



Network Manager
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Challenges of Growth 2013

Task 4: European Air Traffic in 2035

SUMMARY

This report presents the 2013 update of the EUROCONTROL 20-year forecast of IFR flight movements in Europe up to 2035. It focuses on developments after 2019; traffic evolution between now and 2019 is discussed in the EUROCONTROL 7-year forecast published in February 2013 (Ref. 5). This forecast replaces the EUROCONTROL Long-Term Forecast issued in December 2010, and was prepared as a task of Challenges of Growth 2013.

Looking 20 or more years ahead, it is more robust to consider not just a single forecast, but a range of potential scenarios for how air transport in Europe, and the factors influencing it, might develop. This forecast uses four scenarios to explore the future of the aviation and the risks that lie ahead:

- **scenario A:** Global Growth;
- **scenario C:** Regulated Growth (most-likely);
- **scenario C':** Happy Localism;
- **scenario D:** Fragmenting World.

Each scenario has different input assumptions: economic growth, fuel prices, load factors, hub-and-spoke versus point-to-point etc. This leads to different volumes of traffic, and different underlying patterns of growth: long- versus short-haul, rates of up-gauging of aircraft etc.

For Europe¹ as a whole, the **most-likely scenario C** (Regulated Growth) has 14.4 million flights in **2035**,

50% more than 2012. That is 1.8% average annual growth (Figure 2), or around half the rate observed in the 40 years to 2008. The **weakest scenario** (Scenario D) has just **20% more** flights in 2035 than in 2012, and the **strongest** growth (Scenario A) **80% more**. Compared to the forecast published in 2010, the starting point is lower due to the economic downturn and the rate of growth is also lower, due to weaker economic outlook and reduced airport capacity plans. The traffic growth **will be faster in the early years, stronger in Eastern Europe** (Figure 1) **and for arrivals/departures to/from outside Europe than for intra-European flights**.

Air traffic growth will be limited by the available capacity at the airports; this forecast is based on capacity plans reported by airports in a new survey. The combination of a **lower forecast**, but **reduced airport expansion** plans is that, in the most-likely scenario, around **1.9 million flights** (accounting for 12% of the demand) will **not be accommodated in 2035**. The congestion is now lower than in the previous forecast at 2030. The recent drop in traffic has given the system some extra years to react. However, when the capacity limits are reached, congestion at airports will increase quite rapidly (especially in scenario A) which will lead to extra pressure on the network, and more delays.

Even with airport capacity restrictions, airports will grow. In 2035, there will be 20 airports handling more than 150,000 departures a year in the most-likely scenario; a level of traffic currently achieved at 8 airports only.

Some faster-growing airports in Southern and Eastern Europe will join the top 25 within the 20-year horizon (though the list depends on the scenario).

Passengers will travel more long-haul in 2035 than in 2019; the average distance per journey will increase by around 8% between 2019 and 2035 in Europe in the most-likely scenario. The average distance per flight will also change at the same rate. The fleet will evolve and the increasing demand for long-hauls will be served by more "large to very-large" aircraft offering bigger seating capacity.

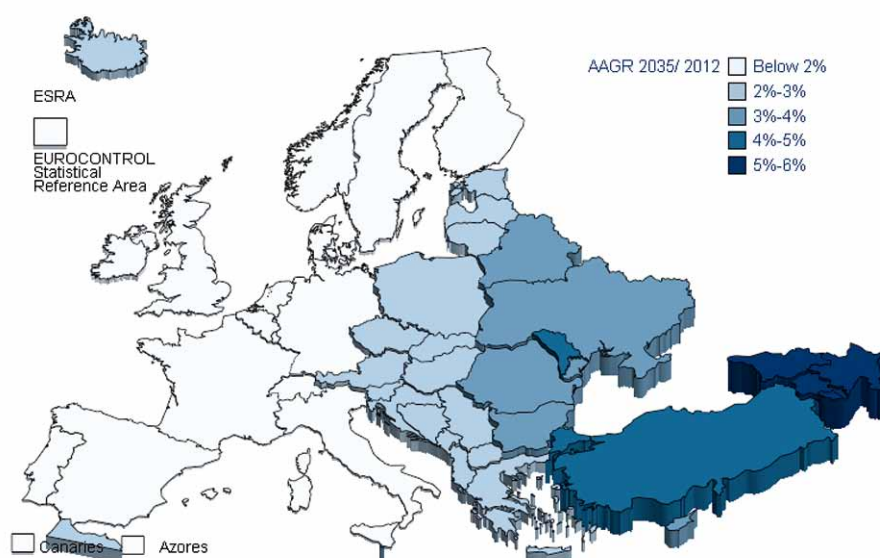


Figure 1. Average annual growth (scenario C: Regulated Growth, the 'most-likely')

¹ In Eurocontrol Statistical Reference Area (ESRA), see Annex B.

Due to the economic downturn leading to slower traffic growth rates than expected, this 20-year forecast starts lower than the previous one published in 2010. Moreover, the baseline economic growth is also expected to be slower from 2020, and airport expansion plans have been sharply reduced compared to the previous forecast. This 20-year forecast expects 3.4 million fewer flights in 2030 than what was forecasted for 2030 in 2010.

With twenty years horizon the forecast is clearly prone to changes in economic, political and social conditions of the future World. Some of the risks have been addressed in the four scenarios of this forecast but there are many other factors that have the potential to change aviation as we know it. Some of the major ones are discussed in section 4.7. Users are advised to consider these when using the forecast results.

The future sustainability of European aviation is also highly dependent on the pace of both traffic growth and technological development, and of evolving public perceptions. To ensure sustainable growth, a comprehensive approach will be required to environmental impact management, including operational, technological, regulatory and market-based measures. The scope of work is ambitious and success will be dependent on investment and international cooperation. The outcomes will have a significant influence on the industry's ability to reduce its environmental impact.

	IFR Movements(000s)									Traffic Multiple 2035/ 2012
	2009	2010	2011	2012	2019	2020	2025	2030	2035	
A: Global Growth	9,413	9,493	9,784	9,548	12,045	12,485	14,139	15,749	17,338	1.8
C: Regulated Growth	.	.	.	.	11,169	11,411	12,561	13,520	14,356	1.5
C': Happy Localism	.	.	.	.	11,169	11,338	12,236	13,015	13,769	1.4
D: Fragmenting World	.	.	.	.	10,132	10,194	10,612	10,840	11,249	1.2

	Average Annual Growth									AAGR 2035/ 2012
	2009	2010	2011	2012	2019/ 2012	2020/ 2019	2025/ 2021	2030/ 2026	2035/ 2031	
A: Global Growth	-6.6%	0.8%	3.1%	-2.4%	3.4%	3.7%	2.5%	2.2%	1.9%	2.6%
C: Regulated Growth	.	.	.	.	2.3%	2.2%	1.9%	1.5%	1.2%	1.8%
C': Happy Localism	.	.	.	.	2.3%	1.5%	1.5%	1.2%	1.1%	1.6%
D: Fragmenting World	0.9%	0.6%	0.8%	0.4%	0.7%	0.7%

Figure 2. Summary of forecast for Europe.

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1. INTRODUCTION

1.1 General

The *Challenges of Growth* series of studies aims to deliver the best-achievable information to support long-term planning decisions for aviation in Europe. EUROCONTROL completed three studies, in 2001, 2004 and 2008. This report is part of the fourth study, *Challenges of Growth 2013 (CG13)*, which overall addresses the following question:

What are the challenges of growth for commercial aviation in Europe between now and both 2035 and 2050?

The mainstream analysis of CG13 is composed of a series of reports (tasks) which set out how aviation might look in 2035 and 2050 and what the challenges might be. This report, “Task 4: European Air Traffic in 2035” explores the traffic development in Europe over the next 20 years. It is complemented by a series of other reports:

- “Task 7: European Air Traffic in 2050” (Ref. 1) which extends the forecast to 2050,
- “Task 5: Mitigation of the Challenges” (Ref. 2) which looks at a number of what-if? scenarios, or ‘mitigation methods’.
- “Task 6: The effects of air traffic network congestion in 2035” (Ref. 3) which projects the effects of the airport congestion on the network.
- “Task 8: Climate Change Risk and Resilience” (Ref. 4) gathers stakeholder views as to whether the industry now considers adaptation actions are necessary, and what actions they are taking.

This report presents the forecast of annual numbers of instrument flight rules (IFR) movements in Europe up to 2035. It has been prepared by the EUROCONTROL Statistics and Forecast Service (STATFOR) in 2012-13 and it replaces the 20-year forecast issued in December 2010 (Ref. 7). The report contains a summary of the forecast scenarios (section 3), a discussion of the forecast results (section 4) and a discussion on environmental impacts (section 5). The annexes give more detail on the forecast method (Annex A), geographical definitions (Annex B), alternative fuels (Annex E), political targets for environment sustainability (Annex F) and list the annual total forecasts per State (Annex C), and major flows in the European airspace (Annex D).

1.2 Summary of the forecast method

The EUROCONTROL long-term forecast uses a model of economic and industry developments taking into account a number of factors influencing the future IFR traffic. It uses a set of four scenarios to explore specific paths leading to different traffic levels. It starts and continues from the latest 7-year forecast, also called the medium-term forecast (MTF), published in February 2013.

The EUROCONTROL 20-year forecast, also called long-term forecast (LTF), is developed by growing baseline traffic using a model of economic and industry developments, taking into account factors related to economic growth, passenger demand, prices, air network structure and fleet composition. Specific models are used to address passenger, cargo, military GAT, business aviation and infrequently-flown airport-pairs. Forecast arrivals and departures are constrained by annual airport capacities and total traffic per State is calculated assuming fixed routing as in the starting year. The 20-year forecast uses the last forecast year of the most recent 7-year forecast as the starting point and develops the forecast further into the future. Hence, this 20-year forecast (LTF13) starts in 2019 where the latest 7-year forecast published in February 2013 ends (Ref. 5).

The 20-year forecast uses scenarios to illustrate and explore possible developments for future aviation, each following a specific path of events leading to a different level of traffic. After consulting the STATFOR User Group and the Airport Observatory Group, four scenarios have been developed for this 20-year forecast:

- **scenario A:** Global Growth;
- **scenario C:** Regulated Growth;
- **scenario C’:** Happy Localism;
- **scenario D:** Fragmenting World.

Scenario C has been constructed as the ‘most-likely’ continuing most-closely in the current trends. The LTF scenarios are detailed in section 3. More detail of the LTF method is given in Annex A.

2. WHAT MIGHT FUTURE DEMAND BE LIKE?

There is growth to come over the next twenty years of aviation but it may look quite different from what we have been used to. The 20-year forecast challenges our preconceptions of 'most-likely scenario'.

Even if the traffic growth rates in the medium term are expected to remain well below the pre-2009 long term trend (see Ref. 5), there is still some potential for further growth of air traffic in Europe. However the demand will not be homogeneous and the traffic growth will not be uniform. Each market segment will be different, long-haul different from short-haul, and each part of Europe different from the other. In introducing this new 20-year forecast we focus on a different deviation from uniformity: between the past and the future.

It can be too easy to imagine that future air traffic will be rather like the past, only with more of it. This, in a nutshell, is the 'most-likely scenario'. One role of a long-term forecast is to challenge the assumptions and preconceptions underlying such a scenario. Different decision-makers may indeed have different views about what 'business as usual' means (one of the reasons we have stopped using the term for 'most-likely'). The scenarios of a long-term forecast are there to provide not just a quantitative foundation for thinking about a baseline case, but also to inform a discussion of risks. The long-term forecast is above all about helping decision-makers to understand the risks: what might happen, and will our plans work if so?

Some fundamentals will remain with us: IFR flights will still be about moving people and goods safely, efficiently, cost-effectively and with minimum impact on the environment. Aviation will still be an economic catalyst for business, for tourism, and for manufacturing industry. Aviation will still deliver social connectivity and security – bringing families, friends and States together. If these fundamentals, the "why?" of aviation, are immutable then the "when?", "what?", "where?", "how?" and "how much?" are all up for change.

This is a twenty-year² forecast. Twenty three years ago, to give just a few examples: EU was made of 12 States only (1989), the deregulation of aviation in Europe was a work-in-progress (1992 milestone yet to come); Ryanair had just abandoned business class in the process of becoming low-cost (1990); the Baltic States were taking steps towards independence (1990-1991); Tim Berners-Lee had just kicked off the world wide web (1989); London/Heathrow had 50% more flights than

Paris/Charles de Gaulle (1991), compared to 5% fewer in 2012, Aeroflot had the biggest fleet in Europe in 1989 with more than 3,000 airframes.

So what are the factors that have the potential to be far bigger in the next 20 years than ever they did in the last?

Regulation is returning. After the recent banking failures, in which too little regulation played its part, more is to be expected. Not the piecemeal regulation of prices and market access that was the theme of the regulations un-wound in the 1990s, nor regulation that is entirely new: noise chapters have been with us for some time, but now the pace of environmental regulation is accelerating (CO₂ of course, in the coming years, but then CO₂ standards, NO_x, contrails,...); and competition regulators are increasingly showing their teeth.

Indeed, **costs** will be under scrutiny as never before, because the debts incurred during the recent financial crisis will reduce many a European government's ability to invest in infrastructure projects or subsidise their transport system through public-service obligation routes or otherwise.

In this, air traffic management is a relatively small part, but the regulations related to the Single European Sky will fundamentally change the **value chain**, with the sharing of cost-risk and with the business trajectory putting more power in the hands of the aircraft operator. This has the potential to change operators' profitability, but also business models.

Co-modality, whether competition or collaboration between modes, has certainly had significant local effects so far and more is in the pipeline. However, for reasons already discussed, further high-speed rail infrastructure is likely to come more slowly.

On the forecasts we use, **China overtakes the US** in terms of total GDP from 2030. As well as its geopolitical implications, this will be accompanied by changes to the flows of the World economy: of raw materials, finished goods, and finance. Just as global transport

² Twenty-three years, to be precise.

re-configured for globalisation, so it will re-configure again for sinicisation³ – or should that be BRIC-isation⁴?

In terms of air traffic growth, **Europe will be in the slow lane**, with the Middle-East and China (Asia/Pacific) growing much more rapidly. The rapid growth of short-haul, low-cost in the last twenty years has changed passengers' expectations of short-haul aviation, and hence affected all carriers' short-haul models. Perhaps the competition from the Middle-East in long-haul will have a similar transformational power.

The **climate is changing**. How it will change is increasingly becoming clear, more uncertain is when (Ref. 6). After discussions with the STATFOR User Group, for this forecast we have assumed that the major impacts of this lie largely beyond 2035, but they are definitely risks for the later years of the forecast: the threats to the infrastructure and to daily operations, the changed travel patterns as Summer temperatures rise and skiing availability changes, the economic challenges of droughts.

Oil prices and supply are well represented in the scenarios of the forecast. Although we have not seen any indisputable evidence for or against a near-term peaking of oil; it seems to remain a possibility that has been quantitatively assessed in previous forecast (Ref. 7).

The economic crisis has provided an additional opportunity for governments to address what has long been identified: the sustainability, or rather unsustainability, of pension provisions. In many European countries there will be **older pensioners, and poorer**. In fact, the effects of this could be a higher propensity to fly on average, since those of working age fly more often.

For short-haul flights, it might seem that every new European airline in the last ten years has trumpeted its low-cost credentials. The **transformational business model** of the next twenty years may be with us already or yet to appear. Perhaps long-haul low cost, or the multi-national alliance, air taxi, or the co-modal firm?

Transport remains a target for terrorists and the '**hassle factor**' of security checks which has been talked about so much since 2001 has, if anything, become even more an issue with a growing perception of the intrusiveness of the data and physical checks. This could blend back into the accepted background again, but it could also turn into a disincentive for travel to some destinations.

³ Sinic ≈ Chinese

⁴ BRIC: Brazil, Russia, India and China.

3. Four scenarios for the future

The 20-year forecast uses a set of four scenarios to explore the future of aviation: A: Global Growth, C: Regulated Growth, C': Happy Localism and D: Fragmenting World. Each scenario has a specific storyline and a mix of characteristics following a particular path into the future with the aim to improve our understanding of factors that will influence future traffic growth and the risks that lie ahead. Scenario C has been constructed as the 'most-likely' and continues in current trends.

Looking twenty years ahead, the World we live in may change in many ways and it is impossible to predict all of the factors, events, decisions and actions that will shape it. Our understanding of global system dependencies and dynamics can never be perfect and, perhaps even more importantly, it is limited by our current experience and knowledge. To overcome this difficulty, we have developed various scenarios, depending on factors like the economy, fuel prices etc. Based on these scenarios, the 20-year forecast explores various possible ways in which the air traffic might evolve in the future.

In contrast to the 7-year forecasts which develop a central forecast as a base scenario and an interval around with bounds referred to as high and low scenarios, the 20-year scenarios are individual, qualitatively-different representations of the many possible futures. Rather than creating an interval that is likely to cover the number of future flights, they each follow a specific path of events and developments that corresponds to the forecast traffic. What the 20-year forecast aims at is not providing the exact future traffic counts but more the understanding of the factors that will shape future air traffic and the risks that lie ahead. None of the scenarios will actually become true in 2035. In reality, the future number of flights will be the result of the effective realisation of the various factors and will be nearer to some of the 20-year forecast scenarios than some others. Nevertheless, these scenarios provide context to help organizations consider the implications of future events (e.g what events might lead to high/ low traffic growth), and help them prepare for change and uncertainty.

The last 20-year forecast (LTF10) published in December 2010 used four scenarios for the future, largely based on previous long-term forecasts. Scenarios A: *Global Growth*, C: *Regulated Growth* and D: *Fragmenting World* drew on the work done for CONSAVE⁵, ACARE⁶ and the IPCC⁷ although they had been updated to reflect the views on likely future developments in aviation. We also developed a specific scenario, "Scenario E: *Resource Limits*" to address the possibility of reaching the peak in oil production.

Historically, there have been four scenarios in the EUROCONTROL 20-year forecasts published. These four scenarios together were judged to capture a range of possible futures for the Industry that was wide enough to support the formulation of strategy. Based on collective decisions of the STATFOR User Group and other experts, the storylines of the scenarios have changed from time to time to better explore the paths leading to different traffic levels.

	2004	2006	2008	2010	2013
A: Global Growth	•	•	•	•	•
B: Business As Usual	•	•	•		
C: Regulated Growth	•	•	•	•	•
D: Fragmenting World	•	•	•	•	•
E: Resource Limits				•	
C': Happy Localism					•

Development of scenarios in 20-year forecasts per publication year ('most-likely' highlighted).

⁵ <http://www.dir.de/consave/>

⁶ <http://www.acare4europe.org/>

⁷ <http://www.ipcc.ch/> (though IPCC has recently been moving away from its high-growth scenario)

For this 20-year forecast (LTF13), we revisited these four scenarios again and, after discussion with the STATFOR User Group (SUG) and the WG 1 of the Airport Observatory, it has been decided to drop Scenario E. Not that the risk of peak oil has gone away, but it was felt that modelling it again was not necessarily the highest priority. Instead discussions during the scenario workshop led to the conclusion that we needed to envisage a scenario in which Europe would look increasingly inwards whilst maintaining the momentum of economic growth. Thus, a new scenario "Scenario C': *Happy Localism*" has been introduced. The latter has been basically defined around the scenario C with the idea that fragile Europe would "better" manage to adapt economically, technologically and politically by keeping an inwards perspective. In other words "Small is beautiful".

In summary, in this forecast we look at the following four scenarios for the future of the aviation in Europe in twenty years horizon in the LTF13:

- **Scenario A: *Global Growth (Technological Growth)*:** Strong economic growth in an increasingly globalised World, with technology used successfully to mitigate the effects of sustainability challenges such as the environment or resources availability.
- **Scenario C: *Regulated Growth*:** Moderate economic growth, with regulation reconciling the environmental, social and economic demands to address the growing global sustainability concerns. This scenario has been constructed as the 'most-likely' of the four, most closely following the current trends.
- **Scenario C': *Happy Localism*:** this scenario is introduced to investigate an alternative path for the future. With European economies being more and more fragile, increasing pressure on costs, stricter environmental constraints, air travel in Europe would adapt to new global environment but taking an inwards perspective. There would be less globalization, more trade inside EU (e.g. Turkey joining Europe is important in this scenario). Also, slow growth of leisure travel to outside Europe, however certainly more inside EU. More point-to-point traffic within Europe. It does not mean that Europe does not grow or does not adapt to

new technologies and innovation but its main focus is "local". Although this scenario is mostly based on scenario C (as its name indicates), it also inherits some aspects of other scenarios like higher fuel prices or low business aviation traffic of scenario D.

- **Scenario D: *Fragmenting World*:** A World of increasing tensions between regions, with more security threats, higher fuel prices, reduced trade and transport integration and knock-on effects of weaker economies.

As with every update of the 20-year forecast, input data have been fully revised using the latest available figures (such as GDP growth, population age structure, etc.). Furthermore, the input assumptions have been brought up to date with our current expectations for the future developments which may have changed since the LTF10 production as the external circumstances have evolved.

Any user of the forecast is strongly advised to consider all four scenarios as a means to manage risk. There are also a number of other important risks (see section 4.7), which this forecast has not included. In particular, the possibility should be considered of changes to the routing of traffic and of major external events.

The general 'storylines' above are further elaborated and translated into quantitative terms to serve as input assumptions in the 20-year forecast model. Since the LTF starts from the end of the MTF, the scenario factors are described from 2019 onwards. Some of the more important factors are:

GDP growth The base GDP forecast has been prepared by Oxford Economics Ltd. (January 2013 update). The forecast growth for 2019-2035 in the EU27 averages 1.6% per annum and is directly used in scenario C: *Regulated Growth*. It is 0.2 percentage points (p.p) higher in scenario A, 0.5 p.p lower in scenario D and 0.2 p.p lower in scenario C'. In the most-likely scenario, the GDP growth trend for EU27 has been cut⁸ by around 0.5 p.p compared to what was expected in the previous 20-year forecast (LTF10) and by around 0.8 p.p compared to what was expected in the previous Challenges of Growth (CG08) as shown in Figure 3.

⁸ Comparison of the GDP average annual growth rates over the 20-year period between 2010 and 2030 from Oxford Economics Ltd economic forecasts.

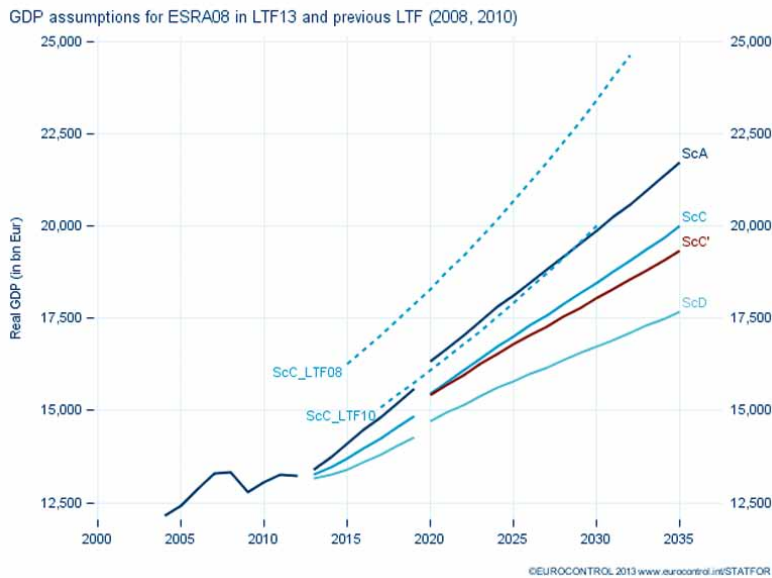


Figure 3. ESRA08 GDP forecasts have seen strong downward revision since 2008.

Elasticities describe the relationships between GDP growth and growth in passenger demand. Following the exploration of market maturity in Task 3 of Challenges of Growth 2013 (Ref. 8) these have been fully recalibrated for this forecast. The study reviewed the elasticities for all region pairs and also examined the specific characteristics of domestic flows in the forecast in order to express the less rapid growth of the domestic markets. While there is a number of European states whose domestic traffic has not grown for some years, there are none that are mature in the sense of having an elasticity near zero for all traffic.

Oil prices steadily grow in scenarios A and C reaching around \$145 per barrel (in 2010\$) by 2035. Uncertainty about the stability of oil production in scenarios C' and D results in speculation, high price volatility and high prices. In the model, this is captured by persistently high oil prices starting at around \$105/barrel in 2019 climbing to around \$200/barrel in 2035. Due to higher refining margins in scenarios C' and D (than in scenarios A or C), the kerosene prices increase somewhat faster and therefore have somewhat stronger effect on fares when these costs are passed onto passengers.

Environmental regulation Even if a global market-based measure to address CO₂ emissions is delayed and the EU Emissions Trading Scheme (ETS) for aviation continues with a reduced scope, the 20-year forecast still needs to reflect the costs of emissions for airlines in the period 2019-2035. We assume that some framework is in place in which 100% of CO₂ emissions

are paid for. This could be by auctioning of emissions permits, but the forecast is not sensitive to the actual mechanism by which these costs are incurred. Scenario D sees the strongest regulation with highest CO₂ costs (around €107/tonne CO₂ in 2035). Scenarios C and C' are more successful at adapting to the global long-term sustainability issues and so have lower costs (around €66/tonne CO₂ in 2035). In scenario A the technology has successfully moved towards less carbon-intensive energy sources and therefore has the lowest CO₂ costs (around €42/tonne CO₂ in 2035). The method assumes that these additional costs of airlines are fully passed onto passengers via an increase in fares.

Network structure of the airlines, i.e. concentration of traffic into hubs or use of more point-to-point operations, has an effect on the total number of flights and their regional distribution. This forecast assumes a growing importance of Middle-East hubs (namely Dubai, Abu Dhabi and Doha) for connecting traffic to/from Middle-East, Asia/Pacific and Southern Africa, resulting in slower growth of transferring passengers at European hubs on these flows. This assumption is used in all but scenario D (possible instability in the Middle-East). In scenarios A and C, Istanbul airport plays also a key role with higher hubbing rates (to a lesser extent compared to previous Middle-East airports) for connecting traffic to/from Asia/Pacific and Southern Africa. This emphasis on Turkey is however not kept in scenario C' where Europe is seen as a region increasingly flown over by long-haul international flights.

	A: Global Growth	C: Regulated Growth	D: Fragmenting World	C': Happy Localism
2019 traffic growth	High ↗	Base →	Low ↘	Base →
Passenger				
Demographics (Population)	Aging UN Medium-fertility variant	Aging UN Medium-fertility variant	Aging UN Zero-migration variant	Aging UN Medium-fertility variant
Routes and Destinations	Long-haul ↗	No Change →	Long-haul ↘	Long-haul ↘
Open Skies	EU enlargement later +Far & Middle-East	EU enlargement earliest	EU enlargement latest	EU enlargement earliest
High-speed rail (new & improved connections)	54 city-pairs faster implementation	54 city-pairs	42 city-pairs later implementation	54 city-pairs faster implementation
Economic conditions				
GDP growth	Stronger ↗	Moderate →	Weaker ↘↘	Weaker ↘
EU Enlargement	Later	Earliest	Latest	Earliest
Free Trade	Global, faster	Limited, later	None	More limited, even later
Price of travel				
Operating cost	Decreasing ↘↘	Decreasing ↘	No change →	Decreasing ↘
Cost of CO ₂	Lowest	Lower	Highest	Lower
Price of oil	Lower	Low	High	High
Other charges	Noise: ↗ Security: ↘	Noise: ↗ Security: →	Noise: → Security: ↗	Noise: ↗ Security: →
Structure				
Network	Middle-East hubs ↗↗ Europe ↘ Turkey ↗	Middle-East hubs ↗↗ Europe and Turkey ↗	No change →	Middle-East hubs ↗↗ Europe and Turkey ↘
Market Structure	Medium ↗↗ Large - Very Large ↗	Medium to Very Large ↗	Large ↗ Very Large ↗	Large ↗ Very Large ↗

Figure 4. Summary characteristics of LTF13 scenarios.

4. FORECAST RESULTS

In the 'most-likely' scenario of the forecast, there will be 14.4 million IFR movements in Europe in 2035, 1.5 times more than in 2012. The growth will average at 1.8% annually but it will be faster in the early years, stronger in Eastern Europe and faster for traffic to and from Europe than for intra-European flights. Turkey will be the largest generator of extra flights in Europe, and will also see the biggest number of additional departing flights in its airspace. Two of the other scenarios forecast substantially different traffic volumes: 17.3 and 11.2 million flights, respectively.

4.1 Summary of results

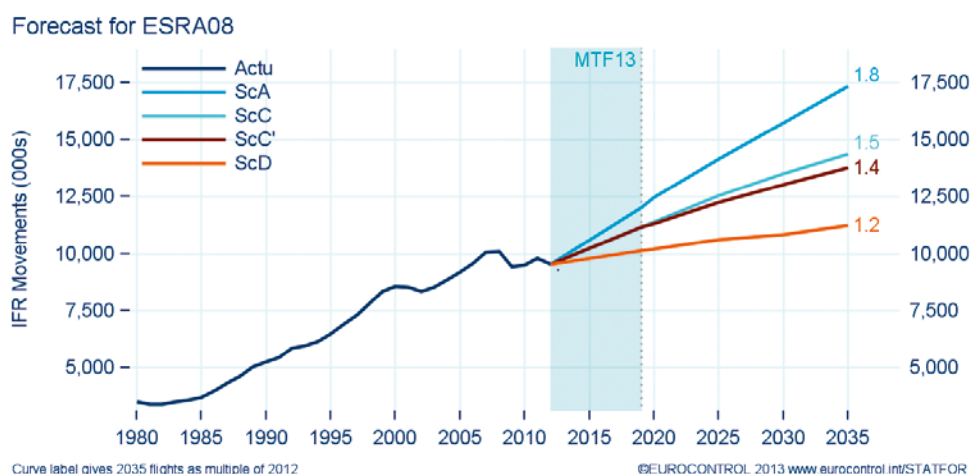


Figure 5. In 2035, the most-likely scenario has 1.5 times more flights than in 2012, but other scenarios show significantly different growth patterns.

	IFR Mvts (million) 2035	Traffic Multiple 2035/2012	Ave Annual Growth 2035/2012	Extra flights/day (thousands)
A: Global Growth	17.3	1.8	2.6%	21
C: Regulated Growth	14.4	1.5	1.8%	13
C': Happy Localism	13.8	1.4	1.6%	12
D: Fragmenting World	11.2	1.2	0.7%	5

Figure 6. Summary of the key traffic values expected in the 4 scenarios for Europe by 2035.

Each scenario paints a picture of a different future with different pattern of traffic growth as shown in the Figure 6. Focusing on the ESRA08 region which covers most of Europe:

- In the 'most-likely' scenario (scenario C) of the LTF13, there will be 14.4 million flights in Europe in 2035, 1.5 times more than in 2012 (Figure 5). That is an average of 1.8% increase per year, around half the historic rate from the 1960s to the peak of 2008. Traffic growth will slow down from 2025 as markets mature, economic growth decelerates and as the capacity limits at airports increasingly become an issue (see section 4.2 for more on airport capacities).
- Scenario C' follows almost the same pattern in growth than scenario C, starting at the same point, however the traffic growth develops less rapidly in scenario C' from 2020 as a result of slower economic growth, higher fuel prices and higher load factors (compared to scenario C). The growth rates slacken from 2025, resulting in a difference of 0.6 million less movements in scenario C' compared to scenario C in 2035.
- Scenario A, starting from the high-growth scenario of the 7-year forecast presents the most challenging traffic situation for Europe supported by quite strong economic growth, low fuel prices, wide range of open skies agreement (compared to other scenarios). There will be 17.3 million flights in 2035 in Europe, corresponding to 1.8 times the 2012 traffic levels. The expected average annual growth of 2.6% over the 20 years is the highest of all scenarios although it shows the biggest discrepancy of speed. The quite steady growth rates (around 3.5%) during

the first 8 years will slow down to less rapid ones in the last 15 years (around 2%). This decelerating trend is explained by a mix of market saturation and also capacity constraints at airports (see sections 4.2 and 4.3).

- Scenario D starts from the low-growth 7-year forecast, in which Europe has struggled for much of the decade to get back into growth. This weak growth is compounded by high oil prices, fragile economic growth, no population migration, no free trade agreements with extra-European partners, high price of travel...an accumulation of factors to be a hindrance to the development of traffic, not only lowering the demand for international flights but also for intra-European ones. This scenario is for 11.2 million flights for Europe in 2035, corresponding to a low average annual growth rate of 0.7%. The number of flights in 2035 in scenario D ends below the expected number of flights in 2019 of the most-likely scenario of the 7-year forecast.

Growth will not be uniform across Europe; it will be faster in some regions and on some flows than others. As Figure 1 illustrates for the 'most-likely' scenario C⁹, growth is stronger in Eastern Europe. The latter States have typically lower starting position at the beginning of the horizon, but these markets have typically more potential for traffic growth than in Western Europe States. For example, in 2010, the yearly departures per 1000¹⁰ capita were 9 for Germany and 3 for Turkey. By 2035, Germany is expected to increase to 13 while Turkey will reach 9, the per capita departures Germany had in 2010 (Turkish population will grow by 16 million in 2035). Eastern Europe markets are relatively less

	IFR Movements(000s)									Traffic Multiple 2035/ 2012
	2009	2010	2011	2012	2019	2020	2025	2030	2035	
A: Global Growth	9,413	9,493	9,784	9,548	12,045	12,485	14,139	15,749	17,338	1.8
C: Regulated Growth	.	.	.	.	11,169	11,411	12,561	13,520	14,356	1.5
C': Happy Localism	.	.	.	.	11,169	11,338	12,236	13,015	13,769	1.4
D: Fragmenting World	.	.	.	.	10,132	10,194	10,612	10,840	11,249	1.2

Figure 7. Summary of forecast for Europe.

⁹ Similar patterns can be observed in the other LTF13 scenarios, yet with some variation at State and flow levels.

¹⁰ Comparison made for States with roughly same population sizes in 2010: Turkey had 73 million inhabitants and Germany had 82 million inhabitants in 2010 (source: United Nations).

	Average Annual Growth									AAGR 2035/ 2012
	2009	2010	2011	2012	2019/ 2012	2020/ 2019	2025/ 2021	2030/ 2026	2035/ 2031	
A: Global Growth	-6.6%	0.8%	3.1%	-2.4%	3.4%	3.7%	2.5%	2.2%	1.9%	2.6%
C: Regulated Growth	.	.	.	.	2.3%	2.2%	1.9%	1.5%	1.2%	1.8%
C': Happy Localism	.	.	.	.	2.3%	1.5%	1.5%	1.2%	1.1%	1.6%
D: Fragmenting World	.	.	.	.	0.9%	0.6%	0.8%	0.4%	0.7%	0.7%

Figure 7: Summary of forecast for Europe.

mature, economies develop faster catching up with Western Europe, and there is more potential for air traffic growth especially as the population expands quickly as well. Figure 8 shows the distribution of the total flights in 2035 (in the 'most-likely' scenario C). Germany and France are expected to remain the busiest States, handling more than 4 million flights each. Then, UK and Turkey will follow with around 3 million flights each to handle in their airspace in 2035. Annex D gives forecast results for States and FABs.

While growth will be faster in the East (see Figure 12), it is still mainly the big western States that will need to deal with the greatest increase in the number of flights. Figure 9 shows that, in scenario C, Turkey will handle almost 5,000 more flights per day in 2035 than it did

in 2012. Germany will have to deal with around 3,500 more flights in 2035 than it did in 2012, then, France and the UK will have to handle each between 2,000-3,000 extra daily flights.

Dealing with departing traffic only, Turkey will be the arrival or departure point for the greatest number of the extra flights in the future European airspace, recording in 2035 around 2,600 departures a day more than in 2012 (Figure 10), equivalent to the departing traffic France handled in 2012. Of these, around 45% will be internal flights landing again at some other Turkish airports. The remaining 55% will have destinations outside Turkey: mostly in Germany, in the Middle-East or Russian Federation (Figure 11).

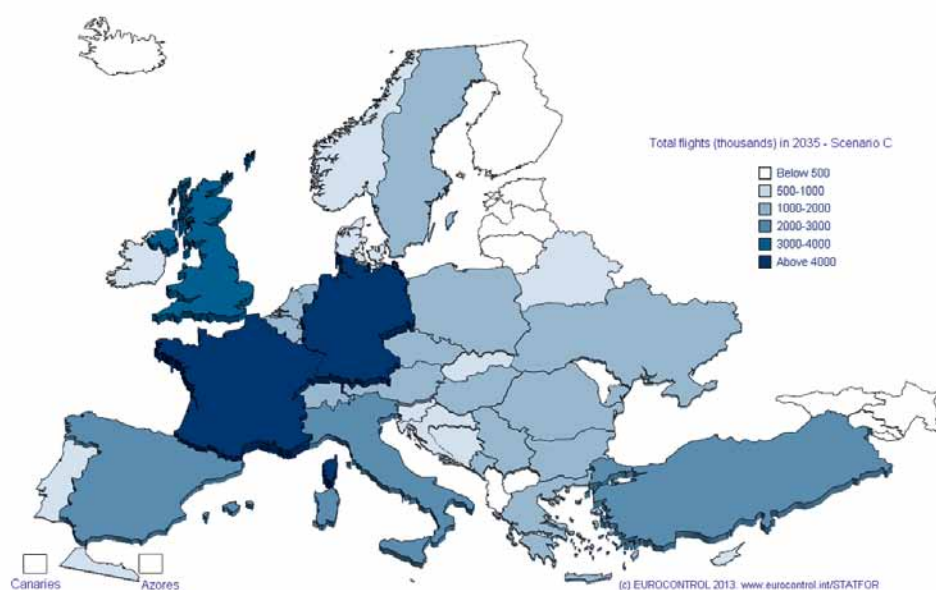


Figure 8. Total traffic in 2035.

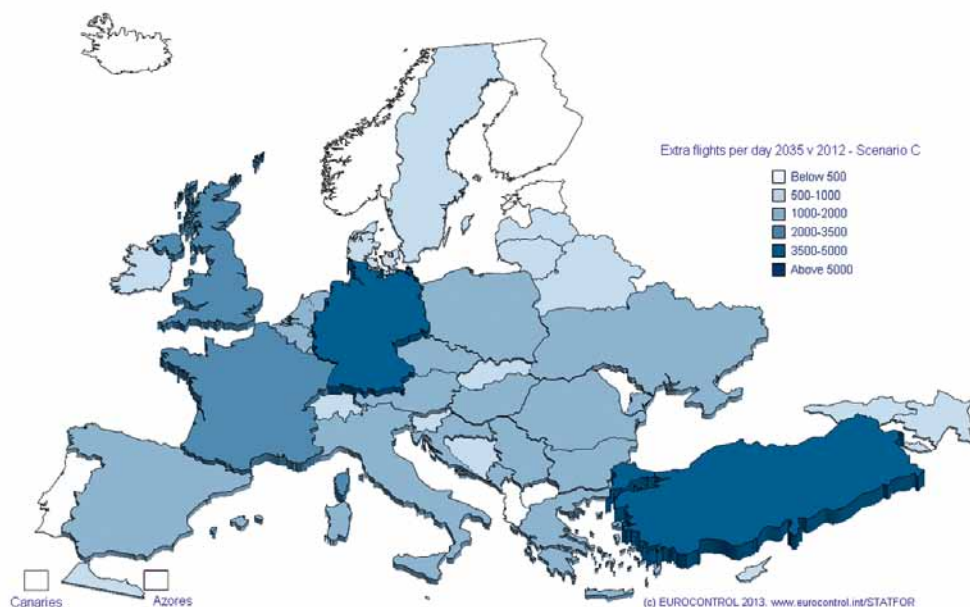


Figure 9. Extra flights a day through airspace.

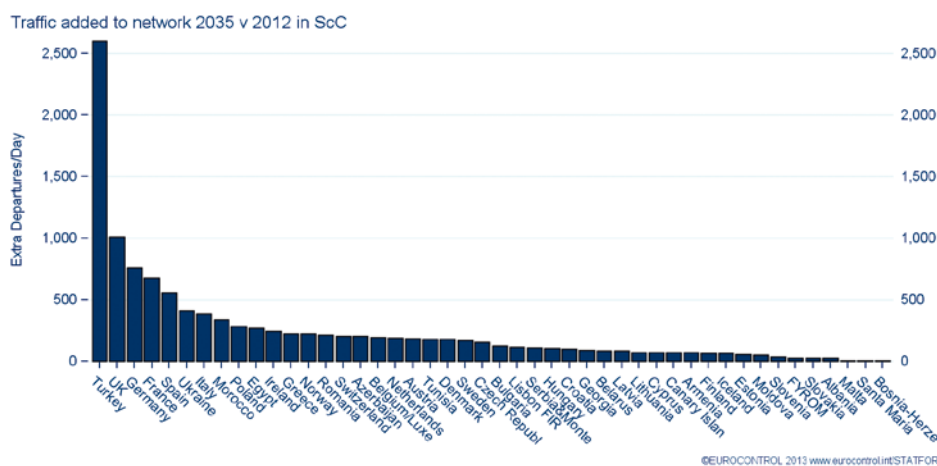


Figure 10. Turkey will be adding the most departing flights to the network by 2035 ('most-likely' scenario).

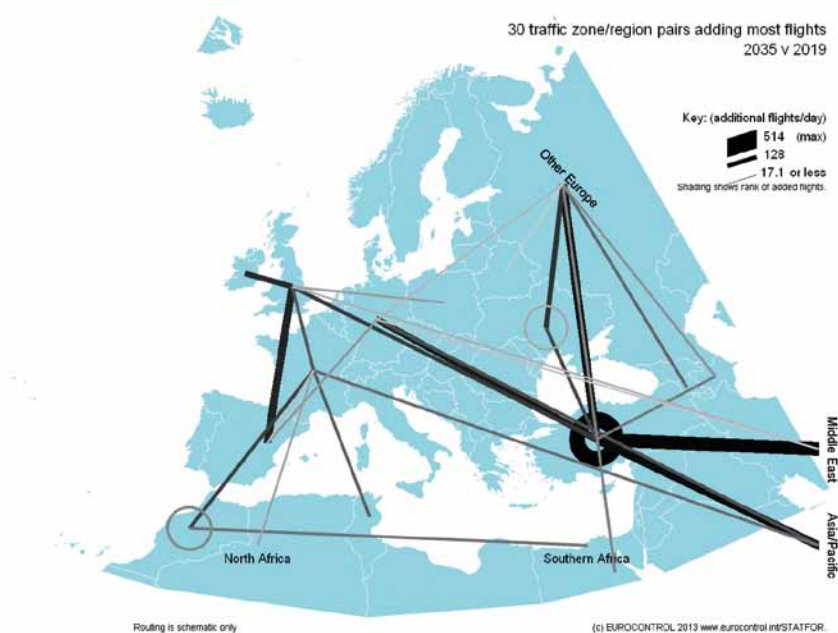


Figure 11. Map of the top 30 traffic growth flows, 2035 versus 2019 ('most-likely' scenario).

The split between the different flows (domestic flights, international arrivals and departures, and overflights) in the airspace varies in each State, one of the most obvious reasons being the geographical size of the State.

For ESRA, intra-European flights currently account for slightly less than 80% of the total traffic arrivals and departures for around 20% and the share of overflights is negligible (see Figure 35 in Annex C). A general trend observed in this forecast is the decline of the share of intra-European flights by 2035 (and consequently the increase of the share of international arrivals/departures). One of the reasons for that is the less rapid growth of the domestic markets, mainly in North West and Mediterranean Europe, already observed in the last 5 years and expected to last as these markets become more and more mature.

In the fastest growing scenario (scenario A), the share of internal flights is expected to decrease to two-thirds of the total traffic. This scenario favours long-haul traffic to the short-haul one. It counts on the development of the Middle-East hubbing pushing connecting traffic outside Europe (though in Turkey). The expected average growth rate of the internal flows is just below 2% per year over the twenty years.

In the most-likely scenario (scenario C), the share of the internal flights will decrease by 10 p.p to 70%. This scenario is for a fast EU enlargement, bringing some economic benefits to joining states earlier than in scenario A, and for increasing hubbing rates in Europe which explain the larger share than in previous scenario. However, the growth of the intra-European traffic over the next twenty years will be significantly lower (1.3% annually) especially when compared to the international traffic from and to outside Europe (3.2% annually) accounting for 28% of the total traffic by 2035. The traffic flying over European airspace will

grow at even faster rates (4.4%) though it will represent only 2% of the total traffic. Within Europe, the growth of the different flow (internals, arrivals/departures and overflights) in each State will evolve in a different ways as summarised in Figure 12.

Scenario C' is a variation of the most-likely scenario weakening the dependence of Europe on outside world. It expects a shift of some of the tourist traffic to Europe destination rather than outside Europe, less long-haul traffic connecting inside Europe, limited free trade with extra-European partners. This results in a lower average annual growth rate for international arrivals/departures (2.8%) than in scenario C.

Scenario D expresses the greater tensions in the world, inside and outside Europe (no migration, no free trade agreements, postponed EU enlargement...). If this scenario shows similar distribution of traffic flows than in scenarios C and C' (roughly 70% internal, 28% arrivals/departures and 2% overflights), the development of internal traffic in Europe by 2035 is almost flat (0.3%) while the growth rate of international traffic averages at 1.8%.

In many of the ESRA North-West and Mediterranean States (e.g. Germany, the UK, France, Italy), domestic traffic has not grown for some years. This trend will continue within the next 20 years in the most-likely scenario; with intra-European traffic to show growth rates slowing down to an average of 0.5% per year for ESRA North-West and 1.4% per year for ESRA Mediterranean. However, ESRA Eastern States will see faster growth rates averaging at 2.2% per year in scenario C: as explained, the potential for traffic development is higher in this part of Europe. As far as the arrivals/departures flows are concerned, ESRA East and ESRA Mediterranean markets will show higher growth rates (2.6%-3% per year) than North Western States (below 1.5% per year) in 2035, scenario C.

		AAGR 2035/ 2012 (%)		
Region	Scenario	Internal	Arr/Dep	Total ¹¹
ESRA North-West	A: Global Growth	0.9%	3.1%	2.1%
	C: Regulated Growth	0.5%	2.1%	1.4%
	C': Happy Localism	0.4%	1.8%	1.2%
	D: Fragmenting World	-0.3%	0.8%	0.3%
ESRA Mediterranean	A: Global Growth	2.1%	3.6%	3.1%
	C: Regulated Growth	1.4%	2.6%	2.2%
	C': Happy Localism	1.4%	2.4%	2.0%
	D: Fragmenting World	0.6%	1.4%	1.1%
ESRA East	A: Global Growth	3.1%	4.2%	4%
	C: Regulated Growth	2.2%	3.2%	3%
	C': Happy Localism	2.3%	3.1%	2.9%
	D: Fragmenting World	1.4%	2%	1.6%

Figure 12. Domestic traffic growth will be slower on average in European North-West and Mediterranean States ('most-likely' scenario, 2035).

As shown in Figure 13, Asia/Pacific will be the most dynamic partner as a region: the average annual growth rate for flights departing Europe to this region is likely to be more than 4% in scenario C in the next twenty

years. North-Africa, Middle-East, Asia/Pacific (especially China) and Other Europe (including Russia) regions are likely to attract European traffic.



Figure 13. Average annual growth on main flows from Europe, 2035 versus 2012 ('most-likely' scenario).

¹¹ Excluding overflights

Figure 14 corresponds to Figure 1 at Functional Airspace Block (FAB) level. In the “most-likely” scenario, the Danube FAB is expected to have the highest average annual growth rate (+3.6%) followed by the Baltic FAB (+2.7%) and the FABCE (+2.4%). FABEC, the busiest FAB in Europe with more than 7 million flights to handle in the most-likely scenario in 2035 will

unsurprisingly see the weakest growth rate of all FABs (+1.4%) by 2035 as part of the slower development of this group of mature markets. This slowdown can largely be explained by the fact that growth is strongly affected by the capacity constraints: in 2035, nearly half of the number of unaccommodated flights in Europe will be found in FABEC (see section 4.2).

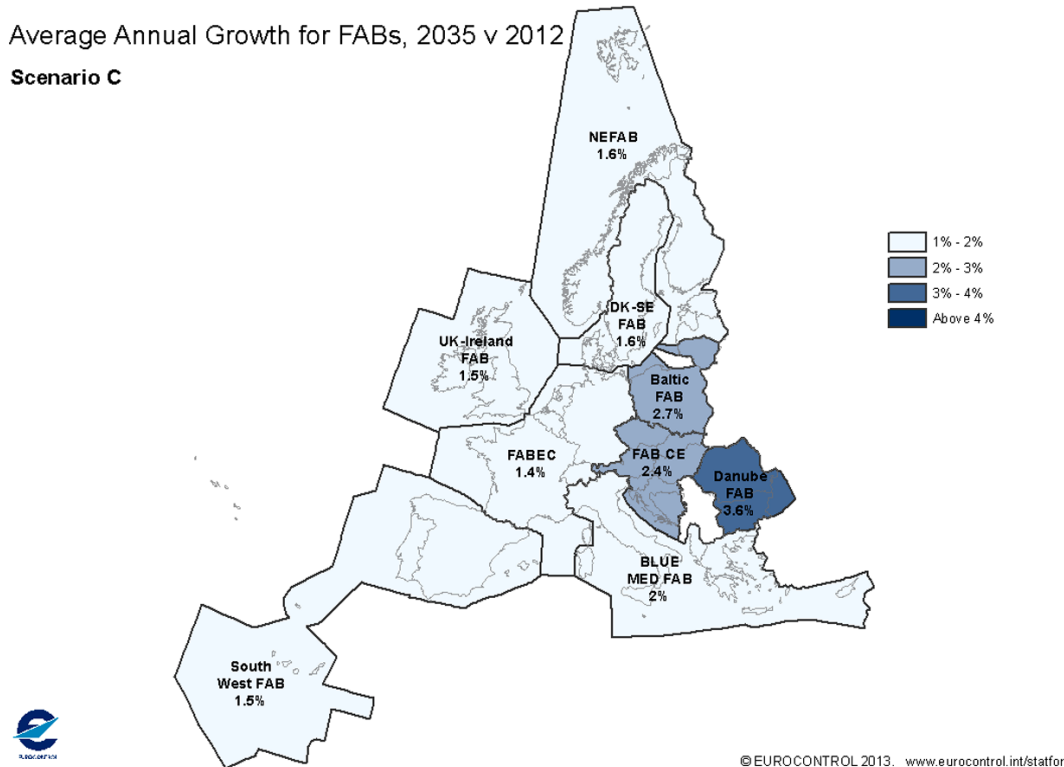


Figure 14. Average annual growth for FABs, 2035 versus 2012 (‘most-likely’ scenario).

4.2 Airport capacity

Air traffic growth will be limited by the available capacity at the airports. The combination of a lower forecast, but reduced airport expansion plans is that in the most-likely scenario, unaccommodated demand is expected in 2035 to occur on a similar scale to that previously forecast for 2030: around 1.9 million unaccommodated flights (accounting for 12% of the demand). However, when the capacity limits will be reached, congestion at airports will increase quite rapidly (especially in scenario A) which will lead to extra pressure on the network, thus more delays.

One of the major challenges of future air traffic growth identified by the previous updates of the long-term forecast and confirmed here is the capacity at the

airports available for accommodating increasing number of flights. In 2010, the 20-year forecast (Ref. 7) estimated the number of flights lost to insufficient airport capacity to be over 2 million by 2025 in its strongest-growth scenario.

This forecast uses a fully refreshed¹² set of airport capacity figures covering some 108 airports, building on: the systematic work done by the EUROCONTROL Airport unit to collect directly from the European key airport stakeholders current and future data covering (amongst others): airport capacity, significant events and works planned as well as efficiency enhancement initiatives. This homogeneous source of data, based on stakeholders’ submissions between October 2012 and January 2013, has been compiled, reviewed and validated.

¹² The set is smaller than in the CG08 study but based on a more homogeneous and validated set of data.

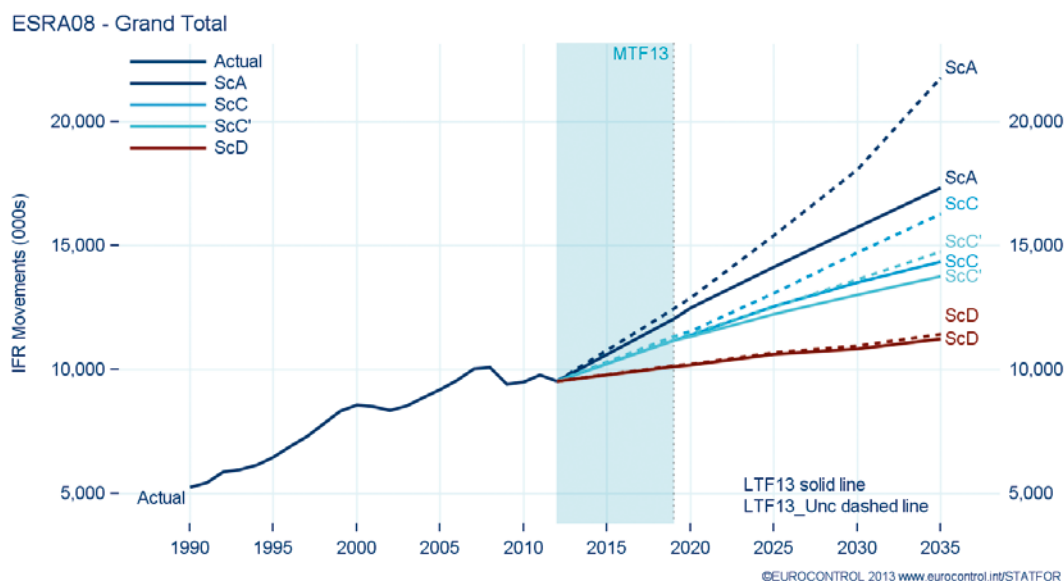


Figure 15. Demand ('unconstrained'¹³) exceeds capacity of airports.

Where information for some key airports was not available, additional data received from STATFOR User Group members (especially the Navigation Service Providers) helped completing the above mentioned sample.

The current sample of actual and future capacity data covers traffic at European airports representing 83% of the 2012 of all European flights in 2012, 8.1 million flights in total, either departed from or arrived at one of these airports. Over the next 20 years, the capacity¹⁴ of the system is expected to increase by 17%, not evenly distributed across the 108 airports. This is a lower percentage of capacity expansion compared to the LTF10 figure which was 40% (over 155 airports). The comparison of the unaccommodated demand with the previous forecast is made difficult as the set of airports with future capacity limits has been fully revisited aiming at being more reliable. Moreover, in the tough economic context: the lack of revenue, the difficulty in obtaining finance and the growing resistance to transport infrastructure projects (e.g. noise, see sections 5.2 and 5.3), some airports reconsidered their plans. Out of the 13 airports which contributed significantly to the capacity growth in LTF10, 12 have cut back their expansion plans.

Along with these difficulties in implementing capacity plans, the decline in traffic experienced in 2009-2012 and into 2013 has lifted the pressure on airport

capacity, giving the system some extra years to react and adapt. With a slower than expected recovery of growth and a return to previous 2008 record flight-counts now delayed to 2016, it may seem that airport congestion is less of a problem for the next few years. It is, indeed, recognised also by the 7-year forecast published in February 2013 (Ref. 5) which estimates the number of unaccommodated flights in 2019 to be only around 0.14 million departures, 1.2% of the expected 'unconstrained' demand in the most-likely (base) scenario. But, as Figure 15 illustrates, in the longer-term the demand will grow, the number of movements at European airports will increase, and the airports will be busy and not always able to fully respond.

The reduction in traffic is in fact also responsible for the future difficulties for airports to respond to the lack of capacity. In the tough economic environment, air industry operators remain under pressure: fewer flights means less revenue at airports, thus fewer possibilities to finance future expansion plans.

The impact of capacity limits on the network are estimated in Figure 16:

- In the most-likely scenario *C: Regulated Growth*, around 1.9 million flights will be lost, approximately 12% of demand in 2035. This is less than in LTF10 in terms of flights, about the same in percentage terms, mainly because of overall lower forecast

¹³ When we refer to demand throughout this report we always mean 'unconstrained' demand, i.e. demand 'not constrained' by airport capacity which is essentially a supply-side limit.

¹⁴ The capacity limits at airport are not varied by scenario.

	Unaccommodated IFR Flights (million)				Unaccommodated demand (%)			
	2020	2025	2030	2035	2020	2025	2030	2035
A: Global Growth	0.4	1.3	2.3	4.4	3%	8%	13%	20%
C: Regulated Growth	0.2	0.5	1.2	1.9	1%	4%	8%	12%
C': Happy Localism	0.1	0.3	0.6	1.0	1%	2%	5%	7%
D: Fragmenting World	0.0	0.1	0.1	0.2	0%	1%	1%	2%

Figure 16. In the most-likely scenario, almost 2 million flights will be lost to airport capacity constraints.

Unit: reduction in total flights (excluding overflights) when airport constraints are taken into account

levels compared to three years ago (see section 4.6 for a discussion of results in the two forecasts). The unaccommodated demand of 2 million flights previously expected to be lost in 2030 in the LTF10 will now only happen five years later. The recent drop in traffic has given the system five extra years to react.

- In the fastest growing scenario *A: Global Growth*, the LTF13 estimates around 4.4 million flights to be lost due to airport capacity shortfall in 2035, corresponding to 20% of the unconstrained demand. The corresponding congestion levels are also delayed compared to the previous forecast, but as in the previous forecast, once the limits are reached, the congestion spreads and the number of unaccommodated flights grow quickly (almost doubling between 2030 and 2035).
- Scenario *C'* and *D*, as a result of slower traffic growth rates, will reduce the demand at airports compared to the other scenarios. In 2035, the system will only be unable to accept the demand for 1 million flights in scenario *C'* and 0.2 million in scenario *D*.

The mismatch between capacity and demand is not the same across Europe. There are regions where the shortfall is likely to be bigger: Turkey will be the most penalised facing almost 30% excess of demand for arrivals and departures at their airports in the most-likely scenario *C* by 2035. Other States located mostly

in Eastern Europe, like Bulgaria, Hungary, Romania will have around 17%-22% (each) excess of demand not accommodated by 2035 in the scenario *C* (Figure 17).

Two further tasks of *Challenges of Growth 2013* study investigate the impact of lack of airport capacity:

- Network congestion (Ref. 3) quantifies the network impact of operating highly congested airports.
- Mitigation (Ref. 2) examines some of the potential solutions to lack of capacity.

Of course, the airport capacities used here are not the final word on what capacity will be available in 2035: new projects may be launched, operations can be further optimised to squeeze more out of existing infrastructure, and more investments may be secured. Yet, at the same time, projects currently foreseen may be delayed, reduced in scope or even cancelled. Comparing data from the 2008 *Challenges of Growth* and now provides plenty of examples of plans being extended, or being scaled back.

Therefore the figures cited in this section should only be an indication of the expected trends, they are likely to change as airports develop and adapt to the increasing demand. Nevertheless, this section reiterates and reconfirms the airport capacity challenge identified by the previous studies (*Challenges of Growth* publications¹⁵ since 2001).

¹⁵ <http://www.eurocontrol.int/articles/challenges-growth>

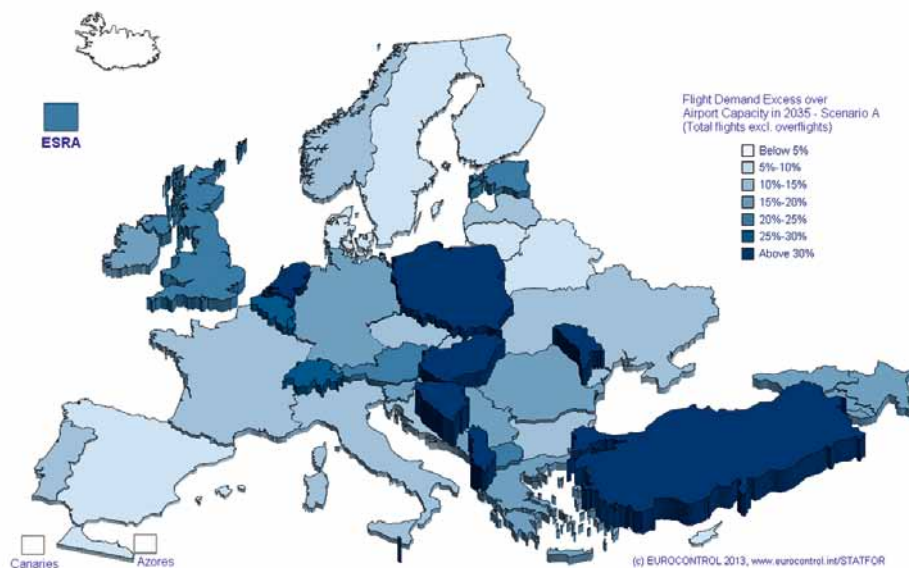


Figure 17. Demand excess for total flights excluding overflights (Scenario A, 2035).

4.3 Airport and airline network

More traffic in Europe will mean busier airports. In 2035, 20 airports will handle more than 150,000 departures a year in the most-likely scenario, a level of traffic currently achieved only at 8 airports in Europe. Some faster-growing airports in Southern and Eastern Europe will join the top 25.

Different airports play different roles in the European network, some being specialised in specific markets by targeting customer groups (e.g. low-cost airports providing point-to-point service to serve short-haul destinations operated by low-cost carriers, city airports mostly frequented by business passengers working for industries located in the city), others attracting additional passengers in extending their catchment area, or by acting as hubs for major carriers. Figure 18 illustrates how the number of busy airports in Europe will increase over the next 20 years. For example, in the most-likely scenario C there will be 20 airports with over 150,000 departures per year, a level of traffic that only 8 airports in Europe handled in 2012.

As explained in section 4.1 States in Eastern Europe will grow more quickly. As a result, a number of airports in this region will join the top 25 in Europe and outpace (in terms of departures) some of the current busiest airports. Many airports in Europe will reach

their capacity limits by 2035 (see section 4.2): precise rankings are sensitive to small changes in growth, but we would expect to see more airports from Turkey, Ukraine and Poland amongst the busiest.

Overall, traffic is likely to concentrate somewhat more across the airport network: while, in 2012, the top 10 airports accounted for around 23% of all departures, it will be 31% in 2035 in the most-likely scenario.

Airlines' strategies for capturing their market share change and evolve in time. In building and updating their network, airlines opt either for hub-and-spoke or point-to-point operations depending on many factors: target passenger market, operating cost profile, slot availability at airport, code sharing strategy to enlarge the possible destinations etc. In the current difficult economic context, there is also a trend for airlines to increasingly form alliances to create more cooperative relationships, and get access to hubs of partners. As further States negotiate bilateral air services agreements with the EU, the market will continue to open to more competition from non-European airlines. If European carriers have to compete with non-European airlines for market shares on specific routes, passengers are nevertheless favoured, being offered more possibilities (price and connectivity) when planning their trips. For example, strongly growing Middle-East carriers offer competitive connections to Middle-East and Asia/Pacific or Southern Africa through their hubs outside Europe.

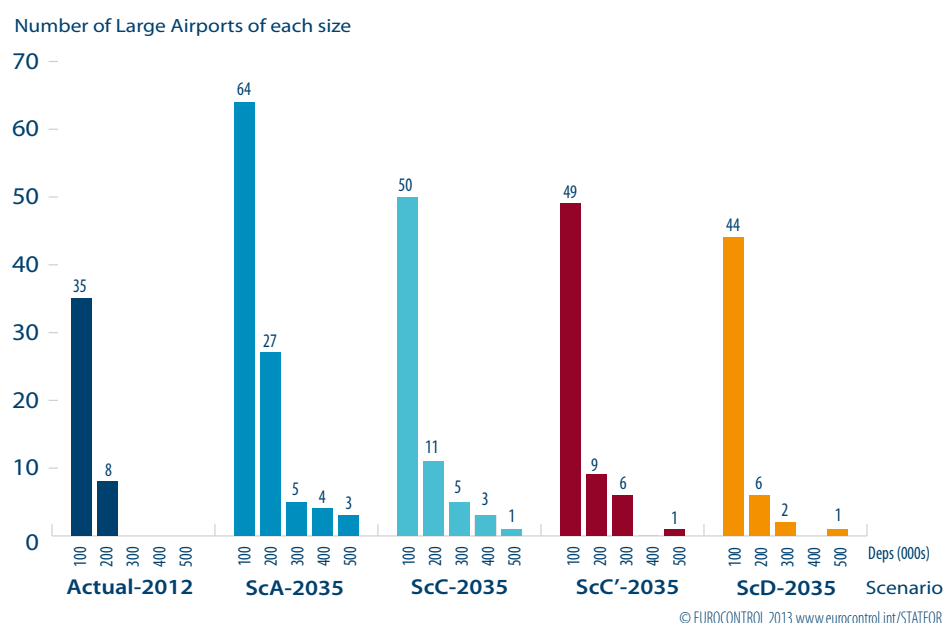


Figure 18. More, larger European airports.

Note: Upper and lower bounds for the columns are $\pm 50,000$.

Figure 19 shows the effect¹⁶ of hubbing assumptions in the LTF on demand for departures from European airports (before constraining with airport capacities). Figure 20 shows the map of differences.

- Scenario C, most-likely, assumes the growing importance of Middle-East as well as European hubs (emphasis on Istanbul) over the next twenty years. This represents an additional 1.9% demand for departures when compared to the 2035 forecast having the same hubbing patterns as now.
- Scenario A assumes increasing share of Middle-East and Istanbul hubs but reduced hubbing

share everywhere else in Europe. Compared with a forecast with no specific hubbing assumption, the expected change in departures would be a reduction of 0.7% from European airports in 2035 since the passengers will more transfer outside Europe, though a little bit in Turkey.

- Scenario C' favours more point-to-point traffic within Europe and gives importance to Middle-East hubs. This will represent a reduction of 1.7% of the demand for departures in 2035, compared to a 2035 forecast with similar hubbing situation as now. This the scenario with the highest number of flights "lost" out of the 3 scenarios.

	Change in flights (000s)				Difference in 'unconstrained' demand for flights (%)			
	2020	2025	2030	2035	2020	2025	2030	2035
A: Global Growth	-8.8	-56.3	-108.5	-162.6	-0.1%	-0.4%	-0.6%	-0.7%
C: Regulated Growth	17.0	108.1	210.5	318.0	0.1%	0.8%	1.4%	1.9%
C': Happy Localism	-13.7	-87.9	-173.6	-269.4	-0.1%	-0.7%	-1.2%	-1.7%

Figure 19. Transfers of connecting flights from Europe to Middle-East hubs decreases demand for departures from Europe for scenarios A and C'.

¹⁶ This comparison estimates the percentage difference in demand between the unconstrained forecast with hubbing hypotheses (see Figure 4) and the unconstrained forecast without hubbing change. Scenario D is not shown as it does not involve any change in hubbing from now.

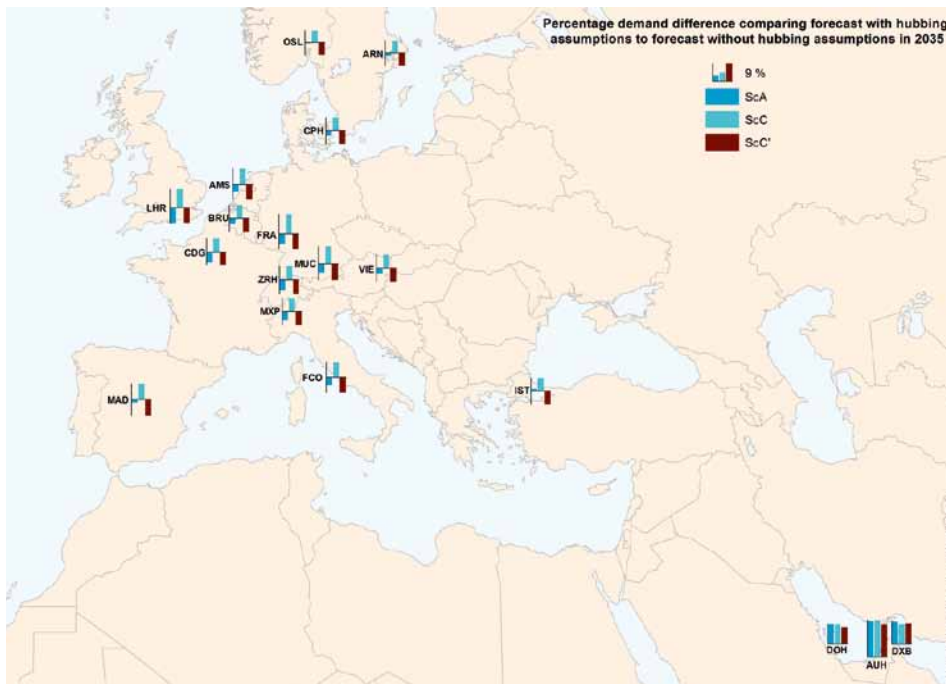


Figure 20. All scenarios (but ScD) count on bigger hubbing effect at Middle-East airports by 2035.

Note: 9% corresponds to the percentage difference for LHR in ScC.

4.4 Travel distance and aircraft size

Passengers will travel more long-haul in 2035 than in 2019; the average distance per journey will increase by around 8% between 2019 and 2035 for European departures. The average distance per flight will change at the same rate. The fleet will evolve and the increasing demand for long-hauls will be served by more "large to very-large" aircraft offering greater seating capacity.

In the forecast, there are a number of factors weighing on the travel distances: new free trade and opens

skies agreements, new states joining the EU, changing hubbing and holiday destinations preferences, weakness of domestic flows etc. All of these factors, blended into the forecast method, have interlinked effects on the passenger demand.

Figure 21 illustrates the increasing length of journeys: in all four scenarios there will be relatively fewer trips below 900 miles (circa 1500km, short-haul) in 2035 than in 2019. More passengers will be flying to destinations over 900 miles. In result, the average distance per journey will increase by some 8% between 2019 and 2035, in scenario C.

Changing distance per passenger departing from ESRA in LTF13

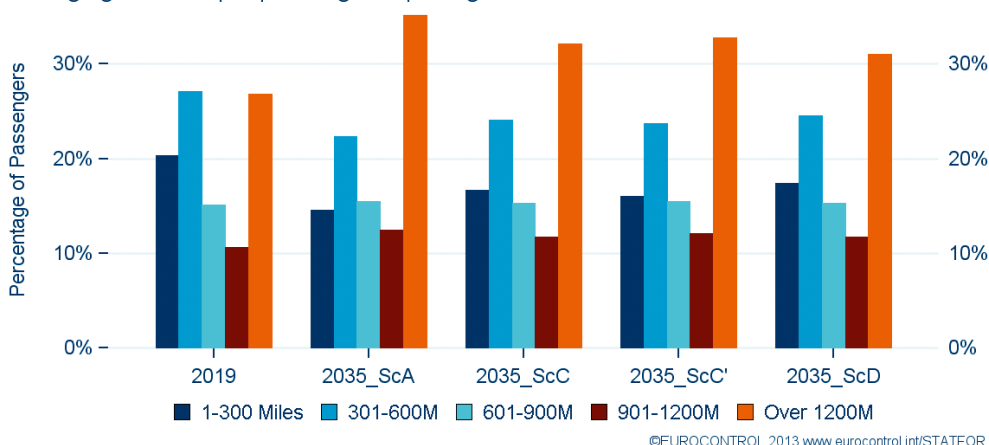


Figure 21. An increasing proportion of passengers travel long-haul, regardless of the scenario.

Changing distance per flight Total in LTF13

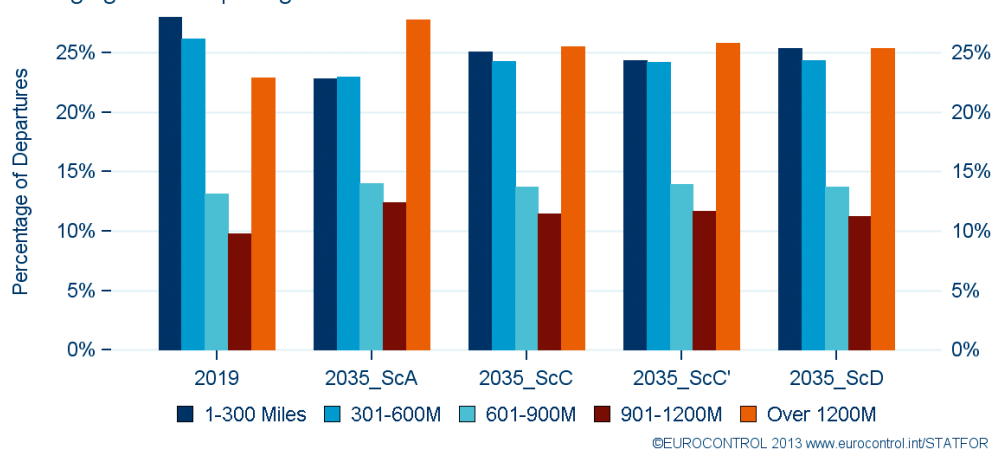


Figure 22.
Proportion of long-haul flights will increase by 2035 (versus 2019) in all scenarios.

As for the passengers, the proportion of long-haul flights will slightly increase in all scenarios. People will on average travel farther and the average distance per flight will increase in parallel. Figure 22 suggests that all scenarios will see an increase in proportion of medium- and long-haul flights between 2019 and 2035. As a consequence, the proportion of short-haul flights will shrink accordingly. In numbers, the average distance per departing flight will increase by some 7% between 2019 and 2035, in the most-likely scenario.

Between 2019 and 2035, the flights will not be flown by the same aircraft; in particular long-haul flights will be operated by larger aircraft to serve the higher numbers of passengers travelling long-distance.

The fleet in Europe develops. Airlines focus on the most efficient and economical utilisation of their aircraft; they can opt between increasing frequencies

or size of aircraft to offer more seating capacity, they balance their fixed and operating costs and plan their fleet renewal accordingly. Manufacturers compete in capturing the market and offer new types of aircraft on both ends of the size-spectrum with better fuel-efficiency and emission parameters.

Figure 23 shows how the average aircraft size changes in the LTF13 scenarios. In all four scenarios, long-haul flights are served with bigger aircraft. The most-likely scenario the average will offer on average around 1.3%¹⁷ more seating capacity per flight each year¹⁸. Larger aircraft are used for short-haul flights in the environmental scenario C: *Regulated Growth*.

The technological and steady economic growth in scenario A: *Global Growth* also captures more passengers on short-haul by offering higher seating capacities.

	Average annual change in aircraft size (seats/flight)					Total
	1-300 Miles	301-600M	601-900M	901-1200M	Over 1200M	
A: Global Growth	1.1%	0.8%	0.6%	0.5%	1.3%	1.2%
C: Regulated Growth	1.3%	1.1%	0.9%	0.8%	1.3%	1.3%
C': Happy Localism	0.1%	0.9%	0.6%	0.5%	1.6%	1.0%
D: Fragmenting World	0.4%	1.2%	0.8%	0.7%	1.7%	1.1%

Figure 23. Aircraft size increases faster for long-haul.

¹⁷ 1.0%-1.3%

¹⁸ These would mainly correspond to very large jets Airbus380 or Boeing 747 derivatives.

4.5 High-speed train

High-speed train both competes with and complements short-haul passenger air transport. Over 50 city-pairs will be connected by new or improved links between 2019 and 2035. Passengers opting for rail will reduce the demand for flights by a little over 0.5% in 2035, often easing the pressure at congested airports rather than reducing the number of operated flights.

One of the major competitors of short-haul air transport is high-speed train (HST). Operating at high speeds, the train can offer comparable transport times for distances up to 800km (Ref. 10). It can also successfully attract passengers by providing in some cases a lower risk of delay, less security hassle, shorter distance to the city centre. HST can sometimes also be perceived as more comfortable (new trains) and more 'green' means of transport and possibly other aspects depending on personal preferences of travellers (loyalty programmes). There are cases of 'comodality' where HST provides feeder services to air travel, but in this analysis our focus is on the reduction in short-haul flights that results from this.

The LTF focuses on the speed of air travel over rail transport as the major factor for capturing the share in

the market. The high-speed rail network continuously develops, new links are built, new connections added and connecting times improved. The LTF13 considers improvements on over 50 city-pairs from projects¹⁹ being finished between 2019 and 2035. These are schematically pictured in blue in Figure 26.

Due to more passengers opting for high-speed train instead of travelling by air, the 'unconstrained' demand for flights (in principal short-haul) will be reduced by somewhat of 0.6% overall in total Europe by 2035 in the most-likely scenario. The HST network does not develop in all parts of Europe to the same extent. Even if the HST network are cross border, the States with more projects in the pipeline are likely to see stronger reduction in demand for flights by 2035 (Figure 25), such as France and Spain (2.5% each) or Sweden (-3%).

The reduction in demand for flights does not directly translate in a reduction of operated flights. Increasingly, the high-speed train connects the major urban areas and notably where the airports are highly congested. This could result in easing the pressure on airports, freeing some capacity at strategic bottlenecks within the network, thus reducing the level of unaccommodated flights.

	Reduction in 'unconstrained' demand for flights (%)			
	2020	2025	2030	2035
A: Global Growth	-0.2%	-0.5%	-0.5%	-0.6%
C: Regulated Growth	0.0%	-0.4%	-0.5%	-0.6%
C': Happy Localism	-0.2%	-0.5%	-0.5%	-0.6%
D: Fragmenting World	.	0.0%	-0.4%	-0.4%

Figure 24. Improved high-speed train connectivity reduces demand for flights.

Reduction in 'unconstrained' demand for flights (%)	
C: Regulated Growth	LTF13
	2035
Denmark	-0.8%
France	-2.5%
Germany	-0.5%
Italy	-0.7%
Spain	-2.5%
Sweden	-3.0%
Switzerland	-0.7%
UK	-0.6%

Figure 25. Effect of improved HST by State

¹⁹ TEN-T priority projects, Alpine tunnel, LGV Sud Europe Mediterranee links, etc. This figure excludes city-pairs which are too close to have a viable air link (Brussels-Lille for example).

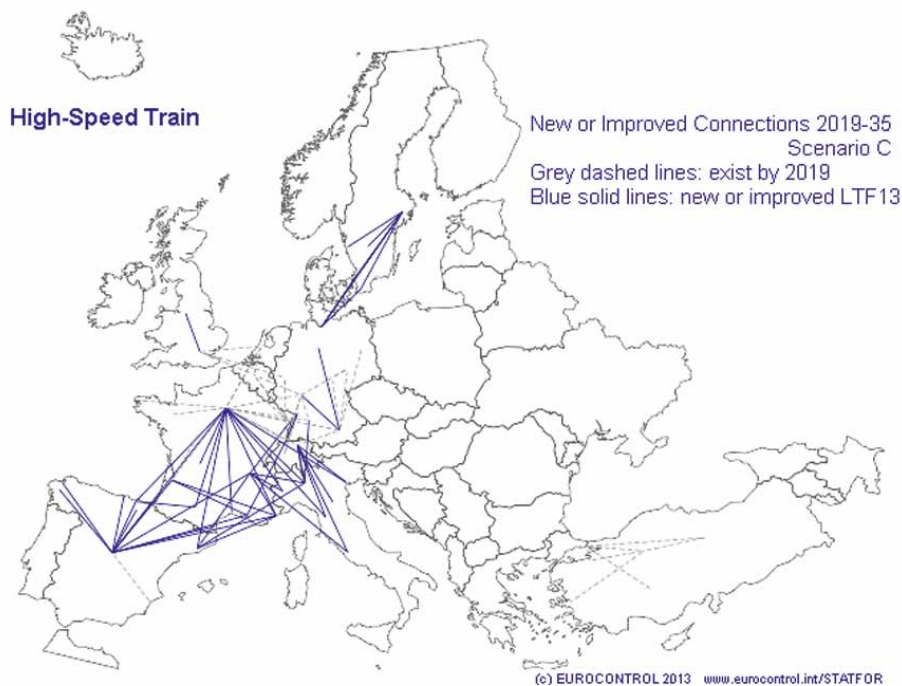


Figure 26. High-speed rail network mostly develops in Western Europe²⁰

A wider analysis of possible effects of offering high-speed train connections as an alternative to short-haul flights has been conducted in Ref. 2, an analysis using a much-extended hypothetical HST network.

4.6 Comparison with previous forecast

LTF13 has different growth in traffic compared the last long-term forecast prepared in 2010. Due to the economic downturn leading to slower traffic growth rates than expected, the LTF13 starting point is lower. After 2020, the baseline economic growth is also expected to be slower by around 0.5%. The LTF13 expects between 3.4 and 5.2 million fewer flights in 2030 than what was forecasted in 2010. The most challenging scenario of the current forecast (A: Global Growth) is slightly below the previous most-likely scenario (C: Regulated Growth), translating a severe downwards revision.

The last EUROCONTROL Long-Term Forecast was published in the end of 2010 (Ref. 7). It used the latest EUROCONTROL 7-year forecast (MTF10b) published in September 2010 as the baseline (Ref. 11) and it developed four scenarios for the future of air traffic up to 2030: A: *Global Growth*, C: *Regulation & Growth*, D: *Fragmenting World* and E: *Limit Resources*. Of these, scenarios A, C and D have been mostly re-used in the current LTF scenarios. A comparison of the LTF10 with the current forecast (LTF13) is presented in Figure 27. Scenario E, not represented in the LTF13, is excluded from the discussion below. However a short projection of the implications of such a scenario is given in section 4.7.

When comparing the two forecasts, all of the LTF13 scenarios have lower traffic in 2030 than the previous LTF10 most-likely scenario. The main reason is the much lower baseline traffic for the LTF13. The LTF10 was produced based on the MTF10b, a forecast showing average annual growth rates of traffic of around 3% (+/-1.2%).

²⁰ In this simplified schematic view city-pairs are connected by direct lines instead of following the railroad network. The diagram does not show the whole network, only changes between 2012-2019 and 2019-2035.

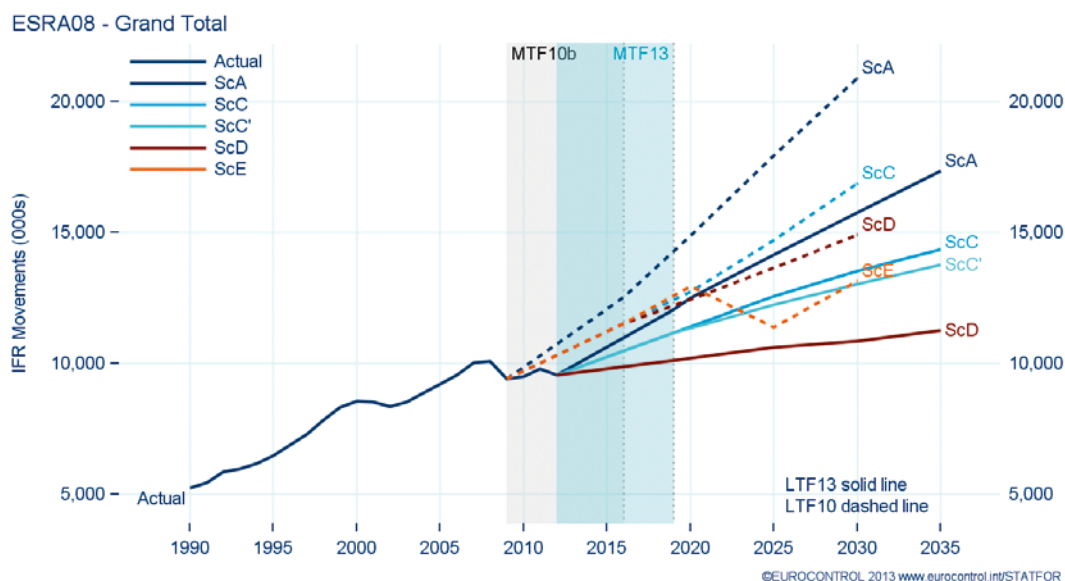


Figure 27. All of the LTF13 scenarios have lower traffic in 2030 than the previous LTF10 most-likely scenario.

LTF10 was prepared just after the 2009 economic downturn. At the end of 2010, economists were expecting on an improvement of the economic situation, supported by the fact most European States had exited recession. A recovery in traffic was therefore predicted. This was partially confirmed in 2011, but the European economies weakened again in 2012, and other events affecting air industry (airline failures, Arab spring) led to a downwards revision of the traffic forecast over all.

This lower-than-previously²¹-expected economic growth in the short-term also had an impact on the medium- to long-term economic growth. The EU economic growth rates used in this forecast have been reduced by 0.5 p.p in the medium-term and by 0.8 p.p from 2025 compared to those used in the 2010 forecast.

In 2010, oil prices were fluctuating around \$85 per barrel, well below the 2008 peaks (\$145/barrel). Since then, oil prices have jumped again, painfully high to

around \$110 during the first 4 months of 2013. This adds to the pressure on airline costs.

The current 20-year forecast has been prepared based on the most recent 7-year forecast published in February 2013 (Ref. 9). In the baseline, the average annual growth rate of traffic between 2012 and 2019 is 2.3% (+/-1.2%) which is lower than the LTF10 assumptions. The lower levels of traffic in 2035 are then related to a lower baseline and the slowdown in traffic growth rates.

Also having an impact on traffic development, this forecast relies on reduced capacity plans: while LTF10 was counting on the main airports reporting plans to expand by around 40% in 20 years, now they only report plans to grow by 17%. This difference weighs on traffic development.

²¹ Pre-crisis, ie before 2009.

4.7 Risks

Users of the forecasts are strongly advised to use the forecast range (from scenario D to scenario A) as an indicator of risk. These four scenarios only cover a limited range of possibilities. Also, this flight forecast elaborates on a medium-term flight forecast prepared in the conditions of unstable economic situation with serious risk of further aggravation and downside effects on traffic development.

The main sources of uncertainty in the forecast are:

- The economic forecasts used here were updated in January 2013. The economic outlook remains uncertain and the return to growth has been delayed. Experience of recent years suggests that we could still see further downward revisions in growth, and **further delay of the recovery**. The low scenario provides some guidance here.
- More generally, future **network changes** (e.g. new routes) are not modeled by the forecast. The possible opening of Kosovo airspace is an up-side risk for some States, but a downside risk for others.
- **Tourism trends** are quite variable. The medium-term forecast aims to be accurate over the seven-year period, rather than identifying which will be the new holiday “destination of preference” in a given year. The recent political instability in both Egypt and Tunisia has led to more variability in tourism destinations.
- **Oil prices** remain changeable with oil being increasingly an item of speculation and investment. With fuel accounting for 25-35% or even more

of costs of the airlines, this can have an effect on fares and cost of travel for customer. As far as oil is concerned, some assumptions have been made to produce the forecast, but there are some risks to be considered, as much can change over the next twenty years. In particular in the LTF10, the scenario *E: Resource Limits* was assessing the quantitative effects on European traffic of a theoretical possibility of World oil production reaching its peak in 2020. If we were to explore the consequences of a same possibility on the most-likely scenario, we could expect a 10-year break in traffic growth between 2020 and 2030, meaning that there would be just over 12 million flights in Europe in 2035, representing a loss of 2.2 million flights compared to the scenario C. The annual growth rate over the period would average around 1% a much slower rate than the 1.8% expected in the most-likely scenario.

- Participation of aviation in the **Emission Trading Scheme**, currently under intense debate, was not integrated in the 7-year forecast²² but factored in into this forecast via assumptions on CO₂ costs from 2020 onwards. However, such regulatory measures (eg. new tax regimes or further environmental limits) contribute to the uncertainty of air transport growth, can be introduced rapidly and change the local outlook for flight growth.
- **Terrorist attacks, wars and natural disasters.** The last seven years have not been quiet ones for aviation. There is no reason to believe the next seven years will be uneventful, with the effects of a further volcano eruption or an H1N1 flu pandemic being some of the risks. The impact on air traffic could be a temporary one, or more significant.

²² Predecessor of this 20-year forecast.

5. ENVIRONMENTAL IMPACT

Technological and operational improvements will continue to reduce aviation's relative environmental impact. However, even with moderate traffic growth, overall impacts will increase, although they may be considerably mitigated.

The environmental impacts of aviation are both global (e.g. CO₂ emissions from burning fuel) and local (e.g. noise and local air quality impacts). Moreover, there are often difficult trade-offs to be made between the various impacts. The Challenges of Growth 2008 Environment Technical Report presented a comprehensive overview of aviation's environmental challenges and the main issues have not changed significantly since its publication (see Ref. 12).

Aviation industry stakeholders have long been working to reduce such environmental impacts, with notable results. Current average aircraft noise levels are around 20 dB lower than 40 years ago and within Europe average emissions of the greenhouse gas carbon dioxide (CO₂) per passenger kilometre (pkm) have fallen from over 160 grams CO₂ per passenger km in 1995 to under 120 grams CO₂ per pkm in 2010, although to some extent such improvements have been offset by traffic growth (see Ref. 13, 14).

Operational and technological improvements and challenging political targets, will undoubtedly continue to reduce the relative environmental impact of aviation (see Ref. 27 and Annex E). However, even at the modest levels of growth forecast in scenario C, without an unforeseen step change, improvements in aircraft technology are unlikely to outstrip growth in the medium-term. Consequently, the overall environmental impact of aviation is likely to increase out until 2035, although it may be considerably mitigated.

5.1 Global Impacts

European aviation's absolute CO₂ emissions will continue to grow but at a slower rate than traffic. Emissions per passenger km may decrease by up to 2% per year if fuel efficiency and traffic forecasts evolve as expected.

In the LTF's outward-looking scenarios C and A, the contribution of aviation to the European economy will increase as the world becomes ever more connected and international trade and tourism expand. However this will be mirrored by a growing necessity to ensure

that the aviation industry develops in a sustainable manner. Globally, CO₂ emissions will become an increasing constraint, gaining in international political importance as the impacts of climate change are more widely experienced. In 2011 civil aviation accounted for around 3.5% of CO₂ emissions in Europe (see Ref. 15). However, as other industries decarbonise, this proportion will increase, driving political pressure to reduce the sector's emissions. Other factors such as resource use will also grow in importance leading to increasing focus on the 'cradle to grave' aircraft lifecycle (see Ref. 12 and 16).

Current growth forecasts are substantially lower than historical trends, enabling the projected emissions gap to be reduced: lower demand will lead to a lesser increase in absolute emissions whilst facilitating fuel efficiency. In scenario C, currently considered the most-likely scenario, aviation's environmental impacts are mitigated by a combination of technological and operational improvements. This is complemented by strong regulation which introduces more stringent standards and drives fuel efficiency whilst minimising the impact on passenger demand. Lower fuel costs are unlikely to decrease incentives to improve fuel efficiency due to the attendant reduction in operating costs and carbon dioxide emissions. Progress in the development of low-carbon alternative fuels is also expected to make a contribution to overall emissions reductions, although uncertainties remain as to the rate and scale of development (Ref. 17, 18 and Annex F).

This combination of operational, technological and regulatory measures will permit intra-European (SES) traffic to grow by around 25% whilst carbon dioxide emissions increase by considerably less. For flights arriving and departing from Europe, growth in emissions will be less than half of the forecast increase in traffic for 2035. Although absolute emissions will grow, emissions per passenger km will continue to fall. Assuming an annual fuel efficiency improvement of 1% from operational and technological improvements in combination with the trend towards larger aircraft and higher load factors, a 2% per annum decrease in CO₂ emissions per pkm is not unrealistic. This is arguably high compared to recent forecasts which posit that similar international targets for fuel efficiency

are not achievable without additional measures, and the need for such measures in Europe is certainly not negated (see Ref. 19). However, traffic growth in Europe is expected to be much slower than in other regions whilst uptake of new technologies should not be affected due to the need to reduce fuel costs and improve environmental performance. If such a trend were sustainable, it could see overall emissions per passenger km fall by almost 40% by 2035 (compared to 2013), although this is undoubtedly ambitious and would be highly dependent on achieving expected technological and operational improvements.

In scenario *C*, the inward perspective which leads to more moderate growth and reduced expansion of long haul markets translates to a smaller increase in emissions and a greater reduction in emissions per aircraft movement. Growing environmental concerns will increase pressure for sustainable travel and promote the adoption of environmentally beneficial technologies. In scenario *D*, the reduction in intra-Europe traffic causes absolute emissions to decrease, although the continuing mitigation of aviation's environmental impact will be dependent on achieving ongoing improvements in a politically and economically unstable environment.

Although it may be low by historical standards, scenario *A*'s average annual growth rate of 2.6% constitutes the LTF's most challenging environmental scenario due to the larger increase in traffic. However, overall emissions increase at a slower rate as stronger growth drives technological improvements and fleet renewal, thus hastening the introduction of better performing aircraft. Consequently, whilst intra-European traffic may grow by up to 50%, emissions will increase by around a third and emissions per passenger km will have the potential to decrease by around 2% per year. However, achieving such technology-driven sustainability benefits will be challenging and will depend on investment and regulatory support in preceding years (see Ref. 18). Further, in higher growth scenarios, the pressure of traffic growth on already constrained capacity at many European airports may reduce performance and increase inefficiency (see Ref. 3). This may lead to increased fuel burn and emissions through, for example, increased holding or delayed departures.

By 2035, aviation's non-CO₂ climate impacts, such as contrail formation and en-route NO_x emissions, are likely to be much better understood. In turn, this may lead to the introduction of technical, operational and regulatory measures to control and limit their

production. Eventual decisions will need to be made according to the available scientific evidence. This may involve trajectories that are not optimised for fuel use and thus trade-offs with CO₂ production.

5.2 Local Impacts

Technological improvements will continue to reduce aircraft engine noise although may be offset by traffic growth and evolving public perception.

Noise, with its immediate and tangible effect on local communities will remain a key constraint in a moderate growth scenario. Advances in reducing aircraft engine noise can be expected as engine by-pass ratios continue to increase and older, noisier aircraft are phased out, although some of this benefit may be offset by the introduction of lower emission open rotor aircraft on regional routes.

Despite improvements in technology which will decrease the actual noise impact per flight, growth in air traffic demand may lead to an increase in populations affected by aircraft noise (Ref. 12). This may trigger more stringent regulatory measures, such as more restrictive noise abatement procedures and airport operational noise quotas and curfews, a further challenge to constrained capacity. However, this may be countered by more stringent noise certification limits which will drive technology development and fleet replacement. Such standards will continue to be revised as technology improves with potentially decreasing lengths of time between the introduction of new certification limits; 29 years passed between the implementation of Chapter 3 and Chapter 4 whereas the gap between implementation of Chapter 4 and its successor will be 11 years. There will also be an increased focus on ATM to mitigate impacts e.g. through operational measures which reduce noise or through noise distribution. Development of land-use planning, where control is dependent on local regulations, will also influence the extent of future population exposure to aircraft noise.

Currently demonstrated trends towards the onset of annoyance at lower levels of actual noise may be a bigger concern and may lead to increased opposition to airport expansion, in particular the construction of new runways (see Ref. 12 and 20). This may be exacerbated by the trend towards larger aircraft to accommodate increased demand on existing routes, particularly in scenarios *A* and *C*, as there will be a proportional increase in larger noise events. Moreover,

with a shift towards high-speed trains between some city pairs, and the demand for intercontinental travel continuing to grow, some short-haul may be released to accommodate larger aircraft serving long-haul routes with a similar increase in noise impact per movement (see Ref. 12). Again, this is most likely in scenarios A and C.

The introduction of new-generation aircraft with reduced engine noise but requiring longer take-off runs at higher thrust due to their greater weight may also modify local noise patterns. As discussed in CG13 Task 8 (see Ref. 4), in the medium to long term the increased take-off runs and reduced climb rates which may be required as the climate changes and temperatures rise may also serve to modify ground noise contour shape and size. Such redistributions of noise impact may exacerbate the trend towards the onset of annoyance at lower levels of noise (see Ref. 21).

Growth in traffic may also lead to an increase in local air quality impacts, despite ongoing technological and operational improvements. Impact will vary with location, scale of operation and the relative contribution of other local sources. However, in areas where relative concentrations from other sources such as road transport are reduced, any increase in aviation's impact will be more tangible. Trends in public opposition on the grounds of air quality and odour suggest that this may be a bigger constraint in future. If local air quality regulatory limits are exceeded, or more stringent limit values introduced, this may impose an environmental cap on capacity. For a more detailed discussion of air quality issues (see Annex 4 in Ref. 12).

expansion is a complex issue and some opposition may be intractable. In the medium to longer term, forecast demand evolution may also be altered by climate change impacts (see Ref. 4).

5.3 Uneven Impacts

Evolution of environmental impacts is linked to changes in demand and thus will vary throughout Europe.

Just as the evolution of traffic growth will not be even throughout Europe, the evolution of environmental impacts will not be uniform (see Figure 1). To a large extent it does not matter where CO₂ is emitted as its impact is a result of overall atmospheric accumulation, although this will of course impact national emissions inventories and airport carbon targets. However, of greater significance will be local impacts, particularly noise. High growth in traffic at a location may expose new populations to aircraft noise, potentially inciting new community opposition. This may be offset to some extent by increased employment opportunities and economic growth. However, resistance to infrastructure

6. GLOSSARY

AAGR	Average Annual Growth Rate
BRIC	Brazil, Russia, India, China
CG08, CG13	Challenges of Growth 2008, 2013
CONSAVE	Constrained Scenarios on Aviation and Emissions programme
Co-modality	Efficient use of different transport modes on their own and in combination
Constrained	Forecast constrained by capacity limits at major airports
Demand	Unconstrained demand (demand before constraining by airport capacity)
ECAC	European Civil Aviation Conference
ESRA, ESRA08	EUROCONTROL Statistical Reference Area (2008)
EU	European Union
ETS	Emission Trading Scheme
FAB	Functional Airspace Block
GAT	General Air Traffic
GDP	Gross Domestic Product
HST	high-speed train
IAG	International Airline Group
ICAO	International Civil Aviation Organisation
IFR	Instrument Flight Rules
LTF	Long-term forecast (20 years)
MTF	Medium-term forecast (7 years)
pkm	passenger kilometre
p-p	percentage points
ScA	scenario A (similarly C, C', D)
SES	Single European Sky
SESAR	Single European Sky ATM Research
STATFOR	Statistics and Forecast Service of EUROCONTROL
SUG	STATFOR User Group
TR	Traffic Region (a grouping of TZs)
TZ	Traffic Zone (\approx State, except for Spain, Portugal, Belgium and Luxembourg, Serbia and Montenegro)
Unaccommodated demand	The forecast flights that exceed an airport's reported capacity.
Unconstrained	Forecast not constrained by capacity limits at major airports

Detailed explanations of the above terms and others are available in EUROCONTROL Glossary for Flight Statistics & Forecasts (Ref. 22).

ANNEX A FORECAST METHOD

Long-term forecast model

The long-term forecast uses a model of economic and industry developments to grow airport-pair traffic that is forecast by the latest MTF further into the future. It addresses passenger, cargo, military GAT, business aviation and small airport-pairs' traffic by specific sub-models and then combines the results to produce the final traffic forecast per State.

The long-term forecast method, like the medium-forecast method (MTF), uses a model of economic and industry developments to grow the baseline airport-pair traffic and produce a view of future flight movements. Each LTF is strictly linked to the latest available MTF whose final forecast year is used as the starting point of the LTF. This also means that the LTF model ignores any events that may happen between now and the final MTF year (starting year of the LTF) as these should be fully covered by the MTF. The LTF10 starts from the 2016 forecast of September 2010 update of the MTF (Ref. 11).

Figure 28 illustrates the LTF model and its sub-models which serve to produce forecasts of passenger, cargo, military GAT, business aviation and small airport-pairs flights and, after merging these, to provide the total flight forecast. Since passenger flights traditionally represent the greatest part of all IFR flights (around 85%

in 2009), the passenger traffic sub-model is the most detailed and is structured around five main groups of factors:

- Global **economy** factors represent the key economic developments driving the demand for air transport.
- Factors characterising the **passengers** and their travel preferences change patterns in travel demand and travel destinations.
- **Price** of tickets set by the airlines to cover their operating costs influences passengers' travel decisions and their choice of transport.
- More hub-and-spoke or point-to-point **network** may alter the number of connections and flights needed to travel from origin to destination.
- **Market structure** describes the size of aircraft used to satisfy the passenger demand and converts the passenger numbers into flights.

Cargo, military GAT, business aviation and small airport-pairs flights' sub-models are less sophisticated, relying more on historical evolution, sometimes in combination with economic developments.

Total forecast arrivals and departures are restricted by airport capacity before the flights are 'flown' through the airspace (assuming same routing as in the baseline year) and the final forecast of total flights per State is produced.

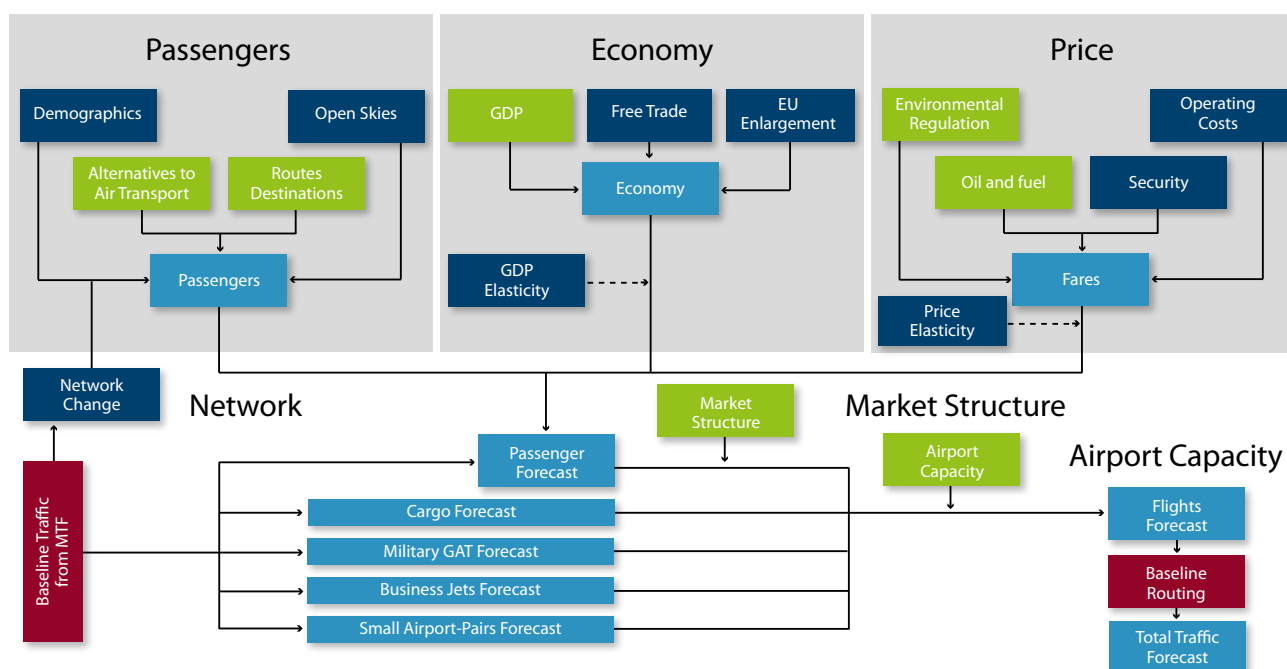


Figure 28. Overview of the long-term forecast model structure

Note: environment-related factors shown in green.

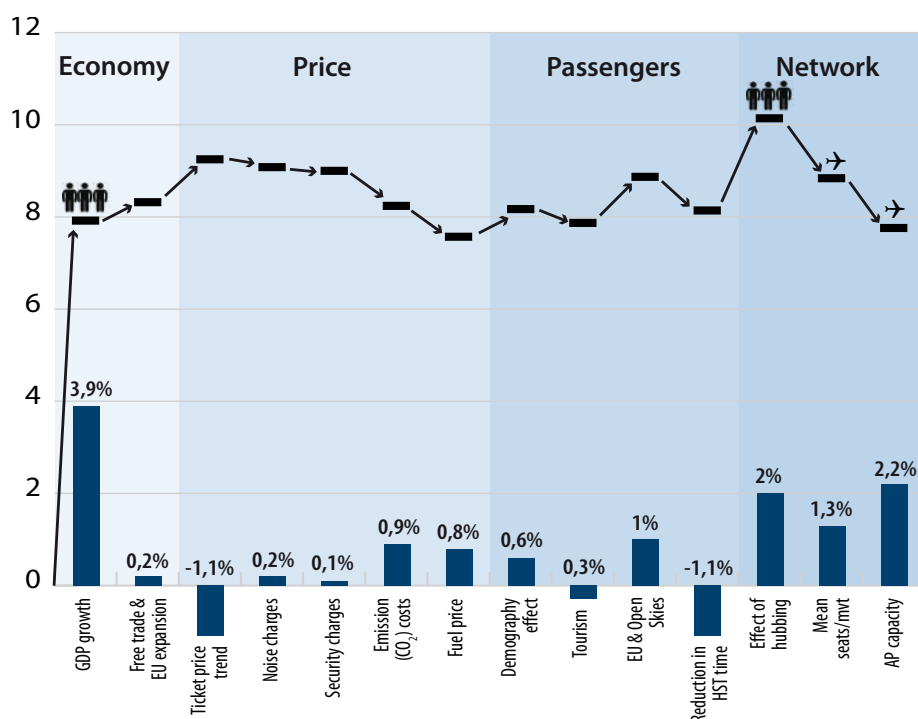


Figure 29. Mix of factors pushing the passenger demand and growth in traffic

Note: schematic simplified example

Importance of different growth factors

The forecast model combines several factors with different effects in terms of strength and direction on the future traffic growth. The 'economy'-related factors play the dominant upward-pushing role, reduced mainly by 'price', 'market structure' and 'airport capacity'.

The various factors entering the forecast model as described in Figure 28 in the previous section have each different impact on the forecast future traffic growth in terms of both, strength and direction. To understand the relative importance of the factors, Figure 29 illustrates how the input assumptions impact on the forecast traffic growth.

The figure presents a mix of the factors (bars in the graph) and shows schematically how these shift up or down the forecast growth in the number of passengers and movements (the dashes in the graph). The graph provides a simplified step-by-step picture of the direction and relative size of the shifts, rather than the precise values. In reality, the forecast model is much more complex with possible interactions between the

factors, irregular time patterns and supplementary network effects. It is the mix of these that produces the final forecast and the reason why neither of them can be treated separately as for simplicity is suggested by the graph. Only the forecast of passenger flights is portrayed in Figure 29; all-cargo, GAT military, business aviation flights and infrequently-flown airport pairs are modelled explicitly with a simplified approach (see Annex A).

The long-term forecast method derives the growth in flights from the growth in passenger numbers. The passenger demand for air-transport is assumed to be closely related to Economy developments represented in the method by GDP growth. This can be boosted by new or extended free trade agreements or EU expansion and is converted into the passenger growth using a GDP multiplier, reflecting the maturity of the air-transport market in the respective region. GDP growth of 3% per annum boosted by extra 0.8% per annum due to a new free trade agreement results in somewhat less than 6% growth in passenger demand.

It is not only the changes in global economic conditions that influence the passengers' decisions to travel by air. An increase in the disposable income (represented by

the GDP growth) and hence more money to spend on travel can be counterbalanced by equal or faster increase in Price of travel. There are several contributors to the evolution of fares: continuously decreasing trend in the air-ticket price is lifted by noise and security charges added to the cost, additional expenses of the airlines related to CO₂ emissions and oil price are passed onto the customers by increased fares. Naturally, changes in prices have inverse effect on the demand (higher price => less demand) determined by the price elasticity.

A decision to take a plane is of course not a result of the mere possibility to do so (even though one may argue that the strong growth of low-cost carriers proves the opposite). Leisure and business Passengers decide where and how they want to travel. Aging of population as well as changing tourism preferences can reduce the flight demand in some regions, EU expansion or Open Skies agreements can facilitate

air-transport and encourage demand in others. Alternative means of transport such as high-speed rail may drag over some of the travellers if fast enough and providing comparable comfort. Travelling from one point to another may require taking several flights with a stronger hubbing system.

Demand in terms of number of passengers is converted into the number of flights using an assumption about the "Market Structure", which is the structure of the fleet and use of aircraft. The expected increase in the mean size of aircraft coupled with increasing load factors reduces the growth, so the growth in fights is significantly less than in passenger numbers.

The airports' ability to serve the flights is represented by the Airport Capacity figures. Though the overall capacity of the system increases, it may not always be at the right place, right time or simply enough to allow for the growth in traffic as demanded.

ANNEX B GEOGRAPHICAL DEFINITIONS

ESRA08

The EUROCONTROL Statistical Reference Area (ESRA) is designed to include as much as possible of the ECAC area for which data are available from a range of sources within the Agency. It is used for high-level reports from the Agency, when referring to 'total Europe'. The ESRA changes only slowly with time; a region is added to the ESRA only when there is a full year's data from all sources, so that growth calculations are possible. 'ESRA08' was introduced in the MTF09 report. It is now used as a basis for comparison at European level in the forecasts. Note that the EUROCONTROL forecast includes also regions outside of the ESRA (eg. Armenia and Latvia) though still within ECAC.

Traffic zones are represented by an aggregate of FIRs & UIR of States. These do not take delegation of airspace into account. For individual States, the differences between charging areas and ACCs can have a big

impact on overflight counts (and thus on total counts where the total is dominated by overflights). For the ESRA as a whole, there is only a small proportion of overflights, so that the difference between a FIR and an ACC definition is small.

Traffic regions

The traffic regions are defined for statistical convenience and do not reflect an official position of the EUROCONTROL Agency.

Traffic flows are described as being to or from one of a number of traffic regions listed in Figure 31 (for example in Figure 36). Each traffic region is made up of a number of traffic zones (=States). In August 2012, STATFOR has updated its traffic region definition as part of the 2012 actions agreed by the STATFOR User Group. The re-definition of the traffic region aims at improving consistency with ICAO and AEA ones. The



Figure 30. The EUROCONTROL Statistical Reference Area.

new definition is listed in Figure 31. In Figure 31, traffic zones are indicated by the first letters of the ICAO location codes for brevity.

As far as “Europe” is concerned, it is split into two regions: ESRA (defined in the previous section) and Other Europe.

For flow purposes, ESRA is split into a “North-West” region mostly of mature air traffic markets, a

“Mediterranean” region stretching from the Canaries to Turkey and with a significant tourist element, and an Eastern region.

The ‘Other Europe’ region (i.e. non ESRA) includes the States along the border of ESRA and extends from Greenland to the Urals and Azerbaijan.

The map of the nine traffic regions used in our statistics is displayed in Figure 32.

ICAO region/country	
ESRA North-West	EB, ED, EF, EG, EH, EI, EK, EL, EN, ES, ET, LF, LN, LO, LS
ESRA Mediterranean	GC, LC, LE, LG, LI, LM, LP, LT
ESRA East	BK, EP, LA, LB, LD, LH, LJ, LK, LQ, LR, LU, LW, LY, LZ, UK
Other Europe	BG, BI, EE, EK (Faroe Islands), ENSB (Bodo Oc.), EV, EY, GE, LX, UB, UD, UG, UH, UI, UL, UM, UN, UO, UR, US, UU, UW, Shanwick Oc., Santa Maria FIR
North Atlantic	C, K, P
Mid-Atlantic	M, T
South-Atlantic	S
North-Africa	DA, DT, GM, HE, HL
Southern Africa	D, F, G, H, (except DA, DT, HE, HL, GC, GM)
Middle-East	L, O (except OA, OP)
Asia/Pacific	A, N, P, Y, OA, OP, R, V, W, Z (except ZZZZ), U (except UK and areas in Other Europe)

Figure 31. Regions used in flow statistics as of 31 August 2012.



Figure 32. Map of the Traffic Regions used in flow statistics as of 31 August 2012.

Functional Airspace Blocks

On top of the traffic zones, this report also presents the forecast of IFR movements in Functional Airspace Blocks (FAB). FABs are blocks of airspace based on operational requirements regardless of the States boundaries (Figure 33). FAB initiatives (definition) are still evolving according to the targets defined to improve the performance of the European air traffic management network. Based on the last changes, STATFOR has taken up the FAB initiatives in August 2012 along with the new definitions stipulated by the European Commission.

More details about the definitions are available on-line through the STATFOR Interactive Dashboard (Ref. 23 and also through the European Commission website). Note that Albania is currently included in the Blue Med FAB in STATFOR definition but is an associated partner not a member.

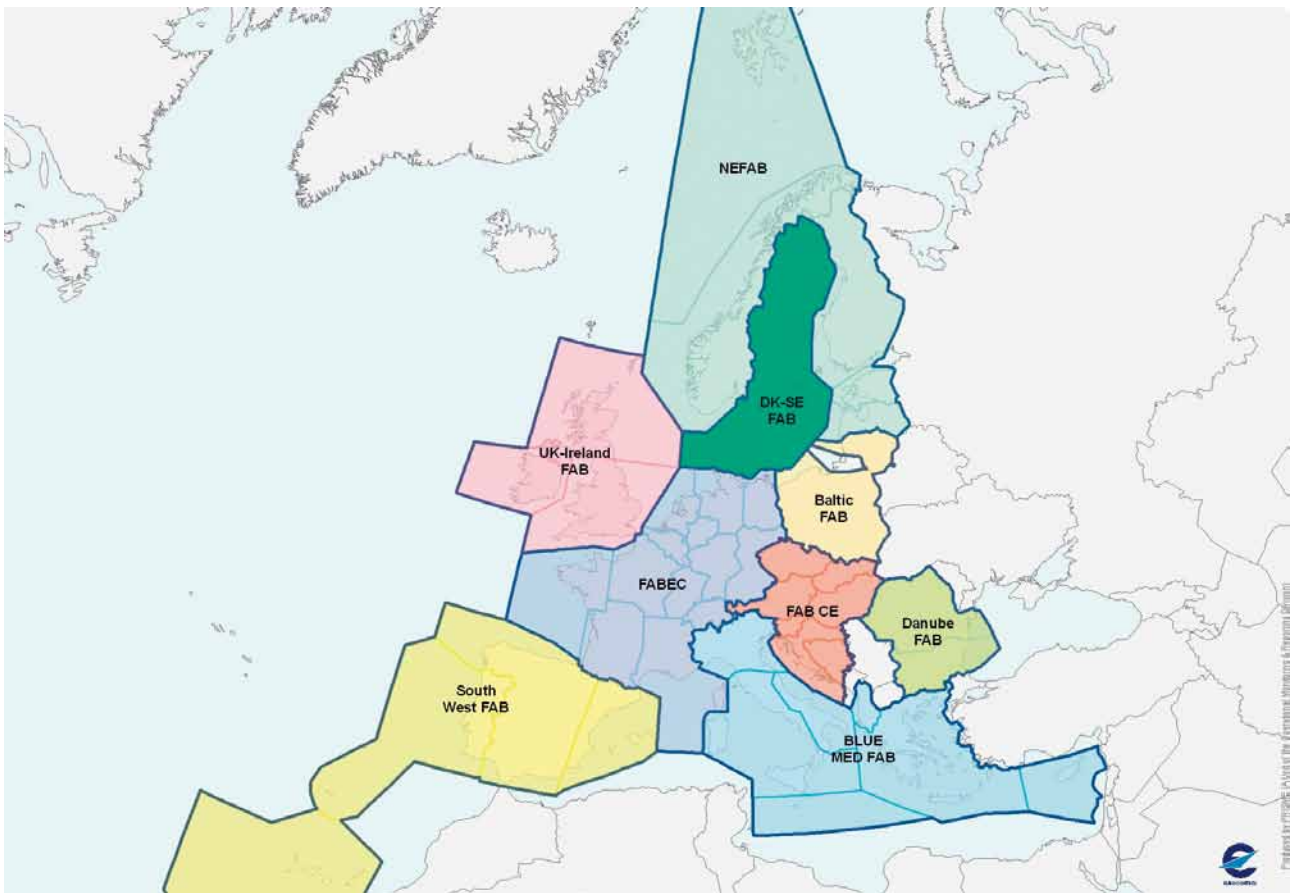


Figure 33. The nine FAB initiatives as of August 2012.

ANNEX C SUMMARY FORECAST FOR ESRA

Forecast for ESRA08

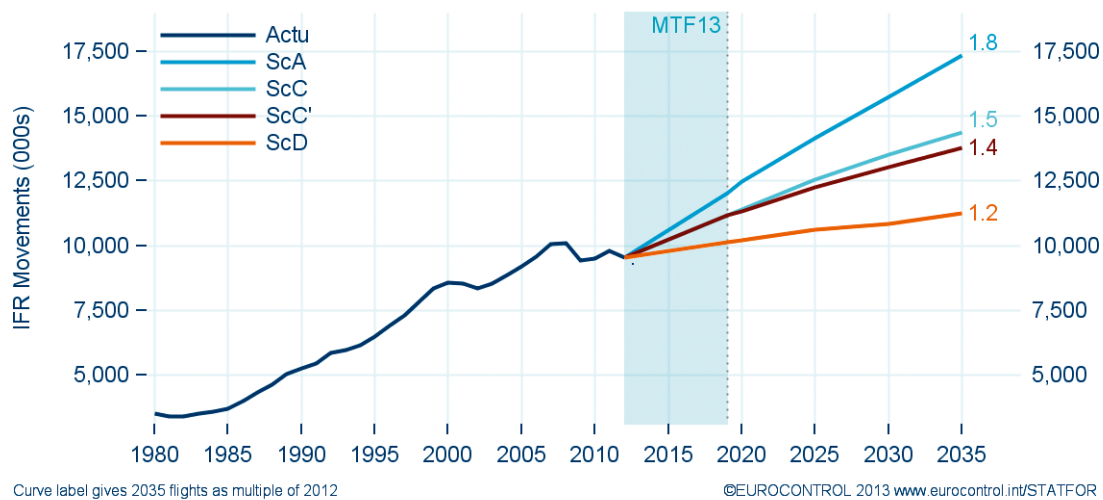


Figure 34. Annual traffic in ESRA

		IFR Movements(000s)									Annual Growth									AAGR 2035/ 2012	Traffic Mul- tiple 2035/ 2012
		2009	2010	2011	2012	2019	2020	2025	2030	2035	2009	2010	2011	2012	2019	2020	2025	2030	2035		
Total: Internal	ScA	7,602	7,562	7,790	7,514	9,091	9,359	10,208	10,934	11,510	.	-0.5%	3.0%	-3.5%	2.8%	2.9%	1.8%	1.4%	1.0%	1.9%	1.5
	ScC	.	.	.	.	8,474	8,625	9,265	9,735	10,068	.	.	.	.	1.7%	1.8%	1.4%	1.0%	0.7%	1.3%	1.3
	ScC'	.	.	.	.	8,474	8,576	9,095	9,495	9,855	.	.	.	.	1.7%	1.2%	1.2%	0.9%	0.7%	1.2%	1.3
	ScD	.	.	.	.	7,710	7,733	7,918	7,947	8,102	.	.	.	.	0.4%	0.3%	0.5%	0.1%	0.4%	0.3%	1.1
Total: Arr/Dep	ScA	1,711	1,815	1,883	1,916	2,760	2,921	3,660	4,461	5,366	.	6.1%	3.7%	1.7%	5.4%	5.8%	4.6%	4.0%	3.8%	4.6%	2.8
	ScC	.	.	.	.	2,520	2,605	3,074	3,518	3,966	.	.	.	.	4.0%	3.4%	3.4%	2.7%	2.4%	3.2%	2.1
	ScC'	.	.	.	.	2,520	2,582	2,928	3,271	3,621	.	.	.	.	4.0%	2.5%	2.5%	2.2%	2.1%	2.8%	1.9
	ScD	.	.	.	.	2,261	2,295	2,506	2,684	2,911	.	.	.	.	2.4%	1.5%	1.8%	1.4%	1.6%	1.8%	1.5
Total: Overflight	ScA	100	116	112	119	194	205	271	354	461	.	15%	-3.4%	6.6%	7.2%	5.7%	5.8%	5.5%	5.4%	6.1%	3.9
	ScC	.	.	.	.	175	182	222	267	321	.	.	.	.	5.6%	4.0%	4.1%	3.8%	3.7%	4.4%	2.7
	ScC'	.	.	.	.	175	180	213	249	292	.	.	.	.	5.6%	3.3%	3.4%	3.1%	3.3%	4.0%	2.5
	ScD	.	.	.	.	161	165	188	209	236	.	.	.	.	4.4%	2.5%	2.6%	2.2%	2.4%	3.0%	2.0
Grand Total	ScA	9,413	9,493	9,784	9,548	12,045	12,485	14,139	15,749	17,338	.	0.8%	3.1%	-2.4%	3.4%	3.7%	2.5%	2.2%	1.9%	2.6%	1.8
	ScC	.	.	.	.	11,169	11,411	12,561	13,520	14,356	.	.	.	.	2.3%	2.2%	1.9%	1.5%	1.2%	1.8%	1.5
	ScC'	.	.	.	.	11,169	11,338	12,236	13,015	13,769	.	.	.	.	2.3%	1.5%	1.5%	1.2%	1.1%	1.6%	1.4
	ScD	.	.	.	.	10,132	10,194	10,612	10,840	11,249	.	.	.	.	0.9%	0.6%	0.8%	0.4%	0.7%	0.7%	1.2

Figure 35. Annual traffic and growth by main flow categories in ESRA

				IFR Movements(000s)												
				2005	2006	2007	2008	2009	2010	2011	2012	2019	2020	2025	2030	2035
1	ESRA North-W	ESRA North-W	ScA	3878.2	3934.1	3995.6	3973.1	3665.3	3573.2	3679.4	3581.4	3978.7	4072.9	4192.9	4307.5	4358.4
			ScC	.	.	.	.	.	.	.	3798.1	3847.3	3941.6	3988.5	4021.4
			ScC'	.	.	.	.	.	.	.	3798.1	3824.5	3878.0	3885.4	3943.7
			ScD	.	.	.	.	.	.	.	3504.7	3492.5	3458.1	3374.2	3341.9
2	ESRA Mediter	ESRA North-W	ScA	1568.6	1606.0	1709.5	1684.3	1548.8	1576.8	1674.8	1653.8	2047.4	2124.3	2417.4	2653.6	2855.9
			ScC	.	.	.	.	.	.	.	1904.5	1944.7	2165.3	2321.2	2426.9
			ScC'	.	.	.	.	.	.	.	1904.5	1930.4	2090.7	2217.1	2298.7
			ScD	.	.	.	.	.	.	.	1717.8	1724.1	1782.7	1789.7	1819.2
3	ESRA Mediter	ESRA Mediter	ScA	1375.1	1471.4	1573.3	1518.2	1445.0	1466.9	1480.4	1350.0	1725.7	1748.4	1922.7	2058.2	2171.1
			ScC	.	.	.	.	.	.	.	1590.9	1606.1	1717.2	1820.9	1876.0
			ScC'	.	.	.	.	.	.	.	1590.9	1598.0	1704.6	1807.6	1871.0
			ScD	.	.	.	.	.	.	.	1444.9	1451.9	1505.6	1522.9	1564.7
4	ESRA East	ESRA North-W	ScA	455.4	495.5	528.6	560.0	513.5	510.6	520.3	520.4	729.1	773.0	901.7	1022.1	1120.6
			ScC	.	.	.	.	.	.	.	656.0	680.1	789.7	863.6	929.7
			ScC'	.	.	.	.	.	.	.	656.0	676.8	771.7	838.7	909.4
			ScD	.	.	.	.	.	.	.	580.7	590.2	636.0	667.2	705.5
5	ESRA North-W	North Atlant	ScA	291.9	298.2	315.3	319.2	290.4	288.8	302.0	293.7	354.3	365.0	394.5	433.8	476.4
			ScC	.	.	.	.	.	.	.	339.4	341.0	353.0	360.4	372.0
			ScC'	.	.	.	.	.	.	.	339.4	335.1	331.5	331.1	335.9
			ScD	.	.	.	.	.	.	.	313.7	308.0	292.4	278.0	268.4
6	ESRA North-W	Other Europe	ScA	191.1	200.7	222.0	242.6	203.6	215.4	243.3	254.8	341.6	363.1	423.6	488.3	540.2
			ScC	.	.	.	.	.	.	.	307.5	319.1	369.9	410.2	452.0
			ScC'	.	.	.	.	.	.	.	307.5	316.5	354.3	382.5	414.8
				.	.	.	.	.	.	.	272.3	278.0	304.2	320.3	338.8

Figure 36. Annual traffic on busiest region-to-region flows through ESRA.

				Annual Growth													AAGR 2035/ 2012	Traffic Mul- tiple 2035/ 2012
				2005	2006	2007	2008	2009	2010	2011	2012	2019	2020	2025	2030	2035		
1	ESRA North-W	ESRA North-W	ScA	.	1.4%	1.6%	-0.6%	-7.7%	-2.5%	3.0%	-2.7%	1.5%	2.4%	0.6%	0.5%	0.2%	0.9%	1.2
			ScC	.	.	.	.	.	.	.	0.8%	1.3%	0.5%	0.2%	0.2%	0.5%	1.1
			ScC'	.	.	.	.	.	.	.	0.8%	0.7%	0.3%	0.0%	0.3%	0.4%	1.1
			ScD	.	.	.	.	.	.	.	-0.3%	-0.3%	-0.2%	-0.5%	-0.2%	-0.3%	0.9
2	ESRA Mediterr	ESRA North-W	ScA	.	2.4%	6.4%	-1.5%	-8.0%	1.8%	6.2%	-1.3%	3.1%	3.8%	2.6%	1.9%	1.5%	2.4%	1.7
			ScC	.	.	.	.	.	.	.	2.0%	2.1%	2.2%	1.4%	0.9%	1.7%	1.5
			ScC'	.	.	.	.	.	.	.	2.0%	1.4%	1.6%	1.2%	0.7%	1.4%	1.4
			ScD	.	.	.	.	.	.	.	0.5%	0.4%	0.7%	0.1%	0.3%	0.4%	1.1
3	ESRA Mediterr	ESRA Mediterr	ScA	.	7.0%	6.9%	-3.5%	-4.8%	1.5%	0.9%	-8.8%	3.6%	1.3%	1.9%	1.4%	1.1%	2.1%	1.6
			ScC	.	.	.	.	.	.	.	2.4%	1.0%	1.3%	1.2%	0.6%	1.4%	1.4
			ScC'	.	.	.	.	.	.	.	2.4%	0.4%	1.3%	1.2%	0.7%	1.4%	1.4
			ScD	.	.	.	.	.	.	.	1.0%	0.5%	0.7%	0.2%	0.5%	0.6%	1.2
4	ESRA East	ESRA North-W	ScA	.	8.8%	6.7%	5.9%	-8.3%	-0.6%	1.9%	0.0%	4.9%	6.0%	3.1%	2.5%	1.9%	3.4%	2.2
			ScC	.	.	.	.	.	.	.	3.4%	3.7%	3.0%	1.8%	1.5%	2.6%	1.8
			ScC'	.	.	.	.	.	.	.	3.4%	3.2%	2.7%	1.7%	1.6%	2.5%	1.7
			ScD	.	.	.	.	.	.	.	1.6%	1.6%	1.5%	1.0%	1.1%	1.3%	1.4
5	ESRA North-W	North Atlant	ScA	.	2.2%	5.8%	1.2%	-9.0%	-0.6%	4.6%	-2.7%	2.7%	3.0%	1.6%	1.9%	1.9%	2.1%	1.6
			ScC	.	.	.	.	.	.	.	2.1%	0.5%	0.7%	0.4%	0.6%	1.0%	1.3
			ScC'	.	.	.	.	.	.	.	2.1%	-1.2%	-0.2%	-0.0%	0.3%	0.6%	1.1
			ScD	.	.	.	.	.	.	.	0.9%	-1.8%	-1.0%	-1.0%	-0.7%	-0.4%	0.9
6	ESRA North-W	Other Europe	ScA	.	5.1%	11%	9.3%	-16%	5.8%	13%	4.7%	4.3%	6.3%	3.1%	2.9%	2.0%	3.3%	2.1
			ScC	.	.	.	.	.	.	.	2.7%	3.8%	3.0%	2.1%	2.0%	2.5%	1.8
			ScC'	.	.	.	.	.	.	.	2.7%	2.9%	2.3%	1.5%	1.6%	2.1%	1.6
			ScD	.	.	.	.	.	.	.	1.0%	2.1%	1.8%	1.0%	1.1%	1.2%	1.3

Figure 37. Annual growth on busiest region-to-region flows through ESRA.

ANNEX D SUMMARY FORECAST BY REGION

IFR Movements (thousands)		2007	2008	2009	2010	2011	2012	2019	2020	2025	2030	2035	AAGR 2035/2012	Traffic Multiple 2035/2012
Albania	ScA	142	148	161	181	197	195	259	272	320	374	427	3.5%	2.2
	ScC	.	.	.	.	.	.	240	250	287	315	340	2.4%	1.7
	ScC'	.	.	.	.	.	.	240	248	278	301	323	2.2%	1.7
	ScD	.	.	.	.	.	.	216	219	235	246	264	1.3%	1.4
Armenia	ScA	48	52	48	53	57	56	93	100	137	179	222	6.2%	4.0
	ScC	.	.	.	.	.	.	83	87	112	140	174	5.1%	3.1
	ScC'	.	.	.	.	.	.	83	86	107	130	158	4.6%	2.8
	ScD	.	.	.	.	.	.	74	77	92	108	129	3.7%	2.3
Austria	ScA	1,180	1,204	1,113	1,137	1,154	1,133	1,443	1,524	1,762	1,971	2,162	2.8%	1.9
	ScC	.	.	.	.	.	.	1,343	1,379	1,573	1,712	1,816	2.1%	1.6
	ScC'	.	.	.	.	.	.	1,343	1,369	1,507	1,608	1,692	1.8%	1.5
	ScD	.	.	.	.	.	.	1,201	1,211	1,271	1,298	1,341	0.7%	1.2
Azerbaijan	ScA	95	108	108	120	124	130	229	245	329	434	570	6.6%	4.4
	ScC	.	.	.	.	.	.	206	215	275	347	434	5.4%	3.3
	ScC'	.	.	.	.	.	.	206	214	264	326	401	5.0%	3.1
	ScD	.	.	.	.	.	.	185	191	230	273	331	4.1%	2.5
Belarus	ScA	173	199	182	196	225	240	356	378	470	564	667	4.5%	2.8
	ScC	.	.	.	.	.	.	319	331	398	458	519	3.4%	2.2
	ScC'	.	.	.	.	.	.	319	328	378	423	470	3.0%	2.0
	ScD	.	.	.	.	.	.	284	290	323	349	380	2.0%	1.6
Belgium/Luxembourg	ScA	1,100	1,108	1,020	1,035	1,091	1,089	1,332	1,376	1,514	1,648	1,791	2.2%	1.6
	ScC	.	.	.	.	.	.	1,249	1,277	1,396	1,478	1,557	1.6%	1.4
	ScC'	.	.	.	.	.	.	1,249	1,266	1,353	1,412	1,474	1.3%	1.4
	ScD	.	.	.	.	.	.	1,132	1,135	1,167	1,179	1,204	0.4%	1.1
Bosnia-Herzegovina	ScA	200	218	224	250	276	268	377	396	486	570	656	4.0%	2.4
	ScC	.	.	.	.	.	.	342	355	421	474	514	2.9%	1.9
	ScC'	.	.	.	.	.	.	342	353	408	455	490	2.6%	1.8
	ScD	.	.	.	.	.	.	306	311	337	355	379	1.5%	1.4
Bulgaria	ScA	444	478	477	504	539	540	824	871	1,099	1,289	1,486	4.5%	2.8
	ScC	.	.	.	.	.	.	739	769	947	1,107	1,229	3.6%	2.3
	ScC'	.	.	.	.	.	.	739	765	920	1,071	1,185	3.5%	2.2
	ScD	.	.	.	.	.	.	657	673	766	842	946	2.5%	1.8

Figure 38. Annual traffic per traffic zone and FAB.

IFR Movements (thousands)		2007	2008	2009	2010	2011	2012	2019	2020	2025	2030	2035	AAGR 2035/ 2012	Traffic Mul- tiple 2035/ 2012
Canary Islands	ScA	308	307	267	275	298	275	329	341	396	449	500	2.6%	1.8
	ScC	.	.	.	.	.	.	294	299	328	351	370	1.3%	1.3
	ScC'	.	.	.	.	.	.	294	297	317	331	346	1.0%	1.3
	ScD	.	.	.	.	.	.	264	263	267	264	262	-0.2%	1.0
Croatia	ScA	398	422	422	459	497	495	695	730	882	1,027	1,175	3.8%	2.4
	ScC	.	.	.	.	.	.	634	656	768	857	930	2.8%	1.9
	ScC'	.	.	.	.	.	.	634	652	743	818	882	2.5%	1.8
	ScD	.	.	.	.	.	.	568	577	624	656	699	1.5%	1.4
Cyprus	ScA	242	272	268	285	281	270	394	421	562	704	872	5.2%	3.2
	ScC	.	.	.	.	.	.	352	366	447	527	611	3.6%	2.3
	ScC'	.	.	.	.	.	.	352	363	424	484	547	3.1%	2.0
	ScD	.	.	.	.	.	.	315	323	363	397	438	2.1%	1.6
Czech Republic	ScA	646	682	648	668	695	679	914	961	1,129	1,278	1,421	3.3%	2.1
	ScC	.	.	.	.	.	.	826	850	979	1,077	1,159	2.3%	1.7
	ScC'	.	.	.	.	.	.	826	844	944	1,026	1,099	2.1%	1.6
	ScD	.	.	.	.	.	.	734	742	790	818	853	1.0%	1.3
Denmark	ScA	631	629	576	595	625	605	742	770	850	935	1,002	2.2%	1.7
	ScC	.	.	.	.	.	.	696	713	769	816	855	1.5%	1.4
	ScC'	.	.	.	.	.	.	696	707	744	772	800	1.2%	1.3
	ScD	.	.	.	.	.	.	634	635	644	643	649	0.3%	1.1
Estonia	ScA	153	174	153	156	178	189	258	275	318	383	427	3.6%	2.3
	ScC	.	.	.	.	.	.	231	238	276	310	345	2.7%	1.8
	ScC'	.	.	.	.	.	.	231	237	267	294	325	2.4%	1.7
	ScD	.	.	.	.	.	.	203	206	224	237	253	1.3%	1.3
FYROM	ScA	123	125	125	125	124	113	151	160	196	238	277	4.0%	2.5
	ScC	.	.	.	.	.	.	139	145	174	198	217	2.9%	1.9
	ScC'	.	.	.	.	.	.	139	145	170	192	211	2.8%	1.9
	ScD	.	.	.	.	.	.	125	127	138	148	163	1.6%	1.4
Finland	ScA	245	261	240	242	267	252	316	327	361	401	440	2.5%	1.7
	ScC	.	.	.	.	.	.	280	284	301	316	335	1.2%	1.3
	ScC'	.	.	.	.	.	.	280	283	295	306	323	1.1%	1.3
	ScD	.	.	.	.	.	.	249	248	247	245	248	-0.1%	1.0

Figure 38 (continued). Annual traffic per traffic zone and FAB.

IFR Movements (thousands)		2007	2008	2009	2010	2011	2012	2019	2020	2025	2030	2035	AAGR 2035/ 2012	Traffic Mul- tiple 2035/ 2012
France	ScA	3,025	3,020	2,801	2,794	2,968	2,923	3,456	3,591	4,017	4,434	4,880	2.3%	1.7
	ScC	.	.	.	.	.	.	3,269	3,335	3,610	3,810	4,007	1.4%	1.4
	ScC'	.	.	.	.	.	.	3,269	3,309	3,490	3,630	3,781	1.1%	1.3
	ScD	.	.	.	.	.	.	2,985	2,987	3,037	3,020	3,042	0.2%	1.0
Georgia	ScA	80	80	77	94	110	108	192	205	277	365	466	6.6%	4.3
	ScC	.	.	.	.	.	.	171	180	232	291	364	5.4%	3.4
	ScC'	.	.	.	.	.	.	171	179	224	276	341	5.1%	3.2
	ScD	.	.	.	.	.	.	154	160	195	233	285	4.3%	2.6
Germany	ScA	3,108	3,151	2,930	2,981	3,078	3,018	3,744	3,876	4,312	4,680	5,034	2.2%	1.7
	ScC	.	.	.	.	.	.	3,477	3,547	3,903	4,122	4,299	1.6%	1.4
	ScC'	.	.	.	.	.	.	3,477	3,517	3,754	3,918	4,074	1.3%	1.4
	ScD	.	.	.	.	.	.	3,115	3,124	3,201	3,197	3,233	0.3%	1.1
Greece	ScA	621	643	638	655	656	633	817	858	1,059	1,269	1,498	3.8%	2.4
	ScC	.	.	.	.	.	.	759	783	917	1,046	1,153	2.6%	1.8
	ScC'	.	.	.	.	.	.	759	779	891	1,005	1,100	2.4%	1.7
	ScD	.	.	.	.	.	.	687	698	761	813	872	1.4%	1.4
Hungary	ScA	615	622	608	622	617	589	857	910	1,093	1,250	1,397	3.8%	2.4
	ScC	.	.	.	.	.	.	774	802	959	1,077	1,161	3.0%	2.0
	ScC'	.	.	.	.	.	.	774	798	927	1,033	1,106	2.8%	1.9
	ScD	.	.	.	.	.	.	689	701	769	818	876	1.7%	1.5
Iceland	ScA	105	110	101	102	111	123	175	184	213	248	288	3.8%	2.3
	ScC	.	.	.	.	.	.	158	162	177	192	210	2.4%	1.7
	ScC'	.	.	.	.	.	.	158	160	171	183	198	2.1%	1.6
	ScD	.	.	.	.	.	.	144	146	152	155	161	1.2%	1.3
Ireland	ScA	597	601	530	513	523	521	661	697	806	917	990	2.8%	1.9
	ScC	.	.	.	.	.	.	620	632	696	745	797	1.9%	1.5
	ScC'	.	.	.	.	.	.	620	626	673	713	762	1.7%	1.5
	ScD	.	.	.	.	.	.	566	566	582	588	600	0.6%	1.2
Italy	ScA	1,779	1,736	1,647	1,712	1,726	1,685	2,097	2,171	2,484	2,777	3,068	2.6%	1.8
	ScC	.	.	.	.	.	.	1,938	1,974	2,155	2,282	2,387	1.5%	1.4
	ScC'	.	.	.	.	.	.	1,938	1,961	2,078	2,155	2,222	1.2%	1.3
	ScD	.	.	.	.	.	.	1,740	1,743	1,772	1,765	1,772	0.2%	1.1

Figure 38 (continued). Annual traffic per traffic zone and FAB.

IFR Movements (thousands)		2007	2008	2009	2010	2011	2012	2019	2020	2025	2030	2035	AAGR 2035/ 2012	Traffic Mul- tiple 2035/ 2012
Latvia	ScA	202	225	206	214	235	233	329	348	418	492	563	3.9%	2.4
	ScC	.	.	.	.	.	.	283	293	343	385	428	2.7%	1.8
	ScC'	.	.	.	.	.	.	283	292	331	366	404	2.4%	1.7
	ScD	.	.	.	.	.	.	248	253	277	295	316	1.3%	1.4
Lisbon FIR	ScA	427	438	406	429	450	438	543	562	648	729	809	2.7%	1.8
	ScC	.	.	.	.	.	.	491	499	545	580	611	1.5%	1.4
	ScC'	.	.	.	.	.	.	491	495	524	543	564	1.1%	1.3
	ScD	.	.	.	.	.	.	442	440	441	436	432	-0.1%	1.0
Lithuania	ScA	195	219	192	206	233	236	338	356	425	490	556	3.8%	2.4
	ScC	.	.	.	.	.	.	297	307	358	398	438	2.7%	1.9
	ScC'	.	.	.	.	.	.	297	305	344	376	410	2.4%	1.7
	ScD	.	.	.	.	.	.	261	266	290	306	326	1.4%	1.4
Malta	ScA	82	84	85	95	81	97	138	147	182	220	264	4.5%	2.7
	ScC	.	.	.	.	.	.	129	135	159	181	205	3.3%	2.1
	ScC'	.	.	.	.	.	.	129	135	157	177	199	3.2%	2.1
	ScD	.	.	.	.	.	.	120	124	139	153	169	2.5%	1.8
Moldova	ScA	35	41	44	54	60	64	101	109	145	176	203	5.1%	3.2
	ScC	.	.	.	.	.	.	91	95	119	146	163	4.2%	2.6
	ScC'	.	.	.	.	.	.	91	94	116	139	154	3.9%	2.4
	ScD	.	.	.	.	.	.	81	84	99	113	132	3.2%	2.1
Morocco	ScA	323	331	312	339	352	324	446	469	596	744	922	4.7%	2.9
	ScC	.	.	.	.	.	.	396	409	483	554	631	2.9%	1.9
	ScC'	.	.	.	.	.	.	396	406	464	519	583	2.6%	1.8
	ScD	.	.	.	.	.	.	353	358	389	416	448	1.4%	1.4
Netherlands	ScA	1,108	1,090	996	1,013	1,085	1,083	1,320	1,357	1,478	1,596	1,686	1.9%	1.6
	ScC	.	.	.	.	.	.	1,240	1,265	1,368	1,442	1,498	1.4%	1.4
	ScC'	.	.	.	.	.	.	1,240	1,255	1,339	1,401	1,467	1.3%	1.4
	ScD	.	.	.	.	.	.	1,123	1,128	1,159	1,167	1,185	0.4%	1.1
Norway	ScA	536	550	526	537	563	587	674	717	759	853	898	1.9%	1.5
	ScC	.	.	.	.	.	.	646	677	698	740	769	1.2%	1.3
	ScC'	.	.	.	.	.	.	646	676	701	727	759	1.1%	1.3
	ScD	.	.	.	.	.	.	609	609	609	609	613	0.2%	1.0

Figure 38 (continued). Annual traffic per traffic zone and FAB.

IFR Movements (thousands)		2007	2008	2009	2010	2011	2012	2019	2020	2025	2030	2035	AAGR 2035/ 2012	Traffic Mul- tiple 2035/ 2012
Poland	ScA	556	612	566	599	655	684	962	1,010	1,188	1,343	1,496	3.5%	2.2
	ScC	.	.	.	.	.	.	858	884	1,021	1,133	1,234	2.6%	1.8
	ScC'	.	.	.	.	.	.	858	879	987	1,080	1,176	2.4%	1.7
	ScD	.	.	.	.	.	.	758	769	827	868	920	1.3%	1.3
Romania	ScA	432	444	434	470	487	487	749	795	1,007	1,186	1,359	4.6%	2.8
	ScC	.	.	.	.	.	.	664	691	844	979	1,082	3.5%	2.2
	ScC'	.	.	.	.	.	.	664	687	818	943	1,038	3.3%	2.1
	ScD	.	.	.	.	.	.	587	601	680	742	815	2.3%	1.7
Santa Maria FIR	ScA	109	116	113	118	123	118	153	158	180	203	227	2.9%	1.9
	ScC	.	.	.	.	.	.	141	143	154	162	170	1.6%	1.4
	ScC'	.	.	.	.	.	.	141	141	146	149	153	1.1%	1.3
	ScD	.	.	.	.	.	.	129	128	125	122	120	0.1%	1.0
Serbia& Montenegro	ScA	457	497	513	543	558	535	729	768	940	1,111	1,276	3.9%	2.4
	ScC	.	.	.	.	.	.	666	693	827	935	1,021	2.9%	1.9
	ScC'	.	.	.	.	.	.	666	689	801	897	973	2.6%	1.8
	ScD	.	.	.	.	.	.	596	606	661	706	771	1.6%	1.4
Slovakia	ScA	324	345	337	370	382	381	546	578	697	799	897	3.8%	2.4
	ScC	.	.	.	.	.	.	495	511	604	678	733	2.9%	1.9
	ScC'	.	.	.	.	.	.	495	509	586	654	703	2.7%	1.8
	ScD	.	.	.	.	.	.	443	450	491	520	555	1.6%	1.5
Slovenia	ScA	306	327	313	328	353	346	462	487	587	679	773	3.6%	2.2
	ScC	.	.	.	.	.	.	425	440	517	579	627	2.6%	1.8
	ScC'	.	.	.	.	.	.	425	437	499	552	595	2.4%	1.7
	ScD	.	.	.	.	.	.	380	386	417	438	468	1.3%	1.4
Spain	ScA	1,779	1,747	1,581	1,608	1,665	1,557	1,865	1,927	2,237	2,549	2,858	2.7%	1.8
	ScC	.	.	.	.	.	.	1,719	1,752	1,922	2,058	2,179	1.5%	1.4
	ScC'	.	.	.	.	.	.	1,719	1,734	1,855	1,950	2,044	1.2%	1.3
	ScD	.	.	.	.	.	.	1,553	1,557	1,599	1,588	1,592	0.1%	1.0
Sweden	ScA	708	736	654	664	724	724	910	949	1,057	1,179	1,281	2.5%	1.8
	ScC	.	.	.	.	.	.	844	866	937	1,005	1,064	1.7%	1.5
	ScC'	.	.	.	.	.	.	844	861	909	947	991	1.4%	1.4
	ScD	.	.	.	.	.	.	765	766	779	787	800	0.4%	1.1

Figure 38 (continued). Annual traffic per traffic zone and FAB.

IFR Movements (thousands)		2007	2008	2009	2010	2011	2012	2019	2020	2025	2030	2035	AAGR 2035/ 2012	Traffic Mul- tiple 2035/ 2012
Switzerland	ScA	1,093	1,096	1,018	1,025	1,063	1,045	1,220	1,266	1,404	1,506	1,596	1.9%	1.5
	ScC	.	.	.	.	.	.	1,171	1,192	1,306	1,362	1,403	1.3%	1.3
	ScC'	.	.	.	.	.	.	1,171	1,184	1,258	1,294	1,332	1.1%	1.3
	ScD	.	.	.	.	.	.	1,066	1,066	1,080	1,072	1,075	0.1%	1.0
Turkey	ScA	757	822	857	965	1,039	1,066	1,865	1,954	2,465	2,918	3,423	5.2%	3.2
	ScC	.	.	.	.	.	.	1,688	1,750	2,153	2,546	2,863	4.4%	2.7
	ScC'	.	.	.	.	.	.	1,688	1,745	2,115	2,505	2,806	4.3%	2.6
	ScD	.	.	.	.	.	.	1,517	1,560	1,811	2,036	2,339	3.5%	2.2
Ukraine	ScA	373	406	378	429	453	466	712	758	980	1,206	1,466	5.1%	3.1
	ScC	.	.	.	.	.	.	638	665	821	976	1,132	3.9%	2.4
	ScC'	.	.	.	.	.	.	638	661	789	921	1,053	3.6%	2.3
	ScD	.	.	.	.	.	.	572	588	674	754	856	2.7%	1.8
UK	ScA	2,550	2,514	2,278	2,181	2,241	2,211	2,678	2,761	3,078	3,370	3,620	2.2%	1.6
	ScC	.	.	.	.	.	.	2,509	2,550	2,766	2,926	3,084	1.5%	1.4
	ScC'	.	.	.	.	.	.	2,509	2,540	2,726	2,866	3,025	1.4%	1.4
	ScD	.	.	.	.	.	.	2,323	2,333	2,409	2,451	2,511	0.6%	1.1
ESRA02	ScA	9,915	9,954	9,301	9,367	9,641	9,388	11,825	12,253	13,853	15,413	16,938	2.6%	1.8
	ScC	.	.	.	.	.	.	10,981	11,215	12,324	13,241	14,030	1.8%	1.5
	ScC'	.	.	.	.	.	.	10,981	11,143	12,005	12,748	13,459	1.6%	1.4
	ScD	.	.	.	.	.	.	9,966	10,022	10,414	10,618	10,996	0.7%	1.2
EU27	ScA	9,441	9,470	8,787	8,805	9,036	8,766	10,810	11,198	12,619	13,998	15,342	2.5%	1.8
	ScC	.	.	.	.	.	.	10,022	10,223	11,190	11,947	12,624	1.6%	1.4
	ScC'	.	.	.	.	.	.	10,022	10,150	10,860	11,432	12,023	1.4%	1.4
	ScD	.	.	.	.	.	.	9,074	9,114	9,402	9,507	9,749	0.5%	1.1
ESRA08	ScA	10,043	10,083	9,413	9,493	9,784	9,548	12,045	12,485	14,139	15,749	17,338	2.6%	1.8
	ScC	.	.	.	.	.	.	11,169	11,411	12,561	13,520	14,356	1.8%	1.5
	ScC'	.	.	.	.	.	.	11,169	11,338	12,236	13,015	13,769	1.6%	1.4
	ScD	.	.	.	.	.	.	10,132	10,194	10,612	10,840	11,249	0.7%	1.2
SES	ScA	9,793	9,833	9,152	9,171	9,407	9,162	11,281	11,695	13,159	14,619	16,028	2.5%	1.7
	ScC	.	.	.	.	.	.	10,462	10,682	11,670	12,464	13,178	1.6%	1.4
	ScC'	.	.	.	.	.	.	10,462	10,609	11,349	11,955	12,591	1.4%	1.4
	ScD	.	.	.	.	.	.	9,487	9,529	9,830	9,951	10,217	0.5%	1.1

Figure 38 (continued). Annual traffic per traffic zone and FAB.

IFR Movements (thousands)		2007	2008	2009	2010	2011	2012	2019	2020	2025	2030	2035	AAGR 2035/ 2012	Traffic Mul- tiple 2035/ 2012
Baltic FAB	ScA	635	704	644	679	741	768	1,098	1,153	1,365	1,553	1,739	3.6%	2.3
	ScC	.	.	.	.	.	.	975	1,006	1,165	1,297	1,418	2.7%	1.8
	ScC'	.	.	.	.	.	.	975	1,000	1,127	1,236	1,349	2.5%	1.8
	ScD	.	.	.	.	.	.	861	875	945	996	1,060	1.4%	1.4
BLUE MED FAB	ScA	2,312	2,294	2,207	2,286	2,283	2,227	2,863	2,979	3,511	4,036	4,587	3.2%	2.1
	ScC	.	.	.	.	.	.	2,637	2,698	3,024	3,293	3,526	2.0%	1.6
	ScC'	.	.	.	.	.	.	2,637	2,682	2,922	3,124	3,303	1.7%	1.5
	ScD	.	.	.	.	.	.	2,369	2,385	2,489	2,546	2,633	0.7%	1.2
Danube FAB	ScA	646	690	687	734	758	746	1,149	1,217	1,534	1,803	2,070	4.5%	2.8
	ScC	.	.	.	.	.	.	1,027	1,068	1,306	1,517	1,678	3.6%	2.2
	ScC'	.	.	.	.	.	.	1,027	1,062	1,267	1,463	1,612	3.4%	2.2
	ScD	.	.	.	.	.	.	910	932	1,054	1,151	1,274	2.4%	1.7
FAB CE	ScA	1,847	1,904	1,806	1,864	1,914	1,865	2,528	2,663	3,121	3,529	3,918	3.3%	2.1
	ScC	.	.	.	.	.	.	2,311	2,380	2,745	3,017	3,232	2.4%	1.7
	ScC'	.	.	.	.	.	.	2,311	2,364	2,641	2,859	3,041	2.1%	1.6
	ScD	.	.	.	.	.	.	2,061	2,085	2,219	2,299	2,407	1.1%	1.3
FABEC	ScA	5,790	5,817	5,406	5,431	5,671	5,564	6,724	6,954	7,712	8,410	9,102	2.2%	1.6
	ScC	.	.	.	.	.	.	6,310	6,433	6,998	7,372	7,701	1.4%	1.4
	ScC'	.	.	.	.	.	.	6,310	6,379	6,761	7,040	7,323	1.2%	1.3
	ScD	.	.	.	.	.	.	5,717	5,729	5,851	5,835	5,896	0.3%	1.1
NEFAB	ScA	927	969	904	924	988	1,001	1,229	1,298	1,427	1,625	1,761	2.5%	1.8
	ScC	.	.	.	.	.	.	1,131	1,172	1,254	1,349	1,435	1.6%	1.4
	ScC'	.	.	.	.	.	.	1,131	1,169	1,240	1,308	1,388	1.4%	1.4
	ScD	.	.	.	.	.	.	1,035	1,039	1,063	1,078	1,106	0.4%	1.1
South West FAB	ScA	1,946	1,912	1,733	1,765	1,823	1,644	1,978	2,044	2,374	2,707	3,041	2.7%	1.8
	ScC	.	.	.	.	.	.	1,819	1,853	2,031	2,175	2,304	1.5%	1.4
	ScC'	.	.	.	.	.	.	1,819	1,835	1,962	2,062	2,162	1.2%	1.3
	ScD	.	.	.	.	.	.	1,642	1,646	1,689	1,678	1,683	0.1%	1.0
UK-Ireland FAB	ScA	2,597	2,559	2,316	2,216	2,272	2,238	2,712	2,797	3,123	3,424	3,678	2.2%	1.6
	ScC	.	.	.	.	.	.	2,539	2,582	2,801	2,966	3,128	1.5%	1.4
	ScC'	.	.	.	.	.	.	2,539	2,571	2,760	2,903	3,066	1.4%	1.4
	ScD	.	.	.	.	.	.	2,350	2,361	2,438	2,481	2,543	0.6%	1.1
DK-SE FAB	ScA	1,008	1,031	931	953	1,008	978	1,222	1,271	1,404	1,553	1,674	2.4%	1.7
	ScC	.	.	.	.	.	.	1,141	1,169	1,257	1,337	1,405	1.6%	1.4
	ScC'	.	.	.	.	.	.	1,141	1,161	1,220	1,264	1,316	1.3%	1.3
	ScD	.	.	.	.	.	.	1,037	1,038	1,051	1,053	1,065	0.4%	1.1

Figure 38 (continued). Annual traffic per traffic zone and FAB.

IFR Movements (thousands)		2008	2009	2010	2011	2012	2019	2020	2025	2030	2035	AAGR 2035/ 2012	Traffic Mul- tiple 2035/ 2012
Albania	ScA	4.5%	8.9%	12%	8.7%	-1.1%	4.1%	4.8%	3.4%	3.1%	2.7%	3.5%	2.2
	ScC	.	.	.	.	.	3.0%	4.1%	2.8%	1.9%	1.5%	2.4%	1.7
	ScC'	.	.	.	.	.	3.0%	3.4%	2.3%	1.6%	1.4%	2.2%	1.7
	ScD	.	.	.	.	.	1.5%	1.3%	1.4%	1.0%	1.4%	1.3%	1.4
Armenia	ScA	8.0%	-6.7%	9.3%	8.1%	-2.0%	7.5%	7.5%	6.6%	5.5%	4.3%	6.2%	4.0
	ScC	.	.	.	.	.	5.7%	5.1%	5.2%	4.6%	4.5%	5.1%	3.1
	ScC'	.	.	.	.	.	5.7%	4.5%	4.4%	4.0%	4.0%	4.6%	2.8
	ScD	.	.	.	.	.	4.0%	3.9%	3.7%	3.2%	3.6%	3.7%	2.3
Austria	ScA	2.0%	-7.6%	2.2%	1.5%	-1.8%	3.5%	5.7%	2.9%	2.3%	1.9%	2.8%	1.9
	ScC	.	.	.	.	.	2.5%	2.7%	2.7%	1.7%	1.2%	2.1%	1.6
	ScC'	.	.	.	.	.	2.5%	1.9%	1.9%	1.3%	1.0%	1.8%	1.5
	ScD	.	.	.	.	.	0.8%	0.9%	1.0%	0.4%	0.6%	0.7%	1.2
Azerbaijan	ScA	13%	0.5%	11%	2.8%	5.4%	8.4%	6.8%	6.1%	5.7%	5.6%	6.6%	4.4
	ScC	.	.	.	.	.	6.8%	4.6%	5.0%	4.7%	4.6%	5.4%	3.3
	ScC'	.	.	.	.	.	6.8%	4.2%	4.3%	4.3%	4.2%	5.0%	3.1
	ScD	.	.	.	.	.	5.1%	3.6%	3.7%	3.5%	4.0%	4.1%	2.5
Belarus	ScA	16%	-8.6%	7.7%	15%	6.7%	5.8%	6.1%	4.5%	3.7%	3.4%	4.5%	2.8
	ScC	.	.	.	.	.	4.1%	3.9%	3.7%	2.8%	2.6%	3.4%	2.2
	ScC'	.	.	.	.	.	4.1%	3.1%	2.8%	2.3%	2.1%	3.0%	2.0
	ScD	.	.	.	.	.	2.4%	2.3%	2.2%	1.6%	1.7%	2.0%	1.6
Belgium/ Luxembourg	ScA	0.7%	-7.9%	1.5%	5.4%	-0.2%	2.9%	3.2%	1.9%	1.7%	1.7%	2.2%	1.6
	ScC	.	.	.	.	.	2.0%	2.2%	1.8%	1.1%	1.1%	1.6%	1.4
	ScC'	.	.	.	.	.	2.0%	1.4%	1.3%	0.9%	0.9%	1.3%	1.4
	ScD	.	.	.	.	.	0.6%	0.3%	0.6%	0.2%	0.4%	0.4%	1.1
Bosnia- Herzegovina	ScA	8.5%	3.1%	11%	10%	-2.6%	5.0%	5.1%	4.2%	3.2%	2.8%	4.0%	2.4
	ScC	.	.	.	.	.	3.5%	3.6%	3.5%	2.4%	1.6%	2.9%	1.9
	ScC'	.	.	.	.	.	3.5%	3.0%	2.9%	2.2%	1.5%	2.6%	1.8
	ScD	.	.	.	.	.	1.9%	1.6%	1.6%	1.0%	1.4%	1.5%	1.4
Bulgaria	ScA	7.7%	-0.2%	5.6%	7.1%	0.2%	6.2%	5.6%	4.8%	3.2%	2.9%	4.5%	2.8
	ScC	.	.	.	.	.	4.6%	4.0%	4.3%	3.2%	2.1%	3.6%	2.3
	ScC'	.	.	.	.	.	4.6%	3.4%	3.8%	3.1%	2.0%	3.5%	2.2
	ScD	.	.	.	.	.	2.8%	2.5%	2.6%	1.9%	2.3%	2.5%	1.8
Canary Islands	ScA	-0.2%	-13%	3.2%	8.2%	-7.7%	2.6%	3.6%	3.1%	2.5%	2.2%	2.6%	1.8
	ScC	.	.	.	.	.	1.0%	1.7%	1.9%	1.3%	1.1%	1.3%	1.3
	ScC'	.	.	.	.	.	1.0%	1.2%	1.3%	0.9%	0.8%	1.0%	1.3
	ScD	.	.	.	.	.	-0.6%	-0.1%	0.2%	-0.2%	-0.2%	-0.2%	1.0

Figure 39. Annual growth per traffic zone and FAB.

IFR Movements (thousands)		2008	2009	2010	2011	2012	2019	2020	2025	2030	2035	AAGR 2035/ 2012	Traffic Mul- tiple 2035/ 2012
Croatia	ScA	6.0%	0.1%	8.7%	8.4%	-0.4%	5.0%	5.1%	3.9%	3.1%	2.7%	3.8%	2.4
	ScC	.	.	.	.	.	3.6%	3.5%	3.2%	2.2%	1.6%	2.8%	1.9
	ScC'	.	.	.	.	.	3.6%	2.9%	2.6%	2.0%	1.5%	2.5%	1.8
	ScD	.	.	.	.	.	2.0%	1.7%	1.6%	1.0%	1.3%	1.5%	1.4
Cyprus	ScA	12%	-1.7%	6.4%	-1.2%	-4.1%	5.6%	6.8%	6.0%	4.6%	4.4%	5.2%	3.2
	ScC	.	.	.	.	.	3.9%	4.0%	4.1%	3.3%	3.0%	3.6%	2.3
	ScC'	.	.	.	.	.	3.9%	3.3%	3.2%	2.7%	2.5%	3.1%	2.0
	ScD	.	.	.	.	.	2.2%	2.5%	2.4%	1.8%	2.0%	2.1%	1.6
Czech Republic	ScA	5.6%	-5.0%	3.2%	4.0%	-2.3%	4.3%	5.2%	3.3%	2.5%	2.1%	3.3%	2.1
	ScC	.	.	.	.	.	2.8%	2.9%	2.9%	1.9%	1.5%	2.3%	1.7
	ScC'	.	.	.	.	.	2.8%	2.2%	2.3%	1.7%	1.4%	2.1%	1.6
	ScD	.	.	.	.	.	1.1%	1.1%	1.2%	0.7%	0.9%	1.0%	1.3
Denmark	ScA	-0.3%	-8.5%	3.3%	5.1%	-3.2%	3.0%	3.7%	2.0%	1.9%	1.4%	2.2%	1.7
	ScC	.	.	.	.	.	2.0%	2.3%	1.5%	1.2%	0.9%	1.5%	1.4
	ScC'	.	.	.	.	.	2.0%	1.6%	1.0%	0.7%	0.7%	1.2%	1.3
	ScD	.	.	.	.	.	0.7%	0.1%	0.3%	-0.0%	0.2%	0.3%	1.1
Estonia	ScA	13%	-12%	2.1%	14%	6.1%	4.5%	6.7%	3.0%	3.8%	2.2%	3.6%	2.3
	ScC	.	.	.	.	.	2.9%	3.3%	3.0%	2.3%	2.2%	2.7%	1.8
	ScC'	.	.	.	.	.	2.9%	2.8%	2.4%	2.0%	2.0%	2.4%	1.7
	ScD	.	.	.	.	.	1.0%	1.6%	1.6%	1.1%	1.3%	1.3%	1.3
FYROM	ScA	2.0%	-0.1%	-0.1%	-0.4%	-9.6%	4.3%	5.3%	4.2%	4.0%	3.1%	4.0%	2.5
	ScC	.	.	.	.	.	3.1%	4.3%	3.7%	2.6%	1.9%	2.9%	1.9
	ScC'	.	.	.	.	.	3.1%	3.7%	3.3%	2.5%	1.9%	2.8%	1.9
	ScD	.	.	.	.	.	1.5%	1.5%	1.6%	1.4%	1.9%	1.6%	1.4
Finland	ScA	6.3%	-7.7%	0.6%	11%	-5.8%	3.3%	3.5%	2.0%	2.1%	1.9%	2.5%	1.7
	ScC	.	.	.	.	.	1.5%	1.4%	1.2%	1.0%	1.1%	1.2%	1.3
	ScC'	.	.	.	.	.	1.5%	1.1%	0.8%	0.7%	1.1%	1.1%	1.3
	ScD	.	.	.	.	.	-0.2%	-0.2%	-0.0%	-0.2%	0.3%	-0.1%	1.0
France	ScA	-0.2%	-7.3%	-0.2%	6.2%	-1.5%	2.4%	3.9%	2.3%	2.0%	1.9%	2.3%	1.7
	ScC	.	.	.	.	.	1.6%	2.0%	1.6%	1.1%	1.0%	1.4%	1.4
	ScC'	.	.	.	.	.	1.6%	1.2%	1.1%	0.8%	0.8%	1.1%	1.3
	ScD	.	.	.	.	.	0.3%	0.1%	0.3%	-0.1%	0.1%	0.2%	1.0

Figure 39 (continued). Annual growth per traffic zone and FAB.

IFR Movements (thousands)		2008	2009	2010	2011	2012	2019	2020	2025	2030	2035	AAGR 2035/ 2012	Traffic Mul- tiple 2035/ 2012
Georgia	ScA	0.0%	-3.6%	22%	16%	-1.7%	8.5%	7.1%	6.2%	5.6%	5.0%	6.6%	4.3
	ScC	.	.	.	.	.	6.8%	5.0%	5.2%	4.7%	4.6%	5.4%	3.4
	ScC'	.	.	.	.	.	6.8%	4.6%	4.5%	4.3%	4.3%	5.1%	3.2
	ScD	.	.	.	.	.	5.2%	4.0%	4.0%	3.6%	4.1%	4.3%	2.6
Germany	ScA	1.4%	-7.0%	1.7%	3.2%	-1.9%	3.1%	3.5%	2.2%	1.7%	1.5%	2.2%	1.7
	ScC	.	.	.	.	.	2.0%	2.0%	1.9%	1.1%	0.8%	1.6%	1.4
	ScC'	.	.	.	.	.	2.0%	1.2%	1.3%	0.9%	0.8%	1.3%	1.4
	ScD	.	.	.	.	.	0.5%	0.3%	0.5%	-0.0%	0.2%	0.3%	1.1
Greece	ScA	3.4%	-0.8%	2.6%	0.2%	-3.5%	3.7%	4.9%	4.3%	3.7%	3.4%	3.8%	2.4
	ScC	.	.	.	.	.	2.6%	3.2%	3.2%	2.7%	2.0%	2.6%	1.8
	ScC'	.	.	.	.	.	2.6%	2.6%	2.7%	2.4%	1.8%	2.4%	1.7
	ScD	.	.	.	.	.	1.2%	1.7%	1.7%	1.3%	1.4%	1.4%	1.4
Hungary	ScA	1.1%	-2.3%	2.4%	-0.8%	-4.4%	5.5%	6.2%	3.7%	2.7%	2.3%	3.8%	2.4
	ScC	.	.	.	.	.	4.0%	3.6%	3.6%	2.3%	1.5%	3.0%	2.0
	ScC'	.	.	.	.	.	4.0%	3.0%	3.0%	2.2%	1.4%	2.8%	1.9
	ScD	.	.	.	.	.	2.3%	1.8%	1.9%	1.2%	1.4%	1.7%	1.5
Iceland	ScA	4.8%	-7.8%	0.6%	9.0%	11%	5.3%	4.7%	3.0%	3.1%	3.1%	3.8%	2.3
	ScC	.	.	.	.	.	3.7%	2.1%	1.8%	1.7%	1.8%	2.4%	1.7
	ScC'	.	.	.	.	.	3.7%	1.1%	1.4%	1.4%	1.6%	2.1%	1.6
	ScD	.	.	.	.	.	2.3%	1.4%	0.8%	0.4%	0.7%	1.2%	1.3
Ireland	ScA	0.6%	-12%	-3.1%	1.9%	-0.4%	3.5%	5.4%	3.0%	2.6%	1.5%	2.8%	1.9
	ScC	.	.	.	.	.	2.5%	1.8%	2.0%	1.4%	1.4%	1.9%	1.5
	ScC'	.	.	.	.	.	2.5%	0.9%	1.5%	1.2%	1.3%	1.7%	1.5
	ScD	.	.	.	.	.	1.2%	0.0%	0.6%	0.2%	0.4%	0.6%	1.2
Italy	ScA	-2.4%	-5.1%	3.9%	0.8%	-2.3%	3.2%	3.5%	2.7%	2.3%	2.0%	2.6%	1.8
	ScC	.	.	.	.	.	2.0%	1.8%	1.8%	1.1%	0.9%	1.5%	1.4
	ScC'	.	.	.	.	.	2.0%	1.2%	1.2%	0.7%	0.6%	1.2%	1.3
	ScD	.	.	.	.	.	0.5%	0.2%	0.3%	-0.1%	0.1%	0.2%	1.1
Latvia	ScA	11%	-8.4%	4.0%	9.8%	-1.0%	5.0%	5.9%	3.7%	3.3%	2.7%	3.9%	2.4
	ScC	.	.	.	.	.	2.8%	3.6%	3.2%	2.4%	2.1%	2.7%	1.8
	ScC'	.	.	.	.	.	2.8%	3.0%	2.6%	2.0%	2.0%	2.4%	1.7
	ScD	.	.	.	.	.	0.9%	1.9%	1.9%	1.2%	1.4%	1.3%	1.4

Figure 39 (continued). Annual growth per traffic zone and FAB.

IFR Movements (thousands)		2008	2009	2010	2011	2012	2019	2020	2025	2030	2035	AAGR 2035/ 2012	Traffic Mul- tiple 2035/ 2012
Lisbon FIR	ScA	2.7%	-7.2%	5.6%	4.8%	-2.7%	3.1%	3.5%	2.9%	2.4%	2.1%	2.7%	1.8
	ScC	.	.	.	.	.	1.6%	1.6%	1.8%	1.3%	1.0%	1.5%	1.4
	ScC'	.	.	.	.	.	1.6%	0.8%	1.1%	0.7%	0.8%	1.1%	1.3
	ScD	.	.	.	.	.	0.1%	-0.4%	0.1%	-0.3%	-0.2%	-0.1%	1.0
Lithuania	ScA	12%	-12%	7.3%	13%	1.0%	5.3%	5.5%	3.6%	2.9%	2.5%	3.8%	2.4
	ScC	.	.	.	.	.	3.3%	3.4%	3.1%	2.2%	1.9%	2.7%	1.9
	ScC'	.	.	.	.	.	3.3%	2.7%	2.4%	1.8%	1.7%	2.4%	1.7
	ScD	.	.	.	.	.	1.5%	1.9%	1.8%	1.1%	1.2%	1.4%	1.4
Malta	ScA	3.5%	0.7%	12%	-15%	20%	5.3%	6.1%	4.4%	3.9%	3.7%	4.5%	2.7
	ScC	.	.	.	.	.	4.2%	5.1%	3.3%	2.6%	2.5%	3.3%	2.1
	ScC'	.	.	.	.	.	4.2%	4.8%	3.1%	2.4%	2.4%	3.2%	2.1
	ScD	.	.	.	.	.	3.1%	3.6%	2.3%	1.9%	2.1%	2.5%	1.8
Moldova	ScA	18%	6.7%	24%	11%	5.7%	6.8%	7.1%	6.0%	4.0%	2.8%	5.1%	3.2
	ScC	.	.	.	.	.	5.1%	4.8%	4.7%	4.0%	2.3%	4.2%	2.6
	ScC'	.	.	.	.	.	5.1%	4.3%	4.1%	3.8%	2.0%	3.9%	2.4
	ScD	.	.	.	.	.	3.5%	3.4%	3.3%	2.8%	3.1%	3.2%	2.1
Morocco	ScA	2.5%	-5.8%	8.6%	3.9%	-8.1%	4.7%	5.2%	4.9%	4.5%	4.4%	4.7%	2.9
	ScC	.	.	.	.	.	2.9%	3.4%	3.3%	2.8%	2.6%	2.9%	1.9
	ScC'	.	.	.	.	.	2.9%	2.6%	2.7%	2.3%	2.4%	2.6%	1.8
	ScD	.	.	.	.	.	1.3%	1.3%	1.7%	1.3%	1.5%	1.4%	1.4
Netherlands	ScA	-1.6%	-8.6%	1.7%	7.2%	-0.2%	2.9%	2.9%	1.7%	1.5%	1.1%	1.9%	1.6
	ScC	.	.	.	.	.	2.0%	2.0%	1.6%	1.1%	0.8%	1.4%	1.4
	ScC'	.	.	.	.	.	2.0%	1.2%	1.3%	0.9%	0.9%	1.3%	1.4
	ScD	.	.	.	.	.	0.5%	0.4%	0.6%	0.1%	0.3%	0.4%	1.1
Norway	ScA	2.6%	-4.4%	2.2%	4.9%	4.2%	2.0%	6.3%	1.1%	2.4%	1.0%	1.9%	1.5
	ScC	.	.	.	.	.	1.4%	4.7%	0.6%	1.2%	0.8%	1.2%	1.3
	ScC'	.	.	.	.	.	1.4%	4.5%	0.7%	0.8%	0.8%	1.1%	1.3
	ScD	.	.	.	.	.	0.5%	-0.0%	0.0%	-0.0%	0.1%	0.2%	1.0
Poland	ScA	10%	-7.6%	5.8%	9.4%	4.6%	5.0%	5.0%	3.3%	2.5%	2.2%	3.5%	2.2
	ScC	.	.	.	.	.	3.3%	3.1%	2.9%	2.1%	1.7%	2.6%	1.8
	ScC'	.	.	.	.	.	3.3%	2.5%	2.3%	1.8%	1.7%	2.4%	1.7
	ScD	.	.	.	.	.	1.5%	1.4%	1.5%	1.0%	1.2%	1.3%	1.3

Figure 39 (continued). Annual growth per traffic zone and FAB.

IFR Movements (thousands)		2008	2009	2010	2011	2012	2019	2020	2025	2030	2035	AAGR 2035/ 2012	Traffic Mul- tiple 2035/ 2012
Romania	ScA	2.8%	-2.3%	8.2%	3.8%	-0.0%	6.3%	6.2%	4.8%	3.3%	2.8%	4.6%	2.8
	ScC	.	.	.	.	.	4.5%	4.0%	4.1%	3.0%	2.0%	3.5%	2.2
	ScC'	.	.	.	.	.	4.5%	3.4%	3.6%	2.9%	1.9%	3.3%	2.1
	ScD	.	.	.	.	.	2.7%	2.4%	2.5%	1.8%	1.9%	2.3%	1.7
Santa Maria FIR	ScA	6.5%	-2.6%	4.5%	4.3%	-3.9%	3.7%	3.3%	2.6%	2.5%	2.3%	2.9%	1.9
	ScC	.	.	.	.	.	2.6%	1.3%	1.5%	1.0%	0.9%	1.6%	1.4
	ScC'	.	.	.	.	.	2.6%	0.0%	0.6%	0.4%	0.5%	1.1%	1.3
	ScD	.	.	.	.	.	1.3%	-1.0%	-0.3%	-0.6%	-0.4%	0.1%	1.0
Serbia& Montenegro	ScA	8.6%	3.3%	5.9%	2.7%	-4.1%	4.5%	5.3%	4.1%	3.4%	2.8%	3.9%	2.4
	ScC	.	.	.	.	.	3.2%	4.1%	3.6%	2.5%	1.8%	2.9%	1.9
	ScC'	.	.	.	.	.	3.2%	3.5%	3.1%	2.3%	1.6%	2.6%	1.8
	ScD	.	.	.	.	.	1.6%	1.6%	1.8%	1.3%	1.8%	1.6%	1.4
Slovakia	ScA	6.4%	-2.4%	9.9%	3.1%	-0.3%	5.3%	5.8%	3.8%	2.8%	2.3%	3.8%	2.4
	ScC	.	.	.	.	.	3.8%	3.3%	3.4%	2.3%	1.6%	2.9%	1.9
	ScC'	.	.	.	.	.	3.8%	2.7%	2.9%	2.2%	1.5%	2.7%	1.8
	ScD	.	.	.	.	.	2.2%	1.6%	1.8%	1.2%	1.3%	1.6%	1.5
Slovenia	ScA	6.8%	-4.2%	4.8%	7.5%	-2.0%	4.2%	5.5%	3.8%	3.0%	2.6%	3.6%	2.2
	ScC	.	.	.	.	.	3.0%	3.5%	3.3%	2.3%	1.6%	2.6%	1.8
	ScC'	.	.	.	.	.	3.0%	2.8%	2.7%	2.1%	1.5%	2.4%	1.7
	ScD	.	.	.	.	.	1.4%	1.5%	1.6%	1.0%	1.3%	1.3%	1.4
Spain	ScA	-1.8%	-9.5%	1.8%	3.6%	-6.5%	2.6%	3.3%	3.0%	2.6%	2.3%	2.7%	1.8
	ScC	.	.	.	.	.	1.4%	1.9%	1.9%	1.4%	1.1%	1.5%	1.4
	ScC'	.	.	.	.	.	1.4%	0.9%	1.4%	1.0%	0.9%	1.2%	1.3
	ScD	.	.	.	.	.	-0.0%	0.3%	0.5%	-0.1%	0.0%	0.1%	1.0
Sweden	ScA	3.9%	-11%	1.5%	9.1%	-0.1%	3.3%	4.3%	2.2%	2.2%	1.7%	2.5%	1.8
	ScC	.	.	.	.	.	2.2%	2.6%	1.6%	1.4%	1.1%	1.7%	1.5
	ScC'	.	.	.	.	.	2.2%	2.0%	1.1%	0.8%	0.9%	1.4%	1.4
	ScD	.	.	.	.	.	0.8%	0.2%	0.3%	0.2%	0.3%	0.4%	1.1
Switzerland	ScA	0.3%	-7.1%	0.7%	3.6%	-1.7%	2.2%	3.8%	2.1%	1.4%	1.2%	1.9%	1.5
	ScC	.	.	.	.	.	1.6%	1.8%	1.9%	0.8%	0.6%	1.3%	1.3
	ScC'	.	.	.	.	.	1.6%	1.1%	1.2%	0.6%	0.6%	1.1%	1.3
	ScD	.	.	.	.	.	0.3%	0.0%	0.2%	-0.1%	0.1%	0.1%	1.0

Figure 39 (continued). Annual growth per traffic zone and FAB.

IFR Movements (thousands)		2008	2009	2010	2011	2012	2019	2020	2025	2030	2035	AAGR 2035/ 2012	Traffic Mul- tiple 2035/ 2012
Turkey	ScA	8.6%	4.2%	13%	7.6%	2.6%	8.3%	4.8%	4.8%	3.4%	3.2%	5.2%	3.2
	ScC	.	.	.	.	.	6.8%	3.6%	4.2%	3.4%	2.4%	4.4%	2.7
	ScC'	.	.	.	.	.	6.8%	3.4%	3.9%	3.4%	2.3%	4.3%	2.6
	ScD	.	.	.	.	.	5.2%	2.8%	3.0%	2.4%	2.8%	3.5%	2.2
Ukraine	ScA	8.7%	-6.9%	14%	5.5%	2.9%	6.2%	6.5%	5.3%	4.2%	4.0%	5.1%	3.1
	ScC	.	.	.	.	.	4.6%	4.3%	4.3%	3.5%	3.0%	3.9%	2.4
	ScC'	.	.	.	.	.	4.6%	3.7%	3.6%	3.2%	2.7%	3.6%	2.3
	ScD	.	.	.	.	.	3.0%	2.8%	2.8%	2.2%	2.6%	2.7%	1.8
UK	ScA	-1.4%	-9.4%	-4.3%	2.8%	-1.4%	2.8%	3.1%	2.2%	1.8%	1.4%	2.2%	1.6
	ScC	.	.	.	.	.	1.8%	1.7%	1.6%	1.1%	1.1%	1.5%	1.4
	ScC'	.	.	.	.	.	1.8%	1.3%	1.4%	1.0%	1.1%	1.4%	1.4
	ScD	.	.	.	.	.	0.7%	0.4%	0.6%	0.3%	0.5%	0.6%	1.1
ESRA02	ScA	0.4%	-6.6%	0.7%	2.9%	-2.6%	3.4%	3.6%	2.5%	2.2%	1.9%	2.6%	1.8
	ScC	.	.	.	.	.	2.3%	2.1%	1.9%	1.4%	1.2%	1.8%	1.5
	ScC'	.	.	.	.	.	2.3%	1.5%	1.5%	1.2%	1.1%	1.6%	1.4
	ScD	.	.	.	.	.	0.9%	0.6%	0.8%	0.4%	0.7%	0.7%	1.2
EU27	ScA	0.3%	-7.2%	0.2%	2.6%	-3.0%	3.0%	3.6%	2.4%	2.1%	1.8%	2.5%	1.8
	ScC	.	.	.	.	.	1.9%	2.0%	1.8%	1.3%	1.1%	1.6%	1.4
	ScC'	.	.	.	.	.	1.9%	1.3%	1.4%	1.0%	1.0%	1.4%	1.4
	ScD	.	.	.	.	.	0.5%	0.4%	0.6%	0.2%	0.5%	0.5%	1.1
ESRA08	ScA	0.4%	-6.6%	0.8%	3.1%	-2.4%	3.4%	3.7%	2.5%	2.2%	1.9%	2.6%	1.8
	ScC	.	.	.	.	.	2.3%	2.2%	1.9%	1.5%	1.2%	1.8%	1.5
	ScC'	.	.	.	.	.	2.3%	1.5%	1.5%	1.2%	1.1%	1.6%	1.4
	ScD	.	.	.	.	.	0.9%	0.6%	0.8%	0.4%	0.7%	0.7%	1.2
SES	ScA	0.4%	-6.9%	0.2%	2.6%	-2.6%	3.0%	3.7%	2.4%	2.1%	1.9%	2.5%	1.7
	ScC	.	.	.	.	.	1.9%	2.1%	1.8%	1.3%	1.1%	1.6%	1.4
	ScC'	.	.	.	.	.	1.9%	1.4%	1.4%	1.0%	1.0%	1.4%	1.4
	ScD	.	.	.	.	.	0.5%	0.4%	0.6%	0.2%	0.5%	0.5%	1.1
Baltic FAB	ScA	11%	-8.6%	5.5%	9.2%	3.6%	5.2%	5.1%	3.4%	2.6%	2.3%	3.6%	2.3
	ScC	.	.	.	.	.	3.5%	3.2%	3.0%	2.2%	1.8%	2.7%	1.8
	ScC'	.	.	.	.	.	3.5%	2.6%	2.4%	1.9%	1.8%	2.5%	1.8
	ScD	.	.	.	.	.	1.6%	1.5%	1.6%	1.1%	1.2%	1.4%	1.4

Figure 39 (continued). Annual growth per traffic zone and FAB.

IFR Movements (thousands)		2008	2009	2010	2011	2012	2019	2020	2025	2030	2035	AAGR 2035/ 2012	Traffic Mul- tiple 2035/ 2012
BLUE MED FAB	ScA	-0.8%	-3.8%	3.6%	-0.1%	-2.4%	3.7%	4.1%	3.3%	2.8%	2.6%	3.2%	2.1
	ScC	.	.	.	.	.	2.4%	2.3%	2.3%	1.7%	1.4%	2.0%	1.6
	ScC'	.	.	.	.	.	2.4%	1.7%	1.7%	1.3%	1.1%	1.7%	1.5
	ScD	.	.	.	.	.	0.9%	0.7%	0.8%	0.5%	0.7%	0.7%	1.2
Danube FAB	ScA	6.9%	-0.4%	6.7%	3.3%	-1.5%	6.4%	5.9%	4.7%	3.3%	2.8%	4.5%	2.8
	ScC	.	.	.	.	.	4.7%	4.0%	4.1%	3.0%	2.0%	3.6%	2.2
	ScC'	.	.	.	.	.	4.7%	3.4%	3.6%	2.9%	2.0%	3.4%	2.2
	ScD	.	.	.	.	.	2.9%	2.4%	2.5%	1.8%	2.1%	2.4%	1.7
FAB CE	ScA	3.1%	-5.2%	3.2%	2.7%	-2.6%	4.4%	5.4%	3.2%	2.5%	2.1%	3.3%	2.1
	ScC	.	.	.	.	.	3.1%	3.0%	2.9%	1.9%	1.4%	2.4%	1.7
	ScC'	.	.	.	.	.	3.1%	2.3%	2.2%	1.6%	1.2%	2.1%	1.6
	ScD	.	.	.	.	.	1.4%	1.2%	1.3%	0.7%	0.9%	1.1%	1.3
FABEC	ScA	0.5%	-7.1%	0.5%	4.4%	-1.9%	2.7%	3.4%	2.1%	1.7%	1.6%	2.2%	1.6
	ScC	.	.	.	.	.	1.8%	1.9%	1.7%	1.0%	0.9%	1.4%	1.4
	ScC'	.	.	.	.	.	1.8%	1.1%	1.2%	0.8%	0.8%	1.2%	1.3
	ScD	.	.	.	.	.	0.4%	0.2%	0.4%	-0.1%	0.2%	0.3%	1.1
NEFAB	ScA	4.5%	-6.6%	2.1%	7.0%	1.3%	3.0%	5.6%	1.9%	2.6%	1.6%	2.5%	1.8
	ScC	.	.	.	.	.	1.8%	3.7%	1.4%	1.5%	1.3%	1.6%	1.4
	ScC'	.	.	.	.	.	1.8%	3.4%	1.2%	1.1%	1.2%	1.4%	1.4
	ScD	.	.	.	.	.	0.5%	0.4%	0.5%	0.3%	0.5%	0.4%	1.1
South West FAB	ScA	-1.8%	-9.4%	1.8%	3.3%	-9.8%	2.7%	3.3%	3.0%	2.7%	2.4%	2.7%	1.8
	ScC	.	.	.	.	.	1.5%	1.9%	1.9%	1.4%	1.2%	1.5%	1.4
	ScC'	.	.	.	.	.	1.5%	0.9%	1.3%	1.0%	1.0%	1.2%	1.3
	ScD	.	.	.	.	.	-0.0%	0.2%	0.5%	-0.1%	0.1%	0.1%	1.0
UK-Ireland FAB	ScA	-1.5%	-9.5%	-4.3%	2.5%	-1.5%	2.8%	3.1%	2.2%	1.9%	1.4%	2.2%	1.6
	ScC	.	.	.	.	.	1.8%	1.7%	1.6%	1.1%	1.1%	1.5%	1.4
	ScC'	.	.	.	.	.	1.8%	1.3%	1.4%	1.0%	1.1%	1.4%	1.4
	ScD	.	.	.	.	.	0.7%	0.5%	0.6%	0.4%	0.5%	0.6%	1.1
DK-SE FAB	ScA	2.2%	-9.7%	2.4%	5.7%	-3.0%	3.2%	4.0%	2.0%	2.0%	1.5%	2.4%	1.7
	ScC	.	.	.	.	.	2.2%	2.5%	1.5%	1.2%	1.0%	1.6%	1.4
	ScC'	.	.	.	.	.	2.2%	1.8%	1.0%	0.7%	0.8%	1.3%	1.3
	ScD	.	.	.	.	.	0.8%	0.1%	0.2%	0.0%	0.2%	0.4%	1.1

Figure 39 (continued). Annual growth per traffic zone and FAB.

ANNEX E ALTERNATIVE FUELS

The development of sustainable biofuels is recognised as a key component of reducing aviation's environmental impact. Technological feasibility is no longer considered to be a barrier: drop-in alternative fuels are now approved and being used in limited quantities by some commercial operators. However, current production capacity is limited and production costs are still too high for biofuels to be commercially viable, although some feedstocks and production techniques (e.g. agricultural or municipal wastes) do show potential to be able to reduce costs to a level comparative to conventional jet fuel. However, such cost reductions will be dependent on both technological learning curves and the evolution of the price of oil and carbon. Current analyses suggest that the breakeven point for biomass-to-liquid fuels may be achieved by around 2030 although this varies according to feedstock, production method and potential regulatory requirements. Higher oil prices will bring forward the breakeven point. Conversely, with lower oil prices, the incentive for biofuel production may be reduced. However, a high carbon price will also be a factor: biofuels are currently classed as having zero CO₂ emissions under the EU ETS (see Ref. 24, 25, 26).

The 2010 EU Biofuels Flightpath document (see Ref. 25) suggests that jet kerosene prices would need to reach \$3/gallon in order for biofuels to begin to breakeven. For scenario C this can be expected by 2030 but may be accelerated by a relatively high carbon price. A similar kerosene price is forecast slightly later for scenario A and won't receive the same boost from the lower carbon price. This kerosene price is potentially reached much earlier in scenarios C' and D, and the high projected cost of carbon in scenario D may be an additional incentive, although the development of the biofuels market may be less certain in a politically fragmented scenario.

Sustainability remains a challenge. Indirect Land Use Change (ILUC) where non-agricultural land is converted for food production is a concern, as are total life cycle emissions and the large quantities of water which are often required. Due to limitations in the availability of land and feedstock eventual demand for biofuel will not be met and decisions will need to be made about where in the economy it will be best used and how such distribution could be achieved, a concern for sectors such as aviation which have limited feasible alternatives to jet kerosene. The extent to which carbon capture and storage (CCS) technologies are successfully developed and implemented is also a factor: use of CCS may divert biofuel to power plants so that the carbon which is released can be captured, thus reducing availability for other sectors.

Estimates for the rate of uptake of biofuels by commercial aviation vary significantly. The EU Biofuels Flightpath Initiative is aiming for 2 million tonnes of biofuel use by 2020 (around 4% of total aviation fuel). However, the capacity to produce such quantities doesn't currently exist so this is a challenging target. By 2030 it can be reasonably expected that the proportion of alternative fuel use will have increased although it is unlikely to be higher than around 10-15%. For 2050 there is a wider range of estimates. The UK Climate Change Committee has conservatively estimated 10%, whilst analysis by the Sustainable Aviation Group suggests 18% may be possible with the right incentives and structures. The 2011 European Commission Transport White Paper proposes an aspirational target of 40% by 2050.

Alternative fuels are not a panacea. However, if sustainably produced from a reliable and cost-effective supply, they will contribute to meeting emissions targets.

ANNEX F POLITICAL TARGETS

Challenging national and international political targets have now been established to reduce aviation CO₂ emissions. International Civil Aviation Organisation (ICAO) has resolved *"to achieve a global annual average fuel efficiency improvement of 2 per cent until 2020 and an aspirational global fuel efficiency improvement rate of 2 per cent per annum from 2021 to 2050, calculated on the basis of volume of fuel used per revenue tonne kilometre performed...[and] to achieve a collective medium term global aspirational goal of keeping the global net carbon emissions from international aviation from 2020 at the same level"* (see Ref. 27)

This is reiterated by industry which has adopted a similar goal, although with a 1.5% per annum fuel efficiency target rather than 2%, with the aim of achieving carbon-neutral growth from 2020 and reducing aviation's overall CO₂ emissions by half by 2050 compared to 2005.

The European Union has set a more ambitious target of a 10% reduction in aviation CO₂ emissions by 2020 compared to 2005 levels. Further challenging European targets have been set by the High Level Group on Aviation Research (Flightplan 2050) of 75% reduction in CO₂ per passenger km, 90% reduction in NO_x emissions, and a 65% reduction in perceived noise of aircraft in flight by 2050 (see Ref. 18). The path to achieve this is set out in the EU Advisory Council for Aeronautics Research in Europe (ACARE) Strategic Research and Innovation Agenda (SRiA).

ANNEX G REFERENCES

Published reports from the current and previous Challenges of Growth studies are available at:
www.eurocontrol.int/articles/challenges-growth.

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