

Doc 9917



Caribbean/South American Regional Traffic Forecasts 2007–2027

**Report of the Seventh Meeting
of the CAR/SAM Traffic
Forecasting Group (CAR/SAM TFG)**

Rio de Janeiro, 3–7 November 2008

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SEVENTH MEETING OF THE CAR/SAM TRAFFIC FORECASTING GROUP

CAR/SAM TFG

(Rio de Janeiro, Brazil, 3–7 November 2008)



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1. INTRODUCTION

1.1 The main purpose of the Caribbean/South American (CAR/SAM) Region Traffic Forecasting Group (TFG) which was established in 1996, is to prepare forecasts for air passenger traffic and aircraft movements as well as peak period analysis, used to support the planning of air navigation services in the Region. Traffic forecasts and the analysis of peak-period planning parameters are important in anticipating where and when airspace and airport congestions may occur. It is then possible to plan for the required expansion of capacity. These forecasts also have an important role in planning the implementation of CNS/ATM systems. The primary users of the forecasts developed by the CAR/SAM TFG are expected to be Member States of ICAO, air navigation service providers in the region, and the ICAO planning and implementation regional group for CAR/SAM (GREPECAS).

1.2 The CAR/SAM TFG to date has held 7 meetings. During the last meeting, held in Rio de Janeiro from 3 to 7 November 2008, the Group developed a new set of forecasts for the six major route groups to, from and within the Region, taking into account the recent developments. The forecasts cover passenger and aircraft movements traffic. Passenger traffic forecasts are based on assumptions made for economic growth and passenger yields. Aircraft movements traffic forecasts are based on assumptions for future trends in average load factors and average aircraft seating capacity. Projections of aircraft movements traffic for the top 25 city pairs in each of the major route groups were also developed. In addition, the analysis of FIR aircraft movements traffic data including peak-period planning parameters for the airspace controlled by COCESNA was carried out. In terms of forecast period, twenty year forecasts were developed with a base year of 2007 and three target years of 2012, 2017 and 2027.

2. METHODOLOGY

2.1 Definition of Route Groups

2.1.1 Traffic to, from and within the CAR/SAM Region has previously been classified, by the Group, into the following six major route groups as defined in Appendix C:

- 1) South Atlantic
- 2) Mid-Atlantic
- 3) Intra-South America
- 4) Between South America and Central America/Caribbean
- 5) Intra-Central America/Caribbean
- 6) Between North America and South America and Central America/Caribbean

2.2 Air Passenger Forecast Methodology

2.2.1 In preparing passenger forecasts for the CAR/SAM region, the Group related air travel demand in the region primarily to economic growth of the regional economies, North America and Western European countries as measured by variations in GDP, as well as to the cost of air travel as measured by yields (gross passenger revenue divided by passenger-kilometres performed). No specific assumptions were made about various possible geo-political and economic events in the future beyond those implicit in the GDP assumptions. (GDP assumptions are discussed in Section 2.3.2)

2.2.2 The Group did a thorough review of the econometric model used at the previous meeting in 2005. The model uses real GDP and real yield to explain changes in scheduled air passenger demand among the six CAR/SAM route Groups listed above. Non-scheduled passenger traffic is not included in this forecast.

2.2.3 The Group recalibrated the previous model using updated time series and cross-sectional datasets for the period 1993 to 2007 with dummy variables applied to capture route group differences. The model proved not to be as good; therefore, the Group decided to test other scenarios that could improve the model. After estimating and evaluating several other models using the six route groups (individually and pooled), results indicated that some of the groups had very similar characteristics. Finally the Group chose a model which pooled together the similar route groups resulting in three route group combinations as follows:

- South Atlantic and Mid Atlantic
- Intra-South America and Intra Central America/Caribbean
- Between South America and Central America/Caribbean AND between North America and South America/Central America/Caribbean

2.2.4 The model, as specified below, was deemed to be the best fit of the historical data, hence it was used to obtain an equivalent air passenger traffic forecast. In producing total regional air passenger forecasts, GDP forecasts for the relevant countries in each route group, (based on Global Insight's long-term forecasts, October 2008) as well as yields forecasts (See Yields Assumptions Section) were then applied to the model. Forecasts for each route group were then revised based on differential growth patterns as observed by the Group as well as the proportion of specific route groups to the regional aggregate. Due to time constraints, only baseline forecasts were produced, the high and low case scenarios were not developed.

$$\text{LN (Passengers)} = \text{Constant} + A * \text{LN}(\text{GDP}) + B * \text{LN}(\text{Yield}) + \text{Dummy Variables}$$

In this functional form, A and B are constant coefficients which represent elasticities.

The calibration produced the following results:

$$\text{Ln (Passengers)} = -13.12 + 1.96 \ln(\text{GDP}) - 0.72 \ln(\text{Yield}) + 2.41 (D_1) + 1.89 (D_2) - 0.47 (D_3)$$

$$(R^2 = 0.98, t_{\text{GDP}} = 21.80, t_{\text{Yield}} = -3.30, t_{D1} = -20.23, t_{D2} = 18.25, t_{D3} = -5.38)$$

2.3 Aircraft Movement Forecast Methodology

2.3.1 Forecasts of aircraft movements for each route group was derived from forecasts of air passengers and assumptions about future trends in load factors and average aircraft seating capacity. The link between these variables is expressed below:

$$\begin{aligned} \text{Number of Aircraft Movements} &= \frac{\text{Number of Air Passengers}}{(\text{Passengers/Seats}) * (\text{Seats per Aircraft})} \\ &= \frac{\text{Number of Air Passengers}}{(\text{Load factors}) * (\text{Average Aircraft Seating Capacity})} \end{aligned}$$

2.3.2 The relationship between changes in the same variables can therefore be deduced to:

$$Y = X1 - X2 - X3$$

Where:

Y = Change in number of aircraft movements (%)

X1 = Change in number of air passengers (%)

X2 = Change in load factors (%)

X3 = Change in average aircraft seats (%)

2.3.3 Judgement was applied to assess whether gradual improvements in load factors could be expected from marketing initiatives and yield programs. In addition an analysis of future trends in average aircraft seating capacity was taken into account. It was assumed that historical trends of using aircraft with larger seating capacity and matching of aircraft size to demand levels will be continued by airlines over the forecast horizon. Furthermore, up to date information relating to aircraft orders and their intended use were also taken into account in these assumptions.

2.3.4 The route group aircraft movement forecasts were then allocated to each of the respective city-pairs taking into account traffic service patterns, types of aircraft, demographics and other pertinent factors.

2.3.5 The historical trends in total seats offered, average aircraft seats, average load factor as well as aircraft movements were established for each of the route groups concerned by utilizing the Traffic by Flight Stage (TFS) data compiled by ICAO.

2.3.6 For each of the major route groups concerned, a detailed city-pair traffic flow was developed using the 2007 Official Airline Guide (OAG) data provided by Back Associates as the basis. A relationship between the TFS data and the aircraft movement data from the OAG was established.

3. HISTORICAL TRENDS AND FORECAST ASSUMPTIONS

3.1 Global Trends

3.1.1 Global Economic trends

3.1.1.1 Between 1997 and 2007, the aggregate world economy measured in terms of Gross Domestic Product (GDP) grew at an average annual rate of 3.8 per cent in real terms. Growth rates varied across regions, from a high of 5.3 per cent for Asia/Pacific to a low of 2.6 percent for Europe including countries in Eastern Europe and the Commonwealth of Independent States (CIS). After recovering from a slowdown in 1998, the World economy went into another downturn in early 2001, that was amplified by the events of 11 September 2001. It showed signs of improvements in the years 2002 and 2003 before witnessing a period of expansion over the 2004-2007 period, due to the enhanced performance in industrial production, private consumption, global trade flows; all this despite sustained increases in oil prices.

3.1.1.2 World population increased at an average annual rate of 1.2 per cent between 1997 and 2007. During the same period GDP per capita grew on average by 2.6 percent per year, which is significantly lower than the growth of real GDP.

3.1.1.3 In 2008, global economic growth is expected to slowdown significantly from 4.8 percent in 2007 to 3.9 per cent. This global economic slowdown has its roots in the financial turmoil that began in the United States as a result, among other factors, of the sub-prime mortgage crisis that quickly spread to the rest of the world. The ensuing tightening of the credit market has impacted consumers and businesses negatively leading to a reduction in consumption and investment and causing businesses to cut down production and reduce staff. All world regions continue to be impacted by the crisis, albeit at varying degrees. The economies of exporting countries would be affected through the decline in demand for and the prices of commodities. The current economic slowdown is expected to continue well into 2009 and the recovery is foreseen to begin in the year 2010. Commodity prices are forecast to increase from their current lows but are not expected to return to the levels reached in 2007 and the first half of 2008. The long-term average annual growth rate of the world GDP is forecast to be around 4.0 per cent over the forecast period (2007-2027).

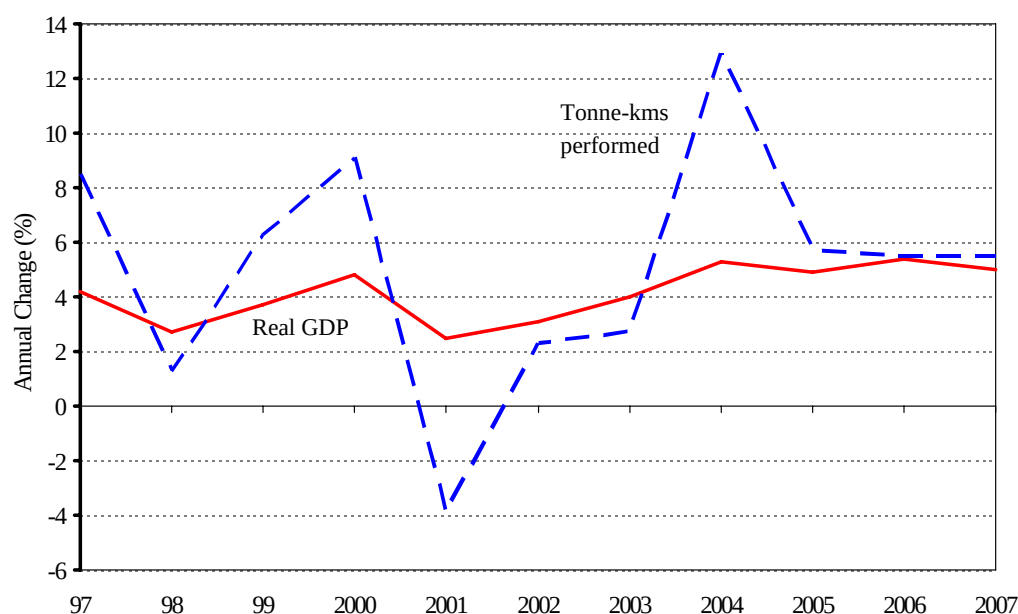
3.1.2 Global Traffic trends

3.1.2.1 Between 1997 and 2007 total scheduled airline traffic, measured in terms of passenger-kilometres performed (PKPs), grew at an average annual rate of 5.1 per cent reaching 4221 billion PKPs by 2007. As expected, the growth pattern of passenger traffic reflects that of economic growth and this linkage is illustrated in Figure 1 below. While in the mid 1990s both GDP and air traffic experienced robust growth, in 1998 they both suffered declining growth rates. Following that period, traffic expansion of 6.5 percent in 1999 and 8.6 per cent in 2000 was achieved. The events of 11 September 2001, which exacerbated the already weak economic environment significantly affected global traffic growth. While GDP grew by a moderate 2.4 per cent in 2001, air traffic growth went through a period of contraction and declined by 2.9 per cent. Following this period, traffic growth was further dampened by events such as the Iraq war in the first half of 2003 and the SARS epidemic. The world traffic rebounded in 2004 and registered 14.1 per cent growth, reflecting the strong recovery by the airlines in Asia/Pacific (the region worst affected by the SARS outbreak), improved performance of some regional economies and the sustained expansion of the Middle East economy. Global traffic continued to grow remarkably between 2005 and 2007, supported by a strong performance of the world economy, registering growth rates of 8.0, 5.8 and 6.7 per cent respectively.

3.1.2.2 In the first half of 2008, air travel demand was affected by higher fuel and commodity prices, which led to increased air fares and decline in consumer discretionary spending on leisure travel. The trend was aggravated by the fallout from the global financial crisis in the second half of the year.

FIGURE 1

**WORLD ANNUAL GROWTH IN GDP AND AIRLINE TRAFFIC
1997-2007**



3.2 Trends and Prospects for The Latin American And Caribbean Region

3.2.1 Data sources

3.2.1.1 In order to study the relationship between traffic and socio-economic trends in the Latin American and Caribbean Region, data from several sources were collected on the economies of the countries in the area. GDP historical and forecast data originate from *Global Insight*. Airline yield information was obtained from ICAO and adjusted by the CAR/SAM TFG based on the most recent information available from other sources.

3.2.2 Historical Traffic Trends of the Latin America and Caribbean Airlines

3.2.2.1 During the past decade (1997-2007), scheduled traffic of the Latin American and Caribbean region airlines, measured in terms of passenger-kilometers performed, grew at an average annual rate of about 3.3 per cent, compared to 5.1 per cent for the total world, reaching 173 billion passenger kms by 2007. Traffic growth was volatile over this period. After experiencing declining growth rates in 2001 (1 percent) and 2002 (3 percent), the region's airlines air traffic recovered in 2004 when it posted a growth of 9.6 per cent. The momentum continued into the following year with a growth of 6.4 per cent in 2005. After another decline of 0.2 per cent in 2006, traffic bounced back in 2007 supported by a better economic environment, and attained a growth rate of 9 per cent. In 2008, traffic growth is expected to remain robust with a rate somewhat close to that registered in the previous year.

3.2.2.2 It should be noted that the forecasts provided in this report were developed by major route-group and cover traffic of all airlines operating on those route groups, not only the airlines registered in the Latin American and Caribbean region.

3.2.3 Economic trends and prospects

3.2.3.1 Over the 1997-2007 period, the aggregate Latin American and Caribbean economy grew at an average annual rate of 3.1 per cent in real terms, whereas GDP per capita grew only at 1.7 per cent (a relatively lower rate compared to World GDP per capita growth of 2.6 percent for the same period).

3.2.3.2 After solid growth of 5.3 per cent in 1997, the regional economy experienced a dramatic slowdown in growth of 2.4 per cent in 1998 and further plunged to 0.4 per cent growth in 1999. The financial market setback led Brazil to introduce severe austerity measures. Other countries in the region, such as Peru, Ecuador, El Salvador, Honduras and Nicaragua, suffered from the adverse effects of repeated natural disasters which resulted in constricted output, especially due to devastation in the agricultural and industrial sectors, and consequently declining overall economic performance. While the Latin American and Caribbean Region enjoyed above average growth in the 1990s, due mainly to large capital inflows; the years 2000 and 2001 experienced relatively weak growth. The region was severely affected by the 2001 slowdown and the 2002 recession. In 2003, recovery began to take its root and as a result, GDP growth started to strengthen. During 2004, with the world's economy enjoying an impressive growth (4.8%), the Latin American and Caribbean Region also registered a robust growth rate of about 5.9 per cent. Following the strong rebound in 2004, economic growth in most countries of the region held up well in the years 2005, 2006 and 2007 with increases of 4.6, 5.5 and 5.5 per cent, respectively. The main factors underlying the growth momentum were strong commodity and raw material exports as well as broad terms-of-trade gains. Despite the demand weaknesses in North America and a decline in commodity prices, the outlook for the region remains positive; most of the economies of the region are expected to maintain a respectable pace of growth in the short-term (2008-2010). For this period, growth is forecast to reach 4.5, 4.3 and 4.5 percent, respectively.

3.2.3.3 **Table 1** below shows GDP growth rates for the major economies in the CAR/SAM region and those of other regions.

TABLE 1
GDP GROWTH RATES FOR THE REGION'S MAJOR ECONOMIES

Country/Region	GDP Growth Rate (per cent)							
	Estimate 2007	Forecast						
		2008	2009	2010	2011	Average annual growth rate		
						2007 to 2012	2012 to 2017	2007 to 2027
<u>Countries</u>								
Argentina	8.6	5.6	5.2	5.2	5.7	5.5	5.9	5.7
Brazil	5.4	5.1	4.5	4.4	3.8	4.3	3.7	3.8
Chile	5.2	3.8	4.9	5.0	4.9	4.8	5.0	4.9
Colombia	7.5	4.6	4.5	4.6	4.5	4.5	4.2	4.2
Mexico	3.2	2.6	2.9	3.6	3.9	3.4	3.9	3.6
Peru	9.0	8.4	5.9	6.1	5.7	6.3	4.8	5.0
Venezuela	8.4	7.0	6.3	6.1	5.3	5.9	4.3	4.2
<u>Regions</u>								
Latin America and Caribbean	5.5	4.5	4.3	4.5	4.3	4.4	4.3	4.2
North America	2.1	1.4	0.4	2.4	3.1	2.0	2.3	2.4
Europe	3.1	1.8	1.4	2.2	2.4	2.1	2.7	2.2
Asia-Pacific	7.4	6.2	5.9	6.3	6.1	2.0	2.3	5.5
Middle East	5.4	6.1	5.2	4.1	4.2	6.1	5.7	3.9
Africa	5.8	5.9	5.9	5.8	5.7	4.7	3.9	5.0
Total World	4.8	3.9	3.4	4.2	4.3	5.7	5.1	4.0

Note: Regional growth rates based on all the countries in the region.

Source: ICAO/Global Insight.

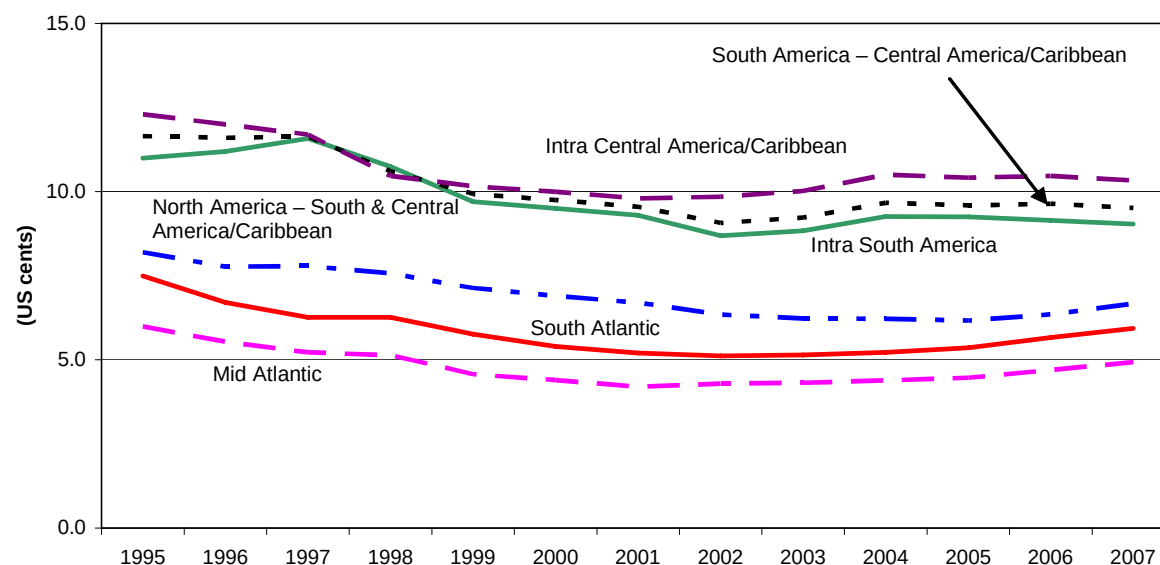
3.3 Yields trends and assumptions

3.3.1 The prospects for airline yields are closely related to cost developments and market conditions in the airline industry. Changes in fuel prices have had important effects on costs, and hence on both financial returns and airline yields, at certain times in the past. After soaring in 1999 and 2000, fuel prices declined moderately in 2001 and have risen continuously since then until July 2008 when they reached record breaking levels inflicting financial strain on the world airline industry. Since August-2008, oil prices have declined dramatically to reach levels below 50\$/barrel. It is anticipated that the substantial price hikes of 2007 and the first half of 2008 will continue to have a notable impact on the aviation industry in the short term; after which they are expected to recover and stabilize, remaining moderate between 80 and 100\$/barrel. These various cost pressures will provide a benchmark for airline yields, with revenues needing to be sufficient to cover costs over the long term.

3.3.2 **Figure 2** depicts the developments in average yields over the past decade for the six route major groups considered in this report. Overall, it shows that average yields on routes linking the CAR/SAM region to other regions are lower than those within the region. It also shows that the declining trend reversed in 2004, when yields in general started to increase. Faced with increasing fuel costs, airlines managed to increase their fares in conjunction with other productivity improvements such as higher load factors and aircraft utilization.

FIGURE 2

DEVELOPMENTS IN AVERAGE PASSENGER YIELDS (1997-2007)



3.3.3 Yields assumptions are provided in **Table 2**. Yields are expected to increase in mature markets and in markets with limited competition and to decline moderately on growing markets with increasing competition.

TABLE 2

YIELDS CHANGE ASSUMPTIONS (PER CENT)

Route Groups	2007-2012 (%)	2012-2017 (%)	2017-2027 (%)
South Atlantic	2.0	1.0	0.0
Mid-Atlantic	2.0	1.0	0.0
Intra-South America	-1.5	-1.0	-0.5
Between South America and Central America/Caribbean	-1.1	0.5	0.0
Intra-Central America/Caribbean	2.7	0.5	0.5
Between North America and South America and Central America/Caribbean	2.5	1.5	0.5

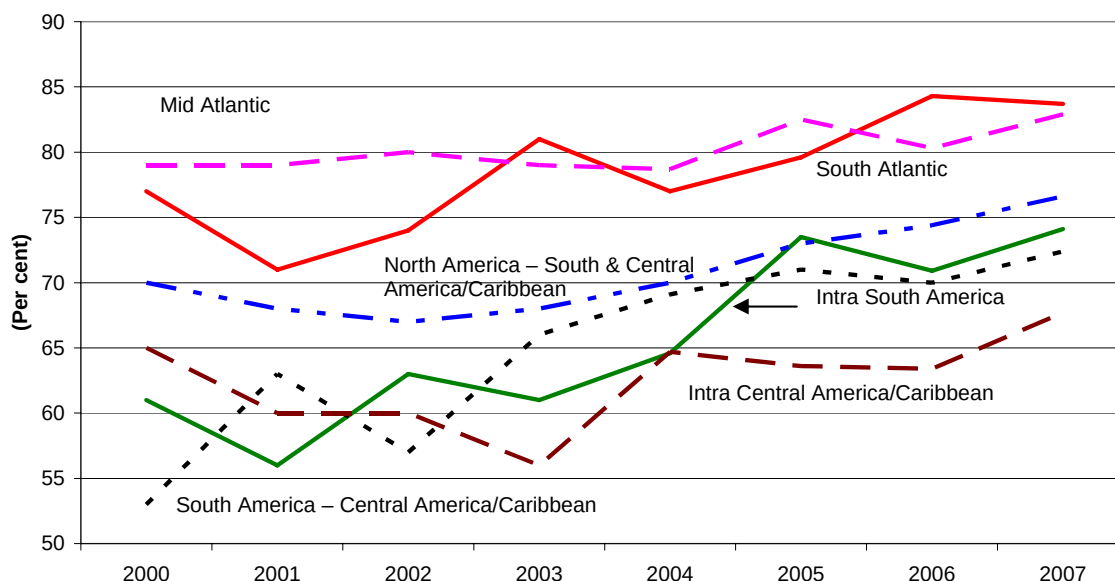
3.4 Analysis of Load Factors and Capacity

3.4.1 The projections for load factors and average aircraft seating capacity for the period up to 2027 have been developed using the approach described in the Methodology section.

3.4.2 **Figure 3** below depicts the historical load factors for the major route groups to, from and within the CAR/SAM region and shows that since the year 2000, airlines have been increasing load factors as part of their efficiency improvement strategies.

FIGURE 3

HISTORICAL LOAD FACTORS (2000-2007)



3.4.3 **Table 3** below shows the load factors. Compared to 2007 levels, load factors are projected to be significantly higher in 2027 on all route groups with the exception of the South Atlantic and Mid-Atlantic where they are anticipated to increase only marginally.

TABLE 3

ANALYSIS OF LOAD FACTORS (PER CENT)

Route Groups	Historical			Forecast		
	2000	2004	2007	2012	2017	2027
South Atlantic	77	77.0	83.7	83.7	85.0	85
Mid-Atlantic	79	78.7	82.9	82.9	85.0	85
Intra-South America	61	64.6	74.1	74.1	77.0	80
Between South America and Central America/Caribbean	53	69.1	72.4	72.4	74.8	80
Intra-Central America/Caribbean	65	64.7	67.7	67.7	71.0	78
Between North America and South America and Central America/Caribbean	70	70.0	76.6	76.6	79.3	85

3.4.4 The evolution of the average aircraft seats for each of the route groups for the period 2000-2007 and the projected average aircraft seats for the target years 2012, 2017 and 2027 are provided in **Table 4**.

TABLE 4
ANALYSIS OF CAPACITY (AVERAGE AIRCRAFT SEATS)

Route Groups	Historical			Forecast		
	2000	2004	2007	2012	2017	2027
South Atlantic	283	281	281	281	281	280
Mid-Atlantic	304	304	292	291	291	290
Intra-South America	162	160	164	168	172	180
Between South America and Central America/Caribbean	166	163	156	157	158	160
Intra-Central America/Caribbean	92	96	100	104	107	115
Between North America and South America and Central America/Caribbean	175	167	166	165	167	170

3.4.5 The average aircraft seats in 2027 are expected to vary from a low of 115 seats for the Intra Central America/Caribbean route group to a high of 290 seats for the Mid-Atlantic route group.

4 FORECASTS OF PASSENGER TRAFFIC AND AIRCRAFT MOVEMENTS FOR MAJOR ROUTE GROUPS TO, FROM AND WITHIN THE LATIN AMERICAN AND CARIBBEAN REGION

4.1 South Atlantic

4.1.1 **Table 5 a)** depicts the development of the South Atlantic traffic for selected periods between 1997-2007 and projections for traffic up to 2027. Passenger traffic grew at an average annual rate of 8.2 per cent, from some 3.4 million passengers in 1997 to about 7.5 million passengers in 2007.

4.1.2 For the period 2007-2027, passenger traffic is expected to grow at an average annual growth rate of 5.4 per cent, reaching approximately 21.5 million passengers in the year 2027.

TABLE 5 a)

	Year	Passengers (Million)	Load Factor	Average Seats
Historical	1997	3.40	74.4	287
	2003	5.30	77.0	309
	2004	6.43	76.0	339
	2005	6.77	79.6	325
	2006	6.79	84.3	286
	2007	7.46	83.7	281
Forecast	2012	9.60	83.7	281
	2017	12.12	85.0	281
	2027	21.48	85.0	280
Average Annual Growth (Per cent)	1997-2007	8.2	1.2	0.3
	2007-2012	5.2	0.0	-0.6
	2012-2017	4.8	0.3	0.0
	2007-2027	5.4	0.1	-0.2

4.1.3 The aircraft movements for the period 2007-2027 are projected to grow at an average annual growth rate of 5.5 per cent, reaching over 90 000 movements in the year 2027, as illustrated in **Table 5b).**

TABLE 5 b)

	Year	Aircraft Movements
Historic	2007	30 749*
Forecast	2012	40 805
	2017	50 732
	2027	90 252
Average Annual Growth (Per cent)	2007-2012	5.8
	2012-2017	4.5
	2007-2027	5.5

* OAG data



4.1.4 Aircraft movements forecast of the top 25 city-pairs for the South Atlantic route group are illustrated in **Table 5 c)**.

TABLE 5 c)

Rank	City Pair	Total Aircraft Movements ^{1/} 2007 ^{2/}	Total Aircraft Movements ^{1/} 2027	Average Annual Growth (Per cent) 2007-2027
1	Madrid-Buenos Aires	3 345	11 787	6.5
2	Sao Paulo(Intl) -Paris(CDG)	2 921	8 523	5.5
3	Santiago(Intl)-Madrid	1 730	5 048	5.5
4	Sao Paulo(Intl) -London(Heathrow)	1 665	5 867	6.5
5	Rio De Janeiro(Intl) -Paris(CDG)	1 559	6 033	7.0
6	Sao Paulo(Intl) -Madrid	1 543	3 721	4.5
7	Sao Paulo(Intl) -Frankfurt	1 523	3 673	4.5
8	Sao Paulo(Intl) -Milan (Malpensa)	1 284	4 969	7.0
9	Rio De Janeiro(Intl) -Madrid	1 112	2 213	3.5
10	Sao Paulo(Intl) -Lisbon	992	2 894	5.5
11	Rio De Janeiro(Intl) -Lisbon	943	3 323	6.5
12	Sao Paulo(Intl) -Johannesburg	878	3 094	6.5
13	Sao Paulo(Intl) -Amsterdam	730	1 761	4.5
14	Paris(CDG) -Buenos Aires	730	2 572	6.5
15	Rome(Fiumicino) -Buenos Aires	727	1 447	3.5
16	Sao Paulo(Intl) -Munich	726	2 118	5.5
17	Salvador -Lisbon	724	2 551	6.5
18	Lisbon-Fortaleza	723	1 744	4.5
19	Recife-Lisbon	722	2 544	6.5
20	Zurich -Sao Paulo(Intl)	676	1 221	3.0
21	Montevideo -Madrid	622	1 815	5.5
22	Natal -Lisbon	521	1 520	5.5
23	Santiago-Paris(CDG)	450	1 313	5.5
24	Milan (Malpensa) -Buenos Aires	414	1 208	5.5
25	Salvador -Madrid	348	1 116	6.0
	Total above routes	27 608	84 073	5.7
	All other routes	31 41	61 79	3.4
	TOTAL	30 749	90 252	5.5

^{1/} Both directions.

^{2/} OAG data.