INSTITUTO SUPERIOR TÉCNICO
Universidade Técnica de Lisboa

Code-Share Economic Gain

Ricardo Jorge Abreu Farinha

Dissertação para obtenção do Grau de Mestre em

Engenharia Civil

Júri

Presidente: Professor Doutor Joaquim Jorge da Costa Paulino Pereira

Orientadora: Professora Doutora Maria do Rosário Maurício Ribeiro Macário

Vogais: Professor Doutor José Manuel Caré Baptista Viegas

Setembro 2008

Acknowledgements

The production of a dissertation can be a lonely and isolating experience, yet it is obviously not possible without the personal and practical support of many people. The writing of this section is then quite nostalgic as it makes me realise that my studies are almost done and that I will move to a new stage of my life.

First of all, I would like to thank my thesis advisors: Professor Rosário Macário (Instituto Superior Técnico) and Professor Jean Bresson (École Nationale de l'Aviation Civile). Professor Macário who made the effort of stopping in Paris on her way to Genoa, to discuss my work and plan the structure of the dissertation. And Professor Bresson who later in the writing of this dissertation was absent due to health problems, but has always inspired and motivated me concerning air transport issues, since the seminar in Toulouse.

I would like to express my deep and sincere gratitude to my internship supervisor at Air France, Philippe Marguier, whose discussions, questions and answers had a crucial impact in the present dissertation. His wide knowledge on air transport economics and his logical way of thinking have been of great value for me. His understanding and guidance have provided a good basis for the present thesis.

I am specially grateful Philippe Castéra for his valuable advices and friendly help. Jointly with Gilles Mihelcic and Jean-Christophe Veve they were always ready to clarify any doubt from language and cultural to internal Air France or air transport questionings.

This dissertation was improved by many papers and reports sent by Jan Brueckner, Ken Button, Yves Crozet, Dr. Kostas Iatrou, Tae Oum, Oz Shy, Robin Lindsey and Chris Tarry. This last two even recommended many further references and named people to be contacted to deepen my research on the code-sharing. Thank you all.

I wish to express my warm and sincere thanks to Sebastián Ponce, my predecessor in Air France who introduced me to the Air France code-sharing economic gain model. His initial live guidance and further mail hints were crucial to the conduct of my internship.

Upon the very last days of this dissertation, some friends looked closely at the final version of the thesis for English style and grammar, correcting both and offering suggestions for improvement. They deserve to be mentioned by their assistance and friendship: Dante Danti, Jean Révis, Rui Colaço and Stéphane Jégo.

I owe my most sincere gratitude to Christine Perrut and Valérie Béhar who were available to be interviewed and endeavoured to find a minute in their busy agendas.

This work would not have been possible without documents sent by Air France coworkers namely with Joël Rouiallon, Cirstin Schneider, Dounia Larak and Lluis Vaquer Campillo.

This is a great opportunity to express my respect to all the executives I met in Air France, namely Patrick Bianquis, Dominique Vaira, Philippe Vasseur and Erwan Le Chapelain.

I want to acknowledge Cyril Deleye for the correction of preliminary pieces in French later used for this dissertation and for his help, support, attention and the diverse experiences during my whole stay in Paris.

I am pleased to thank Catarina Ferreira, Sílvia Tavares and António Andrade. I cherish our many moments together both in personal and academic contexts. They belong to my existence and I will always keep them in my heart even when distances are long and contacts are scarce.

I am grateful to all colleagues at the École Nationale des Ponts et Chaussées and within Air France as well as all the people that made my stay in Paris such a beautiful souvenir. I hope that despite the spatial dispersion we will be able to stay in touch – Abril Vitte Soto, Adrien Lafont, André Agrela, Antonio Riaza, Chantel Fouad, Clémentine Bordier, Engi Jaupi, Hélène Vuong, Ilan Buzinsky, Manal Maila, Marie Firmin, Maria Martinet, Marie Partarrieu, Marta Miralpeix, Paola Gigli, Pierre-Armand Blanco, Sandrine Agrela, Silvia Piumatti and Virginie Dequin. A peculiar thought for Sara Câmara for her energy, simplicity, tolerance, generosity, serenity and happiness of complicity in the small details of life.

I owe my loving gratitude to my parents who away in Madeira have always provided the best conditions for me to study, first in Lisbon and then in Paris. Without their support and understanding I would not reach the required peace to finish my graduate studies. For us, silence can be meaningful. My very special thanks to my sister Ana whom I absolutely adore and who helped me in the final days before the delivery of this work, cooking and processing final data for further analysis in this dissertation. My affectionate thanks as well to my aunt Maria da Luz and my uncle Dionísio and my cousin Paula whose excitement is already part of my live.

Abstract

The objective of this dissertation is to investigate airline alliances and code-share, balancing its advantages and disadvantages after research in the Finance Control department of *Air France* in Paris. Within this department, a specific service for economic studies of alliances has created a code-share gain estimation model for Air France. Its rationale and its results for the last seasons are presented throughout this dissertation. A sensitivity analysis of some parameters in the model is also discussed as well as a cross deduction of *SkyTeam* code-sharing gains for *Alitalia*. Finally, a seat-block vs. free flow empirical study is examined. Methods used include simple mathematical methods and Air France internal models. This dissertation concludes of the relevance and the interest of the code-share for airlines and passengers and summarises the thinking of the social welfare effect of code-sharing.

Keywords: Air France, alliances, code-share, estimation model, free flow, seat-block.

Résumé

L'objectif de cette dissertation est d'analyser des alliances dans le transport aérien en général et des accords de partage de code (code-share) en particulier, en évaluant leurs avantages et leurs inconvénients. Ce travail a été mené à Paris, au sein du département de Contrôle de Gestion Central d'Air France, dans son service spécifique qui concerne les études économiques des alliances. Ce dernier a conçu, en outre, un modèle d'estimation du gain que la compagnie engendrerait par le code-share pour la compagnie. La logique du modèle y est parfaitement décrite et les résultats qui en sont issus sont minutieusement présentés. Une analyse de sensibilité des paramètres du modèle est par ailleurs discutée, ainsi qu'une déduction croisée des gains du code-share avec *SkyTeam* pour *Alitalia*. Le mémoire finit par apporter une étude empirique des accords de bloc-siège et de free flow, avant de conclure à la pertinence et à l'intérêt du code-share pour les compagnies ainsi que pour les passagers. Il synthétise du reste, les effets sociaux de ce type d'accords. Les méthodes utilisées incluent tout à la fois, des méthodes mathématiques simples et modèles internes d'Air France.

Mots-clés : Air France, alliances, bloc-siège, code-share, free flow, modèle d'estimation.

Resumo

Esta dissertação tem como objectivo analisar as alianças no sector do transporte aéreo em geral e dos acordos de partilha de código (code-share) em particular, comparando as suas vantagens e desvantagens. Esta dissertação foi concebida com acesso a informação do departamento de Gestão Financeira da *Air France*. No seio deste departamento, integrei o serviço de estudos económicos das alianças que criou um modelo de estimação do lucro económico devido ao code-share para a companhia. A lógica e os últimos resultados deste modelo são apresentados juntamente com um estudo de sensibilidade de certos parâmetros. Por fim, é levada a cabo uma dedução cruzada dos ganhos do code-share da *SkyTeam* para a *Alitalia*. Entre os métodos utilizados salientam-se métodos numéricos simples e modelos internos da *Air France*. A conclusão da dissertação além de incorporar uma reflexão sobre a pertinência e o interesse do code-share para as companhias aéreas e para os passageiros, sintetiza o impacto social do code-share.

Palavras-chave: Air France, alianças, code-share, free flow, modelo de estimação, seat-block.

TERMS OF CONFIDENTIALITY

1. The present dissertation has been approved by Philippe Marguier on behalf of Air France under the terms of the *ENGAGEMENT RELATIF AUX INFORMATIONS CONFIDENTIELLES ET AUX DROITS D'AUTEUR*[1] signed on February 20th 2008 in Paris by Ricardo Farinha and Air France.
2. Confidential internal Air France information should not be disclosed, announced or passed. All mention to the company internal material, knowledge, figures and further information as well as to procedures, techniques, products, engineering and AF network is strictly confidential.

[1] A copy of this document is presented in appendix I.

Contents

Figures

Tables

Appendixes

Abbreviations and acronyms

ACARE	Advisory Council for Aeronautics Research in Europe
ADP	Aéroports de Paris
AEA	Association of European Airlines
AF	Air France
AI	Air India
AM	Aeromexico
AMS	Amsterdam airport
ARA	Analyse du Réseau Aérien (Air France route profitability system)
ASK	available seat-kilometre
AZ	Alitalia
AT	Royal Air Maroc
ATI	Anti-Trust Immunity
ATL	Atlanta airport
AY	Finnair
BA	British Airways
Bkgs	bookings
BRU	Brussels airport
CAM	Chiffre d'Affaires Marketing (see Glossary)
CAT	Chiffre d'Affaires au Transport (see Glossary)
CDG	Charles de Gaulle airport
CDG2	Charles de Gaulle airport – terminal 2
CEO	Chief Executive Officer
CFO	Chief Financial Officer
COO	Chief Operation Officer
CO_2	carbon dioxide
CPH	Copenhagen airport
CRS	Computer Reservation Systems
CS	code-share
CTAIRA	Chris Tarry Aviation Industry Research and Advisory
CVG	Cincinatti airport
CZ	China Southern
D	day
DB.IP	(Air France) Economic Studies of Alliances department
DL	Delta Airlines
DTW	Detroit airport
DUS	Dusseldorf airport
EF	'equivalent' frequency
EFS	'equivalent' frequency share
ETS	(European Union) Emissions Trading Scheme
EU	European Union
EUR	euro
FB	Bulgaria Air
FCO	Rome Fiumicino airport
F	frequency
FE	frequency effect
FF	free-flow agreement
FFP	frequent flier programme
FRA	Frankfurt airport
GDS	Global Distribution Systems
HM	Air Seychelles
IAH	Houston airport
IATA	International Air Transport Association
ICAO	International Civil Aviation Organisation
ICN	Seoul Incheon airport
ISC	Interline Service Charge
IT	Information Technology
k	'image coefficient'
KE	Korean Air
JAL	Japan Airlines
JAS	Japan Air System
JFK	New York John F. Kennedy airport
JL	JAL Japan Airlines
JU	JAT Airways
JV	joint-venture
KIX	Osaka airport
KLM	Koninklijke Luchtvaart Maatschappij (Royal Aviation Company)
LAN	Línea Aérea Nacional (de Chile)
LAX	Los Angeles airport
LED	Saint Petersburg airport
LH	Lufthansa
LIN	Milan Linate airport
LHR	London Heathrow airport
LYS	Lyon airport
MA	Malev
MAD	Madrid airport
ME	Middle East Airlines
MEX	Mexico City airport
MIA	Miami airport
MIDT	Marketing Information Data Transfer
MIT	Massachusetts Institute of Technology
min	minutes
MK	Air Mauritius
MRU	Mauritius airport
MS	market share
MU	China Eastern
MUC	Munich airport
MXP	Milan Malpensa airport
M€	million euros
NBO	Nairobi airport
NGO	Nagoya airport
NRT	Tokyo Narita airport
OAG	Official Airline Guide
OK	CSA Czech Airlines
ORD	Chicago O'Hare airport
ORY	Paris Orly airport
OSL	Oslo airport
op	operated
PEK	Beijing Capital airport
PRG	Prague airport
PVG	Shanghai airport
PYT	Panama City airport
QSE	quality, safety and environment
QSI	Quality of Service Index
Q4	forth trimester
RPK	revenue passenger-kilometre
RO	TAROM Transporturi Aeriene Române
SAS	Scandinavian Airlines
SB	seat-block agreement
SB	Air Calin

SEZ Mahe (Seychelles) airport
SK SAS Scandinavian Airlines
SLC Salt Lake City airport
SNCF Société Nationale des Chemins de fer Français
SPA Special Prorate Agreement
SR Swissair
ST SkyTeam
STO Stockholm metropolitan area IATA code
SV Saudi Arabian Airlines
SVO Sheremetyevo airport (Moscow)
TAP Transportes Aéreos Portugueses
TU Tunisair
UA United Airlines
UK United Kingdom
US United States
USD American dollar
US$ American dollars
UX Air Europa
UTA Union des Transport Aériens
VBA Visual Basic for Applications
VIE Vienna airport
VIP very important person
VLM Vlaamse Luchttransportmaatschappij (Flemish Air Transport Company)
V0 Code-sharing economic gain model – version 0
V1 Code-sharing economic gain model – version 1
V2.1 Code-sharing economic gain model – version 2.1
V3 Code-sharing economic gain model – version 3
XX partner airline
ZRH Zurich airport

1. Introduction

1.1 Internship context and development

1.1.1 The Economic-Financial General Direction

The ‘Economics-Finance’ Department is at the centre of all Air France (AF) financial decisions taking part in every economic discussion in other departments. It shows the company financial solidity. It contributes with its analysis to the adaptation of AF into the competitive air transport universe answering to the following main aims: cost control, economic control anticipation, appropriate financial information and investment choices.

The General Direction of the ‘Economics-Finance’ Department employs 800 people and almost 1200 coworkers among different teams with an economic and financial activity: product and cost, budget monitoring, management control, financial analysis, treasury, etc. This Direction reports directly to the President, Jean-Cyril Spinetta and the COO (Chief Operations Officer), Pierre-Henri Gourgeon, and is headed by the number three of the company – the CFO (Chief Financial Officer), Philippe Calavia. The Corporate Control Department is a sub-direction of this General Direction.

1.1.2 The Corporate Control Department:

The Control department is responsible for generating global economic data – including future projections as well as past analysis – about the business for the airline managers. These figures will be used by these managers to make the best strategic decisions regarding the company economic performance. In AF, the analyses of the past and future activities are made for all 3 different areas in the company: passengers, cargo and maintenance. Moreover, the Corporate Control Department assumes the cost reporting of each of the areas related to passenger activity: sales, marketing, communication, alliances, etc. Each sales department has its own local control but the results and their analysis on a bigger scale are summarised by the Corporate Control Department.

1.1.3 The service of the Economic Studies of the Alliances (DB.IP) and the internship mission

Within the Corporate Control Department, and under the direction of Philippe Marguier, the entity is responsible for the economic monitoring of the alliances and the code-shares[2] (CSs). Defining, implementing and following of *joint-ventures* (JVs) is another job of the entity. In particular, the definition and management of the formulae of the revenue and cost share with other strategic AF partners is a specific task of this entity.

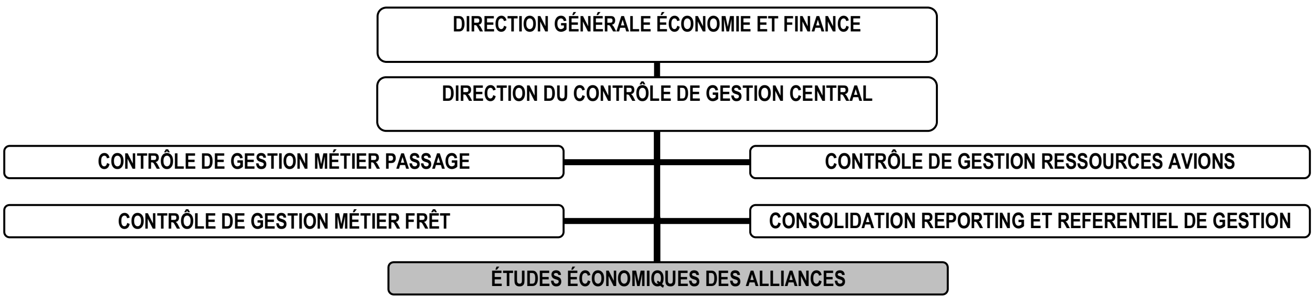


Figure I - Organisation chart of the Financial Department and position of the DB.IP service within it.

2 In accordance with a code sharing agreement, two partner airlines offer services on the same aircraft, each with their own brand, their own IATA code and their own flight number (see further section 3.2 *Theory of code-sharing*)

The DB.IP entity includes 4 people who together are responsible for the economic control of the alliances and the CS with all partner airlines and for the common budget of the *SkyTeam* global alliance. Some of these service concerns are:

- the study of the generated profits by alliances with partner companies;
- the *SkyTeam* budget management;
- the study of the income and cost share in the case of JVs with other strategic airlines, its management and its definition.

The activity of this entity is highly related to the current air transport reality as well as to the world economic situation.

Recently, with *KLM*, this entity has also been charged of defining a new common rule in terms of revenue share regarding the passengers in transit between their flights (quota rule), applicable to the whole *Air France KLM* group. This rule is effective after the IATA Summer 2006 and its aim is to be expanded to other allied airlines, particularly within the new JVs (presently with *Delta Airlines*, *Alitalia*, *Czech Airlines*, *Air Seychelles* and *Air Mauritius*).

Within the framework of its functions, DB.IP has developed and applied a new model which lets the service evaluate the CS between AF (including its regional subsidiaries) and its main partners (*SkyTeam* and some others) from an economic perspective.

The preceding intern, Sebastian Ponce, has created new feeding means for the model in terms of offer, traffic, revenue, connections and CS data (Cambridge Economy Police Associates Ltd, 2007). This work was done since AF had lately carried out new rich application within the Data WareHouse[3] (DWH). Therefore, he slightly redefined the existent model based on these new data.

Thus, the missions of my internship from February until September 2008 were as follow:

- application of the new CS economic gain model to the last IATA seasons;
- study of the evolution by partner of the CS different model data since 2000;
- calibration of the model regarding the system parameters in order to adapt the model to respond to the future evolution, namely in the Interline Service Charge (ISC)[4] and SuperCom[5];
- make the model run on standard operation;
- estimate the gain of *SkyTeam* for *Alitalia* (referring to the possible merge of *Alitalia* with *Air One* (*Lufthansa Group*) or AF)
- sensitivity analysis on some parameters related to the frequency vs market share (with two parameters α and ▯) and to the yield elasticity to the traffic.

The internship contract was discussed and signed between the *École Nationale des Ponts et Chaussées*, AF and myself.

During my internship I had the opportunity to deliver several presentations as follows:

- **Model of Economic Gain from Code-Sharing – for Delta Air Lines, April 2008**
- **Modèle de Gain Économique des Code-Shares, VERSION IATA 2007 PROVISOIRE, June 2008**
- **Évolution du Gain Économique du *Code-Share*, 2000 – 2007, May 2008**

I also enriched the documentation of the model for future users and contributed to the development of the model as stated further on section 3.4.4 *Personal contribution to the model*.

[3] The *Data WareHouse* is a repository of an organization's electronically stored data. Data warehouses are designed to facilitate reporting and analysis. [A3]
[4] the ISC is a commission that was defined by IATA at a rate of 9%.
[5] SuperCom is a super commission which namely enables the marketing airline to finance the accrued frequent flyer miles.

1.2 Purpose and structure of the dissertation

The purpose of this research work is to describe and assess all the types of code-sharing applied to the AF reality and to investigate the economic benefits of such instruments. The analysis of the AF Corporate Control model to quantify the gains from code-sharing agreements and its results is integrated in this dissertation as well as the examination of the impact of AF CSs and its type of CS in each case. All the results reached about the CS and the alliances in general during the internship will also be incorporated in the dissertation.

In this section I begin with my internship context and description and the generic methodology used throughout this dissertation. Next section presents AF and the state of art of the aviation industry at the moment. Section 3 provides a theoretical approach of the CS and a review of the literature on CS agreements, followed by a presentation of the AF Code-share economic gain model. Section 4 explains the actual applications of the model's results, several results from all the studies I have made – in particular a sensitivity analysis on the empirical choice of parameters in the model – and presents the results of the model for IATA 2007. Then in section 5 a survey is carried out on seat-block and free-flow CSs within different scenarios. Finally, all the results are commented, summarised and discussed in the conclusion where advantages and disadvantages of code-sharing are balanced.

The present dissertation makes a contribution to the existing literature as it presents the AF Corporate Control Department model, its many applications with exemplificative results and it attempts to reach empiric conclusions on the economic benefits of different kinds of CS (namely seat-block, free flow or joint venture) within an airline experience. It is the first time that an analysis on block-seat vs. free flow is made in the scientific literature.

The interest of this work is major for airlines which intend to establish a code-share agreement as it points out clearly the issues related to the different kinds of code-share and it contextualises this kind of agreement within the alliances among airlines and the latest updated information on air transport in general.

1.3 Generic methodology

In search of better understanding the economic gain of code-share from the airline perspective, four theoretical studies and one empiric study were carried out. They are presented in section 4. *AF code-share model applications* or 5. *Empiric study: seat-blocks vs. free-flow* depending on whether they are theoretical or empiric. While theoretical studies were used as a guide to conclude about the significance of code-sharing in general and the robustness of the AF Code-Sharing Economic Gain model to quantify its relevance, the empirical study enables a specific analysis on seat-block vs. free-flow code-sharing, as well as tries to evaluate the pertinence joint-venture in code-sharing contexts.

2. State of the art

2.1 Air France

AF – founded in 1933 merging four of the leading French airlines, and integrating *UTA* and *Air Inter* in 1992 (Air France Corporate, 2008) – has focused its activities on three strategic segments:

- ✈ passenger transport and operations;
- ✈ cargo (freight transport);
- ✈ maintenance (aircraft repair and maintenance).

Together these three core businesses represent 97% of the company's revenues. The remaining three percent is generated by AF subsidiaries such as Servair, specialised in in-flight Catering, or Air France Consulting which provides management and engineering solutions for air transport.

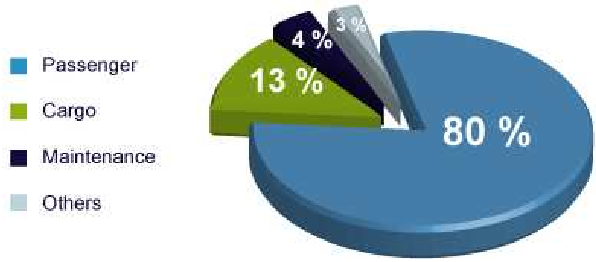


Figure II - Distribution of AF revenues (Air France Corporate, 2008)

AF and KLM merged in 2004 and since then the group has followed a common strategy taking advantage of the global growth in the last years. In this context, Air France KLM group has developed on all major markets, increased profitably through cost containment and continued investment in the future.

Presently, Air France KLM group is in the second phase of the merger aimed at reinforcing the Group's strategic function so that profitability might be further enhanced. New synergies have been studied lately in terms of IT development which will improve current processes. Additionally, a brand new centralised common purchase structure will soon be implemented (Spinetta, 2006) which will enable the group to integrate decision making processes of purchase in order to amplify the group cost synergies.

2.1.1 Network and hubs

since Summer 2006, on the strength of the combined networks of AF and KLM, AF is pursuing a development policy on the fast growing markets of Latin America and Asia, as well as to oil and gas destinations. The Group has launched a new twice a week service to Chengdu, via Amsterdam with KLM. This IATA Summer 2008, AF and KLM are operating a total of 53 weekly flights between Europe and China.

The Group serves five destinations in India, namely Bangalore, Hyderabad, Bombay, Delhi and Madras. AF and KLM now offer 36 weekly flights to India.

After the merge with KLM, the dual network became one of the AIR FRANCE KLM Group main strategies aimed at consolidating the Group's position as a world air transport leader. With a limited number of common destinations (71,2% of long-haul destinations and 64,3% of medium-haul destinations are served by only one of the two carriers (Gourgeon)), the AF and KLM networks are complementary. In other words, AF and KLM have a vast well-balanced dual network at their disposal, better able to resist unforeseen events, and linking Europe to the rest of the world.

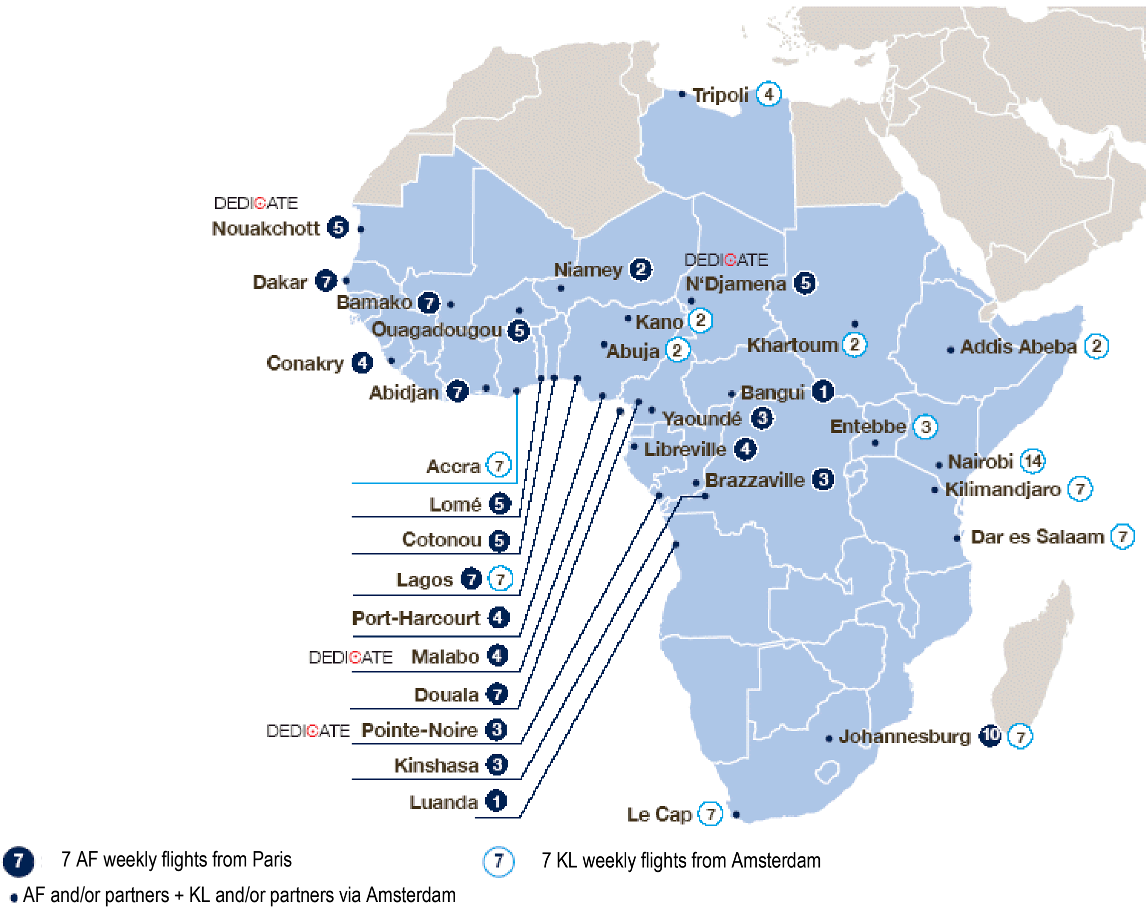


Figure III - African map showing AF/KLM destinations and its complementarity (Airline Route Maps, 2008)

The previous figure only doubles the presence of the group in Johannesburg and Lagos due to substantial point to point traffic and historical traffic rights in both cases. Thin long-haul flows are concentrated on one hub as efficiency gains arise from (Gourgeon):

- a single daily flight from one hub instead of non-daily flights from both hubs[6];
- a single non-stop flight from one hub instead of indirect flights from both hubs[7].

On high-demand routes (such as Lagos and Johannesburg in Africa), AF/KLM offer customers a wider choice of schedules and fares thanks to:

- differentiated timings;
- fare combination[8].

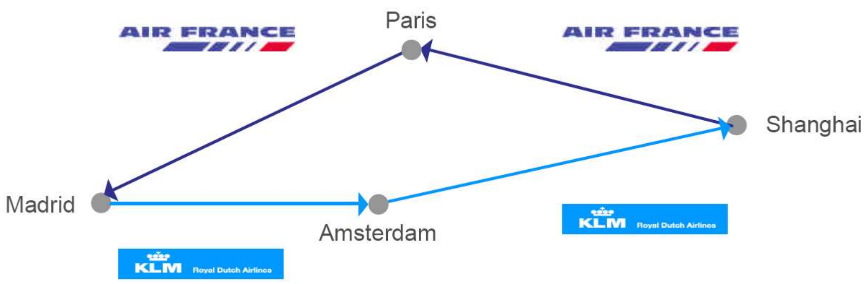


Figure IV – Exemple of fare combination (Gourgeon)

6 Caracas is now only served by AF, on a daily basis and with a larger aircraft (B747-400)

7 Both Manila and Jakarta are only served non-stop by KLM on a daily basis.

8 Final fare = ½ AF round-trip + ½ KLM round-trip.

At the heart of this dual network lies their hub system, the most powerful in Europe, which unlike other European airports has significant development potential. Currently there are 15 daily flights between Amsterdam and Paris CDG, and in peak hours there are flights every 30 minutes.

The Paris-CDG2 hub is one of AF's chief strengths, allowing AF to feed medium-haul passengers onto long-haul flights in Paris. Flights are organised into six banks, each one comprising a wave of arrivals and departures timed to maximise the number of flight connections within the shortest possible timeframe. By combining medium-haul traffic flows with one or more long-haul flights it is possible to increase the availability of flights from one point to another, while at the same time limiting the total number of flights.

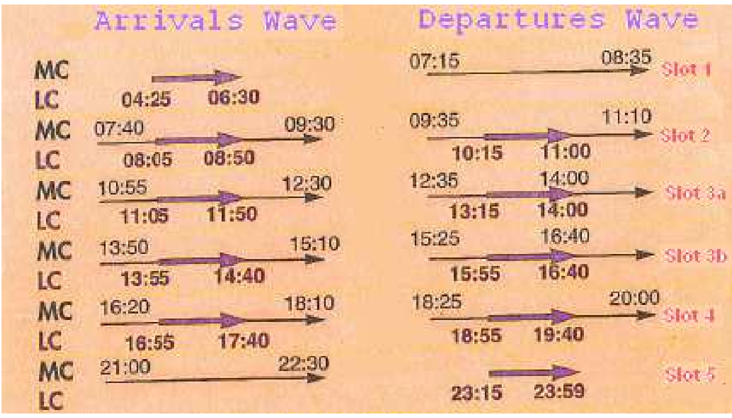


Figure V - AF arrivals and departures waves in the hub: MC = Medium-haul and LC = Long-haul (source: AF Corporate, 2001)

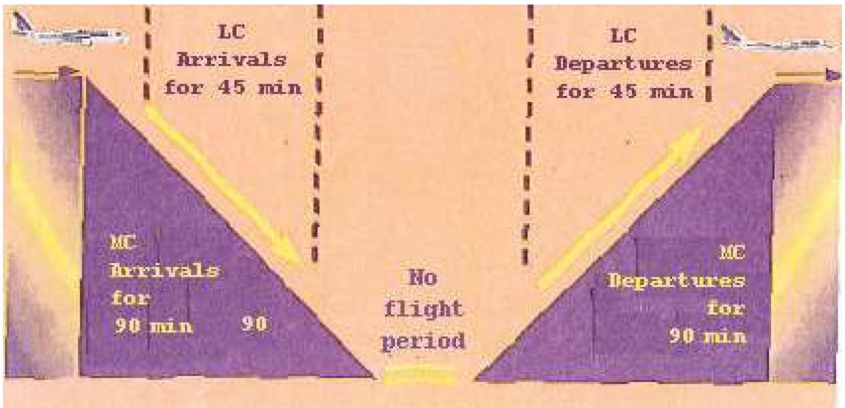


Figure VI - AF's Paris Charles de Gaulle hub slots scheme (source: AF Corporate, 2001)

AF's passenger activity has been extremely dynamic. The increase in traffic impacted all geographical areas. The relevance of the Group's strategy, is based on a strong, balanced network, the efficient Paris-Charles de Gaulle and Amsterdam-Schiphol hubs, the *SkyTeam* global alliance and a modern fleet. For all these reasons, AF-KLM is currently the leader in the majority of the markets in which the group is present.

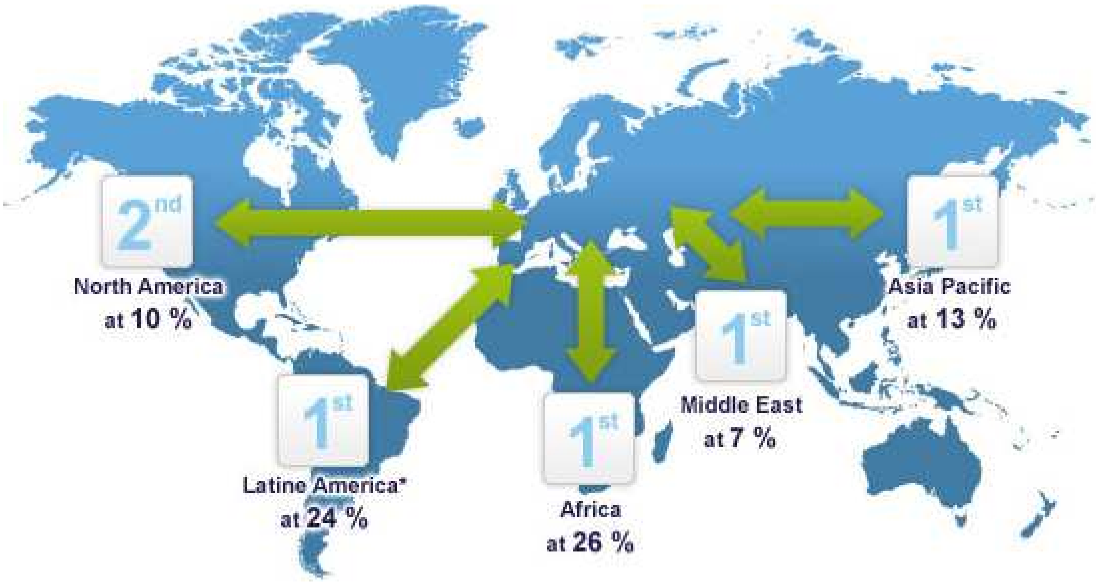


Figure VII – AF KLM: leading European group on nearly all long-haul nonstop markets (SHO, OAG week 36, 2007) (The Official Airline Flight Schedules, 2008)
*** Latin America includes Mexico**

2.1.2 Fleet

On June 30th 2008, there were 407 aircraft in operation, including aircraft belonging to the regional subsidiaries and *Transavia France*. Therefore AF counts on a very modern and rationalised fleet. Since the mid-nineties, AF has undertaken a policy of fleet rationalisation and modernisation focused on increased efficiency and profitability. AF's fleet has an average age of 8.8 years of which long-haul 7.2 years and medium-haul 9.9 years. Comparing to the average age of United States carriers – *Northwest* (18.5 years), *American* (14.7 years) or *Delta* (13.8 years) (Trevidia, 2008) – and most of the European Union airlines – *Alitalia* (14.1 years), *Spanair* (13.1 years), *Lufthansa* (12.7 years), *British Airways* (11.4 years), *Olympic Airlines* (15.7 years), *Brussels Airlines* (12.2 years) (Air Fleets, 2008) – it surely is a young fleet. In 4 years AF aircraft are expected to get only 0.4 years (5 months) older (Spinetta, 2006).

Within *AF-KLM* group, the average age of the fleet does not increase substantiously as *KLM* has a quite young fleet (10.1 years).

Aircraft	Operation	Number
Airbus A318	Air France	18
Airbus A319		45
Airbus A320		64
Airbus A321		20
Airbus A330		16
Airbus A340		19
Avro RJ	CityJet	23
BAe 146		2
Boeing 747	Air France	23
Boeing 777		51
Canadair Regional Jet	Brit Air	30
Embraer 120 Brasilia	Régional	8
Embraer 135/145		37
Embraer 190/195		6
Fokker 50	VLM	18
Fokker 70/100	Brit Air	13
	Régional	14

Table I – AF fleet details (Air Fleets, 2008)

The fleet's development is being managed in line with a strategy combining both flexibility and rationalisation:

- ✈ flexibility, thanks to clauses making it possible to adjust aircraft delivery dates or change models within the same family;
- ✈ rationalisation, by acquiring modern aircraft with similar technical characteristics, i.e. targeting "family effects" in order to capitalise on the technical uniformity of aircraft. Bringing these aircraft into service makes it possible to manage not only crew training costs but also maintenance and fuel costs more efficiently.

Lastly, the introduction of more efficient aircraft will enable the Group to optimise the overall level of environmental performance.

2.1.2.1 Fleet management

As early as 1994, AF decided to rationalise its fleet by purchasing technically similar, latest-generation aircraft. AF has accordingly organised its medium-fleet around the *Airbus A320* family achieving maximum benefit from technical commonalty of a single family fleet. For entry-level long-haul models with a capacity of less than 250 seats, it is building its fleet around the *Airbus A330/A340* and for wide-bodied jets, around the *Boeing 777* and 747 for higher capacity. Note that all *747* aircraft will progressively be replaced by 12 *A380*, the first one to be delivered next year. AF has also an option on two further aircraft and will begin operating three Airbus wide-bodied aircraft during Spring 2009, making it the first European airline to operate the A380.

The airline has already begun preparations for integrating the new aircraft into its fleet operations plan. Over the last two years, AF has been joining forces with *Aéroports de Paris* to conduct a series of airport compatibility tests at the Paris-CDG hub as part of the Airbus *A380*'s first visit to Paris-CDG (Air France, 2007). Fleet rationalisation and modernisation have four main advantages, namely:

1. Economies of scale and therefore improved competitiveness for the airline;
2. Reductions in unit cost for crew training, maintenance and spare parts;
3. Improved management of operating costs including fuel expenses;
4. Enhanced quality of service thanks to streamlined operations and greater comfort.

2.1.3 Quality strategy

Quality is an integral part of AF's strategy. Firstly, because everyone at AF is constantly striving to improve products and services provided to customers, and secondly because AF has decided to adopt a policy of Management through Quality.

Chairman and Chief Executive Officer (CEO) Jean-Cyril Spinetta, together with President and COO Pierre-Henri Gourgeon, have just restated AF's ambition: to be, with KLM, the benchmark airline in quality, safety and environment (QSE) (Air France, 2008). This implies developing any methods aimed at safeguarding and improving flight safety so as to earn the preference of more and more customers.

2.1.3.1 Customer focus

Dialogue between AF and its passengers is fundamental to the airline's quality strategy. Permanent focus on the customer enables to anticipate customer needs and changes in behaviour and to understand customer dissatisfaction.

2.1.4 Air France subsidiaries

AF has nine subsidiaries, specialising in air transport (regional airlines) and complementary activities such as airline catering services (*Servair*), aeronautical maintenance (*CRMA*) and cargo forwarding (*SoDExi*).

To expand services out of the French regions, feed the hubs in Paris and the French provinces, to win over new market segments and even to acquire new expertise, AF relies on these subsidiaries.

Figure VIII – AF subsidiaries (Air France Corporate, 2008)

<u>Key facts and figures</u>

- **183** destinations in 98 countries
- **1,700** daily flights
- **407** aircraft (including 151 regional aircraft)
- **74,354** employees (Air France and its subsidiaries)

Table II – AF Key facts and figures as of June 2008 [H3]

2.1.5 Sustainable Development and Patronage

The airline's commitment to developing and promoting initiatives in support of sustainable development is reflected in its implementation of basic principles concerning Human Rights, work standards, environmental protection and the combat against corruption.

2.2 Air France and its partners

AF is a founding member of *SkyTeam* (ST) which includes other ten airlines as full members: *Aeroflot*, *Aeromexico*, *Alitalia*, *China Southern*, *Continental Airlines*[9], *CSA Czech Airlines*, *Delta Air Lines*, *KLM Royal Dutch Airlines*, *Korean Air* and *Northwest Airlines*. Besides this alliance, AF has also signed special agreements with approximately 40 partners over the world.

Thanks to its many assets, AF is undeniably an attractive partner:

- it is the leading airline in the French market, the largest market for air transport in Europe;
- AF has a strong hub, Paris-CDG2, which is the only one in Europe with real potential for future expansion[10] (Expansion Management, 2008);
- France is the world's top tourist destination, and Paris, the natural gateway for flights to Europe, Africa and the Middle East.

AF has concluded three types of agreements, as follows:

- franchising agreements with carriers operating from regional hubs;
- code-sharing agreements;
- Flying Blue frequent flyer programme (FFP) agreements.

---

9 On June 19, 2008, Continental announced plans to join the Star Alliance and to cooperate with United Airlines, linking both networks and services worldwide to deliver new benefits to our customers. [C8], [H6]

10 Charles de Gaulle is the only European airport with development land still available. Planners are carefully utilizing this resource for long-term benefits. The airport has four runways that are fully operational 24 hours a day.

All partners and franchisees undergo a rigorous selection – first in terms of safety and second respecting commercial criteria. AF only lends its brand to flights operated by airlines guaranteeing service standards equivalent to its own. With respect to ground and in-flight services, the agreements include specifications relative to service quality. Passengers are informed of the airline with which they will actually be flying at the time of reservation, at the airport in the check-in counter and when boarding.

2.2.1 *SkyTeam*

SkyTeam (ST) is an alliance founded in 2000 that is dedicated to providing passengers with greater flight options, improved customer service, and enhanced benefits. With ST and its Associate[11] carriers, passengers can choose from 16,786 daily flights to 905 destinations worldwide in 169 countries to travel the globe (International Air Transport Association, 2008).

It is the second largest airline alliance in the world — behind *Star Alliance* — partnering fourteen carriers from four continents, with two pending associate members. *Middle East Airlines* and *TAROM* are presently in the process of becoming associate members sponsored by AF.

ST also operates a cargo alliance called *SkyTeam Cargo* with all current SkyTeam members except for *Continental Cargo*.

This global alliance does not have a dedicate management entity. Its counts however on a committee which deals with the daily issues. This committee consists of its chairman – Leo M. van Wijk – and the alliance manager of each airline (Moutinho, 2006).

Below are listed some of the benefits for the passenger of *SkyTeam* and global alliances in general:

- worldwide network with more flights and better connections due to an extensive worldwide hub network;
- streamlined travel as passengers only need to book one ticket and check in once for most itineraries with connecting flights on the global alliance partners;
- consistent customer service;
- lounge privileges as passenger are enable to enjoy access to the global alliance member lounges worldwide with qualifying travel (SkyTeam offers 447 lounges around the world);
- worldwide ticket offices as clients may make travel arrangements or receive information at any ticket office of the global alliance partners;
- Frequent Flyer Program miles as passengers may earn or redeem miles on all network flights of the global alliance and benefit from many privileges according to the level of their membership in all the partners. These miles accrued flying on *SkyTeam* airlines tickets are added toward Elite status[12];
- guaranteed reservations for Elite members;
- more fares are offered from discount economy to first class to more destinations and regional or around-the-world passes are suggested;
- enhanced airport procedures which save time to passengers by streamlining;
- single check-in once passengers are connecting to other flight under a code of a member of the same alliance;

[11] In global airlines Associate/Regional members differ from full members on governance issues and voting powers within the alliance.
[12] Level in the FFPs for those who fly the most and use the airline partners most frequently. It gives additional benefits to the FFP most active members. Elite members receive faster check-in, special reservation hotlines priority boarding privileges, priority baggage handling and many other special travel opportunities including upgrades which are free or can be made against their miles.

✈ quality standards guarantee the quality all the airlines.

Airline	Country	Main Hub	Fleet Size	Number of Destinations
Aeroflot	Russia	Sheremetyevo International Airport (Moscow SVO)	82	95
AeroMexico	Mexico	Mexico City International Airport (MEX)	64 [13]	52 [14]
Air France	France	Charles de Gaulle International Airport (Paris CDG)	256	185
Alitalia	Italy	Leonardo da Vinci Airport (Rome FCO)	181	90
China Southern Airlines	China	Beijing Capital International Airport (PEK)	292	121
Continental Airlines	United States (Texas)	George Bush International Airport (Houston IAH)	381	283
CSA Czech Airlines	Czech Republic	Ruzyně International Airport (Prague PRG)	51	69
Delta Air Lines	United States (Georgia)	Hartsfield-Jackson International Airport (Atlanta ATL)	452	324
KLM	Netherlands	Schipol Airport (Amsterdam AMS)	111	129
Korean Air	South Korea	Incheon International Airport (Seoul ICN)	128	115
Northwest Airlines	US (Michigan)	Wayne County Airport (Detroit DTW)	336	255

Table III – ST full members (source: airline's website, August 2008)

Airline	Country	Main Hub	Fleet Size	Number of Destinations
Air Europa	Spain	Barajas International Airport (Madrid MAD)	40	44
Copa Airlines	Panama	Tocumen International Airport (Panama City PYT)	40	42
Kenya Airways	Kenya	Jomo Kenyatta International Airport (Nairobi NBO)	26	42

Table IV – ST associate airlines (source: airlines' websites, August 2008)

Airline	Country	Main Airline
AeroMexico Connect AeroMexico Travel	Mexico Mexico	Aeromexico
Brit Air CityJet Régional	France Ireland France	Air France
Alitalia Express	Italy	Alitalia
Continental Connection Continental Express Continental Micronesia	United States US United States (Guam)	Continental
Delta Connection Delta Shuttle	United States United States	Delta
KLM Cityhopper	Netherlands	KLM
Northwest Airlink	United States	Northwest

Table V – ST affiliates[15] (Wikipedia, 2008)

[13] Does not include *Aeroméxico Connect* nor *Aeroméxico Travel*
[14] Does not include *Aeroméxico Connect* nor *Aeroméxico Travel*

There is much speculation about non-aligned airlines joining one of the global alliances. Some as follows, expressed their desire or are already in the ongoing negotiations to join *SkyTeam*:

As full members:
- Air Algérie
- China Airlines
- China Eastern Airlines
- Garuda Indonesia
- Gol Airlines
- Jet Airways
- Kingfisher Airlines
- Malaysia Airlines
- Vietnam Airlines

As associate members:
- Air Tahiti Nui
- Bangkok Airways
- FlyLAL
- Uzbekistan Airways

2.2.2 Regional Gateways

Regional air transport has an essential role to play in the development of major airlines. AF has built up an important regional sector enabling it to:

- ✈ extend its network by offering services, under its own colours, on routes with less traffic;
- ✈ feed its hubs at Paris - CDG, Bordeaux, Clermont-Ferrand, Lyon and Marseille;
- ✈ strengthen its presence and obtain a dominant position in the domestic market thanks to a tight-knit network.

In return, AF's strategy meets the needs of regional airlines by:

- ✈ reinforcing their commercial policy, thanks to the marketing strength and network of an airline such as AF;
- ✈ offering their passengers more destinations through a structured, coherent network, and a seamless chain of services;
- ✈ offering their customers access to an attractive Frequent Flyer Program.

AF has also a contract with *SNCF* – the most important rail services operator in France – that links its main hub Paris-CDG to many towns in France. In the future, AF will provide itself this service with its own trains and crew on board.

2.2.3 Code-share (CS) agreements

In order to offer more destinations and flights, AF has joined forces with other carriers to sell certain routes and flights on a shared basis. These flights are operated by either airline and are sold under flight numbers of both carriers.

Even though all these flights are sold under an AF code, products and services might differ on board depending on the airline operating the flight.

Figure IX – Airlines which CS agreement is processed by the AF code-sharing economic gain model (Farinha, 2008)

[15] Comparing to Associate members which only differ from full members in terms of governance issues and voting powers within the alliance, affiliates operate for one of the members of the alliance and are elected to earn and redeem miles and to integrate the global network of the alliance if they are affiliate.

2.2.4 Frequent flyer programmes

Frequent Flyer Programme agreements extend the benefits of the AF and KLM *Flying Blue* Frequent Flyer Programme to flights of partner airlines or to clients of non-airline partners. *Flying Blue* members are then enabled to earn air miles and redeem rewards with these partners. These agreements might be reciprocal. Therefore:

- passengers flying from Paris to Atlanta with AF or *Delta Air Lines* earn *Flying Blue* Miles whether they fly under an AF or the DL flight number;
- AF passengers can also earn Miles and obtain rewards from all franchised airlines;
- *Flying Blue* cardholders may also benefit from services offered by non-airline partners such as hotels, car rental, etc.

At present, there are several partners of the AF/KLM *Flying Blue* Frequent Flyer Program, namely the airline and non-airline partners below.

Airline Partners
ST airlines, associates and affiliates, Aircalin, Airlinair, Alaska Airlines, Bangkok Airways (rewards only), Comair, CCM Airlines, Japan Airlines, Kenya Airways, Malaysia Airlines, Malev, Middle East Airlines, Ukraine International Airlines, TAAG Angola Airlines, Twin Jet

Table VI – *Flying Blue* airline partners [H2]

Non-airline Partners
Over 100 non-airline partners have joined the Flying Blue programme, thus increasing opportunities to earn and use Miles. Hotel nights, car hire, safari trips, car racing courses or film shows are just some of the ways to use Miles.

Table VII – *Flying Blue* non-airline partners [H2]

2.3 State of the art of commercial air transport

2.3.1 Challenges

Richard Neufville from the *MIT – Massachusetts Institute of Technology* says that the three challenges for the future are: flexible design facilities, runway capacities and terminal construction costs. The aviation industry at present is restricted in six different main areas:

- environment, its quality, its cost, the respect of the Kyoto Protocol and the new European Union Emissions Trading Scheme (ETS);
- security, its speed, its flexibility and its cost which increased by 50% after the terrorist attacks in New York, London and Madrid;
- safety;
- infrastructure (ground), its capacity, its quality, its cost and its flexibility between the different actors (airlines, passengers, handling, service providers and space tenants);
- infostructure (air navigation control), its capacity, its quality and its cost which lies on the Single Sky in Europe[16] in order to optimise the system;
- passengers' rights, its quality and its cost.

The noise, the compensation to the passengers in case of overbooking, cancellations and significant delays or the rail lobby in Europe also have been playing an important role for the airlines (Verdier, 2007).

[16] The Single European Sky integrates 55% of the total European flight and appears to safely face the fast increase of the air traffic. It redraws the air space without considering the borders. It comprises the former air space of Belgium, France, Germany, Luxemburg, the Netherlands and Switzerland. This Single European Sky aims to reduce the incidents by a factor 3 from 2006 until 2020 despite the growth of traffic. It will also reduce the emissions by an improved air traffic management and economise staff. [B9]

According to ACARE (*Advisory Council for Aeronautics Research in Europe*) (Lawler, 2006) there are 5 High Level Target Concepts. Research has been carried out on air transport services to make them:

- highly customer-oriented;
- highly time efficient;
- highly cost efficient;
- ultra green;
- ultra secure.

2.3.2 The evidence of market segmentation

After the disappearance of the Concorde, value of time is no longer a vital issue. Indeed, price is more and more a competitive advantage which is reflected by the high number of low-cost airlines operating today. The first European low-cost carrier was founded in 1996 and currently *Ryanair* and *easyjet*, each one separately carries more pax.km than *Lufthansa* or AF in the intra-European routes. Ergo, differentiation is essential and that is not only a question of in-flight services, but airlines are searching to differentiate their products also on the ground. There are already even specific terminals and airports for either low-cost carriers or first class passengers.[17] Interestingly and unlike airlines, European airports are expected to remain healthy and profitable no matter what their target is (Van de Voorde). This whole situation is even more curious in the current context where airports compete against each other for airlines and passengers.

On the one hand, in low-cost terminals (Marseille or Kuala Lumpur) or in exclusive low-cost airports (Paris Beauvais, Frankfurt Hahn or Milan Bergamo), for instance passengers are responsible for printing their baggage tag and drop their luggage in the convey belts after having tagged it. All additional services are charged, even check-in in a traditional counter can only be done against a fee. Terminals are not painted, facilities and services are scarce, amenities are basic and the level of comfort is minimal. Passengers have no seating area and the waiting time before the flight is not particularly pleasant. Kuala Lumpur International airport low cost terminal has no travellators, escalators nor aerobridges. Apron is close to the runway and parking ramp is minimised to have a shorter turnaround time (Low Cost Carriers Terminal (Malaysia), 2008). This terminal consists of a single floor operation area, following other similar terminals, to facilitate the passengers' movement of international and domestic departures/arrivals. In case of low-cost specific airports, they are often located far away from big cities. Today, these airlines tend to distort the pure low-cost business model. Some such as *Ryanair*, *easyjet* and *air berlin* have set hubs in order to enhance its productivity and simplicity, the first in Marseille and Madrid, the second in Paris CDG, Amsterdam and Madrid and the latter in Zurich. Officially, only *air berlin* coordinates its arrival and departure slots, while *Ryanair* and *easyjet* are officially based in the airports just named but have not really implemented a hub there, which also means that they do not guarantee connections. *air berlin* goes even further in disguising the pure business model, proposing a Frequent Flyer Programme to its passengers, whereas, *easyjet* offers paying lounges for its passengers and, like *germanwings,* has its seats sold through Global Distribution Systems (GDS) such as *Amadeus* or *Galileo*. In Europe, *Ryanair* is the airline whose business plans most stick to the pure low cost model. Likewise does *Southwest* in the US.

[17] There are even freight specialised airports such as Vatry in France.

Figure X – Check-in area in Kuala Lumpur Low Cost Carrier terminal [H8]

Figure XI – Arrivals lounge in Kuala Lumpur Low Cost Carrier terminal [H14]

At the other end of the spectrum, more refined than mere traditional business class or first class services such as simple lounges, some airlines have started recently the concept of first class terminals. These specially dedicated terminals (in Frankfurt for *Lufthansa* and Doha for *Qatar Airways*) have door-men and receptionists that take the passengers' luggage out of the limousine that picks them up from their hotel, residence or office. If passengers prefer to arrive in their own car, there are valet services upon their arrival at the terminal. In any case, baggage is forwarded and passengers have nothing to worry about. Once in the terminal, a personal assistant is often waiting and will be at first class passengers' service until they board. While they wait in the amazing lounge that offers a wide range of services from wonderful massages to tasty meals, from specially designed beds in separate private rooms to stunning bath tubs, they do not even realise that they and their luggage are being checked-in. Lounges in first class terminals offer even spa with sauna, jacuzzi and several other services. Security check is discreet, fast and without waiting time. All formalities are handled by the personal assistant that will also keep the boarding passes and accompany the passengers. There are no boarding pass readers or boarding counters. And then, from the terminal lounge to the airplane a limousine service is offered. There are even airlines that let passengers choose the car they want to be taken to the airplane.

Figure XII – Hot tubs & spas, whirlpool baths and showers are offered by *Qatar Airways* in its First Class lounge in Doha [H14]

Figure XIII – First class passengers arrive directly at the aircraft by limo when flying with certain airlines [H16]

2.3.3 Particular contexts: **Gulf carriers and private aviation**

The current panorama includes yet the Gulf carriers whose particular business plan lies on an aggressive development policy that benefits from the competitive advantage of reaching non-stop all the major international markets. *Emirates* offers direct flights from Dubai to San Francisco and Los Angeles, Sao Paolo, Johannesburg, Sydney, Auckland and Tokyo, which mean that *Emirates* links the world with a single connection in Dubai International Airport. This airport has at present a connection rate higher than 50% which is massive comparing to other major world airports.

Private aviation for premium passengers covers the needs of government, VIP, military and ambulance medium-haul flights. This is also an area whose boom has just started with considerable groupings such as *Netjets* who have been publishing amazing development rates, year after year (Netjets Europe, 2008). Taking advantage of the strong growth in this sector, *Jet Republic*, a new private aviation company headquartered in Lisbon, announced that it intends to fly to more than 1,000 European airports from Summer 2009 with a fleet of 25 aircraft (with option on 85 more). To support this amazing development, several business aviation terminals (Frankfurt, Hong Kong or Delhi in 2010) or airports (Lisbon Tires, Paris Bourget, London City or Cannes) already exist or will be built soon. Frankfurt private aviation terminal and Hong Kong Business Centre offer spacious and comfortable passenger and crew lounges, conference room and meeting area, limousine services, helicopter rental, VIP catering, and immigration and customs clearance. "Despite the current economic climate, the private jet market is enjoying strong growth," *Jet Republic* CEO Jonathan Breeze commented (Buyck, 2008).

2.3.4 Figures in 2007

This year's *Airline Business* world airline rankings (Ezard, 2008) showed that carriers in all regions enjoyed a strong year in 2007, with the top 150 carriers combining to post a record $22.2 billion net profit and a record $29.2 billion operating profit.

The previous bests in the 14-year history of the ranking were in 1997, when a $9.3 billion net profit was recorded, and 2006, when a $20.4 billion operating profit was posted. But the forecast for this year and 2009 is markedly less optimistic, particularly for airlines in Europe and the US. Notwithstanding, IATA chief economist Brian Pearce says that "The silver lining to the storm cloud is that there are areas of the world where economic growth is proving far more robust than in other cycles."

For instance, Asian carriers had an outstanding year in 2007, and while analysts expect profits in this region to fall in 2008 they do not see airlines collectively dipping into the red. "The Asian carriers are in a much better position than the US and European carriers," says *Morgan Stanley* Singapore-based analyst Chin Lim. "The intra-Asia and Asia-Middle East markets are still very strong. Traditionally when the United States is weak Asian carriers go to intra-Asia. As long as China doesn't collapse they will do well"

Carriers in the Middle East are also in relatively good shape despite the record oil prices. Analysts say local demand which is driven by oil-based economies, remains strong. As a result, airlines from the region are able to increase fares and fuel surcharges while continuing to add capacity. "With these oil prices there is an impact to the earnings for all carriers, but the Middle East carriers better than anyone else can pass it on," says London-based *Citbanki* analyst Andrew Light. AF and *Lufthansa* with regular flights to these destinations benefit from the price elasticity of these specific passengers. It is important to note that the oil price in the Gulf countries is far less expensive than in other markets such as Europe and the US.

Indeed, this general turndown for carriers is even more difficult to pass through after a good previous year for air transport with a global economy growth of 4.9% (Air France, 2008). IATA 2007[18] has been a less easy year for the aviation industry around the world for several reasons. It was said by Giovanni Bisignani[19] that Air Transport 'is like Sysyphus – after a long uphill journey a giant boulder of bad news is driving' it 'back down'. Indeed IATA 2008 is foreseen as a much more difficult year. The outlook for the global airline industry could be described as mostly cloudy with occasional sunshine as high oil prices and the economic downturn take their toll on different regions in different ways.

[18] April 2007 – March 2008
[19] IATA Director General & CEO since June 2002

Firstly, the sector has been strongly affected by the skyrocketing oil price. After enormous efficiency gains since 2001 there is no fat left. Paper tickets are gone, 135 airlines use coded boarding passes and millions of passengers use CUSS (Common Use Self Service) kiosks in almost a hundred airports. Based on a US$ 107 per barrel (Brent) IATA estimated the fuel bill at US$176 billion, US$40 billion even more than in 2007. In this case, loss would be of US$2.3 billion in 2008 (Bisignani, 2008). The problem is that the price of oil remains high and the fuel invoice will become even more devastating for airlines. September 11th brought a significant change making the industry tougher, leaner and more efficient. Nevertheless, this new crisis is not expected to be any easier to pass through. From January until June 2008, 24 airlines went bust (International Air Transport Association, 2008).

Another point that has marked the global economy was the rise of the euro against the dollar and other currencies and the degradation of the macroeconomic context in general in addition the US credit crunch which has been slowing traffic growth.

Europe is also facing tough times ahead, after a strong 2007. "For most airlines 2007 was a pretty good year. There was reasonably good demand," says Chris Tarry, chairman of UK-based CTAIRA[20]. "But what goes up has come down and it has come down with a vengeance. The real issue now is how you suddenly change your view from everything going up to what you're going to have to do to survive."

2.3.5 EU/US open-sky and consolidation

The 'open sky-plus' agreement between European Union and the United States has finally been effective and due to all the reasons named before, a faster concentration has been witnessed in the last months. This agreement was an important step; but it did not break the mould for airlines in order to play in a global competitive playing field. Some years ago, consolidation began in domestic markets *Continental* and *New York Air*, *Delta* and *Western Airlines*, *JAL* with *JAS*, *Air India* and *Indian Airlines*, AF and *UTA* and more recently *TAP* and *Portugália*. *Delta* with *Northwest* and *Vueling* and *ClickAir* (Ezard, 2008) are the next to come and *Austrian*, *SAS* and *Alitalia* among others are ready to consolidate. Once and again the oil crisis speeds up this consolidation and global vision must be taken. Cross-border mergers are delivering shareholder value such as AF-KLM or *Lufthansa/swiss* the latter which is ready to integrate *Brussels Airlines*. To reach the full integration, *Lufthansa Group* will take a 45% strategic stake. Consolidation enables merged airlines to operate in a demanding market environment, to develop further, to attain its growth targets and raise their profitability, and thereby offer customers and staff better long-term perspectives. (Buyck, 2008) (Lufthansa, 2008)

Moreover, *British Airways*'s franchise in South Africa (*Comair*), *LAN* across Latin America (*LAN Argentina, LAN Ecuador and LAN Peru)* or the many *Virgin*s: *Atlantic*, *Nigeria*, *Blue* (Australia) and *America* have proven for the time being that international brands can work safely. This consolidation and the spread of low-cost airlines have already transformed the business model of most United States major carriers dated of the liberalisation of the United States market in 1978 (G., F., 2008). For Gordon Bethune (Chalmet, 2008), consolidation might even be the solution for the current structural problems in the air transport industry. Actually, it has truly been seen 'as the most palatable way to ensure profitability by shrinking the industry: grounding planes, eliminating routes and cutting staffs' (Maynard, 2008). US carriers in particular are facing a bleak forecast. The first half of 2008 has seen carriers running losses, while the third and fourth quarters will sure be a transition period as domestic capacity is being slashed (aviation consulting firm *R.W. Mann & Co.* president Robert Mann) (Boehmer, 2008).

[20] CTAIRA - Chris Tarry Aviation Industry Research and Advisory

2.3.6 Congestion

Yet, from a general point of view, airports have become more and more expensive and some such London Heathrow at unconceivable rates. Extra taxation over airlines has been created namely by the European Union and monopolies are still not effectively regulated in the industry. All in all, airlines have many difficulties to face in the near future. They are struggling for survival and massive changes are needed. Furthermore, there is the dramatic issue of capacity that airlines face in congested airports. S. Theiss (Theiss, 2007) presented a possible approach to the problem in The Hague for the *Airneth* Conference in 2007. As it is a real problem in main world platforms, several other studies have also been presented on this conference subject to the 'Optimal use of scarce airport capacity' namely by the Irish Commission for Aviation Regulation (Cambridge Economy Police Associates Ltd., 2008), Prof David Gillen (Gillen, 2007) or Moshe Givoni and Piet Rietveld (Givoni, 2006).

2.3.7 European Trading Issues

In an effort to attack aviation's small but fast-growing contribution to climate change, the European Union has decided to dictate a cap on CO_2 emissions for all aircraft arriving at or departing from European Union airports. Airlines would then be allowed to buy and sell 'pollution credits' on the European Union 'carbon market' (Emissions Trading Scheme).

International aviation takes part in climate change through distinct aircraft emissions[21] so airlines will be obliged to buy carbon credits from renewable-energy schemes to cover any growth. The scheme, which applies after 2012, means growth in greenhouse gas emissions from flying will have to be cancelled out by buying "carbon credits".

Although the air transport industry has progressed concerning aircraft technology and efficiency, reductions in greenhouse gas emissions made thanks to these investments have not been enough to compensate for the rapid growth of global air traffic (50% over the last decade). A compromise agreement was endorsed by the European Parliament inserting civil aviation in the EU ETS. This is to say that aviation is the first industry from the transport sector to be included in the scheme.

CO_2 emissions from airplanes – which are directly related to the amount of fuel consumed – have risen by 87% since 1990 and now mean 3.5% of total 'human activities' participation to climate change. The *Intergovernmental Panel on Climate Change* (IPCC) has estimated that this share will continue to grow until 2050, corrupting efforts made by other industrial sectors to fulfil Europe's Kyoto commitments**.**

Indeed, the Kyoto Protocol excludes international aviation and merely requests countries to work towards reducing emissions in this sector through the *International Civil Aviation Organisation* (ICAO).

Although the ICAO had initially supported the idea of an Emissions Trading Scheme to meet CO_2 emissions reduction objectives, prospects for a comprehensive global agreement appeared distant and, given this situation, the Commission decided to take unilateral action.

Several policy options were examined, including aviation taxes, such as a fuel tax – as kerosene is currently exempted from taxation – but this would have required a unanimous decision in the Council of Ministers and was strongly opposed by the aviation industry.

In September 2005 (Commission of the European Communities, 2005) the Commission finally concluded that bringing aviation into the European Union – Emissions Trading Scheme would be the most cost-effective way of reducing the climate change impact of aviation. This scheme will apply to all flights between European Union countries and flights taking off from

[21] carbon dioxide, water vapour emissions, contrails - 'aviation smog' – and indirectly nitrogen oxides.

or landing in an European Union country, including intercontinental flights as a whole, not simply the part of the journey in European airspace.

2.3.8 Current events

Today, major airlines tend to have a global network with one or two hubs while low-cost carriers are specific for point to point, even if there are point to point routes within the major airlines networks and some low-cost carriers that start connection services in a kind of hub as discussed earlier in this section.

Interesting is also the fact that the general tendency in the air transport has been and will still be in the near to pay all its externalities contrarily to other means of transport, which makes it even tougher for the airlines to survive in the current conjuncture.

Also due to the oil price nowadays, airlines have strongly reduced their capacities (*VARIG*, *SAS*, *Alitalia*, *British Airways*, *American Airlines*, *United*…), strongly concentrated and some have even disappeared, most of them in the United States domestic market and in the *'all business class'* market in the North Atlantic premium routes. On the other hand, strong and solid airlines benefit from their economies of scale and become even stronger and more solid.

Low-cost airlines are then said to have reached their limit as their economic model is based on the traffic growth as these airlines are confined in the case of a massif fare raise if oil prices remain so high. Nevertheless, the recent strategies of traditional carriers such as *Air France*, *Lufthansa*, *Iberia* or *TAP Portugal* integrate low-fare products on medium-haul flights – the default market of low-cost carriers. This means that the market framework might have combine almost universal low-fare business models initially based on the low-cost niche.

Discussions exist today between the three following concepts: low-cost, low-fare and 'no frills' which are not mutually exclusive and which might combine slightly different targets. According to Rosário Macário, who has developed a study for the European Commission on the low-cost concept itself, seven different low-cost concepts have already been identified.

2.3.9 Predictions of the future

The average natural demand from Europe on long haul flights forecasts from 2007 until 2011(Verdier, 2007):

- Japan +4.6%;
- Asia and Pacific (except Japan) +6.8%;
- Middle East +7.7%;
- Africa +4.8%;
- North America +6.2%;
- Latin America +8.3%.

Analysts in Latin America are predicting that this region could find itself in one of the sunny spots this year, buoyed by double-digit demand growth. "In the fourth quarter, hopefully we'll see some stabilisation," says Mann. "Carriers are burning cash at the moment and the hope is that they stop bleeding cash in the fourth quarter. But this depends on what the United States economy does and what jet fuel prices end up being, so we'll have to wait and see. The risk is that if carriers continue to burn cash, a number of them will reach a reduced cash point where the only option is to restructure, and this will likely end up in liquidation."

Capacity discipline on a scale not seen before in Europe will take place as carriers attempt to weather the storm, according to David Henderson, manager information at the *Association of European Airlines* (AEA). "Lots of individual routes and clusters of routes have fallen into the seriously unprofitable category," he says. This has triggered a half-year re-planning process, with plenty of capacity cuts. This is more or less unprecedented in Europe. I don't know what kind of traffic and capacity picture we'll see in the winter but if this carries into 2009 we will see a highly unusual picture next year."

Light adds: "The important thing is to reduce capacity to maintain pricing power, which is what the US airlines are doing. The Europeans as a group will have to do something similar".

For the next 5 years, a 3.5% world economic development is expected due to the emergent countries (Spinetta, 2006). This growth would generate a natural demand in the long-haul traffic around 6%. However, as fares will continue to rise to compensate the increase of the oil price, the air transport landscape will be redesigned. In the future, airlines will need to be quick to adjust to the prospective reality of current full order books of aircraft manufacturers, pilots shortage and congested airports and runways (Van de Voorde).

Finally, and after all, even with all the challenges that the air traffic has been facing lately, there are also some optimistic perspectives for the air transport in a near future (Bisignani, 2008), even for problematic markets such as United States and Europe:

- globalisation – air transport is the core of international exchanges, with a strategic role in terms of the influence of a determinate country;
- economic growth perspectives – in Asia and Middle East (but also in Europe);
- potential mobility demand by the Asian emergent economies – considerable demographic growth (+1% yearly until 2020) in Asian emergent countries and a forecast of 400 million middle-class people in India in 2010;
- development of a global tourist demand – doubling of the international tourists until 2020[22];
- favourable productivity gains – due to the arrival of the *A380*, the networks reorganisation or the Revenue Management.

2.3.10 Air France

Concerning AF specifically, last year has been important for the joint-venture (JV) agreement with *Delta* for the North-Atlantic[23] connections. Following the strategy of the JV, AF started operating its London-Los Angeles flight right after the effect of the open-skies agreement. Additionally, AF integrated *VLM* – London City based regional airline which reinforces the point-to-point offer from this premium airport in the Londoner business centre – in its group and sent *Alitalia* a proposal of acquisition that finally was not accomplished. On the other hand, the opening of the new terminal at Paris CDG airport totally reserved for AF and its partners stands as an opportunity for the company against competitors operating the same airport[24]. Lately, pursuing its intentions of further consolidation AF has shown interest in *Austrian* (Boehmer, 2008).

Air France Group
Turnover: 16.4 x 10^9 € (+5.2%)
Operational profit: 673 x 10^6 € (+2.9%)
Adjusted operational margin 5.0% (-0.2 pt)
Free cash flow: 259 x 10^6 €
Net profit: 437 x 10^6 € (+2.6%)

Table VIII – Air France Group Data – yearly evolutions (source: IATA 2007)

22 World Tourism Organisation

23 Canada, US and Mexico vs European Union

24 *Star Alliance* has been also joining its members in terminal 1 in Paris CDG to benefit from co-location synergies and actively compete against AF in its main hub. This is to say that Paris CDG is becoming a multi-carrier hub rather than exclusive to AF and global air transport liberalisation has become reality.

Unfortunately due to several issues, AF by itself had a lower net operating profit comparing to the other majors in Europe.

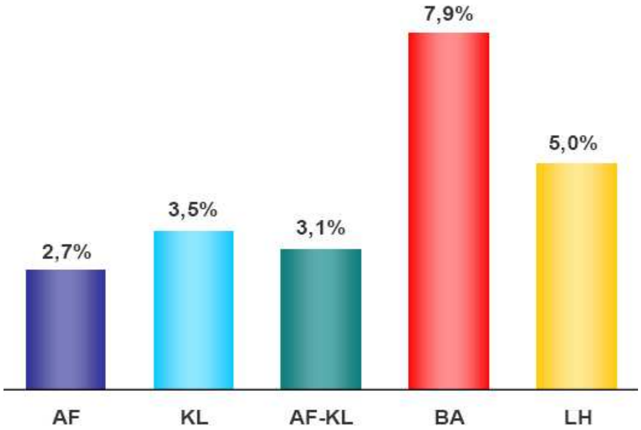


Figure XIV – Net operating profit for IATA 2007 (Spinetta, 2006)

In the current context, airlines with older fleets and inefficient hubs are those which will suffer the most. AF has been working in the last decade to avoid these two factors with a very young fleet[25] and a hub at CDG which is the biggest in Europe in terms of connections (see further figure XV). In addition, AF presents unique competitive advantages which are combined to a balanced business model and reinforced by a reactive customer's policy and a firm financial structure. Some of these fundamental assets are as follows:

- a geographically balanced network;
- a rationalised fleet;
- a worldwide, well-integrated alliance, *SkyTeam*;
- an innovative product offer, putting the customer at the heart of its strategy;
- a strict cost control strategy;
- the powerful hub at Paris-CDG.

AF positioning promotes its development and the fusion AF-KLM allowed several group synergies. AF's flexibility is also an important asset as aircraft acquisition is a complex operation with repercussions for the following two decades. Any purchase must be consistent with a fleet plan based on forecast developments and the airline's cash flow. Therefore, AF expects to have a 2.1% annual growth rate of fleet and offer. To do so, AF will also search the optimal equilibrium by calibrating 4 parameters:

- route launches;
- frequency increase;
- average aircraft capacity increase;
- partnerships.

There are two different types of traffic that play a role in this optimisation:

- business and hip leisure traffic through AF and 'AF by' which brings a good contribution to the network;

25 For the last fiscal year (April 2001 to March 2002), the subsonic fleet had an average age of 8.2 years. Air France regularly purchases new aircraft, preferring new generation aircraft.

✈ and low yield traffic through commercial agreements such as *Air Europa* which provide a lower contribution to the network. Out of this optimisation strategy is the new AF subsidiary brand transavia.com[26] which is specialised in the point to point traffic.

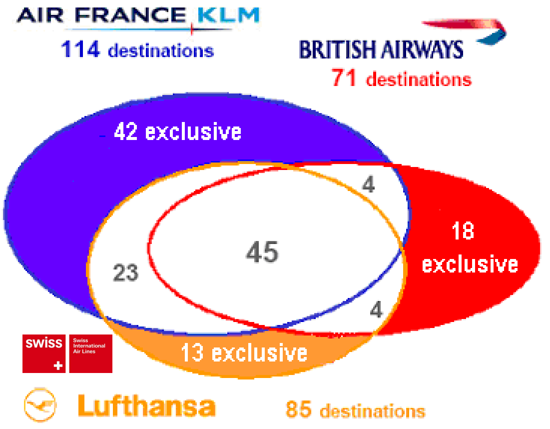


Figure XV – AF/KLM leads in terms of exclusive long-haul destinations departing from Europe (Source: Air France)

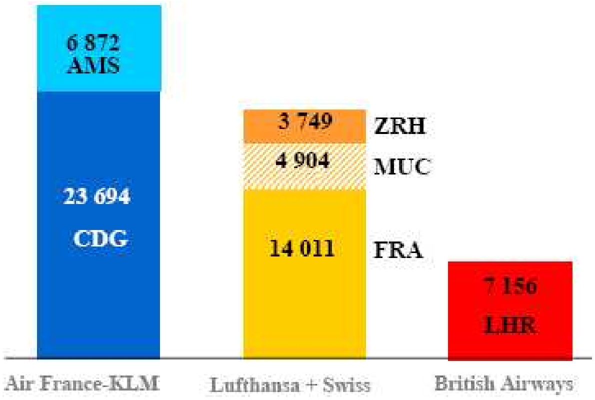


Figure XVI – AF/KLM group profits from the highest number of weekly long-haul/medium-haul connection opportunities in less than 2 hours (Source: Air France)

Intending to better serve these types of passengers, AF is planning to implement a 4th class (named *C38*) on board of its long haul flights. Therefore, first and business class will be enhanced and this new premium economy class will be launched. In this new class seats will be as comfortable as the standard intercontinental business class seats nowadays and an economy class service will be offered.

[26] *Transavia.com* is now a common marketing brand for two legally different carriers: *Transavia* (*KLM* subsidiary) and *Transavia France* (AF subsidiary)

3. Alliances and Code-share

Airlines frequently use CS agreements allowing them to market seats on flights operated by partner airlines, and to help filling their own operated flights. The main objectives are scope economies.

3.1 Alliances

During the last decades the airline industry experienced major changes. Liberalisation significantly increased competition between airlines which affected the structure of the market. For instance, during the 90s incumbent carriers began to use hub-and-spoke systems where passengers are concentrated at a hub airport in order to realise economies of density. Actually, the hub-and-spoke routing increased by about 50% since the United States liberalisation was established in 1978 (Hassin, 2004). Contrasting this trend, low-cost airlines spread around the globe offering point-to-point flights normally for a low fare. Since the 80s, the most visible change still taking place is the formation of strategic alliances (see further in section 3.1.1.1 *Strategic and marketing alliances*) among international carriers. Generally, an airline alliance is defined as a commercial cooperation agreement and eventually of joint operation between two or more airlines in the same or in different countries (Farinha, 2007).

As said in the section 2.3 *State of commercial air transport*, oil prices rise and apparently low cost airlines can no longer follow their original business model. Indeed, in the case of the major airlines, this rise in the price of kerosene has been urging carriers to consolidation. This is not exclusive to traditional carriers as low-cost carriers have already started consolidation taking advantage of economies of scale (Van de Voorde).

Deregulation also helped for the creation of global airline alliances. At present three major global alliances (see further in section 3.1.1.4 *Global alliances*) exist: *oneworld*, *Star Alliance* and *SkyTeam*. These three virtually include all major European and US airlines flying across the North Atlantic (Iatrou, 2006).

Generally speaking, alliances can fall between full integration of the parties and simple market mediated exchanges between them (Doganis, 2001). Unfortunately, airlines cannot always proceed in their alliances due to many reasons, particularly (Farinha, 2007):

- legislation and national ownership regulations (namely in Brazil, India, China and the United States);
- substantial ownership requirements;
- subsistence of the national airline concept;
- public utility issues.

Despite all these restrictions, many alliances have been implemented aiming (Farinha, 2007):

- a strategic answer to the economic globalisation;
- reducing restriction effects by joining airlines networks;
- lowering cost by optimising the airlines fleets.

In the air transport industry alliances constitute a framework for cooperation between airlines by sharing sales offices and maintenance facilities, coordinating schedules, creating common products and/or aligning airport facilities among others. There might be alliances between airlines which are not in any of the three global alliances, between one airline in a global alliance and other that does not participate in any of the global alliances, or even between two airlines from different global alliances. That is the case between AF and *swiss* or *Finnair*. In these cases, alliances might be understood as mere agreements but they are still alliances even if there are no major strategic lines associated with it (see further in section 3.1.1.1 *Strategic and marketing alliances*).

The alliances are an important factor in airline development with members generating marketing and operational benefits. Frequent Flyer Programmes and integrated route networks are amongst the evident benefits to alliance customers. A specific airline which does not serve particular routes, either because it is not allowed to or because these routes themselves are not profitable when operated by this airline due to its minor traffic in these routes, can offer their customers extended network benefits through alliances.

The agreements between the two companies might be off-line or on-line. The off-line agreement includes the SPA (Special Prorate Agreement) which is intended to be a simple agreement where airlines agree only about the price. Flights still have the code of the operating carrier and they can be sold by another company at a specific price. It was the case of the CDG - Saint Petersburg (LED) route when AF only operated in the summer and had a Special Prorate Agreement with *Rossiya Airlines*. On the other hand, the on-line includes block-seat and free flow agreement as well as joint-ventures. These agreements are more complex mainly because they imply code-sharing and this fact makes each of the airlines code-sharing a partner's flight also responsible for its service. On-line Special Prorate Agreements boost the sales comparing to the simple SPAs. Note, however, there are CS agreement which do not integrates Special Prorate Agreement. They do integrate when interlining tickets (two different operating carriers for a single trip) are settled. Fares for each coupon are then set by the SPA. Special Prorate Agreements are then quota agreements, which delineate the revenue sharing between the airlines. When off-line they are just a simple pricing agreement. Contrarily, when Special Prorate Agreements are online (for seat-block agreements (SB), free flow agreement (FF) or JV contexts), the agreement is more complex as questions go beyond the simple pricing agreement. This also derives from the responsibility of carrying the brand of each one of the airlines by apposing each others' marketing codes.

3.1.1 Type of alliances

Alliances include mergers, cross-participations or marketing cooperation through code-sharing or using other tools. Note that the alliance categories described thereafter are not exclusive.

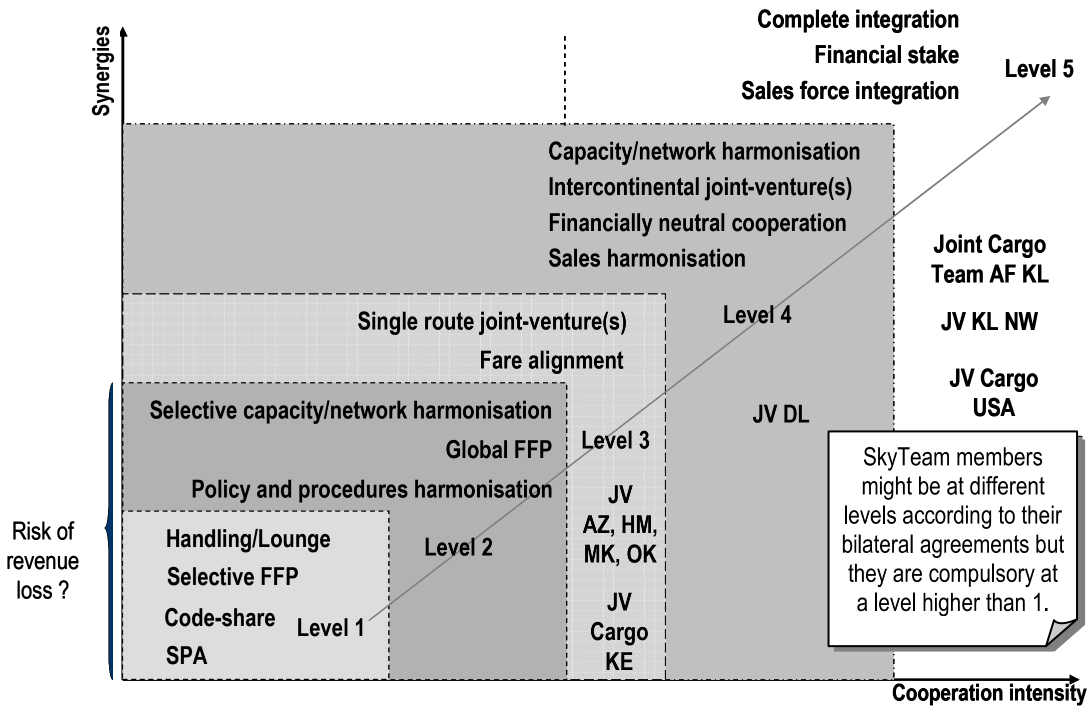


Figure XVII – Graph characterising alliances by the different levels of synergy in function of the cooperation intensity (under the arrow, some AF-KLM agreements are cited as examples)

3.1.1.1 Strategic and marketing alliances

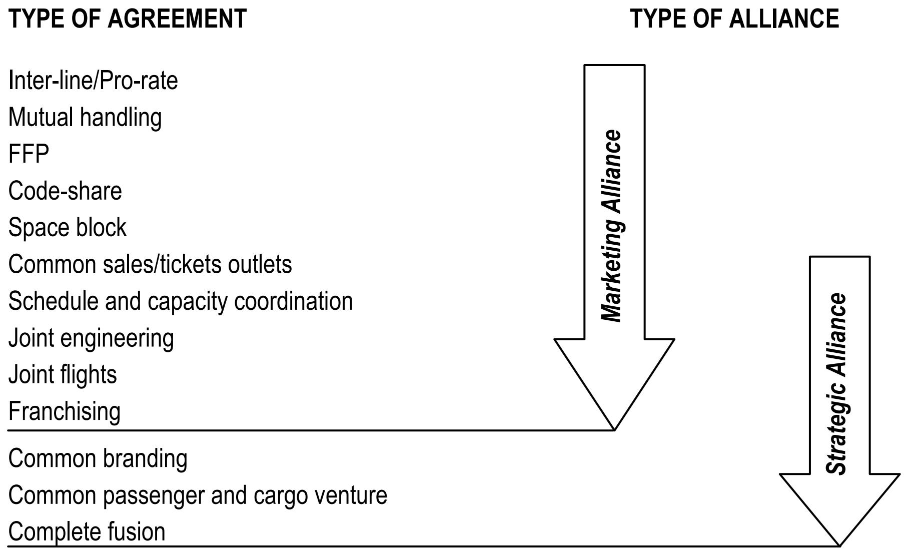


Figure XVIII – Alliance categorisation

It is essential to differ mainly commercial and marketing alliances in order to fine down the sophistication of interline agreements.

A strategic alliance implies that airlines mingle their resources assets aiming at one or several goals. These resources include terminal facilities, maintenance hangars, aircraft, staff, traffic rights or financial resources. CS, common Frequent Flyer Programmes and space-block agreements are generally marketing alliances.

On the other hand, if two or several airlines offer a single common brand and a consistent service standard and share assets, they tend to evolve to a strategic alliance. Of this kind are most of the franchising agreements where a major airline franchises a small airline to fly and operate under its colours[27]. Franchised partner are willing to benefit from the common traffic generated namely by passengers connecting to or from a flight of the main airline.

3.1.1.2 Specific route alliances

Alliances might also have a spatial dimension. Regardless of being strategic or commercial, alliances might be categorised according to their geographic dispersion and their importance. The simplest alliances and those that are currently the most common are specific route alliances (including one or a limited number or routes). These alliances incorporate pro-rate agreements for the interline traffic, code-sharing or both.

3.1.1.3 Regional alliances

Regional alliances which vary much in terms of its content might be classified generally as commercial agreements that cover many routes, normally to and from specific geographic regions or countries. These alliances normally imply for instance code-sharing, joint marketing and sales, capacity coordination and mutual lounge share[28]. Another example is a franchising agreement between a major carrier and a regional operator or a hub feeder. The smaller airline adopts the livery, the brand and the service standards of the franchiser. Depending on the case, the franchised airline carries or not its own code in its operating flights. AF along these lines, has structured since 2001 its own regional centre with three subsidiaries to

---

27 e.g. *Iberia – Air Nostrum*, *Air France – Régional*, *Lufthansa - Cityline*

28 *Malaysian Airlines* and *Thai Airways* have for long a long time had a regional alliance between their home countries. [H27]

boost its offer from several French towns to feed its main hubs in Paris and its regional hubs[29] (see section 2.2.2 *Regional Gateways*) in order to emulate other carrier in the very competitive European market. At the same time, these regional carriers that could be enemies are converted in allies.

3.1.1.4 Global alliances

Air China, in its application to join the *Star Alliance*, stated that: "With economic globalisation and open skies, the competition in the airline industry will become more and more severe. No one airline can create a global network by itself. In order to survive and develop, airlines have to cooperate with other partners in various forms including multilateral alliance cooperation." (Star Alliance, 2008)

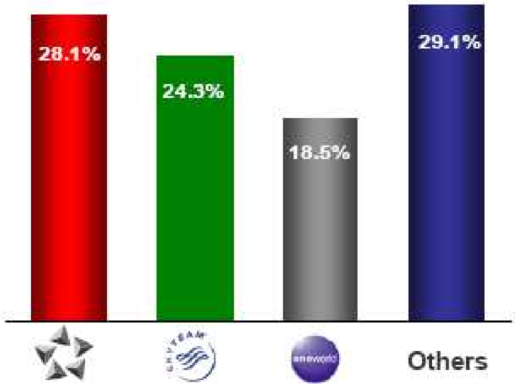
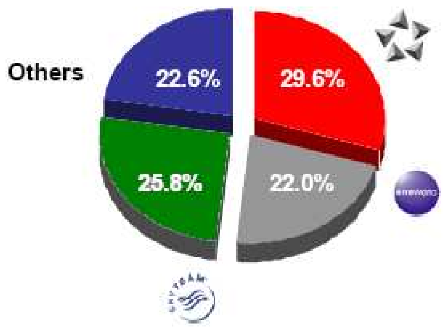


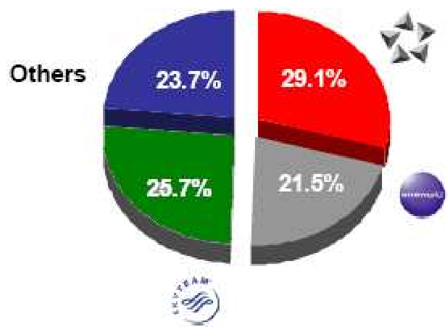
Figure XIX – Global passenger shares by alliance. With *EgyptAir* and *Turkish Airlines*, *Star Alliance* would have reached 29.6% which would have decreased 'Others' to 27.6%.

The three main airline alliances (*oneworld*, *Star* and *SkyTeam*) now account for some 60 per cent of the total world airline capacity (ASKs), with 18 of the world's 20 biggest airlines signed up. Unaligned legacy carriers account for 30 per cent of world capacity, with low cost carriers accounting for the remaining 10 per cent. (oneworld, 2008)



Alliance	Star	SkyTeam	oneworld
ASK (10^9)	1196.3	1042.9	891.1

Figure XX and Table IX – Available Seat Kilometers (ASK) by alliance. With *EgyptAir* and *Turkish Airlines*, *Star Alliance* would have reached 31.0% which would have decreased 'Others' to 21.2%.



Alliance	Star	SkyTeam	oneworld
RPK (10^9)	1196.3	1042.9	891.1

Figure XXI and Table X – Revevue Passenger Kilometers (RPK) by alliance. With *EgyptAir* and *Turkish Airlines*, *Star Alliance* would have reached 30.3% which would have decreased 'Others' to 22.5%.

[29] *Régional* (based in Paris-CDG, Bordeaux, Lyon and Clermont-Ferrand); *Brit Air* (based in Lyon); *City Jet* (based in Dublin and in Paris-CDG); *CCM Airlines* (based in Corsica, Marseille and Lyon); *VLM* (based in London City)

Alliance-	**oneworld**[30]	**SkyTeam**[31]	**Star Alliance**[32]
Countries	150	162	162
Destinations	700	841	965
Daily departures	9,500	16,409	18,000
Passengers (million)	320	427.6	492.8
Fleet	2,500	2,513[33]	3,294

Table XI – General data about the alliances and its networks

Alliance		**MEMBERS**
*one*world (10 member airlines, 20 affiliates)	*Founding members:*	American Airlines, British Airways, Canadian Airlines, Cathay Pacific Airways and Qantas Airways (1 February 1999).
	Additional members:	Finnair and Iberia (September 1999), LAN Airlines (May 2000), Malev, Japan Airlines and Royal Jordanian (April 2007), Dragonair (affiliate, November 2007)
	Former members:	Canadian Airlines, after being purchased by Air Canada, withdrew from the alliance in June 2000. Aer Lingus (joined May 2000 and left April 2007).
	Future members:	Mexicana (2009)
	Potential members:	China Eastern, Grand China Airlines, S7 Airlines, Vietnam Airlines, Westjet
SkyTeam (11 member airlines, 3 associates)	*Founding members:*	Air France, Delta, AeroMexico and Korean Airlines (June 2000).
	Additional members:	CSA Czech Airlines (March 2001), Alitalia (July 2001), KLM, Continental Airlines and Northwest Airlines (September 2004), Aeroflot (April 2006), Kenya Airways, Copa Airlines and Air Europa (associates, September 2007), China Southern Airlines (November 2007).
	Former members:	Continental Airlines will leave to integrate Star Alliance
	Future members:	MEA and Tarom have begun the process of attaining Associate status.
	Potential full members:	Air Algérie, China Airlines, China Eastern, Garuda Indonesia, Gol Airlines, Jet Airways, Kingfisher Airlines, Malaysia Airlines, Vietnam Airlines and Austrian
	Potential associate members:	Air Tahiti Nui, Bangkok Airways, FlyLAL and Uzbekistan Airways
Star Alliance (21 member airlines, 3 regional members)	*Founding members:*	United Airlines, Air Canada, Lufthansa, Thai Airways International and SAS-Scandinavian Airlines (14 May 1997).
	Additional members:	Air New Zealand (March 1999), All Nippon Airways (October 1999), Austrian Airlines Group (March 2000), Singapore Airlines (April 2000), bmi british midland (July 2000), Asiana Airlines (March 2003), Spanair (April 2003), LOT Polish Airlines (October 2003), US Airways (May 2004), Blue1 (October 2004, regional member), Adria Airways and Croatia Airlines (December 2004, regional members), TAP Air Portugal (March 2005), South African Airways and Swiss International Airlines (April 2006), Air China and Shanghai Airlines (December 2007), Turkish Airlines (April 2008), EgyptAir (July 2008).
	Former members:	Ansett Airlines (joined March 1999, failed in 2001), Mexicana Airlines (joined July 2000, ended March 2004), VARIG Brazilian Airlines (joined October 1997, ended January 2007).
	Future members:	Air India and Continental have been accepted as future members and are expected to officially join in 2009. SN Brussels Airlines will also integrate the alliance
	Potential members:	Aerolineas Argentinas, Air Union, S7 Airlines, TAM Airlines and Alitalia

Table XII – World airline alliances members (oneworld, 2008), (SkyTeam, 2008), (Star Alliance, 2008)

If alliances are so positive for airlines then it is important to understand why some airlines withdraw such powerful assets. Reasons are diverse depending on the airline. For *Canadian Airlines* leaving *oneworld* was obligatory as it was purchased by *Air Canada* which was already a *Star Alliance* member. Once integrated within *Air Canada*, it was indirectly integrated within *Star Alliance*. *Aer Lingus* ancient member of *oneworld* was excluded of the alliance after changes in its business model that made the carrier move away the principles of all the other airlines in the alliance, namely due to its low cost new policy. *Varig* was asked to leave *Star Alliance* because it could no longer maintain the alliance quality standards in during its restructuring.

[30] Approximate as at 1 November 2007
[31] Updated in November 2007 (includes new Associates & *China Southern*)
[32] Compiled in April 2008
[33] Mainline Fleet

Switches within alliances are also easy to explain. *Mexicana* left *Star Alliance* since *Iberia* and *American Airlines* were considered to be more valuable partners. Therefore, it will be joining *oneworld* in 2009. More recently, *Continental* has decided to migrate from *ST* to *Star Alliance* after the announcement of the merger of *Delta* and *Northwest* within the alliance which will consequently depreciate the relevance of *Continental* within *SkyTeam*. Negotiations with both *oneworld* and *Star Alliance* were conducted but eventually, *Star Alliance* was the most successful.

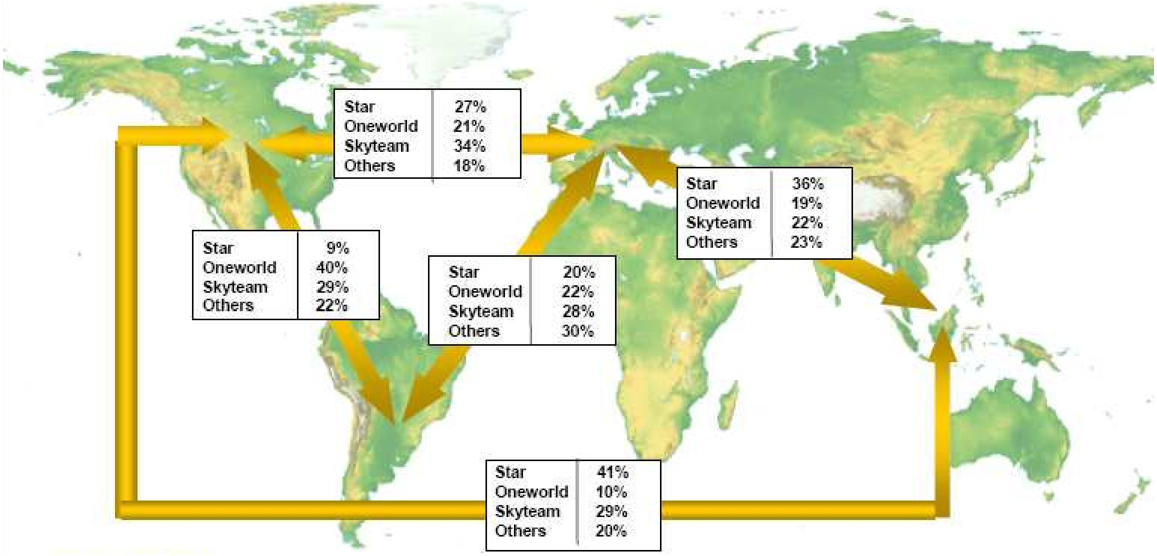


Figure XXII - Capacity shares between traffic areas in Q4 2007 (Puffer, 2007)

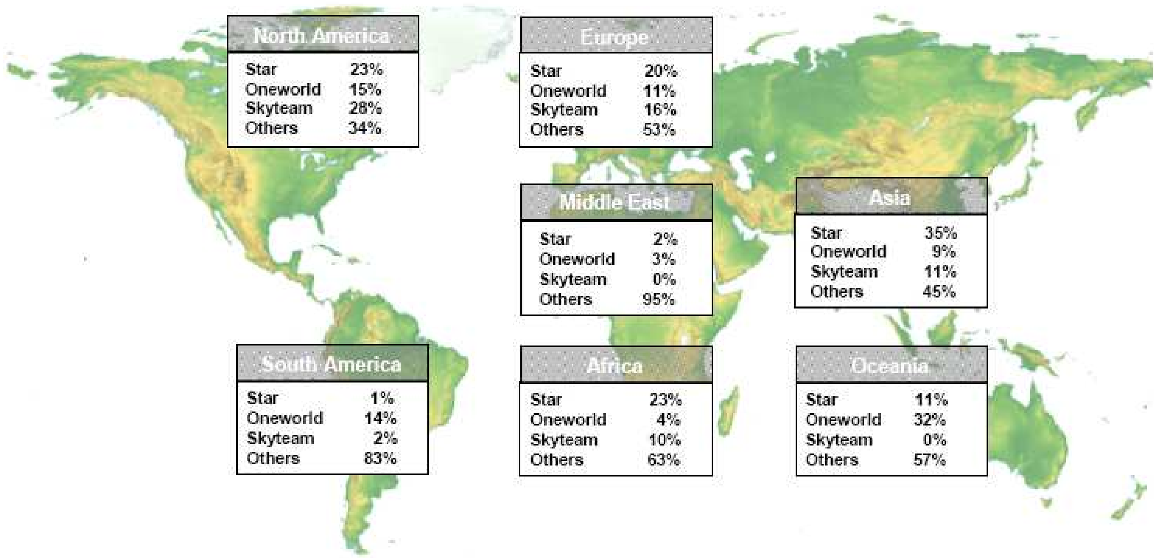


Figure XXIII - Capacity shares within traffic areas in Q4 2007 (Puffer, 2007)

In the previous figures, North America includes Mexico, South America includes Central America and the Caribbean and Oceania includes Pacific.

In order to enter a global alliance, new entrants need to (Moutinho, 2006):

- readjust their network and possibly establish new agreement with third carriers, namely in regional markets to provide capillarity and deepness in the territory;
- adopt and implement norms, techniques and procedures equalling the level of service of the airlines already in the alliance;
- internally restructure in order to guarantee social, labour and financial stability;

✈ adjust and articulate pricing strategies.

It is important to know that these three well-known global alliances are not the only ones that can be generally considered as global alliances. In general, global alliances are those whose main interest is to benefit from the expanded dimension and cost economies from worldwide synergy. This can be done by linking networks of at least two heavyweight carriers that operate in different geographic markets[34]. There is an evidence of the need for global agreement even for low-fare airlines after *Aer Lingus*' announcement to cooperate with *JetBlue Airways* by linking their low-fare networks. Global alliances normally include code-sharing within a large number of routes but the intention is frequently to reach deeper agreements. Consequently, these alliances might include schedule coordination, common handling and offices, combined FFPs and joint maintenance activities. They also benefit from benchmark ease and the fact that as a whole all partners are less vulnerable against regional, national and global vicissitudes. Lately, new phenomena have been witnessed among global alliances such as the IT common systems and 'under one roof' projects in the most important world hub airports that join several alliance members. This 'under one roof' is the same terminal where all member airlines will sooner or later come altogether. Services and use facilities are joined which means much faster connections between flights as well as faster check-in and baggage claims. For instance, at Terminal One at Narita in Japan, *Star Alliance* has cut the waiting times by over 50%. Thus, co-location is sweeping the globe.[35] Not surprising after all because there is no reason for flying around the world in fast planes if passengers land at slow airports.

Connection	Before co-location (min)	After co-location (min)
International – International	110	45
Domestic – International	130	60
International – Domestic	110	75

Table XIII – Minimum Star Alliance connection time in Tokyo Narita airport

Generally, global alliances can be commercial[36] or strategic[37] and in the latter case, joint lobbying is an important surplus. Besides, members of a specific global alliance might have many specific route alliances and a lower number of regional alliances with airlines that do not integrate the same global alliance. Therefore, the global alliance's influence is larger than it might seem at the first sight. In outline, it aims to link carriers based in different geographic areas to provide a worldwide coverage and extended dimension advantages. To demonstrate this multi-alliance reality for a single carrier, following is the example of the Dutch national airline in 2000.

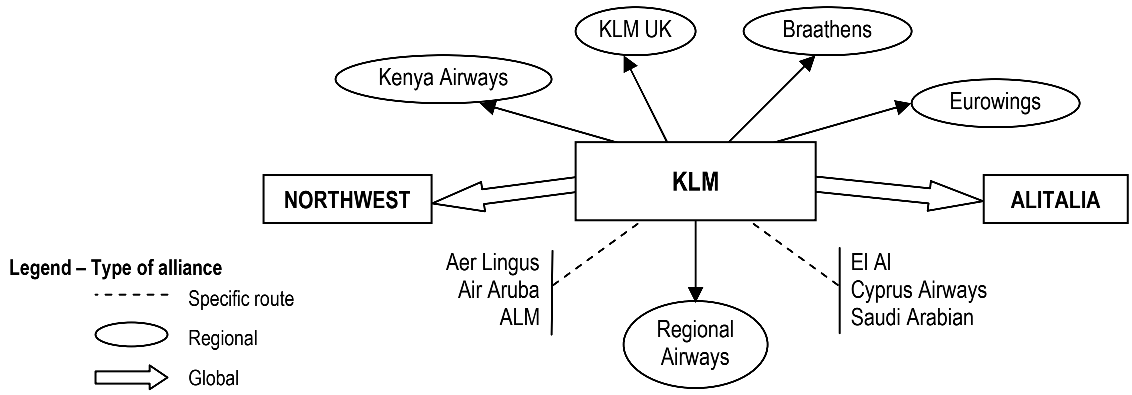


Figure XXIV – KLM alliances in 2000

34 Ideally in different continents
35 Star Alliance has already other co-locations in Bangkok, London Heathrow, Miami, Shanghai, Beijing, Paris Charles de Gaulle and Seoul which have followed rapidly in Narita's footsteps. oneworld did the same in Madrid and SkyTeam in Cairo, Tokyo Narita, Bangkok, Beijing, Moscow – Domodedovo, Shangai, Madrid and London Heathrow.
36 Within Star Alliance, the agreement between TAP Portugal and All Nippon Airways is clearly commercial.
37 On the contrary, KLM – Air France is an example of a global strategic alliance.

3.1.2 Scale, density and scope marketing gain

Synergies within alliances derive from economies of scale in many different domains like network planning, yield management, maintenance, sales and marketing. The benefits from scale and scope economies are for instance:

- ✈ The interconnected widespread network offers ‘all’ possible destinations.
- ✈ The vast network creates much more attractive Frequent Flyer Programmes, specially for premium and business passengers.
- ✈ Ability to offer ‘all’ destinations, prevents passengers to fly other carriers at intermediate points and the off-line connection share falls.
- ✈ Market leadership in several hubs.
- ✈ Ability to block competitors on a specific route, due to competitive prices, frequency increase and/or flight reschedules.
- ✈ The traffic between hubs supports the high-frequency flights in the spokes operated from the hubs.
- ✈ Powerful distribution system through easy access of travel agencies in several markets.
- ✈ Ability to maximise benefits from a spread marketing expense.
- ✈ Ability to provide consistent high service standards in the whole worldwide network.

Lufthansa and *United* proved the dominance enabled by their alliance launched in 1993 due to economies of scale, density and scope. *Lufthansa* strengthened its presence in the United States and *United* developed new markets in Eastern Europe which were not available before due to traffic rights restrictions or unsustainable for direct flight from the United States. Ergo, alliances develop existent markets and reach new ones. This grants a considerable city-pair and schedule choice for travellers, better frequencies and shorter connections over many routes.

	Departures in competition (1995)			*Code-shared departures (2004)*	
	LH	*SK*	*LH+SK*	*LH/SK*	Δ
FRA – CPH	4	3	7	8	+1
FRA – STO	3	2	5	8	+3
DUS – CPH	2	2	4	5	+1
DUS – STO	2	1	3	2	-1
FRA – OSL	1	1	2	5	+3
DUS – OSL	0	1	1	1	=

Table XIV – Impact of *Lufthansa* and *SAS* alliance within six routes between Germany and Scandinavia (CPH = Copenhagen; FRA = Frankfurt; LH = Lufthansa; OSL = Oslo; SK = SAS; STO = Stockholm; Δ = Variation before/after the alliance)

When analysing the passenger traffic by route type, Iatrou (Iatrou, 2008) inquired many allied airlines and found that the greatest increase in passenger traffic was observed primarily on hub-to-hub (16% increase) and hub to non-hub (6 to 15% increase). These findings are consistent with the hub-and-spoke system and the current whole alliance organisation.

The same study found that in terms of traffic, income and load factor, among the three biggest global alliances, *SkyTeam* is the winner in terms of greatest rates of increase due to the alliances and code-share. In terms of the world regions, Asia and Oceania is second to Central America for the region the most positively affected by alliances.

3.1.3 Cost synergies and reductions within alliances

Alliances enable carriers to efficiently manage its fleet which in critical periods might be vital. Within alliances, airlines limit their fleet size and their service range without harming its quality and protecting its network at the same time. For smaller alliances, when fleets increase up until 20 airplanes, there are considerable unit cost reductions thanks to the infrastructure cost that is diluted by more aircraft. This is particularly true if the fleet consists of one single type of airplane. In spite of this, for fleets of more than 20 airplanes, cost saving only due to the increase in the number of aircraft is negligible.

Thus, it is the aircraft capacity, the average flight distance and the staff payment that will play a fundamental role in the case of carriers with larger fleets.

Even if the incremental market power has always been the alliance main driving (comparing to cost reductions), below four positive impacts are stated for alliances related to cost saving:

- higher traffic levels produce economies of density – the possibility for partners in the same alliance to manage the demand by sharing a higher number of flights means that the unit costs will be reduced by the escalation of flights, higher load factors, change of aircraft for bigger airplanes and a more intensive use of many stationary facilities such as airport infrastructures or ticket counters;
- one carrier in the alliance, normally the major partner, might profit from the lower costs of the smaller airline;
- invitations to tender for goods and services provided by outsourcing such as handling, IT development, catering, maintenance, fuel and even new aircraft purchases are made with considerable volumes if many companies are joined for the invitation (when purchasing in large quantities prices are much more competitive for each of the airlines at the end);
- joint hiring and contracting;
- cost savings might arise from several possible extra synergies between partners within an alliance.

The global alliance that declares the greatest rates of cost reduction is *SkyTeam* (Iatrou, 2008).

3.1.4 Competition and anti-competition: a question of yield

This point is fundamental to airlines. By wiping out other carriers on certain routes – namely when a given alliance which comprises the main airlines of two different countries transforms an existent oligopoly into a monopoly – the capacity can be exclusively monitored by these airlines. Consequently, as no competition exists, fares tend to increase.

A corrivalry issue was witnessed when *Lufthansa* and *SAS* started a joint venture in 1995 between Germany and Scandinavia. They had then the control of all the routes. Consequently, the European authorities reacted to fix this competition threat obliging these two carriers not to increase their number of flights and to give up some slots if new entrants could not obtain them through the normal allocation process. Anyway, even if there were restrictions imposed by the European Union, code-sharing and coordinating their flights and their schedules on a certain route through a single sales system, made these carriers so powerful in these specific routes – specially as they dominated the market in either end of the route – that potential competitors certainly hesitated entering this market.

Weakening the competition on specific routes, the yield management of the airlines operating is less dynamic and generates higher revenues. The yield management price discriminates permanently the fares depending on the type of passengers, the origin, the final destination and the load factor in a precise moment. Yield management, might also be known as the revenue management and tries to understand, anticipate and influence the passenger behaviour in order to maximise revenue or profits from an airline. The challenge is to sell the right resources to the right customer at the right time for the right price which is to say that yield management is based on segmentation. Or in other words, charge the passenger according to his willingness to pay for a determinate trip. This process results in price discrimination, where an airline charges passengers a different price to travel in the same flight and with the same service on board. Yield management is a large revenue generator for several major industries. Robert Crandall, former Chairman and CEO of *American Airlines*, called yield management "the single most important technical development in transportation management since we entered deregulation." (Operations Research: The Science of Better, 2008).

The dominance of an airline in a specific airport creates itself barrier to new airlines as well. In case of alliances with the airport dominant carrier(s), competition tends to decrease or even disappear on specific route or relevant markets. This risk is even more evident on domestic flights or international flights of less than 2 hours and a half (Doganis, 2001), because connecting journeys are not really competitive due to the relative connection incremental time. In these routes, this increment averages 100% of the non-stop flights duration.

Market	1994 %	1995 %	1996 %	1997 %	1998 %
ORD – DUS					
AA	100	100	0	0	0
UA/LH	0	0	100	100	100
MIA – FRA					
AA	0	32	36	15	0
UA/LH	95	68	64	85	100
JFK – ZRH					
AA	38	29	28	2	0[38]
DL/SR	62	71	72	98	100
JFK – BRU					
AA	43	44	27	18	0
DL/SN	45	49	61	71	87

Table XV – Transatlantic alliances impact in the market share of some non-stop flights.
(AA = American Airlines; BRU = Brussels; DL = Delta Airlines; DUS = Dusseldorf; FRA = Frankfurt; JFK = New York (John F. Kennedy); LH = Lufthansa; MIA = Miami International; ORD = Chicago (O'Hare); SN = Sabena (bankrupted in 2001); SR = Swissair (bankrupted in 2001); UA = United Airlines; ZRH = Zurich)

On the other hand, on long-haul flights, competition cannot really be beaten through alliances. Alliances have an opposite effect in these journeys. This is because only a small percentage of the long-haul flights passengers are pure trunk point to point passengers. Additionally, in secondary cities, even if there are some non-stop long-haul flights to other main or secondary cities, the incremental duration of the indirect journey is often less than 2-3 hours and a higher number of flights and times of departure and arrival are offered.

The total travel duration is less significant on long-haul routes as the passengers will spend a whole day or a whole night travelling anyway. Overall, 60% of international passengers connect (Gourgeon). In high-performance hubs, thanks to the numerous daily flights serving the airport, indirect flights are not relatively much longer compared to a non-stop flight. Fares are also very similar between indirect and non-stop flights and to add a competitive advantage, indirect flights are often cheaper. More economical fares implying a hub stop, derive from the fact that these cheaper fares compensate the disadvantage of connecting in a hub airport when there are non-stop alternatives. If there are no direct flights and the only option to fly a specific city-pair is through a hub, then prices tend to be even cheaper between allied airlines than pure interline flights.

In the next table, the total duration is the shortest available in Global Distribution Systems and the analysed direct flights are those of the national airline of the considered city.

[38] On these 4 routes, *American Airlines* only restarted operations after the end of the agreement between *Delta Airlines* and *Swissair* following this last one's bankruptcy. *Swiss*, the new swiss airline then launched a partnership with *American Airlines*. Currently, this code-share agreement only competes against *Continental* on this route.

		Connecting European hub				
Departure of the trip	Service details	AMS KL	FRA LH	LHR BA	ZRH LX	Non-stop flight
Dusseldorf	Total journey duration	11h50 (+3h10)	11h45 (+3h05)	11h15 (+2h35)	11h00 (+2h20)	**8h40 (LH)**
	Daily flights	3	4	5	3	1
Geneva	Total journey duration	11h00 (+2h35)	10h55 (+2h30)	11h20 (+2h55)	10h45 (+2h20)	**8h25 (LX)**
	Daily flights	3	4	5	3	1
Milan	Total journey duration	11h35 (+3h00)	10h30 (+1h55)	10h45 (+2h10)	11h15 (+2h40)	**8h35 (AZ)**
	Daily flights	3	4	5	3	2
Vienne	Total journey duration	10h55 (+1h45)	10h35 (+1h25)	11h20 (+2h10)	11h20 (+2h10)	**9h10 (OS)**
	Daily flights	3	4	3	3	1

Table XVI – Comparison between connection services to New York from secondary European cities (Diganis, 2001) (AMS = Amsterdam; BA = British Airways; FRA = Frankfurt; KL = KLM; LH = Lufthansa; LHR = Londres Heathrow; LX = swiss; ZRH = Zurich)

In conclusion, alliances can either reduce or enhance competition and decrease or increase fares and the number of flight options depending on the total duration of the allowed itineraries within the alliance.

3.1.5 Alliances control

The airline alliances have many regulation, institutional, legal and social constraints. In all these dimensions, the US and the EU have chosen different approaches to deal with the competitive threats of completely free alliance and merges. This is even more consequential once deregulation and fragmentation in the European market atomised air carriers in the last decades. On the other hand, lately consolidation is in the agenda (further information on sections 2.3.5 *European Union/United States open sky and consolidation* and 3.1 *Alliances*).

The United States began back in the 80s the contestable markets concept whose conditions enable the easy entrance of new carriers in the market. Ergo, the United States tend to thrust the antitrust laws.

In France and within the European Union, these questions have been discussed long time ago. Discussions and negotiations took place before the signature of the Treaty of Rome (1957) and this *free* competition has been regulated ever since. In other words, the European Union has forbidden any kind of collusion and dominant abuse by supervising more efficiently the behaviour of each market. Following there is a scheme that shows how the European Union guides the fusion portfolios, which in particular is applied to airlines.

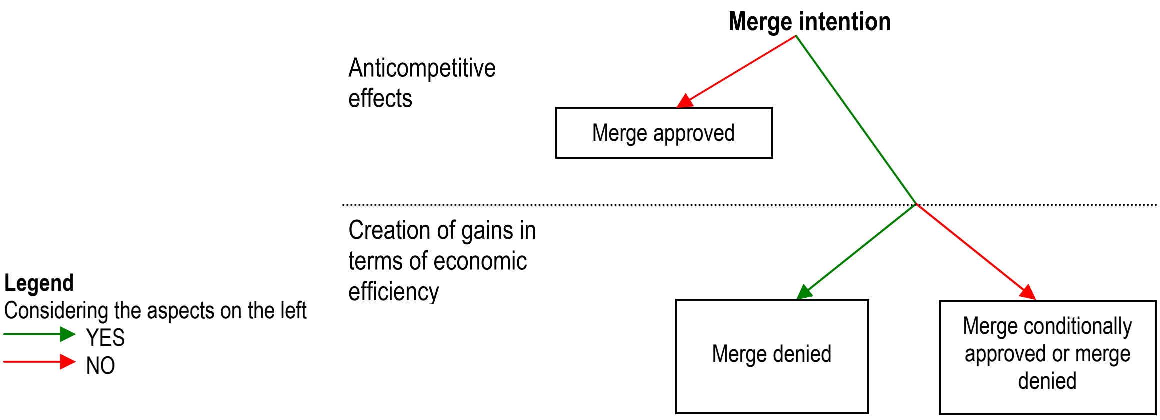


Figure XXV – The aspects which are considered and analysed by the European authorities, and its decision scheme according to the different cases. (Soames, 1999)

This scheme is set off after measuring the merge concentration, the entry barriers for new competitors, the potential extra demand for a new entrant and after evaluating the cost reduction, the new services creation and innovation and other social and political criteria such as the employee's protection.

3.1.6 Alliances and labour issues

Some years ago, only 23% of the trade union members had a positive opinion about alliances. Alliances are only third to privatisation and low-cost evolution regarding the apprehensions of major airline employees. Employees fear productivity or costs comparisons. So, trade unions fight against replacing the services of one specific carrier by a partner airline. This is one of the main lobbies against alliances and whom alliances need to live deal with order to achieve its goals.

3.1.7 Financial Rules

Interline commissions consist of commissions paid by one airline to another when it has made a sale on behalf of the other airline and can be of three kinds: ISC (Interline Service Charge), Incentive commission and SuperCom.

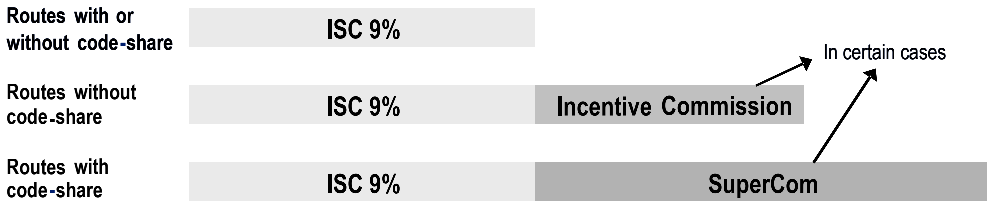


Figure XXVI - Interline commissions (DB.IP, 2002)

Any IATA airline may sell tickets for other IATA carrier. This means that within IATA members, airlines which sell another carrier's ticket should be remunerated for the sales service. ISC is then an IATA interline defined commission and it is valued at 9%. It comprises distribution costs related to the airline ticket counter, travel agency commissions and call centres. Incentive commission is a simple selling elicitation.

SPA	Seat Block	SuperCom / Incentive commission	Profit share
✈ Bilateral billing and quota agreement	✈ Scope extension code-sharing partner aircraft ✈ In particular, balanced exchange formulation without financial exchanges, or exchange formulation of 50/50 of their total capacity. ✈ Purchase/Sell: Air India, RAM, Finnair, AirCalin, Air Seychelles, JAT Airways, Malev, MEA, Bulgaria Air, Saudi Arabian, Tunisair, Air Europa. ✈ Balanced exchange ✈by route: Aeromexico, China Southern, Korean, TAROM, ✈globally: JAL (in the Paris CDG – Tokyo Narita route and Paris CDG – Nagoya operated by JAL and Paris CDG – Osaka operated by AF), China Eastern (between Paris CDG and Shanghai operated by China Eastern and Paris CDG - Beijing operated by AF), Austrian (Paris CDG – Vienna operated by AF and Paris CDG –	✈ Network extension with or without CS on partner's aircraft. ✈ Inventory optimisation (no separate blocks) ✈ SuperCom: Delta ✈ SuperCom and incentive commission: Alitalia, Czech Airlines	✈ Demands very integrated schedules and network in the concerned routes ✈ On overlapped routes, schedule should be optimised and selling agents should be neutral in terms of the operating flight they sell ✈ Economic risk share ✈ eg: Alitalia, Czech Airlines, Air Mauritius, Air Seychelles, Delta

	Vienna and Lyon - Vienna operated by Austrian) ✈ 50/50 of total capacity: Air Mauritius	

Table XVII – Details on different alliance approaches(DB.IP, 2002)

Finally SuperCom, apart from being a selling elicitation as well as the incentive commission, it integrates possible Frequent Flyer Programme, miscellaneous outlays, prepaid and other distribution costs such as after sales service, support cost (commercial, marketing, advertising), Global Distribution Systems and credit card expenses. SuperCom includes yet a revenue abatement consisting of back-end (for important companies with a considerable amount of journeys) and upfront discounts (directly to clients).

3.2 Review of code-sharing concepts

Code-sharing alliances began worldwide in 1989 when *KLM* and *Northwest* signed a CS agreement on a large scale. One year later, the Australian national airline, *Qantas Airways* and the United States' *American Airlines* combined services between an array of US domestic cities and Australian cities.

Nowadays, with strategic alliances with antitrust immunity, CS is elected by the airlines as the kind of cooperation that has produced the best results (Iatrou, 2008).

CS agreements have been a frequently used form of cooperation between partners (whether in the same global alliance or not). These partners are normally airlines[39] so the following analysis will be restricted to this case. A CS consists of a sales agreement that enables an airline to sell seats on a flight operated by a partner airline where the flight carries both airlines identifiers and airline specific flight numbers. Every commercial flight has a code composed of two parts. The first part is a unique airline identifier which is allocated by the *International Civil Aviation Organisation* (ICAO). This two-letter code identifies the airline on every computer system. The second part of the code is the flight number which is determined by the airline itself for the purpose of identifying the places of origin and destination and the times of departure and arrival of the flight (Hassin, 2004). Normally inbound and outbound flights have either odd or even flight numbers.

Within code-sharing, the same physical flight is considered, but each airline sells its tickets under its own brand or IATA code and each one with its own flight number. This means that the flight is displayed in reservations systems under the flight code of each partner airline. The same flight can even be code-shared between more than two airlines. The carrier that operates the flight is called '**operating airline**' and all the other airlines that market the flight are '**marketing airlines**'. Code-sharing might be either reciprocal or not.

Under a code sharing agreement participating airlines present their own flight number for several reasons, including:

- ✈ Connecting flights - This provides clearer routing for the customer, allowing a customer to book travel from point A to C through point B under one carrier's code, instead of a customer booking from point A to B under one code, and from point B to C under another code. This is not only a superficial addition as cooperating airlines also strive to synchronise their schedules and coordinate luggage handling, which makes transfers between connecting flights less time-consuming.

[39] There are also code sharing agreements between airlines and rail lines also known as *Rail & Fly* systems. They involve some integration of both types of transport, e.g., in finding out the fastest connection, allowing exchange between an air ticket and a train ticket, or a step further, the air ticket being valid on the train, etc. IATA has even listed several train stations. In Europe these *Rail & Fly* systems are used to divide markets by selling these combination tickets abroad for a lower price to attract more customers. The systems also prevent local customers from buying these much cheaper tickets as the customer is only allowed to board the plane with a valid train stamp from a specific station. That is the case of the *Lufthansa* or *TAP – Deutsche Bahn* and *Air France* or *Air Austral – SNCF*.

✈ Flights from both airlines that fly the same route - This provides an apparent increase in the frequency of service on the route by each airline.

✈ Perceived service to unserved markets - This provides a method for carriers who do not operate their own aircraft on a given route to gain exposure in the market through display of their flight numbers.

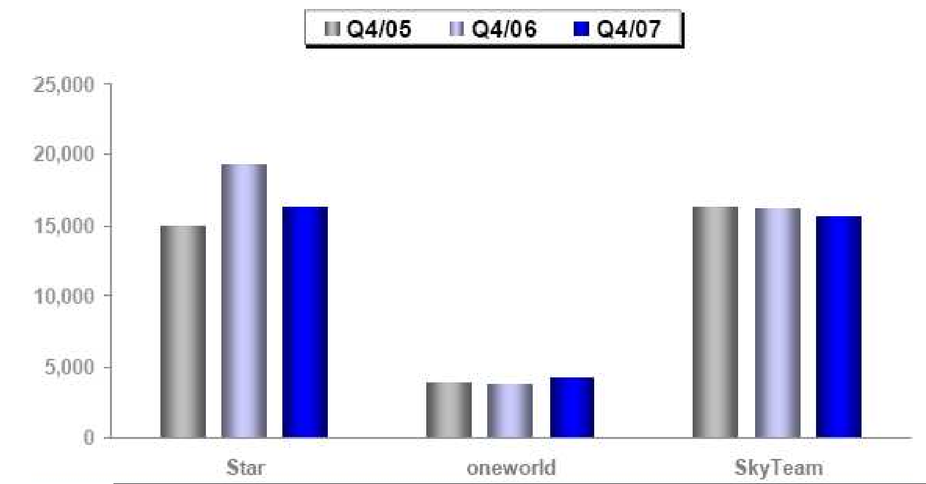
Nowadays, CS agreements became so common that the same flight might have more than a dozen of different airline codes. They are often a basic part of the airline alliances and allow airlines to offer connections they could not offer as one product on their own without a strong increase of product cost. Normally, CS agreements are provided with antitrust immunity in the United States which allows partner airlines to jointly set fares (Czerny, 2006), coordinate pricing, scheduling, distribution and information systems, as well as pool costs and revenues and promote profit neutrality on a group of specific routes.

A code-sharing agreement affects the reservation system of each airline, as it allows each participating airline to sell tickets on flights operated by other contracting carriers under its own code.

A passenger buying a ticket from one airline might end up flying on an aircraft operated by another airline. Thus, with CS agreements interline passengers buy only one ticket issued by carrier A for their flights although one, some, all or none of the flights might in fact be operated by another airline.

Passengers flying under code-sharing are protected by the airline that sold the tickets and this protection is valid also for the segment(s) which is (are) operated by the contracted foreign carrier. 'Protection against cancellations and delays in flights is highly valued by passengers as it might involve the costly provision of hotel and meal services for an overnight stay at the interconnecting point of travel' (Hassin, 2004).

Moreover, CS agreements are indispensable for price discrimination. Suppose that airlines are not allowed to use CS agreements. Then, on a city-pair connection that is not entirely served by only one airline but by a combination of different airlines, passengers need to buy tickets from different airlines to complete their trip. In this situation it is difficult to identify interline passengers. Hence, price discrimination cannot be used and interline passengers are charged like 'regular' passengers. In spite of this, if airlines sign CS agreements they market interline trips as one product which allows price discrimination of interline passengers.



	Q405	Q106	Q206	Q306	Q406	Q107	Q207	Q307	Q407
Star Alliance	14 972	15 064	16 355	19 558	19 336	19 273	15 463	16 042	16 309
oneworld	3 796	3 701	3 881	4 023	3 746	3 868	4 349	4 645	4 167
SkyTeam	16 346	15 972	16 833	16 704	16 243	15 936	14 731	15 681	15 636

Figure XXVII and Table XVIII – Times series of daily CS flights by alliance (Puffer, 2007)

Code-sharing is fast becoming the most widespread type of cooperation between carriers. On the one hand, CS improve the product (in terms of the schedule) offered to passengers without adding any extra cost. In the case of trunk routes, frequency increases and in the case of other routes, they feed the hub with connection traffic. If airlines want to proceed in an alliance they might be interested in a joint-venture. In this case, there is a better capacity rationalisation implied. Apart from that, they can jointly set fares and try to lock up specific markets. It is beneficial for airlines as it enables them to broaden their respective offer without deploying additional resources nor having to negotiate additional flight slots. Generally speaking, such agreements also feature joint Frequent Flyer Programmes and flight scheduling adjustments to ensure smooth connections with onward flights.

Much competition in the airline industry revolves around ticket sales (also known as "seat booking") strategies (revenue management, variable pricing and Geo-marketing). Most travellers and travel agents have a preference for flights which provide a direct connection. Code sharing gives this impression. Computer reservations systems (CRS) also often do not discriminate between direct flights and code sharing flights and present both before options that involve several isolate legs operated by different carriers.

Code-sharing is yet positive for the operating airline as it is enabled to present its services, namely ground and on-board, to other airlines' passengers and operate the flights with high load factors. Nevertheless, if the airline is marketing a partner operating flight whose level of service is lower, commercial staff of the marketing airline should be present in the ground to provide the intervention needed.

A CS agreement is a "win-win" system (Air France Corporate, 2008):

a) it offers obvious, immediately perceptible customer benefits, continually offering users new destinations, shorter journey times and cheaper fares thanks not only but also to Frequent Flyer Programmes.

b) for airlines, it represents a mean of extending their networks by optimising fleet use.

According to AF there are 4 main reasons for the airlines and 8 main reasons for the passengers to believe that CS is beneficial.

Airline	Passenger
✈ Network expansion	✈ More destinations
✈ Better display of the airline in the GDS (either for a non-stop flight or a connection)[40]	✈ More flight options ✈ More connection choices
✈ Lounge sharing to improve the premium product	✈ More competitive average prices
✈ More attractive FFP	✈ End-to-end check-in
	✈ More lounges
	✈ More options to earn and redeem miles
	✈ Single ticket

Table XIX - Summarisation of CS advantages for airlines and passengers

For airlines, all the advantages above are achieved at a minimal cost because no additional aircraft is even added. These CS generate extra passengers who would probably have chosen direct flights or flown through other hubs served by competitors. These expanded service options attract new passengers and result in a deeper partnership that coordinates and offers more frequent flights, thus attracting even more passengers. In presence of economies of density, traffic rises due to code-sharing alliances which help lowering the marginal operating cost of an additional passenger. In addition, joint use of

[40] In GDS, such as Amadeus, Galileo, Worldspan, or Sabre, Non-stop flights are the first to be displayed, then on-line connections appear before interline connections on Computer Reservation Systems (CRS). Thus code-sharing results with the same flight details, except for the flight number, are excessively displayed on computer screens, forcing other airlines flights to be displayed on following pages where they may be missed by passengers searching for required flights.

airport facilities and development of new routes that might restructure the current network may also reduce costs (Du, 2008). The gain obtained by AF through its alliances and estimated by the model is presented further on section 4.1 *Model Results*.

On the other hand, alliances might sometimes become restrictive in terms of network for one of the partners namely if the airline wants to add another flight and the schedule is already operated by the ally. Furthermore, alliances tend to be time consuming when it comes to deal with subjects that are important to only one of the partners. Moreover, alliances normally imply FFP rights which steal one of the most powerful differentiation tools for AF and all the most important major carriers. Frequent flyer agreements are used, for example, to extend the benefits of AF's *Flying Blue* Frequent Flyer Programme (under which passengers earn *air miles* and can use them to claim *reward tickets* and other benefits) to flights of the partner airline. Conversely, members of partner's Frequent Flyer Programme can earn *miles* and use their *rewards tickets* on AF flights. (Pialloux)

CS agreements can even bring strong airlines to neglect their marketing force comparing to the costs cuts obtained by the partner. The trade-off 'partner low cost' vs 'sales force of the major company' is often an illusion. Indeed, the revenue at AF is often much higher than the gain in the partner seat cost. Finally, if the partner maintains an unusual higher demand, this could be at the expense of the major carrier (namely AF) development. Even if AF decided to adopt an outsourcing policy, taking advantage from other airlines lower costs namely in terms of salaries, in France as in most of the developed countries, trade unions exert a huge influence and pressure on these matters. For instance, pilots are often against code-sharing (mainly in trunk routes), because they feel their own job might be threatened and they want to protect their working class (for more info read section 3.1.6 *Alliances and labour issues*).

According to the United States *General Accounting Office* (1998), the listing priority given to code-shared flights on the CRS screen might decrease market competition with competitors operating on the same routes. Second, although code-sharing is not regarded as a merger, it reduces the incentive for alliance partners to compete with each other on hundreds of non-stop, one-stop or multiple-stop long-haul markets. This affects price and currently these routes are the most competitive because they offer the greatest number of airlines from which consumers can choose. If alliance airlines successfully gain market share, market new competitors could be driven out and entry could become more difficult. Limited competition and increased market concentration on these routes result in an increased possibility of collusion, leading to airfare increases and decreases in service quality. Thus, it is possible that CS agreements could have a negative impact on customers and new entrants. Some academic papers reached this same conclusion, and will be presented in the section 3.3 *Academic papers on code-share*.

3.3 Literature on code-sharing

The effects of alliances and in particular CS agreements on airline fares and welfare have been the subject of intensive theoretical and empirical investigation.

Current studies argue that with complementary networks, CS agreements generate positive welfare effects by supposedly knocking down fares for interline passengers who rely on the service of multiple airlines. Nevertheless, with CS agreement, airlines can discriminate between interline and other passengers. If interline passengers have a higher price elasticity of demand than non-interline passengers then airlines might decide to reduce fares in order to attract additional demand from interline passengers, where competition is higher between airlines in CS.

Starting with theoretical approaches, Park (Park, 1997) indicated with a theoretical approach that the welfare effect of code-sharing depends on whether the partner airlines' networks are parallel or complementary in nature. His paper which examined profits and social welfare suggests negative effects for the first case and positive effects for the latter one. The negative aspects arise from reducing competition leading to welfare losses. Contrarily, in the complementary case partner airlines jointly enter into markets they did not serve before and, as a consequence, soar competition there. It is therefore a competition based analysis, where the market was modelled as a Cournot competition[41].

Is is important to note that the estimated percentage of direct flight services on domestic code-shared routes reaches 90% of the passenger volume, whereas international code-shared markets are mainly interline markets prior to code-sharing (Du, 2008), which means that there are no direct flights originally between the two international cities, and passengers had to switch airlines to complete their itinerary.

Brueckner (Brueckner, 2001) corroborates Park's conclusion. His similar results demonstrate that competition is deteriorated and as a consequence the effects of international alliances using CS agreement (with antitrust immunity) are detrimental on intrahub markets – where parallel routes appear. In contrast, when each partner carrier serves only a part of a city-pair connection, markets are likely to get benefits from the agreement. All in all, from a global perspective and based on a simulation analysis, this author concludes that the total welfare effects of CS agreements with antitrust immunity are likely to be positive.

Brueckner and Whalen (Brueckner, 2000) results which account for competition between airline alliances are consistent with those previously described.

Zhang and Zhang (Zhang) analyse competition between strategic alliances but the effects of CS agreements are not explicitly modelled, so no specific conclusions can be made from their literature.

Every study described above considers Cournot behaviour on a city-pair connection that is served in parallel by competing airlines.

Bilotkach (Bilotkach, 2005) points out that CS agreements are crucial for airlines in order to price discriminate interline passengers. He then concludes that antitrust immunity is not crucial to eliminate a double-mark up for interline fares because inter-alliance competition can already reduce interline fares.

Whalen (Whalen, 2003) presents a code-sharing model that concludes that CS and antitrust immunity generates double marginalisation problems. He then finds that immunised alliances fares are 19% lower than non-alliances but code-sharing alliances only 11%, using an eleven year panel of United States and Europe itineraries as sample.

Slightly different results were obtained by Gayle (Gayle, 2006) who exemplifying the *Continental/Delta/Northwest* alliance prove that even in the case of overlapping routes proved that a positive welfare balance could be achieved. He demonstrates this fact with the predictions which resulted from the application Nevo's theoretical model (Nevo) with this alliance as input, and a deep personal research of actual post-alliance prices. In this specific case, authorities acted accordingly and results were positive.

[41] Cournot competition is an economic model used to describe an industry structure in which companies compete on the amount of output they will produce, which they decide on independently of each other and at the same time. It is named after Antoine Augustin Cournot (1801-1877) after he observed competition in a spring water duopoly. It has the following features:

- There is more than one firm and all firms produce a homogeneous product, i.e. there is no product differentiation;
- Firms do not cooperate, i.e. there is no collusion;
- Firms have market power, i.e. each firm's output decision affects the good's price;
- The number of firms is fixed;
- Firms compete in quantities, and choose quantities simultaneously;
- The firms are economically rational and act strategically, usually seeking to maximise profit given their competitors' decisions.

An essential assumption of this model is that each firm aims to maximize profits, based on the expectation that its own output decision will not have an effect on the decisions of its rivals. Price is a commonly known decreasing function of total output. All firms know N, the total number of firms in the market, and take the output of the others as given. Each firm has a cost function ci(qi). Normally the cost functions are treated as common knowledge. The cost functions may be the same or different among firms. The market price is set at a level such that demand equals the total quantity produced by all firms. Each firm takes the quantity set by its competitors as a given, evaluates its residual demand, and then behaves as a monopoly.

Complementing these theoretical approaches, several empirical studies, such as the second part of the previous Gayle's paper, have been carried out to investigate the power of CS agreements to reduce interline fares. Some of these empirical studies are described thereafter.

Oum, Park and Zhang (Oum, 1996) showed that CS agreements lead to fare reductions and increase the traffic for the market leader. Park and Whang (Park, 2000) reached the same conclusion for the specific case of complementary networks. In the other case, on parallel networks, they conclude that fares are likely to increase and passengers numbers cut down. Bamberger, Carlton and Neumann (Bamberger, 2004) confirm these results for domestic airline alliances in the US.

Additionally, Brueckner and Whalen (Brueckner, 2000) discovered that interline fares are 25% lower than those charged by non-allied airlines and Ito and Lee (Ito) that domestic CS practices in the United States had a positive welfare effect overall, even if they noticed that the overwhelming majority of the CS itineraries involve a single operating carrier. They call it 'virtual code-sharing' and suppose that airlines use this as a 'generic' product to compete for the most price sensitive passengers.

Hassin and Shy (Hassin, 2004) figured out that 'no passengers become worse off' but 'some passengers are strictly better off' with international CS agreements where some passengers interconnect to flights originating or terminating at cities not served by foreign airlines. Airfares, market shares, profits and passengers' welfare are compared before and after the implementation of a CS agreement and then code-sharing is demonstrated to be Pareto-improving[42].

More recently, Du, McMullen and Kerkvlier (Du, 2008), examined the effect of code-sharing on domestic market air fares, passenger volumes and consumer welfare using data from the complementary CS agreement between *Southwest* and *ATA Airlines* for Denver airline markets. Empirical studies results find that code-sharing decreased incumbents' air fares and increased their passenger volumes on code-shared routes. Both consumer and producer surplus were found to increase, a result that supports earlier findings by Park (2002) and Park and Zhang (Park, 2000). Furthermore, the paper concludes that the United States domestic market structure is Bertrand competitive[43], as opposed to previous conclusions of Cournot competition in international markets. There is then an increase in both producer and consumer surplus. This is contrary to the preliminary results of Armentier and Richard (Armantier, 2003).

---

42 Pareto-improving means making no one worse off and making at least one person better off.

43 Bertrand competition is a model of competition, named after Joseph Louis François Bertrand (1822-1900). Specifically, it is a model of price competition between duopoly firms which results in each charging the price that would be charged under perfect competition, known as marginal cost pricing. The model has the following assumptions:

- There are at least two firms producing homogeneous products;
- Firms do not cooperate;
- Firms have the same marginal cost;
- Marginal cost is constant;
- Demand is linear;
- Firms compete in price, and choose their respective prices simultaneously;
- There is strategic behaviour by both firms;
- Both firms compete solely on price and then supply the quantity demanded;
- Consumers buy everything from the cheaper firm or half at each, if the price is equal.

Competing in price means that firms can easily change the quantity they supply, but once they have chosen a certain price, it is very hard, if not impossible, to change it. Some examples of firms that might operate in this way are bars, shops or other companies that publish non-negotiable prices.

Bertrand competition versus Cournot competition

- Although the models have similar assumptions, they have very different implications.
- Bertrand predicts a duopoly is enough to push prices down to marginal cost level, that duopoly will result in perfect competition.
- Neither model is necessarily "better". The accuracy of the predictions of each model will vary from industry to industry, depending on the adequacy of each model to the industry situation.
- If capacity and output can be easily changed, Bertrand is generally a better model of duopoly competition. Or, if output and capacity are difficult to adjust, then Cournot is generally a better model.
- Under some conditions the Cournot model can be recast as a two stage model, where in the first stage firms choose capacities, and in the second they compete in Bertrand fashion

Brueckner (Brueckner, 2000) confirms that airline cooperation in the fare-setting process generates substantial benefits for international interline passengers. He adds that code-sharing and antitrust immunity are substitutes in the sense that their combined effect is smaller than the sum of their partial effects.

Armentier and Richard (Armantier, 2005) validate the theoretical deduction of Park (Park, 1997) with an empirical study of the 1999 alliance between *Continental Airlines* and *Northwest Airlines*. Generally, evidence of higher passenger volumes and lower prices along the code-shared was found. However, significantly higher prices across markets with non-stop flights were noted suggesting that *Continental/Northwest* agreement was used to expand the pool of passengers to whom both carriers can sell their seats on their aircraft and then extracting a higher price, on average.

Czerny (Czerny, 2006) shows that CS agreements can lead to welfare losses in the case of complementary networks with the argument that the price discrimination between interline and other passengers had never been taken into consideration before his paper. He also is the first one to differ interline passengers and non-interline passengers to reach an additional conclusion. In his paper he demonstrates that the CS agreements are not straightforward in the case of perfectly complementary airline networks which is in contrast to the current literature. Its analysis is based on the existence or not of price discrimination.

Iatrou (Iatrou, 2005) analyses the effect of airline alliances on the allied partners' output by comparing the traffic change observed between the pre- and the post-alliance period. This analysis concludes that, all other things being equal, strategic alliances do lead to 9.4%, on average, improvement in passenger volume.

The same author (Iatrou, 2006) found that members of *Star Alliance*, *SkyTeam* and *oneworld* are more and more locked-in their alliances which means that strategic flexibility will be reduced increasing high exit cost.

Current studies consistently argue that in the case of complimentary networks, CS agreements generate positive welfare effects because they prevent from double-mark up on interline fares. Only with overlapping network, negative welfare effects of CS agreement (normally with antitrust immunity) are considered to happen because they are expected to reduce competition and increase fares on city-pair connections served by partner airlines in parallel. In this case, interline passengers still benefit from CS agreements but non-interline passengers can be worse off. Also for this reason, criticism has been levelled against code sharing by consumer organisations and national departments of trade since it is claimed it is confusing and not transparent to passengers.

3.4 Air France Code-sharing Economic Gain Model

3.4.1 Presentation

Since 1999 when it was created as a result of an understanding between the Network and the Alliances departments, this model has aimed:

- ✈ To estimate the incremental attained result made by AF due to the CS agreements and its variation over the time.
- ✈ To measure the pertinence for AF of the global stake of CS imports.

This method includes parameters which are defined either globally or differently for medium and long haul routes in order to assure a generally consistent approach. Imprecise outputs might be observed in specific routes or for limited CS agreements which are briefly corrected on a global approach.

3.4.2 Main principles

The Code-Share model has been updated in 2007, but maintains the following essential theoretical principles of the former one:

- No distinction is made between *JV*, *ST* and agreements with other airlines. Frequent Flyer Programmes, cost synergies and corporate image (*SkyTeam*) effects are not explicitly considered in the model.
- The method is based on empirical assumptions and employs a modelling tool using real observed data within the CS context.
- A **constant schedule structure (AF operating and partner frequency)** is assumed for the CS economic gain estimation. However, the current model includes an estimation of possible incremental capacity cost due to incremental demand generated by the CS.

The CS gain is obtained as follows:

Code-Share Gain = Incremental Revenue – Incremental Cost (1)

Incr Rev = Observed revenue with code-share – Estimated revenue without code-share (2)

The revenue without alliance is estimated by the model further on equation (3).

The considered incremental costs are as follow:

- due to the traffic – catering, fees, client compensations, etc. (estimation in the model is 7% of the seat revenue);
- distribution cost (for AF* flights) – distribution, marketing, etc. (estimation in the model is 11.5% of the seat revenue on long-haul and 13.5% on medium-haul AF marketing flights);
- structure cost – alliance management (10 M€ are estimated in total and are split among the different alliances at prorate of the AF code-sharing turnover);
- cost of the hub – connecting passenger cost (30€ are estimated for every passenger connecting at CDG);
- operating cost – incremental seat cost due to the CS (development cost)[44].

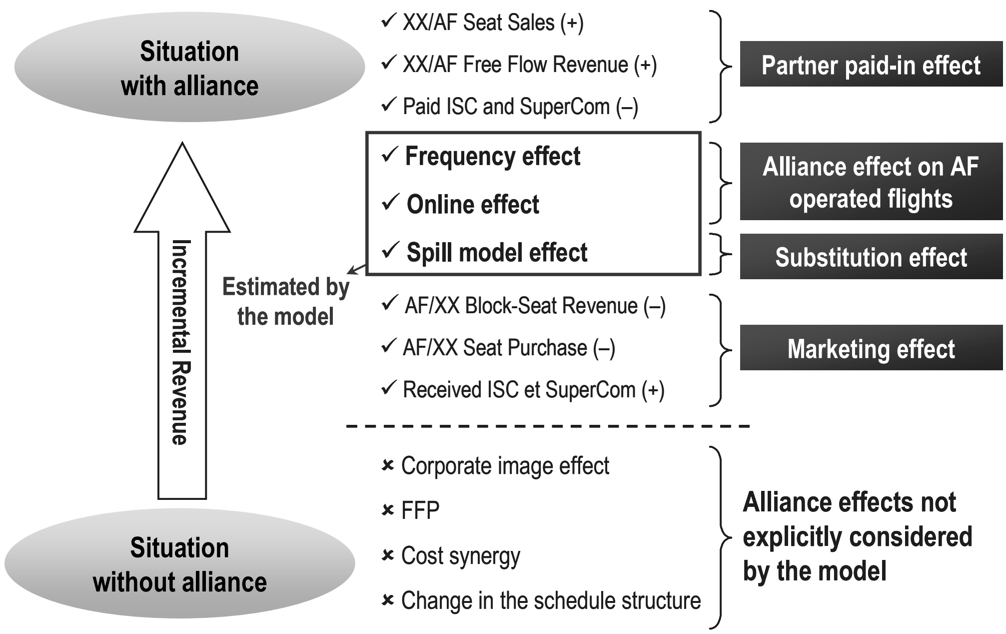


Figure XXVIII – AF Code-Sharing Economic Gain Model Scheme

3.4.2.1 'Trunk', 'Behinds' and 'Beyonds' concept

44 See further 1.4.2.6 *Incremental seat cost due to the code-share*

CS agreements are normally signed between international carriers and flights between the carriers' countries are operated by both airlines in a definite number and connect basically their hubs. Routes between hubs are called **'trunks'**. Thus, the trunks are the neuralgic routes between two countries operated by one or both partners but in the model, all routes between France and the partner's country are considered as hubs. For instance, every route between France and Italy is considered as a trunk with *Alitalia*.

Connections flights in the hereafter of trunk lines (after or before) are called '**beyonds**'. These flights can be feeders for the trunk flight and in that case they are called '**behinds'**. On the other hand, if they are distributors at the other end of the trunk, they are called **'beyonds'**. To simplify in the model all flights departing or arriving at AF hubs are called 'beyonds' and all the flights departing or arriving from XX hubs are considered as behinds.

Thus, trunk routes link generally two hubs where several connections are offered.

Actually, the total of connecting passengers in a code-shared beyond is miser and its volume is highly variable in the time. Marketing beyonds serve mainly to search passengers to feed the trunks and the beyonds that are both operated by the company who sells the ticket.

These concepts are applied to a specific alliance and they are related to this alliance. Thus, according to the alliance, the same route might be considered a beyond/behind or a trunk. For instance, within the *Delta* alliance Paris CDG – Rome flights (also code-shared with other airlines including *Alitalia*) might be a beyond for an Atlanta – Paris CDG. However, within the *Alitalia* alliance, the route Paris CDG - Rome is a trunk and the route Atlanta – Paris CDG (code-shared among others with *Delta* and *Alitalia*) is a beyond.

The following scheme describes this idea of trunks, beyonds and behinds. The different online connection combinations are also shown. Online connections are those whose marketing flight codes for each flight in the trip are the same from end to end.

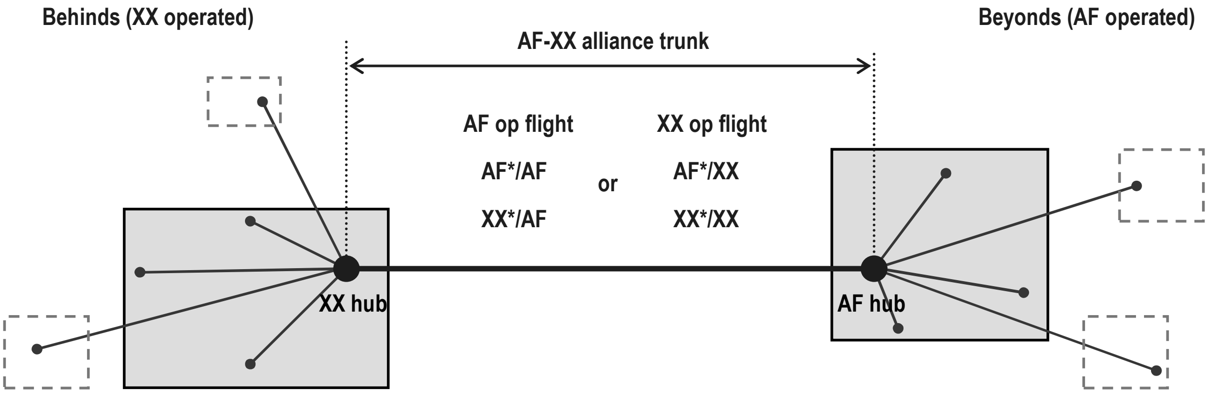


Figure XXIX – Behind, beyond and trunk scheme

XX is the AF's associate airline in study, e.g. for the trunk Paris CDG - Atlanta, XX is *Delta* (DL). An asterisk (*) is inserted to identify the marketing airline, e.g. DL*/AF means a passenger with a DL code travelling on an AF operated flight.

The diagram above generally describes several different cases, such as:

- only the trunk is bilaterally code-shared (*Air Mauritius*, *Malev*, *swiss*);
- the trunk, the beyonds and the behinds are code-shared (the most common case: *KLM*, *Delta*, *Korean Air*…);
- the trunk is unilaterally code-shared as well as the behinds (*Finnair*);
- the trunk is not code-shared but both beyonds and behinds are code-shared (*Continental* and *TAM*);
- the trunk is not code-shared and only the behinds are code-shared (*Alaska Airlines*).

In this specific case described before on the Atlanta - Paris CDG - Rome itinerary, passengers might fly online:

- AF*/AF and AF*/AF
- AF*/AF and AF*/Alitalia
- AF*/Delta and AF*/AF
- AF*/Delta and AF*/Alitalia
- Alitalia*/AF and Alitalia*/AF
- Alitalia*/AF and Alitalia*/Alitalia
- Alitalia*/Delta and Alitalia*/AF
- Alitalia*/Delta and Alitalia*/Alitalia
- Delta*/AF and Delta*/AF
- Delta*/AF and Delta*/Alitalia
- Delta*/Delta and Delta*/AF
- Delta*/Delta and DL*/Alitalia

It means that a passenger might have an AF, Alitalia or Delta ticket even if he will never fly with the airline whose code is shown in his ticket.

The theoretical revenue estimation in the case of no agreements is estimated as follows:

Revenue without Alliance = Traffic without Alliance * Yield without alliance[45] (3)

Trunk Routes (hub to hub), beyonds from the AF hub (AF operated) and behinds from XX hub (XX operated) have different estimation processes. For the latter case, all received ISC[46] (Interline Service Charge) and SuperCom[47] are considered as incremental revenue. For the first two cases, below are the schemes that describe their estimation processes.

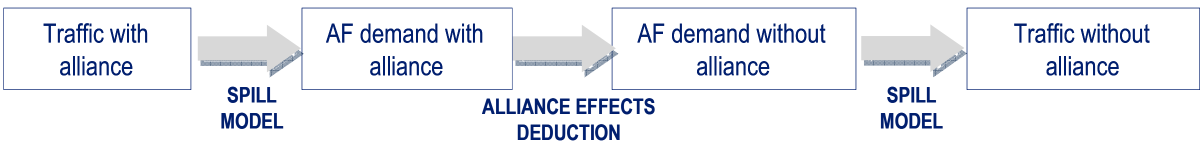


Figure XXX – Estimation scheme of the trunk traffic without alliance estimation scheme

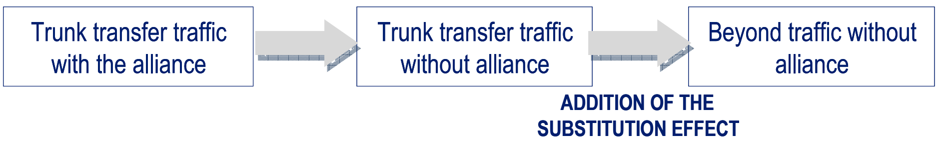


Figure XXXI – Estimation scheme of the beyond[48] traffic without alliance

3.4.2.2 Spill Model

[45] Both the traffic and the yield without alliances are separately estimated by traffic type (see further 1.4.3 *Types of traffic*).

[46] Implemented by IATA, ISC is a general defined charge that the company that operates the flight needs to transfer to the airline that issued the ticket. Within an airline, the outward billing is the process which values any coupons issued by another airline, together with any taxes or Interline Service Charge (ISC) applicable, and creates the interline bill to recover the value from that airline. The other way round, inward billing comprises the system will compare the incoming-billed values for fare, taxes and ISC with the data on the coupon database.

[47] In addition to the ISC, many agreements between the airlines determinate a SuperCom (super commission) on the tickets they issue for flights operated by other carriers. SuperCom is used as an incentive from the operating airline to push other airlines to sell tickets in their flights.

[48] 'Beyond' in the sense of the model.

With a given demand and a given capacity the spill model originally created by Boeing generates a theoretical flight load factor. Generally, spill models estimate average passenger loads when demand occasionally exceeds capacity. Such models have been in use for over 20 years. The shape of the distribution of demand is discussed from both theoretical and empiric perspectives. Sources of variance are identified and calibrated. The model may be revised in real time to respond to changes in process caused by computer reservations systems and revenue management.

AF code-sharing model applies therefore the spill concept to the average flight for each trunk route - this average flight is obtained from the traffic data and the number of flights in a given period. The use of spill models “in reverse” to imply demand from load is shown to have poor accuracy. Despite this, within the Code-Share Gain model it is used in inverted mode (‘Despill Model’) to determine the theoretical demand from the real traffic and then in direct mode to estimate the traffic without alliance. Yet in the Code-Share Gain model, the Spill Model is not applicable to the beyonds because for the same trunk, many connecting flights are fed by different sources.

The basic idea behind spill is that demand for a group of flights can be represented as a distribution about a mean. The integral of this distribution is the “fill” rate for seats on an aircraft. This is shown in Figure XXXII. The integral of the fill rate beyond a truncating capacity is the spilled demand.

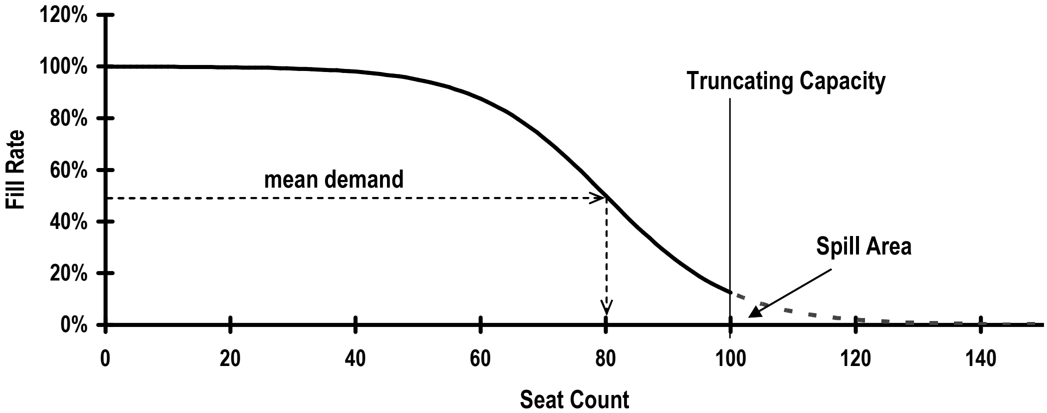


Figure XXXII – Fill rate and spill

Spill estimates the demand in excess of capacity. The model assumes a demand distribution and truncates it with a capacity line. The demand distribution is usually Normal. Formulas approximating a Normal distribution have been used for most applications. Such modelling is widely employed within the airline industry. Revisions to the model recognise an increase in the variance of the demand distribution when demand levels are small, due to random variations adding to the usual cyclic changes in demand. Revisions also adjust for overbooking and revenue management behaviour by truncating demand at a capacity somewhat below the physical seat count. The revenue for spilled demand is close to the local discount fare. Spilled demand can be recaptured, which diminishes the cost of spill. However, the possibility of refilling with recapture adds value to extra seats. Recapture is small for fleet planning cases and can often be ignored. The great frustration with spill modelling is that all its effectiveness in estimating spill in direct application is seldom repeated on reverse mode *ie* estimation of the demand having as input observed load averages is often unreliable.

Overall, spill modelling has produced practical understandings that have found wide use in the airline industry. Future use may be compromised by rising load factors and a developing trend to use pricing to fill under-utilised capacity.

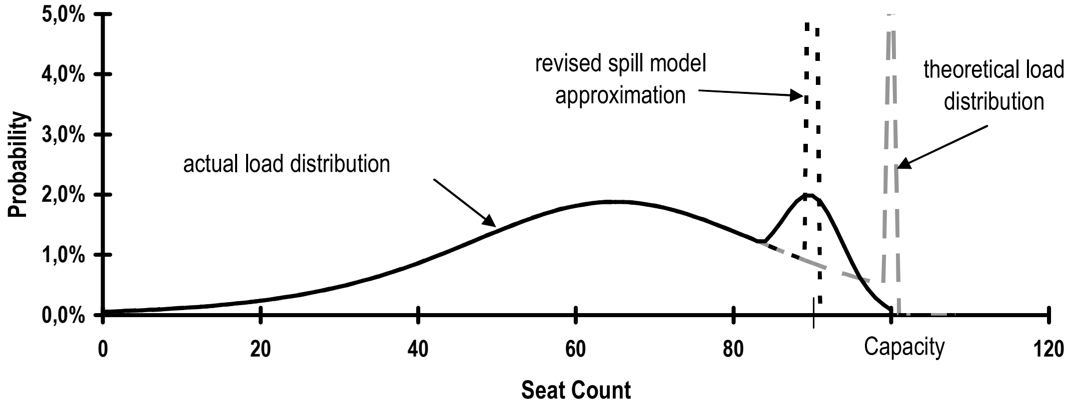


Figure XXXIII – Loads: Theory and practice

3.4.2.2.1 Revenues for spill

The spill model predicts spilled demand. More important perhaps for the airline than the spilled demand in terms of passengers is the revenue that is spilled with spilled passengers. Consequently the revenue for that spilled demand is highly discussed. For the time being, this discussion of spoilage has recognised that spill takes place by turning away discount demand as it requests a reservation. Revenue management systems' function is to spill discount demand and maintain space for higher fare demand. So the question of what revenue is spilled is either very complicated or completely simple. The complicated answer involves understanding what a revenue management system is trying to do on a detailed level, and how well it succeeds. The simple answer is that spill is at the local market discount fare. Discussion will try to motivate the simple answer, the higher the demand is comparing to the available seats.

The purpose of a revenue management is to spill discount fares when spill must occur at all. Most current revenue management systems group fares in to "buckets" and limit sales from the lowest fare bucket. A typical flight leg is half local traffic, and the local traffic is usually well over half at discount fares. Local discount fares are lower than connecting discount fares. So, most revenue management systems limit local discounts first.

When significant numbers of passengers need to be turned away, it is easier to arrange that most denials are discount demand. Furthermore, it is not the average fare turned away that counts, but the expected fare for one last increment of spilled demand that counts. Simulations of leg-based revenue management systems suggest that when spill is not too small, 80% of it is turned away at the discount fare, and only 20% at an average mix of fares. This split is fairly consistent from modest levels of spill up to very high levels of spill and over a range of discount market shares and prices. The rule breaks down at very high levels of spill, when all the discount demand has been denied and higher fares need to be refused. However, this is beyond most real cases. The practical conclusion is that spill revenues are just above the discount levels.

The most advanced revenue management systems try to do better. Origin-Destination based systems try to turn away discount demand from two-leg connecting itineraries if both legs are likely to be spilling. The revenue lost per leg becomes only a share of the connecting discount fare. The value is well below the local discount fare. This line of reasoning means average spill is at revenues slightly below the local discount, not slightly above.

Overall, spill is at the local discount fare, or at a value within 10% of this number for planning cases. This is well within the uncertainty of estimates for other parts of a plan. For markets such as domestic United States hub services, the value runs about 80% of the average yield allocated to a flight leg.

3.4.2.2.2 Recapture of spill

Recapture is the idea that spilled demand does not fail to take the trip. Some of it finds its way back onto other flights by the same airline. This is easy to visualise on a daily or weekly basis. Spill from the 9:00 flight will divert to seats on the 11:00 flight, and spill on the Tuesday departure can arrange to go on Wednesday. For a day or a week, spill applications need to address the issue of recapture.

Recapture is less of an issue for fleet planning. In fleet planning, spill in August cannot be expected to use space in February, and spill to London does not board the flight to Miami. While some spill does find space on adjacent flights, the last incremental units of spill are left with fewer and fewer open alternatives. The broader or longer-run the case or the higher the spill values, the smaller the likelihood of practical recapture.

For the shorter-run, there remains a need for understanding recapture behaviour. Recapture has been studied using demand models that simulate passenger choices and preserve the second, third, and fourth choice departures for spilled passengers. It is important to preserve a list of alternatives, since if a passenger has been spilled off his first choice, he is late booking. Other flights are likely to be full with their primary demand or earlier recaptured demand. While a list is important, preserving a long list presents a problem. At some point customers give up and replan their trip around a different set of times or days. Nonetheless, the list-of-choices logic has been used in simulations covering a month of flights with day-of-week and time-of-day cycles. The results suggest the following simplification of recapture behaviour: spilled demand for a city pair loads itself on flights as if it is seeking empty seats with little attention to schedule. After a first pass of primary demand and primary spill, the pool of spilled demand distributes itself at equal load factors on the remaining available space in the market. Available space is measured as the seats between the first-pass load and the truncating capacity C. Check-out figure XXXIII.

This result is a lot less certain than earlier statements about spill. Modest load factors and small spill will produce the more intuitive result that the more popular flights get most of the recapture. High demands produce the obvious answer that all available capacity is used, and some excess demand is lost entirely.

This understanding of recapture has a significant corollary. Extra seats on flights are not only useful for preventing spill from the flight, they also have value for accommodating spill from competitor's flights or off other flights of the same airline. The reverse side of the "recapture" coin is this constructive use of extra capacity. The term suggested for this phenomenon is "refill."

Recapture means spill is less costly than it seems. This means extra seats are less valuable. Refill means extra seats have increased value.

In annual or fleet cases recapture is small, particularly for incremental changes. For monthly cases for a single flight leg, recapture can be important, but the phenomenon of refill cancels some of its value.

3.4.2.2.3 Errors in estimation

Spill calculations require estimates of a number of parameters. The way to test these estimates is to compare their effect on the value of an incremental seat on the aircraft. The use of a seat is its fill rate. This percentage will then be multiplied by the expected fare for spilled passengers to get the value for an extra seat.

For fleet planning, fill values are higher for the same demand factor, because the data for a fleet for a year has more variation from its average than a flight leg for a month. Although fill values are higher, the uncertainties are lower. Averaging across an entire system reduces the uncertainty in spill fare estimates, and recapture and refill are much smaller issues for annual and fleet spill.

3.4.2.2.4 Estimating demand

The spill model starts with knowledge of the unconstrained demand for a flight. Often, this "knowledge" is an estimate from historical loads. This is fine when load factors were low. An iterative process can establish what demand would result in the observed load. However, when spill is an issue, load factors are already high. With high load factors, most flights are full. There is little information in the load distribution about how much further demand there might have been. It becomes hard to determine what the underlying demand distribution was from the shape of the observed load curve. One way to see this is shown in Figure XXXIV.

Implied demand factor is shown against observed load factor for a flight leg for a month. This is based on numerical inversion of the spill formula. Above 85% load factor, as little as a 0.5% point rise in observed load implies a huge increase in demand. To make matters worse, errors in the estimated spoilage are likely, particularly at high demands. Differing spoilage estimates will give large changes in implied demand. Used in reverse, the spill model does not work in practice at high spill. Numerically, the spill model is poor at "detruncation."

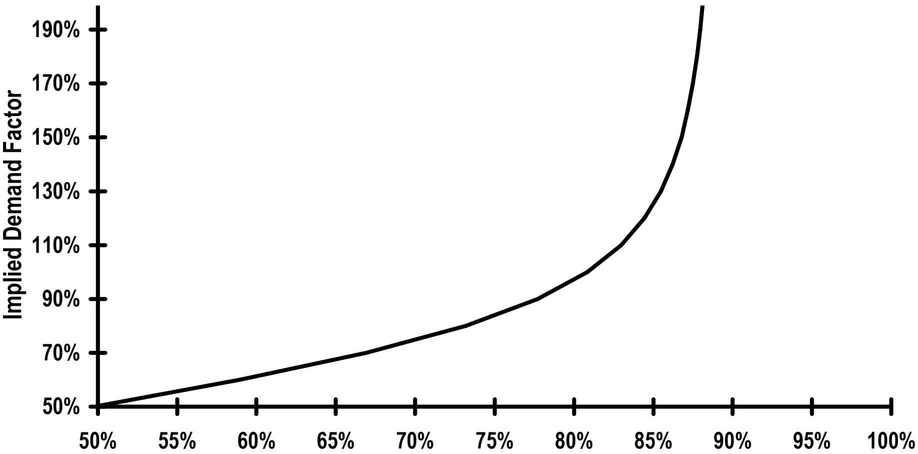


Figure XXXIV – Implied demand skyrockets at high load factors

Two methods are used to get around this. Neither is particularly convenient. The simplest is to look at the leg in question at a lower load factor time, and scale the demand up in proportions typical for similar markets suffering less truncation. The second is to collect information from the revenue management system on day-by-day spilled demand and establish the monthly average. To set its levels, revenue management must forecast the unconstrained demand for each fare class for each flight leg. Thus the day-by-day spoil has been estimated and can be accumulated to a monthly average. Unfortunately, often these forecasts are discarded. When they are recorded, they are not always very good estimates, because forecasting within revenue management systems also suffers from diminished information when spill is high and past bookings have been capped. Finally, recapture and refill add passengers to observed loads, further complicating the issue. All these complaints aside, estimates from the revenue management system are often the best available.

The overall conclusion on demand estimation is that the spill model is fine for predicting spill when demand is known, but not good at helping with the estimates of demand to begin with. Having said that, it is often the only available approach and is more commonly used than admired. In the *AF code-sharing economic gain model* the demand is estimated for the spill on reverse mode, even if the method is not the ideal. In fact, it was both the easiest and thus best option found among the choices considered. In spite of this, results analysis should consider these particular estimation errors.

3.4.2.3 Alliance Effects

Two direct alliance effects exist and are taken in consideration in the model thanks to the CS are taken into consideration:

- ✈ **Frequency effect** as the number of scheduled flights within a given airline increase;
- ✈ **Online effect** because a single airline code fare is offered “from end to end”.

3.4.2.3.1 Frequency effect

This effect is based on the S-curve model which is used to obtain the market share from the percentage of AF flights among the total scheduled flights on a given route.

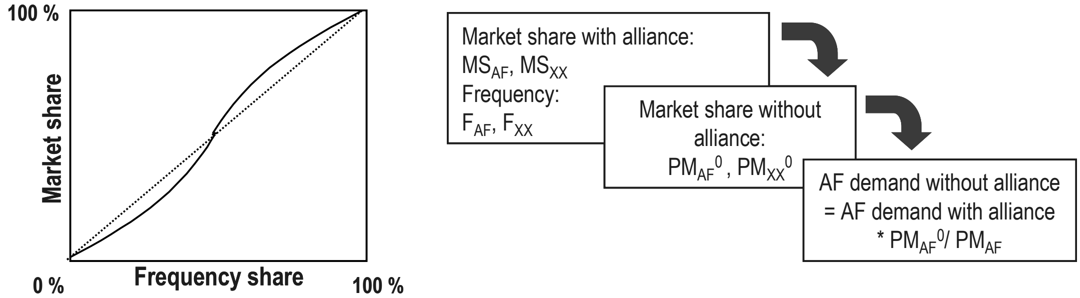


Figure XXXV – Graph of the S-curve that describes the market share in function of the frequency share and estimation scheme of the AF demand without alliance

Frequency effect occurs on trunk routes once two partner airlines both operate on this route. The fact that a specific airline can suggest additional flights on a trunk route thanks to code-shared flights operated by the partner affects that specific airline’s market share.

The curvature of the graph depend on the α, the bending coefficient. Further info is available in section 4.2.2 *α and* . In AF code-sharing economic gain model, different values for α might be used for long-haul and short-haul flights. Actually, in the current parameters, α=1,20 was chosen in both cases.

The frequency effect which (expressed in percentage) is:

$$\text{Frequency Effect} = \frac{MS_{AF} - MS_{AF}^{0}}{MS_{AF}} \qquad (4)$$

MS_{AF} corresponds to AF market share currently with the alliance and MS_{AF}^0 to AF market share without the CS flights offered by the partner (everything else constant which then means that this is not exactly the AF market share without alliance). The frequency effect is then measured by the impact of the partner code-shared flights in the total AF marketing flights.

It is important to note that the frequency effect may be negative. This means that the frequency effect is in favour of the partner and not of AF. It is the case when trunks are fairly operated by the partner comparing to AF.

The S-curve allows translates the fact that the increase in the market share is not directly proportional to the increase in the offered number of flights. Contrarily, it shows that the market share depends on the airline’s position in terms of frequency share with and without alliance. See figures XXXVI for further understanding.

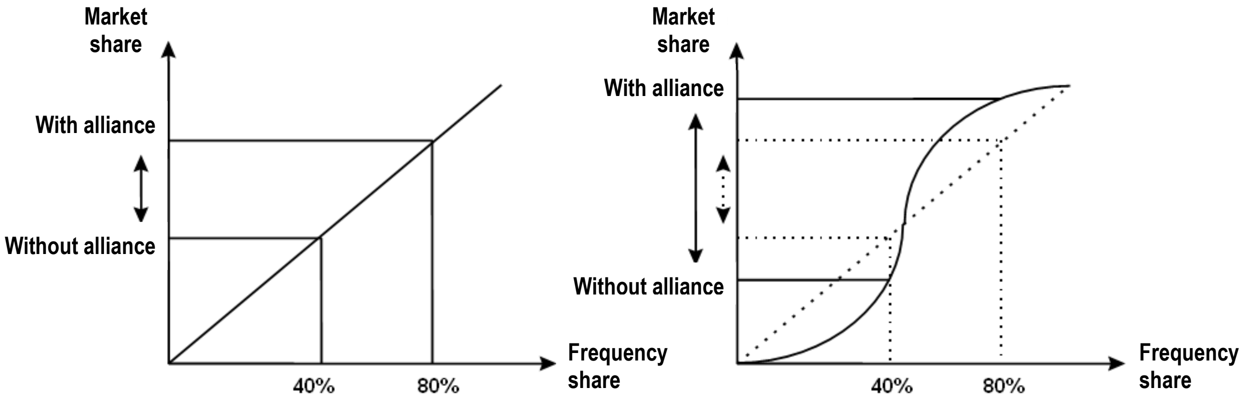


Figure XXXVI – Influence of the S-curve in the final market share comparing to a linear situation.

3.4.2.3.1.1 Market share

For this application the market share of AF and XX associated trunks is estimated by the marketing booking (reservations) data of each airline serving the route (AF, XX and their competitors). It means that market share is defined by the number of sold tickets under a specific airline flight number. A booking is a "record" of a passenger's intent to fly: a booking occurs before a ticket is driven; bookings can be held, changed or cancelled

Data is then retrieved in the MIDT (Marketing Information Data Transfer)[49] which includes traditional airlines that are distributed through the major GDS. MIDT captures approximately 60% of global bookings made by IATA and non-IATA travel agencies and excludes passengers who book directly with an airline (which is a major issue for low-cost carriers). Therefore, consultants normally tend to adjust the data higher based on calibration with other data to estimate true demand.

For trunks departing from or arriving in Paris (CDG and ORY), bookings are estimated from ADP (Aéroport de Paris) data which integrate for each destination the number of passengers on AF flights and the sum total for the competitors (XX and competitors).

Market share calculation is made from 'dry' trunk bookings (hub to hub) and 'via' booking (connecting flights between two hubs).

$$MS_{AF} = \frac{Bkgs_{AF}^{DRY} + Bkgs_{AF}^{VIA}}{Bkgs_{AF}^{DRY} + Bkgs_{AF}^{VIA} + Bkgs_{XX}^{DRY} + Bkgs_{XX}^{VIA} + Bkgs_{ZZ}^{DRY} + Bkgs_{ZZ}^{VIA}} \quad (5)$$

For trunk routes departing from or arriving in Paris, competitors (ZZ) 'dry' bookings are estimated supposing that bookings are proportional to marketing flights, no matter the airline. As these are generally low-cost airlines, 'dry' bookings are roughly equalled to the total bookings for that segment (considering that passengers flying in these airlines make no connection). Although this is not necessarily true, that is the reason for estimating ZZ's 'dry' booking from the marketing traffic and $Bkgs_{AF*}$ and $Bkgs_{ZZ*}$.

[49] reservation data captured by travel agents from the major GDS. These include monthly data elements such as:

- point of origin airport;
- agency postal code;
- travel date;
- origin, destination and routing;
- marketing/operating airline;
- booking class;
- passenger count.

$$Bkgs'_{ZZ^*} = Traffic_{ZZ} \frac{Bkgs_{AF^*}}{Traffic_{AF^*/AF} + Traffic_{AF^*/XX}} \quad (6)$$

$$k = \frac{Bkgs_{AF^*}}{Trafic_{AF^*/AF} + Trafic_{AF^*/XX}} \quad (7)$$

The total traffic for AF ($Traffic_{AF^*/AF}$ and $Traffic_{XX^*/AF}$) operating flights and the total traffic for a specific trunk route (operated by AF, XX or ZZ). So $Traffic_{ZZ+XX}$ can be inferred.

Additionally, $Traffic_{AF^*/AF}$ and $Traffic_{AF^*/XX}$ are found in internal AF databases as well as $Traffic_{XX^*/AF}$. Thus, $Traffic_{XX^*/XX}$ is balanced as follows:

$$Traffic_{XX^*/XX} = Bkgs_{XX^*} \frac{Traffic_{AF^*/AF} + Traffic_{AF^*/XX}}{Bkgs_{AF^*}} - Traffic_{XX^*/AF} \quad (8)$$

As there are different data sources (internal – AF and external – ADP), slight variations may occur. ADP traffic data is then adjusted with AF internal data.

$$Traffic^{estimated}_{AF+XX+ZZ} = ADPTotalTraffic^* \frac{Traffic_{AF^*/AF} + Traffic_{XX^*/AF}}{ADPTraffic_{AF}} \quad (9)$$

(8) + (9) →

$$Traffic_{ZZ} = Traffic^{estimated}_{AF+XX+ZZ} - Traffic_{AF^*/AF} - Traffic_{XX^*/AF} - Traffic_{XX^*/XX} - Traffic_{AF^*/XX} \quad (10)$$

As $Bkgs'_{ZZ}$ are estimated, these route estimated bookings for the competitors are considered with ADP data following the previous method replacing the 'dry' MIDT booking for the MS calculations if these estimated booking are n times bigger than the route bookings MIDT data. For the current model, n = 3.

3.4.2.3.2 Online effect

It is assumed that 20% of the passengers who did an "online" interconnection would have chosen the same connection even if it was "interline" (see figure XXXVII). Thus:

- ✈ 80% of the total revenue from the BEYOND of passengers connecting at CDG is considered as incremental;
- ✈ 80% of the total revenue from the TRUNK of passengers connecting at ATL is considered as incremental.

These values are consistent according to the QSI[50] coefficients (online vs interline) which are used by the Network Department. The DB.IP department has made some empirical studies[51] on this matter, namely in the US market. The results corroborate the used values.

[50] QSI (Quality of Service Index) – statistical model that calculates current market share in any region, or even between given airports. It relates the number of passengers travelling in a particular itinerary to the "quality" in relation to other itineraries between the same airports. Quality in a particular itinerary is defined as a function of various service attributes of that itinerary and the importance given to those service attributes by passengers travelling in that itinerary. This degree of importance or "preference" is measured in terms of "Preference Weights." For a given QSI model, these preference weights are obtained using statistical techniques and/or analyst intuition. Once the preference weights are obtained, QSI values are calculated for each itinerary.

[51] Namely *Étude du Coefficient Online pour modèle d'alliance DB.IP* [B14]. This study analyses the case where there was no code-share agreement with Delta in 2001 and then the online traffic increase from 2002.

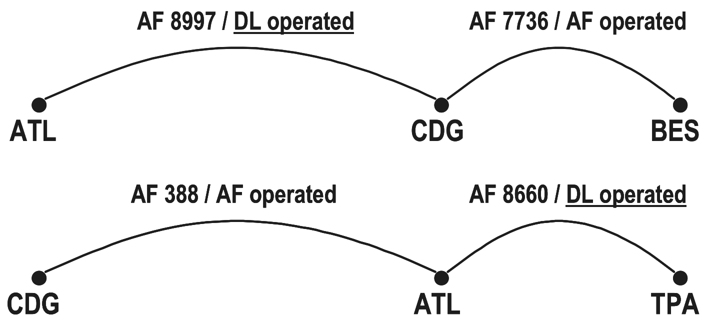


Figure XXXVII - Simple online scheme example with XX operating either the trunk or the behind

3.4.2.4 Incremental capacity

The incremental capacity is the estimated capacity associated with the incremental traffic due to the CS. Therefore, the obtained capacity without alliance is used to estimate the traffic without alliance with the spill model.

This notion of 'incremental capacity' was created after unsatisfactory results in estimated data in the previous model. Thus, there is also an incremental capacity cost which is calculated following an incremental seat development cost approach, based on a statistical analysis (regression) of the ARA[52] cost data. The unit cost is elastic to the aircraft and the distance.

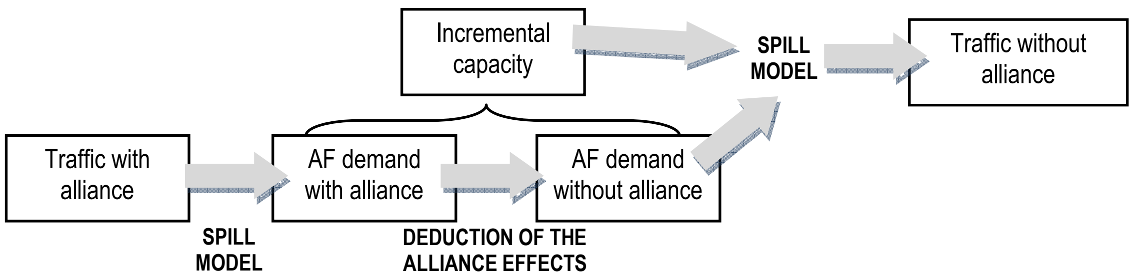


Figure XXXVIII - Integration of the incremental capacity in the model

3.4.2.5 Substitution Effect

The substitution effect is defined by the number of incremental passengers on a flight who would have been "replaced" by others in a non-alliance situation. Actually, certain passenger who seem new thanks to an online transfer would be replaced anyway by other passengers on that specific flight.

In the trunk analysis, this effect is estimated by the spill model when it converts the observed traffic with alliance to the traffic without alliance for a given flight. The substitution effect is the difference between traffic without alliance and the AF*/AF passengers excluding all alliance effects.

In the case of the beyonds, the substitution effect is estimated using a global percentage (non replacement rate) for all transfers 'AF operating' of a given trunk.

3.4.2.6 Incremental seat cost due to the code-share

The cost to develop each seat is defined as a percentage of the average cost excluding traffic and revenue costs.

$$\text{Development cost per seat} = x\% * \text{average (full) cost per seat except traffic and revenue costs} \qquad (11)$$

52 ARA stands for Analyse du Réseau Aérien and is the AF route profitability system.

The x estimation is based on a statistical analysis. This analysis consisted of a logarithmic regression which produces the elasticity of the average unit cost to the aircraft capacity and to the distance. 0.6 is the value reached through the analysis whose rationale is stated as follows:

$$\text{Unit seat cost} = A * \#\text{ seats (aircraft capacity)}^{a} * \text{distance}^{b} \quad (12)$$

$$\text{Leg cost} = \text{Unit seat cost} * \#\text{ seats} \quad (13)$$

(12) + (13) → $$\text{Leg cost} = A * \text{seats}^{a+1} * \text{distance}^{b} \quad (14)$$

$$\frac{\Delta \text{cost}}{\Delta \text{seats}} = \frac{\partial \text{cost}}{\partial \text{seats}} = A * (1+a) * \text{seats}^{a} * \text{distance}^{b} \quad (15)$$

(12) + (15) → $$\frac{\Delta \text{cost}}{\Delta \text{seats}} = (a+1) * \text{unit seat cost} \quad (16)$$

$$x = 1 + a \quad (17)$$

(16) + (17) → $$\frac{\Delta \text{cost}}{\Delta \text{seats}} = x * \text{unit seat cost} \quad (18)$$

x = 0.6 in the model for both long and medium-haul trunk routes.

In this rationale b is forced to equal 0,5 [53]. Additionally the following expression does not depend anymore of the # seats. This is because it is admitted that the expression in function of the square root of the distance implicitly integrates the consideration of the number of seats by aircraft as aircraft tend to be larger for longer distances.

$$\text{Unit seat cost (except traffic and revenue cost)} = d * \text{distance}^{0,5} \quad (19)$$

After estimating d based on a linear regression without constant term from the ARA cost data, the incremental seat cost is defined:

(18) + (19) → $$\text{Incremental seat cost} = x * d * \text{distance}^{0,5} \quad (20)$$

$$c = x * d \quad (21)$$

(20) + (21) → $$\text{Incremental seat cost} = c * \text{distance}^{0,5} \quad (22)$$

$$\text{Incremental capacity cost} = \text{incremental seat cost} * \Delta \text{ capacity} \quad (23)$$

(22) + (23) → $$\text{Incremental capacity cost} = c * \text{distance}^{0,5} * \Delta \text{ capacity} \quad (24)$$

3.4.3 Types of traffic

For a specific trunk within an alliance with XX, there might be different types of traffic:

- point to point (hub to hub),
- connection in the AF hub,
- connection in the XX hub,
- bridge – connection in both AF and XX.

The different traffic types defined to be used by the model are presented in Appendix A – *Types of traffic*.

53 It was proved by empiric studies that d = 0,5 respected the real evolution of the incremental seat cost. Additionally, in the US, this factor is used for airlines to share interline ticket revenues by many airlines. [E6]

3.4.4 Personal contribution to the model

Apart from processing the model for IATA Winter 2007, and conclude the IATA 2007 final figures, several changes were made in the model code and even in certain particular points of the model logic.

The changes, improvements, corrections and creations in the code of the model are presented in *appendix B.*

4. AF code-share model applications

Many applications have been made of the Code-share Gain Model which are considered as by-products of the model. One of them is to feed the Alliances Department Dashboard. Another one is to complete the Results Communication to AF executives. Yet it is a way of checking that some data is missing in the global AF databases.

Results of the model are often sent to the Alliance and Network departments as well as to the Interline service of the Revenue Management department.

More than achieving specific results for each season, this model intends to estimate the evaluation of the CS for AF. That is why I was asked to assess this evolution since the beginning of AF's code-sharing studies. Methodology and results are presented next in section 4.1.2 *Evolution*.

4.1 Model results

4.1.1 IATA 2007

The results issued from the CS model for IATA Summer 2007 and IATA Winter 2007 are presented in *appendix C* in consolidated IATA 2007 version.

4.1.1.1 Methodology

For the regular process of the model, the procedure was followed as described in secion 3.4 *Air France Code-sharing Economic Gain Model*. Despite this, several problems occurred when gathering data through *Pilotage* (a specific Excel model that gathers data from different sources for further analysis with the CS gain). These problems concerning lack of information for some airlines – *swiss*, *Luxair*, *Delta, Qantas* and *KLM* in the AMSCDG route – or fraudulent data (*Air Europa*) were corrected and adjusted individually with simple mathematical methods.

4.1.2 Evolution

Since 2000, different models have been created to estimate the CS gain for AF. During my internship, I was in charge of estimating the evaluation of the results since the beginning within a consistent approach. Following in section 4.1.2.1 *Methodology* is presented the applied methodology.

4.1.2.1 Methodology

The evolution study was made with linear regressions for each single airline. Restrictions to the regression coefficient applied to airlines whose results change too much from a model to another[54]. All regression coefficients were inferred after analysis of distinct models results for each company in IATA years where both model results are available.

		IATA 2000	IATA 2001	IATA 2002	IATA 2003	IATA 2004	IATA 2005	IATA 2006	IATA 2007
SkyTeam Results	Version 0	73.9	78.7	139.3					
	Version 1	43.3	48.2	85.6					
	Version 2.1	19.7	17.5	21.7	100.2	100.0	77.8		
	Version 3	21.7	19.6	21.8	102.6	114.7	80.9	97.7	123.3

Table XX – Study results to evaluate the evolution of SkyTeam code-share gain for since 2000

[54] These coefficients had to belong to the following interval [-0.1; 5]. Higher and lower values were respectively minored to 5 and majored to -0.1.

		IATA 2000	IATA 2001	IATA 2002	IATA 2003	IATA 2004	IATA 2005	IATA 2006	IATA 2007
Global Results	Version 0	97.1	115.3	167.8					
	Version 1	59.8	66.5	97.6					
	Version 2.1	31.3	27.3	24.0	151.6	162.3	144.5		
	Version 3	35.7	32.2	27.6	158.1	181.7	150.7	198.3	203.7

Table XXI – Study results to evaluate the global evolution of the code-share gain for AF since 2000

In the two previous tables, data in colour corresponds to actual official data from the model, processed by Philippe Marguier in red, Sebastián Ponce in blue and by both this latter and me in green.

4.2 Sensitivity analysis

4.2.1 Methodology

Three parameters were studied: α, □ and e2. To proceed with each sensitivity analysis, only the parameters in study varied. All the others were constant. Then, the model was processed and the results are presented in the *appendix F*. These sensitivity analysis were only applied to the IATA Winter 2007. The process of this season had been of my entire responsibility.

4.2.2 α and □

Within the frequency effect modelling, α and □ are called as inputs and influence the S-curve as follows.

The following rationale will integrate a particular notation.

Inputs	MS_{AF}	AF market share with the alliance
	MS_{XX}	Partner airline market share with the alliance with AF
	F_{AF}	AF operating (op) flights for the given trunk
	of which $F_{XX*/AF}$	AF op flights code-shared with the partner airline for the given trunk
	F_{XX}	Op flights of the partner airline for the given trunk
	of which $F_{AF*/XX}$	Op flights of the partner airline which are code-shared for the given trunk
	□	Operating flights weight[55]
	□	Marketing flights weight[46]

Non calculated explicative intermediary quantities	EF_{AF} , EF_{XX}	'Equivalent' flights for AF and XX when allied
	EF_{ZZ}	'Equivalent' flights for all the third airlines
	EF^0_{AF} , EF^0_{XX}	'Equivalent' flights for AF and XX without alliance
	k_{AF} , k_{XX}	"image coefficient"

55 These weights balance the attractivity of operating flights comparing to marketing flights. The model takes □ = 1.0 and □ = 0.15. This latter value is conservative.

Results

EFS_{AF} , EFS_{XX} , EFS_{YY}	'Equivalent' flight share with alliance
EFS^0_{AF} , EFS^0_{XX}	'Equivalent' flight share without alliance
MS^0_{AF} , MS^0_{XX}	Market share without alliance

Once all the variables defined, next is the rationale to reach the market shares in an hypothetic non-alliance situation.

a) 'Equivalent' flights share for AF + XX within the alliance situation. This is done with an inverse application of the S-curve.

$$EFS_{AF} + EFS_{XX} = \frac{(MS_{AF} + MS_{XX})^{1/\alpha}}{(MS_{AF} + MS_{XX})^{1/\alpha} + (1 - MS_{AF} - MS_{XX})^{1/\alpha}} \quad (25)$$

$(1 - PM_{AF} - PM_{XX})$ is the market share of all the other competitors

b) Distribution of the flights share within the alliance (between AF and XX).

$$\frac{EFS_{XX}}{EFS_{AF}} = \left(\frac{MS_{XX}}{MS_{AF}}\right)^{1/\alpha} \quad (26)$$

(25) + (26) →

$$EFS_{AF} = \frac{MS^{1/\alpha}_{AF}}{MS^{1/\alpha}_{AF} + MS^{1/\alpha}_{XX}} \times \frac{(MS_{AF} + MS_{XX})^{1/\alpha}}{(MS_{AF} + MS_{XX})^{1/\alpha} + (1 - MS_{AF} - MS_{XX})^{1/\alpha}} \quad (27)$$

c) Transformation of the EF in the situation of alliance into flight without alliance as 'Equivalent' flights are defined as:

within an alliance $EF_{AF} = k^{1/\alpha}_{AF}(\gamma F_{AF} + \beta F_{AF*/XX})$ (28)

$$EF_{XX} = k^{1/\alpha}_{XX}(\gamma F_{XX} + \beta F_{XX*/AF}) \quad (29)$$

without alliance $EF^0_{AF} = k^{1/\alpha}_{AF} F_{AF}$ (30)

$$EF^0_{XX} = k^{1/\alpha}_{XX} F_{XX} \quad (31)$$

(28)+(30) →

$$EF^0_{AF} = \frac{F_{AF}}{\gamma F_{AF} + \beta F_{AF*/XX}} FE_{AF} \quad (32)$$

(29)+(31) →

$$EF^0_{XX} = \frac{F_{XX}}{\gamma F_{XX} + \beta F_{XX*/AF}} FE_{XX} \quad (33)$$

$$EFS^0_{AF} = \frac{EF^0_{AF}}{EF^0_{AF} + EF^0_{XX} + EF^0_{ZZ}} \quad (34)$$

(32) + (33) + (34) →

$$EFS^0_{AF} = \frac{\frac{F_{AF}}{\gamma F_{AF} + \beta F_{AF*/XX}} EF_{AF}}{\frac{F_{AF}}{\gamma F_{AF} + \beta F_{AF*/XX}} EF_{AF} + \frac{F_{XX}}{\gamma F_{XX} + \beta F_{XX*/AF}} EF_{XX} + EF_{YY}} \quad (35)$$

(35) →

$$EFS^0_{AF} = \frac{\frac{F_{AF}}{\gamma F_{AF} + \beta F_{AF*/XX}} EFS_{AF}}{\frac{F_{AF}}{\gamma F_{AF} + \beta F_{AF*/XX}} EFS_{AF} + \frac{F_{XX}}{\gamma F_{XX} + \beta F_{XX*/AF}} EFS_{XX} + (1 - EFS_{AF} - EFS_{XX})} \quad (36)$$

Similarly:

$$EFS^0_{XX} = \frac{\frac{F_{XX}}{\gamma F_{XX} + \beta F_{XX*/AF}} EFS_{XX}}{\frac{F_{AF}}{\gamma F_{AF} + \beta F_{AF*/XX}} EFS_{AF} + \frac{F_{XX}}{\gamma F_{XX} + \beta F_{XX*/AF}} EFS_{XX} + (1 - EFS_{AF} - EFS_{XX})} \tag{37}$$

If γ = 1 and β = 0 $\rightarrow EFS^O_{AF} = EFS_{AF}$ and $EFS^O_{XX} = EFS_{XX}$

d) Market share without alliance with the direct application of the S-curve.

$$MS^0_{AF} = \frac{\left[EFS^0_{AF}\right]^\alpha}{\left[EFS^0_{AF}\right]^\alpha + \left[EFS^0_{XX}\right]^\alpha + \left[1 - EFS^0_{AF} - EFS^0_{XX}\right]^\alpha} \tag{38}$$

$$MS^0_{XX} = \frac{\left[EFS^0_{XX}\right]^\alpha}{\left[EFS^0_{AF}\right]^\alpha + \left[EFS^0_{XX}\right]^\alpha + \left[1 - EFS^0_{AF} - EFS^0_{XX}\right]^\alpha} \tag{39}$$

e) Frequency effect final result.

$$FE = \frac{MS_{AF} - MS^0_{AF}}{MS_{AF}} \tag{40}$$

This modelling is summarised in figure XXXIX.

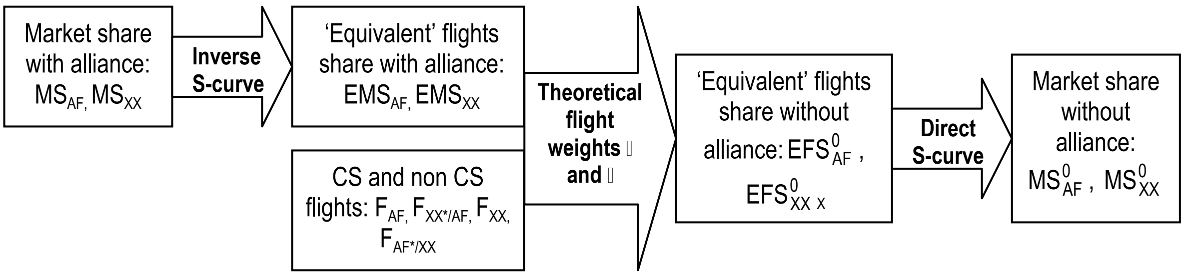


Figure XXXIX – Descriptive scheme of the method to estimate the market share without alliance

4.2.2.1 α sensitivity analysis comments and results

α is the curvature of the S-curve that defines the market share in function of the frequency.

If α = 1, then the graphic is linear and there is no difference between the airlines who have a strong frequency and the other with a weak frequency. If α > 1, the higher α value is, the more the curve bends. On the other hand if α < 1, the curve bends on the opposite sense. Figure XL shows the changes in the S-curve depending on the α value.

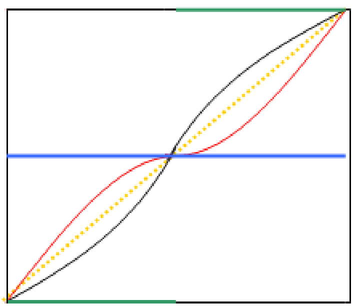


Figure XL - Influence of α in the S-curve bending

α = - ∞ (**blue**)
α = -1 (**red**)
α = 0 (**yellow**)
α = 1 (**black**)
α = + ∞ (**green**)

The results of the sensitivity analysis are presented on *appendix G*.

$\alpha = 1.2$ is the minimum value which is accepted in air transport industry for this kind of analysis. AF decided to adopt this minimum value, not to overestimate its market share in the majority of the markets within CS. Choosing, 1.2 the results obtained by the model will inevitably be conservative. As there is not a demonstrated figure namely for AF and as this figure would vary according to the route and other aspects, it is preferable to underestimate this parameter.

The results of the sensitivity analysis for the following values – 1.0, 1.1, 1.3 and 1.5 – are presented on *appendix G*.

The Gain has a linear behaviour within $\alpha \in [1.0; 1.2]$ at a rate of 0.1176 (*SkyTeam*) and of 0.008 (global) per 0.1 increase of α. For the other cases, the Gain growth per α decreases as α grows. The Incremental Revenue is linear in the whole interval (*SkyTeam*) and within $\beta \in [0.05; 0.2]$ (global) at a rate of 0.0928 and 0.0888 per 0.1 of α respectively. Lastly, incremental passengers results are also affected. The bigger α is, the bigger is the rise per 0.1 of α. For *SkyTeam* from 104.0/0.1 for $\Delta\alpha = -0.2$ until 109.7/0.1 for $\Delta\alpha = 0.3$. On the other hand, globally from 152.0/0.1 for $\Delta\alpha = -0.2$ until 161.0/0.1 for $\Delta\alpha = 0.3$.

4.2.2.2 β sensitivity analysis comments and results

β indicates how much the marketing incremental flights weight for the frequency analysis through the S-curve. If $\beta = 1$, it means that code-sharing a partners operating flight (AF marketing) has the same effect in AF market share than an incremental AF operating flight would have.

If $\beta = 0$, it means that code-sharing a specific partner operating flight has no influence in the market share. The β used in the model is 0,15 which means that 6.67 marketing flights have the same influence as 1 incremental AF operating flight for AF market share. If $\beta \rightarrow +\infty$, only the additional marketing flights influence the curve and AF operating flight will be worth nothing. If $\beta < 0$, marketing flights have a negative impact in the total of AF flight, meaning that each marketing flight decreases the importance of the AF operated flights. If $\beta = -\infty$, since there is one marketing flight, it is the same thing as an AF having less than zero flight. Negative β may have a practical value as long as the final *equivalent frequency* is not negative.

β	Frequency to consider for AF in the S-curve model
$-\infty$	$-\infty$ (not valid)
-1.0	#Opt - #Mkt
0.0	#Opt
0.5	#Opt + 0.5 * #Mkt
1.0	#Opt + #Mkt
$+\infty$	$+\infty$ (100%)

Table XXII – Influence of the value in the total AF frequency considered in the S-curve model
Legend: #Opt = number of operating flights, #Mkt = number of marketing flights

The results of the sensitivity analysis for the following values – 0.05, 0.1, 0.2 and 0.3 – are presented on *appendix G*.

The Gain has a linear behaviour around 0.0465 (*SkyTeam*) and 0.0302 (global) per 0.05 increase of β. The Incremental Revenue is linear in the whole interval (*SkyTeam*) and within $\beta \in [0.05; 0.2]$ (global) at a rate of 0.039 and 0.028 per 0.05 of β. Finally incremental passengers results are also affected. The bigger β is, the bigger is the increase per 0.05 of β. For *SkyTeam* from 58.5/0.05 for $\Delta\beta = -0.1$ until 55/0.05 for $\Delta\beta = 0.15$. On the other hand, globally from 69.0/0.05 for $\Delta\beta = -0.1$ until 66.7/0.05 for $\Delta\beta = 0.15$.

4.2.3 Sensitivity of the yield on the presence of the alliance, e

The elasticity of the yield by passenger with to without alliance means that the yield by passenger within alliance will be higher or lower than the yield by passenger without alliance depending if this elasticity is positive or negative. Studies have demonstrated that the overall yield decreases in the case of alliance. It also means, that within an alliance, an incremental passenger will be caught by this alliance with a lower yield than the recorder yield without alliance. This is to say that airline alliances help airlines filling their airplanes but not necessarily with higher fares.

Currently, e1 and e2 vary depending if this yield elasticity is applied to beyond our trunk routes, respectively. Actually, this elasticity is not valid for beyonds because the model analyses all beyonds of a given trunk and not each beyond route separately. Therefore, e1 = 0 and e2 ≠ 0. After some studies, e2 was fixed at -0.4 which is consistent to revenue forecast models used at AF.

If the model infers a traffic drop-off from the situation without alliance to the situation with alliance, the applied elasticity in this case is a distinct parameter, currently fixed to 0.

4.2.3.1 e2 sensitivity analysis comments and results

Changes are insignificant in terms of gain, incremental revenue and incremental passengers. This last one, does not even change if we vary e2, as expected. e2 is a pure yield (revenue) elasticity, so the traffic calculations are not affected. Despite being negligible, changes in the Gain and Incremental Revenue are linear within the tested interval [-0.2; -0.7]. The elasticity of the Gain is 0.034 (*SkyTeam*) and 0.030 (global) per 0.1 of e2. The variation of the Incremental Revenue is also linear at a rate of 0.017 (*SkyTeam*) and 0.014 (global) per 0.1 of e2.

4.3 *Alitalia SkyTeam*'s gain

This study was based on AF *SkyTeam* gain estimation for IATA 2007 which was presented before in section 4.1.1 *IATA 2007* and was made when AF bid for the purchase of *Alitalia* (AZ), competing against other airlines, namely *Lufthansa*. This study was carried out to show AZ's executives how AF and *SkyTeam* contribute to the airline (comparing to *Lufthansa* and *Star Alliance* which have no current link to AZ).

4.3.1 Methodology

Data for this study was searched in AF *Base Positionnement Concurrentiel* except for the AF *SkyTeam* gains by partner. That base, developed by the Economic Intelligence department, holds a chapter called *fréquences maîtres moyen-courrier concurrence*. Among other information, this chapter provides the number of flights, seats and available seats-kilometres (ASK) for all routes departing from or arriving in Europe and operated by no matter which airline. The three kind of data retrieved were used to calculate a ratio that affected differently the AF gain with a specific airline in order to estimate the Alitalia gain with this same airline. The ratio of AF and Alitalia gains with an airline were supposed to be the same as the ratio of AF and Alitalia in terms of flights, seats and ASK with that given airline. In order to ease the process, all flights between the home countries of both airlines were taken into consideration even if there may be cases when these airlines do not necessarily CS on some of these flights[56].

$$\text{Gain AZ} = \text{Gain AF} * \text{AZ/AF ratio} \tag{41}$$

[56] *SkyTeam* internal policy encourages members to set up code-sharing agreements within the alliance.

After some assumptions, it was considered that the overall gain from *SkyTeam* to Alitalia in IATA 2007 was of around 78 million €. Results of AF's model applied to Alitalia are presented in *appendix H*.

5. Empiric study: seat-blocks vs. free flow

The aim of this section is to define the characteristics of each different code-sharing format, summarising its advantages and disadvantages both from the operating and marketing points of view. Then some questions will be raised on how to choose a specific format of CS.

5.1 Concepts

CS agreements come in two types:

- ✈ seat-block (SB) – the aircraft's capacity is predefined between the operating airline (which actually operates the flight) and the marketing airline, which only sells the seats previously bought to the operating airline;
- ✈ free-flow (FF) – the aircraft's capacity is not shared out numerically in advance.

The settlement of a given CS is directly negotiated between the airlines. These agreements are only possible if both carriers have the traffic rights for the route. Traffic rights can be 'third country CS rights' or 'accorded rights by the governments' among others. The negotiation between the airlines includes the format of the CS, the in-flight service (catering, entertainment system…), the acceptance of animals on-board, etc.

Generally, the products and services served on board are those of the operating airline. It is also the operating airline that defines the rules that will be applicable to a given flight.

In terms of signage and information to the passengers, the logo and the flight number of the marketing airlines should be shown in the check-in except if the screens do not allow its display. All the flight numbers should be displayed in the flight allocated desks or the logo of all the companies code-sharing a specific flight in common check-in desks of the operating airline. Later when boarding starts, the same principle applies – the logo and the flight number of the marketing airlines should be shown except if the screens do not allow its display. At least the flight number must be indicated. In addition to this visual signage, mentioning the airlines that are code-sharing a specific flight is compulsory in the announcements.

Regarding irregularities[57], there is a general rule within code-sharing agreement. If the irregularity is only known within three hours before the departure of the flight, the operating airline is responsible for all passengers affected by the irregularity including all fees and costs (information, re-routing, lodging, etc.). Otherwise, when the irregularity is known before this stretch of time, then it is up to the marketing airlines to be in charge of its own passengers and everything related to the specific irregularity.

If the flight is overbooked, there are different procedures when it comes to searching for volunteers to postpone their trip. In case of FF code-sharing, if possible the research should be done among the operating airline passengers. Even if the volunteers end up being marketing airline passengers their treatment will follow the operating airline rules. On the other hand, within SB code-sharing, the research is made firstly among the airline that has overbooked its quota. The treatment to the passengers respects the rules of the airline that overbooked its block.

Afterwards, compensation, re-routing and all the expenses due to the refused passengers are not treated in the same way depending on the type of agreement. Within FF agreements, it is the operating airline that will deal with the passengers and pay everything related to the boarding refusal. On the other hand, in the case of SB agreements, the operating airline is responsible for the immediate actions regarding the passenger whose boarding was denied but then bills all these costs to the marketing airline.

---

[57] Basically, irregularities are delayed or cancelled flights.

The baggage is accepted according to the operating airline rules and the charges paid by the passenger for additional weight checked-in are defined by the same airline. Nevertheless, the maximum weight allowed in hold by passenger is specified by the marketing airline in the passenger ticket. No matter which kind of CS, the operating airline is in charge of opening the missing baggage files according to their own rules. After this, all problems with lost or damaged luggage are managed by the marketing airline following the process created by the operating airline. In other words, baggage tracing and potential passenger compensations are assured by the marketing airline. Some exceptions exist, as it is the case of *SkyTeam* airlines which decided to deal with all cases occurred in their own operated flights concerning any *SkyTeam* marketing passenger.

Code-sharing often includes connections between the beginning and the end of the trip. It is important to acknowledge that when a passenger misses its connection flight due to the late arrival of the previous flight, IATA established in its 766, § 18 resolution that the operating airline of the delayed flight should re-route the passenger to the final destination. Low-cost carriers for instance, are normally excluded from this rule because their flights cannot be issued as a continuation of another flight. IATA rule applies to tickets issued interline or online for flights that accept this kind of combined tickets. Most of the traditional airlines effectively do accept interline ticketing in order to help filling their flights.

5.1.1 Seat block

The SB is a way of allocating seats where the aircraft's capacity is shared between the operating airline (which actually operates the flight) and the marketing airline.

The marketing airline buys the seats from the operating airline. Each one therefore has its own block of seats allocated and controls and sells these on their own. Since these seats are identified on the cabin plan, they can even be used by passengers for online check-in. In the event of a reciprocal CS agreement, the partner airlines agree on an identical seat price for each class and/or a balanced exchange of seat volumes. There is one envelope for each company which keeps each one's entire revenue.

There are two forms of SB code-sharing:

- ✈ soft block, if there is a flexible block;
- ✈ hard block, if there is a fixed block.

The most common is the hard block, when the marketing airline buys a certain number of seats for a specific flight of the operating carrier. Both airlines manage their own blocks independently and each one of them keeps its own revenues.

Regarding the fare arrangement, in this kind of agreement, the airlines are highly interested in selling their seats at a coordinated price. But this understanding regarding fares and commercial measures is only authorised to those carriers which have received an *Anti-Trust Immunity (*ATI) or a *Self Assessment*, the first one applicable by the US Authorities and the second by the European Commission. The *Self Assessment* being a mere authorisation is less formal than the ATI. Within the *Self Assessment*, it is up to the airlines to analyse the competition themselves, to estimate the effects of the agreement on the specific markets and to propose remedies to compensate its 'authorised collusion'. Once the *European Commission* detects that the principles of the *Self Assessment* are not being respected the authorisation is automatically ceased. For all practical purposes, airlines can exchange information through their reservation systems and implement joint price strategies. For instance, *AF*, *Alitalia*, *CSA Czech Airlines* and *Delta* on the one hand, and *KLM* and *Northwest* on the other hand, obtained the ATI for the transatlantic routes in January 2001. On the other hand, in Germany, there is a rule that forbids all other airlines of price-beating *Lufthansa*. Therefore, any carrier should respect this rule when displaying their prices (which does not prevent other carrier from special arrangements under the table).

The price of each seat bought within a block is determined before the beginning of each season. However, and following section 2.3 *State of art of commercial air transport*, due to the recent oil prices and euro/dollar exchange rates, airlines' costs changed significantly during a single IATA season. Therefore, some airlines including AF are redefining their code-sharing contracts. For instance, with Air Europa, AF will establish from IATA Winter 2008 a new invoice formula, integrating in the seat price a standard and a variable price[58]. The latter will take into consideration the specific aircraft consumption per leg and per seat, the fuel price and the exchange rate (EUR/USD). Both the fuel price and the exchange rate will be considered as constant through a given month as invoices are monthly paid.

5.1.1.1 Soft Block

This form of CS predicts a high flexibility for the marketing airline which can actually, respecting the established minimum limits, return last minute no sold seats (D-3 for example). The airline with the soft block has then a guarantee that the allocated seats will be reserved to its passengers until the limit date before the flight. This type of agreement is signed normally when traffic rights are being discussed with a determined country that demands a certain number of seats for the national airline in the flight operated by the carrier which is asking for the traffic rights. This form of CS is not desired by the operating airlines, but it is accepted in order to get the authorisation to operate a determinate route. AF has this type of agreement with Air India and Saudi Arabian Airlines. In fact, there is no commitment from the marketing airline and on the other hand, the operating company can only officially market the seats which have not been sold by the marketing airline from the day the marketing airline returns their initially allocated seats. In practice, the management of the CS is not that difficult for the operating carrier, because the load factor of the allocated soft seat is followed up to date. In terms of the receipt, the marketing airline only pays the operating airline the seats which were sold, keeping the agreed percentage.

According to AF, this freedom is quite puzzling for the operating carrier which might be obliged to sell the stock of unsold seats and consequently disturbs the optimisation of the Revenue Management policy. Contrarily, it may overbook its block expecting that partner's block seats will be returned unsold last minute. If this is not the case, overbooked passengers will be those of the operating airline. According to Philippe Marguier, soft blocks are too complicated to manage compared to limited FF.

AF soft block agreements
✈Saudi Arabian Airlines (on CDG-Ryad AF operated flights) ✈China Southern behinds (while free-flow is not possible due to technical problems related to IT tests that will lead to a full free-flow agreement)

Table XXIII – List of the soft-block agreements signed by AF

5.1.1.2 Hard Block

The marketing airline buys a seat block from the operating airline. Both airlines fix the size of the blocks and the prices per seat in the CS agreement. When discussing about the price of the blocks, AF for instance, tends to privilege the exchange of seat blocks between the carriers, rather than paying for each seat in the blocks. Hence, block cost equilibrium is

---

[58] Example for Paris – Malaga [B1]:

$$\text{Seat Price} = 89▯ + 60\% * C * (F * E – 734▯) \qquad (42)$$

89▯ - Price negotiated on the route for S08
C – Aircraft consumption per leg and per seat (Ton)
F – Fuel price (USD/Ton) for the month considered
E – Exchange rate (EUR/USD) for the month considered
734▯ - Fuel price reference (EUR/Ton)

eased and price is less important. Notwithstanding, cancelled flights will lead to an invoice of the cancelled blocks. Each airline manages its own block independently fixing its prices freely, keeping its own revenue and dealing with the any overbooked passengers on its block.

AF hard block agreements (trunk routes)	
✈Aeroflot	✈Iran Air
✈Aeromexico	✈JAL
✈Air Calin	✈JAT Airways
✈Air Europa	✈Korean
✈Air India	✈Malev
✈Air Mauritius	✈Middle East Airlines
✈Air Seychelles	✈Royal Air Maroc
✈Austrian	✈TAROM
✈Bulgaria Air	✈Tunisair
✈China Eastern	✈Tunisair
✈China Southern	✈Ukraine International
✈Finnair	

Table XXIV – List of the hard-block agreements signed by AF

5.1.2 Free-flow

A FF agreement involves a seat allocation principle in which the aircraft's capacity is not shared out numerically in advance. The operating airline manages all the seats in its inventory, while the marketing airline sells a notional flight with its own reservation classes, and then assigns these on the basis of the operating airline's inventory as and when required. There is a single stock management policy and the capacity of the airplane is completely controlled by the operating airline. Thus, no marketing passenger may be refused to board. Actually, it is supposed that the marketing airline, which is not responsible for the inventory management, should not have to face the consequences of the overbooking policy adopted by the operating airline. This kind of single marketing and operating passengers' management compels airlines to build dynamic links between their systems. Hence, a FF CS can not be introduced overnight. All rules and conditions are those of the operating carrier and the marketing carrier books its seats under its own code by boning up the seat within the operating airline stocktaking. The marketing airline passes to the operating airline every demand of service upon the moment of the reservation. This info is not processed internally at the marketing airline except for specific cases when a technical bilateral agreement is signed on the matter.

This type of CS offers the advantage of serving routes that are currently relatively thin, but which have high growth potential, at minimal cost. It is a system that enables an airline to adjust live and with all necessary flexibility to expanding demand on a given route.

The institution of a FF CS implies different steps:

- ✈ Definition of a class mapping or class harmony (effort to match the level of the classes, the selling conditions and the service by class). Ideally, there should be a correspondence between classes that would provide the same revenue.
- ✈ Trial test lasting always more than 2 months where the IT systems are adapted. In addition, the time for programming these tests should be considered. This is a long and then costly step.

Regarding the revenue management, the operating carrier retains all the coupons and an invoice is sent to the marketing airline in function of the number of marketing coupons sold. Only one envelope exists which means that all the revenues are kept by the operating airline and the marketing airline will only get the commissions *a posteriori*. These are defined in the code-sharing contract and are described hereafter. In case of tickets that integrate two different operating carriers for a single trip, fares for each coupon are set by an SPA (Special Prorate Agreement). Generally, this applies to a carrier for the beyond and/or the trunk and another one for the trunk and/or the behind. SPAs are also (but not as commonly) applied to SB code-sharing.

Note, however, that code-sharing often integrates Special Prorate Agreement as well, in case of tickets that integrate two different operating carriers for a single trip. Fares for each coupon are then set by an Special Prorate Agreement. Special Prorate Agreements are quota agreements, which delineate the revenue sharing between the airlines. In the off-line version, Special Prorate Agreements also exist, as stated before, when there is just a simple pricing agreement. Contrarily, when Special Prorate Agreements are online for SB, FF or joint-venture contexts, the agreement is more complex as questions go beyond the simple pricing agreement. This derives from the responsibility of carrying the brand of each one of the airlines. This occurs due to the IATA marketing code.

There are two different FF modes:

- ✈ the FF with an invoicing based on the real fares cashed by the marketing airline and taking into account an adjusted weighted mileage principle. This applies to connecting itineraries and the revenue distribution is made according to the operated mileage by each carrier. The principle also calls other inputs such as the standard of living of each airline home country. Finally, the marketing airlines receives two commissions that allow them to finance its GDS costs, its advertising, its code costs and its frequent flyers miles:
    - ✈ the ISC (Interline Service Charge), which is a commission that was defined by IATA at a rate of 9%;
    - ✈ a SuperCommission, which namely enables the marketing airline to finance the accrued frequent flyer miles.
- ✈ the FF with an invoicing based on a fixed sum or on a percentage of a reference fare, both which are defined by passenger depending on the class of booking and on the route (or on group of routes to simplify). For instance, in this later case the agreement might suggest for a given class 60% of the reference fare X on the YYY-ZZZ route. Wherefore, the operating carrier is assured that if the reference fare increases, the revenue will evolve proportionally. Continental Airlines has a code-sharing agreement with AF with this kind of assumption.

AF free flow agreements		
Trunks, beyonds and behinds	Trunks only	Behinds and beyonds only
✈Alitalia	✈Luxair	✈Aeromexico
✈CSA Czech Airlines	✈Swiss	✈Continental
✈Delta		✈JAL
✈KLM	Beyonds only	✈TAM
✈Northwest	✈Finnair	
✈Qantas		Trunks and behinds only
✈Air Europa	Behinds only	✈Kenya Airways
	✈Alaska Airlines	
	✈Malev	
	✈Nationwide	

Table XXV – List of the free-flow agreements signed by AF

In the absence of fare and commercial harmonisation, as it happens between AF and all the Asian carriers, only the second mode is foreseen. Notwithstanding, even in these more protective conditions for the revenue by class, the FF agreement does not oblige the partners to establish a fare harmonisation and generates yield problems and commercial constraints between the two partners.

Software was created by AF which follows the loading of its airplanes and then evaluates the distribution of marketing and operating passengers on a specific flight.

In terms of the prices, the marketing airlines can set the prices they want, and they can even sell tickets at prices which are lower than the amount that will be demanded then by the operating airline. By default, prices are established by seat and booking class.

In the case of joint-ventures, the process is not exactly the same as the airlines keep what they cash and only at final check, there is an one-way transfer (see further section 5.1.4 *Joint Venture*).

5.1.2.1 Limited free-flow

Rarely, but still in some cases, FF is limited which means that one of the partners (normally a marketing partner) has its number of total seats in the flight limited to a certain number. Contrarily to soft-blocks this limit does not guarantee that this predefined number of seats will be available for this airline in case the other airlines have already sold the total of the available seats for that flight.

5.1.3 Advantages and disadvantages of seat-block and free flow agreements

In the table hereafter, the advantages and disadvantages of these two types of code-sharing are pointed out. This is an analysis from the AF point of view. All comments in this table take in consideration that AF is a reputable traditional airline with a well-know prestigious service for decades.

Agreement		Seat-block	Free flow
AF marketing only	Advantages	✈ Better revenue on the routes with low traffic and strong yield ✈ Ease in the management for the IT and Revenue Management department (large blocks) ✈ Enables the development of the route ✈ Brings in uplifting revenue[59] (as the AF block is processed as if it was an AF operated flight)	✈ Increase of the sales force through a better offer (new route or increase in the frequency) without any financial risk ✈ Concerning the beyonds, avoids taking the chance over too low traffic routes (namely behinds) ✈ Ease in terms of airport ground management ✈ Enables the generation of uplifting revenue[59] over the AF trunks from the beyond connections
	Disadvantages	✈ Holds an economic risk ✈ Impossible management of the small blocks by the Revenue Management department ✈ Lack of flexibility ✈ No control of the in-flight product	✈ Affects the negotiations with AF pilots trade unions ✈ Collection of the commissions (ISC and SuperCom) only ✈ Complexity of IT implementation ✈ Difficulty in defining the class mapping by the Revenue Management department ✈ Problems in following the flight data statistically ✈ Generates problems regarding the sizeable groups management ✈ Demands the partner trust

[59] revenue for passengers effectively carried, ie of passengers on the airline operating flights.

AF operating only	**Advantages**	✈ Assures a minimal revenue (from the sold blocks)	✈ Brings in uplifting revenue[59] ✈ Reinforces the sales force ✈ Ease in terms of airport ground management
	Disadvantages	✈ Decreases the revenue on high traffic routes	✈ Complexity of IT implementation ✈ Difficulty in defining the class mapping by the Revenue Management department ✈ Generates problems regarding the partner's sizeable groups management ✈ Demands the partner trust, namely with a Revenue Settlement Agreement[60]
Bilateral operation	**Advantages**	✈ Enables to test the partner before proceeding to a full FF agreement	✈ Reinforces the sales force ✈ Ease in terms of airport ground management
	Disadvantages	✈ Lack of flexibility	✈ Collection of the commissions (ISC and SuperCom) only ✈ Complexity of IT implementation ✈ Difficulty in defining the class mapping by the Revenue Management department ✈ Generates problems regarding the sizeable groups management ✈ Demands the respect of the fare levels and conditions by the sales forces ✈ Demands the partner trust ✈ Demands an efficient revenue management pricing at the partner reservation centre

Table XXVI – SB vs. FF: advantages and disadvantages

5.1.4 Joint venture

A joint venture (JV) is a strategic alliance where two or more parties, usually businesses, form a partnership to share markets, intellectual property, assets, knowledge, and, of course, profits. It consists of a common subsidiary owned by the two companies.

A JV differs from a merger in the sense that there is no transfer of ownership in the deal.

This partnership can happen between goliaths in the aviation industry. AF and *Delta Airlines* have this kind of a strategic alliance for all the flights between EU and the US. It can also occur between two small carriers that believe partnering will help them successfully fight their bigger competitors.

Airlines with identical products and services can also join forces to penetrate markets they would not or could not consider without investing tremendous resources. Furthermore, due to local regulations, some markets can only be penetrated via joint venturing with a local airline. This kind of alliance is possible either with or without code-sharing, even if a CS agreement is almost within the JV. Concerning the type of CS this can be SB or FF, even though it is more logical the FF principle within a JV. In the case of AF, JVs with SB agreements are still implemented for historical and strategic reasons.

In some cases, a large carrier can decide to form a JV with a smaller carrier in order to quickly acquire critical know-how, technology, or resources otherwise hard to obtain, even with plenty of cash at its disposal.

[60] For instance with DL, AF has a deal that determines the standard commission for the trunk plus 25 for the beyond.

The process of partnering is a well-known, time-tested principle. The critical aspect of a JV does not lie in the process itself but in its execution. It is necessary to join forces.

There is a legal agreement that carefully lists which party brings which assets (tangible and intangible) to the JV, as well as the objective of the strategic alliance.

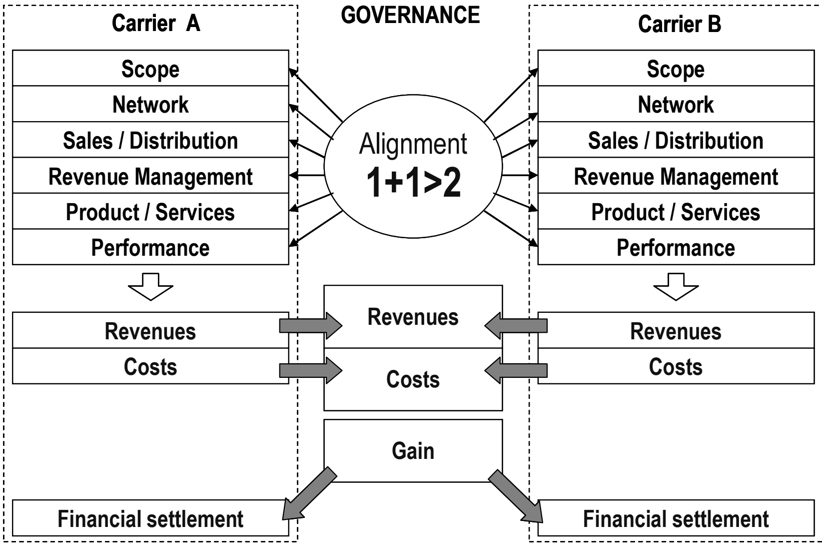


Figure XLI – Illustrative scheme of the JV governance

The decision for an airline to start up a JV involves addressing various elements such as:

- the airlines' target market;
- the competitors;
- the geographical areas that will remain beyond reach without local partners;
- the need to develop a know-how which has already been developed by the partner airline;
- the complementarities of the resources;
- the local legal regulations which can be bypassed by partnering with a local airline;
- the time and funds to implement the JV;
- how to manage the consequent workforce reduction;
- the airlines credibility;
- the strengths and weaknesses of both airlines, alone and together.

Although there are no official statistics on the rate of success of JVs *per se*, a few studies have been conducted in this field. Their main findings were that about 60% of JVs fail within five years. The reason pointed out by experts is that the key factor for this failure is the human factor, such as human resources integration and knowledge sharing, rather than geographical or financial factors.

Joint venturing in third world countries entails an even higher rate of failure. Lack of local legal knowledge, communication problems, divergence on agreed-upon objectives, differing deadline perceptions, etc., all contribute to this elevated rate. AF has a JV with *Air Seychelles* in the Paris Charles de Gaulle – Mahe route which has been at best only marginally profitable in recent years.

The performance of a JV can be measured through several formulas. It depends on the strategic alliance in the first place and its intentions[61].

If reducing competition has the sole objective of stabilising or reversing a slowing revenue growth, it is easy to demonstrate the positive impact a strategic alliance could have on such a goal.

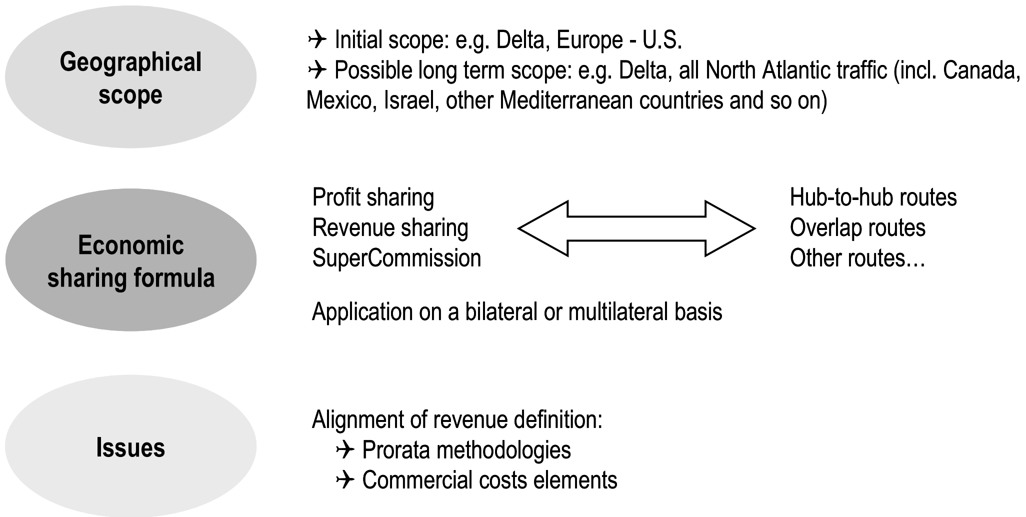


Figure XLII – Basic principles of ATI Financial Settlement

Information sharing will be vital, and it is essential that as early as possible, both airline teams talk and exchange their knowledge. This entails meetings, steering committees, joint company events, employee "swaps" and internal promotions. At present, one executive from *Delta Air Lines* has moved to the AF headquarters in Paris and the same has occurred on the opposite sense with one AF executive based at *Delta Air Lines* headquarters in Atlanta. Additionally, an AF pricer was shifted to Atlanta.

Because strategic alliances are built on trust and convergent goals, partners with different cultures risk failing. They might not trust certain ways of doing business or have divergent goals. Even with similar strategic goals, two partners who lack trust in each other might lack the willingness to reciprocate. When joint venturing, airlines must be prepared to give and take.

In joint-ventures, goals have to be convergent, otherwise sooner or later JV partners will wish to pull out of the deal. That is happening at the moment between AF and *Air Seychelles*.

A joint-venture concept is only effective when there is a true willingness to move forward together. Not even signed contracts have much value if mutual trust and acceptance of the terms are not present. It is actually better not to consider a joint-venture project if motives from either side are questioned by the other side. If this happens, a graceful exit before any legal obligation takes effect is desired in order to prevent an inevitable failure. The risks for any part involved in such an operation are therefore simple to evaluate, as partner might:

- ✈ waste time;

---

61 An airline may have the following intentions [A6]:

- ✈ to increase profits;
- ✈ to extend or maintain the market position;
- ✈ to improve distribution channels;
- ✈ to reduce the overall costs/economies of scale;
- ✈ to diversify its product offerings;
- ✈ to reduce competition;
- ✈ to spread the risk.

- lose money;
- let important technology go;
- gain nothing of significance in return;
- squander their business credibility;
- endanger their image;
- forego the opportunity for an alternative joint-venture with other potential candidates.

Even though these and other risks in joint-ventures are present, the rewards can far outweigh pitfalls. Indeed, it is important for the carriers to completely evaluate their risks.

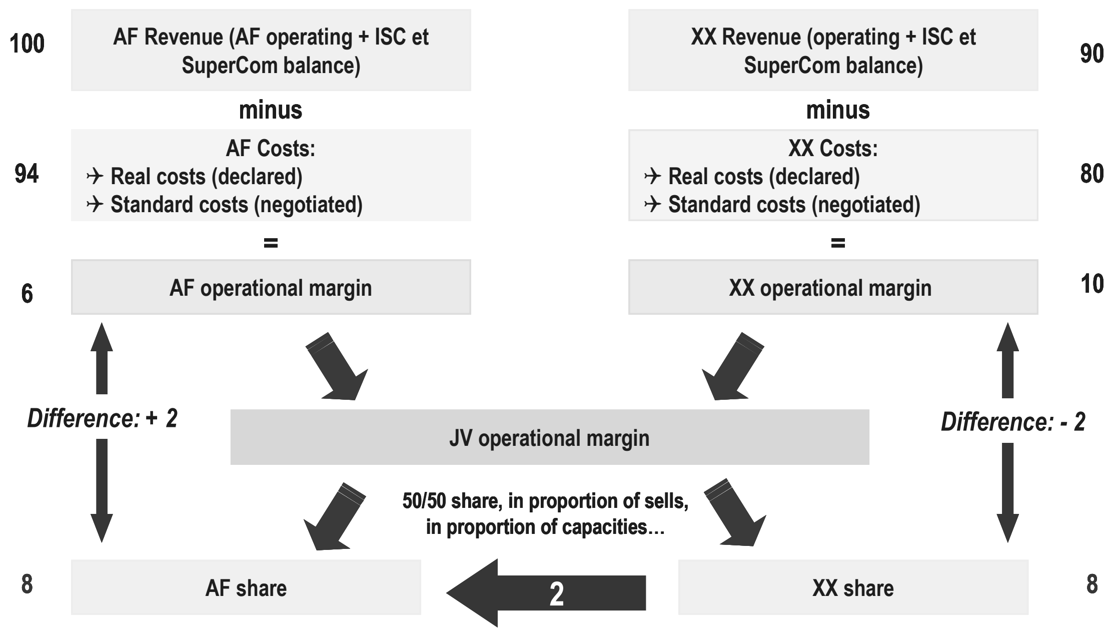


Figure XLIII - JV transfer example scheme. In this case, the transfer will be made from XX to AF.

The geographical locations of the partners and target markets involved dictate the degree of legal complexity regarding the joint-venture.

If both airlines operate in the same country, at least one document needs to be signed: a joint-venture agreement. There are always legal variances depending on the goals and scope of a joint-venture.

Joint-ventures	
AF ✈Air Mauritius (CDGMRU) - SB ✈Air Seychelles (CDGSEZ) - SB ✈Alitalia (CDGFCO, CDGLIN, CDGMXP) - FF ✈CSA Czech Airlines (CDGPRG) - FF ✈Delta ✈(CDGATL, CDGCVG, CDGJFK, CDGSLC, LHRATL, LHRLAX, LHRJFK, LYSJFK + all behinds and beyonds) - FF	AF (in study) ✈China Southern KL ✈Northwest (all North Atlantic routes including beyonds and behinds)

Table XXVII – List of the joint-ventures signed by AF-KLM

If airlines are from different countries – which is the most common – additional documents are needed. Also, in some countries where local market access is restricted, airlines have to go through a local "Validation" of their privileges and of the status of their joint-venture. AF – *KLM*, *Delta* and *Northwest* passed this process for North Atlantic flights. *British Airways*, *Iberia* and *American Airlines* on the one hand and *Lufthansa*, *swiss*, *United*, *Continental* and *Air Canada* on the other, are willing to the follow the *SkyTeam*'s novice first step.

Depending on what airlines want from their business and how fast they want to reach it, joining forces to create a more powerful presence in the market might be an attractive option.

5.1.5 Complementary summarised information

As analysed before, FF is particularly appropriate in the case of the beyonds while in the trunk routes both types (FF or SB) might be chosen for the CS agreement. There are even examples of agreements that differentiate the type of agreement by route such as the code-sharing agreement between *Air Europa* and AF.

Both SB and FF CSs might be separated into 3 other types of agreement (Meugnier):

- ✈ bilateral if CS is reciprocal;
- ✈ unilateral carrier A on a carrier B operating flight;
- ✈ unilateral carrier B on a carrier A operating flight.

All these examples were exhaustively described from an internal AF perspective in table XXIII.

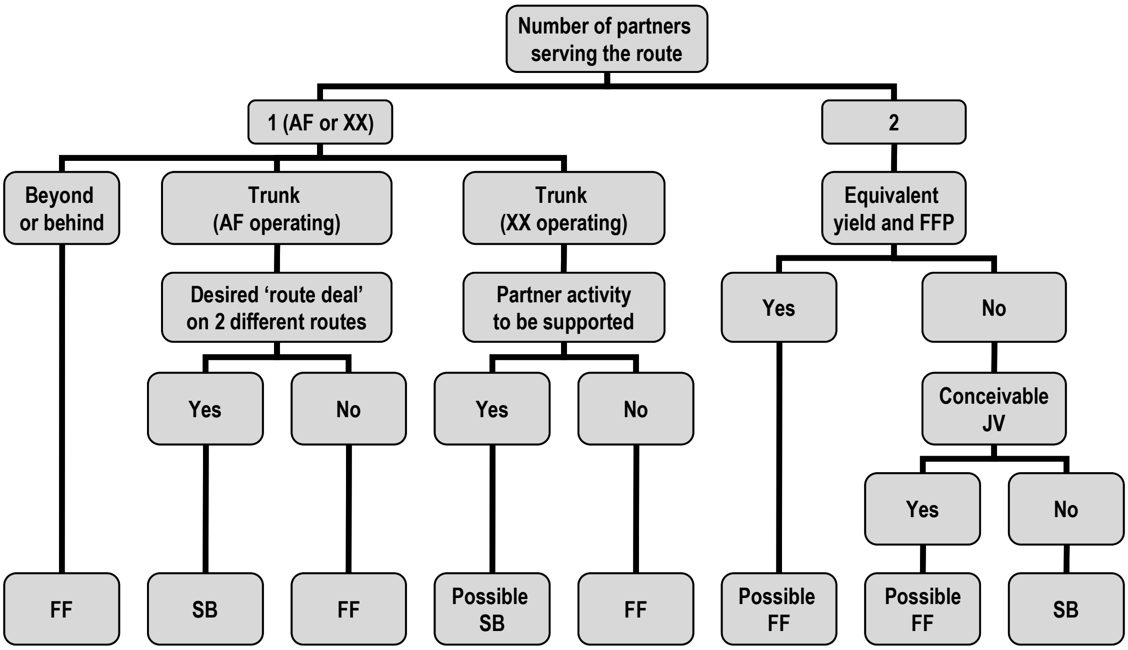


Figure XLIV – Indicative decision tree for code-sharing

5.2 Empiric study on SB vs. FF choice in different scenarios

Code-sharing on a specific route is not an easy decision. Neither is the choice of the type of CS. Some questions and remarks often help executive managers to make their decisions.

5.2.1 By market type

The SB CS represents a high economic risk, so unless the company is sure about its block load factor, FF CS is suggested.

5.2.2 Premium vs. discount destinations

Premium destinations are normally operated under FF and discount destinations under SB agreements. However, exceptions apply such as *JAL* (SB) or *Kenya Airways* (FF).

5.2.3 AF only operated vs. XX only operated vs. overlapping routes

If only one of the airlines operates, it is clear for the marketing airline that a FF agreement is the better option because it is the operating airline that manages the flight and the marketing airline is not sure about filling up its block. On overlapping routes there is no clear tendency for FF or SB even if FF is the most common.

5.2.4 Parallel vs. complementary operation

Code share agreements can be classified into two different types. Parallel operation takes place when two airlines, competing with each other sign a code-sharing agreement. This type of code-sharing has the potential of weakening the competition between carriers. The other type of operation is called complementary and involves facilitating interconnections of international and domestic routes operated by different carriers. In this latter case, the agreement enables each airline to issue a ticket on flights operated by any contracting carrier, thereby offering a service on local routes in the foreign country to be operated by the other airline. In parallel operations FF is widely chosen because both airlines often benefit from the reduction of competition to increase their fares. However, exceptions exist namely airlines which do not code-share the parallel routes such as TAM or Continental.

5.2.5 Beyonds vs. Trunks vs. Behinds

SB agreements are out of question for the marketing flights operated beyond the partner hub because the traffic is minor. The same applies on AF beyonds. AF once unsuccessfully experienced it in the Miami – Guatemala City route, and still has a soft bloc on China Southern behinds while a final free flow agreement is not signed.

5.2.6 Airlines similarities vs. differences

When both airlines have different commercial practices and fare policies (Frequent Flyer Programs, corporate incentives, passengers re-routing management…), SB code-sharing is highly recommended so that the access of the stock by the marketing airline is limited.

AF decided to have a SB CS with the Brazilian airline *TAM* because *TAM* upgrades very easily passengers from coach to first class. *TAM* also offers hard promotions to the corporate passengers, so AF has thought that a SB agreement would better protect its products.

5.2.7 Commercial Power: strong airlines vs. weak airlines

The commercial power of an airline in a specific route might be evaluated by its market share, its network, its size and its number of airplanes. If the partner is too powerful, it risks loading the whole airplane. In these cases a limited FF or a hard SB would be advised. For example, within the AF/*Delta Airlines* CS the local force has a visible impact – *Delta* is dominant on the Cincinnati – Paris and Boston – Paris routes while AF is prevailing in terms of tickets sold on Chicago – Paris. As these two airlines are into a global JV, they decided to keep FF all their CS agreements.

5.2.8 Airline attractiveness

Airlines tend to benefit from the partner's attractiveness. The most attractive the partner is, the most interesting it will be code-sharing with it. In this case, it would be important to have a FF CS. That is what happens namely in Brazil as AF attracts many passengers to *TAM* hubs in Rio de Janeiro and Sao Paolo that then continue through *TAM* operating flight to different points in Brazil and South America. *TAM* is particularly indulged by this traffic, because if AF passengers did not fly on *TAM* operated flights they would fly any other chosen partner.

5.2.9 Implementation timing

If there is a rush in the application of the CS, due to the whole dynamic structure that should be built to link the airlines, FF code-sharing is very unlikely.

5.2.10 Geographic regions

Agreements with Asian airlines, SB is constantly selected – *Air India*, *China Southern*, *China Eastern*, *JAL*, *Korean Air*. The same refers to North African airlines – *Royal Air Maroc*, *Tunisair*; Middle Eastern airlines – *Iran Air*, *Middle East Airlines*, *Saudi Arabian Airlines*; Eastern European airlines – *Bulgaria Air*, *JAT Airways*, *Malev*, *Austrian*, *Ukraine International*, *TAROM*, *Aeroflot*; Latin American airlines – *Aeromexico*; Indian Ocean and Pacific airlines – *Air Calin*, *Air Mauritius*, *Air Seychelles*. Additionally, Eastern European airlines establish SB agreement with a simple balanced exchange of seats when trunk routes are operated by both airlines (exception for *TAROM* and *Austrian*). On the other hand, flights to the US and Eastern Europe tend to be FF – *Alitalia*, *Delta*, *KLM*, *Northwest*, *Swiss*, *Luxair*.

5.2.11 SkyTeam

Despite the tendency of *SkyTeam* members to privilege FF agreements with other members, some exceptions apply such as *Aeromexico* or *China Southern*. Airlines which do not integrate *SkyTeam per se* do not follow any particular rule.

5.2.12 Ability to adjust to the demand

Global FF agreements clearly have the best adjustment to demand, mainly if these are reinforced by a joint-venture. FF agreements do not engage the marketing airline to a predefined number of seats.

5.2.13 Yield protection

In this field, hard SBs are the winners. Hard blocks are internally managed by each airline, and once the airline knows its block capacity, this is treated as an airplane of its own and the Revenue Management department is able to apply its yield policy without surprises. These may occur in case of global FF as the final capacity for each airline is not defined *a priori* which impedes an efficient management of the yield. This happens even in operated flights, as all the marketing airlines have access to the inventory and revenue management cannot be optimised. And this is even more serious if FF is established with a simple FF rather than a fixed priced FF as with a simple FF no control remains in each other revenue for seat. And regarding yield protection, joint-ventures do not particularly help either.

In addition to hard SBs, specific connecting-only FF is also yield protective. Connecting-only FF means that the trunks are not code-shared (*Continental* or *TAM*) and once again, they are treated like two big blocks for each airline, who fully dominate the revenue management for that given flight.

5.2.14 Hub feeding

In this case, FF is better because spill phenomenon occurs more easily in SB agreements. FF offer the flexibility to feed the hub with different routes and in terms of the trunk enables to distribute with the same flexibility the passengers for different destinations. JVs are a good complement to hub feeding.

5.2.15 Simplicity of implementation

As examined previously in table XXVI, SBs are employed much smoothly than FFs. Within FF agreements, those which have an easier application are connecting-only FFs. Following the argumentation in 5.1.4 *Joint venture*, it is important to know that joint-ventures are highly time-consuming and very laborious to implement as they imply many policies and principles harmonisations that may take months to achieve.

5.2.16 Frequency effect on trunk routes

No distinction really exists in this matter between SBs and global FF. They all increase the number of marketing flights on a given trunk route. Frequency effect are negligible however for connecting-only FF as the effect of the CS is merely online to channel passengers through code-shared behinds and beyonds.

5.2.17 Trunk vs. beyond vs. behind

Although trunk routes can be under two kinds of CS agreement (block-seat or free-flow), the beyonds and behinds are always under a free-flow agreement. There is only one exception at AF which is under a soft block agreement (see *3.1.1.1 Soft Block*) with China Southern for their behinds in Asia.

5.2.18 Financial neutrality

It is unmistakable in this field that joint-ventures are colossal assets. Due to the final financial settlement airlines have no reason to compete (this persists perhaps within simple code-sharing). When in a joint-venture agreement, airlines make an effort to increase revenues and reduce costs as both airlines will finally benefit from every synergy. This is not the case on elementary CS, neither SBs or FFs.

5.2.19 AF code-share economic gain model results

To carry out this analysis, results in appendix F were considered.

Generally, SB total gain (96 million €) is equivalent to the FF total gain (103 million €) but the average gain by airline is very different. AF gains more with each FF agreement (11.4 million €) than with SBs (4.6 million €). In terms of the incremental revenue the same comments apply – total SB, 223 million €; total FF, 193 million €; average SB, 10.6 million €; average FF, 21.4 million €.

Concerning the traffic, incremental passengers are approximately 2/3 from FF agreements (4,407 per day) and 1/3 from SBs (2,001 per day). Here, the average incremental amount of passengers is much more significant for FF agreements (489.7 per day) that SBs (95.3 per day).

Similar comments would fit AF CAM within the CS agreements – total FF, 3,292 million €; total SB, 2,212 million €; average FF, 366.2 million €; average SB, 105.3 million €.

A micro analysis would determine the most important partners according to the variable. Thus, the most relevant in terms of gain (*Delta*, *Middle East Airlines*, *Alitalia*, *Korean*) do not follow a constant FF/SB pattern. The same applies to the incremental revenue (*Delta*, *Alitalia*, *JAL*, *Korean*, *Air Mauritius*). In spite of this, the top 4 agreements regarding incremental passengers (*Alitalia*, *Delta*, *KLM*, *Finnair*, *CSA Czech Airlines*) are all FF except for *Finnair* which is easily understandable because FF agreements are much more flexible and almost always integrate code-sharing beyond the hubs which add all connecting passengers to this figure.

It is also relevant to assess the impact of JVs according to the model results. And the conclusion is unequivocal: JVs boost the average results of the model in all criteria. Only 5 joint-ventures produce a estimated gain of 83 million € (16.6 million € by agreement) and an incremental revenue of 183 million € (36.6 million € by agreement). Incremental passengers are also increased (3,426 per day) which mean an average of 685.2 incremental passengers by JV.

Below in table XXVIII, it is proven that joint-ventures double (SB) or quadruplicate (FF) on average the average gain, incremental revenue and incremental passengers within code-sharing.

	Gain (million €)	Incremental Revenue (million €)	Incremental passengers (per day)
SB without JV	4.2	9.5	88.2
SB within JV	8.0	21.5	162.5
FF without JV *(including KLM)*	4.6 *(6.0)*	6.4 *(8.8)*	73.4 *(217.7)*
FF within JV	22.3	46.6	1,033.7
KLM	13.0	21.0	939.0

Table XXVIII – Results in average for code-sharing within diverse contexts.

5.2.20 Comments

It is the weaker partner that takes the most from the alliance in the long-haul, route-specific case.

CS agreements are not always beneficial to a given airline. It should always be analysed and not immediately signed. When the airline offers more than 4 (medium-haul) flights, going *connecting-only* FF should be considered systematically, as the frequency effect is not that meaningful.

Soft-blocks are never desired by the operating company. They still exist only due to traffic rights and sovereignty matters.

Lately, the tendency is to have more and more FF agreements so that the exchanges between the airlines become simpler as there is only one stock management and therefore, this management costs are reduced. Nonetheless, to start a CS with a new airline when there is a lack of information about the other airline, when corporate cultures are very different or even just when IT tests are still going on for harmonisation, SB are the elected option. Additionally, if one of the airlines decides to try a dubious agreement, SB is highly recommended. This is due to the fact that once the agreement is unsure, in case something unexpected happens, it is much easier to withdraw from a SB agreement than a FF agreement.

Theoretically, JVs are always signed within a FF CS. Notwithstanding, AF has for a long time a JV with *Air Seychelles* and *Air Mauritius* with SB code-sharing. This is due to historical reasons, and AF is worried about substantial sales under *Air Seychelles* and *Air Mauritius* codes. In terms of revenue, there is nothing to be concerned because profits are shared 50/50. Yet, it is about the reduction of AF marketing tickets sold which will imply a progressive disappearance of the brand in those routes. It is commonly said within AF that BS JVs are quite illogical.

Another particular case is *Air Europa* which has some routes under SB and others under FF code-sharing. All flights operated by AF correspond to SB routes. Contrarily, *Air Europa* operating flights are either SB or FF. Paris CDG – Malaga, Paris Orly – Madrid, Paris Orly – Seville and Paris CDG – Valencia are SB routes and apparently the reason to have this route under this kind of agreement is historic. This is due to the fact that these routes were previously operated by AF and are now operated by *Air Europa*.

6. Conclusion and recommendations

6.1 Conclusion

This dissertation concludes on the relevance and the interest of the code-share for airlines and passengers, the future of alliances and code-sharing.

The air transport world has faced many shocks in the last years. After the traffic fall, accelerated by the 9/11 events, oil prices have risen to unbelievable values. Even if the air transport has resumed a significant growth since 2003 namely improving load factor, many airlines still encounter severe financial difficulties. This is not exclusive to the United States. Europe has already felt it and even in China – a market which is supposed to be in frank development – carriers have published fiscal deficits for quite a few years. In Western Europe, some carriers were bankrupted (*Sabena*, *Swissair*) and others are in an afflictive situation (*Alitalia, SAS, JAT Airways* and *Austrian*). Airlines are by definition fragile economic actors. The smaller and less experienced they are makes them even more sensitive to all kind of externalities. Hence, alliances and code-sharing are thought to be one of the solutions for airlines to better survive in this permanent austere context.

The risks of continuing a liberalised environment for competitive alliances and code-sharing still evolves in four different areas:

- ✈ through the dominance of the alliance in major hubs, especially in those whose slots are restricted, dispelling any other competitors;
- ✈ on medium and long-haul routes where alliances are transforming existing oligopolies into monopolies, potential competitors for these routes are naturally kept away;
- ✈ for time-sensitive passengers, when no competitor offers non-stop flights on the concerned routes;
- ✈ in case all competitors code-share, medium-term prices tend to increase due to the decrease of competition and therefore, the benefit of the consumer might disappear.

In the matter of the economic gains of CS, there is no doubt that overall both passengers and airlines get to a positive gain. There is a point of conversion, which has not been found, when these gains do not occur any longer. This is to say, that from a certain number of airlines which code-share, gains are marginal and can even be reduced. Imagine the case when all or too many airlines code-share on all or too many other airlines. CS implementation in these circumstances would be unworkable and in addition passengers would have no further gain.

Nevertheless, on point-to-point routes many cases have been documented concerning loss of competition and price rise derived from reduced competition. This reduction or elimination of competition in certain markets may affect the interests of customers. Likewise does the creation of dominant positions in other markets because of code-sharing and consecutive consolidation. This conclusion follows the opposition between parallel and complimentary networks within CS, according to the current available literature in general. It is obvious that CS reduces competitors and close markets, so they lead many times to situations where there is no stimulus to reduce price.

As benefits seem to be positive or negative depending on whether the allied airlines' networks are complimentary or parallel, it is important to assess the global stake of passengers in order to comment from their perspective, and there are little doubts within the current published studies that the overall gain is positive (even if some situations contest this generic conclusion namely when fares increase and social welfare diminishes). Philippe Marguier argues that for passengers it is generally positive in terms of network and fares. However, concerning competition, there is a loss that may affect prices in some routes. There is in fact a trade-off in these situations, because in itineraries already served by the two airlines this loss will occur but not necessarily if only one airline serves the itinerary or if the only one partner operates specific routes in this itinerary. This is because if both carriers already offer a given itinerary, through code-sharing they will become dominant and competition will reduce. On the other hand, if only one carrier offered the itinerary now with two airlines offering the same itinerary, in principle competition will increase. Note that similar to the previous case, if there are other airlines selling the route, CS airlines will together become dominant and prices may rise. Then, if none of the airlines previously offered the route, then competition tends to increase and prices fall. In this case, competition might decrease if there are no more airlines selling the same route, but prices will still fall.

Nowadays, consolidation and code-sharing are economically imposed to carriers mainly in times of crisis. Code-sharing creates more important turnovers and reduces costs. At the same time, most of the passengers perceive some benefits from code-sharing and airlines consolidation.

Code-sharing does not only searches economic gain. As seen, some CSes occur to mild political and legal restrictions in terms of traffic rights. Airlines partners have then access to destinations that in the absence of code-sharing would have remained inaccessible because of their considerable costs and regulatory constraints.

Besides, allied airlines normally take advantage of several functional analysis with co-locations for instance.

It is often the weaker partner that takes the most from the partnership. It does not mean that the stronger airlines do not profit from code-sharing but its gain is obviously lower. Exceptions occur namely when traffic rights are in discussion.

Stronger airlines go for it in order to reach new international markets that they cannot accede directly. Then, even if the gain is proportionally higher for the smaller airlines, the financial gain is proven according to AF code-sharing economic gain model. Additionally, CS is as a competitive advantage against other carriers.

All in all, code-sharing is generally, but not universally, positive for both for airlines and passengers. Within AF, for instance, there are CS agreements which are no successful and which made AF lose money. These are sometimes maintained for historical or traffic rights reasons. There are even odd situations as block-seat joint-ventures which exist between AF and both Air Seychelles and Air Mauritius. This is justified for lack of thrust in the revenue management of Air Seychelles and Air Mauritius, but even so, it is said that this format is weird.

Regulation authorities allow code-sharing to foster economic growth and stimulate competition. But their decisions are thoughtful and their control effective pre and post allowance for code-sharing.

Although there are elements that are probably anti-competitive within code-sharing partnerships, passengers enjoy clear benefits. If it was not the case, alliance partners would not claim such an expansion in traffic levels as a result of partnership consolidation. This means that despite some passengers who lost out, the majority of the passengers are better off.

Airline alliances in general are an important factor in airline development with members generating marketing and operational benefits. FFPs and integrated route networks are amongst the benefits evident to alliance customers. Airlines not flying particular routes can offer their customers extended network benefits through alliances. And difficult events such as September 11th and oil price rises and its consequences, accelerate rather than create trends towards consolidation

Summarised CS benefits
✈ high-frequency flights
✈ improved connection times
✈ offer of more destinations
✈ improved service levels on board and on the ground
✈ more attractive FFP
✈ access to more lounges

Table XXIX – Summarised CS benefits

These benefits are not always linear, so the analysis of code/sharing shall always rely on different questions: type of contract, geographic area, long/medium-haul, large or small airline and network.

Alliances are there to create value, not to share it. In the case of AF, this creation of value is carried out by the direct contribution of the CSs and the indirect effect of the complimentary agreements such as Frequent Flyer Programs, Special Prorate Agreements or even joint-ventures.

Regarding the future of alliances and code-sharing, *SkyTeam* for example searches one, two or three additional full members to fill the present voids namely in India, Latin America and South-Eastern Asia. Currently *Kingfisher, Jet Airways, Malaysian Airlines, Vietnam Airlines* and *GOL* group (now with *Varig*) have been contacted. AF in particular seeks regional agreements like the one signed with *Alaska Airlines* to continue its local CSes to channel its traffic. Apparently, negotiation is going on with *Bangkok Airways*. Other global alliances and major airlines follow the same pattern as the approaching of *TAM* to *Star Alliance* and the future join of *Air India* in the same alliance seem to confirm. In the time to come, there will be fewer realignements but alliances will compete for additional members. Key markets seem to be Latin America, India (Iatrou, 2006), Middle-East, Russia, China (Iatrou, 2006) and South-Eastern Asia.

Code-sharing will help AF reach its defined aims for this IATA year:

- a good performance of the yield;
- upkeep of premium classes reservations;
- a robust financial position;
- the most powerful combined network in Europe to attract business travellers;
- a balanced network for the airline not to be dependent on any area in particular;
- establishment of the 4 airline joint-venture (Air France, KLM, Delta and Northwest) on the transatlantic routes.

Indeed, in the future no European airline will be able to strengthen its position in the single European market with its 500 million consumers, with a single hub. All European airlines will have to learn how to organise themselves in multi-hub systems. AF/KLM already operates with Paris CDG and Amsterdam and *Lufthansa Group* is arranged with 3 hubs in Frankfurt, Munich and Zurich. These hubs will have a competitive advantage if they solidify a point-to-point base in addition to a connection platform.

The current patterns of consolidation will inevitably be followed due to all the synergies it brings in the mergers or the alliances in general. Mergers will be particularly true on an interregional level without destabilizing alliances, as mergers will proceed at a bilateral level while alliances will operate on a multilateral level (Iatrou, 2006). If alliances offer network and expansive growth, mergers promise efficiency. Consolidation will take different forms depending on the region. Alfred Oetsch, *Austrian* CEO, believes that airlines are not bought, it is its market that is bought. This trend to consolidation is also meant within low-cost airlines which tend to move towards a limited number of carriers (Van de Voorde). Thus, consequences are expected on the market structure and the market behaviours with a possible risk of market power abuse (Macário, 2007). The general dyadic moves will be for existent alliances to remain and if need and possible, they will seek mergers. This will probably induce a change in the balance of power within alliances (Iatrou, 2006).

Following this line of thought, airlines will be characterised by their highly complementary networks, their efficient network coordination with partners, their common Frequent Flyer Program and fare combination and some hubs with considerable development.

A final prediction concerns the air-rail intermodal transport in Europe. Within the liberalisation of rail transport and to better fight the train lobby and competition, airlines have shown a serious interest in purchasing trains to operate on their own. This is especially considered to substitute short-haul flights from their hubs. In European hubs several airlines already code-share on trains for connecting passengers. There is then the question of how long airlines will continue to be mere air transport operators and when they will become mobility agents.

6.2 Limitations of the AF code-sharing economic gain model

The definition of CAM in the Data WareHouse is quite complex and the model sometimes does not process these data correctly. Work will be done to simplify the CAM concept in order to make the model process simpler and more intuitive.

The model has been developed with VBA in Microsoft Excel. Hence, when the information imported from the Data WareHouse exceeds the 65,536 entries (Excel worksheet line limit). Any data beyond this limit is just not considered. The macro was changed to automatically delete all lines with no traffic, but this will not be enough when lines with traffic exceed Excel maximum number of lines.

Moreover, the Data WareHouse often sends fraudulent data which have to be corrected manually and if specific data is not sent by the partners, the model cannot fully process these airlines.

6.3 Recommendations for further research

Further research should be carried out about the limits of code-sharing. It is important to know if there is any evidence of the limit of code-share or that support a progressive decrease in the relevance of a new CS agreement when many other have already been signed. It would seem that the gain should be marginal for giant airlines with a code-sharing policy already with many airlines, but no evidence has been published. The same rationale applies to big alliances which will supposedly have marginal gains if they integrate a new member.

Even if some research have been made on the matter, it is also pertinent to know to what extent code-sharing benefits are still effective.

Further research on SB and FF is also recommended as this paper only focus an empiric study. It would interesting even to theoretically understand if there is a difference in prices and social welfare depending on the type of CS (SB vs. FF) and on the type of integration (analysing JVs in order to compare to new or already published results on full mergers).

In addition to these ideas, it would be important to continue monitoring the social welfare of code-sharing. This is due to the fact that alliances and code-sharing need to be constantly controlled although no major competition problem nor increase in price has currently been witnessed.

Concerning the model, it should be adapted to another application than Excel that enables a greater number of airlines, to accommodate future data with additional airlines which will increase the total number of entries.

After implementing the new concept of CAM in databases, the model has to be adapted to process these new data.

Finally, estimation of the yield without alliance should be refined so that the FF traffic contribution of the partner is substituted.

6.4 Aftermath of the internship

This internship at AF enabled me to discover a captivating professional environment within one of the leaders of global air transport. I had to understand and analyse in detail the principle of the existing CS model at AF which also allowed me to familiarise with different concepts of air transport economics.

Intellectually stimulating, the internship has enabled me to acquire skills in Excel, especially in programming Visual Basic language. I also learnt that the validity of the results of an estimation model has always its margin of error.

I had the opportunity to deepen my knowledge in air transport, in my very first professional experience.

Many were the standard professional issues and challenges that I had to face. For instance, the Data WareHouse suffers from a high number of users which slows down it process and sometimes it is even inoperable. Nevertheless, this experience also enriched my internship experience with a real perspective of the professional real world and atmosphere.

I also understand the value of models and how flexible and subjective models can normally be. It is indeed, experience that makes the difference.

7. References

Books

BERECHMAN, J., and DE WIT, J.. “On the future role of alliance”. In: GAUDRY, M. and MAYES, R. (eds.), *Taking Stock of Air Liberalization.* Boston: Kluwer Academic Publishers.

DOGANIS, Rigas. “Alliances: a response to uncertainty or an economic necessity?”. In DOGANIS, Rigas, *The Airline Business in the 21st Century*. Routledge, 2001

INMON, W.H. *Tech Topic: What is a Data Warehouse?*. Volume 1. Prism Solutions. 1995

LEE, Darin. *Competition Policy and Antitrust*. Advances in Airline Economics 1. Elsevier, 2006.

MOUTINHO, João. *Plano de Vôo.* Instituto Superior de Educação e Ciências. Lisbon, January 2006.

ORSONI-VAUTHEY, Valerie. *Happy About Joint Venturing – The 8 Critical Factors of Success*. Happy About. June 30th 2006.

Communications

AIR FRANCE, *AF/UX block seats agreement: proposed price mechanism.* June 2008.

AIR FRANCE, *Les alliances 2007.* Département des Alliances, 2007.

AYOUN, P.. *La politique environnementale du transport aérien : une approche intégrée.* Ecole Nationale de l’Aviation Civile, Toulouse, November 2007.

BISIGNANI, Giovanni. *State of Air Transport Industry*. 64th Annual General Meeting, IATA, June 2nd 2008.

COMMISSION OF THE EUROPEAN COMMUNITIES. *Communication from the Commission to the Council, the European Parliament, the European Economic and Social Committee and the Committee of the Regions – Reducing the Climate Change Impact of Aviation.* Brussels, September 27th 2005.

DB.IP. *Point sur les Alliances, Formules et Règlement Financier*. Air France, February 26th 2002.

FARINHA, Ricardo. *Modèle de Gain Économique des Code-Shares, VERSION IATA 2007 PROVISOIRE*. DB.IP - Études Économiques des Alliances, May 2008.

FORD, Eric. *Working with MIDT, ARC and BSP Data.* ACI-NA AIr Service Data & Planning Seminar, January 2008.

FRISCH, Anne. *Le Système de Management de la Sécurité de la Direction des Services de la Navigation Aérienne – Maturité, Atouts, Défis*. Direction Générale de l’Aviation Civile, November 2007.

GOURGEON, Pierre-Henri. *The hub model*. Air France-KLM.

HEIMLICH, John. *Coping With Sky-High Jet Fuel Prices*. Air Transport Association of America, May 22nd 2008.

IATROU, Kostas. *Airline choices for the future: From Alliances to Mergers.* Global Symposium on Air Transport Liberalization, ICAO Dubai, UAE, September 2006.

LAWLER, Jim. *ACARE’s Strategic Research Agenda 2*. Zurich. ACARE, October 5th 2006.

MEF. *Etude du Coefficient Online pour modèle d’alliance DB.IP*. PH.PF Air France, August 2003.

MEUGNIER, C.. *Code-share Free Flow – Quelques* principes. Air France.

PIALLOUX , Sebastien. *Code share – Support de discussion.* Air France.

PUFFER, Marcus. *Star Alliance – Network Facts & Figures.* Star Alliance, December 2007.

REITAN, Gunnar. *The impact of alliances on traffic patterns and the competitive climate.* Nordic Aviation Conference, Copenhagen, June 1999

SPINETTA, Jean-Cyril. *Résultats annuels, Groupe Air France 2007-08, Présentation au Cadres.* Air France, May 2006.

SOAMES, Trevor. *The Application of EU Competition Rules to Aviation and Alliances*. Norton Rose, Brussels, 1999.

STRAGIER, Joos. *Current issues arising with airline alliances – Panel discussion.* 11th Annual Conference, European Air Law Association, Lisbon, November 5th 1999.

VERDIER, Frédéric. *Les challenges d'une Majeur*. Toulouse. Air France KLM, November 2007.

Press Articles

BOEHMER, Jay. *Carriers Slash US Capacity* in Business Travel News, June 9th 2008.

BUYCK, Cathy. *European Consolidation continues; Lufthansa to take over Brussels Airlines* in ATW Daily News, September 16th 2008.

BUYCK, Cathy. *Private Lisbon company orders up to 105 aircraft, to serve 1,000 airports* in ATW Daily News, September 25th, 2008.

CHALMET, E.. *Interview Gordon Bethune* in La Tribune, April 16th 2008.

CHEONG, Choong Kong. *Alliance Realities* in Aerospace Journal, August 1998.

EZARD, Kerry. *Airline outlook differs by region* in Airline Business, July 21st 2008.

EZARD, Kerry. *Merger mania hits Spain* in Airline Business, July 24th 2008.

FRARY, Mark. *Continental plans United tie-up; will leave SkyTeam for Star Alliance* in Times, June 20th 2008.

G., F.. *Le modèle des compagnies américaines transformé* in La Tribune, April 16th 2008.

HILL, David. *Air France interest in Austrian Airlines hots up* in Austrian Times, August 22nd 2008.

IATROU, Kostas. *The impact of alliances on airline operations* in Daily Travel & Tourism Newsletter, August 7th 2008.

MAYNARD, M.. *Airlines face big cuts as merger hopes fade* in International Herald Tribune, May 30th 2008.

SCHELLING, Ron. *Jet Fuel – To Hedge or Not to Hedge?* in The Trader's Journal, February 2008.

TREVIDIA, Bruno. *Le terrible coup de vieux de la flotte aérienne américaine* in Les Echos, April 11th 2008.

Press Releases

AIR France, *Air France, the First European Airline to Operate the Airbus A380, is preparing the Arrival of the Superjumbo Aircraft*. Paris. June 2007

LUFTHANSA, *Lufthansa takes strategic equity share in Brussels Airlines.* Frankfurt. September 2008.

Reports

CAMBRIDGE ECONOMY POLICE ASSOCIATES LTD.. *Congestion charging.* Discussion Paper, Commission for Aviation Regulation (Ireland), February 2007.

CROZET, Yves. *Marchés et organisations dans le transport aérien : Entre consolidation des positions relatives et nouveaux défis.* Direction Générale d'Aviation Civile (France), 2006.

FARINHA, Ricardo. *Analyse Systémique : 'Les alliances aériennes – les raisons et les perspectives'*. Ecole Nationale des Ponts et Chaussées, Paris, December 2007.

MACÁRIO, R., MACKENZIE-WILLIAMS, P., MEERSMAN, H., MONTEIRO, F., REIS, V., SCHMIDT, H., VAN DE VOORDE, E. and VANELSLANDER, T. (2007). *The consequences of the growing European low-cost airline sector*. European Parliament, Brussels.

VAN DE VOORDE, Eddy. *The Future of Low-Cost Airlines and Airports.* Department of Transport and Regional Economics, Universiteit Antwerpen.

PONCE, Sebastian. *Gain Economique des Code-Shares – DOCUMENTATION*. Air France, Paris, January 2008.

Scientific publications

ARMANTIER, Olivier and RICHARD, Oliver. *Domestic Airline alliances and Consumer Welfare*. Working papers, Dept of Economics, SUNY Stony Brook and Simon School of Business, University of Rochester, 2003.

ARMANTIER, Olivier and RICHARD, Oliver. *Evidence on Pricing from the Continental Airlines and Northwest Airlines Code-Share Agreement*. Département de Sciences Economiques, Université de Montréal, 2005.

BAMBERGER, Gustavo E., CARLTON, Dennis W. and NEUMANN, Lynette R.. *An empirical investigation of the competitive effects of domestic airline alliances.* Journal of Law and Economics, 47(1):195-222, 2004.

BILOTKACH, Volodymyr. *Price competition between international airline alliances.* Journal of Transport Economics and Policy, 39(2):167-189, 2005.

BRESSON, Jean. *Prospective analysis of the Air Transport Industry: Global traffic and individual market-shares – Application to Air France-KLM strategy*. Airneth Workshop, October 28th 2005.

BRUECKNER, Jan K. and PELS, Eric. *European airline mergers, alliance consolidation and consumer welfare.* Journal of Air Transport Management, 11: 27-41, 2005.

BRUECKNER, Jan K.. *International Airfares in the Age of Alliances: The Effects of Codesharing and Antitrust Immunity.* Department of Economics and Institute of Government and Public Affairs, University of Illinois, June 2000.

BRUECKNER, Jan K.. *The economics of international codesharing: an analysis of airline alliances.* International Journal of Industrial Organization, 19(10):1475-1498, 2001.

BRUECKNER, Jan and WHALEN, W. Tom. *The price effect of international airline alliances*. Journal of Law and Economics, 43(2):503-545, 2000.

CZERNY, Achim I.. *Code-share and its effect on airline fares and welfare.* Workgroup for Infrastructure Policy, Technische Universität Berlin, 2006.

DU, Yan, STARR MCMULLEN, B. And KERKVLIET, Joe. *Assessing the Economic Impact of Domestic Airline Code-sharing: A Case study of the ATA and Southwest Airlines Agreement*. Oregon State University, January 2008.

FLORES-FILLOL, Ricardo and MONER-COLONQUES, Rafael. *Strategic effects of airline alliances*. Instituto Valenciano de Invetigaciones Economicas, S.A., June 2008.

GAYLE, Philip G.. *Airline Code-share Alliances and their Competitive Effects.* Journal of Law and Economics, September 8th, 2006.

GILLEN, David. *Demand Management: Options for Ensuring the Efficient Use of Scarce Airport Capacity.* Sauder School of Business, April 2007.

GIVONI, Moshe and RIETVELD, Piet. *Airlines' choice of aircraft size – implications and explanations*. Department of Spatial Economics, Vrije Universiteit, Amsterdam, February 1st 2006.

HASSIN, Orit and SHY, Oz. *Code-sharing agreements and interconnections in markets for international flights.* Review of International Economics, 12(3):337-352 2004.

IATROU, Kostas. *An Attempt to Measure the Traffic Impact of Airline Alliances*. Journal of Air Transportation, September 2005.

ITO, Harumi and LEE, Darin. *Domestic code-sharing practices in the US airline industry.* Journal of Air Transport Management, 11(2):89-97.

NEVO, A.. *Mergers with differentiated products: the case of ready-to-eat cereal industry.* Rand Journal of Economics, Vol. 31, No. 3, 395-421.

OUM, Tae Hoon, PARK, John-Hun and ZHANG, Anming. *The effects of airline codesharing agreements on firm conduct and international air fares.* Journal of Transport Economics and Policy, 30:187-202, 1996.

PARK, John-Hun. *The effects of airline alliances on markets and economic welfare.* Transportation Research, 33(3):181-195, 1997.

PARK, John-Hun and ZHANG, Anming. *An empirical analysis of global airline alliances: cases in North Atlantic markets.* Review of Industrial Organization, 16:367-383, 2000.

SWAN, Dr. William M.. *Spill Modeling for Airlines*. Boeing Marketing, September 1998.

THEISS, Stefan. *Support of the determination of the declared capacity by use of airside simulation for runway capacity analysis.* Department of Airport and Air Transportation Research, RWTH Aachen University, 2007.

WHALEN, W. Tom. *Constrained Contracting and Quasi-Mergers: Price Effects of Code Sharing and Antitrust Immunity in International Airline Alliances*. Economic Analysis Group, US Department of Justice, May 15th 2003.

ZHANG, Anming and ZHANG, Yimin. *Rivalry between strategic alliances.* International Journal of Industrial Organization, 24(2)287-301.

Web Sites

Air Fleets, http://www.airfleets.net/
Air France, http://www.airfrance.fr/
Air France Corporate, http://corporate.airfrance.com/
Airline Route Maps, http://www.airlineroutemaps.com/
American Airlines, http://www.aa.com/
Continental Airlines, http://www.continental.com/
Delta Air Lines, http://fr.delta.com/
Eric Wong's Photos, http://erwcw.smugmug.com/
European Union Information Website (EU and Europe), http://www.euroactiv.com/
Expansion Management, http://www.expansionmanagement.com/
Investopedia.com: Financial Dictionary, http://www.investopedia.com/dictionary/
International Air Transport Association, http://www.iataonline.com
KLM, http://www.klm.fr/
LoungeGuide.net, http://www.loungeguide.net/
Low Cost Carriers Terminal (Malaysia), http://lcct.airasia.com/terminal.htm
Lufthansa, http://www.lufthansa.fr/
Netjets Europe, http://www.netjetseurope.com/
oneworld, http://www.oneworld.com/
Operations Research: The Science of Better, http://www.scienceofbetter.org/can_do/testimonials.htm/
Scandinavian Airlines, http://www.flysas.com
SkyTeam, http://www.skyteam.com/
SkyTeam Fact Sheet August 2008, http://www.skyteam.com/EN/aboutSkyteam/doc/factSheet_aug08_EN.pdf
Star Alliance, http://www.star-alliance.com/
The Network Economy, www.network-economies.com/introduction.html
The Official Airline Flight Schedules, http://www.oag.com/
Tourism Futures International, http://www.tourismfuturesintl.com/
Thai Airways, http://www.thaiairways.com/
United Airlines, http://www.united.com/
Wikipedia, http://www.wikipedia.org/

8. Glossary

Alliance – generic name for different types of agreement between airlines: joint venture, seat-block, code-share, etc.

Available seat-kilometers (ASK) – total number of seats available for the transportation of paying passengers multiplied by the number of kilometers flown.

Beyond – flights in the hereafter of trunk lines (after or before).

CAM – *Chiffre d'Affaires Marketing* which means the revenue cashed from the sold seats by the airline (in Air France Code-sharing Economic Gain model, it is only applied to free flow agreements). Seats sold by a marketing airline, which are CAM for this airline, correspond to the CAT for the operating airline on the marketing airline sold seats.

CAT – *Chiffre d'Affaires au Transport* which is the revenue from all transported by the operating airline. In the Air France Code-sharing Economic Gain model, when processing seat-block agreements, the sold tickets are considered CAT for the airline whose block belongs to and not for the airline that effectively transports the passengers. Furthermore, as some paid tickets are never used for travel, this figure is posted with airport data and not sales data.

Catering – Food supply service for airplanes which follows demanding and restrictive practises due to the safety and security requirements and the passengers heterogeneity. Inflight catering involving the planning and preparation of meals and the assembly of meal trays designed to be served on board an aircraft.

Code-share – a sales agreement between two or more partner airlines which consists of selling the same physical flight (inevitably operating by only one of the airlines), each ally under its own brand or IATA code and each with its own flight number.

Data WareHouse – Data storing computer system which is particularly important to store data from the Global Distribution Systems that will later be used by the Revenue Management systems. This software is not exclusive of Air France.

Economy of density – arising when an airline increases the frequency of flights on a given route structure (as opposed to increasing the size the route structure holding fixed the flight frequency per route for economies of scale). Generally, economies wherein unit costs are lower in relation to population density. The higher the population density, the lower the likely costs of infrastructure required to provide a service. One example would be the costs associated with providing electricity networks to urban vs rural areas.

Economy of scale – increase in efficiency of production as the number of goods being produced increases. Typically, a company that achieves economies of scale lowers the average cost per unit through increased production since fixed costs are shared over an increased number of goods.

Economy of scope – is conceptually similar to economiy of scale. It is the process of reducing the cost of resources and skills for an individual business enterprise by spreading the use of these resources and skills over two or more enterprises. Whereas economies of scale primarily refer to efficiencies associated with supply-side changes, such as increasing or decreasing the scale of production, of a *single product type*, economies of scope refer to efficiencies primarily associated with demand-side changes, such as increasing or decreasing the scope of marketing and distribution, of *different types of products*. Economies of scope are one of the main reasons for such marketing strategies as product bundling, product lining, and family branding.

Fare combinability – system which offers csutomers on destinations served by both Air France and KLM to choose between an outbound trip via KLM's Amsterdam hub and inbound trip with Air France via Paris, or vice-versa, benefiting from the advantages of two half return tickets. With fare combinability, customers benefit from more frequencies fromeach of the hubs, on the inbound or outbound trip.

Free flow – this kind of agreement involves a seat allocation principle in which the aircraft capacity is not shared out numerically. The operating airline manages all the seats and its inventory, while the marketing airline(s) sell(s) a notional flight with its own reservation classes, and then assign(s) these on a basis of the operating airline inventory as and when required.

Frequent flyer agreement – unilateral or bilateral agreement that is used to extend the benefits of an airline frequent flyer programme to flights of a partner airline.

Frequent flyer programme – programme under which passengers can earn air miles and redeem them by reward tickets and other benefits.

Global Distribution System (GDS) – computer reservations system (CRS) used to store and retrieve information and conduct transactions related to air travel, booking and selling tickets for multiple airlines. Originally designed and operated by airlines, CRSes were later extended for the use of travel agents. There are currently four major GDS systems: Amadeus, Galileo, Sabre and Worldspan. These systems are the interface between the airlines and the travel agencies sharing automatic life information about many travel solutions with many details: date, time, price, fare conditions, availability, etc. Modern GDSes typically allow users to book hotel rooms and rental cars as well as airline tickets.

Handling – preparation of the aircraft, involving loading and unloading, as well as the associated logistics such as management and storage of hotel products and passenger assistance on the ground (check-in, ticket counters, airside services, baggage, aircraft cleaning, etc.).

Hub – Term used for a connecting platform where departures and arrivals are scheduled to minimize transfer times. Airlines use hub airports as a transfer point to get passengers to their intended destination. It is part of a hub and spoke model, where travelers moving between airports not served by direct flights change planes en-route to their destinations.

IATA Summer – one of the two yearly IATA seasons beginning in April and finishing in October which is defined for airlines scheduled flights.

IATA Winter – one of the two yearly IATA seasons beginning in November and finishing in March which is defined for airlines scheduled flights. (IATA Winter 2008 means the season from November 2008 until March 2009)

IATA year – starts in April and ends in March (IATA 2008 begins in April 2008 and finishes March 2009)

Commissions paid by one airline to another when it has made a sale on behalf of the other airline.

Interlining – coordinated and/or shared operation by two or more different airlines under voluntary commercial agreement between individual airlines to handle passengers traveling on itineraries that require multiple airlines. Some airlines do not have interlining agreements with some or any other airlines at all.

International Air Transport Association.(IATA) – created in 1945, IATA establishes regulations for the air transport industry and provides its members with a framework for the coordination and proper implementation of tariffs, together with commercial and financial support services.

Joint-venture (often abbreviated JV) – joint company is an entity formed between two or more parties to undertake economic activity together (normally two partners helding equally with 50% each). The parties agree to create a new entity by both contributing equity, and they then share in the revenues, expenses, and control of the enterprise. The venture can be for one specific project only, or a continuing business relationship. This type of shareholder structure notably allows the implementation of technological or industrial alliances in order to undertake specific projects common to both partner companies.

Load factor – the ratio of revenue passenger kilometres to available seat kilimetres of a particular operation (flight, route, alliance, etc.).

Long-haul flight – flights of more than 5 hours, normally linking different continents. In AF, all flights to and from countries beyond Europe and Northern Africa are long-haul flights.

Marketing airline – the airline that sells seats on the partner airline's aircraft under a code-share agreement.

Medium-haul flights – flights of between 2 and 5 hours, normally linking different countries in the same continent. In AF, all flights to and from European and North-African countries are medium-haul flights.

Network economy - economic and monetary system which facilitates and provides incentives to exchange goods, services and values between members of an alliance that understands and adheres to the goals and purposes of a specific commonly defined network.

Operating airline – the airline that actually operates the flight under a code-share agreement.

Open Sky – single air space or relationship between two air spaces where there are no entry restriction in the market.

Pricing – methodology and techniques to define prices.

RPK (Revenue Passenger Kilometres) – number of paying passengers which were transported multiplied by the number of kilometres flown. Revenue passenger kilometers are computed by multiplying the total number of paying passengers by the kilometers they have flown.

Seat block – seat blocking is a way of allocating seats when the aircraft capacity is shared between the operating and the marketing airline. The marketing airline buys the seats from the operating airline. Each therefore has its own block of seats allocated and manages and sells its block by itself. As these seats are identified in the seat plan, online check-in is allowed. In the event of reciprocal code-share agreement, the partner airlines agree to sell its blocks at an identical price per seat for each class or to exchange a balanced volume of seats.

Short-haul flights - flights of less than 2 hours, normally linking different cities in the same country. In AF, all flights to and from countries beyond Europe and Northern Africa are long-haul flights.

Slot – rights allocated to an entity by an airport or government agency granting the slot owner the right to schedule a landing or departure during a specific time period. Landing slots at some major airports are controlled by grandfather rights for airlines that were in place when these restrictions were added.

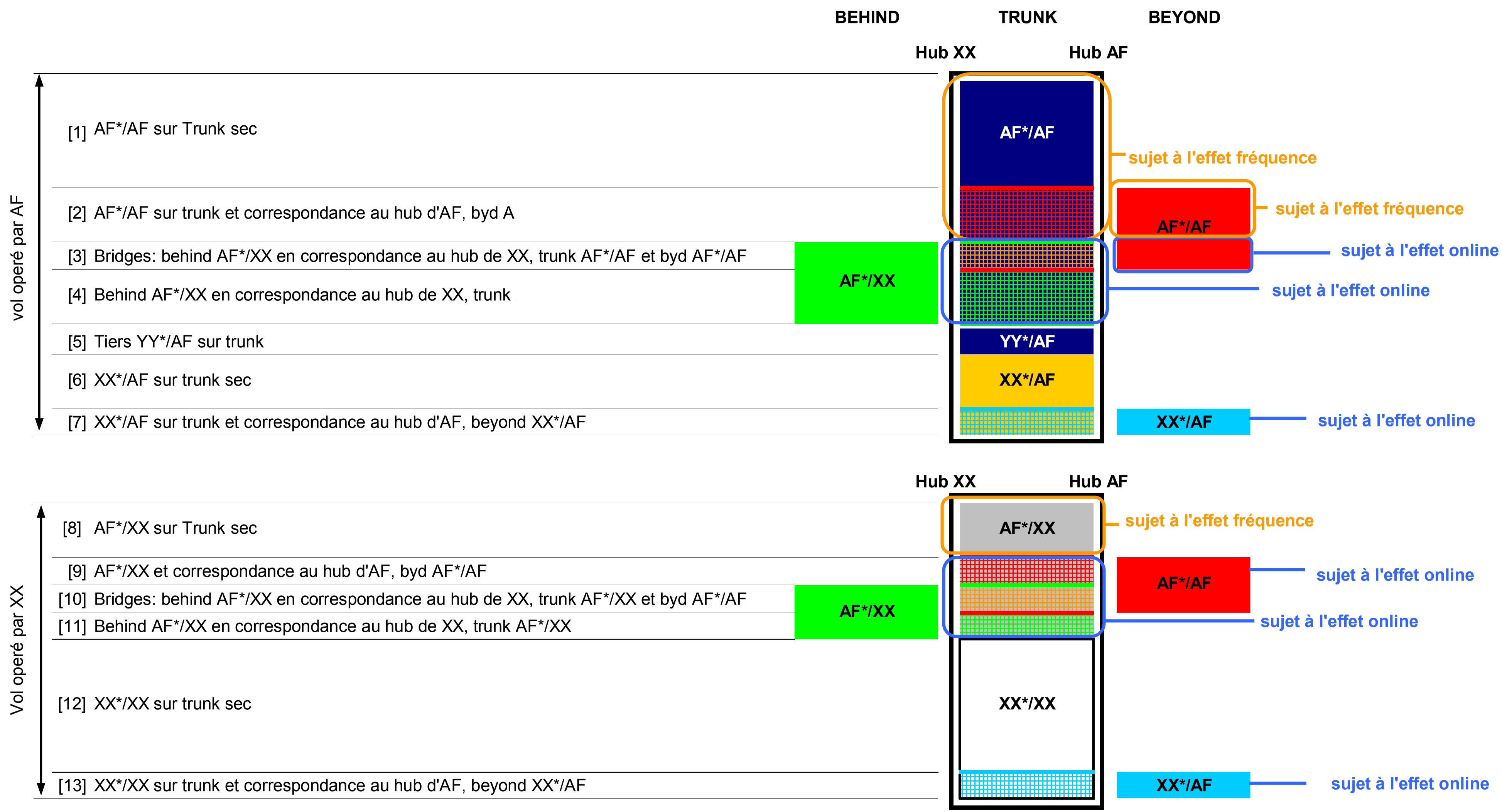
Trade off – situation that involves losing one quality or aspect of something in return for gaining another quality or aspect. It implies a decision to be made with full comprehension of both the upside and downside of a particular choice.

Trunk – routes between hubs.

Yield – revenue by each air ticket.

Yield management – also known as revenue management tries to understand, anticipate and influence the passenger behaviour in order to maximise revenue or profits from an airline. The challenge is to sell the right resources to the right customer at the right time for the right price.

A – Types of traffic



B – Air France code-share model VBA codes

File: Pilotage

Macro: ARABlocsRF

Nature of the work done: Creation

Code:

```
Sub ARABlocsRF()
' by Ricardo Farinha
' Macro enregistrée le 12/08/2008 par RF
' Macro modifiée le 13/08/2008 par RF
'
' Cette macro ouvre le document ARA envoyé par Patrick Castéra et copie les données
' nécessaires dans un onglet de 'PilotCalc'. Cet onglet va être utilisé plus tard
' par la macro 'Pilotage'

' Cette macro remplace la macro ARABlocs
'
==================================================================================
' Onglet             : ARABlocs
'
' Source des données : Patrick Casterà
'
' But                : Rapatriement de ARABlocs dans le Classeur et traitement de
'                      l'onglet 'ARABlocs'
'
' Commentaires       : Les données d''ARABlocs' donnent les ventes et les achats de
'                      Blocs Sièges par tronçon.
'
' Attention!         : Il faut demander la requête ARA pour la saison à étudier à
'                      Patrick Castéra et enregistrer ce document dans 'Requêtes-
'                      Extractions' sous 'ARA Achat et Vente Blocs.xls'.
'=================================================================================

Dim ligne As Integer
ligne = 2

' Avant démarrer la macro, l'utilisateur doit confirmer que la requête ARA envoyée
' par Patrick Castéra est enregistrée de la façon correcte
If MsgBox("Avant de faire tourner cette macro, il faut avoir la requête ARA pour la
saison à étudier." & vbCr & vbCr & _
"Demandez la à Patrick Castéra et enregistrez ce document dans 'Requêtes-
Extractions' sous 'ARA Achat et Vente Blocs.xls'." & vbCr & vbCr & _
"Est-ce que vous l'avez déjà fait ?", vbYesNo, "ATTENTION !") = vbNo Then Exit Sub

' Copie des données nécessaires de la requête ARA et organise les mêmes dans
' l'onglet ARABlocs
Sheets("ARABlocs").Select
Range("A1").Activate

'Efface toutes les lignes
Rows("2:65536").Select
Range("A65536").Activate
Selection.Clear

'Insère les titres des colonnes
Range("A1").Select
ActiveCell.FormulaR1C1 = "Tronçon"
Range("B1").Select
ActiveCell.FormulaR1C1 = "Ventes Blocs"
Range("C1").Select
ActiveCell.FormulaR1C1 = "Achats Blocs"

'Efface toutes les colonnes
Columns("D:IV").Select
```

```
Selection.Clear

'Ouvre le document envoyé par Patrick Castéra: "ARA Achat et Vente Blocs.xls"
locpath = ActiveWorkbook.Path
Classeur = ActiveWorkbook.Name
Workbooks.Open Filename:=locpath & "\Requêtes-Extractions\" & "ARA Achat et Vente
Blocs.xls"
Windows("ARA Achat et Vente Blocs.xls").Activate

'Copie les colonnes nécessaires au modèle
Range("G18:G65536").Select
Application.CutCopyMode = False
Selection.Copy
Windows("Pilotage.xls").Activate
Range("A2").Select
ActiveSheet.Paste
Range("B2").Select
Windows("ARA Achat et Vente Blocs.xls").Activate
Range("I18:I65536").Select
Application.CutCopyMode = False
Selection.Copy
Windows("Pilotage.xls").Activate
ActiveSheet.Paste
Windows("ARA Achat et Vente Blocs.xls").Activate
Range("J18:J65536").Select
Application.CutCopyMode = False
Selection.Copy
Windows("Pilotage.xls").Activate
Range("C2").Select
ActiveSheet.Paste
Windows("ARA Achat et Vente Blocs.xls").Close
Windows("Pilotage.xls").Activate

' cette fonction 'while' permets de mettre les tronçons dans le format utilisé par
' le modèle. Les tronçons dans la requête commencent toujours par l'aéroport
' français et dans le modèle les tronçons sont définis par ordre alphabétique,
' indépendamment du pays des aéroports.
While (Not IsEmpty(ActiveSheet.Cells(ligne, 1)))
        If (Right(Cells(ligne, 1), 3) < Left(Cells(ligne, 1), 3)) Then
            ActiveSheet.Cells(ligne, 1) = Right(Cells(ligne, 1), 3) &
Left(Cells(ligne, 1), 3)
        Else
            Cells(ligne, 1) = Cells(ligne, 1)
        End If

        ligne = ligne + 1
Wend

'Mis en page de l'onglet ARABlocs
Range("A1:A2").Select
Columns("A:A").EntireColumn.AutoFit
Columns("B:B").EntireColumn.AutoFit
Columns("C:C").EntireColumn.AutoFit
Range("A1:C1").Select
Range("C1").Activate
With Selection.Interior
     .ColorIndex = 46
     .Pattern = xlSolid
End With
Selection.Interior.ColorIndex = 3
Selection.Font.ColorIndex = 2
Selection.Font.Bold = True
With Selection
     .HorizontalAlignment = xlCenter
     .VerticalAlignment = xlBottom
     .WrapText = False
     .Orientation = 0
     .AddIndent = False
```

```
        .IndentLevel = 0
        .ShrinkToFit = False
        .ReadingOrder = xlContext
        .MergeCells = False
    End With
    Columns("A:A").EntireColumn.AutoFit
    Columns("B:B").EntireColumn.AutoFit
    Columns("C:C").EntireColumn.AutoFit

    With Selection.Font
        .Name = "Arial"
        .Size = 11
        .Strikethrough = False
        .Superscript = False
        .Subscript = False
        .OutlineFont = False
        .Shadow = False
        .Underline = xlUnderlineStyleNone
        .ColorIndex = 2
    End With
    Range("D11").Select
    Sheets("Macros").Select

End Sub
```

<u>File</u>: Pilotage

<u>Macro</u>: Pilotage

<u>Nature of the work done</u>: Correction + Modification

<u>Code</u>:

```
Sub Pilotage()
'by Nicolas Imhof & Sebastian Ponce & Ricardo Farinha from Philippe 'Marguier

' Ricardo Farinha 18/Jul/2008 --> Correction du calcul de la capacité pour les
'                                 partenaires qui ont de vols non CS sur une ligne
'                                 donnée.
' Ricardo Farinha 13/Aug/2008 --> Adaptation des formules pour 'Montants Ventes
'                                 Blocs' et 'Montants Achats Blocs'
' ===========================================================================
'
' Onglet : PiloteCalc
'
' But    : Faire le bilan de tous les chiffres de tous les partenaires d'AF
'          qui partagent code soit sur le trunk, soit sur un (des) beyonds ou dans
'         les deux cas, nécessaires pour le modèle de gain de Code Shares.
'
===========================================================================

(…)

'Capacité moyenne par avion du partenaire opérant pour la ligne en question on
'considere aussi les vols non CS de la façon suivante
            'Capa par vol AF = (tous les sieges op AF)/(tous les vols op AF)
            'If Sheets("Data TraficTrunk").Cells(wi, 1) <> "AF" Then

            ' Ricardo Farinha 18/Jul/2008 --> Correction du calcul de la capacité
            '                                 pour les partenaires qui ont des vols
            '                                 non CS sur une ligne donnée
            If (Sheets("PiloteCalc").Cells(wD, 6) = "O") Then
            Worksheets("PiloteCalc").Cells(wD, 13).FormulaR1C1 = _
                "=(SUMIF(RoutesCS!C[9],RC[-12]&RC[-8]&""-""&RC[-
7],RoutesCS!C[3])+RC[-2])/(SUMIF(RoutesCS!C[9],RC[-12]&RC[-8]&""-""&RC[-
7],RoutesCS!C[5])+RC[-4]*Macros!R24C3*2)"
```

```
            Else
            Worksheets("PiloteCalc").Cells(wD, 13).FormulaR1C1 = _
                "=(SUMIF(RoutesCS!C[9],RC[-12]&RC[-8]&""-""&RC[-
7],RoutesCS!C[3])+RC[-2])/(SUMIF(RoutesCS!C[9],RC[-12]&RC[-8]&""-""&RC[-
7],RoutesCS!C[5]))"
            End If
            'End If
```

(…)

```
            'Montants ventes blocs
            Worksheets("PiloteCalc").Cells(wD, 18).FormulaR1C1 = _
                "=IF(AND(RC[-11]=""B"",RC[-12]=""O""),SUMIF(ARABlocs!C[-17],RC[-
13],ARABlocs!C[-16]),"""")"
                ' modifié suite au changement de la macro ARABlocs --> ARABlocsRF
by RF 13/Aug/2008
                '"=IF(AND(RC[-9]=""B"",RC[-10]=""O""),SUMIF(ARABlocs!C[-15],RC[-
11],ARABlocs!C[-8]),"""")"

            'Montants achats blocs
            Worksheets("PiloteCalc").Cells(wD, 19).FormulaR1C1 = _
                "=IF(AND(RC[-12]=""B"",RC[-13]=""M""),SUMIF(ARABlocs!C[-18],RC[-
14],ARABlocs!C[-16]),"""")"
                ' modifié suite au changement de la macro ARABlocs --> ARABlocsRF
by RF 13/Aug/2008
                '"=IF(AND(RC[-10]=""B"",RC[-11]=""M""),SUMIF(ARABlocs!C[-16],RC[-
12],ARABlocs!C[-2]),"""")"
```

(…)

<u>File</u>: Gain de Code-Share

<u>Macros</u>: TableauGlobal & TableauGlobalLCMC

<u>Nature of the work done</u>: Addition + Correction

<u>Code</u>:

```
Sub TableauGlobal()
' by Sebastián Ponce & Ricardo Farinha
' Dernière actualisation: 20 novembre 2007 (SP) 13 mai 2008 + 12 août 2008 (RF)
' 12 août 2008 - correction de l'ortographe des notes de bas de page
'
==================================================================================
' Onglet : "GLOBAL"
' But    : Bilan du Gain par Cie
' Inputs : "Gain Trunks", "Gain Byds" et "CA et TMC"
'
'
==================================================================================
```

(…)

```
Cells(wi, 4).Select
    ActiveCell.FormulaR1C1 = _
        "Code-Share seulement. Non compris gains dûs à la combinabilité tarifaire,
aux synergies programme, etc" 'RF: dues --> dûs; sinergie --> synergie
```

(…)

```
Cells(wi + 1, 4).Select
    ActiveCell.FormulaR1C1 = _
        "Pax incrémentaux par sens et par jour sur trunks, y compris les pax
incrémentaux AF*/XX (pas de CAT AF en Free Flow)" 'RF: sense --> sens
```

(…)

```
' Définitions de la zone d'impression
' Macro enregistrée le 13/05/2008 par RF
    ActiveWindow.SmallScroll Down:=-36
    Range("A1:N50").Select
    Range("N1").Activate
    ActiveSheet.PageSetup.PrintArea = "$A$1:$N$50"


End Sub
```

File: Gain de Code-Share

Macro: SchemaParRoute

Nature of the work done: Correction + Modification

Code:

```
Sub SchemaParRoute()
' by Sebastián Ponce & Ricardo Farinha
' Dernière actualisation: 20 novembre 2007
' Dernière correction RF
'
====================================================================================
'
' Onglet : "schema cas BS" et "schema cas FF"
' But    : Détail en schèma du traitement de données pour un trunk
'
====================================================================================

'on demande la cie associée au trunk à étudier
cie = InputBox("Code IATA de la cie à étudier", "Cie", "DL") '"nom" --> "code iata"
(by RF)
If Not cie = "" Then

'on demande le trunk à étudier
trunk = Application.InputBox("Trunk à étudier (codes IATA par ordre alphabétique)",
"Apt1Apt2", "ATLCDG") '(par ordre alphabetique) (by RF)
If Not trunk = 0 Then

'on cherche le trunk dans "Detail Trafic Trunk", si on ne le trouve pas envoie un
'message d'erreur
With Worksheets("Detail Trafic Trunk").Range("T:T") 'Y:Y changé par T:T (by RF)
    Set k = .Find(cie & "-" & trunk, LookIn:=xlValues)
        If Not k Is Nothing Then
            OouM = Sheets("Detail Trafic Trunk").Cells(k.Row, 3)
            BouF = Sheets("Detail Trafic Trunk").Cells(k.Row, 4)
            continuer = True
        Else
        erreur = MsgBox("Le trunk " & trunk & " n'est pas trouvé dans les trunks
associés à " & cie & vbCrLf & "Veuillez recommencer", VbExcalamation, "Erreur")
        continuer = False

        End If
End With

(…)
```

File: Gain de Code-Share

Macro: ClasseurParCie

Nature of the work done: Correction + Modification

Code:

```
Sub ClasseurParCie()
' by Sebastián Ponce
' Updated Ricardo Farinha (June 16th 2008)
'Corrected Ricardo Farinha (August 26th 2008) after the separation of the ISC
'values in the 'Paramètres' sheet
' Dernière actualisation: 27 août 2008
'
==================================================================================
' But    : Création des fichiers de Code Share par Cie
'
==================================================================================
' Mode d'emploi:
'       Pour chaque ligne dans "Detail Trafic Trunk":
'       - S'il n'existe pas un classeur avec le nom du code de la cie
'        (ex: DL pour DeltaAirlines) on crée un fichier à partir de la maquette
'         "CSparCie.xls"
==================================================================================

(…)

Sub AvecAlliance(wi As Integer)
Dim deja As Boolean

==================================================================================
' Onglet : "Avec Alliance"
' But    : Reconstitue le constaté en CS par trunk route pour la cie associée
==================================================================================

(…)

Sub Bilan(cie As String)
classeur = ActiveWorkbook.Name

'on prend les données depuis Gain de Code Share
classeurcie = cie & ".xls"
datedebut = Sheets("Paramètres").Cells(23, 2) 'RF 26 août (20, 2) --> (23,2)
datefin = Sheets("Paramètres").Cells(23, 3) 'RF 26 août (20, 3) --> (23,3)

(…)

Function FormulesBilan(classeur)
'Période
    Range("D5").Select
    ActiveCell.FormulaR1C1 = "='[" & classeur & "]Paramètres'!R[-3]C[19]" 'RF 26
août C[17] --> C[19]
    Range("D6").Select
    ActiveCell.FormulaR1C1 = "='[" & classeur & "]Paramètres'!R[-3]C[19]" 'RF 26
août C[17] --> C[19]

(…)

'COMMENTAIRES
    Range("A48").Select
    ActiveCell.FormulaR1C1 = _
        "="" Coûts liés au recette = ""&SUMIF('[" & classeur & "]Paramètres'!C3,R[-
46]C,'[" & classeur & "]Paramètres'!C23)*100&"" %""" 'RF 27 août 2008: C21 --> C23
    Range("A49").Select
    ActiveCell.FormulaR1C1 = _
        "="" Coûts liés au trafic du trunk = ""&SUMIF('[" & classeur &
"]Paramètres'!C3,R[-47]C,'[" & classeur & "]Paramètres'!C24)*100&"" %""" 'RF 27
août 2008: C22 --> C24
```

```
    Range("A50").Select
    ActiveCell.FormulaR1C1 = _
        "="" Coûts liés au trafic des beyonds = ""&SUMIF('[" & classeur &
"]Paramètres'!C3,R[-48]C,'[" & classeur & "]Paramètres'!C25)*100&"" %""" 'RF 27
août 2008: C23 --> C25
    Range("A51").Select
    ActiveCell.FormulaR1C1 = _
        "="" ISC et Supercom payée trunk = ""&SUMIF('[" & classeur &
"]Paramètres'!C3,R[-49]C,'[" & classeur & "]Paramètres'!C17)*100&"" %""" 'RF 27
août 2008: suite au changement dans l'onglet 'Paramètres'
    Range("A52").Select
    ActiveCell.FormulaR1C1 = _
        "="" ISC et Supercom reçue trunk = ""&SUMIF('[" & classeur &
"]Paramètres'!C3,R[-49]C,'[" & classeur & "]Paramètres'!C18)*100&"" %""" 'RF 27
août 2008: suite au changement dans l'onglet 'Paramètres'
    Range("A53").Select
    ActiveCell.FormulaR1C1 = _
        "="" ISC et Supercom payée beyond = ""&SUMIF('[" & classeur &
"]Paramètres'!C3,R[-50]C,'[" & classeur & "]Paramètres'!C19)*100&"" %""" 'RF 27
août 2008: suite au changement dans l'onglet 'Paramètres'
    Range("A53").Select
    ActiveCell.FormulaR1C1 = _
        "="" ISC et Supercom reçue behind = ""&SUMIF('[" & classeur &
"]Paramètres'!C3,R[-50]C,'[" & classeur & "]Paramètres'!C19)*100&"" %""" 'RF 27
août 2008: suite au changement dans l'onglet 'Paramètres'
    Range("A53").Select

End Function

(…)

Function FormulesAvecAlliance(classeur)

(…)

'Flux financiers
'La colonne de l'onglet paramètres était pas la bonne, alors on l'a changée et
maintenant c'est bien la colonne R. --> by RF 16 June 2008
    Range("Q8").Select
    ActiveCell.FormulaR1C1 = _
        "=SUMIF('[" & classeur & "]Paramètres'!C[-14],R4C4,'[" & classeur &
"]Paramètres'!C[3])*SUMIF('[" & classeur & "]PiloteCalc'!C[-15],R4C4&""-""&R[-3]C[-
16]&""-O"",'[" & classeur & "]PiloteCalc'!C[F14])/1000000" 'RF 26 août: C[1] -->
C[3]

    Range("R5").Select
    ActiveCell.FormulaR1C1 = _
        "=IF(RC[-15]=""B"",-SUMIF('[" & classeur & "]PiloteCalc'!C[-16],R4C4&""-
""&RC[-17]&""-M"",'[" & classeur & "]PiloteCalc'!C[3]),SUMIF('[" & classeur &
"]PiloteCalc'!C[-16],R4C4&""-""&RC[-17]&""-M"",'[" & classeur &
"]PiloteCalc'!C[4])*SUMIF('[" & classeur & "]Paramètres'!C[-15],R4C4,'[" & classeur
& "]Paramètres'!C))/1000000"
    Range("R8").Select
    ActiveCell.FormulaR1C1 = _
        "=SUMIF('[" & classeur & "]Paramètres'!C[-15],R4C4,'[" & classeur &
"]Paramètres'!C[2])*SUMIF('[" & classeur & "]PiloteCalc'!C[-16],R4C4&""-""&R[-3]C[-
17]&""-M"",'[" & classeur & "]PiloteCalc'!C[12])/1000000" 'RF 27 août: C[] --> C[2]

    Range("S5").Select
    ActiveCell.FormulaR1C1 = _
        "=IF(RC[-16]=""B"",SUMIF('[" & classeur & "]PiloteCalc'!C[-17],R4C4&""-
""&RC[-18]&""-O"",'[" & classeur & "]PiloteCalc'!C[1]),-SUMIF('[" & classeur &
"]PiloteCalc'!C[-17],R4C4&""-""&RC[-18]&""-O"",'[" & classeur &
"]PiloteCalc'!C[7])*SUMIF('[" & classeur & "]Paramètres'!C[-16],R4C4,'[" & classeur
& "]Paramètres'!C[-2]))/1000000" 'RF 27 août: C[-1] --> C[-2]
    Range("S6").Select
    ActiveCell.FormulaR1C1 = _
```

```
        "=-SUMIF('[" & classeur & "]Paramètres'!C[-16],R4C4,'[" & classeur &
"]Paramètres'!C)*SUMIF('[" & classeur & "]PiloteCalc'!C[-17],R4C4&""-""&R[-1]C[-
18]&""-O"",'[" & classeur & "]PiloteCalc'!C[17])/1000000"

    Range("T6").Select
    ActiveCell.FormulaR1C1 = _
        "=-SUMIF('[" & classeur & "]Paramètres'!C[-17],R4C4,'[" & classeur &
"]Paramètres'!C[-1])*SUMIF('[" & classeur & "]PiloteCalc'!C[-18],R4C4&""-""&R[-
1]C[-19]&""-M"",'[" & classeur & "]PiloteCalc'!C[16])/1000000"

'PDM estimée
    Range("U5").Select
    ActiveCell.FormulaR1C1 = _
        "=SUMIF('[" & classeur & "]PiloteCalc'!C[-19],R4C4&""-""&RC[-20]&IF(RC[-
19]=""M"",""-M"",""-O""),'[" & classeur & "]PiloteCalc'!C[7])"
    Range("V5").Select
    ActiveCell.FormulaR1C1 = _
        "=SUMIF('[" & classeur & "]PiloteCalc'!C[-20],R4C4&""-""&RC[-21]&IF(RC[-
20]=""M"",""-M"",""-O""),'[" & classeur & "]PiloteCalc'!C[7])"

(…)

End Function

Function form_total_avec(classeur, debuttot, BouF)

(…)

'flux financiers
'suite à un problème de résultats des flux financiers sur l'onglet 'avec alliance',
changement des cellules relatives aux beyonds by RF 16 juin 2008 corrigé par RF 26
août 2008

    Sheets("Avec Alliance").Cells(debuttot + 3, 17).Select
    ActiveCell.FormulaR1C1 = _
        "=SUMIF('[" & classeur & "]Paramètres'!C[-14],R4C4,'[" & classeur &
"]Paramètres'!C[3])*SUMIF('[" & classeur & "]PiloteCalc'!C[25],R4C4&""-O-" & BouF &
""",'[" & classeur & "]PiloteCalc'!C[13])/1000000" 'RF 27 août: C[1] --> C[3]

    Sheets("Avec Alliance").Cells(debuttot, 18).Select
    ActiveCell.FormulaR1C1 = _
        "=(-SUMIF('[" & classeur & "]PiloteCalc'!C[24],R4C4&""-M-" & BouF & """,'["
& classeur & "]PiloteCalc'!C[3])+SUMIF('[" & classeur &
"]PiloteCalc'!C[24],R4C4&""-M-" & BouF & """,'[" & classeur &
"]PiloteCalc'!C[4])*SUMIF('[" & classeur & "]Paramètres'!C[-15],R4C4,'[" & classeur
& "]Paramètres'!C))/1000000"
    Sheets("Avec Alliance").Cells(debuttot + 3, 18).Select
    ActiveCell.FormulaR1C1 = _
        "=SUMIF('[" & classeur & "]Paramètres'!C[-15],R4C4,'[" & classeur &
"]Paramètres'!C[2])*SUMIF('[" & classeur & "]PiloteCalc'!C[24],R4C4&""-M-" & BouF &
""",'[" & classeur & "]PiloteCalc'!C[12])/1000000" 'RF 27 août: C[0] --> C[2]

    Sheets("Avec Alliance").Cells(debuttot, 19).Select
    ActiveCell.FormulaR1C1 = _
        "=(SUMIF('[" & classeur & "]PiloteCalc'!C[23],R4C4&""-O-" & BouF & """,'["
& classeur & "]PiloteCalc'!C[1])-SUMIF('[" & classeur &
"]PiloteCalc'!C[23],R4C4&""-O-" & BouF & """,'[" & classeur &
"]PiloteCalc'!C[7])*SUMIF('[" & classeur & "]Paramètres'!C[-16],R4C4,'[" & classeur
& "]Paramètres'!C[-2]))/1000000" 'RF 27 août: C[-1] --> C[-2]

    Sheets("Avec Alliance").Cells(debuttot + 1, 19).Select
    ActiveCell.FormulaR1C1 = _
        "=-SUMIF('[" & classeur & "]Paramètres'!C[-16],R4C4,'[" & classeur &
"]Paramètres'!C)*SUMIF('[" & classeur & "]PiloteCalc'!C[23],R4C4&""-O-" & BouF &
""",'[" & classeur & "]PiloteCalc'!C[17])/1000000"

    ' Erased by RF 27 aug 2007
    ' Sheets("Avec Alliance").Cells(debuttot + 1, 18).Select
```

```
    ' ActiveCell.FormulaR1C1 = _
    '    "=-SUMIF('[" & classeur & "]Paramètres'!C[-16],R4C4,'[" & classeur &
"]Paramètres'!C)*SUMIF('[" & classeur & "]PiloteCalc'!C[23],R4C4&""-O-" & BouF &
""",'[" & classeur & "]PiloteCalc'!C[17])/1000000"

    Sheets("Avec Alliance").Cells(debuttot + 1, 20).Select
    ActiveCell.FormulaR1C1 = _
        "=-SUMIF('[" & classeur & "]Paramètres'!C[-17],R4C4,'[" & classeur &
"]Paramètres'!C[-1])*SUMIF('[" & classeur & "]PiloteCalc'!C[22],R4C4&""-M-" & BouF
& """,'[" & classeur & "]PiloteCalc'!C[16])/1000000"'flux financiers
'suite à un problème de résultats des flux financiers sur l'onglet 'avec alliance',
changement des cellules relatives aux beyonds by RF 16 juin 2008 corrigé par RF 26
août 2008

(…)

End Function

(…)
```

<u>File</u>: Gain de Code-Share

<u>Macro</u>: PilotCalc

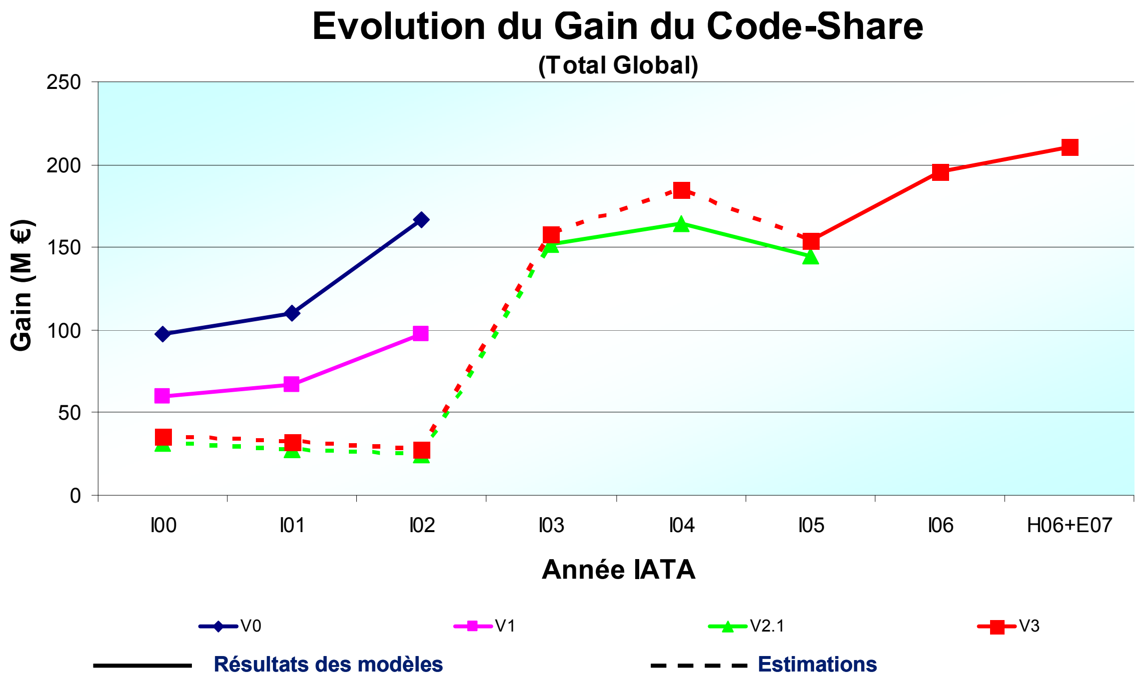
<u>Nature of the work done</u>: Correction + Modification

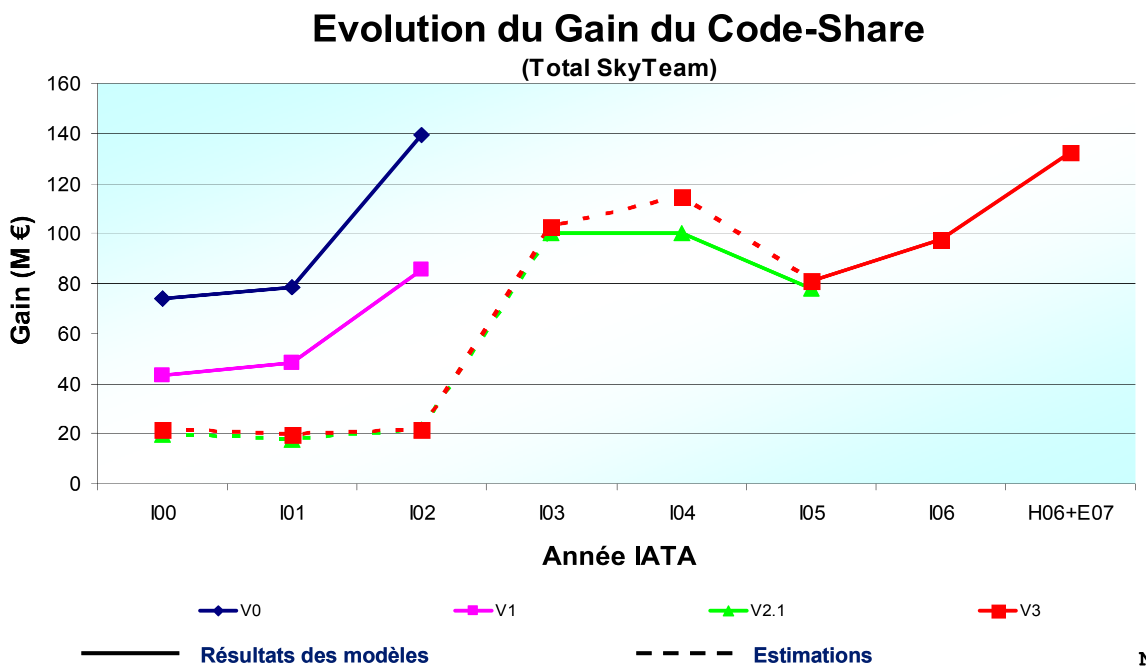
<u>Code</u>:

```
Sub PiloteCalc()
' by Sebastian Ponce & Ricardo Farinha (27 August 2008)
' Dernière actualisation: 20 novembre 2007 (SP) & 27 août 2008 (RF)

'===================================================================================
'
' Onglet       : PiloteCalc
' But          : Rapatrie les données de l'onglet PiloteCalc depuis le fichier
Pilotage
'
' Attention    : Le classeur à rapatrier doit avor le nom de Pilotage.xls pour
'                qu'il soit bien collé dans Gain de Code Share
'
' Mode d'emploi: Rapatrie les données, met des clés et mise en forme
'
'===================================================================================

(…)

Sub Parametres()

(…)

      ISCTrunkPayee = 0.09 'RF 27 août: 'ISCTrunk' --> 'ISCTrunkPayee'
      ISCTrunkRecue = 0.09 'RF 27 août: insertion suite aux modifs du 26 août
      ISCBeyondPayee = 0.09 'RF 27 août: 'ISCBeyond' --> 'ISCBeyondPayee'
      ISCBehindRecue = 0.09 'RF 27 août: insertion suite aux modifs du 26 août

(…)

                    Sheets("Parametres").Cells(wj, 17) = ISCTrunkPayee 'RF 27 août:
'ISCTrunk' --> 'ISCTrunkPayee' suite aux modifs du 26 août
                    Sheets("Parametres").Cells(wj, 18) = ISCTrunkRecue 'RF 27 août:
'ISCBeyond' --> 'ISCTrunkRecue' suite aux modifs du 26 août
                    Sheets("Parametres").Cells(wj, 19) = ISCBeyondPayee 'RF 27
août: insertion suite aux modifs du 26 août
                    Sheets("Parametres").Cells(wj, 20) = ISCBehindRecue 'RF 27
août: insertion suite aux modifs du 26 août
```

```
                    Sheets("Parametres").Cells(wj, 22) = HubCost 'RF 27 août: 20 --
> 22 suite aux modifs du 26 août
                    Sheets("Parametres").Cells(wj, 27) = mu 'RF 27 août: 25 --> 27
suite aux modifs du 26 août
                    Sheets("Parametres").Cells(wj, 28) = nu 'RF 27 août: 26 --> 28
suite aux modifs du 26 août
                    Sheets("Parametres").Cells(wj, 29) = e2_trunk 'RF 27 août: 27 -
-> 29 suite aux modifs du 26 août
                    Sheets("Parametres").Cells(wj, 30) = e1_trunk 'RF 27 août: 28 -
-> 30 suite aux modifs du 26 août
                    Sheets("Parametres").Cells(wj, 31) = lim_var_TMC 'RF 27 août:
29 --> 31 suite aux modifs du 26 août
                    Sheets("Parametres").Cells(wj, 32) = e2_byd 'RF 27 août: 30 -->
32 suite aux modifs du 26 août
                    Sheets("Parametres").Cells(wj, 33) = e1_byd 'RF 27 août: 31 -->
33 suite aux modifs du 26 août

                    If type_cie = 6 Then
                        Sheets("Parametres").Cells(wj, 4) = "LC"
                        Sheets("Parametres").Cells(wj, 8) = CDR_Long
                        Sheets("Parametres").Cells(wj, 10) = alpha_Long
                        Sheets("Parametres").Cells(wj, 13) = online_Long
                        Sheets("Parametres").Cells(wj, 14) = onlinep_Long
                        Sheets("Parametres").Cells(wj, 15) = TNR_L
                        Sheets("Parametres").Cells(wj, 21) = C_L 'RF 27 août: 19 --
> 21 suite aux modifs du 26 août
                        Sheets("Parametres").Cells(wj, 23) = CoutDist_Long 'RF 27
août: 21 --> 23 suite aux modifs du 26 août
                        Sheets("Parametres").Cells(wj, 24) = CoutTraficTrunk_Long
'RF 27 août: 22 --> 24 suite aux modifs du 26 août
                        Sheets("Parametres").Cells(wj, 25) = CoutTraficBeyond_Long
'RF 27 août: 23 --> 25 suite aux modifs du 26 août
                        Sheets("Parametres").Cells(wj, 26) = LFmax_Long 'RF 27
août: 24 --> 26 suite aux modifs du 26 août
                        ActiveSheet.Range(Cells(wj, 1), Cells(wj, 33)).Select 'RF
27 août: 31 --> 33 suite aux modifs du 26 août

With Selection.Interior
                            .ColorIndex = 35
                            .Pattern = xlSolid
                        End With
                    Else
                        Sheets("Parametres").Cells(wj, 4) = "MC"
                        Sheets("Parametres").Cells(wj, 8) = CDR_Moyen
                        Sheets("Parametres").Cells(wj, 10) = alpha_Moyen
                        Sheets("Parametres").Cells(wj, 13) = online_Moyen
                        Sheets("Parametres").Cells(wj, 14) = onlinep_Moyen
                        Sheets("Parametres").Cells(wj, 15) = TNR_M
                        Sheets("Parametres").Cells(wj, 21) = C_M 'RF 27 août: 19 --
> 21 suite aux modifs du 26 août
                        Sheets("Parametres").Cells(wj, 23) = CoutDist_Moyen 'RF 27
août: 21 --> 23 suite aux modifs du 26 août
                        Sheets("Parametres").Cells(wj, 24) = CoutTraficTrunk_Moyen
'RF 27 août: 22 --> 24 suite aux modifs du 26 août
                        Sheets("Parametres").Cells(wj, 25) = CoutTraficBeyond_Moyen
'RF 27 août: 23 --> 25 suite aux modifs du 26 août
                        Sheets("Parametres").Cells(wj, 26) = LFmax_Moyen 'RF 27
août: 24 --> 26 suite aux modifs du 26 août
                        ActiveSheet.Range(Cells(wj, 1), Cells(wj, 33)).Select 'RF
27 août: 31 --> 33 suite aux modifs du 26 août

(…)

End Sub
```

C – Evolution of the code-share gain





NB :

✈ Prise en compte des compagnies selon leur appartenance à *SkyTeam* sur la saison concernée (compagnies membres et compagnies associées confondues)

D – DB.IP different models characteristics and methodology for the evolution study

VERSION AUTHOR DATE	Version 0 Philippe Marguier 2000	Version 1 Philippe Marguier 2000	Version 2.1 Philippe Marguier 2003	Version 3 Sebastián Ponce 2006
MODIFICATIONS	Consideration of: ✈ frequency effect ✈ online effect ✈ substitution effect ✈ financial flows ✈ *spill* Boeing model	Better consideration of 'non overlap'[62] cases Parameters improvement: ✈ online coefficient ✈ substitution coefficient Better recognition of the connections IR1 and IC1 consideration (IR1 = Incremental revenue without 'virtual' capacity IC1 = Cost due to traffic and revenues related to IR1)	Spill model improvement: ✈ Incremental capacity determination Modification in the incremental revenue evaluation concept by the incremental gain estimation IR1, IR2, IC1, IC2, IC3, IC4 consideration (IR2 = Additional incremental revenue with the 'virtual' capacity IC2 = Cost due to traffic and revenues related to IR2 IC3 = Incremental capacity cost + hub cost for incremental connecting passengers IC4 = Structure cost (alliance)	New data source : ✈ *Data Warehouse* (replacing *Infocentre*) Improvement in processing double connections and connections between marketing and operating flights Consideration of the 'virtual' capacity, restricting the spill rate to 30% Update of revenue abatement percentages Several model improvements
CONSEQUENCES		More cautious estimation of the traffic without CS	Estimation closer to reality	QF problem solved More reliable results

IATA year	Author	Available Data	Estimations					
I00	PM	V0	✈	V1	✈	V2.1	✈	V3
I01	PM	V0	✈	V1	✈	V2.1	✈	V3
I02	PM	V0	✈	V1	✈	V2.1	✈	V3
I03	PM	(V2) V1	✈	✈	✈	✈	✈	V3
I03	PM	V2.1	✈	✈	✈	✈	✈	V3
I04	PM	V2.1	✈	✈	✈	✈	✈	V3
I05	PM	V2.1	✈	✈	✈	✈	✈	V3
I06	PM	V2.1	✈	✈	✈	✈	✈	✈
I06	SP	V3	✈	✈	✈	✈	✈	✈
E07+H06	SP	V3+V3	✈	✈	✈	✈	✈	✈

V0 ✈ V1 estimation factors determined from Jan – Jul 2002 study

Estimation factors V1 ✈ V2.1

Estimation factors V2.1 ✈ V3

62 'Overlap' routes are those which are operated by both (or even more) airlines. Contrarily, 'non overlap' routes are operated by only one partner.

E – Partial results of the code-share evolution study

TABLEAU RECAPITULATIF DE L'EVOLUTION DES CODES-SHARE

Code	Compagnie	I00				I01				I02				I03		I04		I05		I06	I07
		V0	V1	V2.1	V3	V0	V1	V2.1	V3	V0	V1	V2.1	V3	V2.1	V3	V2.1	V3	V2.1	V3	V3	V3
		PC	RF			PC	RF			PC	RF			PC	RF	PC	RF	PC	RF	SP	RF
AM	Aeromexico	5,0	2,7	5,3	6,8	4,9	2,6	5,2	6,7	2,2	1,2	2,3	3,0	1,9	2,4	4,2	5,3	2,6	3,3	2,4	2,9
CZ	China Southern Airl	-0,2	0,0	0,0	0,0	5,3	-0,1	-0,1	-0,1	1,5	0,0	0,0	0,0	0,0	0,0	-2,1	-3,1	-2,0	-3,0	2,4	3,5
DL	Delta	67,9	38,6	12,8	11,6	57,1	32,5	10,8	9,7	98,4	55,9	18,6	16,8	75,2	67,9	50,8	46,0	43,0	38,8	47,6	45,7
HM	Air Seychelles													10,5	11,8	3,6	4,1	2,9	3,2	5,8	8,2
JL	Japan Air Lines	2,7	5,4	3,0	2,3	3,1	6,2	3,4	2,6	0,8	1,6	0,9	0,7	4,2	3,2	13,4	10,2	14,2	10,8	9,1	8,3
KE	Korean Air	1,0	2,0	1,6	3,4	1,0	2,0	1,6	3,4	0,7	1,4	1,1	2,4	5,6	11,9	15,7	33,3	7,7	16,2	13,5	14,2
ME	Middle East Airlines	5,0	5,9	7,3	10,4	6,1	7,2	9,0	12,7	4,8	5,6	7,0	10,0	10,9	15,4	15,5	22,0	13,3	18,9	14,8	19,5
MK	Air Mauritius	1,1	1,2	1,3	1,4	-1,9	-2,0	-2,3	-2,5	-6,9	-7,3	-8,4	-8,9	5,2	5,5	6,0	6,4	12,2	12,9	8,7	8,4
MU	China Eastern Airl													2,6	3,8	3,4	4,9	1,2	1,7	3,2	4,3
NW	Northwest																			1,4	4,2
QF	Qantas															0,0	0,0	0,3	1,5	11,1	11,9
SA	South African Airways													3,6	5,0						
SV	Saudi Arabian Airlines																			-0,4	-0,6
TN	Air Tahiti Nui													0,0	0,0	-0,6	-1,0				
VN	Vietnam Airlines													0,0	0,0	5,5	8,1				
	Sous-total LC	82,5	55,7	31,4	35,8	75,6	48,4	27,6	32,5	101,5	58,4	21,5	23,9	119,7	127,0	115,6	136,0	95,4	104,4	119,5	130,6
AT	Royal Air Maroc	5,1	2,0	0,0	0,0	6,2	2,4	0,0	0,0	5,8	2,2	0,0	0,0	6,0	0,7	4,7	0,6	5,5	0,7	0,9	-0,1
AY	Finnair									6,0	4,9	2,7	4,0	4,7	6,9	4,7	6,9	7,7	11,3	12,6	12,9
AZ	Alitalia	0,0	0,0	0,0	0,0	15,1	11,2	-0,1	-0,1	36,6	27,1	-0,3	-0,3	18,4	21,1	24,7	28,3	17,7	20,2	20,6	19,0
FB	Bulgaria air																			-0,1	-0,2
IB	Iberia	0,0	0,0	0,0	0,0	8,3	2,6	0,0	0,0	7,2	2,2	0,0	0,0	0,3	0,3	0,0	0,0				
JU	Jat Airways																			0,6	0,5
KL	KLM													0,0	0,0	3,8	1,3	6,9	2,4	9,4	13,4
LO	Lot	-0,2	-0,4	0,0	0,0	0,2	0,4	0,0	0,0	-0,3	-0,6	0,0	0,0	0,1	0,1	0,0	0,0				
LX	Swiss																			0,3	0,5
MA	MALEV	2,0	0,0	0,0	-0,1	0,8	0,0	0,0	0,0	1,1	0,0	0,0	-0,1	-0,7	-2,1	0,3	1,0	0,6	1,8	4,0	2,7
NI	Portugalia									2,0	1,0	0,2	0,2	2,2	2,6	3,2	3,6	2,2	2,5	4,7	
OK	Czech Airlines	2,3	0,0	0,0	0,0	0,6	0,0	0,0	0,0	1,4	0,0	0,0	0,0	-1,0	-0,8	0,6	0,5	-0,1	-0,1	0,7	1,7
OS	Austrian	4,8	2,6	0,0	0,0	3,0	1,6	0,0	0,0	4,5	2,4	0,0	0,0	0,5	0,6	1,5	1,7	1,5	1,7	2,5	2,0
PS	Ukrain Intl Airlines																	0,0	0,0	1,3	0,5
RO	TAROM																			-0,1	0,2
SU	Aeroflot													1,5	2,0	1,3	1,6	2,4	3,1	2,2	0,8
TU	Tunis Air	0,8	0,0	0,0	0,0	0,2	0,0	0,0	0,0	0,5	0,0	0,0	0,0	-0,3	-0,3	-0,4	-0,4	0,3	0,3	0,8	1,3
UX	Air Europa													0,0	0,0	4,2	3,7	6,4	5,6	16,1	17,8
	Sous-total MC	14,8	4,1	-0,1	-0,2	34,4	18,1	-0,2	-0,2	64,8	39,2	2,5	3,8	31,9	31,1	48,8	48,8	49,1	49,4	76,4	73,1
Total	SkyTeam	73,9	43,3	19,7	21,7	78,7	48,2	17,5	19,6	139,3	85,6	21,7	21,8	100,2	102,6	100,0	114,7	77,8	80,9	97,7	123,3
	Brut	97,3	59,8	31,3	35,7	110,0	66,5	27,4	32,3	166,3	97,7	24,0	27,6	151,6	158,1	164,4	184,9	144,5	153,8	195,9	203,7

F – Global results of the AF code-share model for IATA 2007

TABLEAU RECAPITULATIF GLOBAL

Année IATA 07

Période 01/04/2007 à 31/03/2008

	cies	GAIN [1]	Recette Incrementale	Pax Incrémentaux [2]	CAM XX*/AF [3]	Solde BS [4]	Solde ISC/SC [5]	CAM AF [6]	dt CAM AF*/XX trunk et behind
	KL	**13**	21	939	40		5	241	46
SkyTeam	AM	**3**	13	67	0	0		193	17
SkyTeam	AZ	**19**	36	1710	77		27	890	71
SkyTeam	CZ	**3**	9	42		0		52	10
SkyTeam	DL	**46**	100	1060	224		26	1754	66
SkyTeam	KE	**14**	32	134		2		148	50
SkyTeam	NW	**4**	6	73	7		1	46	7
SkyTeam	OK	**2**	4	331	8		6	85	18
SkyTeam	SU	**1**	3	15		1		144	12
S/S Total		**105**	**225**	**4372**	**356**	**4**	**65**	**3553**	**298**
AS	KQ	**1**	1	21			0	5	3
AS	UX	**16**	24	972	13	-25	3	580	43
S/S Total		**122**	**250**	**5365**	**369**	**-22**	**68**	**4138**	**344**
	AI	**-3**	-0	-10		1,2		49	
	AT	**-0**	9	150		1		34	10
	AY	**13**	16	348	0	-16		41	30
	FB	**-0**	0	-1		0		21	
	HM	**8**	11	158		-17		29	25
	JL	**8**	36	179	1	-0		479	36
	JU	**0**	1	32		-0		16	2
	LG	**5**	8	170			1	29	8
	LX	**0**	1	47	5		1	217	0
	MA	**3**	3	43		-1		57	13
	ME	**20**	21	273		-9		83	33
	MK	**8**	32	167		3		102	47
	MU	**4**	13	55		0		447	19
	OS	**2**	5	82		-0		83	16
	PS	**1**	0	8		0		39	4
	QF	**13**	16	56	10		1	29	7
	RO	**0**	1	9		0		79	8
	SB	**11**	15	197		-23		56	30
	SV	**-1**	0	-1		0		40	0
	TU	**1**	3	54		-0		20	5
TOTAL		**218**	**440**	**7380**	**386**	**-82**	**70**	**6087**	**636**

[1] Code-Share seulement. Non compris gains dues à la combinabilité tarifaire, aux sinergies programme, etc

[2] Pax incrémentaux par sense et par jour sur trunks, y compris les pax incrémentaux AF*/XX (pas de CAT AF en Free Flow) non compris les pax XX*/AF en blocs sièges

[3] CAM XX*/AF : Recettes XX*/AF (en Free Flow sur Trunk) et beyond hub d'AF

[4] Solde BS : Vente BS - Achats BS

[5] Solde ISC + Supercom : ISC/SC reçue - ISC/SC payée

[6] CAM AF = CA AF*/AF (sur Trunk) + CAT ou CAM AF*/XX (si BS ou FF respectivement) + CAM AF*/XX (sur Behind) + CAT AF*/AF (sur Beyond)

Additional comments :

- KL data on AMSCDG in November and December 2007 were missing
- DL data on all routes in October 2007 and March 2008 were missing
- UX data excludes AGPCDG in IATA Summer 2007 due to a change in the code-share type from block seat to free flow
- LG data on all routes in November 2007, February and March 2008 were missing
- QF data on all routes in the whole IATA Winter 2007 were missing, so the results presented correspond to IATA Winter 2006 + IATA Summer 2007

G – Results of the sensitivity analysis

TABLEAU RECAPITULATIF GLOBAL

alpha = 1,0

Période

	cies	GAIN [1]	Recette Incrementale	Pax Incrémentaux [2]	CAM XX*/AF [3]	Solde BS [4]	Solde ISC/SC [5]	CAM AF [6]	dt CAM AF*/XX trunk et behind
	KL	11	15	407	18		1,6	85	11
SkyTeam	AM	0	3	16	0	0,1		70	7
	AZ	4	8	673	29		10,5	329	28
	CZ	1	4	20		0,0		20	4
	DL	12	29	415	77		8,6	590	19
	KE	4	10	53		0,7		53	19
	NW	1	2	34	2		0,2	17	4
	OK	0	1	135	3		2,2	31	6
	SU	-0	0	2		0,5		60	5
S/S Total		34	71	1756	130	1	23	1256	103
AS	KQ	0	0	6			0,1	1	1
	UX	5	7	599	4	-16,3	0,7	204	22
S/S Total		39	78	2361	134	-15	24	1461	126
Compagnies Code-Share	AS	0	0	1				18	0
	AT	-0	3	66		0,4		12	3
	AY	4	5	168	0	-6,4		12	12
	FB	-0	0	-1		0,1		8	
	HM	5	7	83		-6,4		14	12
	JL	1	7	43	1	0,3		177	12
	JU	1	1	19		-0,1		6	1
	LG	2	3	37			0,2	10	1
	LX	0	0	22	3		0,3	96	0
	MA	1	0	3		-0,1		21	5
	ME	8	7	123		-3,6		31	12
	MK	6	14	58		3,9		53	22
	MU	1	3	15		0,1		164	7
	OS	-1	-0	7		-0,1		31	6
	PS	0	-0	3		-0,1		12	2
	QF	5	6		5			9	0
	RO	-0	-1	-9		0,1		30	3
	SB	3	4	107		-9,8		14	14
	SV	-0	0	-1		0,2		16	0
	TU	1	1	24		-0,0		7	2
TOTAL		75	139	3129	142	-36	24	2202	240

TABLEAU RECAPITULATIF GLOBAL

alpha = 1,1

Période

	cies	GAIN [1]	Recette Incrementale	Pax Incrémentaux [2]	CAM XX*/AF [3]	Solde BS [4]	Solde ISC/SC [5]	CAM AF [6]	dt CAM AF*/XX trunk et behind
	KL	12	16	422	18		1,6	85	11
SkyTeam	AM	1	4	23	0	0,1		70	7
	AZ	6	10	718	29		10,5	329	28
	CZ	1	4	21		0,0		20	4
	DL	13	32	436	77		8,6	590	19
	KE	4	10	57		0,7		53	19
	NW	1	2	35	2		0,2	17	4
	OK	1	1	143	3		2,2	31	6
	SU	0	1	4		0,5		60	5
S/S Total		40	80	1858	130	1	23	1256	103
AS	KQ	0	0	6			0,1	1	1
	UX	5	7	599	4	-16,3	0,7	204	22
S/S Total		45	87	2463	134	-15	24	1461	126
Compagnies Code-Share	AS	0	0	1				18	0
	AT	-0	3	67		0,4		12	3
	AY	4	5	168	0	-6,4		12	12
	FB	-0	0	-1		0,1		8	
	HM	5	7	83		-6,4		14	12
	JL	2	11	63	1	0,3		177	12
	JU	1	1	20		-0,1		6	1
	LG	2	3	37			0,2	10	1
	LX	0	0	22	3		0,3	96	0
	MA	1	0	5		-0,1		21	5
	ME	8	7	125		-3,6		31	12
	MK	6	15	60		3,9		53	22
	MU	1	4	20		0,1		164	7
	OS	-0	0	16		-0,1		31	6
	PS	0	0	4		-0,1		12	2
	QF	5	6		5			9	0
	RO	-0	-1	-6		0,1		30	3
	SB	3	4	107		-9,8		14	14
	SV	-0	0	-1		0,2		16	0
	TU	1	1	25		-0,0		7	2
TOTAL		83	154	3279	142	-36	24	2202	240

TABLEAU RECAPITULATIF GLOBAL

alpha = 1,3

Période

	cies	GAIN [1]	Recette Incrementale	Pax Incrémentaux [2]	CAM XX*/AF [3]	Solde BS [4]	Solde ISC/SC [5]	CAM AF [6]	dt CAM AF*/XX trunk et behind
	KL	**13**	17	453	18		1,6	85	11
SkyTeam	AM	**2**	6	37	0	0,1		70	7
SkyTeam	AZ	**10**	15	808	29		10,5	329	28
SkyTeam	CZ	**1**	4	22		0,0		20	4
SkyTeam	DL	**17**	39	481	77		8,6	590	19
SkyTeam	KE	**5**	12	64		0,7		53	19
SkyTeam	NW	**1**	2	37	2		0,2	17	4
SkyTeam	OK	**1**	2	160	3		2,2	31	6
SkyTeam	SU	**1**	1	8		0,5		60	5
S/S Total		**51**	**99**	**2070**	**130**	**1**	**23**	**1256**	**103**
AS	KQ	**0**	0	6			0,1	1	1
AS	UX	**5**	7	600	4	-16,3	0,7	204	22
S/S Total		**56**	**106**	**2676**	**134**	**-15**	**24**	**1461**	**126**
Compagnies Code-Share	AS	**0**	0	1				18	0
Compagnies Code-Share	AT	**-0**	3	67		0,4		12	3
Compagnies Code-Share	AY	**4**	5	168	0	-6,4		12	12
Compagnies Code-Share	FB	**-0**	0	-1		0,1		8	
Compagnies Code-Share	HM	**5**	7	83		-6,4		14	12
Compagnies Code-Share	JL	**3**	16	103	1	0,3		177	12
Compagnies Code-Share	JU	**1**	1	22		-0,1		6	1
Compagnies Code-Share	LG	**2**	3	37			0,2	10	1
Compagnies Code-Share	LX	**0**	0	23	3		0,3	96	0
Compagnies Code-Share	MA	**1**	1	8		-0,1		21	5
Compagnies Code-Share	ME	**9**	8	130		-3,6		31	12
Compagnies Code-Share	MK	**6**	15	64		3,9		53	22
Compagnies Code-Share	MU	**2**	6	33		0,1		164	7
Compagnies Code-Share	OS	**0**	1	36		-0,1		31	6
Compagnies Code-Share	PS	**0**	0	6		-0,1		12	2
Compagnies Code-Share	QF	**5**	6		5			9	0
Compagnies Code-Share	RO	**0**	0	2		0,1		30	3
Compagnies Code-Share	SB	**3**	4	107		-9,8		14	14
Compagnies Code-Share	SV	**-0**	0	-1		0,2		16	0
Compagnies Code-Share	TU	**1**	1	25		-0,0		7	2
TOTAL		**99**	**184**	**3591**	**142**	**-36**	**24**	**2202**	**240**

TABLEAU RECAPITULATIF GLOBAL

alpha = 1,5

Période

	cies	GAIN [1]	Recette Incrementale	Pax Incrémentaux [2]	CAM XX*/AF [3]	Solde BS [4]	Solde ISC/SC [5]	CAM AF [6]	dt CAM AF*/XX trunk et behind
	KL	**14**	19	484	18		1,6	85	11
SkyTeam	AM	**2**	8	53	0	0,1		70	7
SkyTeam	AZ	**13**	19	898	29		10,5	329	28
SkyTeam	CZ	**1**	4	24		0,0		20	4
SkyTeam	DL	**20**	44	531	77		8,6	590	19
SkyTeam	KE	**5**	13	71		0,7		53	19
SkyTeam	NW	**2**	2	39	2		0,2	17	4
SkyTeam	OK	**2**	3	178	3		2,2	31	6
SkyTeam	SU	**1**	1	13		0,5		60	5
S/S Total		**60**	**114**	**2291**	**130**	**1**	**23**	**1256**	**103**
AS	KQ	**0**	0	6			0,1	1	1
AS	UX	**5**	7	601	4	-16,3	0,7	204	22
S/S Total		**65**	**122**	**2898**	**134**	**-15**	**24**	**1461**	**126**
Compagnies Code-Share	AS	**0**	0	1				18	0
Compagnies Code-Share	AT	**-0**	3	69		0,4		12	3
Compagnies Code-Share	AY	**4**	5	168	0	-6,4		12	12
Compagnies Code-Share	FB	**-0**	0	-1		0,1		8	
Compagnies Code-Share	HM	**5**	7	83		-6,4		14	12
Compagnies Code-Share	JL	**4**	22	143	1	0,3		177	12
Compagnies Code-Share	JU	**1**	1	24		-0,1		6	1
Compagnies Code-Share	LG	**2**	3	37			0,2	10	1
Compagnies Code-Share	LX	**0**	0	24	3		0,3	96	0
Compagnies Code-Share	MA	**1**	0	12		-0,1		21	5
Compagnies Code-Share	ME	**9**	8	135		-3,6		31	12
Compagnies Code-Share	MK	**5**	14	68		3,9		53	22
Compagnies Code-Share	MU	**2**	8	47		0,1		164	7
Compagnies Code-Share	OS	**1**	2	57		-0,1		31	6
Compagnies Code-Share	PS	**0**	0	8		-0,1		12	2
Compagnies Code-Share	QF	**5**	6		5			9	0
Compagnies Code-Share	RO	**1**	1	12		0,1		30	3
Compagnies Code-Share	SB	**3**	4	107		-9,8		14	14
Compagnies Code-Share	SV	**-0**	0	-0		0,2		16	0
Compagnies Code-Share	TU	**1**	1	25		-0,0		7	2
TOTAL		**109**	**208**	**3916**	**142**	**-36**	**24**	**2202**	**240**

TABLEAU RECAPITULATIF GLOBAL

beta = 0,05

Période

	cies	GAIN [1]	Recette Incrementale	Pax Incrémentaux [2]	CAM XX*/AF [3]	Solde BS [4]	Solde ISC/SC [5]	CAM AF [6]	dt CAM AF*/XX trunk et behind
	KL	**12**	16	419	18		1,6	85	11
SkyTeam	AM	**1**	5	27	0	0,1		70	7
	AZ	**5**	9	694	29		10,5	329	28
	CZ	**1**	4	21		0,0		20	4
	DL	**16**	36	457	77		8,6	590	19
	KE	**4**	10	55		0,7		53	19
	NW	**1**	1	31	2		0,2	17	4
	OK	**1**	1	139	3		2,2	31	6
	SU	**0**	0	3		0,5		60	5
S/S Total		**41**	**81**	**1847**	**130**	**1**	**23**	**1256**	**103**
AS	KQ	**0**	0	6			0,1	1	1
	UX	**5**	7	600	4	-16,3	0,7	204	22
S/S Total		**46**	**89**	**2452**	**134**	**-15**	**24**	**1461**	**126**
Compagnies Code-Share	AS	**0**	0	1				18	0
	AT	**-0**	3	66		0,4		12	3
	AY	**4**	5	168	0	-6,4		12	12
	FB	**-0**	0	-1		0,1		8	
	HM	**5**	7	83		-6,4		14	12
	JL	**3**	14	87	1	0,3		177	12
	JU	**0**	1	16		-0,1		6	1
	LG	**2**	3	37			0,2	10	1
	LX	**0**	0	23	3		0,3	96	0
	MA	**1**	0	6		-0,1		21	5
	ME	**8**	6	115		-3,6		31	12
	MK	**5**	14	54		3,9		53	22
	MU	**1**	5	27		0,1		164	7
	OS	**-0**	1	24		-0,1		31	6
	PS	**0**	0	4		-0,1		12	2
	QF	**5**	6		5			9	0
	RO	**0**	-0	1		0,1		30	3
	SB	**3**	4	107		-9,8		14	14
	SV	**-0**	0	-1		0,2		16	0
	TU	**1**	1	24		-0,0		7	2
TOTAL		**85**	**159**	**3295**	**142**	**-36**	**24**	**2202**	**240**

TABLEAU RECAPITULATIF GLOBAL

beta = 0,1

Période

	cies	GAIN [1]	Recette Incrementale	Pax Incrémentaux [2]	CAM XX*/AF [3]	Solde BS [4]	Solde ISC/SC [5]	CAM AF [6]	dt CAM AF*/XX trunk et behind
	KL	**12**	16	428	18		1,6	85	11
SkyTeam	AM	**1**	5	29	0	0,1		70	7
	AZ	**7**	11	730	29		10,5	329	28
	CZ	**1**	4	21		0,0		20	4
	DL	**15**	36	456	77		8,6	590	19
	KE	**4**	11	58		0,7		53	19
	NW	**1**	2	34	2		0,2	17	4
	OK	**1**	1	146	3		2,2	31	6
	SU	**0**	1	5		0,5		60	5
S/S Total		**43**	**85**	**1905**	**130**	**1**	**23**	**1256**	**103**
AS	KQ	**0**	0	6			0,1	1	1
	UX	**5**	7	600	4	-16,3	0,7	204	22
S/S Total		**48**	**93**	**2511**	**134**	**-15**	**24**	**1461**	**126**
Compagnies Code-Share	AS	**0**	0	1				18	0
	AT	**-0**	3	66		0,4		12	3
	AY	**4**	5	168	0	-6,4		12	12
	FB	**-0**	0	-1		0,1		8	
	HM	**5**	7	83		-6,4		14	12
	JL	**3**	14	85	1	0,3		177	12
	JU	**1**	1	19		-0,1		6	1
	LG	**2**	3	37			0,2	10	1
	LX	**0**	0	23	3		0,3	96	0
	MA	**1**	0	6		-0,1		21	5
	ME	**8**	7	122		-3,6		31	12
	MK	**6**	14	58		3,9		53	22
	MU	**1**	5	26		0,1		164	7
	OS	**-0**	1	25		-0,1		31	6
	PS	**0**	0	4		-0,1		12	2
	QF	**5**	6		5			9	0
	RO	**-0**	-0	-0		0,1		30	3
	SB	**3**	4	107		-9,8		14	14
	SV	**-0**	0	-1		0,2		16	0
	TU	**1**	1	25		-0,0		7	2
TOTAL		**88**	**164**	**3364**	**142**	**-36**	**24**	**2202**	**240**

TABLEAU RECAPITULATIF GLOBAL

beta = 0,2

Période

	cies	GAIN [1]	Recette Incrementale	Pax Incrémentaux [2]	CAM XX*/AF [3]	Solde BS [4]	Solde ISC/SC [5]	CAM AF [6]	dt CAM AF*/XX trunk et behind
	KL	**13**	17	446	18		1,6	85	11
SkyTeam	AM	**1**	5	32	0	0,1		70	7
	AZ	**9**	14	794	29		10,5	329	28
	CZ	**1**	4	22		0,0		20	4
	DL	**15**	36	461	77		8,6	590	19
	KE	**5**	12	62		0,7		53	19
	NW	**1**	2	38	2		0,2	17	4
	OK	**1**	2	157	3		2,2	31	6
	SU	**1**	1	7		0,5		60	5
S/S Total		**48**	**93**	**2020**	**130**	**1**	**23**	**1256**	**103**
AS	KQ	**0**	0	6			0,1	1	1
	UX	**5**	7	600	4	-16,3	0,7	204	22
S/S Total		**53**	**101**	**2625**	**134**	**-15**	**24**	**1461**	**126**
Compagnies Code-Share	AS	**0**	0	1				18	0
	AT	**-0**	3	67		0,4		12	3
	AY	**4**	5	168	0	-6,4		12	12
	FB	**-0**	0	-1		0,1		8	
	HM	**5**	7	83		-6,4		14	12
	JL	**3**	13	82	1	0,3		177	12
	JU	**1**	1	23		-0,1		6	1
	LG	**2**	3	37			0,2	10	1
	LX	**0**	0	23	3		0,3	96	0
	MA	**1**	0	7		-0,1		21	5
	ME	**9**	8	133		-3,6		31	12
	MK	**6**	15	65		3,9		53	22
	MU	**1**	5	26		0,1		164	7
	OS	**-0**	1	28		-0,1		31	6
	PS	**0**	0	5		-0,1		12	2
	QF	**5**	6		5			9	0
	RO	**0**	-0	-3		0,1		30	3
	SB	**3**	4	107		-9,8		14	14
	SV	**-0**	0	-1		0,2		16	0
	TU	**1**	1	24		-0,0		7	2
TOTAL		**94**	**174**	**3501**	**142**	**-36**	**24**	**2202**	**240**

TABLEAU RECAPITULATIF GLOBAL

beta = 0,3

Période

	cies	GAIN [1]	Recette Incrementale	Pax Incrémentaux [2]	CAM XX*/AF [3]	Solde BS [4]	Solde ISC/SC [5]	CAM AF [6]	dt CAM AF*/XX trunk et behind
	KL	**14**	18	462	18		1,6	85	11
SkyTeam	AM	**2**	6	36	0	0,1		70	7
	AZ	**11**	17	852	29		10,5	329	28
	CZ	**1**	4	23		0,0		20	4
	DL	**16**	37	469	77		8,6	590	19
	KE	**5**	12	67		0,7		53	19
	NW	**2**	2	41	2		0,2	17	4
	OK	**2**	3	168	3		2,2	31	6
	SU	**1**	1	10		0,5		60	5
S/S Total		**53**	**100**	**2128**	**130**	**1**	**23**	**1256**	**103**
AS	KQ	**0**	0	6			0,1	1	1
	UX	**5**	7	600	4	-16,3	0,7	204	22
S/S Total		**58**	**108**	**2734**	**134**	**-15**	**24**	**1461**	**126**
Compagnies Code-Share	AS	**0**	0	1				18	0
	AT	**-0**	3	68		0,4		12	3
	AY	**4**	5	168	0	-6,4		12	12
	FB	**-0**	0	-1		0,1		8	
	HM	**5**	7	83		-6,4		14	12
	JL	**3**	13	80	1	0,3		177	12
	JU	**1**	1	27		-0,1		6	1
	LG	**2**	3	37			0,2	10	1
	LX	**0**	0	23	3		0,3	96	0
	MA	**1**	1	7		-0,1		21	5
	ME	**9**	9	141		-3,6		31	12
	MK	**5**	14	71		3,9		53	22
	MU	**1**	5	28		0,1		164	7
	OS	**0**	1	32		-0,1		31	6
	PS	**0**	0	6		-0,1		12	2
	QF	**5**	6		5			9	0
	RO	**-0**	-0	-4		0,1		30	3
	SB	**3**	4	107		-9,8		14	14
	SV	**-0**	0	-1		0,2		16	0
	TU	**0**	1	24		-0,0		7	2
TOTAL		**98**	**181**	**3633**	**142**	**-36**	**24**	**2202**	**240**

TABLEAU RECAPITULATIF GLOBAL

e2 = -0,2

Période

Groupe	cies	GAIN [1]	Recette Incrementale	Pax Incrémentaux [2]	CAM XX*/AF [3]	Solde BS [4]	Solde ISC/SC [5]	CAM AF [6]	dt CAM AF*/XX trunk et behind
	KL	**13**	17	437	18		1,6	85	11
SkyTeam	AM	**1**	5	30	0	0,1		70	7
SkyTeam	AZ	**9**	14	763	29		10,5	329	28
SkyTeam	CZ	**1**	4	21		0,0		20	4
SkyTeam	DL	**16**	36	458	77		8,6	590	19
SkyTeam	KE	**5**	12	60		0,7		53	19
SkyTeam	NW	**1**	2	36	2		0,2	17	4
SkyTeam	OK	**1**	2	152	3		2,2	31	6
SkyTeam	SU	**0**	1	6		0,5		60	5
S/S Total		**49**	**93**	**1963**	**130**	**1**	**23**	**1256**	**103**
AS	KQ	**0**	0	6			0,1	1	1
AS	UX	**5**	7	600	4	-16,3	0,7	204	22
S/S Total		**54**	**100**	**2569**	**134**	**-15**	**24**	**1461**	**126**
Compagnies Code-Share	AS	**0**	0	1				18	0
Compagnies Code-Share	AT	**-0**	3	67		0,4		12	3
Compagnies Code-Share	AY	**4**	5	168	0	-6,4		12	12
Compagnies Code-Share	FB	**-0**	0	-1		0,1		8	
Compagnies Code-Share	HM	**5**	7	83		-6,4		14	12
Compagnies Code-Share	JL	**4**	15	83	1	0,3		177	12
Compagnies Code-Share	JU	**1**	1	21		-0,1		6	1
Compagnies Code-Share	LG	**2**	3	37			0,2	10	1
Compagnies Code-Share	LX	**0**	0	23	3		0,3	96	0
Compagnies Code-Share	MA	**1**	0	6		-0,1		21	5
Compagnies Code-Share	ME	**9**	8	128		-3,6		31	12
Compagnies Code-Share	MK	**6**	15	62		3,9		53	22
Compagnies Code-Share	MU	**2**	5	26		0,1		164	7
Compagnies Code-Share	OS	**0**	1	26		-0,1		31	6
Compagnies Code-Share	PS	**0**	0	5		-0,1		12	2
Compagnies Code-Share	QF	**5**	6		5			9	0
Compagnies Code-Share	RO	**0**	-0	-2		0,1		30	3
Compagnies Code-Share	SB	**3**	4	107		-9,8		14	14
Compagnies Code-Share	SV	**-0**	0	-1		0,2		16	0
Compagnies Code-Share	TU	**1**	1	25		-0,0		7	2
TOTAL		**96**	**175**	**3433**	**142**	**-36**	**24**	**2202**	**240**

TABLEAU RECAPITULATIF GLOBAL

e2 = -0,3

Période

Groupe	cies	GAIN [1]	Recette Incrementale	Pax Incrémentaux [2]	CAM XX*/AF [3]	Solde BS [4]	Solde ISC/SC [5]	CAM AF [6]	dt CAM AF*/XX trunk et behind
	KL	**13**	17	437	18		1,6	85	11
SkyTeam	AM	**1**	5	30	0	0,1		70	7
SkyTeam	AZ	**9**	13	763	29		10,5	329	28
SkyTeam	CZ	**1**	4	21		0,0		20	4
SkyTeam	DL	**15**	36	458	77		8,6	590	19
SkyTeam	KE	**5**	11	60		0,7		53	19
SkyTeam	NW	**1**	2	36	2		0,2	17	4
SkyTeam	OK	**1**	2	152	3		2,2	31	6
SkyTeam	SU	**0**	1	6		0,5		60	5
S/S Total		**47**	**91**	**1963**	**130**	**1**	**23**	**1256**	**103**
AS	KQ	**0**	0	6			0,1	1	1
AS	UX	**5**	7	600	4	-16,3	0,7	204	22
S/S Total		**52**	**98**	**2569**	**134**	**-15**	**24**	**1461**	**126**
Compagnies Code-Share	AS	**0**	0	1				18	0
Compagnies Code-Share	AT	**-0**	3	67		0,4		12	3
Compagnies Code-Share	AY	**4**	5	168	0	-6,4		12	12
Compagnies Code-Share	FB	**-0**	0	-1		0,1		8	
Compagnies Code-Share	HM	**5**	7	83		-6,4		14	12
Compagnies Code-Share	JL	**3**	14	83	1	0,3		177	12
Compagnies Code-Share	JU	**1**	1	21		-0,1		6	1
Compagnies Code-Share	LG	**2**	3	37			0,2	10	1
Compagnies Code-Share	LX	**0**	0	23	3		0,3	96	0
Compagnies Code-Share	MA	**1**	0	6		-0,1		21	5
Compagnies Code-Share	ME	**9**	8	128		-3,6		31	12
Compagnies Code-Share	MK	**6**	15	62		3,9		53	22
Compagnies Code-Share	MU	**1**	5	26		0,1		164	7
Compagnies Code-Share	OS	**-0**	1	26		-0,1		31	6
Compagnies Code-Share	PS	**0**	0	5		-0,1		12	2
Compagnies Code-Share	QF	**5**	6		5			9	0
Compagnies Code-Share	RO	**0**	-0	-2		0,1		30	3
Compagnies Code-Share	SB	**3**	4	107		-9,8		14	14
Compagnies Code-Share	SV	**-0**	0	-1		0,2		16	0
Compagnies Code-Share	TU	**1**	1	25		-0,0		7	2
TOTAL		**93**	**172**	**3433**	**142**	**-36**	**24**	**2202**	**240**

TABLEAU RECAPITULATIF GLOBAL

e2 = -0,5

Période

	cies	GAIN [1]	Recette Incrementale	Pax Incrémentaux [2]	CAM XX*/AF [3]	Solde BS [4]	Solde ISC/SC [5]	CAM AF [6]	dt CAM AF*/XX trunk et behind
	KL	**12**	16	437	18		1,6	85	11
SkyTeam	AM	**1**	5	30	0	0,1		70	7
SkyTeam	AZ	**7**	12	763	29		10,5	329	28
SkyTeam	CZ	**1**	4	21		0,0		20	4
SkyTeam	DL	**15**	35	458	77		8,6	590	19
SkyTeam	KE	**4**	11	60		0,7		53	19
SkyTeam	NW	**1**	2	36	2		0,2	17	4
SkyTeam	OK	**1**	2	152	3		2,2	31	6
SkyTeam	SU	**0**	1	6		0,5		60	5
S/S Total		**44**	**87**	**1963**	**130**	**1**	**23**	**1256**	**103**
AS	KQ	**0**	0	6			0,1	1	1
AS	UX	**5**	7	600	4	-16,3	0,7	204	22
S/S Total		**49**	**95**	**2569**	**134**	**-15**	**24**	**1461**	**126**
Compagnies Code-Share	AS	**0**	0	1				18	0
Compagnies Code-Share	AT	**-0**	3	67		0,4		12	3
Compagnies Code-Share	AY	**4**	5	168	0	-6,4		12	12
Compagnies Code-Share	FB	**-0**	0	-1		0,1		8	
Compagnies Code-Share	HM	**5**	7	83		-6,4		14	12
Compagnies Code-Share	JL	**2**	13	83	1	0,3		177	12
Compagnies Code-Share	JU	**0**	1	21		-0,1		6	1
Compagnies Code-Share	LG	**2**	3	37			0,2	10	1
Compagnies Code-Share	LX	**0**	0	23	3		0,3	96	0
Compagnies Code-Share	MA	**1**	0	6		-0,1		21	5
Compagnies Code-Share	ME	**8**	8	128		-3,6		31	12
Compagnies Code-Share	MK	**6**	15	62		3,9		53	22
Compagnies Code-Share	MU	**1**	5	26		0,1		164	7
Compagnies Code-Share	OS	**-0**	1	26		-0,1		31	6
Compagnies Code-Share	PS	**0**	0	5		-0,1		12	2
Compagnies Code-Share	QF	**5**	6		5			9	0
Compagnies Code-Share	RO	**0**	-0	-2		0,1		30	3
Compagnies Code-Share	SB	**3**	4	107		-9,8		14	14
Compagnies Code-Share	SV	**-0**	0	-1		0,2		16	0
Compagnies Code-Share	TU	**1**	1	25		-0,0		7	2
TOTAL		**89**	**167**	**3433**	**142**	**-36**	**24**	**2202**	**240**

TABLEAU RECAPITULATIF GLOBAL

e2 = -0,7

Période

	cies	GAIN [1]	Recette Incrementale	Pax Incrémentaux [2]	CAM XX*/AF [3]	Solde BS [4]	Solde ISC/SC [5]	CAM AF [6]	dt CAM AF*/XX trunk et behind
	KL	**12**	16	437	18		1,6	85	11
SkyTeam	AM	**1**	5	30	0	0,1		70	7
SkyTeam	AZ	**6**	10	763	29		10,5	329	28
SkyTeam	CZ	**1**	4	21		0,0		20	4
SkyTeam	DL	**15**	35	458	77		8,6	590	19
SkyTeam	KE	**4**	10	60		0,7		53	19
SkyTeam	NW	**1**	2	36	2		0,2	17	4
SkyTeam	OK	**1**	1	152	3		2,2	31	6
SkyTeam	SU	**0**	1	6		0,5		60	5
S/S Total		**42**	**85**	**1963**	**130**	**1**	**23**	**1256**	**103**
AS	KQ	**0**	0	6			0,1	1	1
AS	UX	**5**	7	600	4	-16,3	0,7	204	22
S/S Total		**47**	**92**	**2569**	**134**	**-15**	**24**	**1461**	**126**
Compagnies Code-Share	AS	**0**	0	1				18	0
Compagnies Code-Share	AT	**-0**	3	67		0,4		12	3
Compagnies Code-Share	AY	**4**	5	168	0	-6,4		12	12
Compagnies Code-Share	FB	**-0**	0	-1		0,1		8	
Compagnies Code-Share	HM	**5**	7	83		-6,4		14	12
Compagnies Code-Share	JL	**1**	12	83	1	0,3		177	12
Compagnies Code-Share	JU	**0**	1	21		-0,1		6	1
Compagnies Code-Share	LG	**2**	3	37			0,2	10	1
Compagnies Code-Share	LX	**0**	0	23	3		0,3	96	0
Compagnies Code-Share	MA	**1**	0	6		-0,1		21	5
Compagnies Code-Share	ME	**8**	7	128		-3,6		31	12
Compagnies Code-Share	MK	**6**	15	62		3,9		53	22
Compagnies Code-Share	MU	**1**	5	26		0,1		164	7
Compagnies Code-Share	OS	**-0**	1	26		-0,1		31	6
Compagnies Code-Share	PS	**0**	0	5		-0,1		12	2
Compagnies Code-Share	QF	**5**	6		5			9	0
Compagnies Code-Share	RO	**0**	-0	-2		0,1		30	3
Compagnies Code-Share	SB	**3**	4	107		-9,8		14	14
Compagnies Code-Share	SV	**-0**	0	-1		0,2		16	0
Compagnies Code-Share	TU	**0**	1	25		-0,0		7	2
TOTAL		**85**	**162**	**3433**	**142**	**-36**	**24**	**2202**	**240**

H – *SkyTeam* code-share gain for *Alitalia*

Alitalia GAIN DE AZ AVEC SKYTEAM

	cies	Fréq AF+XX	Fréq AZ+XX	Ratio F AZ/AF	ASK AF+XX	ASK AZ+XX	Ratio A AZ/AF	Seats AF+XX	Seats AZ+XX	Ratio S AZ/AF	GAIN AF	GAIN F AZ	GAIN A AZ	GAIN S AZ	
	KL	456	344	0,75	15 928 923	21 454 916	1,35	25 497	21 308	0,84	13	10	18	11	
SkyTeam	AM	35	0	0,00	40 593 273	0	0,00	5 738	0	0,00	3	0	0	0	
SkyTeam	AZ/AF	1 236	1 237	1,00	52 194 982	52 247 332	1,00	67 003	67 094	1,00	19	19	19	19	
SkyTeam	CZ	12	0	0,00	18 548 748	0	0,00	1 956	0	0,00	3	0	0	0	
SkyTeam	DL	411	243	0,59	399 373 003	206 847 931	0,52	58 584	29 166	0,50	46	27	24	23	
SkyTeam	KE	28	6	0,21	42 915 474	10 121 544	0,24	4 802	1 128	0,23	14	3	3	3	
SkyTeam	NW	28	0	0,00	23 038 554	0	0,00	3 619	0	0,00	4	0	0	0	
SkyTeam	OK	134	140	1,04	7 490 394	5 881 052	0,79	8 595	7 870	0,92	2	2	1	2	
SkyTeam	SU	138	98	0,71	30 097 174	26 508 710	0,88	12 470	11 540	0,93	1	1	1	1	
S/S Total		**2 478**	**2 068**	**0,83**	**630 180 525**	**323 061 485**	**0,51**	**188 264**	**138 106**	**0,73**	**105**	**62**	**66**	**59**	
AS	KQ	6	0	0,00	4 213 944	0	0,00	648	0	0,00	1	0	0	0	
AS	UX	713	187	0,26	44 736 398	26 531 170	0,59	43 618	24 617	0,56	16	4	10	9	
S/S Total		**3 197**	**2 255**	**0,71**	**679 130 867**	**349 592 655**	**0,51**	**232 530**	**162 723**	**0,70**	**122**	**66**	**76**	**68**	Somme des Gains
												86	**63**	**86**	Ratio Global * Gain AF Global
													74		Moyenne

Notes: 1. Fréq = Frequency ie marketing flights per week. For the same operating flight, if there is a code-share agreement for that specific flight, frequencies double as there is an only operating flight but two marketing flights (AF and XX).

2. ASK = Available Seat Kilometer

3. Seats ie seats per week

4. All data relate to a typical week of IATA Winter 2007 on all operations between France/Italy and the country where the partner is based.

.

I – Engagement Relatif aux Informations Confidentielles et aux Droits d'Auteur

ENGAGEMENT RELATIF AUX INFORMATIONS CONFIDENTIELLES ET AUX DROITS D'AUTEUR

LE PRESENT ENGAGEMENT PREND EFFET A COMPTER DU PREMIER JOUR DE STAGE.

1. Je m'engage à ne pas divulguer ni communiquer à quiconque en dehors d'Air France, ni utiliser autrement que pour les affaires d'Air France, aucune information confidentielle d'Air France et notamment, sans que cette liste soit limitative, aucune information, connaissance ou documentation qu'Air France a désigné comme la sienne propre et/ou qui est relative aux procédés, techniques, produits, engineering, programmes d'Air France.

   Cet engagement demeurera valable après la fin de mon stage.

2. A mon départ de la compagnie, je m'engage à remettre à mon responsable de stage les documents d'Air France, de toute nature, qui seront en ma possession, et spécialement ceux contenant des informations confidentielles, tels que, sans que cette liste soit limitative, dessins, calques, ou copies de toute espèce, cahiers de notes, documents, rapports, ainsi que tout matériel, objet ou document qui m'auraient étés confiés ou passés en communication par Air France, ou que j'aurais pu élaborer au cours de mon activité à la compagnie.

   Je prends note que les informations et documents confidentiels reçus de tiers par Air France seront couverts par les dispositions du présent paragraphe.

3. Je m'engage à ne pas révéler à Air France, ni inciter Air France à utiliser des informations ou documents confidentiels appartenant à des tiers ou acquis au cours des stages précédents.

4. Je m'engage à respecter et à faire tout ce qui sera nécessaire pour qu'Air France puisse respecter ses obligations légales et contractuelles, relatives en particulier, mais non exclusivement, aussi bien aux droits de propriété industrielle, littéraire et artistique qu'à la protection des informations et à la sauvegarde des secrets.

5. Au cas où je serais amené à rédiger un rapport de stage ou tout autre document traitant des activités que j'aurais pu avoir ou des informations que j'aurais pu recueillir au cours de mon stage, je m'engage à soumettre le texte de ce rapport, ou tout autre document, à l'approbation de mon responsable de stage à Air France. Cette approbation pourra être soumise à la condition que soient apportées des modifications ou suppressions raisonnables. Je m'engage, en outre, à considérer le texte approuvé comme complet et définitif et à n'y apporter aucune modification ou adjonction sans l'accord exprès d'Air France.

6. Je reconnais avoir reçu un double du présent engagement qui se suffit à lui-même sans qu'il soit nécessaire pour l'interpréter de se référer à d'autres documents ou informations qui m'auraient été communiqués par un membre quelconque d'Air France.

A Paris, le 28 février 2008

Signature du stagiaire :

(Précédée de la mention manuscrite « Lu et Approuvé »)

Lu et approuvé