Survey on standard weights of passengers and baggage

Final report

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Executive summary

Introduction

March 2008 European Aviation Safety Agency (EASA) granted NEA the service contract for the Performance of a Survey on Standard Weights of Passengers and Baggage. The aim of the survey was to conduct a Pan-European survey of the current weights of passengers, carry-on luggage and checked baggage.

The 2008-2009 EASA Survey on Standard Weights of Passengers and Baggage has been carried out according to requirements laid down in the contract. The total number of observations for passengers is 22,901 and 22,353 for checked baggage (see Table 0.1).

Table 0.1 Net number of observations

	Total net number of observations in survey
All Passengers	22,901
Checked baggage	22,353

Source: NEA

Conclusions

The 2008 – 2009 EASA survey on Standard Weights of Passengers and Baggage gives mass values of passengers, carry-on luggage and checked baggage.

The survey set-up proved to be an effective way to build a data-set on passenger, carry-on luggage and checked baggage mass values on European flights that enabled statistically sound analyses of factors influencing these mass values and comparison with the current EU safety regulations in place.

The results of the analyses can be used for revisions of the currently applicable regulations on standard masses. Comparisons show that the masses derived from the survey are higher than currently incorporated in EU safety regulations on standard masses for male passengers, female passengers, all adults, carry-on luggage and checked baggage.

The correlations with the following factors have been analysed:

- *Passenger characteristics*: age, gender;
- *Passenger behavioural characteristics*: carrying an infant, carrying carry-on luggage, travelling by purpose (business or leisure);
- *Place and time of the measurements*: airport (eight airports were selected) season (Summer or Winter);
- *Trip characteristics*: direction (outbound or inbound), route type (domestic, European and non-European), region of departure or arrival (fourteen regions have been distinguished), and class of travel (economy, business or first);
- *Flight characteristics*: flight type (scheduled or not-scheduled), airline type (regular scheduled, charter or low cost) and airline policies concerning maximum of baggage mass.

The analyses show that passenger characteristics (gender, age, purpose of trip) have the most influence on passenger mass. The factor 'gender' shows the strongest correlation with passenger mass.

Recommended standard masses for updating EU safety regulations and further research

The recommended standard mass values for male, female, adult passengers and checked baggage are presented in Table 0.2. Separate standard masses for male and female adults are recommended. The recommended male/female ratio is 70/30. For carry-on luggage masses it is recommended to include this mass in a value for passenger + carry-on luggage. The recommended standard mass for checked baggage is 17 kg.

Table 0.2 Recommended standard masses for updating EU safety regulations*

Passenger seats:	*20 and more*		*30 and more*	
Passengers	*Male*	*Female*	*M/F ratio*	*All adult*
All flights	94 kg	75 kg	70/30	88 kg
Checked baggage				
All flights	17 kg	17 kg	n.a.	17 kg

Source: NEA

* The standard masses include hand baggage and the mass of any infant below two years of age carried by an adult on one passenger seat.

Determination of a standard mass for children is a remaining issue because the required accuracy was not reached. This is due to the fact that the weight of humans typically increases strongly between 2 and 12 years. In order to determine a new statistical standard mass for children, it is recommended to perform an additional survey with special focus on children.

Based on the outcomes of the survey, it is recommended to perform a full new survey in 10 years time in order to update the dataset. It is not recommended to apply general weight development data on the exisiting dataset to update standard mass values because of differences in the survey purposes and designs (sampling frames, age of population surveyed etc.).

1 Introduction

1.1 Project Aim

In March, 2008 the Euopean Aviation Safety Agency (EASA) granted NEA the service contract for the Performance of a Survey on Standard Weights of Passengers and Baggage. The aim of the survey was to conduct a Pan-European survey of the current weights of passengers, carry-on luggage and checked baggage. As initially defined by the JAA SWWG[1] the objective was to ascertain a set of weights of passengers, hand and checked baggage for use of aircraft mass and balance upon statistical principles and to investigate, identify and advise on the circumstances in which weights may be inapplicable and require a separate analysis.

The results of this project will be considered for an update of the standard mass tables used by European airlines.

A further aim was to identify and assess the various factors that have influenced the change of passengers and baggage weights and their impact on the standard mass values. The project will also contribute to identifying statistical principles to further review standard mass values on a regular basis.

1.2 Background

The JAA SWWG report dated the 31st of October, 2006 states that a number of factors have changed since the standard mass values were determined. One of the optional recommendations of the report was to use health survey data to update the passenger standard masses and a weight survey for bags. “Health data presents the advantage of being available from various European countries. … Health survey data also has the advantage that it is available every year so that it would be possible to conduct a review of standard weights at regular intervals so that they never become invalid.”

In this paragraph an overview is given of desk research on the weight development of people and the effect this might have on the weight and balance of an airplane.

1.2.1 Trend analysis on weight development

Global trends

Globally, there are more than 1 billion overweight adults. According to the US Federal Centres for Disease Control and Prevention, a solid majority of 65% of Americans were overweight in 2006. The average American man grew from 75,30 kg (166 pounds) in 1960 to 86,64 kg (191 pounds) in 2002, while the

[1] JAA SWWG: Standard Weights Working Group of the Joint Aviation Authorities

average women's weight rose from 63.5 kg (160 pounds) to over 74 kg (164 pounds).[2]

The new federal guidelines, which came into effect in the US on August 11th, 2005, mean that female passengers with carry-on baggage will be counted as weighing 81 kg (179 pounds) in the Summer months, which is an increase of almost 16 kg (35 pounds), and almost 83.5 kg (184 pounds) in the Winter, which is a gain of more than 15 kg (34 pounds), with the average weight for male passengers with carry-on bags rising to almost 91 kg (200 pounds) in the Summer and 93 kg (205 pounds) in the Winter. Both increases are of almost 7 kg (15 pounds). In addition, youngsters aged between 2 and 13 years old will be calculated at 37 kg (82 pounds) in the Summer and almost 39.5 kg (87 pounds) in the Winter. The increase in weight takes into account the fact that recent research in the US has revealed that passenger's body weight has increased and clothing is generally heavier in the Winter months.[3]

About 17.6 million children under five years of age worldwide are estimated to be overweight. According to the US Surgeon General, in the US the number of overweight children has doubled and the number of overweight adolescents has trebled since 1980.[4]

Increased consumption of more energy-dense, nutrient-poor foods with high levels of sugar and saturated fats, combined with reduced physical activity, have led to overweight and obesity rates that have risen three-fold or more since 1980 in some areas of North America, the United Kingdom, Eastern Europe, the Middle East, the Pacific Islands, Australia and China. Overweight is commonly assessed by using body mass index (BMI). The BMI for overweight is over 25. This development is not restricted to industrialised societies; this increase is often faster in developing countries than in the developed world. In addition to this, both adults and children from lower socio-economic groups are found to be less physically active than those of a higher socio-economic status.[5]

European trends

Data on weight development in Europe usually are taken from national health surveys. Because of differences in the survey designs (sampling frames, age of population surveyed etc.) the results are difficult to compare. Truly comparable data are available from the results of single Pan-European studies; the most recent study that includes the prevalence of overweight and obesity is the WHO MONICA project. The latest results of this project showed that in the mid-1990's between 8% (Moscow, Russia) and 24% (Kuopio Province, Finland and rural Augsburg, Germany) of men aged between 35 to 64 were obese. For women aged between 35 to 64, between 10% (Toulouse in France, Gothenburg in

[2] Lehigh University; http://www3.lehigh.edu/News/V2news_story.asp?iNewsID=1765
[3] New regulations result in increased average weight of passengers and luggage on US airlines, Airline Industry Information- (C)1997-2005 M2 Communications Limited, 2005
[4] World Health Organization, Global Strategy on Diet, Physical Activity and Health, Factsheet 2003
[5] World Health Organization, Global Strategy on Diet, Physical Activity and Health, Factsheet 2003

Sweden, and Vaud/Fribourg in Switzerland) and 36% (Tanobrzeg Vovoidship, Poland) were obese.[6]

Recent WHO estimates (based on national survey data) suggest that the prevalence of obesity in men aged 15 and above ranges from 5% in Uzbekistan to 26% in Greece, and the prevalence in women ranges from 6% in Norway to 30% in Turkey. There does not appear to be any clear geographical pattern to the variation in the prevalence of obesity in either men or women.

Overweight affects 30-80% of adults in the countries of the WHO European Region. And about 20% of children and adolescents are overweight.[7]
Although the numbers of those overweight are rising everywhere, The *world health report 2002* revealed that Europe now has one of the highest average BMI of all WHO regions - nearly 26.5. According to the most recent data on nationally representative samples from different countries in the European Region, the prevalence of obesity (BMI over 30) ranges from 5% to 20% in men and up to 30% in women. Research also shows a rapid closing of the gap in prevalence between the Western and Eastern parts of the Region. Currently almost 400 million adults in the Region are estimated to be overweight and about 130 million are estimated to be obese.[8]

The increase of weight is very profound amongst children. In France, for example, the prevalence of childhood overweight and obesity increased from 3% in 1960 to 16% in 2000. In Poland the prevalence increased from 8% to 18% between 1994 and 2000, while Hungary reports 20% of children aged 11-14 years are obese.[9] Amongst primary school-aged children (both sexes), the highest prevalence rates of overweight were in Portugal (7-9 years, 32%), Spain (2-9 years, 31%) and Italy (6-11 years, 27%); the lowest rates were in Germany (5-6 years, 13%), Cyprus (2-6 years, 14% and Serbia and Montenegro (6-10 years, 15%).[10]

1.2.2 Causes of weight developments

As incomes rise and populations become more urban, diets high in complex carbohydrates give way to more varied diets with a higher proportion of fats, saturated fats and sugars. At the same time, large shifts towards less physically demanding work have been observed worldwide. A more sedentary lifestyle due to the rise in welfare is one obvious cause for the increase of weight. Most of our daily living environments, including transport, housing, employment, school and some leisure settings, have become less conductive to physical activity.

[6] http://www.heartstats.org/datapage.asp?id=4745; Prevalence of and trends in overweight and obesity in Europe, British Heart Foundation Statistics Website, August 4, 2008
[7] World Health Organization, The challenge of obesity in the WHO European Region and the strategies for response. Summary, 2007
[8] World Health Organization Europe, Fact sheet EURO13/05, Copenhagen, Bucharest, 12 September 2005
[9] World Health Organization Europe, Fact sheet EURO13/05, Copenhagen, Bucharest, 12 September 2005
[10] World Health Organization, The challenge of obesity in the WHO European Region and the strategies for response. Summary, 2007

Consequently, the overall trend is towards considerably lower levels of total physical activity.[11] Combine this with the (regular) consumption of (too much) fast food and the increase of weight is obvious.

Physical inactivity also seems to be a growing problem during childhood due to the societal changes described below:

1 **Transport sector**: In most Western European countries, the steeply growing demand for mobility over several decades has been satisfied mainly through the increased use of private cars. Similar patterns have been observed in recent years in the Eastern part of the Region. In addition, barriers such as a real or perceived level of safety associated with physically active forms of transport such as walking or cycling have prevented people from integrating these forms of activity into their lifestyle
2 **Urban planning and the housing environment**: The distances travelled have increased over the last decades because of the geographical separation of living, working, shopping and leisure activities. Technical developments such as elevators and devices that make household chores less physically demanding have also influenced opportunities for physical activity in the local environment
3 **Occupational settings**: A large proportion of employees now spend most of their working time sitting with little or no physical activity. This is partly because the service sector has expanded continuously in most countries, at the expense of the agricultural and industrial sectors
4 **School settings**: Children spend more time in institutions than ever before
5 **Leisure time and sport**: The way people spend leisure time is subject to changing trends. Especially children and adolescents are very much attracted by screen-based activities (i.e. computer games)

1.2.3 Forecast (future trends)

The past and future trend developments strike out the profound changes in society and in behavioural patterns of communities over recent decades. Societal changes and worldwide nutrition transitions are driving the increase of weight development. Economic growth, modernisation, urbanisation and globalisation of food markets are just some of the forces thought to underlie the future weight development. The number of overweight people (both adults and children) will only rise and the total number of overweight people is expected to increase rapidly.

The prevalence of obesity has risen three-fold or more in many European countries since the 1980's. If prevalence continues to increase at the same rate as in the 1990's, it is estimated that about 150 million adults in the Region will be obese by 2010. This means that over a period of five years there will be 20 million more obese people and that is four million more per year. The figures show a clear upward trend, even in countries with traditionally low rates of overweight and obesity, such as France, the Netherlands and Norway. Furthermore, while the prevalence in the European Region is expected to rise by

[11] World Health Organization, Steps to health. A European Framework to promote Physical Activity for Health, 2007

an average of 2.4% in women and 2.2% in men, some countries might show a faster increase, such as Finland, Germany, Greece, Sweden and the United Kingdom for men and Georgia, the Republic of Moldova, Slovakia, an Tajikistan for women.

The increase of overweight amongst children and adolescents has accelerated in recent years: according to the International Obesity Task Force, the annual increase in prevalence of around 0.2% during the 1970's rose to 0.6% during the 1980's and to 0.8% in the early 1990's. In some cases it reached as high as 2.0% by the turn of the millenium.[12] The International Obesity Task Force predicts that about 38% of school-aged children in the WHO European Region will be overweight by 2010, and that more than a quarter of these children will be obese.[13]

1.2.4 Impact of weight on air transport operations

In 1994 an average weight was set in Europe of 83 kg (185 pounds) for each passenger and their carry-on luggage. SAS undertook a study that revealed that the average passenger weight was actually 3 kg (6.6 pounds) heavier. This discovery by SAS is higher than the industry standard weight that was set about thirteen years ago.[14]

In the US, most airlines have assumed a weight of 81.65 kg (80 pounds) for each adult passenger in the Summer months and 83.91 kg (185 pounds) in the Winter months; checked baggage are assumed to weigh 11.34 kg (25 pounds) each, since 1994 up to 2003. Whereas 1994 was up until then the most recent year in which statistics from the US Federal Centres for Disease Control had been available.

Following the crash of commuter US Airways Express Flight 5481 (type Beech 1900D) on January 8, 2003, at Charlotte-Douglas Airport in North Carolina, the US Federal Aviation Administration (FAA) and the National Transport Safety Board (NTSB) conducted surveys. In some surveys it was found that passengers – once clothing and personal items were factored in – weighed an average of 9.36 kg (20.63 pounds) more than assumed; carry-on baggage weighed 2.59 kg extra (5.72 pounds); and checked baggage, 1.73 kg (3.81 pounds), a total of 13.68 kg (30.16 pounds) more than the assumed average.
EU-OPS Subpart J establishes requirements for mass and balance of aircraft, including standard mass values to be used for crew, passengers and baggage. On this issue, the Standard Weights Working Group of the Joint Aviation Authorities (JAA SWWG) has submitted a report on October 31st, 2006, which has been communicated to EASA following the agreement signed between the Agency and the JAA. This report states that a number of factors have changed since the standard mass values were determined and includes recommendations for a Pan-European survey to be conducted.

[12] World Health Organization Europe, Fact sheet EURO13/05, Copenhagen, Bucharest, 12 September 2005
[13] World Health Organization, The challenge of obesity in the WHO European Region and the strategies for response. Summary, 2007
[14] A Weighty Issue, Access Intelligence, LLC, 2006

According to the JAA SWWG report, health statistics data and airline survey data from a number of countries have shown that body masses have grown steadily. The JAA report gives the example of the UK Office of National Statistics http://www.statistcs.gov.uk/. In addition, the report also states there is a strong anecdotal evidence that passengers are carrying heavier bags into the cabin. Furthermore, the luggage charging policies applied in scheduled or charter flights may have an influence in the baggage repartition between cargo hold and cabin.

The effect of weight changes on the weight and balance of an airplane varies. Especially small planes are more weight-sensitive. Adjusted weight requirements could have an impact on the profitability of flights. Mostly on smaller planes, cargo might have to be left behind or some seats unsold, which will hurt sales. According to a Canadian study, passengers account for only 9% of the total weight of a Boeing 747, but 22% of a ten-passenger commuter plane.[15]

The weight of checked baggage is a separate issue on small (commuter) planes, where the cargo hold is often behind the passengers, not below them, and thus not only affects the total weight of the plane, but also the centre of gravity. If the centre of gravity is too far back, the pilots may be unable to control the plane's pitch.

However, an increase in passenger weights would also impact the larger aircraft as a result of record load factors. A 4.5 kg increase in passenger weights would mean that a 160-seater, such as a A320, would be forced to fly with eight passengers less on range-limited flights. Long-haul flights using wide bodies have greater margins, but at the extreme of range, higher passenger weights with high load factors may have an appreciable impact on performance and therefore also on potential profitability.

A comparison of various aircraft types indicates that the ratio of passenger weight to overall aircraft weight is inversely proportional to the size of the aircraft. For example, in a Boeing 747, the passenger weight represents approximately 9% of the aircraft's weight (450 passengers at 85.28 kg (188 pounds), aircraft of 396,893 kg (875,000 pounds)) whereas the passenger weight in a Caravan can represent approximately 22% (ten passengers at 85.28 kg, aircraft of 3,878 kg (8,550 pounds)). For aircraft under 5,670 kg (12,500 pounds), there can be significant deviations from the published standard passenger weights due to the small sample size (nine passengers or fewer). This deviation error is further amplified in small aircraft due to the higher percentage of total aircraft weight that the passengers represent. If a small aircraft is being loaded to maximum gross weight, this discrepancy in passenger weight could result in an overweight condition that adversely affects the safety of flight. For example, stall speeds increase with increased aircraft weight; if the pilot is unaware of this change to aircraft performance, the reference speeds used for critical phases of flight will be incorrect.[16]

[15] Lehigh University; http://www3.lehigh.edu/News/V2news_story.asp?iNewsID=1765
[16] Lehigh University; http://www3.lehigh.edu/News/V2news_story.asp?iNewsID=1765

According to an expert article[17], some carriers (commonly referred to as low cost carriers) have baggage policies that differ from the policies of 'traditional flag carriers' and charge a fee for checked baggage. This might lead to the situation that passengers carry more carry-on luggage and less checked baggage. As a result, the weight and balance of the airplane will be different than assumed in current EU safety regulations.

Conclusions of desk research on weight development

- Recent worldwide research has revealed that passenger's body mass has increased and clothing is generally heavier in the Winter months. Research shows a clear upward trend, even in countries with traditionally lower rates of overweight and obesity.
- The increase of overweight amongst children and adolescents has accelerated in recent years. In the US the number of overweight children has doubled and the number of overweight adolescents has trebled since 1980. According to the most recent data on nationally representative samples from different countries in the European Region, the prevalence of obesity (BMI over 30) ranges from 5% to 20% in men and up to 30% in women.
- Causes for the increase of weight are increased consumption of more energy-dense, nutrient-poor foods with higher levels of sugar and saturated fats, combined with reduced physical activity (more sedentary lifestyle due to the rise in welfare), have led to overweight and obesity rates that have risen three-fold or more all over the world since 1980. Mean masses of adult passengers will probably be higher than currently taken into account in EU safety regulations.
- The effect of weight changes on the weight and balance of an airplane varies. Especially small planes are more weight-sensitive, but an increase in passenger weight would also impact the larger aircraft as a result of record load factors.

1.2.5 Diffusion and flexibility in application of definitions in the air travel market

The air travel market has changed significantly in the past decades and is now characterized by diffusion and flexibility in the application of definitions. In the current European (EU) safety regulations, holiday charter means a charter flight solely intended as an element of a holiday travel package. In recent years charter carriers have started to sell seat-only tickets on charter flights. In one charter flight, a combination can be found of passengers with a ticket as part of a holiday package and seat-only ticket. New operators that use different travel policies, allowances and conditions compared to the traditional flag carriers have entered the market. These operators are commonly referred to as 'low-cost carriers', but lack a formal definition. In addition, some of these operators provide both scheduled flights and charter flights. Some of these operators charge a fee for each piece of checked baggage and do not impose a weight restriction on carry-on luggage. These differences are relevant because they influence passenger behaviour. Also, these flights have become eligible for

[17] A Weighty Issue, Access Intelligence, LLC, 2006

business trips. This means that an assumption that only ‘holiday’ passengers can be found on low-cost carriers does not hold true. Furthermore, the traditionally so-called ‘charter airlines’ or ‘holiday flights’, also operate regular scheduled flights (e.g. Transavia.com).

1.3 Report structure

Chapter 2 explains the methodology of the survey.
Chapter 3 elaborates on the response of the survey.
Chapter 4 gives an overview of the results of the survey.
Chapter 5 presents the conclusions and recommendations of the survey and identifies the remaining issues.

The Annexes

2 Methodology of the survey

2.1 Introduction

This chapter describes the principles and approach of the survey and gives a description of analyses and statistical principles applied in the survey.

The principles and approach of the survey are based on requirements stated in the EU OPS regarding weight surveys. These requirements refer to:

- The sample size, based on a relative confidence rate (accuracy) and determined by previous surveys and a pilot survey. The required sample size is presented in paragraph 2.2.4.
- Division of Europe in eight different regions, in accordance with the JAA SWWG. The division is presented in paragraph 2.2.2.

2.2 Principles and approach of the survey

2.2.1 General set-up of the survey

The aim of the survey was to conduct a Pan-European survey of the current weights of passengers, carry-on luggage and checked baggage. The general set-up was to carry out a survey at different airports in Europe, representing different regions during the Summer and the Winter. The regional division and selection process of airports is presented in the next paragraph. In each period (Summer and Winter) surveys have been performed at each selected airport. All individual airport measurements lasted one working week (Monday until Friday), except for the pilot/Summer survey at Athens International Airport, which was spread over two periods during the Summer of 2008.

All preparations and practical arrangements were agreed upon with the airport authorities in preparatory meetings and were supported by them during execution. During these preparatory meetings the possible weighing locations were evaluated and the best were selected based on passenger flow volumes and characteristics and available physical space to set up the equipment. The locations on the air side had to be situated after the (main) shopping areas to maximize the probability that the passenger is weighed with all the items purchased in the tax free shops.

Each survey was carried out by a team consisting of two NEA consultants and a flexible number of local staff recruited through staffing agencies that provide temporary staff for work at the airport on a regular basis. The temporary staff members were not employed by the airport.

Depending on the physical characteristics of the airport, passenger flow volumes and characteristics and security policies, the survey teams worked together as either one team or two separate teams.

Depending on the type of location the following weights were measured:

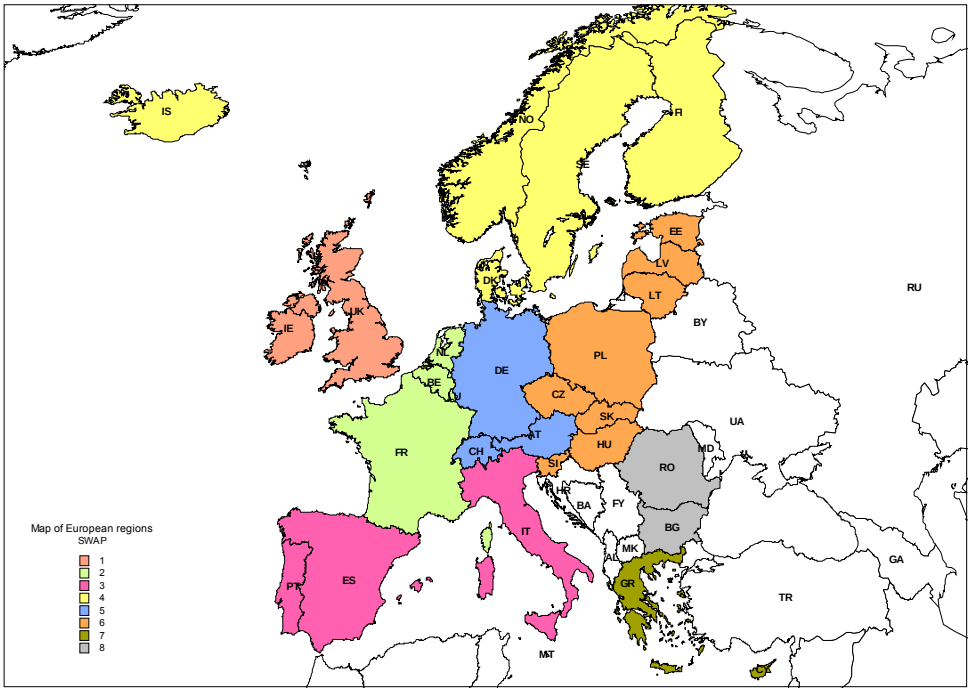
- Land side inbound: checked baggage, and if possible, passenger and carry-on luggage
- Land side outbound: only checked baggage
- Air side (inbound and outbound): only passenger and carry-on luggage

2.2.2 Regional division and selection of airports

Regional division

Europe has been divided into eight regions, in accordance with the JAA SWWG, see Figure 2.1. The regions were composed by their communality of population weight and length and only include 'EASA countries'. Data collected in each region is representative for the whole region.

Figure 2.1 Regional division of Europe



Source: NEA

Airport selection

For each region one airport was selected where the weighing took place. This selection was made according to the following criteria:

- The passenger throughput should be large enough to enable the fieldworkers to weigh a sufficient amount of passengers and baggage.
- There should be variability in the factors that possibly influence passenger and baggage weight. This means the airport should serve both European and

non-European arrivals and have both scheduled and non-scheduled flights. Preferably there should also be a low-cost airline operating at the airport.
- The airport itself should be cooperative and a safe working environment.

The selected airports per region are presented in Table 2-1.

Table 2-1 Regions and selected airports representing the regions

	Region	*Airport*
1	UK and Ireland	London Gatwick Airport (LGW)
2	Benelux and France	Amsterdam Schiphol Airport (AMS)
3	Spain, Portugal and Italy	Madrid Barajas Airport (MAD)
4	Scandinavia, Finland and Iceland	Copenhagen Airport Kastrup (CPH)
5	Germany, Switzerland and Austria	Frankfurt Airport (FRA)
6	Estonia, Latvia, Lithuania, Czech Republic, Slovakia, Poland, Slovenia, Hungary	Warsaw Frederic Chopin Airport (WAW)
7	Greece, Cyprus and Malta	Athens International Airport (ATH)
8	Romania and Bulgaria	Sofia Airport (SOF)

Source: NEA

The selection process per region is described below. The 2006 Eurostat air passenger traffic data was used, unless noted otherwise. IATA airport codes are used in the tables.

Region 1: UK and Ireland

Candidate airports are: London Heathrow (LHR), London Gatwick (LGW), London Stansted (STN), Manchester (MAN), Dublin (DUB). Please see Table 2-2 for details.

Table 2-2 Region 1: UK, Ireland

Airport	*Pass. (mln)*	*Intra-EU*	*Extra-EU*	*Domestic*	*Non-scheduled*
LHR	67.72	36%	55%	9%	0%
LGW	34.25	52%	35%	12%	27%
STN	23.69	82%	6%	11%	4%
MAN	22.75	55%	28%	17%	38%
DUB	21.27	86%	9%	6%	9%

Source: NEA

Disregarded are:
LHR (lack of non-scheduled flights)
STN (lack of non-scheduled flights)
DUB (lack of extra-EU passengers).

The final choice was between LGW and MAN. LGW was selected as it is the larger airport of the two, and because low-cost airline EasyJet operates from there. LGW responded positively to our request to participate.

Region 2: Benelux and France

Airports studied were: Brussels (BRU), Paris Charles de Gaulle (CDG), Paris Orly (ORY), Schiphol (AMS). Please see Table 2-3 for details.

Table 2-3 Region 2: Benelux and France

Airport	*Pass. (mln)*	*Intra-EU*	*Extra-EU*	*Domestic*	*Non-scheduled*
BRU	16.74	70%	30%	0%	18%
CDG	56.45	42%	49%	9%	5%
ORY	25.60	19%	20%	61%	4%
AMS	46.13	57%	43%	0%	9%

Source: NEA

Disregarded are:
CDG (different airport for budget airlines)
ORY (different airport for budget airlines).

Paris has a separate airport for budget airlines, it is physically rather difficult and time-consuming to switch from one airport to the other in a limited period of time available to perform the survey. That left two options: BRU and AMS. The latter is the larger of the two and has an excellent variety of passengers. Also, the low-cost carrier Transavia.com operates from AMS. As NEA is located in the Netherlands, we could perform the AMS survey ‘out of home’.

Region 3: Spain, Portugal and Italy

Airports studied were: Madrid (MAD), Milan (MXP), Rome (FCO), Barcelona (BCN). Please refer to Table 2-4 for details.

Table 2-4 Region 3: Spain, Portugal and Italy

Airport	*Pass. (mln)*	*Intra-EU*	*Extra-EU*	*Domestic*	*Non-scheduled*
MAD	44.93	32%	22%	46%	3%
MXP	21.90	46%	37%	17%	9%
FCO	30.33	37%	22%	42%	4%
BCN	29.69	42%	9%	49%	4%

Source: NEA

Disregarded are:
MXP (different airport for budget airlines)
FCO (different airport for budget airlines)
BCN (lack of extra-EU passengers).

Because Milan and Rome have different airports for budget airlines, they are less attractive for the survey. Even though MAD has a relatively high number of domestic passengers, the airport is large enough to be able to find a sufficient variety of passengers. It is also a hub for the low-cost airline EasyJet. Because of this, MAD was our primary choice for this region. MAD reacted positively and was willing to cooperate.

Region 4: Scandinavia

Airports studied were: Stockholm (ARN), Helsinki (HEL), Copenhagen (CPH), Oslo (OSL). Please refer to Table 2-5 for details.

Table 2-5 Region 4: Scandinavia

Airport	*Pass. (mln)*	*Intra-EU*	*Extra-EU*	*Domestic*	*Non-scheduled*
ARN	17.80	51%	19%	30%	0%
HEL	12.01	59%	17%	24%	9%
CPH	20.85	64%	28%	8%	7%
OSL	~17	n/a	n/a	n/a	n/a

Source: NEA

Disregarded is ARN (lack of non-scheduled flights)

HEL, CPH and OSL were all considered to be appropriate weighing sites. Eurostat has no detailed data on OSL, but it handles about 17 million passengers a year and is used by various airlines (domestic, international, scheduled and non-scheduled).

As the low-cost airline Sterling Airlines uses CPH as its hub and due to the fact that CPH is the largest airport of the three, we requested CPH to participate. CPH agreed to cooperate.

Region 5: Germany, Switzerland and Austria

Airports studied were: Berlin (TXL), Cologne (CGN), Düsseldorf (DUS), Frankfurt (FRA), Hamburg (HAM), Hannover (HAJ), Munich (MUC) and Stuttgart (STR). Please see Table 2-6 for details.

Table 2-6 Region 5: Germany, Switzerland and Austria

Airport	*Pass. (mln)*	*Intra-EU*	*Extra-EU*	*Domestic*	*Non-scheduled*
TXL	11.84	39%	13%	48%	3%
CGN	9.98	49%	15%	36%	6%
DUS	16.62	50%	27%	23%	7%
FRA	53.13	37%	50%	13%	1%
HAM	12.01	42%	16%	42%	4%
HAJ	5.73	52%	26%	22%	11%
MUC	30.80	43%	26%	31%	2%
STR	10.16	49%	19%	31%	9%

Source: NEA

None of the German airports were immediately disregarded, but we preferred to conduct the survey at one of the two largest airports in Germany, MUC or FRA. Following advice from the EASA, MUC was approached. Unfortunately, they refused to cooperate without separate permission and/or request on behalf of the airlines operating at Munich Airport. FRA reacted positively to our request and participated in the survey.

Region 6: Baltic states, Poland, Czech Republic, Slovakia, Hungary and Slovenia

Airports studied were: Warsaw (WAW), Prague (PRG), Ljubljana (LJU) and Budapest (BUD). Please refer to Table 2-7 for details.

Table 2-7 Region 6: Baltic states, Poland, Czech Republic, Slovakia, Hungary and Slovenia

Airport	*Pass. (mln)*	*Intra-EU*	*Extra-EU*	*Domestic*	*Non-scheduled*
WAW	8.12	66%	23%	12%	7%
PRG	11.54	72%	27%	1%	15%
LJU	1.55	66%	34%	0%	86%
BUD	8.25	73%	27%	0%	7%

Source: NEA

Disregarded is LJU (lack of scheduled flights)

Region 7: Greece, Cyprus, Malta

Airports studied: Athens (ATH). See Table 2-8 for details.

Table 2-8 Region 7: Greece, Cyprus and Malta

Airport	*Pass. (mln)*	*Intra-EU*	*Extra-EU*	*Domestic*	*Non-scheduled*
ATH	15.07	46%	17%	36%	3%

Source: NEA

ATH was selected because it is the only large international airport in the region. ATH also participated as pilot airport for the survey.

Region 8: Romania and Bulgaria

Airports studied were: Bucharest (OTP) and Sofia (SOF). Please refer toTable 2-9 for details.

Table 2-9 Region 8: Romania and Bulgaria

Airport	*Pass. (mln)*	*Intra-EU*	*Extra-EU*	*Domestic*	*Non-scheduled*
OTP	3.51	n/a	n/a	9%	5%
SOF*	2.75	n/a	n/a	n/a	n/a

** Data for SOF has been taken from the website of Sofia Airport and concerns the year 2007.*
Source: NEA

Sofia was selected based on the positive response in the survey preparations.

2.2.3 Field work process

The weighing team at each airport consisted of two NEA consultants and locally hired temporary staff members.

Instructions for performing the survey

- The *required sample size* is 1,000 passengers plus carry-on luggage AND 1,000 pieces of checked baggage. Allowing for mistakes and data entry errors, the aim is to oversample both figures by at least 10%.
- The *sampling should take place randomly.* It is important to be at a busy location with a steady flow of preferably highly diversified travellers/destinations.
- *Participation is strictly voluntary*.
- The survey is *anonymous*: no personal data will be collected. The aim is to collect *statistics*.
- The *inbound passengers* (arriving passengers) and their *checked baggage* were weighed at the (exit of the) baggage reclaim area.
- The *outbound passengers* (departing passengers) were weighed as close to the gates as possible, just before entering the airplane. This was done to

ensure that tax-free items purchased at the airport, were included in the recorded mass.

- The *checked baggage of outbound passengers* was weighed near the check-in counters.
- A *transfer passenger* is recorded as 'outbound passenger' in case the passenger and carry-on luggage were being weighed close to the gates. *Checked baggage of a transfer passenger* is marked as 'outbound' in case it was being weighed near the check-in counters (if the passenger had to check it in again). A transfer passenger is treated as 'inbound passenger' when he participated in the survey at the baggage reclaim area.

A full overview of the weighing process can be found in Annex A.

2.2.4 Required sample size

A way to determine the required sample size is stipulated in Appendix 1 to JAR-OPS 1.620(g) Paragraph (a)(2)(ii)(A). It stipulates that a minimum of 2,000 passengers of each gender must be weighed in order to establish separate notional weights for males and females. The minimum number of passengers is not necessary for every route sampled. Routes showing similar characteristics may be combined and the investigation of differing factors affecting passenger masses may allow a similar combination of routes. Similarly, a minimum of 2,000 pieces of hand/carry-on baggage and 2,000 pieces of hold/checked baggage in each of the route categories (e.g. domestic/short-haul, European/medium haul and intercontinental/long haul).

The required sample size for a survey can be determined by using data from an existing survey report or on the basis of a pilot survey. For this survey used both ways were used to determine the required sample size. The required sample size is based on a relative confidence rate (accuracy) of 1% for all adult passengers and 2% for all sub-categories of the survey (examples of these sub-categories are male passengers, female passengers, children, scheduled flights etc.). Calculation of the required sample size = sumsquare*(1,96 * stdev * 100)/ sumsquare*(1 * mean). The total sample size is independent of the size of the population.

NEA initially based the required sample size on the 2003 survey of passenger weights, the market research report performed by NFO New Zealand for CAA New Zealand[18]. The required sample size has also been determined based on the pilot survey NEA performed at ATH. This gives the outcomes as shown in Table 2-10. This required sample size based on the pilot survey relates to the total sample size for the Summer and the Winter survey combined.

The survey requirements in JAR-OPS relate to adult passengers. The results from the pilot survey in Athens indicate that the required sample size per airport is 2,226 if all passenger types are included (male, female and children in the age between 2 and 12 years old). The required sample size is 1,821 in case only adult passengers (over 12 years old) are taken into account. This relates to the

[18] Reference 'Survey of Passenger Weights Market Research Report'

Summer and the Winter survey combined. Children in the ages between 2 and 12 years old obviously show a large spread in weights (please refer to the last column of Table 2-10). If we allow for 5% incorrect or incomplete observations, the total required sample size per airport would be 1.05 * 1,821 is 1,912. For the Summer survey this leads to a sample size per airport of 956 observations.

Table 2-10 Required sample size following the outcomes of the pilot survey at ATH

	Pilot ATH All passengers	*Pilot ATH* Excl. children	*Male*	*Female*	*Child*
n =	798	769	415	354	29
Mean passenger mass	81	83	92	72	42
Std.dev.	20	18	16	14	18
Total required sample size >	2,226	1,821	1,204	1,366	6,996

Source: NEA

The standard deviation for children is substantial which means you would need an enormous sample size, which is outside the pre-conditions of this survey Special focus on such an amount of children during the survey needs to be avoided in order not to jeopardize the randomness of the survey.

Random sampling from the population within the dataset is a tool to determine the probability to find a certain mass and to make sure the outcomes do not bias the result. For further justification of the sample size, the required sample size was determined based on four random samples of the Athens pilot data automatically generated by SPSS, see Table 2-11. According to these tables the number of passengers to be weighed should be in the range of 1,930 – 2,121.

Table 2-11 Required sample size according to four random samples of the ATH pilot data

	Pilot ATH Sample 1	*Sample 2*	*Sample 3*	*Sample 4*
n =	100	110	101	103
Mean passenger mass	83	79	82	86
Std.dev.	19	18	18	20
Required sample size >	2,119	1,931	1,930	2,121

Source: NEA

Random sampling is also done by taking 100 samples of 30 passengers each, in order to determine to what extend the dataset is valid for mean masses for *individual flights*. The highest mass value of these 100 samples gives a recommended value to be used.

The purpose of the survey is to get an accurate view of the weight of men and women. Therefore, the sample size of men and women should be of a substantial size in order to get reliable results. This leads to the conclusion that the sample size should equal the minimum number of around 1,000, both for female and male, is sufficient.

The three different ways to categorise our data (route type, flight type and direction) do not have separate minimum sample sizes. These criteria are used in the field work to select weighing locations. The purpose of this is to prevent a bias caused by differences in population on different flight types and/or route types.

Based on the analysis above, it can be concluded that the required sample size of 1,000 observations per airport/season is legitimate. For this survey the target for each location was set at 1,000 useable records for passenger mass (including and excluding carry-on luggage) and 1,000 useable records for checked baggage mass per season. Experience shows that in these kinds of data collection processes it has to be anticipated that a selection of the data collection will be incomplete, incorrect or unusable. The teams performing the field work were therefore instructed to 'over-sample' the required numbers.

2.2.5 Data surveyed and recorded

In this section the collected field work data and the data that was added afterwards from other sources will be described.

The following mass values were measured:
- Passenger mass including carry-on luggage
- Passenger mass excluding carry-on luggage
- Checked baggage mass.

The following independent factors were measured:
- Passenger characteristics: age, gender;
- Passenger behavioural characteristics: carrying an infant, carrying carry-on luggage, travelling by purpose (business or leisure);
- Place and time of the measurements: airport (eight airports were selected) season (Summer or Winter);
- Trip characteristics: direction (outbound or inbound), route type (domestic, European and non-European), region of departure or arrival (fourteen regions have been distinguished), flight length categories (short haul, medium haul and long haul) and class of travel (economy, business or first);
- Flight characteristics: airline and flight number, flight type (scheduled or non-scheduled), airline type (regular scheduled, charter or low cost) and airline policies concerning maximum of baggage mass.

In the following paragraph an operational definition of all measured variables is stated.

Operational definition of dependent variables

Mass
Values in kilograms measured by the Disomat scales, calibrated by Kalibra.

Mass of passenger
The value in kilograms of a single passenger including clothing carried by a passenger (jacket, sweater, scarf) and carry-on luggage, measured by use of the Disomat scales, calibrated by Kalibra. In case the passenger is travelling with an infant younger than two years the mass of the infant is included in the passenger mass.

Mass of passenger without carry-on luggage
The value in kilograms of a single passenger including clothing carried by a passenger (jacket, sweater, scarf) and without carry-on luggage, measured by use of the Disomat scales, calibrated by Kalibra.

Mass of carry-on luggage
The value in kilograms of all belongings carried by a single passenger to be taken into the aircraft, e.g. purse, tax-free bags, photo equipment, excluding clothing carried by a passenger (jacket, sweater, scarf). This is calculated as the difference between the mass of a passenger without carry-on luggage from the mass of the same passenger with carry-on luggage.

Mass of checked baggage
The value in kilograms per piece of baggage that the passenger was going to check-in before boarding or that the passenger had checked-in on the arriving flight.

Operational definition of independent factors

Age
The age of the passenger in years as stated.

Gender
The term gender is used to define five passenger categories based on age and gender. The following categories are distinguished: (1) male, (2) female, (3) child (2-12 years), (4) male with infant between 0-2 years and (5) female with infant between 0-2 years.

Place of measurement
The airport where the survey took place. Eight airports were selected: AMS, ATH, CPH, FRA, LGW, MAD, SOF, WAW.

Time
The season in which the survey took place: in Summer or Winter.

Purpose
The motive for travelling as stated by the passenger. Two categories are used: business and leisure.

Direction
Direction defines whether the passenger is arriving or departing from the place of measurement. Two categories are used: inbound and outbound.

Airport of departure
The airport where the arriving passenger boarded the airplane that has arrived at the place of measurement.

Airport of arrival
The airport where the departing passenger will land after boarding at the place of measurement.

Class of travel
The service level of the flight, as stated by the passenger or mentioned on the airline ticket or boarding pass. Three categories are used: economy, business and first class.

Airline code
Identification code for the airline the passenger was travelling with registered as a 2-character format.

Flight number
The 2-, 3- or 4-digit code as used by the carriers. The airline code and flight number combined define a unique flight.

Route type
Route type defines the geographical scope of the flight route in three categories: (1) European, (2) non-European and (3) domestic. A flight is categorised as European if both the airport of departure and the airport of arrival are located in the following countries on European territory: Andorra, Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Macedonia, Malta, Moldova, Monaco, Montenegro, Netherlands, Norway, Poland, Portugal, Romania, San Marino, Republic of Serbia, Slovakia, Slovenia, Slowenia, Spain, Sweden, Switzerland, Ukraine, United Kingdom. A non-European flight only has the airport of origin or destination in one of the European countries defined. A domestic flight starts and ends in the same country.

Flight type
Flight type defines whether a flight is scheduled or non-scheduled. A flight is scheduled when that flight is published in the Official Airline Guide (further noticed as OAG data). All other flights are non-scheduled.

Airline type
Classification of airlines used in this survey to analyse passenger behaviour according to different service levels and travel conditions offered by the airlines. Three categories are used: (1) regular scheduled, (2) charter and (3) low-cost. This is not an official classification. See ANNEX J and ANNEX K for the used list of charter and low-cost carriers.

Region of departure
The geographical region where the airport of departure is located. Fourteen categories are identified as specified. in Table 2-12.

Region of arrival
The geographical region where the airport of arrival is located. Fourteen categories are identified as specified inTable 2-12 .

Table 2-12 Regions of departure / region of arrival19

Code	*European regions*	*Code*	*Non-European regions*
1	UK and Ireland	11	Africa and the Middle East
2	Benelux and France	12	Asia
3	Spain, Portugal and Italy	13	North America
4	Scandinavia and Iceland	14	South America
5	Germany, Switzerland and Austria	15	Other
6	Northeast Europe		
7	Greece, Cyprus, Malta and Turkey		
8	Romania and Bulgaria		
9	Other European countries (incl. Russia)		

Source: NEA

Non-European locations are divided into five regions. The actual airports of arrival and departure that were encountered in the survey, were taken into account to determine the regionalization. The following regions are set: North America (including Mexico) and South America. The Asian region captures Middle and Eastern Asian destinations like India, China and Japan. The Middle Eastern countries are grouped together with Africa. The last catchall region includes Australia and various island destinations.

Distance
The value in kilometres between the airport of departure and the airport of arrival according to geographical coordinates in The Global Airport Database http://www.partow.net/miscellaneous/ airportdatabase/index.html).

Flight length
Categorization of distance in three categories: (1) short haul, (2) medium haul and (3) long haul.

[19] European regions are defined by a single-digit code and non-European regions by a two-digit code.

Baggage allowance restriction
Airline carry-on luggage and checked baggage allowance policies and guidelines according to their websites. See ANNEX L for the website list.

Working definitions in detail

During the process of data collection and data handling the definitions, as mentioned above were implemented in the following way:

Passenger characteristics
When a passenger was carrying an infant, i.e. child younger than 2 years of age, the weight of the infant is included in the weight of its accompanier.

For 'purpose' there is only a distinction made in business trip and leisure trip. All holiday trips were marked as leisure and all other purposes (e.g. family visit, recital, funeral) as well.

Trip characteristics
A trip is defined as going from one airport to the next connecting airport (or vice versa). A trip could be part of a whole journey of a passenger, if a journey contains one or more transfer airports. The next connecting airport is not necessarily the final destination of the journey.

Flight/airline type
An airline can be designated as a low-cost or charter airline, or both. However, this does not mean that all of the operated flights of such an airline are low-cost and/or charter flights. On top of that, airlines that typically operate scheduled flights can also operate charter flights, especially in the holiday season. For that reason a distinction had to be made between the flight type and the airline type. The airline type is manually determined by using information found on the websites of the carriers. The flight type is automatically determined by using the OAG data which includes only the scheduled flights. All flights not registered in the OAG data are marked as non-scheduled flights.

Region of departure/region of arrival
For each trip, the region a passenger is travelling from or to, is determined based on the country of departure and the country of arrival. The region codes used, are chosen in accordance with the JAA SWWG.

This in contrast to the regional division used for the selected airports representing the European regions of the EASA survey as presented in Table 2-12.

Distance and flight length
Distance between two airports is determined to categorize the flights into short-, medium- and long-haul. This distance is calculated by using longitude/latitude information for each airport in our dataset. For flight length the next categories are chosen:

- Short-haul is a distance shorter than 500 km
- Medium haul is a distance between 500 and 5,000 km
- Long haul is a distance longer than 5,000 km.

Baggage allowance restriction

In most cases the information about baggage allowance restriction can be found on the websites of the carriers. However, this was not a straightforward job, because of the many special cases and exceptions found within each carrier's luggage policy. The number of carriers found in the survey is very large and it was recognized that finding the required information for all observations was not realistic. The approach therefore has been as follows:

In the database it was possible to calculate the number of observations per carrier. Using that information, a set of carriers with the highest number of observations was selected. For these carriers, information was sought on their websites. This was firstly done after the Summer survey, and again after the Winter survey for any important carriers still missing. For some carriers there are no carry-on luggage weight limits (e.g. EasyJet) and so observations in the dataset for these carriers could not be connected to a maximum luggage weight. It was also found that luggage policies could change in the months between the two survey periods (e.g. British Airways changed their carry-on luggage allowance from 23 kg (Summer 2008) to a limit based only on luggage dimensions) but it has been decided to use the allowances independent of the season, and always use the maximum weight that was found first.

Carriers can apply distinguishing luggage policies depending on the destination and flight length (e.g. on long haul flights the checked baggage allowance can be higher than on short or medium haul). Finally, carriers usually have different luggage policies for the different flight classes that are available.

During the Summer, the baggage allowance policies for European and North American flights were examined. The policies for African and Asian flights were gathered for a selected number of carriers after the Winter survey.

To summarize, the following information was gathered for a selected number of carriers:

- Carry-on luggage restriction :
  - Maximum weight economy class
  - Maximum weight business class
  - Maximum weight first class
- Checked baggage restriction:
  - Per distance and flight length (European, North American, African, Asian):
    - Maximum weight per piece, economy class
    - Maximum weight per piece, business class
    - Maximum weight per piece, first class.

2.3 Data cleaning

This paragraph describes the process of improving the quality of the data gathered during both the Summer and Winter surveys. As indicated in paragraph 2.2.4, the actual target for weight observations at all locations was set higher than the minimum required sample size mentioned previously in the proposal. It was expected that this would provide the opportunity to delete obviously

incorrect or incomplete data. Still, it is important to fix as many errors and salvage as much of the data as possible, so that the statistical analysis can be done in the best possible way.

First the cleaning process of the Summer data is described. Next the manner in which data cleaning for the Winter survey took place is compared to the approach for the Summer survey. Then it is explained why it was useful to apply the Winter approach to the already corrected Summer data. Afterwards the results of the cleaning process for both Summer and Winter data are summarized.

2.3.1 Cleaning Summer data

This paragraph describes the cleaning of the Summer dataset. In the data the airports and airlines are represented by IATA codes. Some of the data were incorrect due to coding errors that were, in general, easily traceable. Additionally, there were errors related to the passenger, like their age, gender or weight which had clearly been entered incorrectly. Others were related to the actual flight, the person or the luggage. Below all identified issues are described and categorised: (1) Missing data in records, (2) Data entry errors - Inconsistent values and (3) Data entry errors - Impossible values. In addition, the corrections are described.

Adding missing data in records

- *Airline codes and flight numbers*:
  - Airline codes are either in the 3-letter ICAO format or the 2-letter IATA format. Although the 2-letter format is most commonly used and therefore incorporated in our software, some carriers were only identified with the 3-letter format on the ticket or boarding pass. At Madrid Airport only the 3-letter format was used throughout the airport. The survey team used a conversion table during the survey to identify the codes used in the software. In some cases it was decided to leave the field ‘airline code’ blank during data entry and make notes of these events. All necessary additions and corrections were carried out during the post-processing.
  - In some cases the flight number was missing, but the departing airport, arriving airport and airline code were available. In such a case the flight number was added based on the flight schedules (this was possible because the data files contain information about the survey date and time).

- *Fields on passenger weight left blank:* In some cases only the passenger weight was entered, but not the passenger weight including carry-on luggage. Field workers were instructed to do so when no carry on luggage was available. In these cases the weight including carry-on luggage was set equal to the weight excluding carry-on luggage.

Data entry errors - *Inconsistent values*

- *Gender/child:* the data form included an option to categorise a passenger as a child as opposed to a male or female over 12 years. However, in some cases the value entered for the 'age' was not consistent with this category. The cases where the entered passenger age was under 13 years were re-categorised as a child. Entries where the passenger was categorised as child, but the entered age was over 12 years were deleted because the gender information was not available.

- *Relation between flight direction (inbound/outbound) inconsistent with airports of departure/arrival:* despite automatically generated suggestions by the software for airport of departure/arrival based on flight direction, inconsistent data were sometimes entered. In all records the most reliable data fields were preserved and contradictory data were changed to match the reliable data. This means that the flight number, the flight direction or airport of departure or arrival was changed.

- *Flight number inconsistent with departure/arrival and/or airline:* in these cases the flight number was the correct item; all other inconsistent data were corrected.

Data entry errors - *Impossible values*

- *Weight excluding carry-on luggage exceeds weight including carry-on luggage:* Obvious data entry error. In these cases the values were switched.

- *High passenger weight values:* in case the entered passenger weight exceeded 150 kg, the survey team leader was consulted to double check the entered weight values. If not, the record was deleted.

- *Excessively low passenger weight values:* in case the entered passenger weight was less than 25 kg and the entered age 13 or above, this was treated as an obvious data entry error. In these cases the record was deleted.

- *Entered values on the combination of airline code, flight number, departure and arrival completely impossible and untraceable:* in such a case the record was deleted.

All corrections are automatically carried out with SPSS syntax files that contain the commands for data corrections. In this way all corrections are transparent, traceable and reproducible.

2.3.2 Comparison of Summer/Winter data corrections

Some of the errors during the Summer survey could be prevented by improving the data entry software. By forcing the user to fill in all of the fields, and setting limits to a person's age, their weight, and the weight of their hand and checked luggage, it became a lot harder to inadvertently pollute the survey data with

incomplete or wrongly typed records. Additionally, the ‘child’ category for gender was removed, because whether a person is a child can be derived from their age. The ‘direction’ flag (inbound/outbound) also could no longer contradict the entered airports for departure and arrival.

Because of this, the only fields that still needed to be checked for errors were the departure and arrival airport, airline and flight number. For the Summer data corrections this was mostly done manually. For the Winter corrections, we used digital flight schedules and newly designed algorithms to automatically fix the records where possible.

This improved methodology was then also applied to the Summer dataset. It was necessary to double-check all of the flight numbers, because they needed to be correct to be able to determine whether the flights were scheduled or non-scheduled, which is an important variable in the statistical analysis. Aside from that, since the Summer corrections were done manually, some errors were overlooked. Using the algorithm was an easy way to weed out most of the remaining errors. Please refer to Table 3-1 and Table 3-2.

2.3.3 Data correction algorithm

The flight information in the dataset was compared to the flight information in the digital flight schedules. If the airport of departure, the airport of arrival, airline and flight number of a record matched perfectly, then the record was assumed to be correct. The records that could not be matched were classified as erroneous. These erroneous records were then further categorised as records that could be fixed automatically and records that required a manual check, to see if they should be kept or deleted.

Using regular expressions, the algorithm altered the erroneous records to try and find a match with one or more real flights from the digital flight schedules. Small errors, such as typos in the departing or arrival airport codes, or one digit changes in the flight numbers, were fixed automatically. The more drastic fixes were reviewed manually afterwards, to see if they made sense. If not, the records were deleted. The Table 2-13 ranks the corrections from least to most severe.

Table 2-13 Data correction algorithm, performed fixes (from least to most severe)

Fix #	*Description*	*Type*
1	Different airline	Automatic
2	Switch departure airport and arrival airport	Automatic
3	Change one digit in the flight number	Automatic
4	Change the departure airport or the arrival airport	Automatic
5	Any combination of fixes #1-#3	Manual
6	Change two digits in the flight number	Manual
7	Completely different flight number	Manual
8	Different airline and change two digits in the flight number	Manual
9+	Different combinations of the above fixes	Manual

Source: NEA

2.4 Adding data on luggage and baggage allowance policies

To analyse the impact of carry-on luggage allowance policies on the actual carry-on luggage masses an additional factor has been added to the database. The maximum values for carry-on luggage mass as stated by the airlines were added to the passenger carry-on luggage and checked baggage records. The baggage allowance policies' details have been gathered based on the frequencies of passengers traveling with the airlines. In the first step, the main carriers based on their frequency within the whole survey were identified. In the next step, a selection was made for each airport of the most frequent carriers.

From almost 80% of the carry-on luggage records and the checked baggage records, the relevant policy details have been identified and added, which provides sufficient data to obtain significant results.

Table 2-14 Number of baggage records within the survey and used in specific correlation analysis

	Total in survey	*Airline policies on baggage allowance added*
Carry-on luggage	22,901	17,463 (76%)*
Checked baggage	22,353	17,643 (79%)*

* *These figures are only used for the analysis of the carry-on luggage and checked baggage to evaluate the correlation between passenger behaviour and baggage allowance policies*

Source: NEA

2.5 Description of analyses/statistical principles applied in the survey

First step

The first step of the analysis is focused on revealing the mean mass weights of several samples of objects (persons or luggage), measured in the survey. The following variables are used as sampling criterion:

- Passenger characteristics: age, gender;
- Passenger behavioural characteristics: carrying an infant, carrying carry-on luggage, travelling by purpose (business or leisure);
- Place and time of the measurements: airport (eight airports were selected) season (Summer or Winter);
- Trip characteristics: direction (outbound or inbound), route type (domestic, European and non-European), region of departure or arrival (fourteen regions have been distinguished, see Table 2-12), and class of travel (economy, business or first);
- Flight characteristics: flight type (scheduled or not-scheduled), airline type (regular scheduled, charter or low cost) and airline policies concerning maximum of baggage mass.

The outcomes of the first step of the analysis are presented in the tables in ANNEX C, ANNEX D. and ANNEX E. The following measurements are included: mean, n, standard deviation, accuracy and confidence range.

Mean ($\overline{x}$) is the arithmetical mean of mass values, calculated as shown in the following formula:

$$\overline{x} = \frac{\sum_{j=1}^{n} x_j}{n}$$

Where: n = the number of objects (passengers or pieces of luggage)
Σ = the sum of measured mass value of object x_1 up to object x_n

The standard deviation (s) is calculated as follows:

$$s = \sqrt{\frac{\sum_{j=1}^{n}(x_j - \bar{x})^2}{n-1}}$$

Where: x_j = the deviation between the mass value of object x_j from the sample mean $\bar{x}$.

The accuracy of the sample mean is calculated according to the next formula:

$$e_r = \frac{1.96 \cdot s \cdot 100}{\sqrt{n \cdot \bar{x}}}$$

The accuracy refers to the confidence range of the sample means. When the outcome of the formula does not exceed 1%, the confidence range is considered highly sufficient. An outcome of 2% is considered sufficient enough. When the outcome is 5% or more, the accuracy is considered to be insufficient.

The confidence range is calculated at the significance level of 95% with the formula:

$$\bar{x} + \frac{1.96 \cdot s}{\sqrt{n}}$$

The outcome of this formula estimates the interval (sample mean plus or minus outcome of the formula) of the mass value of the population.

Second step

The second step of the analysis is focused on the relation between the dependent variable mass value of objects (persons or luggage) and factors which were thought to influence mass values. The factors, taken into account are the variables, which were used as sample criteria in the first step of analysis. In order to determine whether the selected variables are correlated to mass values, Pearson's product-moment correlation coefficient (r) is calculated with the following formula:

$$r = \frac{1}{n-1} \cdot \frac{\sum_{i=1}^{n}(x_i - \bar{x})(y_i - \bar{y})}{s_X \cdot s_Y}$$

Where: x refers to the values of the dependent variable and y refers to the values of the factor taken in account. The value of the outcome r is a value between -1 and +1. When the value is 0, there is no linear correlation between the factor and the mass values. A positive or negative correlation is indicated when the value of r is higher of lower than 0. In the tables presenting r-values, only correlations at the significance level of 95% are mentioned.

Third step

The third step of the analysis is focused on determining the linear regression analysis. Regression analysis is a method from statistics to determine the relation between a dependent variable and one or more explanatory variables.

In the analysis below the dependent variable is the mass (weight) of a passenger. The mass varies between passengers: one passenger will have a higher mass than another passenger. A regression analysis explains this variation in mass from passenger to passenger, from the age of the person, the trip purpose the type of flight, etc.. The results of the analysis helps answering questions such as:

- Do long haul flights on average carry passengers with higher masses (after correcting for age, trip purpose, etc.)?
- What is the influence of the age of a passenger on its mass (after correcting for gender, trip purpose, etc.)?

To carry out the regression analysis, first a certain relation between the dependent variable and the explanatory variables has to be specified, in this case a linear relationship (all explanatory variables affect the mass in a linear way, not for instance through a logarithmic or exponential function of age):

Mass = constant + β_1.age + β_2.longhaul + …..

This is called a linear regression model. The constant is the value of the mass that we get (in kg, since mass is in kg) when all explanatory variables would be equal to 0.
β_1 , β_2 , etc. are the coefficients of the model (often called: the 'betas'). Statistical estimation of the model means finding the appropriate values for these coefficients.

A statistical technique called Ordinary Least Squares (OLS), is used to estimate the coefficients. This technique determines the coefficients in such a way that it minimises the squared difference between the observed mass of a passenger and the mass that the model would predict based on the explanatory variables (and the constant), summed over all passengers in the dataset.

In order to explore the difference of mass values between two samples (i.e. female and male passengers or Winter and Summer measurements) the T-test is applied. When more samples are the object of analysis, the differences between the samples are measured with analysis of variance.

Given two paired sets X_1 and X_2 of n measured values, the paired t-test determines whether they differ from each other in a significant way under the assumptions that the paired differences are independent and identically normally distributed.

The t-value to test whether the means are different is calculated in different ways according to an assumption about the variance between the two sets. If the assumption is that the two sets have the same variance, the t-value is calculated as follows:

$$t = \frac{\overline{X_1} - \overline{X_2}}{S_{X_1X_2} \cdot \sqrt{\frac{1}{n_1} + \frac{1}{n_2}}}$$

Where

$$S_{X_1X_2} = \sqrt{\frac{(n_1 - 1)S_{X_1}^2 + (n_2 - 1)S_{X_2}^2}{n_1 + n_2 - 2}}$$

$\overline{X_i}$ is the mean value of set X_i

S_{X_i} is the estimator of the standard deviation of set X_i

n_i is the size of set X_i.

If the assumption is that the two sets have unequal variance, the equation is as follows:

$$t = \frac{\overline{X_1} - \overline{X_2}}{s_{\overline{X_1} - \overline{X_2}}}$$

Where

$$s_{\overline{X_1} - \overline{X_2}} = \sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}$$

s_i is the standard deviation of set X_i
n_i is the size of set X_i.

In this last step of the analysis multiple factors are taken into account. When two or more samples are the object of analysis, multivariate analysis of variance is applied. Analysis of variance (ANOVA) is a statistical test for heterogenity of means by analysis of group variances. To apply the test, assume random sampling of a variate Y with equal variances, independent errors, and a normal distribution. Let n be the number of replicates (sets of identical observations) within each of K factor levels (treatment groups), and y_{ij} be the j^{th} observation within factor level i. Multiple analysis of variance (MANOVA) is a procedure for testing the equality of mean vectors of more than two populations. The sets are compared on multiple response variables simultaneously.

3 Response

3.1 Introduction

This chapter gives a brief description of the weighing locations, the performed field work at the eight airports and experiences and problems encountered. A more detailed description has been laid down in the Summer and the Winter survey reports. A detailed survey plan is presented in ANNEX A and the schedule for the Summer and the Winter surveys is presented in ANNEX B.

Furthermore, this chapter describes the process of controlling and cleaning the databases, in which the results of the measurements are recorded.

3.2 Description of the field work per airport

A detailed description of the field work per airport has been given in the Summer and the Winter survey reports.

A very thorough and in-depth study of the airport timetable and selection of locations in advance, are of the highest importance for the survey in order to be secured of a constant and diversified flow of passengers. Location selection was based on the following criteria: number of passengers, suitability of the location, available space and, to some extent, availability of electricity. In the following paragraph the weighing locations are identified and differences between the Summer and the Winter are discussed. Sometimes different and/or additional locations were used, for instance because the locations used in the Summer were no longer available anymore in the Winter (e.g. due to redesign of the airport or new security measures). Still, only locations were used that fit within the survey requirements.

London Gatwick Airport (LGW)

LGW Airport has two terminals: North and South. These two Terminals are linked by an automatic transit train (the trip takes about two minutes). The survey was performed in the South Terminal, where we had the best mixture of arrivals and airline types. The weighing locations in the departure area were defined behind the security check and tax free shopping area (Pier 2) close to the exits to the gates where European, intercontinental and also some local flights take off. The originally designated weighing locations at the baggage reclaim and check-in areas was changed, due to the fact that these locations turned out to be unpractical from a survey point of view (passengers were too far away to be interested for the survey). During the Winter survey the same locations were used.

Amsterdam Schiphol Airport (AMS)

AMS airport uses three different areas for departures and four for arrivals. The weighing locations for passengers and carry-on luggage were at the roots of the different Piers and after the tax free shops (in order to catch the best mixture of arrivals (European and intercontinental) and airline types (scheduled/non-scheduled and flag carriers/charters/low cost carriers)). Weighing of checked baggage could be done at two different locations in the Departure halls and inbound checked baggage was weighed at two different locations in the reclaim halls. During the Winter survey the same locations were used as in the Summer survey, but in addition, Gate B was used because of low passenger flows at Gate D (especially top level).

Madrid Barajas Airport (MAD)

MAD Airport uses three terminals: T1 and T2 for a wide range of carriers, and T4 mainly for Iberia flights. Weighing took place at different locations in the three terminals to reach the preferred number of passenger and luggage weighing for the defined categories. In the Winter survey one additional location in the secured areas was used because of small passenger flows.

Copenhagen Airport Kastrup (CPH)

CPH Airport uses three terminals: T1 mainly for domestic flights, and T2 and T3 for European and intercontinental flights. Weighing took place at different locations in the three terminals to reach the preferred number of passenger and luggage weighing for the defined categories. In the Winter survey the same locations were used.

Frankfurt Airport (FRA)

FRA Airport uses two terminals T1 and T2. Weighing took place at different locations in Terminal 1 to reach the preferred number of passenger and luggage weighing for the defined categories. All target groups are represented and the flow is continuously high at terminal 1. In the Winter survey the same locations were used.

Warsaw Frederic Chopin Airport (WAW)

WAW Airport uses three terminals: T1 and T2 for European, Domestic and intercontinental flights and Terminal 3 (Etudia) for low-cost carriers. Weighing took place at different (secured) locations in Terminals 1 and 2. In the Winter survey the same locations were used.

Athens International Airport (ATH)

ATH Airport uses a Main Terminal and a Satellite Terminal. Weighing took place at different locations within the Main Terminal. The Summer survey dataset

consists of the data collected during the pilot (dataset validated by EASA) completed with additional data collected at ATH Airport in July/August 2008. The locations were the surveys were performed: Gate B (Schengen and domestic flights) and Gate A (extra Schengen), check-in counters at the Departure Hall and the Reclaim Hall. In the Winter survey the same locations were used.

Sofia Airport (SOF)

SOF Airport uses two Terminals (distance by car: five minutes; not within walking distance). Terminal 2 is used for the (inter)continental flights. Terminal 1 is much smaller and only the low-cost carriers and domestic flights fly to and from this terminal. In the Summer, one survey day was used for the weighing at Terminal 1. The other days of the week the survey took place at Terminal 2. Although the initial plan was to perform surveys for one day at Terminal 1 it was decided to carry out all surveys at Terminal 2. The decision was made based on the expected number of passengers at Terminal 1 in our survey week, supplied by our airport contacts and due to the large amount of time involved in transferring the scales from one terminal to the other and through customs. More passengers were expected at terminal 2 than at terminal 1.

3.3 Experiences and problems encountered and counter measures

After the performance of the pre-pilot at the Panteia office and the pilot at ATH, some minor adjustments were made to the data entry forms and software. Some further adjustments were made to the data entry program before the start of the Winter survey, in order to make the software more user-friendly. The adjustments do not affect the comparability of the data of the Summer and the Winter surveys.

Some of the improvements compared to the Summer version are:

- One executable instead of three different ones
- Search option for airports and airlines (press CTRL+F)
- Previous flight information can be captured easily (press F5)
- Input validation; erroneous data can no longer be submitted
- Both comma's and periods are accepted as decimal separator; whatever is preferred can be used.

The software was tested by all members of the weighing teams before it was officially put to use.

Security proceedings varied at the different airports. At some locations it was not allowed for NEA staff to access secured areas (airside) without the company of an airport representative, or security passes could only be handed out for two consecutive days. In those cases we were either escorted by an airport representative or by one of the temporary team members with the necessary security clearance. Knowing that the security procedures had been tightened at several airports, we requested the security passes for both consultants and local staff members well in advance for the Winter survey. Especially at AMS, FRA and CPH stricter rules made it more difficult to obtain the necessary passes.

Changing weighing locations (dismantling, transport and set-up at new location) can take a significant amount of time, due to the long distances and the fact that all equipment (weighing scales, laptops) need to pass the security checkpoints where they are thoroughly inspected. Therefore, it is important to be at locations with constant and varied passenger flows.

Reliance on electrical outlets at the survey airports meant that we were often confined to specific locations within the terminal during the Summer survey. During the Summer survey these locations were sufficient to be able to collect a sizeable sample, but the lack of mobility might pose a problem during the Winter survey with significant smaller passenger flows. To improve the mobility of the weighing teams, battery packs were purchased and tested in order to supply power to the weighing scales during the Winter survey. Tests within the NEA office showed that using the battery packs had no effect on the accuracy of the scales. The capacity of the battery packs was enough to keep two scales up and running for half a day. Because of the weight of the battery packs and their limited capacity, it was decided to not use them extensively. Two battery packs were purchased and at each airport the team had one battery pack available.

It is crucial to have a multi-lingual weighing team in order to be able to invite as many people to participate in the survey as possible. Furthermore, it is important to have people in the team that speak the local language, especially during the Winter survey, when there are less tourists travelling. Temporary staff was recruited from the same sources as used for the Summer survey. Allowing us to work with (partly) experienced staff. Overall support from our airport contacts during preparation (flight schedules, adjusted or additional survey locations) and performance (on site support, storage of equipment) of the survey has been very good.

The passenger flows can vary significantly during the days of the week. Except for Frankfurt and Amsterdam, we decided by mutual agreement with EASA to leave on Sunday for the survey locations. With this, anticipating that the number of travellers in the Winter season is lower than during the Summer season and allowing the survey teams to use the survey week to its full extent. The surveys were performed from Monday up to and including Friday.

A poster had been prepared to use at all airports, explaining the purpose of the survey. Due to safety regulations, it was unfortunately not allowed to use the poster at all airports. Also weighing team members were approached on a regular basis by passengers to obtain general airport and/or travel information, which is was not always efficient for the survey.

Early Monday morning the weighing equipment was delivered by the transport company and Friday afternoon picked-up again. Transport from one airport to the other was arranged over the weekend.

At all airports the weighing of inbound intercontinental passengers, carry-on luggage and checked baggage is a bit difficult (as anticipated). Reasons for this are mainly: catching a connecting flight, being tired after a long trip and waiting time and wanting to go home or to scheduled appointments. The closer the weighing team could get to the reclaim belts, the higher the response rate to the

survey. At some airports (e.g. LGW, ATH) it was possible to make arrangements with baggage management to direct more incoming flights to specific reclaim belts, close to locations were we could perform our survey. This turned out to be effective and helpful.

In the Summer survey, NEA had incorporated a question about the membership of a frequent flyer program in relation to additional luggage allowance. As only a marginal share of the passengers qualify, make use of the additional allowance and understand the question. By mutual agreement with EASA it was decided to leave this question out of the Winter survey. Especially based on the fact that the participation in such programs does not influence the weight of the passenger.

3.4 Results of data cleaning

In this paragraph the results of the data cleaning process, as described in chapter 2, are shown.

3.4.1 Collected and corrected data per season

The Table 3-1 up to and including Table 3-4 show how many records were fixed and deleted from the gross dataset, for both the Summer and the Winter surveys. For the Summer data (Table 3-1andTable 3-2), the tables indicate how many corrections were made after the Summer survey and also how many in the second correction round after the Winter survey. After the Summer and Winter data had been brought together in one database, the OAG data was added. The OAG data contain the information of all Official Airline Flight schedules. The additionally deleted Summer records could not be matched to an existing flight from the OAG data or contained missing data, and therefore could not be fixed and were deleted.

The percentage net data of the Winter session is higher than the percentage of net data of the Summer session. This is due to the improved data entry software.

Table 3-1 Summer passenger data collected and corrected

Airport	*Gross data*	*Summer corrections*	*Additional corrections*	*Deleted records Summer*	*Additional deleted records*	*Net data*
AMS	1,714	96	33	5	3	1,706 (99.5%)
ATH	1,879	92	92	49	0	1,830 (97.4%)
CPH	1,514	394	33	34	4	1,476 (97.5%)
FRA	1,332	368	42	48	0	1,284 (96.4%)
LGW	1,136	129	56	1	0	1,135 (99.9%)
MAD	1,446	415	68	87	2	1,357 (93.8%)
SOF	892	297	22	0	0	892 (100%)
WAW	1,903	335	51	88	0	1,815 (95.4%)
Total	11,816	2,126	397	312	9	11,495 (97.3%)

Source: NEA

Table 3-2 Summer checked baggage data collected and corrected

Airport	*Gross data*	*Summer corrections*	*Additional corrections*	*Deleted records Summer*	*Additionally deleted records*	*Net data*
AMS	1,259	62	54	1	7	1,251 (99.4%)
ATH	1,587	96	106	17	3	1,567 (98.7%)
CPH	1,251	336	31	84	1	1,166 (93.2%)
FRA	1,445	223	100	43	3	1,399 (96.8%)
LGW	1,099	78	31	2	0	1,097 (99.8%)
MAD	1,325	315	13	112	7	1,206 (91.0%)
SOF	633	80	2	0	2	631 (99.7%)
WAW	1,444	298	35	65	1	1,378 (95.4%)
Total	10,043	1488	372	324	24	9,695 (96.5%)

Source: NEA

Table 3-3 Winter passenger data collected and corrected

Airport	*Gross data*	*Corrections*	*Deleted records*	*Net data*
AMS	1,469	108	0	1,469 (100%)
ATH	1,177	23	1	1,176 (99.9%)
CPH	1,455	385	15	1,440 (99.0%)
FRA	1,421	249	2	1,419 (99.9%)
LGW	1,639	245	0	1,639 (100%)
MAD	1,471	389	18	1,453 (98.8%)
SOF	916	91	0	916 (100%)
WAW	1,895	311	1	1,894 (99.9%)
Total	11,443	1,801	37	11,406 (99.7%)

Source: NEA

Table 3-4 Winter checked baggage data collected and corrected

Airport	*Gross data*	*Corrections*	*Deleted records*	*Net data*
AMS	1,587	266	0	1,587 (100%)
ATH	1,437	26	0	1,437 (100%)
CPH	1,420	411	9	1,411 (99.4%)
FRA	1,678	447	2	1,676 (99.9%)
LGW	2,304	357	0	2,304 (100%)
MAD	1,354	414	2	1,352 (99.9%)
SOF	898	50	0	898 (100%)
WAW	1,997	214	1	1,996 (99.9%)
Total	12,675	2,185	14	12,661 (99.9%)

Source: NEA

3.5 Frequency tables

3.5.1 Meta information

The survey has resulted in a database of 22,901 passenger records (both passenger mass and mass of carry-on luggage) and 22,353 records for the mass of checked baggage. In this paragraph, tables are presented containing meta information, demonstrating the validity of the recorded and cleaned data. In Annex I detailed tables on frequencies can be found. Table I.1 up to and including table I.17 refer to the frequencies of passengers and carry-on luggage. Table I.18 up to and including table I.35 refer to the frequencies of checked baggage,

Frequency tables related to the net number of records of passengers and carry-on luggage

Table 3-5 Frequency table: passenger records by gender

Gender	*Frequency*	*Percent*
Male	12,588	55.0
Female	8,351	36.5
Child (2-12 years)	1,420	6.2
Male & Infant (<2 years)	298	1.3
Female & Infant (<2 years)	244	1.1
Total	22,901	100.0

Source: NEA

Table 3-6 Frequency table: passengers records by season

Season	*Frequency*	*Percent*
Summer	11,495	50.2
Winter	11,406	49.8
Total	22,901	100.0

Source: NEA

Table 3-7 Frequency table: passengers records by airport, total survey

Airport	*Frequency*	*Percent*
AMS	3,175	13.9
ATH	3,006	13.1
CPH	2,916	12.7
FRA	2,703	11.8
LGW	2,774	12.1
MAD	2,810	12.3
SOF	1,808	7.9
WAW	3,709	16.2
Total	22,901	100.0

Source: NEA

Table 3-8 Frequency table: passengers records on Non-European, European or Domestic flights

Routetype	*Frequency*	*Percent*
Non-European	7,821	34.2
European	12,790	55.8
Domestic	2,290	10.0
Total	22,901	100.0

Source: NEA

Table 3-9 Frequency table: purpose of trip, related to number of passengers

Purpose	*Frequency*	*Percent*
Leisure	15,739	68.7
Business	7,162	31.3
Total	22,901	100.0

Source: NEA

Table 3-10 Frequency table: class of travel, related to number of passengers

Class	*Frequency*	*Percent*
Economy	20,997	91.7
Business	1,767	7.7
First	137	0.6
Total	22,901	100.0

Source: NEA

Frequency tables related to the net records of checked baggage

In this paragraph the most important frequency tables for checked baggage are reported.

Table 3-11 Frequency table: checked baggage records related by gender

Gender	*Frequency*	*Percent*
Male	12,553	56.2
Female	9,252	41.4
Child (2-12 years)	465	2.1
Male & Infant (<2 years)	30	.1
Female & Infant (<2 years)	53	.2
Total	22,353	100.0

Source: NEA

Table 3-12 Frequency table: checked baggage by season

Season	*Frequency*	*Percent*
Summer	9,692	43.4
Winter	12,661	56.6
Total	22,353	100.0

Source: NEA

Table 3-13 Frequency table: pieces of checked baggage by airport, total survey

Airport	*Frequency*	*Percent*
AMS	2,838	12.7
ATH	3,004	13.4
CPH	2,576	11.5
FRA	3,074	13.8
LGW	3,400	15.2
MAD	2,558	11.4
SOF	1,529	6.8
WAW	3,374	15.1
Total	22,353	100.0

Source: NEA

Table 3-14 Frequency table: Non-European, European or Domestic flight

Routetype	*Frequency*	*Percent*
Non-European	7,995	35.8
European	11,758	52.6
Domestic	2,600	11.6
Total	22,353	100.0

Source: NEA

Table 3-15 Frequency table: purpose

Purpose	*Frequency*	*Percent*
Leisure	17,679	79.1
Business	4,674	20.9
Total	22,353	100.0

Source: NEA

Table 3-16 Frequency table: class of travel

Class	*Frequency*	*Percent*
Economy	21,764	97.4
Business	576	2.6
First	13	0.1
Total	22,353	100.0

Source: NEA

3.5.2 Records on passengers and baggage

The survey has resulted in a database of 22,901 passenger records (both passenger mass and mass of carry-on luggage) and 22,353 records for the mass of checked baggage. The figures are presented by season and gender in Table 3-17.

Based on the following, it was decided to neglect the categories male/female carrying an infant as separate ones:

- Although it was appreciated to perform an analysis of the number of passengers travelling with infants (0-2 years), focusing on these passengers during the survey was avoided in order not to jeopardize the randomness of the survey.
- No significant difference is found between the mean masses of male/female without an infant in relation to the mean masses of male/female carrying an infant (please refer to Table C.1).
- As the records for passengers (male and female) carrying an infant are relatively low (in the Summer 513 passengers carrying an infant and in the Winter 29 passengers) and only represent about 2.4% of the total dataset.

Therefore, the figures for passengers carrying an infant are presented in italic in Table 3-17. In further analyses the records are integrated in the records by gender see Table 3-18.

Table 3-17 Net numbers of passengers and checked baggage weighed by season and gender

Season	*Gender*	*Number of passengers*	*Share (%)*	*Checked baggage*	*Share (%)*
Summer	Male	5,612	48.8%	5,162	53.3%
	Female	4,287	37.3%	4,172	43.0%
	Child (2-12 years)	1,083	9.4%	327	3.4%
	Male & Infant (<2 years)	*287*	*2.5%*	*13*	*0.1%*
	Female & Infant (<2 years)	*226*	*2.0%*	*18*	*0.2%*
	Total	11,495	100%	9,692	100%
Winter	Male	6,976	61.2%	7,391	58.4%
	Female	4,064	35.6%	5,080	40.1%
	Child (2-12 years)	337	3.0%	138	1.1%
	Male & Infant (<2 years)	*11*	*0.1%*	*17*	*0.1%*
	Female & Infant (<2 years)	*18*	*0.2%*	*35*	*0.3%*
	Total	11,406	100%	12,661	100%
Total	Male	12,588	55.0%	12,553	56.2%
	Female	8,351	36.5%	9,252	41.4%
	Child (2-12 years)	1,420	6.2%	465	2.1%
	Male & Infant (<2 years)	*298*	*1.3%*	*30*	*0.1%*
	Female & Infant (<2 years)	*244*	*1.1%*	*53*	*0.2%*
	Total	22,901	100%	22,353	100%

Source: NEA

Table 3-18 Passenger masses excluding carry-on luggage by season and gender (the figures for adult passengers include passengers carrying an infant)

Season	*Gender*	*Mean*	*n*	*Std.dev.*	*Accuracy (%)*	*Conf. Range (95%)*
Summer	All adults	75.1	10,412	16.4	0.4	0.31
	- Male	*82.6*	*5,899*	*6,987*	*14.7*	*0.4*
	- Female	*65.3*	*4,513*	*4,082*	*12.9*	*0.6*
	Child (2-12 years)	31.1	1,083	11.6	2.2	0.69
	Measured passengers[20]		11,495			
Winter	All adults	79.5	11,069	16.6	0.4	0.31
	- Male	*86.3*	*6,987*	*14.7*	*0.4*	*0.34*
	- Female	*67.9*	*4,082*	*12.9*	*0.6*	*0.40*
	Child (2-12 years)	29.7	337	12.3	4.4	1.31
	Measured passengers		11,406			
Total	All adults	77.4	21,481	16.6	0.3	0.22
	- Male	*84.6*	*12,886*	*15.0*	*0.3*	*0.26*
	- Female	*66.6*	*8,595*	*12.7*	*0.4*	*0.27*
	Child (2-12 years)	30.7	1,420	11.7	2.0	0.61
	Measured passengers		22,901			

Source: NEA

[20] The number of measured passengers is included in the table as reference to paragraph 4.2. Statistical analyses are not stated as these values are irrelevant for the survey and for revision of standard masses.

4 Results

4.1 Introduction

This chapter presents the outcomes of the statistical analyses that were performed. The chapter starts with a paragraph describing the outcomes of mean values of the survey, including a separate paragraph on the results of the sampling for children. The next paragraphs give an overview of different factors and the correlation between factors and mass values and of the regression analysis. The chapter ends with a comparison with current EU safety regulations and conclusions.

4.2 Mean masses – step 1

4.2.1 Children masses

A large standard deviation can be observed in the findings for children. As stated in the chapter on the methodology of the survey, the required sample size is based on a relative confidence rate (accuracy) of 1% for all adult passengers and 2% for all sub-categories of the survey (examples of these sub-categories are male passengers, female passengers, children, scheduled flights etc.). Although the accuracy for all measured children is 2%, this is not robust to determine a standard mass for all children. The required accuracy is 1% in order to determine a standard mass.

The outcome of the survey shows an average of 31.1 kg in the Summer and 29.7 kg in the Winter (accuracy of 4.4%). The difference between the Summer and the Winter values for children is highly disturbed by differences in age between the Winter and the Summer sample. Therefore, an overview of mean mass by age is given in Table C-2.
When the actual age of children is taken into account, there are still differences between their Summer and their Winter mass. This is due to the wide age range (2-12 years) for this category, as the respondents typically experience significant growth (and therefore weight increase) during this age period. Due to the large variety on weight distribution caused by the age of children, the number of measured objects by age is too low to lead to a sufficient accurate mean mass for children. The average passenger mass for children travelling therefore, can not be distinguished clearly.

The mean mass for children from 2 to 12 years old used in EU safety regulations is 35 kg. The survey shows mean child-masses of 30.7 kg. Children's mass is highly determined by age (Table 4.1). Different masses for children between factors such as season, flight characteristics or trip characteristics are caused by different distribution over age classes.

In order to estimate a standard mass for children under 12 years old, which can be used in new EU safety regulation, 100 samples of 30 passengers were taken. The mean masses of the children in those samples varies from 25 kg up to 40

kg. Based on the outcomes of the desk research, stating that about 38% of school-aged children in the WHO European Region will be overweight by 2010, and that more than a quarter of these children will be obese, the highest value of 40 kg would be the most safe border for the standard mass of children under 12 years old.

Table 4.1 Passenger masses by age; children 2-12 years

Age	*mean*	*n*	*St.dev*	*Accuracy (%)*	*Confidence range (95%)*
2 years	14.0	37	1.9	4.4	0.61
3 years	15.9	90	2.8	3.7	0.58
4 years	18.5	113	2.7	2.7	0.50
5 years	21.5	108	3.5	3.1	0.66
6 years	23.5	109	4.2	3.4	0.79
7 years	26.4	174	5.4	3.0	0.80
8 years	30.9	154	6.7	3.4	1.06
9 years	33.9	152	7.0	3.3	1.11
10 years	36.9	160	7.4	3.1	1.14
11 years	42.1	153	9.3	3.5	1.47
12 years	46.3	170	9.2	3.0	1.38
total child (2-12 years)	30.7	1,420	11.7	2.0	0.61

Source: NEA

Conclusion:

- Due to the accuracy within the survey, it is not possible to determine a standard mass for children. It is recommended to perform an additional survey in order to determine the standard mass for children.
- In case it will not be possible to perform such a survey on short time notice, it is recommended to apply the standard mass of 40 kg.

4.2.2 Passenger masses

The passenger masses as measured in the survey are presented in Table 3-18. The mean value for all adult passengers is 77.4 kg. All detailed tables are presented in ANNEX C, ANNEX D, and ANNEX E.

Passenger characteristics

Gender

The total mean mass for male passengers is higher than for female passengers (84.6 kg and 66.6 kg). The difference is almost 17 kg.

Age

Table 4.1 shows that female passengers in the ages between 30 and 50 are slightly underrepresented. This might influence the average weight of adult passengers, as the frequency of male passengers is higher (Table 3-5).

Table 4.2 Age distribution by gender

Age category	*Mean mass*	*Share of male*	*Share of female*
1 13-15	58.8	0.48	0.52
2 16-20	68.7	0.51	0.49
3 21-25	71.4	0.53	0.47
4 26-30	75.0	0.58	0.42
5 31-35	78.5	0.64	0.36
6 36-40	79.9	0.63	0.37
7 41-45	81.4	0.66	0.34
8 46-50	81.9	0.64	0.36
9 51-55	81.7	0.62	0.38
10 55-60	81.7	0.62	0.38
11 61-65	81.1	0.60	0.40
12 <65	80.0	0.60	0.40
Total	77.4	0.60	0.40

Source: NEA

Purpose of the trip

During the field work passengers were interviewed about the purpose of their trip. Two answers were possible: business or leisure. Male passengers on ‘business’ trips show higher mean masses than male passengers travelling for the purpose of ‘leisure’ (86.8 kg and 83.2 kg). Travelling female passengers show no differences in mass values between ‘business’ or ‘leisure’ purposes, as shown in Table 4.3. All mean values on trip purpose are presented in Table C-3.

Table 4.3 Purpose of trip

Gender	*Purpose*	*Mean*	*n*	*Std. dev.*	*Accuracy (%)*	*Confidence range (95%)*
Male	Leisure	83.2	7,899	15.0	0.4	0.33
	Business	86.8	4,987	14.6	0.5	0.40
	Total	84.6	12,886	15.0	0.3	0.26
Female	Leisure	66.6	6,680	12.7	0.5	0.30
	Business	66.3	1,915	12.5	0.8	0.56
	Total	66.5	8,595	12.7	0.4	0.27

Source: NEA

Time and place of the measurements

Season

In the Summer survey the mean mass for all adults was 2.3 kg lower (75.1 kg) and in the Winter 2.1 kg higher (79.5 kg) than the average of the survey (77.4 kg). Refer to Table 3-18.

The difference between the Summer and the Winter can partially be explained by the sample composition: the Summer survey includes more female passengers than the Winter survey (43% female adults in the Summer and 37% female adults in the Winter). Apart from differences in sample compositions, there still remain differences between masses of passengers in the Summer and the Winter. Heavier coats, clothes and shoes might be causing those differences.

The mean male passenger mass is 82.6 kg in Summer and 86.3 kg in the Winter (a difference of 3.7 kg). The upper boundary for male Winter masses is 87 kg. Female passengers show mean masses of 65.3 kg in Summer and 67.9 kg in Winter (a difference of 2.6 kg). The upper boundary for female masses in Winter is 69 kg.

Airport where the survey was performed

The weighing of passengers took place at eight European airports. In Table C-14 ,Table C-15, Table C-16, Table C-17, Table C-18 and Table C-19 passenger masses by season and airport of weighing are presented. Passengers weighed in Madrid show lower mean mass values (about 2.3 kg less) than passengers measured at other airports. These lower values appear on the mean masses of male passengers as well as female passengers and the lower masses in Madrid appear in the Summer survey as well as in the Winter survey. At Sofia the mean mass value is about 2.1 kg heavier.

Trip characteristics

Route type

Three route types are distinguished in this survey: domestic, European and non-European. The mean mass of passengers travelling on a domestic route type is slightly higher (0.9 kg), than the mean mass of all passengers (Table C-5). No significant mean mass differences were found in the survey for male and/or female passengers.

Region of departure and arrival

In the following paragraph attention is being paid to differences in measured masses between passengers departing to or arriving from several regions. When the measured mean values are 1 kg more or less then the grand total mean, regions are mentioned. The paragraph is based upon Table C-10, Table C-11, Table C-12 and Table C-13.

The mean body mass of male passengers departing from or travelling to South America, Asia, Spain, Portugal or Italy is lower than the grand total mean of all male passengers (84.6 kg). Higher weights are measured amongst men, departing to or arriving from North-Eastern Europe, Romania and Bulgaria. Male passengers, departing to Greece, Cyprus, Malta and Turkey weigh more then the average male whereas male passengers arriving from this very same region show no difference from the grand total mean (84.6 kg).

Female passengers with higher masses than the grand total mean (66.5 kg), are the ones that:

- depart to Scandinavia and Iceland, Africa and the Middle East, UK and Ireland, Benelux and France and North America, or
- arrive from UK and Ireland, Scandinavia and Iceland.

Female passengers with lower weights than the female grand total mean, depart to Asia, South America, Romania and Bulgaria, Spain, Portugal and Italy. The very same lower masses are measured for females, arriving from Spain, Portugal, Italy, Greece, Cyprus, Malta and Turkey.

Overall it can be concluded that the accuracy percentages are rather high.

Flight characteristics

Flight type

The variable flight type implicates two characteristics: ‘scheduled’ or ‘non-scheduled’. The mean mass of all passengers travelling on a scheduled flight is 75.2 kg, and on non-scheduled flights the mean passenger mass is 69.3 kg (Table C- 7). This difference in mean masses of passengers is caused by ratio (male/female distribution), Table 4.4. The percentage female passengers is lower on scheduled flights than its percentage on non-scheduled flights (39% and 49%).

Table 4.4 Flight type related to gender distribution

Flight type	*Share of male*	*Share of female*
0 Scheduled	0.61	0.39
1 Non-scheduled	0.51	0.49
Total	0.60	0.40

Source: NEA

Airline type

Three airline types are distinguished[21]: 'regular scheduled', 'charter' and 'low-cost'. The mean mass of passengers on regularly scheduled flights is the highest (75.3 kg) and the mean mass of passengers in chartered flights (70.2 kg) is the lowest of the three airline types (Table C-8 and Table C-9). Charter flights show lower mean masses because they carry more female passengers than regularly scheduled flights (52% and 38% female). This difference is caused by ratio (male/female distribution), as shown in Table 4.5.

Table 4.5 Airline type related to gender distribution

Airline type	*Share of male*	*Share of female*
0 Regular scheduled	0.62	0.38
1 Charter	0.48	0.52
2 Low-cost	0.55	0.45
3 Charter & low-cost	0.59	0.41
Total	0.60	0.40

Source: NEA

Class of travel

Male passengers, travelling first class or business class tend to weigh slightly more (1.1 kg) than the average male passenger (Table C-4). For female passengers the opposite is the case. Female passengers travelling first class or business class tend to weight slightly less (-0.3 kg) than the average female passenger.

4.2.3 Carry-on luggage

The grand total mean of carry-on luggage mass is 6.1 kg (Table 4.6). In the Summer survey the total mean is lower (5.3 kg) and in the Winter the total

[21] The fourth type ('charter and low cost') is not analysed as the measurements of this passengers is low (4% of the total number of measurements), and mass differences are therefore not significant

mean is higher (6.9 kg). Male passengers carry-on luggage mass is heavier (6.7 kg) than the carry-on luggage of female passengers (5.9 kg).

Table 4.6 Mean masses of carry-on luggage for all passengers

Season	gender	mean	n	Std. Dev	accuracy (%)	conf range (95%)
Summer	male	6.0	5,899	4.6	1.9	0.12
	female	5.2	4,513	4.1	2.3	0.12
	child	2.0	1,083	2.6	7.7	0.15
	total	5.3	11,495	4.4	1.5	0.08
Winter	male	7.2	6,987	4.7	1.5	0.11
	female	6.7	4,082	4.6	2.1	0.14
	child	2.2	337	2.6	12.5	0.28
	total	6.9	11,406	4.7	1.2	0.09
Total	male	6.7	12,886	4.7	1.2	0.08
	female	5.9	8,595	4.4	1.6	0.09
	child	2.0	1,420	2.6	6.5	0.13
	total	6.1	22,901	4.6	1.0	0.06

Source: NEA

Further categorisation of the mean masses of carry-on luggage is not useful, due to the fact that the outcomes of these categories would not comply with the required accuracy (2%).

It is recommended for carry-on luggage masses to include this mass in a value for passenger + carry-on luggage (Table 4.7). In this case it is not necessary to apply a large safety margin on the carry-on luggage weight. If this method is applied the survey results show that an average mass of 7 kg can be used for carry-on luggage of adult passengers (6.5 kg + confidence range of 0.07 kg and rounded to the upper value).

Table 4.7 Passenger masses including carry-on luggage by season and gender (the figures for adult passengers include passengers carrying an infant)

Season	*Gender*	*Mean*	*n*	*Std.dev.*	*Accuracy (%)*	*Conf. Range (95%)*
Summer	All adults	80.8	10,412	17.5	0.4	0.34
	- Male	*88.7*	*5,899*	*16.3*	*0.5*	*0.42*
	- Female	*70.5*	*4,513*	*13.3*	*0.5*	*0.39*
	Child (2-12 years)	33.0	1,083	12.4	2.2	0.74
	Measured passengers[22]		11,495			
Winter	All adults	86.6	11,069	17.5	0.4	0.33
	- Male	*93.5*	*6,987*	*15.6*	*0.4*	*0.37*
	- Female	*74.6*	*4,082*	*13.8*	*0.6*	*0.42*
	Child (2-12 years)	32.0	337	13.5	4.5	1.44
	Measured passengers		11,406			
Total	All adults	83.8	21,481	17.7	0.3	0.24
	- Male	*91.3*	*12,886*	*16.1*	*0.3*	*0.28*
	- Female	*72.5*	*8,595*	*13.7*	*0.4*	*0.29*
	Child (2-12 years)	32.8	1,420	12.7	2.0	0.66
	Measured passengers		22,901			

Source: NEA

The carry-on luggage mass is partly determined by airline policies concerning maximum allowed mass of carry-on luggage. Those airline policies vary from 5 kg per person up to 23 kg per person[23]. The most common maxima are 5, 6, 8, 10 and 12 kg per person (Table 4.8). The measured masses of carry-on luggage vary from 4.2 up to 10.2 kg. Because part of the passengers carry no carry-on luggage at all, standard deviations are rather high. Due to the large variety on maximum allowed weights, the number of measured objects per maximum mass class is too low to lead to sufficient accurate measurements per maximum weight class. Except for the mass values of carry-on luggage in the maximum mass class of 8 kg, all measured values exceed the accuracy level of 2%. Therefore, the next table is only meant to be illustrative.

[22] The number of measured passengers is included in the table as reference to paragraph 4.2. Statistical analyses are not stated as these values are irrelevant for the survey and for revision of standard masses.

[23] Maximum allowed masses are known for 75% of the measured passengers

Table 4.8 Maximum allowed* and measured values of carry-on luggage masses by airline and destination

Maximum allowed	*Mean*	*n*	*Std.dev.*	*Accuracy (%)*	*Conf. Range (95%)*
5 kg	4.2	1,504	3.6	4.3	0.18
6 kg	6.3	2,408	4.5	2.9	0.18
7 kg	6.7	443	4.3	6.0	0.40
8 kg	6.9	5,460	4.7	1.8	0.13
9 kg	6.8	263	4.7	8.3	0.56
10 kg	6.2	2,588	4.3	2.7	0.17
12 kg	7.1	1,876	4.8	3.1	0.22
13 kg	7.7	17	5.0	30.7	2.38
14 kg	7.3	44	5.5	22.5	1.64
15 kg	10.4	9	6.1	38.3	4.00
16 kg	8.2	355	5.5	6.9	0.57
18 kg	6.9	794	4.7	4.7	0.32
20 kg	7.2	138	4.6	10.7	0.77
23 kg	7.4	499	5.0	5.9	0.43
Total	6.5	16,398	4.6	1.1	0.07

* *The luggage allowances have been retrieved from the websites from the airlines and can vary depending on different flight classes and distance and flight length (on long haul flights the checked baggage allowance can be higher than on short or medium haul). Please refer to 2.2.5*

Source: NEA

4.2.4 Checked baggage

The mean mass of checked baggage is 16.7 kg (Table 4.9). There is hardly any difference between the checked baggage mass of the Winter and the Summer survey. There is no significant difference between the checked baggage mass of male and female passengers.

Table 4.9 Checked baggage masses by season and gender

Season	*Gender*	*Mean*	*n*	*Std.dev.*	*Accuracy (%)*	*Conf. Range (95%)*
Summer	Male	16.9	5,162	5.8	0.9	0.16
	Female	17.0	4,172	5.7	1.0	0.17
	Child (2-12 years)	14.2	327	6.0	4.6	0.65
	Male & Infant (<2 years)	19.9	13	7.1	19.3	3.83
	Female & Infant (<2 years)	17.2	18	7.9	21.3	3.67
	Total	16.9	9,692	5.8	0.7	0.12
Winter	Male	16.5	7,391	5.9	0.8	0.13
	Female	16.8	5,080	5.7	0.9	0.16
	Child (2-12 years)	17.1	138	6.2	6.0	1.03
	Male & Infant (<2 years)	19.8	17	6.7	16.1	3.18
	Female & Infant (<2 years)	18.8	35	5.4	9.5	1.79
	Total	16.6	12,661	5.8	0.6	0.10
Total	Male	16.7	12,553	5.9	0.6	0.10
	Female	16.9	9,252	5.7	0.7	0.12
	Child (2-12 years)	15.1	465	6.2	3.7	0.56
	Male & Infant (<2 years)	19.8	30	6.7	12.2	2.41
	Female & Infant (<2 years)	18.3	53	6.3	9.4	1.71
	Total	16.7	22,353	5.8	0.5	0.08

Source: NEA

In the following circumstances, checked baggage mass is higher than the grand total mean: baggage that is meant for more than one person (Table E-18), non-European flights (Table E-4 and Table E-5), non-scheduled flights, charter and low-cost flights (Table E-7) and checked baggage belonging to passengers travelling to or from Asia, North America and South America (Table E-9, Table E-10, Table E-11 and Table E-12).

4.3 Analysis by explanatory variables - step 2

In this paragraph the relation between the dependent variable mass value of objects (passengers or baggage) and factors which were thought to influence mass values are investigated. Paragraph 4.3.1 starts with the presentation of the correlation between all factors and mass values of passengers and their carry-on luggage. Paragraph 4.3.2 follows an interpretation of the presented correlations.

4.3.1 Correlation between factors and mass values

In Table F-1 correlations are presented between measured passenger mass and factors which were thought to influence mass values. The values of Pearson's r are presented for correlation between several factors on the one hand and masses of passengers with and without carry-on luggage on the other. Pearson's r varies from -1 (there is a strong negative correlation) up to +1 (there is a strong positive correlation). A negative value of the correlation means that a high value of the factor correlates with low values of masses. A positive value of the correlation means that high values on the measured factor correlate with high values of masses. When there is no correlation between factor and mass, the value is 0. When correlations are not significant no values are presented (the table shows 'n.s.').

On the base of the strength of the correlations between the factors and the masses of passengers and their carry-on luggage, it is possible to rank the factors from the strongest (lowest number 1) up to the weakest correlations (highest number).

Ranking correlations between factors and adult passenger masses

The survey shows the following ranking in importance of factors related to *passenger* masses of adults:

1 **gender**: female masses are 17 kg lower than male masses
2 **age** (years): passengers from 13 up to 30 years old have less masses (10 kg less than passengers older than 30 years of age)
3 when the **purpose of the flight** is business, masses are higher than when the purpose is leisure (7 kg higher)
4 **season**:in the Winter the masses are higher than in the Summer (7 kg difference)
5 **place of measurement**: passengers weighted in Madrid, Warsaw and London Gatwick show lower masses:
   - Madrid 3 kg less than all other regions
   - Warsaw 1.7 kg. less than all other regions
   - London Gatwick 1.5 kg less than all other regions
6 **difference between flying to and coming from** the following directions:
   - other European countries (incl. Russia) (4 kg difference)
   - Spain, Portugal and Italy (2 kg difference)

- Scandinavia and Iceland (2 kg. difference)
- North America (2 kg difference)
- Benelux and France (2 kg. difference)
- Northeast Europe (almost 2 kg. difference)
- UK and Ireland (1 kg. difference)

7 **airline type**:
- in low-cost airlines adult passenger masses are 2.5 kg. less than all other airline types
- difference between airline type charter and all other types is 4.6 kg

8 **flight type**: the masses of adult passengers in non-scheduled flights are 5.9 kg lighter than the masses of passengers in scheduled flights

9 **check-in baggage**: yes or no (0,4 kg difference)

10 **haul** < 500 km and all other hauls further away (2,3 kg. difference)
- haul > 5000 km and all other hauls (0,9 kg. difference)

11 **direction** inbound or outbound (0,09 kg. difference)

12 **route type** European and all other types (1,2 kg. difference)

No significant differences between factors and adult masses were observed for the following factors:

- **place of measurement**: Amsterdam, Athens, Copenhagen, Frankfurt, Sofia
- **route type** domestic or other types
- **difference between flying to or coming from** the following regions:
  - Germany, Switzerland and Austria
  - Greece, Cyprus, Malta and Turkey
  - Romania and Bulgaria
  - Africa and the Middle East
  - Asia
  - South America

Ranking correlations between factors and carry-on luggage

The survey shows the following ranking in importance of factors related to masses of *carry-on luggage*

1 **flight type**: the mass of carry-on luggage in non-scheduled flights is 2.5 kg lighter than the mass of carry-on luggage in scheduled flights

2 **season**: in the Winter carry-on luggage is 1.3 kg heavier than in the Summer.

3 **purpose**: adults who claim their flight has a business purpose have 1.4 kg heavier carry-on luggage than adults who claim their trip has a leisure purpose.

4 **difference in masses of carry on luggage between flying to and from** the following regions:
- South America is (1.5 kg difference)
- Greece, Cyprus, Malta and Turkey (1.2 kg difference)
- Africa and the Middle East (0.7 kg difference)
- Germany, Switzerland and Austria (0.6 kg difference)
- Spain, Portugal and Italys (0.5 kg difference)
- Scandinavia and Iceland (0.5 kg difference)

5 **check in baggage**: adults without checked baggage carry 1,5 kg heavier carry-on luggage than adults with checked baggage.
6 **place of measurement**:
   - measured masses in Frankfurt are 1.6 kg heavier than elsewhere
   - measured masses in Amsterdam are 0.3 kg heavier than elswhere
   - measured masses in Sofia are 0.3 kg lighter than elsewhere
   - measured masses in Warsaw are 0.24 kg lighter than elswhere
   - measured masses in Madrid are 0.12 kg lighter than elswhere
7 **airline type**: passengers in charter flights carry 2.0 kg less carry-on luggage than passengers of other flights. In low-cost carriers, carry-on luggage is 1 kg lighter than those of all other flights.
8 **maximum kg of handbag**: higher maximun allowed values of carry-on luggage correlate slightly with higher measured values.
9 **gender**: carry-on luggage of female passengers is 0.8 kg lighter than carry-on luggage of male passengers.
10 **age**: passengers from 13 to 20 years carry 1.6 kg less carry-on luggage than older passengers.
11 **haul**:
   - passengers in long haul > 5,000 km flights carry 0.3 kg more carry-on luggage than passengers in other flights
   - passengers in short haul < 500 km flights carry 0.06 kg less carry-on luggage than passengers in other flights
12 **route type** masses of carry-on luggage in domestic flights are 0.3 kg lighter than masses of all other flights.
13 **direction** masses of carry-on luggage of outbound passengers is 0.2 kg heavier than these masses of inbound passengers

No significant differences were observed for:

- **Route type**: European
- **Place of measurement**: Copenhagen, Athens, and London Gatwick
- **Difference between flying to or coming from**: Romania and Bulgaria, Benelux and France, Northeast Europe, UK and Ireland, Other European countries (incl. Russia), Asia and North America

Ranking correlations between factors and checked baggage

The survey shows the following ranking in importance of factors related to masses of *checked baggage*

13 **distance in kilometers**: the further the distance of the flight the heavier the masses of checked in luggage.
14 **route type**: The checked in luggage mass in non-European flights is 2.3 kg more than the luggage mass on European flights and 3.4 kg more than the luggage mass domestic flights.
15 **haul:** The checked in luggage mass in long haul (>5,000 km) flights is 2.5 kg more than the luggage mass in medium haul (500-5,000 km) flights and 3.8 kg more than the luggage mass of short haul (<500 km) flights.
16 **label USA**: checked in luggage mass with a USA-label is 2.5 kg more than all other checked in luggage mass.

17 **purpose**: passengers who claim the purpose of their trip is business have 1.7 kg heavier checked in luggage mass than passengers flying for leisure reasons.
18 **number of persons**: Checked in luggage mass that belongs to more than one person is 1.8 kg heavier than the luggage that belongs to one person.
19 **maximum kilo**: airlines with maximum checked in luggage of 15 kg show lower masses than airlines with maxima of 18 kf and more (3 kg less)
20 **charter**: Checked in luggage mass in charter flights is 1.4 kg heavier than luggage masses in other flights
21 **flight type**: Checked in luggage mass in scheduled flights is 0.7 kg lighter than luggage masses in non-scheduled flights
22 **direction**: Checked in luggage mass in inbound flights is 0.5 kg heavier than luggage masses in outbound flights
23 **low cost:** Checked in luggage mass in low-cost flights is 0.5 kg heavier than luggage masses in other flights
24 **age**: Checked in luggage mass of very old (>80 years old) passengers and children (<12 years old) is somewhat lighter (1 kg) than checked in luggage mass of other passengers.

No significant differences were observed for:

- **class**: Checked in luggage of first class passengers shows 6.1 kg more mass than the luggage of economy and business class passengers, but this difference is not significant.
- **gender**: there is no significant difference between the checked in luggage mass of female and male passengers.
- **season**: In the Winter checked in luggage mass is the same as in the Summer

4.3.2 Appropriateness of the factors

In the following paragraph an interpretation of the correlations, presented in paragraph 4.5.1, is given. During this interpretation two questions are leading:

- What might cause the correlation between factors and masses?
- To what extent would it be appropriate to use the factor in new regulations?

The First question shall be answered by investigating interactions between different factors, examined in this study. The second question shall be answered by arguing whether the following four criteria are applicable:

- The factor in question is **specific**, meaning that the nature of the factor can be defined in a clear, understandable, and unambiguous way.
- The factor is **measurable**, meaning that when two or more different parties measure the same factor at the same time and place, the same values are measured.
- The factor is **acceptable** for all or at least most parties involved in aircraft business. In this study a factor is defined as unacceptable when implication of the factor in regulations may lead to additional administrative burdens
- The factor is **realistic**, meaning that evidence-based differences of measured masses are substantial.

The abovementioned criteria are summarised in Table 4.10 and will be clarified in the coming paragraphes. A factor will be called appropriate when all four required criteria are met.

Table 4.10 Criteria to judge the appropriateness of factors in new regulations

Factor	specific	measurable	acceptable	realistic		
				passenger	carry on	check in
passenger characteristics						
Gender: female or male	yes	yes	yes	yes	no	no
age	yes	yes	no	yes	yes	no
purpose: business or leisure	no	no	no	no	yes	no
checked baggage: yes or no	yes	yes	no	no	yes	n.a.
Time/place of measurement						
Time: Winter or Summer	yes	yes	yes	yes	yes	no
Place: AMS, ATH, CPH, FRA, LG, MAD, SOF, WAW	yes	yes	no	mad	fra	no
Trip characteristics						
direction inbound or outbound	yes	yes	no	no	no	no
Route type: domestic, Eur etc	yes	yes	yes	no	no	yes
Haul: long, medium, short	yes	yes	yes	no	no	yes
distance flight (km)	yes	yes	no	no	no	yes
Flight characteristics						
flight type (non) scheduled	no	no	yes	yes	yes	yes
Airline type: charter, low cost	no	no	yes	yes	yes	yes
maximum kg baggage	yes	no	yes	no	no	yes
Region departure/destination						
Thirteen regions*	yes	yes	no	no	no	no

* The 14th region covers other various arriving and destinating airports

Passenger characteristics

Gender

Gender is an appropriate factor to use in new regulations because the factor meets all four requirements:

- ***Specific:*** The factor gender is used to define five passenger categories based on age and sex. The following categories are distinguished: (1) male, (2) female, (3) child (2-12 years), (4) male with infant between 0-2 years and (5) female with infant between 0-2 years. Differences in sexe are clear and unambiguous. The age categories of infants and children are clear, understandable and unambiguous, because they are linked to the age of the person.
- ***Measurable:*** Because airlines make a distinction between the price of the flight and the age where children or infants are concerned, it is possible for airlines to measure the distinct gender categories
- ***Acceptable:*** Because gender plays a role in the current regulations, gender should be acceptable for all parties concerned.
- ***Realistic:*** Five categories of gender types were defined. It did not seem to be realistic to make a distinction between adult passengers with or without carrying infants, because the proportion of adults carrying infants was very small – especially in the Winter months. The second reason why the distinction between adults with and without carrying infants is not realistic is the fact that the mean masses of adults with infants are not different from the mean masses of adults without infants. Because the category ‘child from 2-12 years old ‘ shows very significant differences in mass weight (compared with the masses of adults) it seems realistic to take this category into account. The number of measured children was however too low to lead to the sufficient accuracy level of at least 2%. This is the reason why the category ‘children from 2-12 years old’ is not taken into account. This leads to the conclusion that only two categories of the factor gender remain: adult female passengers (female passengers carrying an infant included) and adult male passengers (male passengers carrying infants included). These two categories of the factor ‘gender’ show the strongest correlation with passenger mass: female passengers weigh less than male passengers. The most important cause of differences in masses between men and women is their body length and body structure: men are longer than women and have more muscles. It is realistic to use the factor ‘gender’ in new regulations because it is a very significant factor predicting differences in adult passenger mass. Gender predicts 28% of the differences in adult passenger mass.

Age

Age is not an appropriate factor to use in new regulations because the factor meets only three of the four requirements:

- ***Specific:*** The passengers age in this survey is measured in a subjective way: passengers told their own age. Because all passengers are able to give an adequate answer when asked about their age, this factor is clear, understandable and unambiguous.

- ***Measurable:*** Because all passengers have to travel with their passports, and the date of birth is written in the passport, the age of every passenger is measurable in an objective way.
- ***Acceptable:*** When age is taken into account in new regulations, airlines will have to make specific administrative adjustments to be able to follow the new rule. Furthermore, this might be in violation of the privacy law. Therefore, this factor is considered unacceptable.
- ***Realistic:*** There is a significant positive correlation between age and passenger mass. Younger passengers between 13 and 30 years old show substantial fewer masses than older passengers. Age predicts 6.1% of the differences in adult passenger mass. Part of the relation between age and body mass is caused by different male/female ratio's in the ages of 35 and 50 years old. After correction for gender differences, age predicts 4,7% of the differences in adult passenger mass. Due to the positive correlation between age and passenger mass age is a realistic factor for regulations.

Purpose of the flight

The purpose of the flight is not an appropriate factor to use in new regulations because the factor meets none of the four requirements:

- ***Specific:*** The factor purpose is the motive for travelling as stated by the passenger. Two categories were used: business and leisure. When asked about the motive of their flight, passengers gave answers in more categories than the two distinguished categories in this survey. Neither the category 'business' nor the category 'leisure' is therefore unambiguous.
- ***Measurable:*** When two or more differences would have to categorize the same flight purpose, different answers are possible. Mixing up flying business class with flying for business purposes is imaginable. This is why the factor "purpose" is not measurable enough.
- ***Acceptable:*** Aircraft companies would have to start a separate registration when the factor purpose is subject to new regulations. Therefore, the factor is not acceptable.
- ***Realistic:*** Business purpose predicts 2.5% of the differences in adult passenger mass. Part of correlation between business purpose and adult passenger mass is caused by gender and age: especially male passengers between 30 and 50 years old claim the purpose of their flight is business. After correction for this influence of gender and age, only 0.4% of the differences in adult passenger mass are predicted by business purpose. An influence this small is not considered substantial enough for new regulations.

Checked baggage: yes or no

The factor checked baggage is not an appropriate factor to use in new regulations because the factor meets only two of the four requirements:

- ***Specific:*** A passenger might have checked baggage or not. Checked baggage is defined in terms of a concrete action and therefore clear, understandable, and unambiguous.
- ***Measurable:*** when different people in different places perform the operations specified in the definition of 'checked baggage' the same values (yes or no) will be measured.

- ***Acceptable:*** relating passenger masses to their checked baggage would imply extra administrative actions on behalf of the airlines. This is why the factor “checked baggage” is not considered acceptable.
- ***Realistic:*** The factor ‘checked baggage’ predicts 0.1% of the differences in adult passenger mass. An influence this small is not considered substantial enough for new regulations.

Time and place of measurement

Season

The factor ‘season’ is an appropriate factor to use in new regulations, because the factor meets all four requirements. After correction for gender differences however, season predicts only 0.5% of the differences in adult passenger mass:

- ***Specific:*** The factor ‘season’ contains two categories: Winter and Summer. Both categories can be defined as clear, understandable, and unambiguous by specifying the days of the month as a starting and ending point of that particular season.
- ***Measurable:*** The factor ‘season’ is measurable because all European countries use the same time table and calendar.
- ***Acceptable:*** The factor ‘season’ already plays a role in aircraft business, because passenger movements vary by season. It should therefore be easy to incorporate the factor season into new regulations.
- ***Realistic:*** There is a correlation between season and passenger mass. In the Winter the masses are higher. Season predicts 2.6% of the differences in adult passenger mass (carry on luggage included). Part of the higher masses in the Winter are caused by gender differences: in the Winter the fraction of female passengers is lower than in the Summer. In the Winter male passengers are older than male passengers in the Summer and they have higher masses of carry-on luggage. After correction for these gender differences, season predicts only 0.5% of the differences in adult passenger mass. An influence this small is not considered substantial enough for new regulations.

Place of measurement

The factor ‘place of measurement Madrid’ is not an appropriate factor to use in new regulations because the factor does not meet all four requirements:

- ***Specific:*** The factor ‘place of measurement’ contains eight specific airports. Each airport represents a part of Europe. Such a definition is clear, understandable, and unambiguous.
- ***Measurable:*** Because data collection of this survey is described precisely, any other party could repeat the measurements in the same way. The factor is therefore measurable.
- ***Acceptable:*** Based on the accuracy level it can be concluded that follow-up research is recommendable. Moreover, it should be discussed with stakeholders whether it is acceptable to create different rules for different parts of Europe, as this might complicate the performance of the regulations.
- ***Realistic:*** Seven of the eight airports show similar passenger masses. Adult passenger masses in Madrid were lower than passenger masses in all other airports (5 kg. lower). The factor “place of measurement Madrid” predicts 0.6% of the differences in adult passenger mass. Part of the differences in

passenger mass between Madrid en the other airports where measurements took place is caused by gender and age differences. The data on passengers coming from and going to Madrid, contain more female passengers (2% more female passengers than other measured airports) and the average age of the passengers is lower (the average age of passengers measured in Madrid is 2 years younger than passengers measured in other airports). Furthermore, fewer passengers claimed that the purpose of their trip was business. After correction for these factors passenger masses in Madrid diminished by 3 kg. lower than passenger masses in all other airports.

Trip characteristics

Direction

Direction is not an appropriate factor to use in new regulations because the factor meets only two of the four requirements:

- ***Specific:*** The factor 'direction' contains two categories: inbound passengers (arrivals) and outbound (departing) passengers. This definition is sufficiently clear and unambiguous.
- ***Measurable:*** the factor meets the criterion of measurement.
- ***Acceptable:*** The factor is not acceptable for new regulations, because only departing passengers are boarding.
- ***Realistic:*** Arriving passenger mass is lower than departing passenger mass (1.3 kg). The factor direction predicts 0.1% of the differences in adult passenger mass. An influence this small is not considered substantial enough for new regulations.

Route type

Route type is not an appropriate factor to use in new regulations because the factor meets only two of the four requirements:

- ***Specific:*** Route type defines the geographical scope of the flight route into three categories: (1) European, (2) non-European and (3) domestic. A flight is categorised as European if both the airport of departure and the airport of arrival are located in European countries. Because some European countries are smaller and others are larger, the surface area of the category 'domestic' has a different meaning in different countries. This is why the category 'domestic' is not specific.
- ***Measurable:*** The factor is very well measurable.
- ***Acceptable:*** When route type would contain only two remaining categories European and non-European, the factor is simple enough to be acceptable.
- ***Realistic:*** Passenger mass of European flights is a bit higher than passenger mass in all other flights. Route type predicts 0.1% of the differences in adult passenger mass. An influence this small is not considered substantial enough for new regulations.

Flight distance

Flight distance is not an appropriate factor to use in new regulations because the factor meets only one of the four requirements:

- ***Specific:*** The factor flight distance is the distance in kilometers between the airport of departure and the airport of arrival, categorised in three distance categories: (1) short haul (<500 km), (2) medium haul (500-5,000 km) and (3) long haul (> 5,000 km).

- ***Measurable:*** The factor is not well measurable, because passengers might make stops in between. Because of these stops the total distance of the flight of the passenger does not correspond with the total distance of the flight of one special airplane.
- ***Acceptable:*** Introducing the factor flight distance into regulations would make things very complex for aircraft companies. The factor is therefore not acceptable.
- ***Realistic:*** Flight distance predicts 0.02% of the differences in adult passenger mass. After correction for mass differences, caused by gender, age and carry-on baggage, flight distance predicts only 0.01% of the differences in adult passenger mass. An influence this small is not considered substantial enough for new regulations.

Flight characteristics

Flight type

Flight type is not an appropriate factor to use in new regulations because the factor meets only two of the four requirements:

- ***Specific:*** The flight type is determined by OAG data which includes only the scheduled flights. All flights not registered in the OAG data are marked as non-scheduled flights. It is not certain whether this definition is unambiguous.
- ***Measurable:*** as long as OAG data are registered, the factor flight type is measurable.
- ***Acceptable***: Because current regulations contain flight characteristics as distinguishable criterion, it should be no problem to introduce new regulations based on flight characteristics.
- ***Realistic:*** Scheduled flights predict 0.5% of the differences in adult passenger mass. Passenger mass in scheduled flights is 5.9 kg more than passenger mass in other flights. Part of the relation between scheduled flights and passenger mass is caused by age, season and airline policies concerning carry-on luggage. The average age of the passengers in scheduled flights is higher, the fraction of scheduled flights is higher in the Winter and the mass of carry-on luggage of passengers in scheduled flights is higher because of differences in airline policies. After correction for these factors the difference between passenger mass in scheduled flights and all other flights is 1.2 kg.

Airline type

Airline type is not an appropriate factor to use in new regulations because the factor does not meet all four requirements:

- ***Specific:*** The factor airline type is defined in three categories of flights: (1) regular scheduled, (2) charter and (3) low-cost. These categories are not clear and unambiguous.
- ***Measurable:*** The airline company decides which flight is called ‘charter’ or ‘low-cost’. Therefore, the factor is not measurable in an independent way.
- ***Acceptable:*** Because the factor is part of current regulations, the factor is acceptable.
- ***Realistic:*** The category ‘charter’ predicts 0.3% of the differences in adult passenger mass; this is a 4.6 kg difference. The differences in passenger mass between charter flights and all other flights is partially due to

differences in gender, age, airline regulations regarding carry-on luggage, season and purpose of the flight. After correction for these factors the difference between charter flights and all other flights diminishes from 4.6 kg to 1.9 kg. After this correction the category 'charter' predicts 0.1% of the differences in adult passenger mass. This influence is considered not substantial for new regulations.

4.4 Regression analysis – step 3

4.4.1 Passenger masses including carry-on luggage

In Table F-1 and Table F-2 corr elations between individual factors and passenger masses were presented. In the previous paragraph it has been explained that there is interaction between factors. Male and female passengers choose differently for flight type and airline type. Please refer to ANNEX C and ANNEX D. This interaction leads to differences in male/female ratio per flight type, which might influence mean masses of passengers. In order to eliminate the influence of interaction between factors, we examined all independent variables in a regression analysis. The results are presented in Table 4.11. The coefficient values can be found in the column 'non-standardized coeff beta'. This results in a formula that predicts the mass of an adult passenger as follows: the mass of an adult passenger is 71.7 kg, minus 17.1 kg if the passenger is female, plus 1.2 kg if the person is carrying a handbag (plus nothing, with no handbag), plus 0.2 kg for every year of age, plus 2.6 kg in the Winter, plus 2.1 kg if the purpose is business, plus 1.7 kg if the flight is a charter.

Table 4.11 Linear regression analysis with dependent variable passenger masses incl. carry-on luggage (best fit model); all passengers > 12 years

Predictors	*Non-standardized coeff. B*	*% of mass variance predicted*
(Constant)	71.7	
Gender	-17.1	27.0%
Handbag	1.2	10.4%
Age	0.2	4.0%
Season	2.6	0.5%
Purpose	2.1	0.2%
Charter	1.7	0.1%
flight type	1.0	0.0%
Total	n.a.	42.2%

Source: NEA

Aside from the factors shown in the table, no other factors measured in the survey have influenced passenger masses. All factors in the table predict 42%

of the differences in passenger masses of all passengers older than 12 years of age. This is a very high percentage, taking into account, that the length of passengers, which normally explains part of passenger mass, is not measured in this survey. Passenger characteristics (gender, age, purpose of trip) have the most influence on passenger mass. 27% of the mass variance is predicted by gender. Flight and trip characteristics only contribute to a limited extent to mass differences.

Conclusions:

- Within the regression analysis it has been showed that gender is the most important factor. Therefore, separate standard masses for male and female adults are recommended.
- It is recommended to include the carry-on luggage mass in the mass value for passenger + carry-on luggage. In this case it is not necessary to apply a large safety margin on the carry-on luggage weight.
- The masses of passengers measured in the Winter are leading.
- No other distinction in factors is recommended for passengers.
- The recommended male/female ratio is 70/30.
- Based on the aforementioned, the following standard masses are recommended:
  - male passengers: 94 kg
  - female passengers: 75 kg
  - all adult passengers: 88 kg

More details can be found in the Annex, Table F-13.

By way of illustration, the effect of the m/f ratio on the mean mass for adult passengers, is shown for a few factors in Table 4.12.

Table 4.12 Different ratios

Factors	*Ratio male/female*	*All adults' mean mass*
To compare: current ration within EU safety regulations for 'All flights except holiday charters', applied to survey outcome	80/20	87.7 kg
Purpose = business	72/28	86.2 kg
Class of travel = business	66/34	85.0 kg
Route type = European	61/39	84.1 kg
Flight type = non-scheduled	51/49	82.2 kg
To compare: current ration within EU safety regulations for 'Holiday charters', applied to survey outcome	50/50	82.0 kg

Source: NEA

In the Summer survey a relatively high number of female passengers was weighed although the majority of respondents was still male (57/43 male/female ratio). In the Winter survey the male/female ratio was 63/37. The survey shows that mass values are strongly influenced by male/female ratio and by season. According to airport statistics of WAW, AMS and FRA the actual overall male/female ratio was 58%/42% in the Summer and 64%/36% in the Winter. This confirms that the random oberservations within the survey reflect the actual situation at the airports.

4.4.2 Checked baggage

Most measured baggage masses vary between 15 kg and 18 kg. The variables, taken into account in this survey can hardly determine differences in baggage mass. Only 6% of the differences in measured baggage mass can be determined by the variables in the survey. Unknown factors and errors are responsible for most of the variance in luggage weight (Table 4.13). The conclusion is that the factors that have been measured in this survey are not explanatory for the actual carried mass of baggage. Therefore, it is not recommendable to distinguish in further categories for checked baggage (e.g. for flight types).

Table 4.13 Linear regression analysis with dependant variable checked baggage masses (best fit model)

	Non-standardized Coefficients B	% of mass variance predicted
(Constant)	11.1	
Intercontinental flight	1.2	3.5%
Purpose: business	-1.1	0.9%
Baggage for 2 or more	1.4	0.7%
Domestic flight	-0.8	0.4%
Maximum kg	0.2	0.2%
Class: business	-2.3	0.2%
Short haul	-0.5	0.1%
Long haul	0.7	0.0%
Charter	0.9	0.0%
Low cost	0.2	0.0%
total	n.a	6.0%

Source: NEA

Most measured baggage masses vary between 15 kg and 18 kg. Based on the survey results, it is recommended for checked baggage masses to use the mean observed mass of 16.7 kg + the confidence range of 0.08 kg and rounded to the upper value.

Conclusion:

- This results in a standard mass of 17 kg for checked baggage.

4.5 Comparison with EU safety regulations

The 2008 - 2009 EASA survey on Standard Weights of Passengers and Baggage at eight European airports have given best estimates of the mean masses of passengers, their carry-on luggage and checked baggage for aeroplanes with more than twenty or thirty seats. This paragraph discusses the way these masses can be used in practice.

4.5.1 Current EU safety regulations

The current EU safety regulations are formulated in EU-OPS 1, subpart J – Mass and balance. EU-OPS 1.620 are presented in Table 4.14.

Table 4.14 Standard masses of male and female passengers on an aeroplane with 20 and 30 or more seats

Passenger seats:	*20 and more*		*30 and more*
	Male	*Female*	*All adult*
All flights except holiday charters	88 kg	70 kg	84 kg
Holiday charters	83 kg	69 kg	76 kg
Children	35 kg	35 kg	35 kg

Source: EU-OPS 1.620

The standard masses include hand baggage and the mass of any infant below two years of age carried by an adult on one passenger seat. When the number of passenger seats is 30 or more, no separate weights for male and female passengers are prescribed.

Where the total number of passenger seats available on an aeroplane is nineteen or less, currently the standard masses as presented in Table 4.15 are applicable.

Table 4.15 Average standard masses in aeroplanes with nineteen or less seats

Passenger seats	*1 - 5*	*6 - 9*	*10 - 19*
Male	104 kg	96 kg	92 kg
Female	86 kg	78 kg	74 kg
Children	35 kg	35 kg	35 kg

Source: EU-OPS 1.620

Table 4.14 (20 and more seats) contains the basic information with respect to the passenger masses. JAA SWWG made a distinction between ‘All flights except holiday charters’ and ‘Holiday charters’. To calculate the mean mass for ‘adults’, JAA SWWG used a break down of 80% male and 20% female for the ‘All flights except holiday charters’ category and 50% male, 50% female for ‘Holiday charters’. The masses in the Table 4.15 are derived from Table 4.14 (‘All flights except holiday charters’) by adding 4 kg for 10 – 19 seats, 8 kg for 6 – 9 seats and 16 kg for 1 – 5 seats. The rationale for that is given in the Final report of JAA SWWG. Of relevance here, is to conclude that a higher mass of passengers in smaller airplanes has nothing to do with the actual mean masses of passengers in aircrafts with more or less seats, but has to do with safety margins.

On flights where no carry-on luggage is carried in the cabin, or where carry-on luggage is accounted for separately, 6 kg may be deducted from the above male and female masses. Articles such as an overcoat, an umbrella, a small handbag or purse, reading material or a small camera are not considered as carry-on baggage.

Table 4.16 Standard masses of checked baggage on an aeroplane with 20 or more seats

Type of flight	*Baggage standard mass*
Domestic	11 kg
Within the European region	13 kg
Intercontinental	15 kg
All other	13 kg

Source: EU-OPS 1.620

Where the total number of passenger seats available on the aeroplane is *twenty or more,* the standard mass values given in Table 4.16 are applicable for each piece of checked baggage. For aeroplanes with nineteen passenger seats or less, the actual mass of checked baggage, determined by weighing, must be used.

4.5.2 Measured passenger masses applied to safety regulation

The 2008 - 2009 EASA survey on Standard Weights of Passengers and Baggage gives best estimates for the standard masses for the passenger categories ‘male’ and ‘female’. It is been concluded in the survey that gender and ratio are the most important factors in determining the standard masses of adult passengers. These findings have been applied in Table 4.17, using the same methodology as has been used for current EU safety regulations. For children the value of 40 kg would be the most safe border for the standard mass of children under 12 years old, as the accuracy of the survey outcomes for children is too high. In order to determine a new statistical standard mass for children, it is recommended to perform an additional survey with special focus on children.

Table 4.17 Standard masses of male and female passengers on an aeroplane with 20 and 30 or more seats (EU-OPS), and measured masses*

Passenger seats:	*20 and more*		*30 and more*	
	Male	*Female*	*M/F ratio*	*All adult*
EU-OPS standard masses				
All flights except holiday charters	88 kg	70 kg	80/20	84 kg
Holiday charters	83 kg	69 kg	50/50	76 kg
Children	35 kg	35 kg	n.a.	35 kg
Measured mean masses from the survey				
Scheduled	92kg	73 kg	70/30	86 kg
Non-scheduled	88 kg	71 kg	50/50	80 kg
Children	40 kg	40 kg	n.a.	40 kg

Source: EU-OPS 1.620 and NEA

* The standard masses include hand baggage and the mass of any infant below two years of age carried by an adult on one passenger seat.

It can be concluded that the standard masses of male and female passengers have increased, compared to current EU safety regulations. However, the increase of the standard mass for all adults on scheduled flights, is less than would have been expected. This is a result of the fact that the male/female ratio has changed (as a result of this survey).

Conclusion:

- Standard adult passenger masses (male, female and all adult) have increased. Therefore, revision of EU safety regulations is recommended.
- Although the standard masses of adult passengers on non-scheduled flights differs from the standard mass of adult passengers on scheduled flights, it is recommended to disregard the factor ‘charter’, because it does not comply with the set criteria for appropriateness (see Flight characteristics – flight type. Refer to paragraph 4.3.2).

4.5.3 Measured checked baggage masses applied to safety regulation

Table 4.18 Checked baggage masses

	EU-OPS 1.620	*2008 - 2009 EASA survey*	*% difference*
Domestic	11 kg	15 kg	+36%
Within the European region	13 kg	16 kg	+23%
Intercontinental	15 kg	18 kg	+20%

Source: EU-OPS 1.620 and NEA

In Table 4.18 the diffences between the outcomes of the survey and current EU safety regulations are illustrated.

Most measured baggage masses vary between 15 kg and 18 kg.

Conclusion:

- Although the standard masses of checked baggage differs from the standard mass of the standard masses for route type in current EU safety regulations, it is recommended to disgard the factor 'route type', because it does not comply with the set criteria for appropriateness (see paragraph 4.3.2.)
- Based on the survey results, it is recommended for checked baggage masses to use the mean observed mass of 16.7 kg + the confidence range of 0.08 kg and rounded to the upper value. This results in a recommended value of 17 kg.

4.5.4 Recommended standard masses for updating EU safety regulations

In Table 4.19 the following standard masses for male, female, adult passengers and checked baggage are recommended.

Table 4.19 Recommended standard masses for updating EU safety regulations*

Passenger seats:	*20 and more*		*30 and more*	
Passengers	*Male*	*Female*	*M/F ratio*	*All adult*
All flights	94 kg	75 kg	70/30	88 kg
Checked baggage				
All flights	17 kg	17 kg	n.a.	17 kg

Source: NEA

* The standard masses include hand baggage and the mass of any infant below two years of age carried by an adult on one passenger seat.

The figures in the Table 4.19 are based on the outcomes of the survey (as stated earlier) :

- The masses of passengers measured in the Winter are leading.
- No other distinction in factors are given.

5 Conclusions and recommendations

5.1 Conclusions

5.1.1 Conclusions on the survey set-up and the field work

The 2008-2009 EASA Survey on Standard Weights of Passengers and Baggage has been carried out according to requirements laid down in EU-OPS regarding weight surveys:

- the survey has been performed at eight selected airports, each representing a region of Europe, where a number of different routes could be surveyed on consecutive days and where random selection of passengers took place;
- the survey has been performed in Summer and Winter period;
- the survey sample size was within the required accuracy levels to cover all relevant factors within the required statistical confidence levels, except for children.

The 2008 – 2009 EASA survey on Standard Weights of Passengers and Baggage gives mass values of passengers, carry-on luggage and checked baggage. The correlations between mass values and influencing factors have been analysed. The results of the analyses can be used for revisions of the currently applicable regulations on standard masses. Data on weight development in Europe usually are taken from national health surveys. Because of differences in the survey designs (sampling frames, age of population surveyed etc.) the results are difficult to compare. Therefore, it is not recommended to use statistical extrapolation in order to determine future standard masses for passengers.
The correlations with the following factors have been analysed:

- *Passenger characteristics*: age, gender;
- *Passenger behavioural characteristics*: carrying an infant, carrying carry-on luggage, travelling by purpose (business or leisure);
- *Place and time of the measurements*: airport (eight airports were selected) season (Summer or Winter);
- *Trip characteristics*: direction (outbound or inbound), route type (domestic, European and non-European), region of departure or arrival (fourteen regions have been distinguished), and class of travel (economy, business or first);
- *Flight characteristics*: flight type (scheduled or not-scheduled), airline type (regular scheduled, charter or low cost) and airline policies concerning maximum of baggage mass.

The survey set-up proved to be an effective way to build a data-set on passenger, carry-on luggage and checked baggage mass values on European flights that enabled statistically sound analyses of factors influencing these mass values and comparison with the regulations currently in place in EU-OPS. For children, the results derived from the survey are only to a limited extend in accordance with the set accuracy levels. Special focus on a relatively large number of children during the survey needs to be avoided in order not to jeopardize the randomness of the survey.

5.1.2 Conclusions on the survey results

The survey resulted in standard masses for the following categories: male, female, all adult, children, carry-on luggage and checked baggage.

Conclusion on infants:

- No significant difference is found between the standard masses of male/female without an infant in relation to the standard masses of male/female carrying an infant. Therefore, the masses of male/female carrying an infant has been included in the mass of male/female passengers.

Conclusions on children:

- Due to the high accuracy outcome of the survey for children, it is not possible to determine a standard mass for children. It is recommended to perform an additional survey in order to determine the new standard mass for children.
- In case it will not be possible to perform such a survey on short time notice, it is recommended to apply the standard mass of 40 kg.

Conclusion on carry-on luggage:
Based on the survey results, it is recommended for carry-on luggage masses to include this mass in a value for passenger + carry-on luggage. Table 4.7. In this case it is not necessary to apply a large safety margin on the carry-on luggage weight.

- Conclusions on adult passengers:
- Within the regression analysis it has been showed that gender is the most important factor. Therefore, separate standard masses for male and female adults are recommended.
- It is recommended to include the carry-on luggage mass in the mass value for passenger + carry-on luggage. In this case it is not necessary to apply a large safety margin on the carry-on luggage weight.
- The masses of passengers measured in the Winter are leading.
- No other distinction in factors is recommended for passengers.
- The recommended male/female ratio is 70/30.
- Based on the aforementioned, the following standard masses are recommended:
  - male passengers: 94 kg
  - female passengers: 75 kg
  - all adult passengers: 88 kg

Conclusion on checked baggage:

- The recommended standard mass for checked baggage is 17 kg.

A factor is called appropriate when all four required criteria are met (specific, measurable, acceptable and realistic).The factors meeting all four requirements are gender and season. After correction for gender differences however, season predicts only 0.5% of the differences in adult passenger mass and therefore the factor ‘season’ has been integrated in the recommended adult standard mass.

In the adult standard masses, gender has been integrated in the male/female ratio.

5.1.3 Conclusions on comparison of survey results with EUOPS

The 2008 - 2009 EASA survey on Standard Weights of Passengers and Baggage gives best estimates for the standard masses for the passenger categories 'male' and 'female' and all adults for the periods under consideration. It has been concluded in the survey that gender and ratio are the most important factors in determining the standard masses of adult passengers.

It can be concluded that the standard masses of male and female passengers have increased, compared to current EU safety regulations. However, the increase of the standard mass for all adults on scheduled flights, is less than would have been expected. This is a result of the fact that the male/female ratio is changed (as a result of this survey).

Although the standard masses of checked baggage differs from the standard mass of the standard masses for route type in current EU safety regulations, it is recommended to disregard the factor 'route type', because it does not comply with the set criteria for appropriateness.

The following standard masses for updating EU safety regulations are recommended:

Passenger seats:	*20 and more*		*30 and more*	
Passengers	*Male*	*Female*	*M/F ratio*	*All adult*
All flights	94 kg	75 kg	70/30	88 kg
Checked baggage				
All flights	17 kg	17 kg	n.a.	17 kg

5.2 Recommendations on revisions of standard mass regulations

Revision of the regulations on standard masses for passengers, carry-on luggage and checked baggage is recommended. This is supported by two empirical issues:

- The outcomes of the survey indeed showed an increase in passenger mass and checked baggage mass as suggested in JAA SWWG report dated the 31st of October, 2006.
- The desk research in chapter 1 provides a summary of several studies in which the increase of body mass is also confirmed.

The findings from these studies are as follows:

- Recent worldwide research has revealed that passenger's body mass has increased and clothing is generally heavier in the Winter months. Research

shows a clear upward trend, even in countries with traditionally lower rates of overweight and obesity.

- The increase of overweight amongst children and adolescents has accelerated in recent years. According to the most recent data on nationally representative samples from different countries in the European Region, the prevalence of obesity ranges from 5% to 20% in men and up to 30% in women.
- The increased consumption of more energy-dense, nutrient-poor foods with higher levels of sugar and saturated fats, combined with reduced physical activity (more sedentary lifestyle due to the rise in welfare), have led to overweight and obesity rates that have risen three-fold or more all over the world since 1980.

It is expected that the standard mass of the European population in the coming years will increase further based on the following:

- In 10 years time the current younger adult generation will represent the age class between 40 to 50 years and will show a further increase in body mass, based on the predictions of desk research.
- In case the survey is carried out in one year, the probability of measuring different standard masses is unlikely because of minor mass changes.

Based on this, a full new survey to update the dataset is recommended in 10 years time.As mentioned before, it is not recommended to use statistical extrapolation in order to determine future standard masses for passengers.

Due to the high accuracy outcome of the survey for children, it is not possible to determine a standard mass for children. In order to determine a new statistical standard mass for children, it is recommended to perform an additional survey with special focus on children.

ANNEX A Weighing team instructions

General information and preparations

- The weighing team consists of two NEA consultants and Temporary Staff. One NEA employee will be the Team Leader responsible for the correct execution of the field work. The Team Leader is responsible for all aspects of the survey and will be the first contact for the airport. In case of any problem, contact the Team Leader.
- Meeting with and training of Temporary Staff on day 1 (Monday):
  - Introduction of the project objective and approach;
  - Practice set-up and using equipment and the software
  - Make agreements on breaks, lunch, sanitary stops, etc.
  - Discuss all operational details, daily meeting point and times.
- Never leave the equipment and team member belongings unattended.

Instructions for shipment, storage and movement of equipment

- Shipment of the scales is carried out by **SDV International Logistics** and **Roberts Europe** and need to be picked-up and delivered at a designated location.
- Each weighing scale is packed in a separate box, a shipment contains four boxes. As the shipment of equipment makes a round trip, all paper work necessary for performing the surveys at the airports is included.
- The equipment must be stored at a secure location overnight – make sure to have agreement on access to the equipment with the airport contact.
- At the end of the last survey day, outbound shipment of the scales has to be arranged.
- The Team Leader is in charge of the in- and outbound shipment.

Instructions for performing the survey

- The *required sample size* is 1,000 passengers plus carry-on luggage AND 1,000 pieces of checked baggage. Allowing for mistakes and data entry errors, the aim is to oversample both figures by at least 10%.
- The *sampling should take place randomly*, meaning that the best way would be to instruct your temporary staff to invite every third or fifth passenger to participate. You should do this at as much different locations at the airport as possible to cover all types of flights, destinations, passengers etc. As this is not always possible, it is quite obvious that you try to be at a busy location with a steady flow of preferably highly diversified travellers/destinations.
- Always be polite to passengers; participation is strictly voluntary.
- Stress that the survey is *anonymous*: no personal data will be collected. We are collecting *statistics*.

- Duly note the following issues:
  - When a passenger is carrying an infant (child < 2 years of age) the weight of the infant will be included by the weight of its accompanier.
  - In case you meet a transfer passenger please fill out the form as it was an outbound passenger.

Only in case he has to go to the baggage reclaim and after that he checks his baggage in again, and you meet him at the check-in counter, he can be treated as an inbound passenger.

The inbound passengers and their carry-on luggage will be weighed at the gate when leaving the aircraft or at the baggage reclaim area. Their checked baggage will be weighed at the baggage reclaim.

The outbound passengers will be weighed as close to the gate as possible before entering the aircraft, whilst the luggage will be weighed at check-in. Passenger and carry-on luggage weight measurements of outbound passengers take place close to the gate to ensure that tax-free items purchased at the airport will be included. It is not necessary to know the total number of passengers on the plane nor to link the passengers with their checked baggage.

INSTRUCTIONS FOR LOCAL WEIGHING TEAM

General instructions

- In case of any problem, contact the Team Leader.
- Never leave the equipment and team member belongings unattended.
- Always be polite to passengers; participation is strictly voluntary.
- In case of an evacuation or other emergency, listen to the instruction of the airport authorities and leave everything in place.
- Make notes of who works with which equipment for all working times.

Instructions for storage, set-up and movement of equipment

- Each day starts with the set-up of equipment and charging the battery pack.
- Equipment should be safely stored before changing locations at airport.
  - Notify airport contact for any significant change
  - Shut down all equipment and secure for transport
  - Execute change (be prepared for security check)
- At the end of the last survey day, outbound shipment of the scales has to be arranged. This will require tape and scissors.

Instructions for approaching passengers

- Approach the passenger and ask whether they want to participate in **an air safety related survey.**
- The selection of passengers must be random:
  - Approach the passenger (the one nearest to you);
  - In case of a group or family the whole group is welcome to cooperate;
  - Do not discriminate on appearance or characteristics.
- The survey should be presented as a study for the European Aviation Safety Agency regarding passenger and baggage weights (see Project Description and poster).

- Stress that the survey is *anonymous*: no personal data will be collected. We are collecting *statistics*.

Instructions for data collection

- After the introduction the passenger will either cooperate or not:
  - In case the passenger cooperates, escort him/her to the scale and ask them to have their boarding pass ready because this will make the data entry faster.
  - In case the passenger rejects to cooperate, fill out the non-response form as complete as possible.

- For the *Passenger and Carry-on Luggage Weighing*, go through the following steps at the weighing location:
  - Welcome the passenger;
  - Ask the passenger to step on the scale and to stand as still as possible;
  - Ask the questions in the data entry form (origin, destination, age, etc.);
  - Record the weight of the passenger including hand luggage (see definitions below);
  - Ask the passenger step off the scales and put his/her carry-on luggage beside the scale.
  - Record the weight of the passenger excluding carry-on luggage.
  - Thank the passenger for participating in the study and wish him/her a nice flight. Make sure they take all their carry-on luggage with them!
- For the *Checked baggage Weighing*, go through the following steps at the weighing location:
  - Welcome the passenger;
  - Ask the passenger place the luggage on the scale and to stand as still as possible – each piece of luggage should be registered as a separate record;
  - Ask the questions in the data entry form;
  - Thank the passenger for participating in the study and wish him/her a nice flight.
- Duly note the following issues:
  - Children 2-12 years: ask accompanying adult for cooperation as well the child himself - this will result in two separate records;
  - When a passenger is carrying an infant (child < 2 years of age) the weight of the infant will be included by the weight of its accompanier.
  - If the passenger refuses to mention the age, ask for a range or the year of birth;
  - In case you meet a transfer passenger please fill out the form as it was an outbound passenger. Only in case he has to go to the baggage reclaim and after that he checks his baggage in again, and you meet him at the check-in counter, he can be treated as a inbound passenger.
  - Do not mention the weight of the passenger or luggage. At request the passenger weight can be mentioned, but not the luggage weight (as the weighing team is not in the position to have any opinion about the weight of the luggage in reference to the airline policy and/or applicable legislation on weight allowance).
  - Data entry staff need to fill in a time sheet which can be found next to the computers
  - At the end of each day NEA will write a report about the experiences of that day
  - In case the data entry is not possible at the computers; paper data entry forms are available

Definitions

- **Age**: The length of time that one has existed, starting from the year of birth
- **Checked baggage weight**: any piece of luggage that has to be checked-in for travel.
- **Carry-on luggage weight**: all bags (including tax-free bags), cases (including photo equipment), purses, a pillow etc. carried by a passenger to be taken into the aircraft.
- **Passenger weight**: the weight of a passenger including all clothing carried by that passenger.

Poster Size A0

AIR SAFETY SURVEY

on weights of air passengers and luggage

At this airport a survey is carried out as part of a pan-European study into the weights of passengers, carry-on luggage and checked baggage. The aim of this study is to verify the average standard weight indicators currently in force in European legislation.

The study is carried out on behalf of the European Aviation Safety Agency (EASA) and in cooperation with Airport Authorities.

Passengers are kindly requested to participate in the survey. All information will be treated confidentially and anonymously.

EASA

NEA
a member of Panteia

European Aviation Safety Agency

The following text is available on plastic cards to the weighing team in case passengers do not completely understand one of the languages the weighing team speaks.

Dear passenger,

We kindly request your cooperation in a safety survey on behalf of the European Aviation Safety Agency (EASA).

All aircraft have a maximum weight limit. However, as weighing all airline passengers and their carry-on luggage for each flight would be too lengthy, regular surveys are carried out in order to update and improve the average standard weight. We need to weigh passengers, their carry-on luggage as well as their checked-in luggage.

We would greatly appreciate if you would participate in our survey by following the instructions of our survey team. The survey will not take much of your time.

All information will be treated confidentially and anonymously.

Thank you for your cooperation.

WINTER SESSION Passenger and Luggage weighing

PURPOSE	L = leisure B = business

CLASS OF TRAVEL	E = economy B = business F = first class

Date:
Time: AM / PM
Name:

LOCATION

	Before check in	*B*
	After check in	*P*
	Baggage reclaim	*P+B*
	Combined: Inbound-outbound	*P/B/P+B*

		P1	P2	P3	P4	P5	P6	P7
P	Weight **incl**. carry-on luggage	kg	kg	kg	kg	kg	kg	kg
P	Weight **excl**. carry-on luggage	kg	kg	kg	kg	kg	kg	kg
P	Check in luggage (Y/N)							
	Male/Female (M/F)							
	Infant < 2 years (Y/N)							
	Purpose: L/B							
	Inbound/outbound							
	Airport of origin/destination							
	Airline code							
	Flight Number							

	Class of travel (E/B/F)							
	Age							
B	Luggage for 1 person/2 or more persons							
B	Weight **check in** luggage	kg	kg	kg	kg	kg	kg	kg
B	Weight **check in** luggage	kg	kg	kg	kg	kg	kg	kg
B	Weight **check in** luggage	kg	kg	kg	kg	kg	kg	kg

Passenger and carry-on luggage weighing (also available in French and German)

Outbound passengers

Are you flying for business or for leisure?
Where are you flying to? What is your next airport?
Could I see your boarding pass please?
Which airline are you using?
What is your flight number?

Are you travelling in business class or economy class today?
Do you have any checked in luggage?
How old are you? May I ask your age please?

Inbound passengers

Are you flying for business or for leisure?
Where have you flown from? What was your last airport?
Which airline are you using?
What is your flight number?

Have you travelled in business class or economy class today?
Do you have any checked in luggage?
How old are you? May I ask your age please?

Luggage weighing (also available in French and German)

Outbound passengers

Is this luggage for one person? Is this luggage for you only?
Are you flying for business or for leisure?
Where are you flying to? What is your next airport?
Could I see your boarding pass please?
Which airline are you using?
What is your flight number?

Are you travelling in business class or economy class today?
How old are you? May I ask your age please?

Inbound passengers

Is this luggage for one person? Is this luggage for you only?
Are you flying for business or for leisure?
Where have you flown from? What was your last airport?
Which airline are you flying with?
What is your flight number?

Have you travelled in business class or economy class today?
How old are you? May I ask your age please?

ANNEX B Survey schedule

The Pilot and Summer survey schedule is presented in Table B-1.

Table B-1 Pilot and Summer survey 2008 schedule

Wk 26	Wk 27	Wk 28	Wk 29	Wk 30	Wk 31	Wk 32	Wk 33
ATH pilot			LGW	CPH	FRA*	MAD	FRA
				SOF	AMS	WAW	ATH Summer

Source: NEA

* Frankfurt Summer survey was postponed to the back-up week (week 33, 2008) due to strikes.
** ATH Summer refers to the additional survey executed at Athens International Airport to complete the dataset.

All survey teams consisted of NEA staff and local temporary staff. The temporary staff was recruited through, (1) agencies, providing survey staff, (2) students via local university contacts and (3) freelancers. Recruitment requirements were, among others, experience, foreign language skills, and security cleared. The composition of the survey teams was sometimes changed in order to get the highest output quality, because some of the temporary staff members were not able to meet our requirements.

The Winter survey 2009 schedule is presented in Table B-2. .

Table B-2 Winter survey 2009 schedule

Wk 2	Wk 3	Wk 4	Wk 5	Wk 6	Wk 7
AMS	SOF*	ATH	FRA		SOF
CPH	WAW	LGW	MAD		

Source: NEA

* Sofia Winter survey was postponed to the back-up week (week 7, 2009) due to the political issues between Russia and Ukraine, which effected Sofia as well

ANNEX C Tables passengers excluding carry-on luggage

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Table C-1 Passenger weights by season and gender

Season	*Gender*	*Mean*	*n*	*Std.dev.*	*Accuracy (%)*	*Confidence range (95%)*
Summer	Male	82.6	5,612	15.1	0.5	0.39
	Female	65.3	4,287	12.3	0.6	0.37
	Child (2-12 years)	31.1	1,083	11.6	2.2	0.69
	Male & Infant (<2 years)	83.1	287	14.6	2.0	1.69
	Female & Infant (<2 years)	65.2	226	12.3	2.5	1.61
	Total	71.0	11,495	20.5	0.5	0.37
Winter	Male	86.3	6,976	14.7	0.4	0.34
	Female	67.9	4,064	12.9	0.6	0.40
	Child (2-12 years)	29.7	337	12.3	4.4	1.31
	Male & Infant (<2 years)	80.9	11	14.2	10.4	8.40
	Female & Infant (<2 years)	72.5	18	11.4	7.2	5.25
	Total	78.0	11,406	18.5	0.4	0.34
Total	Male	84.6	12,588	15.0	0.3	0.26
	Female	66.6	8,351	12.7	0.4	0.27
	Child (2-12 years)	30.7	1,420	11.7	2.0	0.61
	Male & Infant (<2 years)	83.0	298	14.6	2.0	1.65
	Female & Infant (<2 years)	65.8	244	12.4	2.4	1.55
	Total	74.5	22,901	19.9	0.3	0.26

Table C-2 Passenger weights by season and age; children 2-12 years

Season	*Age*	*Mean*	*n*	*Std.dev.*	*Accuracy (%)*	*Confidence range* (95%)
Summer	2	13.7	18	1.7	5.9	0.80
	3	15.5	56	2.7	4.5	0.71
	4	18.4	83	2.8	3.3	0.61
	5	21.1	83	3.1	3.1	0.66
	6	23.9	82	4.3	3.9	0.94
	7	26.3	136	5.7	3.7	0.96
	8	30.4	124	6.3	3.7	1.11
	9	33.6	116	6.8	3.7	1.24
	10	36.2	124	6.9	3.4	1.22
	11	42.0	129	9.1	3.7	1.57
	12	46.3	132	9.1	3.3	1.55
	Total child (2-12 years)	31.1	1,083	11.5	2.2	0.69
Winter	2	14.4	19	2.0	6.4	0.91
	3	16.5	34	3.0	6.0	0.99
	4	18.7	30	2.5	4.8	0.89
	5	22.8	25	4.4	7.6	1.74
	6	22.2	27	3.7	6.2	1.39
	7	26.7	38	4.2	5.0	1.33
	8	32.9	30	8.1	8.8	2.88
	9	34.9	36	7.5	7.0	2.45
	10	39.0	36	8.5	7.1	2.78
	11	43.0	24	10.4	9.7	4.18
	12	46.4	38	9.8	6.7	3.11
	Total child (2-12 years)	29.7	337	12.3	4.4	1.31
Total	2	14.0	37	1.9	4.4	0.61
	3	15.9	90	2.8	3.7	0.58
	4	18.5	113	2.7	2.7	0.50
	5	21.5	108	3.5	3.1	0.66
	6	23.5	109	4.2	3.4	0.79
	7	26.4	174	5.4	3.0	0.80
	8	30.9	154	6.7	3.4	1.06
	9	33.9	152	7.0	3.3	1.11
	10	36.9	160	7.4	3.1	1.14
	11	42.1	153	9.3	3.5	1.47
	12	46.3	170	9.2	3.0	1.38
	Total child (2-12 years)	30.7	1,420	11.7	2.0	0.61

Table C-3 Passenger weights by season, purpose and gender

Season	*Gender*	*Purpose*	*Mean*	*n*	*Std.dev.*	*Accuracy (%)*	*Confidence range (95%)*
Summer	Male	Leisure	81.6	3,872	15.0	0.6	0.47
		Business	84.6	2,027	15.0	0.8	0.65
		Total	82.6	5,899	15.0	0.5	0.38
	Female	Leisure	65.4	3,425	12.4	0.6	0.42
		Business	65.1	1,088	12.1	1.1	0.72
		Total	65.3	4,513	12.3	0.6	0.36
	Child (2-12)	Leisure	31.5	831	11.5	2.5	0.78
		Business	29.4	252	11.4	4.8	1.41
		Total	31.1	1,083	11.5	2.2	0.69
	Total	Leisure	69.6	8,128	20.2	0.6	0.44
		Business	74.2	3,367	20.8	0.9	0.70
		Total	71.0	11,495	20.5	0.5	0.37
Winter	Male	Leisure	84.7	4,027	14.9	0.5	0.46
		Business	88.4	2,960	14.0	0.6	0.51
		Total	86.3	6,987	14.7	0.4	0.34
	Female	Leisure	67.9	3,255	12.9	0.7	0.44
		Business	68.0	827	12.9	1.3	0.88
		Total	67.9	4,082	12.9	0.6	0.40
	Child (2-12)	Leisure	29.7	329	12.2	4.4	1.32
		Business	30.7	8	15.7	35.4	10.86
		Total	29.7	337	12.3	4.4	1.31
	Total	Leisure	75.2	7,611	18.9	0.6	0.42
		Business	83.8	3,795	16.3	0.6	0.52
		Total	78.0	11,406	18.5	0.4	0.34
Total	male	Leisure	83.2	7,899	15.0	0.4	0.33
		Business	86.8	4,987	14.6	0.5	0.40
		Total	84.6	12,886	15.0	0.3	0.26
	female	Leisure	66.6	6,680	12.7	0.5	0.30
		Business	66.3	1,915	12.5	0.8	0.56
		Total	66.5	8,595	12.7	0.4	0.27
	Child (2-12)	Leisure	31.0	1,160	11.7	2.2	0.68
		Business	29.5	260	11.5	4.7	1.40
		Total	30.7	1,420	11.7	2.0	0.61
	Total	Leisure	72.3	15,739	19.8	0.4	0.31
		Business	79.3	7,162	19.2	0.6	0.44
		Total	74.5	22,901	19.9	0.3	0.26

Table C-4 Passenger weights by season, class and gender (children 2-12 years excluded; male/female with infants < 2 years included)

Season	*Gender*	*Class*	*Mean*	*n*	*Std.dev.*	*Accuracy (%)*	*Confidence range (95%)*
Summer	Male	Economy	82.5	5,044	15.0	0.5	0.42
		Business	83.3	788	15.3	1.3	1.07
		First	84.8	67	12.3	3.5	2.93
		Total	82.6	5,899	15.0	0.5	0.38
	Female	Economy	65.3	3,992	12.4	0.6	0.38
		Business	65.3	470	12.1	1.7	1.09
		First	65.0	51	12.0	5.1	3.30
		Total	65.3	4,513	12.3	0.6	0.36
	Total (ex. Child 2-12 yrs)	Economy	74.9	9,036	16.3	0.4	0.34
		Business	76.6	1,258	16.6	1.2	0.92
		First	76.3	118	15.6	3.7	2.82
		Total	75.1	10,412	16.4	0.4	0.31
Winter	Male	Economy	86.0	6,697	14.6	0.4	0.35
		Business	92.6	285	14.7	1.8	1.71
		First	87.1	5	6.8	6.8	5.96
		Total	86.3	6,987	14.7	0.4	0.34
	Female	Economy	67.8	3,999	12.8	0.6	0.40
		Business	71.2	81	15.4	4.7	3.36
		First	76.3	2	10.8	19.7	14.99
		Total	67.9	4,082	12.9	0.6	0.40
	Total (excl. child 2-12 yrs)	Economy	79.2	10,696	16.5	0.4	0.31
		Business	87.9	366	17.3	2.0	1.77
		First	84.0	7	8.9	7.8	6.56
		Total	79.5	11,069	16.6	0.4	0.31
Total	Male	Economy	84.5	11,741	14.9	0.3	0.27
		Business	85.7	1,073	15.7	1.1	0.94
		First	85.0	72	11.9	3.2	2.76
		Total	84.6	12,886	15.0	0.3	0.26
	Female	Economy	66.6	7,991	12.7	0.4	0.28
		Business	66.2	551	12.8	1.6	1.07
		First	65.4	53	12.1	5.0	3.25
		Total	66.5	8,595	12.7	0.4	0.27
	Total (excl. child 2-12 yrs)	Economy	77.2	19,732	16.6	0.3	0.23
		Business	79.1	1,624	17.4	1.1	0.85
		First	76.7	125	15.4	3.5	2.70
		Total	77.4	21,481	16.6	0.3	0.22

Table C-5 Passenger weights by season, route type and gender (male/female with infants <2 years included)

Season	*Gender*	*Route type*	*Mean*	*n*	*Std.dev.*	*Accuracy (%)*	*Confidence range (95%)*
Summer	Male	Non-European	81.7	2,128	15.2	0.8	0.65
		European	83.1	3,277	14.9	0.6	0.51
		Domestic	83.1	494	15.1	1.6	1.33
		Total	82.6	5,899	15.0	0.5	0.38
	Female	Non-European	65.1	1,762	12.6	0.9	0.59
		European	65.5	2,399	12.3	0.8	0.49
		Domestic	64.3	352	11.1	1.8	1.15
		Total	65.3	4,513	12.3	0.6	0.36
	Child (2-12)	Non-European	31.9	459	11.8	3.4	1.08
		European	30.2	548	11.1	3.1	0.93
		Domestic	31.9	76	12.2	8.6	2.74
		Total	31.1	1,083	11.5	2.2	0.69
	Total	Non-European	69.7	4,349	20.6	0.9	0.61
		European	71.7	6,224	20.5	0.7	0.51
		Domestic	71.7	922	20.1	1.8	1.29
		Total	71.0	11,495	20.5	0.5	0.37
Winter	Male	Non-European	85.9	2,039	14.8	0.7	0.64
		European	86.5	4,121	14.9	0.5	0.45
		Domestic	85.8	827	13.1	1.0	0.89
		Total	86.3	6,987	14.7	0.4	0.34
	Female	Non-European	69.1	1,301	13.5	1.1	0.73
		European	67.3	2,267	12.6	0.8	0.52
		Domestic	67.7	514	12.3	1.6	1.06
		Total	67.9	4,082	12.9	0.6	0.40
	Child (2-12)	Non-European	28.7	132	12.3	7.3	2.10
		European	30.5	178	12.1	5.8	1.77
		Domestic	29.9	27	13.8	17.4	5.21
		Total	29.7	337	12.3	4.4	1.31
	Total	Non-European	77.4	3,472	19.0	0.8	0.63
		European	78.4	6,566	18.6	0.6	0.45
		Domestic	77.9	1,368	16.9	1.2	0.90
		Total	78.0	11,406	18.5	0.4	0.34

Table C-6 Passenger weights by season, route type and gender (male/female with infants <2 years included) (Part II)

Season	*Gender*	*Route type*	*Mean*	*n*	*Std.dev.*	*Accuracy (%)*	*Confidence range* (95%)
Total	Male	Non-European	83.8	4,167	15.2	0.5	0.46
		European	85.0	7,398	15.0	0.4	0.34
		Domestic	84.8	1,321	13.9	0.9	0.75
		Total	84.6	12,886	15.0	0.3	0.26
	Female	Non-European	66.8	3,063	13.1	0.7	0.46
		European	66.4	4,666	12.5	0.5	0.36
		Domestic	66.3	866	11.9	1.2	0.79
		Total	66.5	8,595	12.7	0.4	0.27
	Child (2-12)	Non-European	31.2	591	12.0	3.1	0.97
		European	30.3	726	11.3	2.7	0.82
		Domestic	31.4	103	12.6	7.8	2.43
		Total	30.7	1,420	11.7	2.0	0.61
	Total	Non-European	73.2	7,821	20.2	0.6	0.45
		European	75.1	12,790	19.8	0.5	0.34
		Domestic	75.4	2,290	18.5	1.0	0.76
		Total	74.5	22,901	19.9	0.3	0.26

Table C- 7 Passenger weights by season, flight type and gender (male/female with infants < 2 years included)

Season	*Gender*	*Flight type*	*Mean*	*n*	*Std.dev.*	*Accuracy (%)*	*Confidence range (95%)*
Summer	Male	Scheduled	82.6	5,037	15.2	0.5	0.42
		Non-scheduled	82.4	862	14.2	1.2	0.95
		Total	82.6	5,899	15.0	0.5	0.38
	Female	Scheduled	65.1	3,658	12.1	0.6	0.39
		Non-scheduled	66.0	855	13.4	1.4	0.90
		Total	65.3	4,513	12.3	0.6	0.36
	Child (2-12)	Scheduled	31.2	803	11.9	2.6	0.82
		Non-scheduled	30.8	280	10.4	4.0	1.22
		Total	31.1	1,083	11.5	2.2	0.69
	Total	Scheduled	71.5	9,498	20.2	0.6	0.41
		Non-scheduled	68.1	1,997	21.6	1.4	0.95
		Total	71.0	11,495	20.5	0.5	0.37
Winter	Male	Scheduled	86.2	6,685	14.5	0.4	0.35
		Non-scheduled	86.8	302	17.6	2.3	1.98
		Total	86.3	6,987	14.7	0.4	0.34
	Female	Scheduled	68.0	3,820	12.9	0.6	0.41
		Non-scheduled	66.9	262	12.4	2.3	1.51
		Total	67.9	4,082	12.9	0.6	0.40
	Child (2-12)	Scheduled	29.3	273	12.6	5.1	1.49
		Non-scheduled	31.6	64	11.0	8.5	2.69
		Total	29.7	337	12.3	4.4	1.31
	Total	Scheduled	78.3	10,778	18.2	0.4	0.34
		Non-scheduled	72.9	628	22.5	2.4	1.76
		Total	78.0	11,406	18.5	0.4	0.34
Total	Male	Scheduled	84.7	11,722	14.9	0.3	0.27
		Non-scheduled	83.6	1,164	15.3	1.1	0.88
		Total	84.6	12,886	15.0	0.3	0.26
	Female	Scheduled	66.6	7,478	12.6	0.4	0.29
		Non-scheduled	66.2	1,117	13.2	1.2	0.77
		Total	66.5	8,595	12.7	0.4	0.27
	Child (2-12)	Scheduled	30.7	1,076	12.1	2.3	0.72
		Non-scheduled	30.9	344	10.5	3.6	1.11
		Total	30.7	1,420	11.7	2.0	0.61
	Total	Scheduled	75.2	20,276	19.5	0.4	0.27
		Non-scheduled	69.3	2,625	21.9	1.2	0.84
		Total	74.5	22,901	19.9	0.3	0.26

Table C-8 Passenger weights by season, airline type and gender (male/female with infants < 2 years included)

Season	*Gender*	*Airline type*	*Mean*	*n*	*Std.dev.*	*Accuracy (%)*	*Confidence range (95%)*
Summer	Male	Regular scheduled	82.8	4,315	15.2	0.5	0.45
		Charter	83.0	415	13.1	1.5	1.26
		Low-cost	81.9	993	15.1	1.1	0.94
		Charter & low-cost	81.6	176	14.3	2.6	2.11
		Total	82.6	5,899	15.0	0.5	0.38
	Female	Regular scheduled	64.9	3,071	12.1	0.7	0.43
		Charter	66.9	461	13.7	1.9	1.25
		Low-cost	65.4	857	12.1	1.2	0.81
		Charter & low-cost	68.1	124	12.4	3.2	2.18
		Total	65.3	4,513	12.3	0.6	0.36
	Child (2-12)	Regular scheduled	31.2	709	11.7	2.8	0.86
		Charter	30.7	133	9.8	5.4	1.66
		Low-cost	30.7	196	11.5	5.2	1.61
		Charter & low-cost	31.5	45	13.2	12.3	3.87
		Total	31.1	1,083	11.5	2.2	0.69
Winter	Male	Regular scheduled	86.5	5,822	14.7	0.4	0.38
		Charter	87.5	166	15.8	2.7	2.40
		Low-cost	84.7	878	14.0	1.1	0.93
		Charter & low-cost	84.5	121	15.2	3.2	2.71
		Total	86.3	6,987	14.7	0.4	0.34
	Female	Regular scheduled	68.1	3,132	13.0	0.7	0.46
		Charter	68.9	174	13.3	2.9	1.98
		Low-cost	66.9	695	12.4	1.4	0.92
		Charter & low-cost	67.5	81	11.4	3.7	2.49
		Total	67.9	4,082	12.9	0.6	0.40
	Child (2-12)	Regular scheduled	29.4	251	12.9	5.4	1.59
		Charter	31.4	31	10.5	11.8	3.69
		Low-cost	30.6	47	10.7	10.0	3.07
		Charter & low-cost	27.5	8	8.9	22.5	6.19
		Total	29.7	337	12.3	4.4	1.31

Table C-9 Passenger weights by season, airline type and gender (male/female with infants < 2 years included) (Part II)

Season	*Gender*	*Airline type*	*Mean*	*n*	*Std.dev.*	*Accuracy (%)*	*Confidence range* (95%)
Total	Male	Regular scheduled	84.9	10,137	15.0	0.3	0.29
		Charter	84.3	581	14.1	1.4	1.14
		Low-cost	83.2	1,871	14.7	0.8	0.67
		Charter & low-cost	82.8	297	14.7	2.0	1.68
		Total	84.6	12,886	15.0	0.3	0.26
	Female	Regular scheduled	66.5	6,203	12.7	0.5	0.32
		Charter	67.4	635	13.6	1.6	1.06
		Low-cost	66.0	1,552	12.2	0.9	0.61
		Charter & low-cost	67.8	205	12.0	2.4	1.64
		Total	66.5	8,595	12.7	0.4	0.27
	Child (2-12)	Regular scheduled	30.7	960	12.1	2.5	0.76
		Charter	30.8	164	9.9	4.9	1.51
		Low-cost	30.7	243	11.3	4.6	1.42
		Charter & low-cost	30.9	53	12.7	11.1	3.42
		Total	30.7	1,420	11.7	2.0	0.61
	Adult	Regular scheduled	77.9	16,340	16.8	0.3	0.26
		Charter	75.5	1,216	16.2	1.2	0.91
		Low-cost	75.4	3,423	16.1	0.7	0.54
		Charter & low-cost	76.7	502	15.5	1.8	1.36
		Total	77.4	21,481	16.6	0.3	0.22
	Overall	Regular scheduled	75.3	17,300	19.8	0.4	0.29
		Charter	70.2	1,380	21.2	1.6	1.12
		Low-cost	72.5	3,666	19.3	0.9	0.63
		Charter & low-cost	72.3	555	20.4	2.3	1.69
		Total	74.5	22,901	19.9	0.3	0.26

Table C-10 Passenger weights by gender and region of departure (male/female with infants < 2 years included)

Gender	*Region of departure*	*Mean*	*N*	*Std.dev.*	*Accuracy (%)*	*Confidence range (95%)*
Male	1 UK and Ireland	85.1	1,244	14.6	1.0	0.81
	2 Benelux and France	84.8	1,868	15.3	0.8	0.69
	3 Spain. Portugal and Italy	80.8	1,683	13.7	0.8	0.65
	4 Scandinavia and Iceland	85.3	1,118	14.6	1.0	0.86
	5 Germany. Switzerland and Austria	84.0	1,763	15.1	0.8	0.71
	6 Northeast Europe	85.6	1,881	14.8	0.8	0.67
	7 Greece. Cyprus. Malta and Turkey	86.2	1,544	14.9	0.9	0.74
	8 Romania and Bulgaria	86.5	958	15.8	1.2	1.00
	9 Other Eur countries (incl. Russia)	82.7	82	14.5	3.8	3.13
	11 Africa and the Middle East	83.7	173	16.1	2.9	2.40
	12 Asia	83.6	61	14.5	4.4	3.65
	13 North America	85.3	352	15.8	1.9	1.65
	14 South America	82.4	144	15.0	3.0	2.45
	15 Other	88.3	15	10.6	6.1	5.38
	Total	84.6	12,886	15.0	0.3	0.26
Female	1 UK and Ireland	67.9	995	12.8	1.2	0.80
	2 Benelux and France	68.2	1,144	12.9	1.1	0.75
	3 Spain. Portugal and Italy	64.7	1,201	11.8	1.0	0.67
	4 Scandinavia and Iceland	67.6	732	12.1	1.3	0.87
	5 Germany. Switzerland and Austria	66.2	882	12.1	1.2	0.80
	6 Northeast Europe	66.1	1,396	12.8	1.0	0.67
	7 Greece. Cyprus. Malta and Turkey	66.5	1,185	12.9	1.1	0.73
	8 Romania and Bulgaria	64.6	454	12.8	1.8	1.18
	9 Other Eur countries (incl. Russia)	66.6	57	11.8	4.6	3.06
	11 Africa and the Middle East	67.7	88	15.1	4.7	3.16
	12 Asia	64.0	48	11.3	5.0	3.19
	13 North America	68.7	239	14.3	2.6	1.82
	14 South America	64.6	163	12.3	2.9	1.89
	15 Other	65.7	11	12.6	11.4	7.47
	Total	66.5	8,595	12.7	0.4	0.27

Table C-11 Passenger weights by gender and region of departure (male/female with infants < 2 years included) (Part II)

Gender	*Region of departure*	*Mean*	*n*	*Std.dev.*	*Accuracy (%)*	*Confidence range (95%)*
Child (2-12)	1 UK and Ireland	33.2	127	11.6	6.1	2.02
	2 Benelux and France	30.9	217	11.4	4.9	1.52
	3 Spain. Portugal and Italy	31.5	133	11.3	6.1	1.93
	4 Scandinavia and Iceland	31.9	154	11.4	5.6	1.80
	5 Germany. Switzerland and Austria	30.5	151	12.9	6.7	2.06
	6 Northeast Europe	29.5	315	11.2	4.2	1.24
	7 Greece. Cyprus. Malta and Turkey	30.7	166	12.2	6.0	1.86
	8 Romania and Bulgaria	28.0	101	10.7	7.4	2.08
	9 Other Eur countries (incl. Russia)	32.8	5	11.3	30.2	9.93
	11 Africa and the Middle East	29.1	19	10.1	15.7	4.55
	12 Asia	21.8	3	7.7	40.0	8.73
	13 North America	33.4	21	15.5	19.8	6.62
	14 South America	39.2	7	15.7	29.7	11.65
	15 Other	44.0	1			
	Total	30.7	1,420	11.7	2.0	0.61

Table C-12 Passenger weights by gender and region of destination (male/female with infants <2 years included)

Gender	*Airline type*	*Mean*	*n*	*Std.dev.*	*Accuracy (%)*	*Confidence range (95%)*
Male	1 UK and Ireland	85.2	1,837	15.1	0.8	0.69
	2 Benelux and France	83.9	947	14.9	1.1	0.95
	3 Spain. Portugal and Italy	82.9	1,595	13.9	0.8	0.68
	4 Scandinavia and Iceland	85.0	1,353	15.2	1.0	0.81
	5 Germany. Switzerland and Austria	86.4	1,579	15.0	0.9	0.74
	6 Northeast Europe	85.5	657	14.7	1.3	1.13
	7 Greece. Cyprus. Malta and Turkey	84.6	1,241	14.7	1.0	0.82
	8 Romania and Bulgaria	85.9	444	15.8	1.7	1.47
	9 Other Eur. countries (incl. Russia)	88.1	358	16.6	2.0	1.72
	11 Africa and the Middle East	84.0	933	15.2	1.2	0.97
	12 Asia	82.2	470	14.6	1.6	1.32
	13 North America	84.3	1,011	15.0	1.1	0.93
	14 South America	80.6	411	13.7	1.6	1.33
	15 Other	87.3	50	13.6	4.3	3.77
	Total	84.6	12,886	15.0	0.3	0.26
Female	1 UK and Ireland	68.0	1,220	13.2	1.1	0.74
	2 Benelux and France	65.8	584	12.0	1.5	0.97
	3 Spain. Portugal and Italy	65.2	1,200	11.8	1.0	0.67
	4 Scandinavia and Iceland	68.2	815	12.3	1.2	0.84
	5 Germany. Switzerland and Austria	65.6	914	12.9	1.3	0.84
	6 Northeast Europe	66.6	366	12.5	1.9	1.28
	7 Greece. Cyprus. Malta and Turkey	65.5	954	12.6	1.2	0.80
	8 Romania and Bulgaria	65.9	213	11.0	2.2	1.47
	9 Other Eur. countries (incl. Russia)	65.9	188	11.9	2.6	1.70
	11 Africa and the Middle East	67.3	728	14.3	1.5	1.04
	12 Asia	66.3	283	11.8	2.1	1.37
	13 North America	66.8	748	12.6	1.4	0.90
	14 South America	67.1	335	12.8	2.0	1.37
	15 Other	70.7	47	12.4	5.0	3.54
	Total	66.5	8,595	12.7	0.4	0.27

Table C-13 Passenger weights by gender and region of destination (male/female with infants <2 years included) (Part II)

Gender	*Airline type*	*Mean*	*N*	*Std.dev.*	*Accuracy (%)*	*Confidence range* (95%)
Child (2-12)	1 UK and Ireland	29.6	112	11.8	7.4	2.19
	2 Benelux and France	30.4	125	11.5	6.6	2.01
	3 Spain. Portugal and Italy	30.0	152	11.3	6.0	1.79
	4 Scandinavia and Iceland	31.8	154	11.6	5.8	1.83
	5 Germany. Switzerland and Austria	30.3	142	12.3	6.7	2.02
	6 Northeast Europe	28.9	44	12.2	12.5	3.60
	7 Greece. Cyprus. Malta and Turkey	31.2	173	11.0	5.2	1.63
	8 Romania and Bulgaria	31.3	49	11.3	10.1	3.17
	9 Other Eur. countries (incl. Russia)	31.8	21	11.6	15.6	4.94
	11 Africa and the Middle East	30.4	214	11.5	5.1	1.54
	12 Asia	26.1	39	11.0	13.3	3.47
	13 North America	34.5	149	12.7	5.9	2.04
	14 South America	26.9	45	10.4	11.3	3.05
	15 Other	30.0	1			
	Total	30.7	1,420	11.7	2.0	0.61

Table C-14 Passenger weights by gender and airport; Summer

Season	*Gender*	*Airport*	*Mean*	*n*	*Std.dev.*	*Accuracy (%)*	*Confidence range (95%)*
Summer	Male	AMS	82.8	944	14.4	1.1	0.92
		ATH	83.4	866	14.8	1.2	0.99
		CPH	83.3	721	15.3	1.3	1.12
		FRA	83.1	641	16.9	1.6	1.31
		LGW	83.1	516	14.6	1.5	1.26
		MAD	78.2	690	14.0	1.3	1.04
		SOF	83.4	500	14.9	1.6	1.31
		WAW	83.4	734	15.1	1.3	1.09
		total	82.6	5,612	15.1	0.5	0.39
	Female	AMS	66.1	582	11.7	1.4	0.95
		ATH	65.0	760	12.6	1.4	0.89
		CPH	66.5	549	11.6	1.5	0.97
		FRA	64.2	414	11.3	1.7	1.09
		LGW	66.7	414	12.8	1.8	1.23
		MAD	63.0	597	11.2	1.4	0.90
		SOF	63.7	244	11.7	2.3	1.47
		WAW	66.2	727	14.1	1.6	1.03
		total	65.3	4,287	12.3	0.6	0.37
	Child (2-12 years)	AMS	31.7	162	11.6	5.6	1.78
		ATH	32.1	145	11.9	6.0	1.93
		CPH	30.8	196	10.8	4.9	1.52
		FRA	31.8	114	13.5	7.8	2.48
		LGW	33.4	95	11.2	6.7	2.24
		MAD	32.3	70	11.7	8.5	2.74
		SOF	27.8	92	11.0	8.1	2.24
		WAW	29.6	209	10.6	4.9	1.44
		total	31.1	1,083	11.5	2.2	0.69
	Male & Infant (<2 years)	AMS	84.8	5	6.6	6.8	5.80
		ATH	87.0	26	14.8	6.5	5.67
		CPH	74.0	7	5.3	5.3	3.90
		FRA	80.5	77	14.6	4.0	3.26
		LGW	83.3	54	11.8	3.8	3.14
		MAD	-	-	-	-	-
		SOF	84.4	31	18.8	7.8	6.62
		WAW	84.3	87	15.0	3.7	3.16
		total	83.1	287	14.6	2.0	1.69

Table C-15 Passenger weights by gender and airport; Summer (Part II)

Season	*Gender*	*Airport*	*Mean*	*n*	*Std.dev.*	*Accuracy (%)*	*Confidence range (95%)*
	Female & Infant (<2 years)	AMS	86.4	13	14.5	9.1	7.87
		ATH	68.6	33	10.4	5.2	3.55
		CPH	65.1	3	9.8	17.1	11.14
		FRA	64.0	38	12.0	5.9	3.80
		LGW	63.7	56	10.7	4.4	2.81
		MAD	-	-	-	-	-
		SOF	62.7	25	10.6	6.7	4.17
		WAW	61.9	58	10.6	4.4	2.73
		Total	65.2	226	12.3	2.5	1.61
	Total	AMS	72.3	1,706	20.2	1.3	0.96
		ATH	71.5	1,830	19.9	1.3	0.91
		CPH	70.0	1,476	21.8	1.6	1.11
		FRA	71.7	1,284	21.1	1.6	1.16
		LGW	72.0	1,135	19.5	1.6	1.13
		MAD	69.1	1,357	17.0	1.3	0.90
		SOF	71.7	892	22.1	2.0	1.45
		WAW	69.7	1,815	21.9	1.4	1.01
		Total	71.0	11,495	20.5	0.5	0.37

Clarification: '-': no observations

Table C-16 Passenger weights by gender and airport; Winter

season	gender	airport	Mean	n	Std.dev.	Accuracy (%)	Confidence range (95%)
Winter	Male	AMS	87.5	874	15.9	1.2	1.05
		ATH	88.6	700	13.9	1.2	1.03
		CPH	85.8	873	14.4	1.1	0.95
		FRA	84.4	971	14.0	1.0	0.88
		LGW	86.4	925	14.8	1.1	0.95
		MAD	82.7	875	13.1	1.0	0.87
		SOF	89.2	630	16.2	1.4	1.27
		WAW	87.0	1,128	14.3	1.0	0.84
		total	86.3	6,976	14.7	0.4	0.34
	Female	AMS	70.3	527	14.0	1.7	1.20
		ATH	68.8	441	13.7	1.9	1.28
		CPH	68.6	535	12.6	1.6	1.07
		FRA	67.5	417	12.1	1.7	1.16
		LGW	69.3	695	13.7	1.5	1.02
		MAD	65.2	537	11.4	1.5	0.96
		SOF	66.1	272	12.9	2.3	1.53
		WAW	66.4	640	11.7	1.4	0.90
		total	67.9	4,064	12.9	0.6	0.40
	Child (2-12 years)	AMS	29.5	62	11.5	9.7	2.87
		ATH	23.7	25	11.1	18.4	4.36
		CPH	36.2	30	12.3	12.1	4.38
		FRA	26.1	29	11.4	15.9	4.16
		LGW	30.7	19	13.5	19.7	6.06
		MAD	31.4	34	12.7	13.6	4.26
		SOF	30.3	14	10.3	17.7	5.38
		WAW	29.7	124	12.5	7.4	2.19
		total	29.7	337	12.3	4.4	1.31
	Male & Infant (<2 years)	AMS	69.7	3	19.5	31.7	22.11
		ATH	87.8	2	3.9	6.1	5.39
		CPH	92.6	1	-	-	-
		FRA	99.7	1	-	-	-
		LGW	-	-	-	-	-
		MAD	75.2	2	14.3	26.3	19.80
		SOF	-	-	-	-	-
		WAW	81.3	2	3.6	6.2	5.00
		total	80.9	11	14.2	10.4	8.40

Table C-17 Passenger weights by gender and airport; Winter (Part II)

season	gender	airport	Mean	n	Std.dev.	Accuracy (%)	Confidence range (95%)
	Female & Infant (<2 years)	AMS	71.3	3	9.7	15.4	10.98
		ATH	75.4	8	10.8	9.9	7.47
		CPH	86.6	1	-	-	-
		FRA	63.1	1	-	-	-
		LGW	-	-	-	-	-
		MAD	67.5	5	13.3	17.3	11.67
		SOF	-	-	-	-	-
		WAW	-	-	-	-	-
		total	72.5	18	11.4	7.2	5.25
	Total	AMS	78.8	1,469	20.0	1.3	1.02
		ATH	79.7	1,176	18.6	1.3	1.07
		CPH	78.4	1,440	17.1	1.1	0.88
		FRA	78.2	1,419	17.2	1.1	0.89
		LGW	78.5	1,639	17.4	1.1	0.84
		MAD	75.0	1,453	16.5	1.1	0.85
		SOF	81.4	916	19.6	1.6	1.27
		WAW	76.3	1,894	20.5	1.2	0.92
		total	78.0	11,406	18.5	0.4	0.34

Clarification: '-': no observations

Table C-18 Passenger weights by gender and airport; totals

season	Gender	Airport	Mean	n	Std.dev.	Accuracy (%)	Confidence range (95%)
Total	Male	AMS	85.1	1,818	15.3	0.8	0.70
		ATH	85.7	1,566	14.6	0.8	0.72
		CPH	84.7	1,594	14.8	0.9	0.73
		FRA	83.9	1,612	15.2	0.9	0.74
		LGW	85.2	1,441	14.8	0.9	0.77
		MAD	80.7	1,565	13.7	0.8	0.68
		SOF	86.6	1,130	15.9	1.1	0.93
		WAW	85.6	1,862	14.7	0.8	0.67
		Total	84.6	12,588	15.0	0.3	0.26
	Female	AMS	68.1	1,109	13.0	1.1	0.77
		ATH	66.4	1,201	13.1	1.1	0.74
		CPH	67.6	1,084	12.1	1.1	0.72
		FRA	65.9	831	11.8	1.2	0.80
		LGW	68.4	1,109	13.4	1.2	0.79
		MAD	64.1	1,134	11.3	1.0	0.66
		SOF	65.0	516	12.4	1.6	1.07
		WAW	66.3	1,367	13.0	1.0	0.69
		Total	66.6	8,351	12.7	0.4	0.27
	Child (2-12 years)	AMS	31.1	224	11.6	4.9	1.52
		ATH	30.8	170	12.1	5.9	1.82
		CPH	31.5	226	11.2	4.6	1.45
		FRA	30.7	143	13.3	7.1	2.18
		LGW	32.9	114	11.6	6.4	2.12
		MAD	32.0	104	12.0	7.2	2.30
		SOF	28.1	106	10.9	7.4	2.07
		WAW	29.6	333	11.3	4.1	1.22
		Total	30.7	1,420	11.7	2.0	0.61
	Male & Infant (<2 years)	AMS	79.2	8	14.0	12.2	9.68
		ATH	87.1	28	14.2	6.1	5.27
		CPH	76.3	8	8.2	7.4	5.67
		FRA	80.7	78	14.6	4.0	3.25
		LGW	83.3	54	11.8	3.8	3.14
		MAD	75.2	2	14.3	26.3	19.80
		SOF	84.4	31	18.8	7.8	6.62
		WAW	84.2	89	14.9	3.7	3.09
		Total	83.0	298	14.6	2.0	1.65

Table C-19 Passenger weights by gender and airport; totals (Part II)

	Female & Infant (<2 years)	AMS	83.6	16	14.7	8.6	7.22
		ATH	69.9	41	10.7	4.7	3.27
		CPH	70.5	4	13.4	18.7	13.17
		FRA	64.0	39	11.8	5.8	3.70
		LGW	63.7	56	10.7	4.4	2.81
		MAD	67.5	5	13.3	17.3	11.67
		SOF	62.7	25	10.6	6.7	4.17
		WAW	61.9	58	10.6	4.4	2.73
		Total	65.8	244	12.4	2.4	1.55
	Total	AMS	75.3	3,175	20.4	0.9	0.71
		ATH	74.7	3,006	19.8	0.9	0.71
		CPH	74.1	2,916	20.1	1.0	0.73
		FRA	75.1	2,703	19.4	1.0	0.73
		LGW	75.9	2,774	18.5	0.9	0.69
		MAD	72.2	2,810	17.0	0.9	0.63
		SOF	76.6	1,808	21.4	1.3	0.99
		WAW	73.0	3,709	21.4	0.9	0.69
		Total	74.5	22,901	19.9	0.3	0.26

Clarification: '-': no observations

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Table D-1 Maximum kilos of permitted carry-on luggage

Max kg	*Frequency*	*Percentage*
5	1,696	9.7
6	2,562	14.7
7	471	2.7
8	5,746	32.9
9	269	1.5
10	2,768	15.9
12	1,981	11.3
13	18	0.1
14	46	0.3
15	9	0.1
16	375	2.1
18	851	4.9
20	151	0.9
23	520	3.0
Total	17,463	100

Source: NEA, based on data available on airline websites

Table D-2 Percentage of passengers carrying more or less than permitted kilos of carry-on luggage

Max kg	*Percentage maximum or less*	*Percentage more than maximum*	*n*
5-6 kg	63.5	36.5	4,258
7-8 kg	67.4	32.6	6,217
9-10 kg	81.6	18.4	3,037
11 kg and up	92.7	7.3	3,951
Total	74.7	25.3	17,463

Table D-3 Passenger weights by season and gender; incl. carry-on luggage

	Gender	*Mean*	*n*	*Std. dev.*	*Accuracy (%)*	*Confidence range (95%)*
Summer	Male	88.6	5,612	16.3	0.5	0.43
	Female	70.5	4,287	13.2	0.6	0.40
	Child (2-12 years)	33.0	1,083	12.4	2.2	0.74
	Male & Infant (<2 years)	90.0	287	15.5	2.0	1.79
	Female & Infant (<2 years)	70.5	226	14.2	2.6	1.85
	Total	76.3	11,495	22.1	0.5	0.40
Winter	Male	93.5	6,976	15.6	0.4	0.37
	Female	74.6	4,064	13.7	0.6	0.42
	Child (2-12 years)	32.0	337	13.5	4.5	1.44
	Male & Infant (<2 years)	91.0	11	15.8	10.2	9.32
	Female & Infant (<2 years)	81.6	18	14.9	8.4	6.88
	Total	84.9	11,406	19.7	0.4	0.36
Total	Male	91.3	12,588	16.1	0.3	0.28
	Female	72.5	8,351	13.6	0.4	0.29
	Child (2-12 years)	32.8	1,420	12.7	2.0	0.66
	Male & Infant (<2 years)	90.1	298	15.5	1.9	1.76
	Female & Infant (<2 years)	71.3	244	14.5	2.6	1.82
	Total	80.6	22,901	21.4	0.3	0.28

Table D-4 Passenger weights by season, purpose and gender; incl. carry-on luggage

Season	*Gender*	*Purpose*	*Mean*	*n*	*Std. dev.*	*Accuracy (%)*	*Confidence range (95%)*
Summer	Male	Leisure	87.0	3,872	16.0	0.6	0.50
		Business	91.8	2,027	16.4	0.8	0.71
		Total	88.7	5,899	16.3	0.5	0.42
	Female	Leisure	70.5	3,425	13.4	0.6	0.45
		Business	70.7	1,088	13.0	1.1	0.77
		Total	70.5	4,513	13.3	0.5	0.39
	Child (2-12)	Leisure	33.5	831	12.4	2.5	0.84
		Business	31.5	252	12.4	4.8	1.53
		Total	33.0	1,083	12.4	2.2	0.74
	Total	Leisure	74.6	8,128	21.6	0.6	0.47
		Business	80.5	3,367	22.7	1.0	0.77
		Total	76.3	11,495	22.1	0.5	0.40
Winter	Male	Leisure	91.4	4,027	15.8	0.5	0.49
		Business	96.5	2,960	14.8	0.6	0.53
		Total	93.5	6,987	15.6	0.4	0.37
	Female	Leisure	74.4	3,255	13.8	0.6	0.47
		Business	75.5	827	13.6	1.2	0.93
		Total	74.6	4,082	13.8	0.6	0.42
	Child (2-12)	Leisure	31.9	329	13.4	4.5	1.45
		Business	33.2	8	15.7	32.8	10.90
		Total	32.0	337	13.5	4.5	1.44
	Total	Leisure	81.5	7,611	20.0	0.6	0.45
		Business	91.8	3,795	17.1	0.6	0.55
		Total	84.9	11,406	19.7	0.4	0.36
Total	Male	Leisure	89.2	7,899	16.0	0.4	0.35
		Business	94.6	4,987	15.6	0.5	0.43
		Total	91.3	12,886	16.1	0.3	0.28
	Female	Leisure	72.4	6,680	13.7	0.5	0.33
		Business	72.8	1,915	13.5	0.8	0.60
		Total	72.5	8,595	13.7	0.4	0.29
	Child(2-12)	Leisure	33.0	1,160	12.7	2.2	0.73
		Business	31.6	260	12.5	4.8	1.51
		Total	32.8	1,420	12.7	2.0	0.66
	Total	Leisure	77.9	15,739	21.1	0.4	0.33
		Business	86.5	7,162	20.7	0.6	0.48
		Total	80.6	22,901	21.4	0.3	0.28

Table D-5 Passenger weights by season, gender and class ; incl. carry-on luggage

Season	*Gender*	*Class*	*Mean*	*n*	*Std. dev.*	*Accuracy (%)*	*Confidence range (95%)*
Summer	Male	Economy	88.3	5,044	16.2	0.5	0.45
		Business	90.4	788	16.7	1.3	1.17
		First	90.8	67	13.1	3.5	3.14
		Total	88.7	5,899	16.3	0.5	0.42
	Female	Economy	70.5	3,992	13.3	0.6	0.41
		Business	70.8	470	13.1	1.7	1.18
		First	69.5	51	12.9	5.1	3.53
		Total	70.5	4,513	13.3	0.5	0.39
	Total (ex. Child 2-12 yrs)	Economy	80.5	9,036	17.4	0.4	0.36
		Business	83.1	1,258	18.2	1.2	1.00
		First	81.6	118	16.7	3.7	3.02
		Total	80.8	10,412	17.5	0.4	0.34
Winter	Male	Economy	93.2	6,697	15.5	0.4	0.37
		Business	101.4	285	15.0	1.7	1.74
		First	94.9	5	6.9	6.4	6.03
		Total	93.5	6,987	15.6	0.4	0.37
	Female	Economy	74.5	3,999	13.7	0.6	0.42
		Business	79.6	81	16.1	4.4	3.50
		First	83.9	2	12.3	20.3	17.05
		Total	74.6	4,082	13.8	0.6	0.42
	Total (excl. Child 2-12 yrs)	Economy	86.2	10,696	17.4	0.4	0.33
		Business	96.6	366	17.7	1.9	1.82
		First	91.7	7	9.2	7.5	6.85
		Total	86.5	11,069	17.5	0.4	0.33
Total	Male	Economy	91.1	11,741	16.0	0.3	0.29
		Business	93.4	1,073	17.0	1.1	1.02
		First	91.1	72	12.8	3.2	2.96
		Total	91.3	12,886	16.1	0.3	0.28
	Female	Economy	72.5	7,991	13.7	0.4	0.30
		Business	72.1	551	13.9	1.6	1.16
		First	70.1	53	13.0	5.0	3.51
		Total	72.5	8,595	13.7	0.4	0.29
	Total (excl. Child 2-12 yrs)	Economy	83.6	19,732	17.6	0.3	0.25
		Business	86.1	1,624	18.9	1.1	0.92
		First	82.2	125	16.5	3.5	2.90
		Total	83.8	21,481	17.7	0.3	0.24

Table D-6 Passenger weights by season, gender and route type; incl. carry-on luggage

Season	*Gender*	*Route type*	*Mean*	*n*	*Std. dev.*	*Accuracy (%)*	*Confidence range (95%)*
Summer	Male	Non-European	87.9	2,128	16.4	0.8	0.70
		European	89.1	3,277	16.2	0.6	0.55
		Domestic	88.8	494	15.9	1.6	1.40
		Total	88.7	5,899	16.3	0.5	0.42
	Female	Non-European	70.6	1,762	13.6	0.9	0.64
		European	70.7	2,399	13.3	0.8	0.53
		Domestic	69.4	352	11.6	1.8	1.22
		Total	70.5	4,513	13.3	0.5	0.39
	Child(2-12)	Non-European	33.9	459	13.0	3.5	1.19
		European	32.2	548	11.8	3.1	0.99
		Domestic	33.9	76	12.9	8.6	2.90
		Total	33.0	1,083	12.4	2.2	0.74
	Total	Non-European	75.2	4,349	22.2	0.9	0.66
		European	77.0	6,224	22.1	0.7	0.55
		Domestic	76.9	922	21.2	1.8	1.37
		Total	76.3	11,495	22.1	0.5	0.40
Winter	Male	Non-European	93.3	2,039	15.6	0.7	0.68
		European	93.9	4,121	15.8	0.5	0.48
		Domestic	92.4	827	14.0	1.0	0.95
		Total	93.5	6,987	15.6	0.4	0.37
	Female	Non-European	75.9	1,301	14.5	1.0	0.79
		European	74.0	2,267	13.5	0.7	0.55
		Domestic	74.1	514	13.0	1.5	1.12
		Total	74.6	4,082	13.8	0.6	0.42
	Child(2-12)	Non-European	30.7	132	13.2	7.4	2.26
		European	32.9	178	13.3	6.0	1.96
		Domestic	32.3	27	15.3	17.8	5.77
		Total	32.0	337	13.5	4.5	1.44
	Total	Non-European	84.4	3,472	20.3	0.8	0.67
		European	85.4	6,566	19.7	0.6	0.48
		Domestic	84.3	1,368	17.9	1.1	0.95
		Total	84.9	11,406	19.7	0.4	0.36
Total	Male	Non-European	90.5	4,167	16.3	0.5	0.49
		European	91.8	7,398	16.2	0.4	0.37
		Domestic	91.1	1,321	14.8	0.9	0.80
		Total	91.3	12,886	16.1	0.3	0.28
	Female	Non-European	72.8	3,063	14.2	0.7	0.50
		European	72.3	4,666	13.5	0.5	0.39
		Domestic	72.2	866	12.7	1.2	0.84
		Total	72.5	8,595	13.7	0.4	0.29

Table D-7 Passenger weights by season, gender and route type; incl. carry-on luggage (Part II)

	Child(2-12)	Non-European	33.2	591	13.1	3.2	1.06
		European	32.3	726	12.2	2.7	0.89
		Domestic	33.5	103	13.5	7.8	2.61
		Total	32.8	1,420	12.7	2.0	0.66
	Total	Non-European	79.3	7,821	21.8	0.6	0.48
		European	81.3	12,790	21.3	0.5	0.37
		Domestic	81.3	2,290	19.6	1.0	0.80
		Total	80.6	22,901	21.4	0.3	0.28

Table D-8 Passenger weights by season, flight type and gender; incl. carry-on luggage

Season	*Gender*	*Flighttype*	*Mean*	*n*	*Std. dev.*	*Accuracy (%)*	*Confidence range (95%)*
Summer	Male	Scheduled	89.1	5,037	16.4	0.5	0.45
		Non-scheduled	86.3	862	15.1	1.2	1.01
		Total	88.7	5,899	16.3	0.5	0.42
	Female	Scheduled	70.7	3,658	13.1	0.6	0.42
		Non-scheduled	69.8	855	14.1	1.4	0.94
		Total	70.5	4,513	13.3	0.5	0.39
	Child(2-12)	Scheduled	33.3	803	12.9	2.7	0.89
		Non-scheduled	32.3	280	11.0	4.0	1.29
		Total	33.0	1,083	12.4	2.2	0.74
	Total	Scheduled	77.3	9,498	21.8	0.6	0.44
		Non-scheduled	71.7	1,997	22.6	1.4	0.99
		Total	76.3	11,495	22.1	0.5	0.40
Winter	Male	Scheduled	93.6	6,685	15.4	0.4	0.37
		Non-scheduled	92.2	302	18.4	2.3	2.08
		Total	93.5	6,987	15.6	0.4	0.37
	Female	Scheduled	74.8	3,820	13.8	0.6	0.44
		Non-scheduled	71.7	262	13.2	2.2	1.59
		Total	74.6	4,082	13.8	0.6	0.42
	Child(2-12)	Scheduled	31.7	273	13.8	5.2	1.64
		Non-scheduled	33.1	64	11.9	8.8	2.91
		Total	32.0	337	13.5	4.5	1.44
	Total	Scheduled	85.4	10,778	19.3	0.4	0.36
		Non-scheduled	77.6	628	23.9	2.4	1.87
		Total	84.9	11,406	19.7	0.4	0.36
Total	Male	Scheduled	91.6	11,722	16.0	0.3	0.29
		Non-scheduled	87.8	1,164	16.3	1.1	0.93
		Total	91.3	12,886	16.1	0.3	0.28
	Female	Scheduled	72.8	7,478	13.6	0.4	0.31
		Non-scheduled	70.3	1,117	13.9	1.2	0.82
		Total	72.5	8,595	13.7	0.4	0.29
	Child(2-12)	Scheduled	32.9	1,076	13.1	2.4	0.78
		Non-scheduled	32.4	344	11.2	3.6	1.18
		Total	32.8	1,420	12.7	2.0	0.66
	Total	Scheduled	81.6	20,276	20.9	0.4	0.29
		Non-scheduled	73.1	2,625	23.1	1.2	0.88
		Total	80.6	22,901	21.4	0.3	0.28

Table D-9 Passenger weights by season, airline type and gender; incl. carry-on luggage

Season	*Gender*	*Airline type*	*Mean*	*n*	*Std. dev.*	*Accuracy (%)*	*Confidence range (95%)*
Summer	Male	Regular scheduled	89.3	4,315	16.5	0.6	0.49
		Charter	87.3	415	14.2	1.6	1.37
		Low-cost	87.2	993	15.9	1.1	0.99
		Charter & low-cost	85.1	176	14.9	2.6	2.21
		Total	88.7	5,899	16.3	0.5	0.42
	Female	Regular scheduled	70.4	3,071	13.2	0.7	0.47
		Charter	71.3	461	14.5	1.9	1.32
		Low-cost	70.3	857	13.0	1.2	0.87
		Charter & low-cost	72.0	124	13.4	3.3	2.36
		Total	70.5	4,513	13.3	0.5	0.39
	Child(2-12)	Regular scheduled	33.3	709	12.8	2.8	0.94
		Charter	32.2	133	10.4	5.5	1.77
		Low-cost	32.4	196	12.2	5.2	1.70
		Charter & low-cost	33.5	45	13.6	11.8	3.96
		Total	33.0	1,083	12.4	2.2	0.74
Winter	Male	Regular scheduled	94.0	5,822	15.6	0.4	0.40
		Charter	92.8	166	16.8	2.7	2.55
		Low-cost	91.3	878	14.6	1.1	0.97
		Charter & low-cost	90.2	121	15.8	3.1	2.82
		Total	93.5	6,987	15.6	0.4	0.37
	Female	Regular scheduled	75.0	3,132	13.9	0.6	0.49
		Charter	73.3	174	14.4	2.9	2.14
		Low-cost	73.3	695	13.0	1.3	0.96
		Charter & low-cost	74.8	81	13.1	3.8	2.85
		Total	74.6	4,082	13.8	0.6	0.42
	Child(2-12)	Regular scheduled	31.7	251	14.1	5.5	1.74
		Charter	32.3	31	11.0	12.0	3.87
		Low-cost	33.4	47	12.4	10.6	3.53
		Charter & low-cost	29.6	8	8.3	19.3	5.72
		Total	32.0	337	13.5	4.5	1.44

Table D-10 Passenger weights by season, airline type and gender; incl. carry-on luggage (Part II)

Season	*Gender*	*Airline type*	*Mean*	*n*	*Std. dev.*	*Accuracy (%)*	*Confidence range (95%)*
Total	Male	Regular scheduled	92.0	10,137	16.2	0.3	0.32
		Charter	88.9	581	15.2	1.4	1.23
		Low-cost	89.1	1,871	15.5	0.8	0.70
		Charter & low-cost	87.2	297	15.5	2.0	1.76
		Total	91.3	12,886	16.1	0.3	0.28
	Female	Regular scheduled	72.7	6,203	13.7	0.5	0.34
		Charter	71.8	635	14.5	1.6	1.12
		Low-cost	71.6	1,552	13.0	0.9	0.65
		Charter & low-cost	73.1	205	13.3	2.5	1.82
		Total	72.5	8,595	13.7	0.4	0.29
	Child(2-12)	Regular scheduled	32.9	960	13.2	2.5	0.83
		Charter	32.2	164	10.5	5.0	1.60
		Low-cost	32.6	243	12.2	4.7	1.53
		Charter & low-cost	33.0	53	12.9	10.6	3.48
		Total	32.8	1,420	12.7	2.0	0.66

Table D-11 Passenger weights by gender and region of departure incl. carry-on luggage

	Region of departure	*Mean*	*n*	*Std. dev.*	*Accuracy (%)*	*Confidence range (95%)*
Male	1 UK and Ireland	91.5	1,244	15.3	0.9	0.85
	2 Benelux and France	91.7	1,868	16.7	0.8	0.76
	3 Spain. Portugal and Italy	87.0	1,683	14.7	0.8	0.70
	4 Scandinavia and Iceland	91.9	1,118	15.8	1.0	0.93
	5 Germany. Switzerland and Austria	92.0	1,763	16.1	0.8	0.75
	6 Northeast Europe	92.3	1,881	16.0	0.8	0.72
	7 Greece. Cyprus. Malta and Turkey	92.5	1,544	15.9	0.9	0.80
	8 Romania and Bulgaria	92.8	958	17.0	1.2	1.07
	9 Other Eur countries (incl. Russia)	89.3	82	15.8	3.8	3.42
	11 Africa and the Middle East	89.2	173	17.2	2.9	2.57
	12 Asia	90.2	61	15.3	4.2	3.83
	13 North America	92.2	352	16.7	1.9	1.74
	14 South America	88.0	144	16.0	3.0	2.61
	15 Other	92.9	15	13.0	7.1	6.55
	Total	91.3	12,886	16.1	0.3	0.28
Female	1 UK and Ireland	73.8	995	13.5	1.1	0.84
	2 Benelux and France	74.5	1,144	14.3	1.1	0.83
	3 Spain. Portugal and Italy	70.7	1,201	12.7	1.0	0.72
	4 Scandinavia and Iceland	73.6	732	12.9	1.3	0.94
	5 Germany. Switzerland and Austria	73.2	882	13.4	1.2	0.88
	6 Northeast Europe	71.4	1,396	13.7	1.0	0.72
	7 Greece. Cyprus. Malta and Turkey	72.1	1,185	13.6	1.1	0.78
	8 Romania and Bulgaria	69.7	454	13.8	1.8	1.27
	9 Other Eur countries (incl. Russia)	72.4	57	13.5	4.8	3.49
	11 Africa and the Middle East	73.0	88	16.7	4.8	3.48
	12 Asia	71.2	48	11.6	4.6	3.29
	13 North America	75.6	239	15.4	2.6	1.95
	14 South America	69.4	163	13.2	2.9	2.03
	15 Other	71.1	11	16.1	13.4	9.51
	Total	72.5	8,595	13.7	0.4	0.29

Table D-12 Passenger weights by gender and region of departure incl. carry-on luggage (Part II)

	Region of departure	*Mean*	*n*	*Std. dev.*	*Accuracy (%)*	*Confidence range (95%)*
Child(2-12)	1 UK and Ireland	35.8	127	12.8	6.2	2.22
	2 Benelux and France	33.1	217	12.5	5.0	1.67
	3 Spain. Portugal and Italy	33.7	133	12.2	6.1	2.07
	4 Scandinavia and Iceland	33.9	154	11.6	5.4	1.84
	5 Germany. Switzerland and Austria	33.5	151	14.7	7.0	2.34
	6 Northeast Europe	31.0	315	12.0	4.3	1.33
	7 Greece. Cyprus. Malta and Turkey	32.7	166	13.0	6.1	1.98
	8 Romania and Bulgaria	29.4	101	11.3	7.5	2.20
	9 Other Eur countries (incl. Russia)	36.2	5	11.0	26.5	9.61
	11 Africa and the Middle East	31.0	19	12.0	17.4	5.41
	12 Asia	25.0	3	9.0	40.6	10.17
	13 North America	36.1	21	16.7	19.7	7.14
	14 South America	39.3	7	15.8	29.8	11.70
	15 Other	44.0	1	.		
	Total	32.8	1,420	12.7	2.0	0.66

Table D-13 Passenger weights by gender and region of arrival; incl. carry-on luggage

	Region of arrival	*Mean*	*n*	*Std. dev.*	*Accuracy (%)*	*Confidence range (95%)*
Male	1 UK and Ireland	91.7	1,837	16.1	0.8	0.74
	2 Benelux and France	90.7	947	16.2	1.1	1.03
	3 Spain. Portugal and Italy	89.4	1,595	15.1	0.8	0.74
	4 Scandinavia and Iceland	92.0	1,353	16.1	0.9	0.86
	5 Germany. Switzerland and Austria	93.7	1,579	16.2	0.9	0.80
	6 Northeast Europe	92.1	657	16.0	1.3	1.23
	7 Greece. Cyprus. Malta and Turkey	90.0	1,241	15.7	1.0	0.87
	8 Romania and Bulgaria	92.3	444	17.1	1.7	1.59
	9 Other Eur. Countries (incl. Russia)	95.3	358	18.0	2.0	1.86
	11 Africa and the Middle East	91.2	933	16.9	1.2	1.08
	12 Asia	89.5	470	15.1	1.5	1.36
	13 North America	91.1	1,011	15.8	1.1	0.98
	14 South America	86.9	411	14.7	1.6	1.42
	15 Other	93.1	50	14.5	4.3	4.03
	Total	91.3	12,886	16.1	0.3	0.28
Female	1 UK and Ireland	74.0	1,220	14.2	1.1	0.80
	2 Benelux and France	72.0	584	13.2	1.5	1.07
	3 Spain. Portugal and Italy	71.2	1,200	12.9	1.0	0.73
	4 Scandinavia and Iceland	74.2	815	13.0	1.2	0.89
	5 Germany. Switzerland and Austria	71.8	914	13.8	1.2	0.90
	6 Northeast Europe	72.3	366	13.6	1.9	1.39
	7 Greece. Cyprus. Malta and Turkey	70.3	954	13.4	1.2	0.85
	8 Romania and Bulgaria	71.3	213	11.7	2.2	1.57
	9 Other Eur. Countries (incl. Russia)	72.4	188	12.5	2.5	1.79
	11 Africa and the Middle East	72.6	728	15.4	1.5	1.12
	12 Asia	72.7	283	13.4	2.1	1.56
	13 North America	73.3	748	13.5	1.3	0.97
	14 South America	74.3	335	14.4	2.1	1.54
	15 Other	75.3	47	12.3	4.7	3.52
	Total	72.5	8,595	13.7	0.4	0.29

Table D-14 Passenger weights by gender and region of arrival; incl. carry-on luggage (Part II)

	Region of arrival	*Mean*	*n*	*Std. dev.*	*Accuracy (%)*	*Confidence range (95%)*
Child(2-12)	1 UK and Ireland	31.7	112	12.8	7.5	2.37
	2 Benelux and France	32.7	125	12.3	6.6	2.16
	3 Spain. Portugal and Italy	31.9	152	12.3	6.1	1.95
	4 Scandinavia and Iceland	33.9	154	12.5	5.8	1.98
	5 Germany. Switzerland and Austria	32.5	142	13.1	6.6	2.15
	6 Northeast Europe	30.8	44	13.2	12.7	3.91
	7 Greece. Cyprus. Malta and Turkey	32.9	173	12.2	5.5	1.81
	8 Romania and Bulgaria	33.1	49	11.8	10.0	3.31
	9 Other Eur. countries (incl. Russia)	34.2	21	12.7	15.9	5.44
	11 Africa and the Middle East	31.8	214	12.3	5.2	1.64
	12 Asia	28.6	39	11.7	12.8	3.67
	13 North America	37.3	149	14.1	6.1	2.27
	14 South America	29.4	45	11.5	11.4	3.35
	15 Other	32.6	1	.		
	Total	32.8	1,420	12.7	2.0	0.66

Table D-15 Passenger weights by gender and airport; incl. carry-on luggage; Summer

	Gender	*Airport*	*Mean*	*n*	*Std. dev.*	*Accuracy (%)*	*Confidence range (95%)*
Summer	Male	AMS	88.7	944	16.1	1.2	1.03
		ATH	89.4	866	15.7	1.2	1.04
		CPH	89.2	721	16.4	1.3	1.20
		FRA	90.5	641	18.2	1.6	1.41
		LGW	88.6	516	15.5	1.5	1.33
		MAD	83.4	690	14.9	1.3	1.11
		SOF	89.5	500	16.3	1.6	1.43
		WAW	89.4	734	16.4	1.3	1.18
		Total	88.6	5,612	16.3	0.5	0.43
	Female	AMS	71.5	582	12.6	1.4	1.02
		ATH	70.4	760	13.4	1.4	0.96
		CPH	71.7	549	12.3	1.4	1.03
		FRA	71.0	414	12.8	1.7	1.23
		LGW	72.3	414	13.6	1.8	1.31
		MAD	67.6	597	11.9	1.4	0.96
		SOF	68.9	244	12.9	2.3	1.61
		WAW	70.7	727	14.9	1.5	1.08
		Total	70.5	4,287	13.2	0.6	0.40
	Child (2-12 years)	AMS	33.9	162	12.6	5.7	1.93
		ATH	34.0	145	12.8	6.1	2.08
		CPH	32.5	196	11.2	4.8	1.57
		FRA	35.0	114	15.3	8.1	2.82
		LGW	35.6	95	12.1	6.8	2.43
		MAD	34.1	70	12.0	8.3	2.82
		SOF	29.3	92	11.6	8.1	2.38
		WAW	31.3	209	11.6	5.0	1.57
		total	33.0	1,083	12.4	2.2	0.74
	Male & Infant (<2 years)	AMS	97.4	5	12.3	11.0	10.75
		ATH	93.6	26	15.6	6.4	6.00
		CPH	80.2	7	5.4	4.9	3.96
		FRA	89.2	77	16.0	4.0	3.57
		LGW	89.7	54	12.6	3.8	3.37
		MAD	-	-	-	-	-
		SOF	89.1	31	19.2	7.6	6.77
		WAW	90.6	87	15.7	3.6	3.31
		total	90.0	287	15.5	2.0	1.79

Table D-16 Passenger weights by gender and airport; incl. carry-on luggage; Summer (Part II)

	Gender	*Airport*	*Mean*	*n*	*Std. dev.*	*Accuracy (%)*	*Confidence range (95%)*
	Female & Infant (<2 years)	AMS	97.7	13	22.0	12.3	11.98
		ATH	73.5	33	10.9	5.1	3.73
		CPH	67.9	3	9.1	15.2	10.31
		FRA	71.2	38	13.2	5.9	4.18
		LGW	68.0	56	11.3	4.3	2.95
		MAD	-	-	-	-	-
		SOF	67.7	25	10.4	6.0	4.08
		WAW	65.8	58	11.7	4.6	3.02
		Total	70.5	226	14.2	2.6	1.85
	Total	AMS	77.7	1,706	22.0	1.3	1.04
		ATH	76.9	1,830	21.2	1.3	0.97
		CPH	75.1	1,476	23.4	1.6	1.19
		FRA	78.6	1,284	22.9	1.6	1.26
		LGW	77.3	1,135	20.6	1.6	1.20
		MAD	73.9	1,357	18.1	1.3	0.96
		SOF	77.0	892	23.9	2.0	1.57
		WAW	74.5	1,815	23.5	1.5	1.08
		Total	76.3	11,495	22.1	0.5	0.40

Clarification: '-': no observations

Table D-17 Passenger weights by gender and airport; incl. carry-on luggage; Winter

Season	*Gender*	*Airport*	*Mean*	*n*	*Std. dev.*	*Accuracy (%)*	*Confidence range (95%)*
Winter	Male	AMS	95.3	874	16.9	1.2	1.12
		ATH	95.5	700	14.9	1.2	1.11
		CPH	93.2	873	15.2	1.1	1.01
		FRA	92.8	971	14.8	1.0	0.93
		LGW	92.5	925	15.5	1.1	1.00
		MAD	90.0	875	14.1	1.0	0.93
		SOF	96.0	630	17.1	1.4	1.33
		WAW	94.0	1,128	15.4	1.0	0.90
		Total	93.5	6,976	15.6	0.4	0.37
	Female	AMS	77.5	527	15.2	1.7	1.30
		ATH	75.2	441	14.2	1.8	1.33
		CPH	75.5	535	13.4	1.5	1.14
		FRA	75.3	417	13.3	1.7	1.28
		LGW	75.2	695	14.3	1.4	1.07
		MAD	73.0	537	12.2	1.4	1.03
		SOF	71.4	272	13.7	2.3	1.63
		WAW	72.6	640	12.6	1.3	0.98
		Total	74.6	4,064	13.7	0.6	0.42
	Child (2-12 years)	AMS	32.0	62	13.1	10.2	3.25
		ATH	25.5	25	11.7	17.9	4.58
		CPH	39.7	30	13.6	12.3	4.86
		FRA	29.0	29	12.9	16.2	4.70
		LGW	33.0	19	14.2	19.4	6.41
		MAD	34.8	34	14.4	13.9	4.83
		SOF	32.4	14	11.4	18.4	5.97
		WAW	31.1	124	13.2	7.5	2.32
		Total	32.0	337	13.5	4.5	1.44
	Male & Infant (<2 years)	AMS	77.2	3	23.9	35.0	27.01
		ATH	90.8	2	5.9	9.1	8.23
		CPH	98.0	1	-	-	-
		FRA	113.3	1	-	-	-
		LGW	-	-	-	-	-
		MAD	97.1	2	9.9	14.1	13.72
		SOF	-	-	-	-	-
		WAW	91.4	2	4.2	6.4	5.88
		Total	91.0	11	15.8	10.2	9.32

Table D-18 Passenger weights by gender and airport; incl. carry-on luggage; Winter (Part II)

Season	*Gender*	*Airport*	*Mean*	*n*	*Std. dev.*	*Accuracy (%)*	*Confidence range (95%)*
	Female & Infant (<2 years)	AMS	78.7	3	21.5	30.9	24.33
		ATH	83.2	8	14.0	11.7	9.73
		CPH	93.4	1	-	-	-
		FRA	75.0	1	-	-	-
		LGW	-	-	-	-	-
		MAD	79.7	5	17.4	19.2	15.28
		SOF	-	-	-	-	-
		WAW	-	-	-	-	-
		Total	81.6	18	14.9	8.4	6.88
	Total	AMS	86.2	1,469	21.5	1.3	1.10
		ATH	86.3	1,176	19.7	1.3	1.12
		CPH	85.5	1,440	18.1	1.1	0.94
		FRA	86.3	1,419	18.4	1.1	0.96
		LGW	84.5	1,639	18.1	1.0	0.88
		MAD	82.4	1,453	17.3	1.1	0.89
		SOF	87.7	916	20.7	1.5	1.34
		WAW	82.6	1,894	22.2	1.2	1.00
		Total	84.9	11,406	19.7	0.4	0.36

Clarification: '-': no observations

Table D-19 Passenger weights by gender and airport; totals. incl. carry-on luggage

Season	*Gender*	*Airport*	*Mean*	*n*	*Std. dev.*	*Accuracy (%)*	*Confidence range (95%)*
Total	Male	AMS	91.9	1,818	16.8	0.8	0.77
		ATH	92.1	1,566	15.6	0.8	0.77
		CPH	91.4	1,594	15.9	0.9	0.78
		FRA	91.9	1,612	16.3	0.9	0.80
		LGW	91.1	1,441	15.6	0.9	0.81
		MAD	87.1	1,565	14.8	0.8	0.73
		SOF	93.1	1,130	17.0	1.1	0.99
		WAW	92.2	1,862	16.0	0.8	0.73
		Total	91.3	12,588	16.1	0.3	0.28
	Female	AMS	74.4	1,109	14.2	1.1	0.83
		ATH	72.2	1,201	13.9	1.1	0.79
		CPH	73.6	1,084	13.0	1.1	0.77
		FRA	73.2	831	13.2	1.2	0.90
		LGW	74.1	1,109	14.1	1.1	0.83
		MAD	70.2	1,134	12.4	1.0	0.72
		SOF	70.2	516	13.4	1.6	1.15
		WAW	71.6	1,367	13.9	1.0	0.74
		Total	72.5	8,351	13.6	0.4	0.29
	Child (2-12 years)	AMS	33.4	224	12.7	5.0	1.66
		ATH	32.8	170	12.9	5.9	1.95
		CPH	33.5	226	11.8	4.6	1.53
		FRA	33.8	143	15.0	7.3	2.46
		LGW	35.2	114	12.4	6.5	2.28
		MAD	34.4	104	12.8	7.2	2.46
		SOF	29.7	106	11.6	7.4	2.21
		WAW	31.2	333	12.2	4.2	1.31
		Total	32.8	1,420	12.7	2.0	0.66
	Male & Infant (<2 years)	AMS	89.8	8	18.9	14.6	13.12
		ATH	93.4	28	15.1	6.0	5.59
		CPH	82.5	8	8.0	6.7	5.55
		FRA	89.5	78	16.1	4.0	3.58
		LGW	89.7	54	12.6	3.8	3.37
		MAD	97.1	2	9.9	14.1	13.72
		SOF	89.1	31	19.2	7.6	6.77
		WAW	90.6	89	15.6	3.6	3.23
		Total	90.1	298	15.5	1.9	1.76

Table D-20 Passenger weights by gender and airport; totals. incl. carry-on luggage (Part II)

Season	*Gender*	*Airport*	*Mean*	*n*	*Std. dev.*	*Accuracy (%)*	*Confidence range (95%)*
	Female & Infant (<2 years)	AMS	94.2	16	22.6	11.7	11.05
		ATH	75.4	41	12.0	4.9	3.69
		CPH	74.3	4	14.8	19.5	14.48
		FRA	71.3	39	13.0	5.7	4.08
		LGW	68.0	56	11.3	4.3	2.95
		MAD	79.7	5	17.4	19.2	15.28
		SOF	67.7	25	10.4	6.0	4.08
		WAW	65.8	58	11.7	4.6	3.02
		Total	71.3	244	14.5	2.6	1.82
	Total	AMS	81.6	3,175	22.2	0.9	0.77
		ATH	80.6	3,006	21.1	0.9	0.76
		CPH	80.2	2,916	21.6	1.0	0.78
		FRA	82.7	2,703	21.0	1.0	0.79
		LGW	81.5	2,774	19.5	0.9	0.73
		MAD	78.3	2,810	18.2	0.9	0.67
		SOF	82.4	1,808	23.0	1.3	1.06
		WAW	78.7	3,709	23.2	0.9	0.75
		Total	80.6	22,901	21.4	0.3	0.28

Clarification: '-': no observations

ANNEX E Tables check-in baggage

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Table E-1 Checked baggage weights by season and gender

Season	*Gender*	*Mean*	*n*	*Std.dev*	*Accuracy (%)*	*Confidence range (95%)*
Summer	Male	16.9	5,162	5.8	0.9	0.16
	Female	17.0	4,172	5.7	1.0	0.17
	Child (2-12 years)	14.2	327	6.0	4.6	0.65
	Male & Infant (<2 years)	19.9	13	7.1	19.3	3.83
	Female & Infant (<2 years)	17.2	18	7.9	21.3	3.67
	Total	16.9	9,692	5.8	0.7	0.12
Winter	Male	16.5	7,391	5.9	0.8	0.13
	Female	16.8	5,080	5.7	0.9	0.16
	Child (2-12 years)	17.1	138	6.2	6.0	1.03
	Male & Infant (<2 years)	19.8	17	6.7	16.1	3.18
	Female & Infant (<2 years)	18.8	35	5.4	9.5	1.79
	total	16.6	12,661	5.8	0.6	0.10
Total	Male	16.7	12,553	5.9	0.6	0.10
	Female	16.9	9,252	5.7	0.7	0.12
	Child (2-12 years)	15.1	465	6.2	3.7	0.56
	Male & Infant (<2 years)	19.8	30	6.7	12.2	2.41
	Female & Infant (<2 years)	18.3	53	6.3	9.4	1.71
	total	16.7	22,353	5.8	0.5	0.08

Table E-2 Checked baggage weights by season, purpose and gender

Season	*Gender*	*Purpose*	*Mean*	*n*	*Std.dev*	*Accuracy (%)*	*Confidence range (95%)*
Summer	Male	Leisure	17.0	4,448	5.7	1.0	0.17
		Business	16.1	727	6.6	3.0	0.48
		Total	16.9	5,175	5.9	0.9	0.16
	Female	Leisure	17.1	3,925	5.7	1.0	0.18
		Business	16.3	265	6.1	4.5	0.73
		Total	17.0	4,190	5.7	1.0	0.17
	Child(2-12)	Leisure	14.2	325	6.0	4.6	0.65
		Business	17.5	2	2.0	15.7	2.74
		Total	14.2	327	6.0	4.6	0.65
	Total	Leisure	16.9	8,698	5.7	0.7	0.12
		Business	16.1	994	6.5	2.5	0.40
		Total	16.9	9,692	5.8	0.7	0.12
Winter	Male	Leisure	17.3	4,759	5.7	0.9	0.16
		Business	15.2	2,649	6.0	1.5	0.23
		Total	16.5	7,408	5.9	0.8	0.13
	Female	Leisure	17.2	4,089	5.7	1.0	0.17
		Business	15.2	1,026	5.7	2.3	0.35
		Total	16.8	5,115	5.7	0.9	0.16
	Child(2-12)	Leisure	17.3	133	6.2	6.1	1.05
		Business	13.0	5	4.8	32.2	4.18
		Total	17.1	138	6.2	6.0	1.03
	Total	Leisure	17.2	8,981	5.7	0.7	0.12
		Business	15.2	3,680	6.0	1.3	0.19
		Total	16.6	12,661	5.8	0.6	0.10
Total	Male	Leisure	17.2	9,207	5.7	0.7	0.12
		Business	15.4	3,376	6.2	1.4	0.21
		Total	16.7	12,583	5.9	0.6	0.10
	Female	Leisure	17.1	8,014	5.7	0.7	0.12
		Business	15.4	1,291	5.8	2.1	0.32
		Total	16.9	9,305	5.7	0.7	0.12
	Child(2-12)	Leisure	15.1	458	6.2	3.8	0.57
		Business	14.3	7	4.5	23.6	3.37
		Total	15.1	465	6.2	3.7	0.56
	Total	Leisure	17.1	17,679	5.7	0.5	0.08
		Business	15.4	4,674	6.1	1.1	0.17
		Total	16.7	22,353	5.8	0.5	0.08

Table E-3 Checked baggage weights by season, gender and class

Season	*Gender*	*Class*	*Mean*	*n*	*Std.dev*	*Accuracy (%)*	*Confidence Range (95%)*
Summer	Male	Economy	16.9	5,013	5.8	1.0	0.16
		Business	16.8	159	6.0	5.6	0.94
		First	24.0	3	6.1	29.0	6.94
		Total	16.9	5,175	5.9	0.9	0.16
	Female	Economy	17.0	4,138	5.7	1.0	0.17
		Business	16.8	50	5.5	9.0	1.52
		First	15.4	2	5.5	49.6	7.64
		Total	17.0	4,190	5.7	1.0	0.17
	Total (ex. Child 2-12 yrs)	Economy	17.0	9,151	5.8	0.7	0.12
		Business	16.8	209	5.9	4.8	0.80
		First	20.5	5	7.0	29.7	6.10
		Total	17.0	9,365	5.8	0.7	0.12
Winter	Male	Economy	16.5	7,136	5.9	0.8	0.14
		Business	16.4	268	6.4	4.7	0.77
		First	27.1	4	3.6	12.9	3.50
		Total	16.5	7,408	5.9	0.8	0.13
	Female	Economy	16.8	5,015	5.7	0.9	0.16
		Business	16.2	96	5.8	7.2	1.17
		First	20.6	4	2.2	10.5	2.16
		Total	16.8	5,115	5.7	0.9	0.16
	Total (excl. Child 2-12 yrs)	Economy	16.6	12,151	5.8	0.6	0.10
		Business	16.4	364	6.3	3.9	0.64
		First	23.9	8	4.4	12.9	3.07
		Total	16.6	12,523	5.8	0.6	0.10
Total	Male	Economy	16.7	12,149	5.9	0.6	0.10
		Business	16.6	427	6.3	3.6	0.60
		First	25.8	7	4.7	13.4	3.46
		Total	16.7	12,583	5.9	0.6	0.10
	Female	Economy	16.9	9,153	5.7	0.7	0.12
		Business	16.4	146	5.7	5.6	0.92
		First	18.9	6	4.0	17.1	3.22
		Total	16.9	9,305	5.7	0.7	0.12
	Total (excl. Child 2-12 yrs)	Economy	16.8	21,302	5.8	0.5	0.08
		Business	16.5	573	6.1	3.0	0.50
		First	22.6	13	5.5	13.3	3.00
		Total	16.8	21,888	5.8	0.5	0.08

Table E-4 Checked baggage weights by season, route type and gender

Season	*Gender*	*Routetype*	*Mean*	*n*	*Std.dev*	*Accuracy (%)*	*Confidence range (95%)*
Summer	Male	Non-European	18.3	1,769	5.8	1.5	0.27
		European	16.3	2,789	5.7	1.3	0.21
		Domestic	15.5	617	5.9	3.0	0.47
		Total	16.9	5,175	5.9	0.9	0.16
	Female	Non-European	18.3	1,419	5.7	1.6	0.30
		European	16.6	2,273	5.5	1.4	0.23
		Domestic	15.4	498	5.8	3.3	0.51
		Total	17.0	4,190	5.7	1.0	0.17
	Child(2-12)	Non-European	16.4	115	5.8	6.4	1.06
		European	12.7	195	5.7	6.3	0.80
		Domestic	15.6	17	6.0	18.4	2.86
		Total	14.2	327	6.0	4.6	0.65
	Total	Non-European	18.2	3,303	5.8	1.1	0.20
		European	16.3	5,257	5.6	0.9	0.15
		Domestic	15.4	1,132	5.9	2.2	0.34
		Total	16.9	9,692	5.8	0.7	0.12
Winter	Male	Non-European	18.4	2,689	5.9	1.2	0.22
		European	15.7	3,889	5.7	1.1	0.18
		Domestic	14.5	830	5.4	2.5	0.37
		Total	16.5	7,408	5.9	0.8	0.13
	Female	Non-European	18.5	1,936	5.6	1.4	0.25
		European	16.0	2,549	5.6	1.4	0.22
		Domestic	14.8	630	5.2	2.7	0.40
		Total	16.8	5,115	5.7	0.9	0.16
	Child(2-12)	Non-European	18.3	67	6.7	8.7	1.60
		European	16.6	63	5.2	7.8	1.29
		Domestic	11.4	8	5.4	33.2	3.77
		Total	17.1	138	6.2	6.0	1.03
	Total	Non-European	18.4	4,692	5.8	0.9	0.16
		European	15.8	6,501	5.7	0.9	0.14
		Domestic	14.6	1,468	5.3	1.9	0.27
		Total	16.6	12,661	5.8	0.6	0.10

Table E-5 Checked baggage weights by season, route type and gender (Part II)

Season	*Gender*	*Routetype*	*Mean*	*n*	*Std.dev*	*Accuracy (%)*	*Confidence range (95%)*
Total	Male	Non-European	18.3	4,458	5.9	0.9	0.17
		European	15.9	6,678	5.7	0.9	0.14
		Domestic	14.9	1,447	5.6	1.9	0.29
		Total	16.7	12,583	5.9	0.6	0.10
	Female	Non-European	18.4	3,355	5.7	1.0	0.19
		European	16.3	4,822	5.6	1.0	0.16
		Domestic	15.0	1,128	5.5	2.1	0.32
		Total	16.9	9,305	5.7	0.7	0.12
	Child(2-12)	Non-European	17.1	182	6.2	5.2	0.90
		European	13.7	258	5.8	5.2	0.71
		Domestic	14.2	25	6.1	16.7	2.38
		Total	15.1	465	6.2	3.7	0.56
	Total	Non-European	18.3	7,995	5.8	0.7	0.13
		European	16.0	11,758	5.7	0.6	0.10
		Domestic	15.0	2,600	5.6	1.4	0.21
		Total	16.7	22,353	5.8	0.5	0.08

Table E-6 Checked baggage weights by season, flight type and gender

Season	*Gender*	*Flight type*	*Mean*	*n*	*Std.dev*	*Accuracy (%)*	*Confidence range (95%)*
Summer	Male	Scheduled	16.9	4,596	5.9	1.0	0.17
		Non-scheduled	17.2	579	5.4	2.6	0.44
		Total	16.9	5,175	5.9	0.9	0.16
	Female	Scheduled	17.0	3,751	5.8	1.1	0.18
		Non-scheduled	17.2	439	5.2	2.8	0.48
		Total	17.0	4,190	5.7	1.0	0.17
	Child(2-12)	Scheduled	14.5	285	6.1	4.9	0.70
		Non-scheduled	11.9	42	5.1	12.9	1.53
		Total	14.2	327	6.0	4.6	0.65
	Total	Scheduled	16.8	8,632	5.9	0.7	0.12
		Non-scheduled	17.0	1,060	5.4	1.9	0.33
		Total	16.9	9,692	5.8	0.7	0.12
Winter	Male	Scheduled	16.4	7,048	6.0	0.8	0.14
		Non-scheduled	18.3	360	4.6	2.6	0.47
		Total	16.5	7,408	5.9	0.8	0.13
	Female	Scheduled	16.7	4,794	5.7	1.0	0.16
		Non-scheduled	17.8	321	5.4	3.3	0.59
		Total	16.8	5,115	5.7	0.9	0.16
	Child(2-12)	Scheduled	17.2	130	6.3	6.3	1.07
		Non-scheduled	16.1	8	4.7	20.2	3.25
		Total	17.1	138	6.2	6.0	1.03
	Total	Scheduled	16.5	11,972	5.9	0.6	0.11
		Non-scheduled	18.1	689	5.0	2.1	0.37
		Total	16.6	12,661	5.8	0.6	0.10
Total	Male	Scheduled	16.6	11,644	5.9	0.6	0.11
		Non-scheduled	17.6	939	5.2	1.9	0.33
		Total	16.7	12,583	5.9	0.6	0.10
	Female	Scheduled	16.8	8,545	5.8	0.7	0.12
		Non-scheduled	17.4	760	5.3	2.1	0.37
		Total	16.9	9,305	5.7	0.7	0.12
	Child(2-12)	Scheduled	15.4	415	6.2	3.9	0.60
		Non-scheduled	12.6	50	5.2	11.5	1.44
		Total	15.1	465	6.2	3.7	0.56
	Total	Scheduled	16.7	20,604	5.9	0.5	0.08
		Non-scheduled	17.4	1,749	5.3	1.4	0.25
		Total	16.7	22,353	5.8	0.5	0.08

Table E-7 Checked baggage weights by season, airline type and gender

Season	*Gender*	*Airline type*	*Mean*	*n*	*Std.dev*	*Accuracy (%)*	*Confidence range (95%)*
Summer	Male	Regular scheduled	17.0	3,557	6.1	1.2	0.20
		Charter	17.8	250	5.5	3.8	0.68
		Low-cost	16.0	1,121	5.3	1.9	0.31
		Charter & low-cost	18.5	247	4.9	3.3	0.61
		Total	16.9	5,175	5.9	0.9	0.16
	Female	Regular scheduled	17.1	2,933	5.9	1.3	0.21
		Charter	17.7	197	5.3	4.2	0.74
		Low-cost	16.2	858	5.1	2.1	0.34
		Charter & low-cost	18.3	202	4.8	3.6	0.66
		Total	17.0	4,190	5.7	1.0	0.17
	Child(2-12)	Regular scheduled	14.7	218	6.2	5.7	0.83
		Charter	14.2	16	4.6	15.8	2.23
		Low-cost	12.6	66	5.3	10.2	1.28
		Charter & low-cost	14.2	27	6.0	15.8	2.25
		Total	14.2	327	6.0	4.6	0.65
Winter	Male	Regular scheduled	17.0	6,708	6.0	0.8	0.14
		Charter	17.6	463	5.4	2.8	0.49
		Low-cost	16.0	2,045	5.2	1.4	0.23
		Charter & low-cost	18.1	476	5.0	2.5	0.45
		Total	16.9	9,692	5.8	0.7	0.12
	Female	Regular scheduled	16.5	5,479	6.1	1.0	0.16
		Charter	18.1	335	4.9	2.9	0.53
		Low-cost	15.6	1,337	5.1	1.7	0.27
		Charter & low-cost	19.7	257	5.8	3.6	0.71
		Total	16.5	7,408	5.9	0.8	0.13
	Child(2-12)	Regular scheduled	16.8	3,585	6.0	1.2	0.20
		Charter	18.8	288	5.3	3.3	0.61
		Low-cost	15.8	1,049	4.6	1.8	0.28
		Charter & low-cost	19.0	193	5.3	3.9	0.75
		Total	16.8	5,115	5.7	0.9	0.16

Table E-8 Checked baggage weights by season, airline type and gender (Part II)

Season	*Gender*	*Airline type*	*Mean*	*n*	*Std.dev*	*Accuracy (%)*	*Confidence range (95%)*
Total	Male	Regular scheduled	17.5	93	6.6	7.7	1.34
		Charter	16.3	11	5.6	20.4	3.32
		Low-cost	16.9	20	4.8	12.4	2.10
		Charter & low-cost	15.7	14	5.4	18.0	2.82
		Total	17.1	138	6.2	6.0	1.03
	Female	Regular scheduled	16.6	9,157	6.1	0.7	0.12
		Charter	18.4	634	5.1	2.2	0.40
		Low-cost	15.7	2,406	4.9	1.2	0.19
		Charter & low-cost	19.3	464	5.6	2.7	0.51
		Total	16.6	12,661	5.8	0.6	0.10
	Child(2-12)	Regular scheduled	16.7	9,036	6.1	0.8	0.13
		Charter	18.0	585	5.2	2.3	0.42
		Low-cost	15.8	2,458	5.1	1.3	0.20
		Charter & low-cost	19.1	504	5.4	2.5	0.47
		Total	16.7	12,583	5.9	0.6	0.10

Table E-9 Checked baggage weights by gender and region of departure

Gender	*Region of departure*	*Mean*	*n*	*Std.dev*	*Accuracy (%)*	*Confidence range (95%)*
Male	1 UK and Ireland	16.6	1,709	5.2	1.5	0.25
	2 Benelux and France	17.5	1,121	5.6	1.9	0.33
	3 Spain, Portugal and Italy	16.4	1,686	5.9	1.7	0.28
	4 Scandinavia and Iceland	15.3	915	5.7	2.4	0.37
	5 Germany, Switzerland and Austria	17.2	1,522	5.8	1.7	0.29
	6 Northeast Europe	16.6	1,648	5.8	1.7	0.28
	7 Greece, Cyprus, Malta and Turkey	15.8	1,561	6.4	2.0	0.32
	8 Romania and Bulgaria	15.8	974	6.4	2.5	0.40
	9 Other Eur countries (incl. Russia)	16.4	110	5.5	6.2	1.02
	11 Africa and the Middle East	17.8	270	6.7	4.5	0.80
	12 Asia	18.1	113	5.6	5.8	1.04
	13 North America	18.8	729	5.3	2.1	0.38
	14 South America	19.6	213	5.9	4.0	0.79
	15 Other	13.7	12	4.3	17.7	2.42
	Total	16.7	12,583	5.9	0.6	0.10
Female	1 UK and Ireland	16.5	1,380	4.9	1.6	0.26
	2 Benelux and France	17.9	897	5.4	2.0	0.35
	3 Spain, Portugal and Italy	16.5	1,177	5.8	2.0	0.33
	4 Scandinavia and Iceland	15.7	738	5.7	2.6	0.41
	5 Germany, Switzerland and Austria	17.6	1,106	5.6	1.9	0.33
	6 Northeast Europe	17.0	1,253	5.8	1.9	0.32
	7 Greece, Cyprus, Malta and Turkey	15.6	1,186	6.1	2.2	0.35
	8 Romania and Bulgaria	16.4	527	6.3	3.3	0.53
	9 Other Eur countries (incl. Russia)	16.5	60	6.1	9.4	1.55
	11 Africa and the Middle East	17.7	177	6.1	5.1	0.90
	12 Asia	19.2	79	5.8	6.7	1.28
	13 North America	18.9	527	5.6	2.5	0.48
	14 South America	19.2	194	4.6	3.4	0.65
	15 Other	14.5	4	2.1	14.3	2.07
	Total	16.9	9,305	5.7	0.7	0.12

Table E-10 Checked baggage weights by gender and region of departure (Part II)

Gender	*Region of departure*	*Mean*	*n*	*Std.dev*	*Accuracy (%)*	*Confidence range (95%)*
Child(2-12)	1 UK and Ireland	14.8	45	5.2	10.3	1.53
	2 Benelux and France	13.1	38	5.9	14.4	1.89
	3 Spain, Portugal and Italy	14.3	42	6.0	12.7	1.82
	4 Scandinavia and Iceland	11.2	47	5.2	13.3	1.49
	5 Germany, Switzerland and Austria	17.4	80	6.1	7.7	1.34
	6 Northeast Europe	15.2	92	5.8	7.8	1.18
	7 Greece, Cyprus, Malta and Turkey	14.9	36	6.7	14.7	2.20
	8 Romania and Bulgaria	16.0	38	6.5	13.0	2.08
	9 Other Eur countries (incl. Russia)	13.8	5	9.3	58.7	8.12
	11 Africa and the Middle East	15.0	11	5.9	23.1	3.47
	12 Asia	18.0	3	8.8	55.2	9.94
	13 North America	17.1	22	6.4	15.6	2.66
	14 South America	17.8	6	5.8	25.9	4.61
	15 Other	-	-	-	-	-
	Total	15.1	465	6.2	3.7	0.56

Table E-11 Checked baggage weights by gender and region of arrival

Gender	*Region of arrival*	*Mean*	*n*	*Std.dev*	*Accuracy (%)*	*Confidence range (95%)*
Male	1 UK and Ireland	16.1	1,539	5.1	1.6	0.26
	2 Benelux and France	17.0	1,273	5.7	1.9	0.32
	3 Spain, Portugal and Italy	16.3	1,890	5.7	1.6	0.26
	4 Scandinavia and Iceland	16.1	1,192	5.6	2.0	0.32
	5 Germany, Switzerland and Austria	16.3	1,582	6.2	1.9	0.30
	6 Northeast Europe	15.6	781	6.0	2.7	0.42
	7 Greece, Cyprus, Malta and Turkey	15.6	1,411	6.1	2.0	0.32
	8 Romania and Bulgaria	17.3	162	6.8	6.0	1.05
	9 Other Eur. countries (incl. Russia)	17.3	268	6.6	4.6	0.79
	11 Africa and the Middle East	18.3	503	6.5	3.1	0.57
	12 Asia	18.4	419	6.0	3.1	0.58
	13 North America	18.6	1,190	5.3	1.6	0.30
	14 South America	18.5	260	6.3	4.2	0.77
	15 Other	18.7	113	5.1	5.0	0.93
	Total	16.7	12,583	5.9	0.6	0.10
Female	1 UK and Ireland	16.5	1,115	5.3	1.9	0.31
	2 Benelux and France	17.2	973	5.9	2.2	0.37
	3 Spain, Portugal and Italy	16.5	1,490	5.4	1.7	0.28
	4 Scandinavia and Iceland	16.6	869	5.8	2.3	0.38
	5 Germany, Switzerland and Austria	16.2	999	5.5	2.1	0.34
	6 Northeast Europe	16.1	540	5.8	3.1	0.49
	7 Greece, Cyprus, Malta and Turkey	15.8	1,069	6.2	2.3	0.37
	8 Romania and Bulgaria	17.9	107	6.1	6.5	1.16
	9 Other Eur. countries (incl. Russia)	16.1	205	6.0	5.1	0.82
	11 Africa and the Middle East	18.0	359	6.1	3.5	0.63
	12 Asia	18.8	281	5.5	3.4	0.64
	13 North America	18.6	956	5.2	1.8	0.33
	14 South America	19.1	217	5.8	4.0	0.77
	15 Other	18.5	125	4.5	4.3	0.79
	Total	16.9	9,305	5.7	0.7	0.12

Table E-12 Checked baggage weights by gender and region of arrival (Part II)

Gender	*Region of arrival*	*Mean*	*n*	*Std.dev*	*Accuracy (%)*	*Confidence range (95%)*
Child(2-12)	1 UK and Ireland	14.6	36	5.3	11.9	1.73
	2 Benelux and France	15.3	39	7.4	15.2	2.32
	3 Spain, Portugal and Italy	14.2	81	5.5	8.4	1.19
	4 Scandinavia and Iceland	12.6	73	5.2	9.5	1.20
	5 Germany, Switzerland and Austria	15.1	48	6.2	11.7	1.76
	6 Northeast Europe	16.6	17	6.9	19.7	3.26
	7 Greece, Cyprus, Malta and Turkey	15.1	50	7.4	13.6	2.06
	8 Romania and Bulgaria	17.0	4	5.2	30.0	5.10
	9 Other Eur. countries (incl. Russia)	15.7	15	6.3	20.4	3.19
	11 Africa and the Middle East	15.6	29	5.7	13.3	2.08
	12 Asia	18.2	10	6.0	20.4	3.72
	13 North America	17.4	51	5.6	8.8	1.52
	14 South America	18.6	11	7.5	23.9	4.44
	15 Other	16.2	1	.		
	Total	15.1	465	6.2	3.7	0.56

Table E-13 Checked baggage weights by gender and region; Summer

Season	*Gender*	*Airport*	*Mean*	*N*	*Std.dev*	*Accuracy (%)*	*Confidence range (95%)*
Summer	Male	AMS	18.0	678	5.5	2.3	0.41
		ATH	16.2	832	6.4	2.7	0.44
		CPH	15.2	606	5.3	2.8	0.42
		FRA	17.6	725	5.5	2.3	0.40
		LGW	16.9	626	5.0	2.3	0.39
		MAD	16.8	661	6.3	2.9	0.48
		SOF	17.3	364	6.9	4.1	0.71
		WAW	17.3	683	5.5	2.4	0.42
		Total	16.9	5,175	5.9	0.9	0.16
	Female	AMS	18.5	538	5.7	2.6	0.48
		ATH	15.8	709	6.0	2.8	0.44
		CPH	15.8	495	5.1	2.8	0.45
		FRA	17.8	610	5.5	2.5	0.44
		LGW	17.1	438	5.1	2.8	0.48
		MAD	16.8	525	5.9	3.0	0.51
		SOF	17.6	237	6.6	4.8	0.84
		WAW	17.2	638	5.5	2.5	0.43
		Total	17.0	4,190	5.7	1.0	0.17
	Child (2-12 years)	AMS	13.5	35	6.5	16.0	2.16
		ATH	13.9	26	5.6	15.5	2.14
		CPH	10.9	64	5.0	11.4	1.23
		FRA	16.1	63	6.1	9.3	1.50
		LGW	14.7	32	5.6	13.3	1.94
		MAD	14.6	20	5.6	16.8	2.45
		SOF	16.3	30	6.5	14.3	2.33
		WAW	14.9	57	5.6	9.7	1.44
		Total	14.2	327	6.0	4.6	0.65
	Total	AMS	18.1	1,251	20.2	6.2	1.12
		ATH	16.0	1,567	19.9	6.2	0.99
		CPH	15.2	1,165	21.8	8.2	1.25
		FRA	17.6	1,398	21.1	6.3	1.11
		LGW	16.9	1,096	19.5	6.8	1.15
		MAD	16.8	1,206	17.0	5.7	0.96
		SOF	17.4	631	22.1	10.0	1.73
		WAW	17.2	1,378	21.9	6.7	1.15
		Total	16.9	9,692	20.5	2.4	0.41

Table E-14 Checked baggage weights by gender and region; Winter

Season	*Gender*	*Airport*	*Mean*	*n*	*Std.dev*	*Accuracy (%)*	*Confidence range (95%)*
Winter	Male	AMS	18.2	873	5.6	2.0	0.37
		ATH	15.3	858	6.4	2.8	0.43
		CPH	16.5	772	6.0	2.6	0.42
		FRA	17.5	1,015	6.2	2.2	0.38
		LGW	16.9	1,261	5.2	1.7	0.29
		MAD	16.1	809	5.7	2.4	0.39
		SOF	15.2	608	6.0	3.1	0.48
		WAW	16.0	1,212	5.8	2.0	0.33
		Total	16.5	7,408	5.9	0.8	0.13
	Female	AMS	18.5	686	5.5	2.2	0.41
		ATH	15.4	573	6.1	3.2	0.50
		CPH	16.5	623	6.3	3.0	0.50
		FRA	17.4	631	5.5	2.5	0.43
		LGW	16.5	1,031	5.0	1.8	0.30
		MAD	16.5	534	5.4	2.8	0.46
		SOF	15.8	286	6.0	4.4	0.70
		WAW	16.8	751	5.9	2.5	0.42
		Total	16.8	5,115	5.7	0.9	0.16
	Child (2-12 years)	AMS	17.4	28	6.5	13.9	2.41
		ATH	15.2	6	10.4	54.6	8.32
		CPH	15.9	16	5.5	17.1	2.72
		FRA	18.7	30	6.4	12.2	2.28
		LGW	15.7	12	4.5	16.2	2.53
		MAD	16.1	9	5.5	22.5	3.62
		SOF	19.8	4	7.4	36.6	7.27
		WAW	16.8	33	5.8	11.7	1.97
		Total	17.1	138	6.2	6.0	1.03
	Total	AMS	18.3	1,587	5.5	1.5	0.27
		ATH	15.3	1,437	6.3	2.1	0.32
		CPH	16.5	1,411	6.1	1.9	0.32
		FRA	17.5	1,676	6.0	1.6	0.29
		LGW	16.7	2,304	5.1	1.2	0.21
		MAD	16.2	1,352	5.6	1.8	0.30
		SOF	15.4	898	6.0	2.6	0.39
		WAW	16.3	1,996	5.9	1.6	0.26
		Total	16.6	12,661	5.8	0.6	0.10

Table E-15 Checked baggage weights by gender and region; totals

Season	*Gender*	*Airport*	*Mean*	*n*	*Std.dev*	*Accuracy (%)*	*Confidence range (95%)*
Total	Male	AMS	18.1	1,551	5.5	1.5	0.27
		ATH	15.7	1,690	6.4	1.9	0.31
		CPH	15.9	1,378	5.7	1.9	0.30
		FRA	17.5	1,740	5.9	1.6	0.28
		LGW	16.9	1,887	5.2	1.4	0.23
		MAD	16.4	1,470	6.0	1.9	0.31
		SOF	16.0	972	6.4	2.5	0.40
		WAW	16.5	1,895	5.7	1.6	0.26
		Total	16.7	12,583	5.9	0.6	0.10
	Female	AMS	18.5	1,224	5.6	1.7	0.31
		ATH	15.6	1,282	6.0	2.1	0.33
		CPH	16.2	1,118	5.8	2.1	0.34
		FRA	17.6	1,241	5.5	1.7	0.31
		LGW	16.7	1,469	5.0	1.5	0.26
		MAD	16.6	1,059	5.7	2.1	0.34
		SOF	16.6	523	6.4	3.3	0.55
		WAW	17.0	1,389	5.7	1.8	0.30
		Total	16.9	9,305	5.7	0.7	0.12
	Child (2-12 years)	AMS	15.2	63	6.7	11.0	1.67
		ATH	14.1	32	6.5	16.0	2.27
		CPH	11.9	80	5.5	10.1	1.20
		FRA	17.0	93	6.3	7.5	1.27
		LGW	14.9	44	5.3	10.5	1.56
		MAD	15.1	29	5.5	13.4	2.01
		SOF	16.7	34	6.6	13.3	2.22
		WAW	15.6	90	5.7	7.5	1.17
		Total	15.1	465	6.2	3.7	0.56
	Total	AMS	18.2	2,838	5.6	1.1	0.21
		ATH	15.7	3,004	6.2	1.4	0.22
		CPH	15.9	2,576	5.8	1.4	0.22
		FRA	17.5	3,074	5.8	1.2	0.20
		LGW	16.8	3,400	5.1	1.0	0.17
		MAD	16.5	2,558	5.9	1.4	0.23
		SOF	16.2	1,529	6.4	2.0	0.32
		WAW	16.7	3,374	5.7	1.2	0.19
		Total	16.7	22,353	5.8	0.5	0.08

Table E-16 Checked baggage weights by season, gender and haul label

Season	*Gender*	*Haullabel*	*Mean*	*N*	*Std.dev*	*Accuracy (%)*	*Confidence range (95%)*
Summer	Male	Short Haul: < 500 km	15.1	478	6.1	3.6	0.54
		Medium haul: 500 .. 5000 km	16.6	3,560	5.8	1.1	0.19
		Long haul: > 5000km	18.7	1,137	5.6	1.7	0.32
		Total	16.9	5,175	5.9	0.9	0.16
	Female	Short Haul: < 500 km	15.3	415	5.9	3.7	0.57
		Medium haul: 500 .. 5000 km	16.7	2,829	5.6	1.2	0.21
		Long haul: > 5000km	18.7	946	5.4	1.8	0.34
		Total	17.0	4,190	5.7	1.0	0.17
	Child	Short Haul: < 500 km	10.5	8	7.1	47.1	4.94
		Medium haul: 500 .. 5000 km	13.6	255	5.9	5.3	0.73
		Long haul: > 5000km	16.8	64	5.5	8.0	1.34
		Total	14.2	327	6.0	4.6	0.65
	Total	Short Haul: < 500 km	15.2	901	6.0	2.6	0.39
		Medium haul: 500 .. 5000 km	16.5	6,644	5.7	0.8	0.14
		Long haul: > 5000km	18.7	2,147	5.5	1.2	0.23
		Total	16.9	9,692	5.8	0.7	0.12
Winter	Male	Short Haul: < 500 km	14.8	838	5.5	2.5	0.37
		Medium haul: 500 .. 5000 km	15.9	4,662	5.9	1.1	0.17
		Long haul: > 5000km	18.7	1,908	5.5	1.3	0.25
		Total	16.5	7,408	5.9	0.8	0.13
	Female	Short Haul: < 500 km	14.9	593	5.3	2.8	0.42
		Medium haul: 500 .. 5000 km	16.1	3,060	5.7	1.3	0.20
		Long haul: > 5000km	18.9	1,462	5.3	1.4	0.27
		Total	16.8	5,115	5.7	0.9	0.16
	Child	Short Haul: < 500 km	14.2	12	6.4	25.5	3.61
		Medium haul: 500 .. 5000 km	16.7	80	6.0	7.8	1.31
		Long haul: > 5000km	18.7	46	6.2	9.6	1.78
		Total	17.1	138	6.2	6.0	1.03
	Total	Short Haul: < 500 km	14.9	1,443	5.4	1.9	0.28
		Medium haul: 500 .. 5000 km	16.0	7,802	5.8	0.8	0.13
		Long haul: > 5000km	18.8	3,416	5.4	1.0	0.18
		Total	16.6	12,661	5.8	0.6	0.10

Table E-17 Checked baggage weights by season, gender and haul label (Part II)

Season	*Gender*	*Haullabel*	*Mean*	*N*	*Std.dev*	*Accuracy (%)*	*Confidence range (95%)*
Total	Male	Short Haul: < 500 km	14.9	1,316	5.7	2.1	0.31
		Medium haul: 500 .. 5000 km	16.2	8,222	5.9	0.8	0.13
		Long haul: > 5000km	18.7	3,045	5.5	1.0	0.20
		Total	16.7	12,583	5.9	0.6	0.10
	Female	Short Haul: < 500 km	15.1	1,008	5.5	2.3	0.34
		Medium haul: 500 .. 5000 km	16.4	5,889	5.7	0.9	0.15
		Long haul: > 5000km	18.8	2,408	5.3	1.1	0.21
		Total	16.9	9,305	5.7	0.7	0.12
	Child	Short Haul: < 500 km	12.7	20	6.8	23.3	2.96
		Medium haul: 500 .. 5000 km	14.4	335	6.1	4.5	0.65
		Long haul: > 5000km	17.6	110	5.8	6.2	1.09
		Total	15.1	465	6.2	3.7	0.56
	Total	Short Haul: < 500 km	15.0	2,344	5.6	1.5	0.23
		Medium haul: 500 .. 5000 km	16.2	14,446	5.8	0.6	0.09
		Long haul: > 5000km	18.7	5,563	5.5	0.8	0.14
		Total	16.7	22,353	5.8	0.5	0.08

Table E-18 Checked baggage weights by season, gender and number of persons concerned

Season	*Gender*	*Baggage for:*	*Mean*	*n*	*Std.dev*	*Accuracy (%)*	*Confidence range (95%)*
Summer	Male	One person	16.6	4,042	5.7	1.1	0.18
		More than one person	18.2	1,133	6.2	2.0	0.36
		Total	16.9	5,175	5.9	0.9	0.16
	Female	One person	16.7	3,371	5.5	1.1	0.19
		More than one person	18.2	819	6.2	2.3	0.42
		Total	17.0	4,190	5.7	1.0	0.17
	Child	One person	13.7	249	5.8	5.2	0.72
		More than one person	15.7	78	6.5	9.2	1.44
		Total	14.2	327	6.0	4.6	0.65
	Total	One person	16.5	7,662	5.7	0.8	0.13
		More than one person	18.1	2,030	6.2	1.5	0.27
		Total	16.9	9,692	5.8	0.7	0.12
Winter	Male	One person	16.4	6,834	5.8	0.8	0.14
		More than one person	17.9	574	6.5	2.9	0.53
		Total	16.5	7,408	5.9	0.8	0.13
	Female	One person	16.6	4,755	5.6	1.0	0.16
		More than one person	18.9	360	6.8	3.7	0.70
		Total	16.8	5,115	5.7	0.9	0.16
	Child	One person	16.3	98	5.9	7.1	1.16
		More than one person	19.2	40	6.5	10.5	2.01
		Total	17.1	138	6.2	6.0	1.03
	Total	One person	16.5	11,687	5.8	0.6	0.10
		More than one person	18.3	974	6.6	2.3	0.41
		Total	16.6	12,661	5.8	0.6	0.10
Total	Male	One person	16.5	10,876	5.8	0.7	0.11
		More than one person	18.1	1,707	6.3	1.6	0.30
		Total	16.7	12,583	5.9	0.6	0.10
	Female	One person	16.7	8,126	5.6	0.7	0.12
		More than one person	18.4	1,179	6.4	2.0	0.36
		Total	16.9	9,305	5.7	0.7	0.12
	Child	One person	14.4	347	5.9	4.3	0.62
		More than one person	16.9	118	6.7	7.1	1.20
		Total	15.1	465	6.2	3.7	0.56
	Total	One person	16.5	19,349	5.7	0.5	0.08
		More than one person	18.2	3,004	6.3	1.2	0.23
		Total	16.7	22,353	5.8	0.5	0.08

Table E-19 Checked baggage weights by gender and permitted weight (max.kg)

Gender	*Permitted weight (maximum kg.)*	*Mean*	*n*	*Std.dev*	*Accuracy (%)*	*Confidence range (95%)*
Male	15	14.3	215	4.5	4.2	0.60
	18	18.7	7	7.4	29.2	5.47
	20	16.0	7,665	5.8	0.8	0.13
	23	18.2	1,806	5.5	1.4	0.25
	30	15.1	206	6.0	5.5	0.82
	32	18.0	89	5.7	6.6	1.19
	Total	16.3	9,988	5.8	0.7	0.11
Female	15	14.1	209	4.8	4.6	0.65
	18	17.6	10	4.4	15.7	2.76
	20	16.2	5,586	5.6	0.9	0.15
	23	18.3	1,398	5.7	1.6	0.30
	30	15.0	62	5.2	8.6	1.28
	32	17.5	28	5.2	10.9	1.91
	Total	16.6	7,293	5.6	0.8	0.13
Child	18	5.9	1	-.	-	-
	20	14.0	284	5.9	4.9	0.69
	23	17.2	73	6.0	8.0	1.38
	30	16.1	1	-.	-	-
	Total	14.6	359	6.1	4.3	0.63
Total	15	14.2	424	4.7	3.1	0.44
	18	17.4	18	6.2	16.4	2.86
	20	16.0	13,535	5.7	0.6	0.10
	23	18.2	3,277	5.6	1.1	0.19
	30	15.1	269	5.8	4.6	0.70
	32	17.9	117	5.6	5.6	1.01
	Total	16.4	17,640	5.7	0.5	0.08

ANNEX F Tables relation between factors and weight

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Table F-1 Correlations between different factors and mass weights on passengers and carry-on luggage; male (Pearson correlations)

Factor	*Weightin*	*Weightex*	*Handbag*	*n*
Gender	-	-	-	12,886
Season	0.15	0.10	0.17	12,886
Business class	*n.s.*	*n.s.*	*n.s.*	12,886
Purpose business	*n.s.*	*n.s.*	0.06	12,886
Direction inbound	*n.s.*	*n.s.*	*n.s.*	12,886
Route type domestic	*n.s.*	*n.s.*	*n.s.*	12,886
Airline type charter	*n.s.*	*n.s.*	-0.10	12,886
Airline type low cost	-0.03	*n.s.*	-0.05	12,886
Check bag yes	0.02	*n.s.*	0.07	12,886
Route type European	*n.s.*	*n.s.*	*n.s.*	12,886
Haul > 5000 km	0.04	*n.s.*	0.07	12,886
Haul < 500 km	*n.s.*	*n.s.*	*n.s.*	12,886
Distance flight (km)	0.03	*n.s.*	0.05	12,880
Maximum kg carry-on lugg	0.03	*n.s.*	0.07	10,051
Carry-on lugg < or > max carry-on lugg	0.28	0.06	0.69	10,051
Age (years)	0.25	0.27	*n.s.*	12,886
Flight type non scheduled	-0.06	*n.s.*	-0.16	12,886
Airport				
Amsterdam	*n.s.*	*n.s.*	*n.s.*	12,886
Athens	-0.01	0.00	*n.s.*	12,886
Copenhagen	*n.s.*	*n.s.*	0.00	12,886
Frankfurt	0.02	-0.02	*n.s.*	12,886
London Gatwick	0.04	0.05	*n.s.*	12,886
Madrid	-0.07	-0.08	0.02	12,886
Sofia	-0.05	*n.s.*	-0.04	12,886
Warsaw	-0.04	-0.02	-0.07	12,886
Difference in weights between destination/departure				
1 UK and Ireland	*n.s.*	0.01	*n.s.*	2,873
2 Benelux and France	-0.09	-0.09	*n.s.*	2,746
3 Spain, Portugal and Italy	*n.s.*	*n.s.*	*n.s.*	2,642
4 Scandinavia and Iceland	0.06	0.06	*n.s.*	1,958
5 Germany, Switzerland and Austria	-0.05	*n.s.*	-0.08	3,225
6 Northeast Europe	*n.s.*	*n.s.*	*n.s.*	2,293
7 Greece, Cyprus, Malta and Turkey	-0.08	*n.s.*	-0.13	2,301
8 Romania and Bulgaria	*n.s.*	*n.s.*	*n.s.*	1,393
9 Other European countries (incl. Russia)	*n.s.*	*n.s.*	*n.s.*	440
11 Africa and the Middle East	*n.s.*	*n.s.*	*n.s.*	1,106
12 Asia	*n.s.*	*n.s.*	*n.s.*	531
13 North America	-0.07	*n.s.*	*n.s.*	1,363
14 South America	0.16	0.09	0.22	555

Note: n.s. = correlation is not significant at 95% level of confidence x

Table F-2 Correlations between different factors and mass weights on passengers and carry-on luggage; female (Pearson correlations)

Factor	*Weightin*	*Weightex*	*Handbag*	*n*
Gender	-	-	-	8,595
Season	0.15	0.10	0.17	8,595
Business class	*n.s.*	*n.s.*	*n.s.*	8,595
Purpose business	*n.s.*	*n.s.*	0.06	8,595
Direction inbound	*n.s.*	*n.s.*	*n.s.*	8,595
Route type domestic	*n.s.*	*n.s.*	*n.s.*	8,595
Airline type charter	*n.s.*	*n.s.*	-0.10	8,595
Airline type low cost	-0.03	*n.s.*	-0.05	8,595
Check bag yes	0.02	*n.s.*	0.07	8,595
Route type European	*n.s.*	*n.s.*	*n.s.*	8,595
Haul > 5,000 km	0.04	*n.s.*	0.07	8,595
Haul < 500 km	*n.s.*	*n.s.*	*n.s.*	8,595
Distance flight (km)	0.03	*n.s.*	0.05	8,588
Maximum kg carry-on lugg	0.03	*n.s.*	0.07	6,347
Carry-on lugg < or > max carry-on lugg	0.28	0.06	0.69	6,347
Age (years)	0.25	0.27	*n.s.*	8,595
Flight type non scheduled	-0.06	*n.s.*	-0.16	8,595
Airport				
Amsterdam	*n.s.*	*n.s.*	*n.s.*	8,595
Athens	-0.01	0.00	*n.s.*	8,595
Copenhagen	*n.s.*	*n.s.*	0.00	8,595
Frankfurt	0.02	-0.02	*n.s.*	8,595
London Gatwick	0.04	0.05	*n.s.*	8,595
Madrid	-0.07	-0.08	0.02	8,595
Sofia	-0.05	*n.s.*	-0.04	8,595
Warsaw	-0.04	-0.02	-0.07	8,595
Difference in weights between destination/departure				
1 UK and Ireland	*n.s.*	0.01	*n.s.*	2,046
2 Benelux and France	-0.09	-0.09	*n.s.*	1,700
3 Spain, Portugal and Italy	*n.s.*	*n.s.*	*n.s.*	1,992
4 Scandinavia and Iceland	0.06	0.06	*n.s.*	1,269
5 Germany, Switzerland and Austria	-0.05	*n.s.*	-0.08	1,737
6 Northeast Europe	*n.s.*	*n.s.*	*n.s.*	1,625
7 Greece, Cyprus, Malta and Turkey	-0.08	*n.s.*	-0.13	1,799
8 Romania and Bulgaria	*n.s.*	*n.s.*	*n.s.*	664
9 Other European countries (incl. Russia)	*n.s.*	*n.s.*	*n.s.*	245
11 Africa and the Middle East	*n.s.*	*n.s.*	*n.s.*	816
12 Asia	*n.s.*	*n.s.*	*n.s.*	331
13 North America	-0.07	*n.s.*	*n.s.*	987
14 South America	0.16	0.09	0.22	498

Note: n.s. = correlation is not significant at 95% level of confidence x

Table F-3 Correlations between different factors and mass weights on passengers and carry-on luggage; ; total (ex children)

Factor	*Weightin*	*Weightex*	*Handbag*	*n*
Gender	-0.52	-0.53	-0.08	21,481
Season	0.16	0.13	0.15	21,481
Business class	0.04	0.03	0.04	21,481
Purpose business	0.19	0.16	0.15	21,481
Direction inbound	-0.03	-0.02	-0.02	21,481
Route type domestic	*n.s.*	*n.s.*	-0.02	21,481
Airline type charter	-0.05	-0.03	-0.10	21,481
Airline type low cost	-0.07	-0.05	-0.08	21,481
Check bag yes	0.06	0.04	0.12	21,481
Route type European	0.03	0.03	*n.s.*	21,481
Haul > 5,000 km	-0.02	-0.03	0.03	21,481
Haul < 500 km	0.02	0.02	0.01	21,481
Distance flight (km)	-0.04	-0.05	*n.s.*	21,468
Maximum kg carry-on lugg	0.05	0.02	0.10	16,398
Carry-on lugg < or > max carry-on lugg	0.26	0.09	0.67	16,398
Age (years)	0.25	0.25	0.05	21,481
Flight type non scheduled	-0.09	-0.05	-0.17	21,481
Airport				
Amsterdam	*n.s.*	*n.s.*	0.02	21,481
Athens	*n.s.*	*n.s.*	*n.s.*	21,481
Copenhagen	0.01	*n.s.*	0.00	21,481
Frankfurt	*n.s.*	*n.s.*	0.11	21,481
London Gatwick	-0.01	0.01	*n.s.*	21,481
Madrid	-0.08	-0.08	-0.01	21,481
Sofia	*n.s.*	*n.s.*	-0.02	21,481
Warsaw	-0.01	0.00	-0.03	21,481
Difference in weights between destination/departure				
1 UK and Ireland	0.04	0.03	*n.s.*	4,919
2 Benelux and France	-0.04	-0.04	*n.s.*	4,446
3 Spain, Portugal and Italy	0.07	0.06	0.06	4,634
4 Scandinavia and Iceland	0.07	0.06	0.05	3,227
5 Germany, Switzerland and Austria	*n.s.*	*n.s.*	-0.07	4,962
6 Northeast Europe	0.05	0.05	*n.s.*	3,918
7 Greece, Cyprus, Malta and Turkey	-0.06	*n.s.*	-0.13	4,100
8 Romania and Bulgaria	*n.s.*	*n.s.*	*n.s.*	2,057
9 Other European countries (incl. Russia)	0.11	0.10	*n.s.*	685
11 Africa and the Middle East	*n.s.*	*n.s.*	0.07	1,922
12 Asia	*n.s.*	*n.s.*	*n.s.*	862
13 North America	-0.05	-0.05	*n.s.*	2,350
14 South America	0.09	*n.s.*	0.14	1,053

Note: n.s. = correlation is not significant at 95% level of confidence x

Table F-4 T-test for equality of mean weights by gender, season and flight type scheduled and non-scheduled (children excluded)

		t	*df*	Sig (2-tailed)	Mean diff	Std. Error diff	*95% Upper*	*95% Lower*
Male, Summer	weight incl. carry-on lugg	4.6	5,897	0.00	2.75	0.60	1.58	3.93
	weight excl. carry-on lugg	0.4	5,897	n.s	0.21	0.56	-0.87	1.30
	carry-on luggage	15.3	5,897	0.00	2.54	0.17	2.21	2.86
Male Winter	weight incl. carry-on lugg	1.5	6,985	n.s	1.38	0.92	-0.41	3.18
	weight excl. carry-on lugg	-0.6	6,985	n.s	-0.56	0.86	-2.25	1.14
	carry-on luggage	7.1	6,985	0.00	1.94	0.27	1.40	2.48
Female Summer	weight incl. carry-on lugg	1.7	4,511	n.s	0.86	0.50	-0.13	1.85
	weight excl. carry-on lugg	-1.8	4,511	n.s	-0.83	0.47	-1.75	0.09
	carry-on luggage	10.9	4,511	0.00	1.69	0.15	1.39	1.99
Female Winter	weight incl. carry-on lugg	3.6	4,080	0.00	3.17	0.88	1.45	4.90
	weight excl. carry-on lugg	1.3	4,080	n.s	1.11	0.82	-0.51	2.72
	carry-on luggage	7.0	4,080	0.00	2.07	0.30	1.49	2.65

Note: 95% = 95% Confidence Interval of Difference

Table F-5 Mean weights by gender, season and flight type (children excluded)

Season	*Gender*	*Flighttype*		*Weightin*	*Weightex*	*Handbag*	*n*
Summer	Male	0 Scheduled	Mean	89.1	82.6	6.4	5,037
			Std. Dev.	16.4	15.2	4.7	
		1 Non-scheduled	Mean	86.3	82.4	3.9	862
			Std. Dev.	15.1	14.2	3.4	
		Total	Mean	88.7	82.6	6.0	5,899
			Std. Dev.	16.3	15.0	4.6	
	Female	0 Scheduled	Mean	70.7	65.1	5.6	3,658
			Std. Dev.	13.1	12.1	4.2	
		1 Non-scheduled	Mean	69.8	66.0	3.9	855
			Std. Dev.	14.1	13.4	3.3	
		Total	Mean	70.5	65.3	5.2	4,513
			Std. Dev.	13.3	12.3	4.1	
Winter	Male	0 Scheduled	Mean	93.6	86.2	7.3	6,685
			Std. Dev.	15.4	14.5	4.7	
		1 Non-scheduled	Mean	92.2	86.8	5.4	302
			Std. Dev.	18.4	17.6	3.7	
		Total	Mean	93.5	86.3	7.2	6,987
			Std. Dev.	15.6	14.7	4.7	
	Female	0 Scheduled	Mean	74.8	68.0	6.8	3,820
			Std. Dev.	13.8	12.9	4.7	
		1 Non-scheduled	Mean	71.7	66.9	4.8	262
			Std. Dev.	13.2	12.4	3.4	
		Total	Mean	74.6	67.9	6.7	4,082
			Std. Dev.	13.8	12.9	4.6	
Total	Male	0 Scheduled	Mean	91.6	84.7	6.9	11,722
			Std. Dev.	16.0	14.9	4.7	
		1 Non-scheduled	Mean	87.8	83.6	4.3	1,164
			Std. Dev.	16.3	15.3	3.5	
		Total	Mean	91.3	84.6	6.7	12,886
			Std. Dev.	16.1	15.0	4.7	
	Female	0 Scheduled	Mean	72.8	66.6	6.2	7,478
			Std. Dev.	13.6	12.6	4.5	
		1 Non-scheduled	Mean	70.3	66.2	4.1	1,117
			Std. Dev.	13.9	13.2	3.4	
		Total	Mean	72.5	66.5	5.9	8,595
			Std. Dev.	13.7	12.7	4.4	

Table F-6 Passenger weights by age groups and gender (excl. carry-on luggage and excl. children)

	Male			Female			Total		
Age	Mean	n	Std. Dev.	Mean	n	Std. Dev.	Mean	n	Std. Dev.
13-15 years	60.9	253	12.4	56.9	272	9.6	58.8	525	11.2
16-20 years	75.7	786	13.6	61.1	741	10.1	68.7	1,527	14.1
21-25 years	78.8	1,317	13.2	63.2	1,181	11.0	71.4	2,498	14.5
26-30 Years	82.5	1,734	13.8	64.7	1,258	11.7	75.0	2,992	15.7
31-35 years	85.4	1,674	14.8	66.4	961	12.8	78.5	2,635	16.8
36-40 years	87.2	1,528	14.2	67.5	895	12.9	79.9	2,423	16.7
41-45 years	88.2	1,445	14.6	68.4	747	12.9	81.4	2,192	16.9
46-50 years	88.8	1,197	14.3	69.4	665	13.2	81.9	1,862	16.7
51-55 years	87.9	980	14.2	71.5	592	12.7	81.7	1,572	15.8
56-60 years	88.0	844	13.8	71.4	519	12.8	81.7	1,363	15.7
61-65 years	87.5	594	13.6	71.6	402	13.1	81.1	996	15.5
66 and older	86.3	534	14.1	70.7	362	11.6	80.0	896	15.2
Total	84.6	12,886	15.0	66.5	8,595	12.7	77.4	21,481	16.6

* the average passenger weights is correlated with age. Up to 30 years the weights of passengers are lower than the grand total mean weights. The average weights of persons from 31 years and older are higher than the grand total mean weights. The correlation between age and weight applies as well to female as to male passengers.

Table F-7 T-test for equality of mean weights by gender and season: differences between route types (children excluded)

		t	*df*	Sig (2-tailed)	Mean difference	Std. Error difference	*95% Upper*	*95% Lower*
Male, Summer	Weightin	-1.1	2,620	n.s	-0.9	0.8	-2.5	0.7
	Weightex	-1.8	2,620	n.s	-1.4	0.8	-2.9	0.1
	Handbag	2.1	2,620	0.04	0.5	0.2	0.0	0.9
Male Winter	Weightin	1.3	2,864	n.s	0.8	0.6	-0.4	2.1
	Weightex	0.2	2,864	n.s	0.1	0.6	-1.0	1.3
	Handbag	3.7	2,864	0.00	0.7	0.2	0.3	1.1
Female Summer	Weightin	1.5	2,112	n.s.	1.1	0.8	-0.4	2.7
	Weightex	1.2	2,112	n.s.	0.9	0.7	-0.6	2.3
	Handbag	1.2	2,112	n.s.	0.3	0.2	-0.2	0.8
Female Winter	Weightin	2.5	1,813	0.01	1.9	0.7	0.4	3.3
	Weightex	2.1	1,813	0.04	1.4	0.7	0.1	2.8
	Handbag	1.7	1,813	n.s.	0.4	0.3	-0.1	0.9

Note: 95% = 95% Confidence Interval of Difference

Table F-8 Mean weights by gender, season and route type (children excluded)

Season	*Gender*	*Routetype*		*Weightin*	*Weightex*	*Handbag*	*n*
0 Summer	Male	Non-European	Mean	87.9	81.7	6.1	2,128
			Std. Dev	16.4	15.2	4.7	
		European	Mean	89.1	83.1	6.0	3,277
			Std. Dev	16.2	14.9	4.5	
		Domestic	Mean	88.8	83.1	5.7	494
			Std. Dev	15.9	15.1	4.5	
		Total	Mean	88.7	82.6	6.0	5,899
			Std. Dev	16.3	15.0	4.6	
	Female	Non-European	Mean	70.6	65.1	5.4	1,762
			Std. Dev	13.6	12.6	4.3	
		European	Mean	70.7	65.5	5.1	2,399
			Std. Dev	13.3	12.3	4.0	
		Domestic	Mean	69.4	64.3	5.2	352
			Std. Dev	11.6	11.1	3.9	
		Total	Mean	70.5	65.3	5.2	4,513
			Std. Dev	13.3	12.3	4.1	
1 Winter	Male	Non-European	Mean	93.3	85.9	7.3	2,039
			Std. Dev	15.6	14.8	4.8	
		European	Mean	93.9	86.5	7.3	4,121
			Std. Dev	15.8	14.9	4.6	
		Domestic	Mean	92.4	85.8	6.6	827
			Std. Dev	14.0	13.1	4.4	
		Total	Mean	93.5	86.3	7.2	6,987
			Std. Dev	15.6	14.7	4.7	
	Female	Non-European	Mean	75.9	69.1	6.8	1,301
			Std. Dev	14.5	13.5	5.0	
		European	Mean	74.0	67.3	6.7	2,267
			Std. Dev	13.5	12.6	4.5	
		Domestic	Mean	74.1	67.7	6.4	514
			Std. Dev	13.0	12.3	4.5	
		Total	Mean	74.6	67.9	6.7	4,082
			Std. Dev	13.8	12.9	4.6	

Table F-9 Mean weights by gender, season and route type (children excluded) (Part II)

Season	*Gender*	*Routetype*		*Weightin*	*Weightex*	*Handbag*	*n*
Total	Male	Non-European	Mean	90.5	83.8	6.7	4,167
			Std. Dev	16.3	15.2	4.7	
		European	Mean	91.8	85.0	6.8	7,398
			Std. Dev	16.2	15.0	4.6	
		Domestic	Mean	91.1	84.8	6.3	1,321
			Std. Dev	14.8	13.9	4.5	
		Total	Mean	91.3	84.6	6.7	12,886
			Std. Dev	16.1	15.0	4.7	
	Female	Non-European	Mean	72.8	66.8	6.0	3,063
			Std. Dev	14.2	13.1	4.7	
		European	Mean	72.3	66.4	5.9	4,666
			Std. Dev	13.5	12.5	4.3	
		Domestic	Mean	72.2	66.3	5.9	866
			Std. Dev	12.7	11.9	4.3	
		Total	Mean	72.5	66.5	5.9	8,595
			Std. Dev	13.7	12.7	4.4	

Table F-10 T-test for equality of mean weights by gender and season: differences between haul labels (children excluded)

		t	*df*	*Sig (2-tailed)*	*Mean difference*	*Std. Error difference*	*95% Upper*	*95% Lower*
Male Summer	Weightin	2.2	2,043	0.03	1.7	0.8	0.2	3.1
	Weightex	2.8	2,043	0.01	2.0	0.7	0.6	3.4
	Handbag	-1.5	2,043	n.s	-0.3	0.2	-0.8	0.1
Male Winter	Weightin	0.9	2,327	n.s	0.6	0.6	-0.7	1.8
	Weightex	1.3	2,327	n.s	0.8	0.6	-0.4	1.9
	Handbag	-1.2	2,327	n.s	-0.2	0.2	-0.6	0.1
Female Summer	Weightin	-1.15	1,534	n.s	-0.8	0.7	-2.3	0.6
	Weightex	-0.47	1,534	n.s	-0.3	0.7	-1.6	1.0
	Handbag	-2.06	1,534	0.04	-0.5	0.3	-1.0	0.0
Female Winter	Weightin	-2.22	1,456	0.03	-1.6	0.7	-3.1	-0.2
	Weightex	-1.42	1,456	n.s	-1.0	0.7	-2.3	0.4
	Handbag	-2.60	1,456	0.01	-0.7	0.3	-1.1	-0.2

Note: 95% = 95% Confidence Interval of Difference; n.s. = difference is not significant at 95% level of confidence x

Table F-11 Percentage female passengers by region in which flight started or ended

	Summer		*Winter*		*Total*	
Region	*Start*	*End*	*Start*	*End*	*Start*	*End*
1 UK and Ireland	45%	42%	44%	39%	44%	40%
2 Benelux and France	38%	42%	38%	33%	38%	38%
3 Spain, Portugal and Italy	46%	47%	38%	40%	43%	43%
4 Scandinavia and Iceland	44%	42%	41%	35%	43%	38%
5 Germany, Switzerland and Austria	37%	42%	31%	32%	33%	37%
6 Northeast Europe	51%	37%	37%	34%	43%	36%
7 Greece, Cyprus, Malta and Turkey	47%	47%	40%	37%	44%	43%
8 Romania and Bulgaria	34%	34%	30%	30%	32%	32%
9 Other European countries (incl. Russia)	48%	39%	32%	30%	41%	34%
11 Africa and the Middle East	34%	50%	32%	39%	34%	44%
12 Asia	48%	39%	35%	37%	44%	38%
13 North America	45%	44%	33%	41%	40%	43%
14 South America	56%	44%	49%	46%	53%	45%

Region=region in which flight started or ended

Table F-12 Analysis of variances in differences in weights between regions of start and finish flight by region and gender

Gender	*Region departure / arrival*	*SS*	*df*	*MS*	*F*	*Sig.*
Male	1 UK and Ireland	210	1	210	0.8	n.s.
	2 Benelux and France	475	1	475	1.7	n.s.
	3 Spain, Portugal and Italy	8,396	1	8,396	36.9	0.00
	4 Scandinavia and Iceland	1,050	1	1,050	4.1	0.04
	5 Germany, Switzerland and Austria	2,618	1	2,618	10.1	0.00
	6 Northeast Europe	0	1	0	0.0	n.s.
	7 Greece, Cyprus, Malta and Turkey	3,382	1	3,382	13.3	0.00
	8 Romania and Bulgaria	52	1	52	0.2	n.s.
	9 Other European countries (incl. Russia)	2,420	1	2,420	7.8	0.01
	11 Africa and the Middle East	602	1	602	2.1	n.s.
	12 Asia	25	1	25	0.1	n.s.
	13 North America	289	1	289	1.1	n.s.
	14 South America	124	1	124	0.6	n.s.
Female	1 UK and Ireland	58	1	58	0.3	n.s.
	2 Benelux and France	2,500	1	2,500	12.9	0.00
	3 Spain, Portugal and Italy	420	1	420	2.6	n.s.
	4 Scandinavia and Iceland	800	1	800	4.7	0.03
	5 Germany, Switzerland and Austria	785	1	785	4.2	0.04
	6 Northeast Europe	395	1	395	2.1	n.s.
	7 Greece, Cyprus, Malta and Turkey	2,008	1	2,008	10.9	0.00
	8 Romania and Bulgaria	371	1	371	2.1	n.s.
	9 Other European countries (incl. Russia)	0	1	0	0.0	n.s.
	11 Africa and the Middle East	13	1	13	0.1	n.s.
	12 Asia	99	1	99	0.6	n.s.
	13 North America	934	1	934	4.8	0.03
	14 South America	2,649	1	2,649	13.5	0.00

Table F-13 Linear regression analysis with dependent variable passenger weights incl. carry-on luggage (best fit model); all passengers >12 years

Predictors	*Non-standardized coeff. B*	*Std. error*	*Standardized coeff. Beta*	*T*	*sig. std error*
(Constant)	71.7	0.32		221.38	0.00
Gender	-17.1	0.19	-0.47	-89.19	0.00
Handbag	1.2	0.02	0.30	56.43	0.00
Age	0.2	0.01	0.20	37.58	0.00
Season	2.6	0.19	0.07	13.69	0.00
Purpose	2.1	0.20	0.06	10.30	0.00
Charter	1.7	0.49	0.02	3.45	0.00
flight type	1.0	0.37	0.02	2.77	0.01

Adj. R Square	0.42
Std. Error of the Estimate	13.48

The column ‘Std error’ gives the standard error of the estimated coefficient. This is a measure of the variation that exists around the coefficients. The larger it is, the less sure we are about the coefficient. A more convenient way to look at this is the t-ratio, which is given in the column ’T’. This is the coefficient divided by its standard error (e.g. 71.7/0.32=221). If for a positive coefficient the t-ratio will exceed 1.96, we call the estimated coefficient ‘statistically significant’. This means that it is statistically different from zero: there is an impact of this variable on the mass (at the 5% significance level). For negative coefficients, we have significance if the t-ratio will be below -1.96. All coefficients in this table therefore are significant at the 5% significance level. They are even significant at a more demanding significance level (often below 1%), as indicated in the final column ’sig. std error’, which means that the probability of incorrectly ascribing a real effect to an explanatory variable is below 1%.

The numbers in the column ‘Standardized coeff. Beta’ give a transformation of the original estimated coefficients in the first column; they give the relative importance of the coefficients (excluding the constant) in explaining the mass. This shows that the presence of the handbag is the most important variable for explaining the mass, followed by the age, etc..

The t-ratio measures the level of precision of an individual coefficient (one variable at a time). The quality of the model as a whole can be seen from a measure of the ‘fit’, such as the R-square. This measures how well the model explains the dependent variable, the mass. The R-square gives the share of the variation in the mass that is explained by the equation that was estimated (so by the variation in the explanatory variables). Here the model explains 42% of the

variation in the mass, which is a common outcome for a model on a large cross section data set (models on small time series often get larger R-squares). The R-square is the table was adjusted, that means that we have taken into account the number of coefficients in the model. Finally the 'Std. Error of the estimate' gives the variation that we have in the predicted mass. The mass that our model equation predicts has a standard error of 13.5 kg. That means that there is a 95% probability that the predicted mass will be between the average mass minus 26 kg (lower bound) and the average mass plus 26 kg (upper bound).

Table F-14 Linear regression analysis with dependent variable passenger weights incl. carry-on luggage (best fit model); male passengers

	Non-stand. Coeff.		Standardized Coeff.	t	Sig.
Predictors	B	Std. Error	Beta	B	Std. Error
(Constant)	72.1	0.48		150.9	0.00
handbag	1.2	0.03	0.34	42.0	0.00
age	0.2	0.01	0.22	27.7	0.00
purpose	2.8	0.27	0.08	10.3	0.00
season	2.8	0.26	0.09	11.0	0.00
flight type	1.9	0.55	0.03	3.5	0.00
long haul	3.4	0.88	0.09	3.9	0.00
domestic	-1.1	0.44	-0.02	-2.5	0.01
charter	1.8	0.74	0.02	2.4	0.02
Adj. R Square	0.21				
Std. Error of Estimate	14.30				

Table F-15 Linear regression analysis with dependent variable passenger weights excl. carry-on luggage (best fit model); male passengers

	Non-stand. Coeff.		Standardized Coeff.	t	Sig.
Predictors	B	Std. Error	Beta	B	Std. Error
(Constant)	73.3	0.47		156.4	0.00
age	0.2	0.01	0.24	28.0	0.00
purpose	2.9	0.27	0.10	10.9	0.00
season	3.0	0.26	0.10	11.4	0.00
flight type	2.3	0.46	0.04	4.9	0.00
long haul	3.3	0.89	0.09	3.8	0.00
domestic	-1.3	0.44	-0.03	-2.9	0.00
low-cost	-0.8	0.35	-0.02	-2.4	0.02
Adj. R Square	0.09				
Std. Error of Estimate	14.31				

Table F-16 Linear regression analysis with dependent variable carry-on luggage weights (best fit model); male passengers

	Non-stand. Coeff.		Standardized Coeff.	t	Sig.
Predictors	B	Std. Error	Beta	B	Std. Error
(Constant)	5.0	0.21		23.9	0.00
purpose	1.4	0.09	0.14	14.5	0.00
flight type	-1.8	0.21	-0.09	-8.7	0.00
season	1.0	0.10	0.10	10.0	0.00
max_kg	0.1	0.01	0.07	6.9	0.00
eu	-0.6	0.11	-0.05	-5.2	0.00
age	0.0	0.00	0.05	5.1	0.00
domestic	-0.7	0.14	-0.05	-4.6	0.00
low cost	-0.6	0.15	-0.04	-4.2	0.00
Adj. R Square	0.07				
Std. Error of the Estimate	4.56				

Table F -17 Linear regression analysis with dependent variable passenger weights incl. carry-on luggage (best fit model); female passengers

	Non-stand. Coeff.		Standardized Coeff.	t	Sig.
Predictors	B	Std. Error	Beta	B	Std. Error
(Constant)	56.1	0.41		138.7	0.00
handbag	1.1	0.03	0.37	38.2	0.00
age	0.2	0.01	0.25	25.8	0.00
season	2.0	0.27	0.07	7.3	0.00
charter	2.2	0.51	0.04	4.4	0.00
Adj. R Square	0.21				
Std. Error of the Estimate	12.12				

Table F -18 Linear regression analysis with dependent variable passenger weights excl. carry-on luggage (best fit model); female passengers

	Non-stand. Coeff.		Standardized Coeff.	t	Sig.
Predictors	B	Std. Error	Beta	B	Std. Error
(Constant)	56.9	0.37		154.0	0.00
age	0.2	0.01	0.27	25.7	0.00
season	2.2	0.27	0.09	8.2	0.00
charter	2.0	0.51	0.04	4.0	0.00
Adj. R Square	0.08				
Std. Error of the Estimate	12.13				

Table F-19 Linear regression analysis with dependent variable carry-on luggage weights (best fit model); female passengers

	Non-stand. Coeff.		Standardized Coeff.	t	Sig.
Predictors	B	Std. Error	Beta	B	Std. Error
(Constant)	5.7	0.24		23.5	0.00
season	1.4	0.11	0.16	12.4	0.00
flighttype	-1.7	0.21	-0.11	-8.2	0.00
eu	-0.7	0.13	-0.07	-5.8	0.00
purpose	0.6	0.13	0.06	4.9	0.00
max_kg	0.0	0.01	0.04	2.9	0.00
age	0.0	0.00	-0.03	-2.1	0.03
direction	0.3	0.14	0.03	2.1	0.04
Adj. R Square	0.05				
Std. Error of the Estimate	4.30				

Table F-20 Linear regression analysis with dependant variable checked baggage masses (best fit model)

	Non-standardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta	B	Std. Error
(Constant)	11.1	0.7		16.1	0.00
Intercontinental flight	1.2	0.2	0.08	5.2	0.00
Purpose: business	-1.1	0.1	-0.08	-10.3	0.00
Baggage for 2 or more	1.4	0.1	0.08	11.3	0.00
Domestic flight	-0.8	0.1	-0.05	-5.6	0.00
Maximum kg	0.2	0.0	0.09	7.4	0.00
Class: business	-2.3	0.4	-0.07	-6.2	0.00
Short haul	-0.5	0.2	-0.03	-2.9	0.00
Long haul	0.7	0.2	0.05	2.8	0.00
Charter	0.9	0.4	0.02	2.4	0.02
Low cost	0.2	0.1	0.02	2.3	0.02
adj r2	0.06				
std error of estimate	5.56				

Source: NEA

ANNEX G IATA airport code (3-letter)

Airport code	*name*
AAL	Aalborg
AAR	Aarhus Tirstrup
ABV	Abuja
ABZ	Aberdeen Dyce
ACC	Accra Kotoka
ACE	Arrecife Lanzarote
ADA	Adana
ADB	Izmir Adnan Menderes
AES	Alesund Vigra
AGA	Agadir Al Massira
AGP	Malaga Pablo Ruiz Picasso
AHO	Alghero Fertilia
AHU	Al Hoceima Cote Du Rif
ALA	Almaty Alma Ata
ALC	Alicante
ALG	Alger Houari Boumediene
AMM	Amman Queen Alia International
AMS	Amsterdam Schiphol
ANC	Anchorage International Airport
ANU	Antigua Saint Johns Vc Bird International/Coolidge Airport
AOK	Karpathos
AQJ	Aqaba
ARN	Stockholm Arlanda
ASW	Aswan
ATH	Athinai Eleftherios Venizelos
ATL	Atlanta The William B Hartsfield Atlanta International Airport
AUA	Aruba Oranjestad Queen Beatrix International Airport
AUH	Abu Dhabi Nadia International Airport
AXD	Alexandroupolis
AYT	Antalya
AZS	Samana El Catay
BAH	Bahrain Muharraq International
BBU	Bucharest Baneasa
BCN	Aeropuerto Transoceanico De Barcelona
BEG	Beograd Aerodrom
BEY	Beirut Rafic Hariri International
BFS	Belfast International
BGI	Bridgetown Grantley Adams International Airport
BGO	Bergen Flesland
BGY	Milano Bergamo Orio Al Serio
BHD	Belfast City
BHX	Birmingham
BIO	Bilbao Sondica
BIQ	Biarritz Bayonne Anglet Parme
BJL	Banjul Yundum
BJV	Milas-Bodrum Airport
BJZ	Badajoz Talavera La Real
BKK	Bangkok Don Muang International
BLL	Billund

Airport code	*name*
BLQ	Bologna Giuseppe Marconi Borgo Panigale
BLR	Bangalore International Airport
BOD	Bordeaux Merignac
BOG	Bogota Eldorado
BOJ	Burgas
BOM	Mumbai Chhatrapati Shivaji International Airport
BON	Bonaire Kralendijk Flamingo Airport
BOS	Boston General Edward Lawrence Logan International Airport
BRE	Bremen Neuenland
BRI	Bari Palese Macchie
BRS	Bristol Lulsgate
BRU	Brussels Bruxelles National/Zaventem
BSL	Basel/Mulhouse Euroairport
BUD	Budapest Ferihegyi
BVA	Beauvais Tille
BZG	Bydgoszcz
CAG	Cagliari Elmas
CAI	Cairo International Airport
CAN	Guangzhou Baiyun
CCC	Caya Coco
CCS	Caracas Aeropuerto Internacional De Maiquetia Simon Bolivar
CCU	Kolkatta Dum Dum International Airport
CDG	Paris Charles De Gaulle
CFE	Clermont Ferrand Aulnat
CFU	Kerkyra/Corfu
CGN	Koln Konrad Adenauer
CHQ	Chania
CIA	Roma Ciampino
CLJ	Cluj Napoca
CLT	Charlotte/Douglas International Airport
CMB	Colombo Katunayake
CMN	Casablanca Mohamed V
CPH	Kobenhavn Kastrup
CPT	Cape Town Df Malan
CRL	Charleroi Gosselies
CTA	Catania Fontanarossa
CTU	Chengdu
CUN	Cancun International
CUR	Curacao Willemstad Aeropuerto Hato
CVG	Cincinnati/Covington Cincinatti/Northern Kentucky International Airport
CWL	Cardiff Rhoose
DAM	Damascus
DAR	Dar Es Salaam
DBV	Dubrovnik
DEL	Delhi Indira Gandhi International Airport
DEN	Denver International Airport
DFW	Dallas/Fort Worth International Airport

Airport code	*name*
DJE	Djerba Djerba/Zarzis
DKR	Dakar Yoff
DLM	Dalaman
DME	Moskva Moscow Domodemovo
DMM	Dammam
DOH	Doha
DOK	Donetsk
DRS	Dresden
DSA	Robin Hood Airport Doncaster Sheffield
DTM	Dortmund Wickede
DTW	Detroit Metropolitan Wayne County Airport
DUB	Dublin
DUS	Düsseldorf Rhein Ruhr
DXB	Dubai International Airport
EAS	San Sebastian
EBB	Kampala Entebbe
EDI	Edinburgh
EFL	Kefalonia
EIN	Eindhoven
EMA	East Midlands Derby Leicester Nottingham
ESB	Ankara Esenboga
EVN	Erevan Yerevan Zapadny
EWR	Newark/New York Newark Liberty Airport
EXT	Exeter
EZE	Buenos Aires Aeropuerto Internacional Ezeiza/Ministro Pistarini
FAE	Sorvag Faroe Islands Vagar
FAO	Faro
FCO	Roma Leonardo Da Vinci/Fiumicino
FLR	Firenze Peretola
FMO	Munster/Osnabruck Greven
FNC	Funchal
FRA	Frankfurt Rhein Main
FUE	Fuerteventura/Puerto Del Rosario
GCI	Guernsey
GDN	Gdansk Lech Walesa
GIB	Gibraltar North Front
GIG	Rio De Janeiro Galeao Antonio Carlos Jobim International Airport
GLA	Glasgow Abbotsichn
GND	Grenada Pearls
GOA	Genoa Cristoforo Colombo Seatri
GOI	Goa Dabolim
GOJ	Nizhniy Novgorod Strigino
GOT	Goteborg Landvetter
GPA	Araxos/Patras
GRO	Girona Girona Costa Brava
GRU	Sao Paulo Aeroporto Internacional Guarulhos
GRX	Granada
GRZ	Graz Thalerhof

Airport code	*name*
GSE	Goteborg Save
GUA	Guatemala City La Aurora
GUW	Atyrau Guryev International
GVA	Geneve Cointrin
GYD	Baku Heydar Aliyev International
GYE	Guayaquil Simon Bolivar
HAJ	Hannover Langenhagen
HAM	Hamburg Fuhlsbuttel
HAN	Hanoi Noi Bai
HAU	Haugesund Karmoy
HAV	La Habana Aeropuerto Internacional Jose Marti
HBE	Alexandria Borg El Arab
HEL	Helsinki Vantaa
HER	Heraklion
HHN	Hahn
HKG	Hong Kong International Airport
HKT	Phuket
HME	Hassi Messaoud Oued Irara
HOG	Holguin
HOQ	Hof/Plauen
HRE	Harare
HRG	Hurghada
HUY	Humberside
HYD	Hyderabad Begumpet/Rajiv Gandhi International
IAD	Washington Dulles International Airport
IAH	Houston Intercontinental Airport
IBZ	Ibiza
ICN	Seoul Incheon
IEG	Zielona Gora Babimost
IKA	Imam Khomeini International Airport
INN	Innsbruck Kranebitten
INV	Inverness
IOA	Ioannina
IOM	Isle Of Man Ronaldsway Airport
IST	Istanbul Ataturk International Airport
JED	Jeddah King Abdul Aziz Airport
JER	Jersey
JFK	New York John F Kennedy International Airport
JIK	Ikaria
JKH	Chios
JKL	Kalymnos Island National Airport
JMK	Mykonos
JNB	Johannesburg Or Tambo International Airport
JNX	Naxos
JSI	Skiathos
JTR	Santorini
JTY	Astypalea Island
KBP	Kiev Borispol
KEF	Reykjavik Keflavik

Airport code	*name*
KGD	Kaliningrad
KGS	Kos
KIN	Kingston Norman Manley
KIV	Chisinau
KIX	Osaka Kansai Airport
KRK	Krakow John Paul Ii
KRP	Karup
KRS	Kristiansand Kjevik
KRT	Khartoum
KSD	Karlstad
KTW	Katowice
KUF	Samara Kurumoch
KUL	Kuala Lumpur International Airport
KVA	Kavalla
KWI	Kuwait
LAD	Luanda Aeroporto 4 De Fevereiro Belas
LAS	Las Vegas Mccarran International Airport
LAX	Los Angeles International Airport
LBA	Leeds/Bradford
LCA	Larnaca
LCG	La Coruna
LCY	London City Airport
LED	St Petersburg Leningrad Pulkovo
LEI	Almeria
LEJ	Leipzig/Halle Schkeuditz
LEN	Leon Aeropuero De Bajio
LGW	London Gatwick Airport
LHE	Lahore Allama Iqbal International
LHR	London Heathrow Airport
LIM	Lima Aeropuerto Internacional Jorge Chavez
LIN	Milano Linate
LIS	Lisboa Aeroporto Da Portela De Sacavem
LJU	Ljubljana Brnik
LNZ	Linz Horsching
LOS	Lagos Murtala Muhammed
LPA	Las Palmas/Gran Canaria
LPI	Linkoping
LPL	Liverpool John Lennon
LRH	La Rochelle Laieu
LRS	Leros
LTN	London Luton Airport
LUX	Luxembourg Findel
LWO	Lviv
LXR	Luxor
LXS	Lemnos
LYS	Lyon Antoine De Saint Exupery
MAA	Chennai Madras Meenambakkam
MAD	Madrid Barajas
MAH	Mahon Menorca

Airport code	*name*
MAN	Manchester Ringway International Airport
MBA	Mombasa Moi International
MBJ	Montego Bay Sangster
MCO	Orlando International Airport
MEM	Memphis International Airport
MEX	Ciudad De Mexico Aeropuerto Internacional Benito Juarez
MIA	Miami International Airport
MIR	Monastir Skanes
MJT	Mytilene
MJV	Murcia San Javier
MLA	Malta Luqa
MLE	Male
MLN	Melilla
MLO	Milos
MME	Tees Side
MMX	Malmo Sturup
MNL	Manila Ninoy Aquino International Airport
MPL	Montpellier Mediteranee/Frejorgues
MPW	Mariupol Zhdanov
MRS	Marseille Marignane Provence
MRU	Mauritius Sir Seewoosagur Ramgoolam
MSP	Minneapolis/St Paul Minneapolis St Paul International Wold Chamberlain Airport
MSQ	Minsk Minsk 2
MUC	Munchen Franz Josef Strauss
MXP	Milano Malpensa
NAP	Napoli Capodichino
NBO	Nairobi Jomo Kenyatta
NCE	Nice Cote D Azur
NCL	Newcastle
NDR	Nador
NGO	Nagoya Centrair
NKG	Nanjing
NOC	Knock/Connaught
NRK	Norrkoping Kungsangen
NRN	Weeze Niederrhein
NRT	Tokyo Narita
NTE	Nantes Chateau Bougon
NUE	Nurnberg
NWI	Norwich
ODS	Odessa Tsentrainy
OLB	Olbia Costa Smeralda
OPO	Porto Francisco Sa Carneiro Pedras Rubras
ORD	Chicago O Hare International Airport
ORK	Cork
ORY	Paris Orly
OSL	Oslo Metropolitan Area
OTP	Bucharest Henri Coanda International Otopeni
OVD	Oviedo/Aviles Asturias

Airport code	*name*
PAS	Paros
PBM	Zandery Paramaribo Johan Adolf Pengel
PDL	Ponta Delgada Sao Miguel Island
PDX	Portland International Airport
PEK	Beijing Capital
PFO	Paphos International
PHL	Philadelphia International Airport
PIK	Prestwick
PLQ	Palanga
PMI	La Palma Palma De Mallorca
PMO	Palermo Punta Raisi
PMV	Margerita Porlamarar Aeropuerto Internacional Del Caribe General S Marino
PNA	Pamplona
PNQ	Poona
POP	Puerto Plata
POZ	Poznan Lawica
PRG	Praha Ruzyne
PSA	Pisa Galilei San Giusto
PTY	Panama City General Omar Torrijos Herrara
PUJ	Punta Cana
PUY	Pula
PVG	Shanghai Pu Dong
RAI	Praia
RAK	Marrakech Menara
REC	Recife Guararapes Gilberto Freyre International
REU	Reus
RHO	Rhodos Diagoras/Maritsa
RIX	Riga Spilve
RNN	Ronne Bornholm
RNS	Rennes Saint Jacques
ROV	Rostov On Don
RTM	Rotterdam
RUH	Riyadh King Khalid Airport
RZE	Rzeszow Jasionka
SAH	Sanaa El Rahaba
SAN	San Diego International Airport Lindbergh Field
SAW	Istanbul Sabiha Gokcen
SBZ	Sibiu
SCL	Santiago De Chile Aeropuerto Comodoro Arturo Merino Benitez
SCQ	Santiago De Compostela Santiago
SDQ	Santo Domingo Aeropuerto De Las Americas
SDR	Santander
SEA	Seattle Tacoma International Airport
SFB	Sanford Central Florida Regional Airport
SFJ	Sondre Stromfjord Kangerlussuaq Stromfjord Air Base
SFO	San Francisco San Francisco International Airport
SGD	Sonderborg

Airport code	*name*
SGN	Ho Chi Minh City Tan Son Nhut International Airport
SIN	Singapore Changi International Airport
SJO	San Jose Juan Santamaria International
SKG	Thessaloniki Mikra
SKP	Skopje
SMI	Samos
SNN	Shannon Limerick
SOF	Sofia Vrajdebna
SOU	Southampton Eastleigh
SPC	Santa Cruz De La Palma
SPU	Split Kastela
SSA	Salvador Deputado Luis Eduardo Magalhaes International
SSG	Malabo
SSH	Sharm El Sheikh Ras Nasrani
STN	London Stansted
STR	Stuttgart Echterdingen
SVG	Stavanger Sola
SVO	Moskva Moscow Sheremetyevo
SVQ	Sevilla San Pablo
SVX	Yekaterinburg Ekaterinburg Koltsovo
SXB	Strasbourg Entzheim
SXF	Berlin Schonefeld
SXM	St Maarten Philipsburg Princes Juliana
SZG	Salzburg
SZZ	Szczecin Goleniow
TAB	Tobago Scarborough Crown
TAS	Tashkent Toshkent Yuzny
TBS	Tbilisi Novoalexeyevka
TCP	Taba International
TFN	Tenerife Los Rodeos
TFS	Santa Cruz De Tenerife Reina Sofia Tenerife Sur
TGD	Pogdorica
TIA	Tirana International Airport Nene Tereza
TIP	Tripoli Idris
TIV	Tivat
TKU	Turku
TLL	Tallinn Yulemiste
TLS	Toulouse Blagnac
TLV	Tel Aviv Ben Gurion
TMP	Tampere Pirkkala
TNG	Tanger Boukhalef
TPE	Taipei Taiwan Taoyuan International
TRD	Trondheim Vaernes
TRF	Oslo/Sandefjord Torp
TRN	Torino Caselle
TRV	Thiruvananathapuram Trivandrum International Airport
TSE	Astana International
TSF	Treviso S Angelo

Airport code	*name*
TSR	Timisoara Giarmata
TUN	Tunis Carthage Airport
TXL	Berlin Tegel
UAK	Narssarssuaq
UIO	Quito Mariscal Sucre
UVF	St Lucia Vieux Fort Hewanorra
VAR	Varna
VCE	Venezia Marco Polo Tessera
VGO	Vigo
VIE	Wien Schwechat
VIT	Vitoria
VLC	Valencia
VNO	Vilnius
VRA	Varadero
VRN	Verona Villafranca
VVI	Santa Cruz Viru Viru International
WAT	Waterford
WAW	Warszawa Frederic Chopin
WDH	Windhoek Hosea Kutako International Airport
WRO	Wroclaw
XRY	Jerez De La Frontera
YEG	Edmonton International Airport
YHZ	Halifax International Airport
YOW	Ottawa Macdonald Cartier International Airport
YUL	Montreal Trudeau
YVR	Vancouver International Airport
YXY	Whitehorse Whitehorse Airport
YYC	Calgary International Airport
YYZ	Toronto Lester B Pearson International Airport
ZAG	Zagreb Pleso
ZAZ	Zaragoza
ZRH	Zurich Kloten
ZTH	Zakynthos

ANNEX H IATA airline code (2-letter)

airline	airline name		airline	airline name		airline	airline name		airline	airline name
0B	Blue Air		CU	Cubana de Aviación		KF	Blue1		S3	Santa Barbara Airlines
1Y	Ilyich-Avia		CX	Cathay Pacific		KL	KLM Royal Dutch Airlines		S4	SATA International
2N	Nextjet		CY	Cyprus Airways		KM	Air Malta		SA	South African Airways
2U	Sun d'Or International Airlines		CZ	China Southern Airlines		KQ	Kenya Airways		SE	XL Airways France
4P	Viking Airlines		D1	Dubrovnik Airline		KU	Kuwait Airways		SK	Scandinavian Airlines System
4Q	Air Italy Polska		DB	Brit Air		LA	LAN Airlines		SN	Brussels Airlines
4U	Germanwings		DE	Condor Flugdienst		LE	Lotus Air		SQ	Singapore Airlines
5L	Aerosur		DK	Thomas Cook Airlines Scandinavia		LG	Luxair		SS	Corsairfly
5W	Astraeus		DL	Delta Air Lines		LH	Lufthansa		SU	Aeroflot Russian Airlines
6B	TUIfly Nordic		DS	EasyJet Swizerland		LO	LOT Polish Airlines		SV	Saudi Arabian Airlines
6H	Israir		DY	Norwegian Air Shuttle		LS	Jet2.com		SW	Air Namibia
7B	Krasnojarsky Airlines		EB	Air Pullmantur		LX	Swiss International Air Lines		T1	Inter Airlines
7D	Donbassaero		EC	Avialeasing Aviation Company		LY	El Al Israel Airlines		T4	Hellas Jet
7H	Corendon Airlines		EI	Aer Lingus		M1	AMC Airlines		TE	FlyLal
8A	Atlas Blue		EK	Emirates Airline		M8	Air Cairo		TF	Malmo Aviation
8I	Myway Airlines		EY	Etihad Airways		MA	Malév Hungarian Airlines		TG	Thai Airways International
8Q	Onur Air		F7	Flybaboo		ME	Middle East Airlines		TK	Turkish Airlines
8U	Afriqiyah Airways		FB	Bulgaria Air		MH	Malaysia Airlines		TP	TAP Portugal
9U	Air Moldova		FH	Futura International Airways		MK	Air Mauritius		TS	Air Transat
A3	Aegean Airlines		FI	Icelandair		MP	Martinair		TU	Tunisair
A7	Air Plus Comet		FR	Ryanair		MS	Egyptair		TY	Iberworld
A9	Georgian Airways		FV	Pulkovo Aviation Enterprise		MT	Thomas Cook Airlines		U2	easyJet
AA	American Airlines		G0	Ghana International Airlines		MU	China Eastern Airlines		U8	Armavia
AB	Air Berlin		GF	Gulf Air Bahrain		MX	Mexicana de Aviación		UA	United Airlines
AC	Air Canada		GL	Air Greenland		NB	Sterling Airlines		UI	Eurocypria Airlines
AF	Air France		GR	Aurigny Air Services		NE	SkyEurope		UL	SriLankan Airlines
AH	Air Algérie		H5	Hola Airlines		NH	All Nippon Airways		UM	Air Zimbabwe
AI	Air India Limited		H9	Pegasus Airlines		NW	Northwest Airlines		UN	Transaero Airlines
AM	Aeroméxico		HG	Niki		O2	Oceanic Airlines		US	US Airways
AP	Air One		HP	Phoenix Airways		OA	Olympic Airlines		UX	Air Europa
AR	Aerolineas Argentinas		HV	Transavia Holland		OK	Czech Airlines		V3	Carpatair
AT	Royal Air Maroc		HY	Uzbekistan Airways		OR	Arkefly		V7	Air Senegal International
AV	Avianca - Aerovias Nacionales de Colombia, S.A.		IB	Iberia Airlines		OS	Austrian Airlines		VE	Volare Airlines
AY	Finnair		IG	Meridiana		OU	Croatia Airlines		VG	VLM Airlines
AZ	Alitalia		IR	Iran Air		OV	Estonian Air		VN	Vietnam Airlines
B1	BH Air		IY	Yemenia		OZ	Asiana Airlines		VO	Austrian Arrows
B2	Belavia Belarusian Airlines		IZ	Arkia Israel Airlines		PK	Pakistan International Airlines		VR	TACV
B4	Flyglobespan		J2	Azerbaijan Airlines		PS	Ukraine International Airlines		VS	Virgin Atlantic Airways
BA	British Airways		JG	Jettime		PV	Privilege Style		VV	Aerosvit Airlines
BD	bmi		JJ	TAM Brazilian Airlines		PY	Surinam Airways		VY	Vueling Airlines
BE	Flybe		JK	Spanair		QF	Qantas		W6	Wizz Air
BJ	Nouvel Air Tunisie		JL	Japan Airlines		QI	Cimber Air		WF	Widerøe
BR	EVA Air		JN	Excel Airways		QR	Qatar Airways		WW	bmibaby
BT	Air Baltic		JP	Adria Airways		QS	Travel Service		X3	TUIfly
BU	Bulgarian Air Charter		JU	Jat Airways		RB	Syrian Arab Airlines		XD	Free Bird Airlines
BY	Thomsonfly		JZ	Skyways Express		RC	Atlantic Airways		XG	Clickair
C0	Centralwings		K1	Karthago Airlines		RE	Aer Arann		XO	LTE International Airways
CA	Air China		KC	Air Astana		RJ	Royal Jordanian		XQ	SunExpress
CI	China Airlines		KD	KD Avia		RO	Tarom		YM	Montenegro Airlines
CO	Continental Airlines		KE	Korean Air		S1	Sky Airlines		YW	Air Nostrum
									Z4	Zoom Airlines
									ZB	Monarch Airlines

ANNEX I Overview of variable names

This annex provides an overview of variable names used in the databases Passenger and Carry-on luggage data and Checked baggage data. The databases are described separately. On CD_rom the databases are delivered in two different formats: SPSS file (.sav) and Ascii file (.txt).

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Table I-1 Variable names of Passenger and Carry-on luggage data

List of variable names containing collected data

1	airport	Airport of weighing session (AMS, ATH, CPH, FRA, LGW, MAD, SOF, WAW)
2	season	Two seasons are specified: 0 = Summer 1 = Winter
3	age	
4	gender	0 = Male 1 = Female 2 = Child (2-12 years) 3 = Male & Infant (<2 years) 4 = Female & Infant (<2 years) 5 = Child (2-12 years) & Infant (<2 years)
5	infant	Passenger with a baby (younger than 2 years) 0 = Yes 1 = No
6	purpose	0 = Leisure 1 = Business
7	direction	0 = Outbound flight 1 = Inbound flight
8	departure	Airport of departure (3-letter IATA airport code*)
9	arrival	Airport of arrival (3-letter IATA airport code*)
10	airline	Airline code (2-letter IATA airline designators*)
11	flightnr	Flight number
12	class	Three classes are specified: 0 = Economy 1 = Business 2 = First
13	checkbag	Passenger has checked baggage: 0 = Yes 1 = No
14	weightin	Weight of the passenger, including all of his/her carry-on luggage
15	weightex	Weight of the passenger, excluding all of his/her carry-on luggage

* with exceptions.

Table I-2 Variable names of Passenger and Carry-on luggage data (Part II)

List of variables containing additional data

16	airportcode	Airport of departure or airport of arrival (3-letter IATA airport code)
17	airport_name	Name of airport converted from the field 'airportcode'
18	airport_country	Country of airport converted from the field 'airportcode'
19	airline_name	Name of airline converted from the field 'airline'
20	airline_country	Country of airline converted from the field 'airline'
21	ID	Record number
22	routetype	0 = Non-European 1 = European 2 = Domestic
23	flighttype	0 = scheduled (flight found in OAG data) 1 = non-scheduled
24	airlinetype	0 = regular scheduled 1 = charter 2 = low cost 3 = charter & low cost
25	RegionDepart	Region of airport of departure. Categorized as: 1 = UK and Ireland 2 = Benelux and France 3 = Spain, Portugal and Italy 4 = Scandinavia and Iceland 5 = Germany, Switzerland and Austria 6 = Northeast Europe 7 = Greece, Cyprus, Malta and Turkey 8 = Romania and Bulgaria 9 = Other European countries (incl. Russia) 11 = Africa and the Middle East 12 = Asia 13 = North America 14 = South America 15 = Other
26	RegionArr	Region of airport of arrival. Same code used as RegionDepart
27	dkms	Distance in kilometres between departure and arrival airport
28	haullabel	0 = Short Haul: distance shorter than 500 km 1 = Medium haul: distance between 500 and 5000 km 2 = Long haul: distance longer than 5000km
29	handbaggage	Total weight of all carry-on luggage
30	Max_kg	Maximum weight value determined from simplified airline regulations

Table I-3 Variable information: Passenger and carry-on luggage data

Position	*Variable*	*Label*	*Measurement Level*	*Column Width*
1	airport	airport of weighing session	Nominal	3
2	season	<none>	Nominal	8
3	age	<none>	Scale	8
4	gender	<none>	Nominal	8
5	infant	Passenger with a baby (younger than 2 years): yes / no	Nominal	8
6	purpose	<none>	Nominal	8
7	direction	Outbound flight or Inbound flight	Nominal	8
8	departure	Airport of departure (3-letter)	Nominal	3
9	arrival	Airport of arrival (3-letter)	Nominal	3
10	airline	Airline code (2-letter)	Nominal	9
11	flightnr	Flight number	Scale	8
12	class	Class of travel	Nominal	8
13	checkbag	Passenger has check in luggage: yes / no	Nominal	8
14	weightin	Weight of the passenger, including all of his/her carry-on luggage	Scale	8
15	weightex	Weight of the passenger, excluding all of his/her carry-on luggage	Scale	8
16	airportcode	Airport of departure or airport of arrival	Nominal	13
17	airport_name	Name of airport converted from airportcode	Nominal	40
18	airport_country	Country of airport converted from airportcode	Nominal	20
19	airline_name	Name of airline converted from airline code	Nominal	20
20	airline_country	Country of airline converted from airline code	Nominal	20
21	ID	Record number	Scale	10
22	routetype	Non-European, European or Domestic flight	Scale	11
23	flighttype	Scheduled or non-scheduled flight	Nominal	8
24	airlinetype	Type of carrier: Regular scheduled / Charter / Low cost / Charter and Low cost	Scale	13
25	RegionDepart	Region of airport of departure	Nominal	11
26	RegionArr	Region of airport of arrival	Nominal	11
27	dKMs	Distance in kilometres between departure and arrival airport	Scale	10
28	haullabel	Short/medium/long haul flight	Scale	11
29	handbaggage	Total weight of all carry-on luggage	Scale	13
30	max_kg	Maximum weight value determined from simplified airline regulations	Nominal	11

Table I-4 Frequency table: airport of weighing session

Airport	*Frequency*	*Percent*
AMS	3,175	13.9
ATH	3,006	13.1
CPH	2,916	12.7
FRA	2,703	11.8
LGW	2,774	12.1
MAD	2,810	12.3
SOF	1,808	7.9
WAW	3,709	16.2
Total	22,901	100.0

Table I-5 Frequency table: season

Season	*Frequency*	*Percent*
Summer	11,495	50.2
Winter	11,406	49.8
Total	22,901	100.0

Table I-6 Frequency table: gender

Gender	*Frequency*	*Percent*
Male	12,588	55.0
Female	8,351	36.5
Child (2-12 years)	1,420	6.2
Male & Infant (<2 years)	298	1.3
Female & Infant (<2 years)	244	1.1
Total	22,901	100.0

Table I-7 Frequency table: Passenger with a baby (< 2 years): yes / no

Infant	*Frequency*	*Percent*
Yes	542	2.4
No	22,359	97.6
Total	22,901	100.0

Table I -8 Frequency table: purpose

Purpose	*Frequency*	*Percent*
Leisure	15,739	68.7
Business	7,162	31.3
Total	22,901	100.0

Table I -9 Frequency table: Outbound flight or Inbound flight

Direction	*Frequency*	*Percent*
Outbound	18,332	80.0
Inbound	4,569	20.0
Total	22,901	100.0

Table I -10 Frequency table: class of travel

Class	*Frequency*	*Percent*
Economy	20,997	91.7
Business	1,767	7.7
First	137	0.6
Total	22,901	100.0

Table I -11 Frequency table: Passenger has check in luggage: yes / no

Checkbag	*Frequency*	*Percent*
Yes	19,160	83.7
No	3,741	16.3
Total	22,901	100.0

Table I-12 Frequency table: Non-European, European or Domestic flight

Routetype	*Frequency*	*Percent*
Non-European	7,821	34.2
European	12,790	55.8
Domestic	2,290	10.0
Total	22,901	100.0

Table I -13 Frequency table: Scheduled or non-scheduled flight

Checkbag	*Frequency*	*Percent*
Scheduled	20,276	88.5
Non-scheduled	2,625	11.5
Total	22,901	100.0

Table I-14 Frequency table: Type of carrier

Routetype	*Frequency*	*Percent*
Regular scheduled	17,300	75.5
Charter	1,380	6.0
Low-cost	3,666	16.0
Charter & low-cost	555	2.4
Total	22,901	100.0

Table I-15 Frequency table: Region of airport of departure

RegionDepart	*Frequency*	*Percent*
UK and Ireland	2,366	10.3
Benelux and France	3,229	14.1
Spain, Portugal and Italy	3,017	13.2
Scandinavia and Iceland	2,004	8.8
Germany, Switzerland and Austria	2,796	12.2
Northeast Europe	3,592	15.7
Greece, Cyprus, Malta and Turkey	2,895	12.6
Romania and Bulgaria	1,513	6.6
Other European countries (incl. Russia)	144	0.6
Africa and the Middle East	280	1.2
Asia	112	.5
North America	612	2.7
South America	314	1.4
Other	27	0.1
Total	22,901	100.0

Table I-16 Frequency table: Region of airport of arrival

RegionArr	*Frequency*	*Percent*
UK and Ireland	3,169	13.8
Benelux and France	1,656	7.2
Spain, Portugal and Italy	2,947	12.9
Scandinavia and Iceland	2,322	10.1
Germany, Switzerland and Austria	2,635	11.5
Northeast Europe	1,067	4.7
Greece, Cyprus, Malta and Turkey	2,368	10.3
Romania and Bulgaria	706	3.1
Other European countries (incl. Russia)	567	2.5
Africa and the Middle East	1,875	8.2
Asia	792	3.5
North America	1,908	8.3
South America	791	3.5
Other	98	0.4
Total	22,901	100.0

Table I-17 Frequency table: Short / medium / long haul flight

Haullabel	*Frequency*	*Percent*
Short Haul: < 500 km	2,975	13.0
Medium haul: 500 .. 5000 km	15,141	66.1
Long haul: > 5000km	4,785	20.9
Total	22,901	100.0

Table I-18 Frequency table: Maximum weight value determined from simplified airline regulations

Max_kg	*Frequency*	*Percent*	*Valid Percent*	*Cumulative Percent*
5	1,696	7.4	9.7	9.7
6	2,562	11.2	14.7	24.4
7	471	2.1	2.7	27.1
8	5,746	25.1	32.9	60.0
9	269	1.2	1.5	61.5
10	2,768	12.1	15.9	77.4
12	1,981	8.7	11.3	88.7
13	18	0.1	0.1	88.8
14	46	0.2	0.3	89.1
15	9	0.0	0.1	89.1
16	375	1.6	2.1	91.3
18	851	3.7	4.9	96.2
20	151	0.7	0.9	97.0
23	520	2.3	3.0	100.0
Total	17,463	76.3	100.0	
Missing	5,438	23.7		
Total	22,901	100.0		

Table I-19 Variable names of Checked baggage data

List of variable names containing collected data

1	airport	Airport of weighing session (AMS, ATH, CPH, FRA, LGW, MAD, SOF, WAW)
2	season	Two seasons are specified: 0 = Summer 1 = Winter
3	age	
4	gender	0 = Male 1 = Female 2 = Child (2-12 years) 3 = Male & Infant (<2 years) 4 = Female & Infant (<2 years) 5 = Child (2-12 years) & Infant (<2 years)
5	infant	Passenger with a baby (younger than 2 years) 0 = Yes 1 = No
6	purpose	0 = Leisure 1 = Business
7	direction	0 = Outbound flight 1 = Inbound flight
8	departure	Airport of departure (3-letter IATA airport code*)
9	arrival	Airport of arrival (3-letter IATA airport code*)
10	airline	Airline code (2-letter IATA airline designators*)
11	flightnr	Flight number
12	class	Three classes are specified: 0 = Economy 1 = Business 2 = First
13	baggfor	Passenger's checked baggage is mentioned for: 0 = one passenger only 1 = more than one passenger
14	weight	Weight of one piece of checked baggage

* with exceptions.

Table I -20 Variable names of Checked baggage data

List of fields containing additional data

15	airportcode	Airport of departure or airport of arrival (3-letter IATA airport code)
16	airport_name	Name of airport converted from the field 'airportcode'
17	airport_country	Country of airport converted from the field 'airportcode'
18	airline_name	Name of airline converted from the field 'airline'
19	airline_country	Country of airline converted from the field 'airline'
20	ID	Record number
21	routetype	0 = Non-European 1 = European 2 = Domestic
22	flighttype	0 = scheduled (flight found in OAG data) 1 = non-scheduled
23	airlinetype	0 = regular scheduled 1 = charter 2 = low cost 3 = charter & low cost
24	RegionDepart	Region of airport of departure. Categorized as: 1 = UK and Ireland 2 = Benelux and France 3 = Spain, Portugal and Italy 4 = Scandinavia and Iceland 5 = Germany, Switzerland and Austria 6 = Northeast Europe 7 = Greece, Cyprus, Malta and Turkey 8 = Romania and Bulgaria 9 = Other European countries (incl. Russia) 11 = Africa and the Middle East 12 = Asia 13 = North America 14 = South America 15 = Other
25	RegionArr	Region of airport of arrival. Same codes used as RegionDepart
26	dkms	Distance in kilometres between departure and arrival airport
27	haullabel	0 = Short Haul: distance shorter than 500 km 1 = Medium haul: distance between 500 and 5000 km 2 = Long haul: distance longer than 5000km
28	labelUSA	0 = no USA regulation 1 = USA regulation
29	Max_kg	Maximum weight value determined from simplified airline regulations

Table I -21 Variable information: Checked baggage data

Position	*Variable*	*Label*	*Measurement Level*	*Column Width*
1	airport	airport of weighing session	Nominal	3
2	season	<none>	Nominal	8
3	age	<none>	Scale	8
4	gender	<none>	Nominal	8
5	infant	Passenger with a baby (younger than 2 years): yes / no	Nominal	8
6	purpose	<none>	Nominal	8
7	direction	Outbound flight or Inbound flight	Nominal	8
8	departure	Airport of departure (3-letter)	Nominal	3
9	arrival	Airport of arrival (3-letter)	Nominal	3
10	airline	Airline code (2-letter)	Nominal	9
11	flightnr	Flight number	Scale	8
12	class	Class of travel	Nominal	8
13	baggfor	Checked baggage for: one passenger / more than one passenger	Nominal	8
14	weight	Weight of one piece of checked baggage	Scale	8
15	airportcode	Airport of departure or airport of arrival	Nominal	13
16	airport_name	Name of airport converted from airportcode	Nominal	40
17	airport_country	Country of airport converted from airportcode	Nominal	20
18	airline_name	Name of airline converted from airline code	Nominal	20
19	airline_country	Country of airline converted from airline code	Nominal	20
20	ID	Record number	Scale	10
21	routetype	Non-European, European or Domestic flight	Scale	11
22	flighttype	Scheduled or non-scheduled flight	Nominal	8
23	airlinetype	Type of carrier: Regular scheduled / Charter / Low cost / Charter and Low cost	Scale	13
24	RegionDepart	Region of airport of departure	Nominal	11
25	RegionArr	Region of airport of arrival	Nominal	11
26	dKMs	Distance in kilometres between departure and arrival airport	Scale	10
27	haullabel	Short / medium / long haul flight	Scale	11
28	labelUSA	USA related flight	Scale	10
29	max_kg	Maximum weight value determined from simplified airline regulations	Nominal	11

Table I -22 Frequency table: airport of weighing session

Airport	*Frequency*	*Percent*
AMS	2,838	12.7
ATH	3,004	13.4
CPH	2,576	11.5
FRA	3,074	13.8
LGW	3,400	15.2
MAD	2,558	11.4
SOF	1,529	6.8
WAW	3,374	15.1
Total	22,353	100.0

Table I -23 Frequency table: season

Season	*Frequency*	*Percent*
Summer	9,692	43.4
Winter	12,661	56.6
Total	22,353	100.0

Table I-24 Frequency table: gender

Gender	*Frequency*	*Percent*
Male	12,553	56.2
Female	9,252	41.4
Child (2-12 years)	465	2.1
Male & Infant (<2 years)	30	.1
Female & Infant (<2 years)	53	.2
Total	22,353	100.0

Table I-25 Frequency table: Passenger with a baby (< 2 years): yes / no

Infant	*Frequency*	*Percent*
Yes	91	0.4
No	22262	99.6
Total	22,353	100.0

Table I-26 Frequency table: purpose

Purpose	*Frequency*	*Percent*
Leisure	17,679	79.1
Business	4,674	20.9
Total	22,353	100.0

Table I -27 Frequency table: Outbound flight or Inbound flight

Direction	*Frequency*	*Percent*
Outbound	16,432	73.5
Inbound	5,921	26.5
Total	22,353	100.0

Table I-28 Frequency table: class of travel

Class	*Frequency*	*Percent*
Economy	21,764	97.4
Business	576	2.6
First	13	0.1
Total	22,353	100.0

Table I -29 Frequency table: Checked baggage for one or more passengers

Baggfor	*Frequency*	*Percent*
One passenger	19,349	86.6
More than one	3,004	13.4
Total	22,353	100.0

Table I-30 Frequency table: Non-European, European or Domestic flight

Routetype	*Frequency*	*Percent*
Non-European	7,995	35.8
European	11,758	52.6
Domestic	2,600	11.6
Total	22,353	100.0

Table I-31 Frequency table: Scheduled or non-scheduled flight

Flighttype	*Frequency*	*Percent*
Scheduled	20,604	92.2
Non-scheduled	1,749	7.8
Total	22,353	100.0

Table I-32 Frequency table: Type of carrier

Routetype	*Frequency*	*Percent*
Regular scheduled	15,865	71.0
Charter	1,097	4.9
Low-cost	4,451	19.9
Charter & low-cost	940	4.2
Total	22,353	100.0

Table I-33 Frequency table: Region of airport of departure

RegionDepart	*Frequency*	*Percent*
UK and Ireland	3,134	14.0
Benelux and France	2,056	9.2
Spain, Portugal and Italy	2,905	13.0
Scandinavia and Iceland	1,700	7.6
Germany, Switzerland and Austria	2,708	12.1
Northeast Europe	2,993	13.4
Greece, Cyprus, Malta and Turkey	2,783	12.4
Romania and Bulgaria	1,539	6.9
Other European countries (incl. Russia)	175	0.8
Africa and the Middle East	458	2.0
Asia	195	0.9
North America	1,278	5.7
South America	413	1.8
Other	16	0.1
Total	22,353	100.0

Table I-34 Frequency table: Region of airport of arrival

RegionArr	*Frequency*	*Percent*
UK and Ireland	2,690	12.0
Benelux and France	2,285	10.2
Spain, Portugal and Italy	3,461	15.5
Scandinavia and Iceland	2,134	9.5
Germany, Switzerland and Austria	2,629	11.8
Northeast Europe	1,338	6.0
Greece, Cyprus, Malta and Turkey	2,530	11.3
Romania and Bulgaria	273	1.2
Other European countries (incl. Russia)	488	2.2
Africa and the Middle East	891	4.0
Asia	710	3.2
North America	2,197	9.8
South America	488	2.2
Other	239	1.1
Total	22,353	100.0

Table I-35 Frequency table: Short / medium / long haul flight

Haullabel	*Frequency*	*Percent*
Short Haul: < 500 km	2,344	10.5
Medium haul: 500 .. 5000 km	14,446	64.6
Long haul: > 5000km	5,563	24.9
Total	22,353	100.0

Table I-36 Frequency table: USA related flight

labelUSA	*Frequency*	*Percent*	*Valid Percent*	*Cumulative Percent*
No USA regulation	15,037	67.3	85.2	85.2
USA regulation	2,603	11.6	14.8	100.0
Total	17,643	78.9	100.0	
Missing	4,713	21.1		
Total	22,353	100.0		

Table I-37 Frequency table: Maximum weight value determined from simplified airline regulations

Max_kg	*Frequency*	*Percent*	*Valid Percent*	*Cumulative Percent*
15	424	1.9	2.4	2.4
18	18	0.1	0.1	2.5
20	13,535	60.6	76.7	79.2
23	3,277	14.7	18.6	97.8
30	269	1.2	1.5	99.3
32	117	0.5	0.7	100.0
Total	17,640	78.9	100.0	
Missing	4,713	21.1		
Total	22,353	100.0		

ANNEX J List of charter airlines

Table J-1 List of charter airlines

Airline code	*Name*
2U	Sun d'Or International Airlines
4P	Viking Airlines
4Q	Air Italy Polska
6B	TUIfly Nordic
7H	Corendon Airlines
B1	BH Air
BY	Thomsonfly
D1	Dubrovnik Airline
DE	Condor Flugdienst
DK	Thomas Cook Airlines Scandinavia
EB	Air Pullmantur
FQ	Thomas Cook Airlines
H9	Pegasus Airlines
HV	Transavia Holland
JF	Jetairfly
JG	Jettime
K1	Karthago Airlines
LE	Lotus Air
M1	AMC Airlines
MP	Martinair
MT	Thomas Cook Airlines
OR	Arkefly
P1	Privat Air
PV	Privilege Style
S1	Sky Airlines
S4	SATA International
SS	Corsairfly
T1	Inter Airlines
TS	Air Transat
UI	Eurocypria Airlines
W1	Windrose Air
X3	TUIfly
XD	Free Bird Airlines

ANNEX K List of low-cost airlines

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K-1 List of low-cost airlines 257
K-2 List of low-cost airlines (Part II) 258

Table K-1 List of low-cost airlines

Airline code	*Name*
2L	Helvetic Airways
4U	Germanwings
6G	Air Wales
8A	Atlas Blue
8I	Myway Airlines
AB	Air Berlin
B4	Flyglobespan
BE	Flybe
BT	Air Baltic
BY	Thomsonfly
C0	Centralwings
D5	Dauair
DC	Golden Air
DE	Condor Flugdienst
DI	dba
DP	First Choice Airways
DY	Norwegian Air Shuttle
E8	Alpi Eagles
F7	Flybaboo
FR	Ryanair
GX	Jetx Airlines
HV	Transavia Holland
HW	Iceland Express
IG	Meridiana
IV	Wind Jet
JK	Spanair
JN	Excel Airways
KF	Blue1
LF	FlyNordic
LK	Air Luxor
LS	Jet2.com
LT	LTU International
NB	Sterling Airlines
NE	SkyEurope
OF	Air Finland
PE	Air Europe
QS	Travel Service
RE	Aer Arann
SE	XL Airways France
SH	Fly Me Sweden
SM	Swedline Express
TF	Malmo Aviation

Table K-2 List of low-cost airlines (Part II)

Airline code	*Name*
TV	Virgin Express
U2	easyJet
VA	Volare Airlines
VG	VLM Airlines
VY	Vueling Airlines
VZ	MyTravel Airways
W6	Wizz Air
WO	Air Southwest
WW	bmibaby
XG	Clickair
ZB	Monarch Airlines

ANNEX L List of website links consulted for baggage allowance restriction

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http://www.airchina.com.cn/PassengerService/GroundService/BaggageLimitation/default.shtml

http://home.airindia.in/SBCMS/Webpages/Hand-Baggage.aspx?MID=27#

http://home.airindia.in/SBCMS/Webpages/Checked-Baggage.aspx?MID=27#

http://www.evaair.com/html/b2c/english/tips/Airport_service/Baggage/#a3

http://www.egyptair.com/English/Pages/Carryonbaggage.aspx?OrderID=f

http://www.egyptair.com/English/Pages/BaggageAllowance.aspx?OrderID=a

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http://germany.czechairlines.com/en/portal/passengers/baggage/basic_information.htm

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http://www.airbaltic.com/public/baggage_transportation.html

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http://www.skyeurope.com/en/information-services/travel-information/baggage.aspx

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http://www.aircanada.com/en/travelinfo/airport/baggage/carry-on.html

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http://www.thy.com/en-INT/services/passenger_services/luggage_information.aspx

http://ww2.flysaa.com/fares/nav/en/en_frameset.html?contents=/fares/faresTDPDspSearch.jsp?NewSession=true&locale=en_be&loadFrame=false

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http://www.iberia.com/OneToOne/v3/obsmenu.do?prgOid=8462&tabId=3&menuId=02090300000000&menuRP=1&language=en&country=NL&market=NL&IS_ANONYMOUS=true

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