state-owned holding which owns 89% of Alitalia's equity. IRI is currently extremely leveraged, and it is expected to use the cash coming from the privatization of some of its subunits (retailing, telecommunication, banking) to repay its huge debt, and to finance restructuring charges in some troubled sectors (steel, construction).

Alitalia, instead, is not considered by IRI a strategic subunit, and it has received in the past very little capital inflows from its major stockholder. The leveraged position of

* Source: ICAO

Alitalia, and the inability of IRI to contribute with new equity capital in the future, could seriously undermine the expansion programs of Alitalia. The airline is expected to invest $3.5 billion in the next four years to replace all its short-haul fleet (by substituting the old DC9-30 with the new MD87), and to increase its medium and long-haul fleet (by acquiring A321, MD11, and B747)[3]. Despite a significant improvement in its operating performance, the operating cash flow is not sufficient to finance the expansion plans. In the past, the purchase of new aircraft has been financed through selling and leasing back part of the fleet. However, this means are not going to be viable because of the leveraged capital structure of Alitalia. As a result, Alitalia has requested IRI to contribute with $500 million in the next two years to finance the acquisition program.

- Passenger mix and brand image: Alitalia's passenger mix has been historically poorer than that of its major competitors. The major source of passengers for the international traffic comes from the ethnic segment (Italian immigrants flying back to Italy), which is traditionally the most-price sensitive segment. On the other hand, the business segment has never been particularly attracted by Alitalia's on-board service and punctuality (it is universally known by the acronym Always Late In Takeoff Always Late In Arrival). Despite some recent attempts to improve on-board service and punctuality, Alitalia is still not able to capture a good share of business traffic. As a matter of fact, on its trans-Atlantic flights, Alitalia offers in business class half of the seats that British Airways offers in comparable flights.
- Capacity management: Alitalia is considerably less efficient than its European competitors with respect to capacity management. From Table 4 we notice that Alitalia had in 1991 the worst load factor in total traffic among the eight major European carriers; Alitalia was 10.4 percentage points lower than KLM and 8.9 percentage points lower than British Airways. The situation was almost similar for the international traffic: Alitalia was second lowest, just 0.2 percentage points above Iberia, but 9.2 percentage points lower than KLM and 8.8 percentage points lower than British Airways. This is result is particularly

negative if one considers that, as mentioned, Alitalia suffers from a poor brand image and has a poor passenger mix. Other airlines, such as Swissair and, to a lesser extent, Lufthansa, have load factors comparable to those of Alitalia, but they can benefit from a better passenger mix, since they are more targeted to the business segment.

- Strong unions: Italy has strong national labor unions and state-owned companies, such as Alitalia, have historically been battlegrounds between unions and the government. Alitalia's unions have often staged striken, even for weeks, during contract negotiations, and they have fiercely opposed any suggestion of reduction of personnel. Alitalia's management has always taken a "soft line" to unions, by conceding salary increases without receiving in exchange specific concessions about productivity improvements, and avoiding any kind of lay-offs. The long-term implications of this industrial relation strategy can be severe. First, this sheds some doubts on the ability of Alitalia to reduce the number of workers or even to improve the productivity of personnel which will be necessary to compete after deregulation. Second, the period of degraded service, during strikes, degraded the image of the company in foreign countries. Finally, a history of labor difficulties may hinder the search of a foreign partners for strategic alliances-mergers because other airlines may be reluctant to associate with a carrier experiencing labor unrest.

4.4 Evaluation of Strategic Options

As noticed in the last section, Alitalia is currently in a weak competitive position because of the leveraged capital structure that limits future expansion programs, the undefined marketing strategy that keeps the airline away from the profitable business segment, and the operating inefficiencies resulting in low load factors. Therefore, in order to survive deregulation the company has to pursue a new competitive strategy in order to

reach "critical mass". Since Alitalia is too small to pursue a "go-alone" strategy (such as that of Lufthansa), it has to follow one of the two following options:

- Strategic alliance or merge: In order to expand globally its position in the international market, Alitalia must look for a strategic alliance-merger with another European carrier with similar needs. The partner has to be chosen according to a market complementarity criterion. In this sense SAS and KLM seem to be the best potential partners among the other possible candidates (Swissair and Iberia). In fact the two airlines have a very strong position in the Northern Europe and North Atlantic markets, while Alitalia is currently well positioned in the Eastern Europe (after the merge with Malev), Southern Europe, Middle East, Africa and South America markets. An obstacle to the merger is the difference between the products of the two potential partners; as mentioned, Alitalia suffers from a poor brand image, while SAS and, to a lesser extent, KLM are pursuing with the European Quality Alliance a high-quality niche approach to growth.
  British Airways could also be a good partner given its strong presence in the international market, and a link of the two networks could "sandwich most of Europe between them"[4]. However, the difference in the dimensions of the two carriers (British Airways is more than 3 times larger than Alitalia, and it has recently acquired significant stakes of USAir and Qantas) could create political problems for the implementation of the merger. The Italian government would never give the majority of Alitalia to a foreign carrier, while British Airways would not be interested in a minority ownership of the Italian carrier. Another alternative is a marketing agreement with a US carrier (Northwest or Continental) in order to have access to feeding traffic in the US domestic market.
- Market niche strategy: Given its current market share, and its limited ability to become a major carrier, Alitalia could follow a niche market strategy by pursuing a niche strategy by targeting the leisure segment, competing with charters, with its subsidiary ATI, while the parent airline could be focused on the business segment. In this case Alitalia should

exploit its favorable geographic position to become the leading carrier of European traffic toward the Middle East and Africa. The potential drawbacks of this strategy come from the new way of competing that will prevail after deregulation. High service-high fare niche strategy is usually difficult to implement because it can be easily matched by any competitor which is more efficient. Low service-low fare niche strategy (such as that of Southwest in the U.S.) is also difficult to implement in the deregulated European market; the presence of charters, which are usually more efficient than scheduled carriers, is a serious limitation for an airline willing to gain market share in the leisure segment.

However, in order to successfully implement anyone of the two suggested strategies, Alitalia should significantly change many of its operating policies to restore profitability, in the case of a merger, or to increase operating cash flows, in the case of a niche strategy. Among the most urgent operating policy changes are:

- Massive workforce layoffs: In 1991 Alitalia announced more than 2500 redundancies in its workforce. Nevertheless, because of the paternalistic attitude of the Italian government, the company was able to cut only 250 employees. On the other hand Alitalia needs public capital to finance its expansion plans (as mentioned, the Italian government is so indebted that it cannot provide that money, and the company cannot count only on its modest operating cash flow). Since the actual market value of Alitalia's stocks is 20 percent below the book value, such a restructuring plan is required, before issuing public equities, in order to persuade investors of the future possibilities of the company to make money.
- Capacity reallocation between domestic and international routes: Alitalia's fleet allocation between domestic and international routes is extremely inefficient. In 1991, Alitalia lost $140 million in its domestic routes (even though it was benefitting from monopoly power) because of some unprofitable routes with load factors between 20-40 percent. In

the international market, instead, Alitalia was unable to increase the flight frequency on certain routes because of a lack of aircraft. As a result, the current inefficient fleet allocation both depressed Alitalia's earnings and reduced the possibility of expansion in the European market. Therefore, the company should reduce its domestic losses by cutting services on those domestic routes that have load factors lower than 50 percent, and gain market share in the international market by utilizing this new available capacity to expand its services in the inter-European market.

- Change organization to a more market oriented structure: In order to respond to the new dynamic environment, Alitalia needs a decision making structure which is less bureaucratic and more oriented to respond to customer needs. The traditional functional based organization should be changed into a new market oriented structure where all departments collaborate together to the definition of the product (for example scheduling should be done jointly by the marketing and the planning department) through cross-functional teams.

Finally, regardless to what competitive strategy is adopted, Alitalia needs to implement a Yield Management System to support its new marketing strategy in the deregulated market. The next section provides more details regarding the necessity of this investment.

4.5 Strategic Reasons for Implementing YMS at Alitalia

- Yield management is a growth instrument in a capacity constrained market: As mentioned in Chapter 3, yield management becomes more important in a capacity constrained context. In this case, it is more difficult for an airline to grow in scale because scarce resources (routes, airport slots, etc.) do not allow any further expansion. This will be exactly the situation that Alitalia will face, in the next few years, in the European market.

In this situation, an airline will have to achieve traffic growth and restore profitability by exploiting economies of density rather than economies of scale. Yield management is the required tool because it allows the number of spoiled seats and spilled demand to be minimized.

- Yield management improves passenger mix: Alitalia has to improve its passenger mix, by reducing its reliance upon the ethnic segment, and by increasing its share in the business segment (especially in the intra-European market). The only way to do it is to provide a better service level to the business segment and to adequately support this new marketing strategy with the right capacity allocation policies. Yield management is the required tool because it improves passenger mix by protecting seats for the higher fare classes.
- Yield management is a hedge against market volatility: In the deregulated European market, pricing strategies will become more aggressive and volatile. There will be an increase of the number of fare classes offered on any flight, and airlines will use more deeply discounted fares to divert traffic from their competitors. Alitalia will have to adapt its marketing policies to the new competitive environment. Yield management is the required tool because it provides a hedge against market uncertainty by giving the company the necessary flexibility to anticipate or follow competitors' pricing moves (Chapter 5 provides an example of this).
- Yield management generates additional cash flow that can be used to finance expansion plans: As mentioned, Alitalia is facing a difficult financial situation, since it is not able to finance new capacity investments entirely with operating cash flow, its major shareholder is not able to contribute with new equity capital and the capital structure is already considerably leveraged. Therefore, Alitalia needs to increase its operating cash flow to finance its expansion plans. One possible way is to reduce operating costs by cutting personnel. Another way, less traumatic, is to maximize revenues by keeping constant the production function of the airline. Yield management is the required tool since it maximizes sales revenues without significantly affecting the operating costs (apart from

the marginal costs for the additional passengers), and transfers these improvements directly to the bottom line and, therefore, to new cash flow.

- An airline cannot compete in a deregulated market without a Yield Management System: Alitalia cannot be the only major airline in the European market which is not using yield management. Being the only non-user would put Alitalia in an extremely vulnerable position since it could not match the marketing strategies of its major competitors and, at the same time, its marketing strategies would be immediately matched by its competitors. The consequences of being the last could be dramatic. People Express was forced to bankruptcy because it was the only U.S. carrier which did not adopted a Yield Management System. As Don Burr, former CEO of People Express Airlines, said "Nothing changed at our company, but our competitors used widespread yield management in every one of our markets, and they pushed us straight toward bankruptcy"[5].

Reference

1. Il Sole 24 Ore, April 13, 1993

2. Il Sole 24 Ore, March 5, 1992

3. Il Sole 24 Ore, November 19, 1992

4. Louis Gialloreto, "Examination of Strengths and Weaknesses of Eight Major European Carriers", Airline Business, September 1, 1992

5. Scoreboard, 4, 1992

Chapter 5
Evaluating an Investment in YMS at Alitalia

As mentioned in Chapter 4, there are several strategic reasons for Alitalia to invest in a Yield Management System. In order to decide to invest in this system, however, one must also evaluate the economic impact that such a system has on Alitalia's operating cash flows. This chapter evaluates the economic impact of an investment in YMS at Alitalia. The objective of this thesis, however, is not to give a single number representing the Net Present Value (NPV) of such an investment; this would require too many data that are not available at this moment, or which are proprietary to Alitalia. The objective of this thesis is, instead, to provide Alitalia with a framework to evaluate the economic impact of the investment, as a function of some operating parameters.

The first section provides a very brief overview of the evaluation technique that is used in this context: Discounted Cash Flow. The second section evaluates the incremental cash flows that Alitalia could achieve with this investment. Although it is impossible to give a precise estimate of the additional cash flows, given the lack of access to Alitalia proprietary data, it is possible to give a rough estimate by using industry average data. It is worth noting, however, that the incremental cash inflows are so huge, compared to the incremental cash outflows, that the investment has a positive NPV with very conservative estimates of the incremental cash inflows. The third section evaluates the cost of capital to be used to discount the incremental cash flows of the investment. The fourth section evaluates the two alternatives that an airline faces when it decides to develop a Yield Management System: make or buy. The analysis suggests that, in Alitalia's case, the "buy" alternative is the one to follow, since it allows the airline to use the system right after the purchase, instead of waiting 2-3 years for the development. The section also evaluates the major features that Alitalia should consider when deciding what system it should buy.

5.1 Methodology Followed: Discounted Cash Flow

The methodology followed to evaluate this investment is the traditional Discounted Cash Flow (DCF) method. The DCF approach considers the additional cash flows coming from the project and discounts them at the cost of capital that reflects the risk of the project. If the project has a positive NPV, it should be undertaken[1].

In this case, the additional cash flows come from the increased revenues, coming from the better passenger mix and the reduction of spoiled seats, minus the additional costs, coming from the ticketing and on-board service costs for the additional passengers and the increase in the costs of the voluntary denied boardings.

The cost of capital comes from the Capital Asset Pricing Model, and it is expressed as:

$$R_{project} = R_f + \beta_{project} * (R_m - R_f) \qquad (8)$$

where R_f is the risk free rate, $\beta_{project}$ is Alitalia's unlevered beta (assuming that the effect of tax shield is negligible and the YMS project is financed with the same capital structure of Alitalia as a whole) and $(R_m - R_f)$ is the market risk premium.

5.2 Evaluation of the Incremental Cash Flows

The potential incremental cash flows associated with the use of a Yield Management System can be determined by estimating the revenue contribution from each of the following key effects:

- Spill reduction: Yield management minimizes the number of high yield, late-booking passengers who are lost, presumably to competition, because of a flight booked full prematurely. This is accomplished primarily by shifting less time-sensitive demand (which is also usually more price sensitive and therefore books earlier) to less full flights, thereby increasing revenues on those flights. Assuming that spill is reduced by shifting passengers to other flights, each instance can be quantified in terms of a full coach fare as incremental cash flow;
- Seat mix improvement: Yield management avoids sales at discounts to less price-sensitive (and generally later booking) travelers. This is accomplished not just by setting allocations or restrictions more accurately, but also by reacting more quickly to booking anomalies as they occur;
- Spoilage reduction: Yield management minimizes the number of empty seats at departure for flights which had booked full. This involves fine tuning of overbooking levels;
- Denied boarding reduction: By optimizing overbooking levels, yield management minimizes also the number of denied boardings for a certain flight. Costs of denied boardings are usually measured as multiples (typically three times, according to industry estimates[2]) of the average fare to account for passenger compensation, lost future sales, etc.

In the case of Alitalia the actual incremental cash flows are considerably larger than the difference between the current cash flows and the future cash flows obtained with yield management. In fact, being the only major European airline which is not using automated yield management, Alitalia is bearing the risk of losing revenues by being matched in its fares by its competitors (the fourth section explains this in details). Therefore, as shown in Figure 13, the real incremental cash flows must be computed in comparison to a situation

where everyone else is using yield management. In this case, the incremental cash flows are considerably higher and they are represented by the dark shaded area.

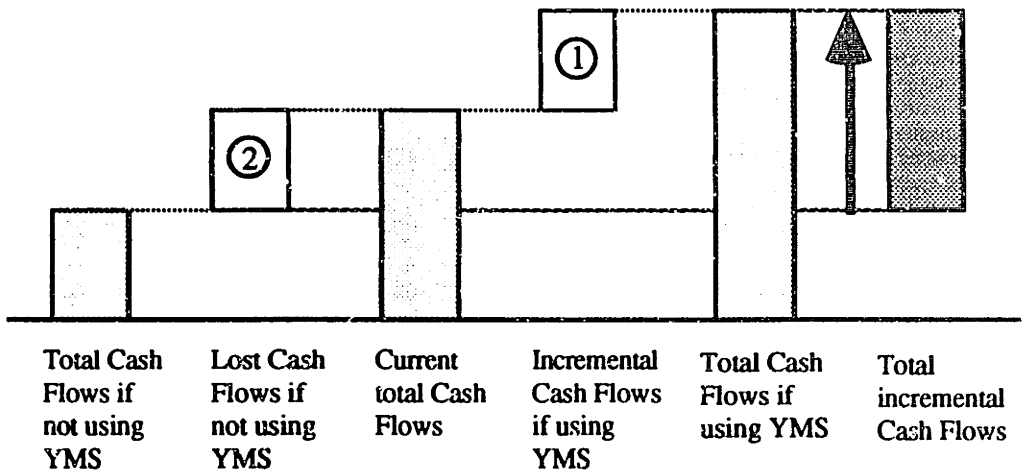

Figure 13: Incremental Cash Flows from the use of YMS

Unfortunately, it is difficult to estimate the negative impact for Alitalia of not using yield management, when every one else is using it. Therefore, the evaluation of the incremental cash flows will include two separate steps: first, incremental cash flows from the usage of YMS (area 1 in Figure 13) will be computed based on industry estimates; second, lost cash flows from not using YMS (area 2 in Figure 13) will be estimated based on the potential loss of traffic revenues.

- Incremental cash flows from the use of YMS: Incremental cash flows can be estimated by computing the revenue impact of the four different effects that were described above in this section. Industry average studies[2] provide the following figures:

Effect	% revenues
- Total seat-mix (spill reduction + seat-mix improvement)	+2%
- Total overbooking (spoilage reduction + denied boarding reduction)	+2-3%

Table 7 computes the incremental cash flows assuming that the most conservative estimate (2 percent revenues increase for both seat-mix and overbooking effect) is applied to Alitalia's revenues. Marginal costs are assumed to be 20 percent of the incremental revenues, and they include all the costs required to improve passenger mix (better ground and on-board services) and to serve the incremental passenger (reservation, ticketing, on-board service, etc.).

	1992
Total Revenues	$3,500
Incremental revenues of seat-mix effect @2%	$70
Incremental revenues of overbooking effect @2%	$70
Total incremental revenues	$140
- Marginal costs @20%	($28)
EBIT	$112
- Taxes @52%	($58)
Incremental Cash Flows	$54

Table 7: Incremental cash flows for Alitalia from using YMS (millions $)

- Lost cash flows from not using YMS: It is almost impossible to estimate the impact on revenues of being the only airline which is not using yield management. The impact depends on how much Alitalia could be attacked by other airlines and on how "costly" could be its defense. The extent of the attack depends on how many Origin-Destination markets can be attacked, on what is the traffic volume in each market and how deeply an entrant would underprice Alitalia. Therefore, the only possible estimate is to compute what is the impact on cash flows of a 1 percent decrease of traffic revenues because of the competitive weakness. Table 8 shows the impact on Alitalia's cash flows of a 1 percent decrease of 1992 traffic revenues. It is worth noting that even a small decrease in revenues, 1 percent indeed, has a remarkable impact ($13 million) on the bottom line.

Therefore, in the event of a larger decrease of revenues because of a price war, Alitalia's cash flows could be reduced by several tens of millions.

	1992
Total Revenues	$3,500
Revenues decrease @1%	($35)
Total incremental revenues	($35)
- Marginal costs @20%	$7
EBIT	($28)
- Taxes @52%	$15
Incremental Cash Flows	($13)

Table 8: Lost cash flows for Alitalia from not using YMS (millions $)

In summary, the above analysis, even if extremely rough, shows the order of magnitude of the total incremental cash flows per year, deriving from yield management: $54 million of incremental cash flows, plus $13 million for every one percentage point of traffic revenue that would be lost by not using yield management.

5.3 Evaluation of the Cost of Capital

The evaluation of Alitalia's cost of capital follows the straight Capital Asset Pricing Model. A simple assumption about the capital structure of the project, is that the investment will be financed with the same structure of the overall capital structure of Alitalia. This assumption eliminates the need to unlever and relever the capital structure to compute the cost of capital. The following data must be used[3]:

$R_f = 7.5\%$ (interest rate of 10 years Eurobond issued by the Italian government)

$\beta_{asset\ Alitalia} = 0.97$ (unlevered beta of Alitalia in the Milan Stock Exchange)

$(R_m - R_f) = 8\%$ (market risk premium)

The evaluation of the cost of capital assumes that the risk of the investment in YMS is the same one of Alitalia's core business, that the investment is financed with the same capital structure of Alitalia (D/E ratio equal to 1.7), and that the effect of tax shield is negligible. As a result, the cost of capital for the project can be evaluated with the following equation:

$$R_{Alitalia} = R_f + \beta_{asset\ Alitalia} * (R_m - R_f) \quad (9)$$

Therefore, the cost of capital to be used to discount cash flows of the project is 15.26%.

5.4 Evaluation of the Alternative Products: Make or Buy

When investing in a new Yield Management System, airlines face different choices: should the airline develop its own system, or buy one among the available systems in the market? What are the evaluation criteria to choose the system? This section addresses this two points, and gives the rationale for the "buy" recommendation to Alitalia that is developed in Chapter 6.

Make or buy

As mentioned in Chapter 3, the major European airlines followed different approaches in implementing Yield Management Systems. Some developed autonomously their own system (such as British Airways, KLM, SAS); others (Lufthansa, Air France) co-developed the system with U.S. YMS producers; still others (Iberia, Sabena) bought the system directly from U.S. producers.

- Make: Developing its own Yield Management System may be a uneconomical decision. The major drawback is related to the time required for the development and testing of the system (usually around 3 years). In this period, the airline loses the potential incremental cash flows that are generated by the system (a more precise estimate of these cash flows was provided in the second section).

  Furthermore, during the period of development, the airline is in a vulnerable competitive position. Suppose that airline A is currently developing its Yield Management System, while airline B already uses it. Since both airlines are connected to a common Computer Reservation System, each one knows the fare structure of the other in every market. However, the two airlines don't know how many seats the other one is protecting for each fare class.

  Suppose that airline B decides to lower discounted fares to divert demand from airline A in a certain market. Airline B can decide with its Yield Management System the optimal protection level for each fare class. Airline A must now decide whether or not to match the discounted fare of A. If it doesn't, it loses leisure traffic to airline B. If it does it, it cannot decide the optimal protection level for each fare class, since it cannot utilize yield management. The consequences of a sub-optimal seat allocations are that, if airline A protects too many high fare seats, these seats will be spoiled at departure, while if airline A allows too many low fare seats, it will worsen its passenger mix. In both cases airline A will lose operating revenues.

Additional costs for the "make" alternative are development costs (the development of an entire system usually requires 20-30 man/years, or $800,000-$1,000,000 per year), and the hardware of the system (around $1 million for databases, workstations and PCs for the yield management analysts).

Airlines often chose the "make" option because they have resources in their Operation Research department which need to be utilized. Another reason is that by developing the system, the airline can better control any confidential information about the company, and can customize the system according to its specific needs and targets.

- Buy: The major advantage of the "buy" option, is the availability of the system in 6-12 months. The system can also be customized, to a certain extent, to the needs of the customer by modifying the end-user interface, or adapting the optimization and the overbooking model to the specific marketing policies of the airline.

Most of the companies providing Yield Management Systems license the software for a fee, and then sell the hardware at the beginning of the contract. The fee for software, installation and consulting is around $1 million. For the hardware, the initial expense is equal to that of the "make" alternative (around $1 million for databases, workstations and PCs for the yield management analysts).

Table 9 shows the evaluation of the "make" versus "buy" alternatives. The "make" alternative has a considerably higher initial investment, mainly due to the lost revenues for the airline during the development period; to estimate these lost revenues one should use a similar analysis of that in the second section of this Chapter.

	Make		**Buy**	
Investment				
	Hardware	1	Hardware	1
	Software development	2.5-3.5		
			Software license	1
	Lost revenues (2-3 years)	?		
Total		>3.5-4.5		2

Table 9: Evaluation of the "make or buy" alternatives (millions of $)

The "buy" alternative, on the other hand, has a higher cost, due to the software license fee. Given the relevance of the initial investment for the "make" option, it is evident, from Table 9, that, from a strict economic point of view, the "buy" option is better. However, as mentioned, other external factors (confidentiality of data, corporate pride) often lead airlines to choose the "make" option.

System Evaluation Criteria

Assuming that Alitalia decides to buy the system in the market, it must choose among several products available. The following is a list of the main evaluation criteria that Alitalia should use to choose the system:

- Forecasting capabilities:
  - Treatment of seasonality
  - Demand unconstraining method
  - User validation of forecasts
- Optimization model capabilities:
  - Nested leg optimization algorithm
  - Origin-Destination optimization algorithm
  - Interactive modeling
  - Group optimization
- Overbooking model capabilities:
  - Forecast of no-show rates
  - Use of denied boarding statistics and costs
  - Integration with the optimization model
- System usage:
  - Interactive screen displays
  - User friendliness
  - Management reporting capabilities
  - Decision support functionalities

In choosing the system, Alitalia's management should attribute a weight to each of the above items, grade each product on an item by item basis, and choose the system with the highest weighted score.

Reference

1. Richard Brealy, Stewart Myers, "Principles of Corporate Finance", McGraw Hill, 1991

2. Barry Smith, John Leimkuhler, Ross Darrow, "Yield Management at American Airlines", American Airlines Decision Technologies, 1989

3. Bloomberg, May 5, 1993

Chapter 6
Conclusions and Recommendations

Chapter 4 outlined the strategic reasons for Alitalia to invest in a Yield Management System. Alitalia needs to improve its operating margins and to increase its operating cash flow, if it wants to survive in the deregulated market and implement its expansion programs. Chapter 5, although it was not possible to achieve a more precise analysis given the absence of data, gave a rough estimate of the amount of incremental cash flows coming from such an investment. Given that the additional cash inflows (additional revenues) are typically one to two orders of magnitude greater than the required cash outflows (marginal operating costs, system development costs, etc.) the NPV of the project is undoubtedly positive.

However, the most important criterion that should affect Alitalia's decision is the development time of the system. Alitalia is the only major European airline which has not yet developed or bought a Yield Management System. If one considers that the 1993 deregulation will increase price competition and fare variability in the international market, it is clear that Alitalia needs the system as soon as possible. It cannot wait two to three years to develop its own system and risk, at the same time, to have its fares matched by competitors, without having the possibility of matching competitors' moves. The potential costs of not having the system are huge.

Therefore, Alitalia should buy one of the existing systems available in the market and, in a second stage, adapt the system to its specific needs (database, marketing policies, end-user interface, etc.). It is very important that the system includes forecasting, overbooking and an optimization model in order to allow Alitalia to use yield management for fifth and sixth freedom flights, which will be the ones where competition will be more

fierce under deregulation. The system should also include a group optimization model, in order Alitalia to use yield management to compete with charters in the group leisure segment. Finally, the system should be interactive and friendly to users in order to facilitate the diffusion of yield management policies in the marketing department of Alitalia.

Considerable attention should be also devoted in designing the database of the system. As mentioned in Chapter 3, the database of a Yield Management System, if it is carefully designed, can provide a large amount of information for strategic analysis such as route, frequency and capacity planning. These kinds of analysis will become more and more important for an airline in a deregulated environment, and the ability to simulate the behavior of competitors will become a necessary condition for survival.

Yield management is an tremendous opportunity for Alitalia to increase its performance and implement its new competitive strategy. The investment is not huge, and the potential additional revenues are enormous. The key point is not to wait; People Express' case taught that an airline cannot survive for a long time if it is the only one which does not use such a system.