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Is there a need and scope to revitalize small regional air transport in Europe?

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Abstract

This paper deals with the past developments and future prospects of regional air transport in Europe. Under pressure from e.g. low cost carriers and increasing average aircraft size, "traditional", "niche" regional air traffic has heavily lost market shares. In the first part of the paper, we employ air transport supply data to show this trend and its connectivity impacts on selected airports and regions. Also, we discuss the range of potential drivers behind this trend.

Against this background, a successful revitalization of small regional air services could probably help improving regional connectivity and the utilization (and financials) of small airports. In the second part of the paper, we therefore aim at identifying pillars for a sustainable new and innovative regional air transport "2.0" in Europe, which could be used as a basis for future research. The following areas of research have been identified:

- Cost-reduction potential of new regional aircraft technologies
- Improving operational efficiency and new technologies at ATM and airport level
- Effects of newly designed institutional set-ups for regional air transport and overall assessments of potential supply patterns and demand levels of regional air transport 2.0 operations as well as resulting social-economic impacts, such as on connectivity and airport financials.

Keywords: small regional air transport, regional airports, remote regions, regional air traffic

Classification: Airline network development, Airline Case Study, Air Transport Policy and regulation

1. Introduction

Regional air traffic in Europe has changed tremendously over the past years. Under pressure from discount low cost carriers, most regional airlines have either ceased operations or been transformed into pure operating platforms for network carriers. Average aircraft size has increased, and many thinner routes that used to be served at relatively high frequencies by aircraft with less than about 50 seats have disappeared. Hence, many remote regions have lost air transport connectivity, with the typical low-frequency low cost service probably not making a good substitute for business travellers and regional economies.

A successful re-vitalization of regional air services could therefore yield in better regional connectivity and at the same time help improving the utilization and financials of hundreds of smaller airports and airfields.

In this paper, we first employ air transport supply data to illustrate the decline of regional aviation in Europe and its connectivity impacts on selected airports. Also, we discuss the range of potential drivers behind this trend. Second, we aim at identifying pillars for a sustainable new and innovative regional air transport “2.0” in Europe, from both the technical, operational and economic perspectives, which should act as basis for future research:

- A **technology view** shall be taken to analyze current and future small aircraft technologies with regard to their potentials to significantly reduce unit costs, which could make it easier for small aircraft operators to break-even.
- An **operational perspective** shall help to identify new measures for the reduction of operational costs, like flat-fee landing charges and ATM cost, which are not directly related to the aircraft technology level. We also look at the regional airport level where dramatic potentials for cost reductions might exist, such as GLS (GBAS).
- Finally, an **economic view** may be taken to discuss new institutional set-ups that could help to strengthen regional air transport. Also, we propose to estimate potential supply patterns and demand levels of regional air transport 2.0 operations to assess the overall commercial viability of such services, as well as resulting social-economic impacts, such as on connectivity and airport financials.

2. Development of regional air services in Europe

In the “good old”, pre-deregulation days of aviation, air transport in Europe, as in most other world regions, consisted of three main pillars:

- Scheduled flights by (mostly) state-owned legacy carriers, such as Lufthansa, Air France, British Airways or KLM, which operated in heavily regulated regimes of domestic monopolies and cross-border duopolies;
- Holiday charter flights operated by dedicated leisure carriers on behalf of tour operators. In most cases, those flights took place on otherwise unserved routes e.g. from airports in Northern Europe to holiday destinations in Southern Europe. Traffic rights were usually granted on a reciprocal basis;
- Regional (feeder) services from small airports to the main ones, and between regions.

Unlike today, the latter were in most cases served by specialized niche carriers, holding permissions for routes that were not of interest to the major carriers. These regional “niche” carriers could either be independent operators or subsidiaries of the national carriers. Examples for the former initially included Nürnberger Flugdienst (NFD, later: Eurowings) in Germany, Crossair in Switzerland, Air Anglia, Manx Airlines or Air UK in the UK, and Proteus Airlines in France, and for the latter Lufthansa Cityline and Eurowings (after being sold to Lufthansa) in Germany, Crossair (after partly taken over by Swissair) in Switzerland, Regional Airlines in France or BA Cityflyer in the UK.

Figures 1 and 2 show exemplary former regional route networks of Crossair (Switzerland, 1995) and Air Anglia (UK, 1975).

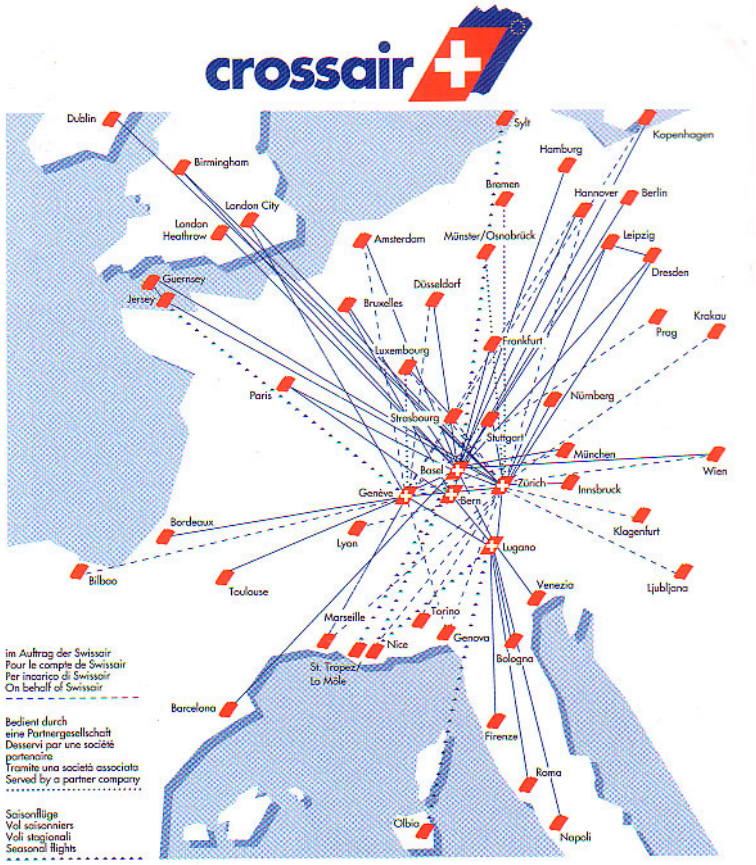

Figure 1: Route network of Crossair (1995)

Figure 2: Route network of Air Anglia (1975)

In the 1990s, before the boom of the European low cost carrier sector, regional air traffic in Europe grew well, as figure 3 shows for the 40-60 and 60-110 seat categories. The number of weekly departures of such aircraft doubled from about 12,000 and 13,000 in 1993 to about 24,000 and 22,000 in the year 2000.

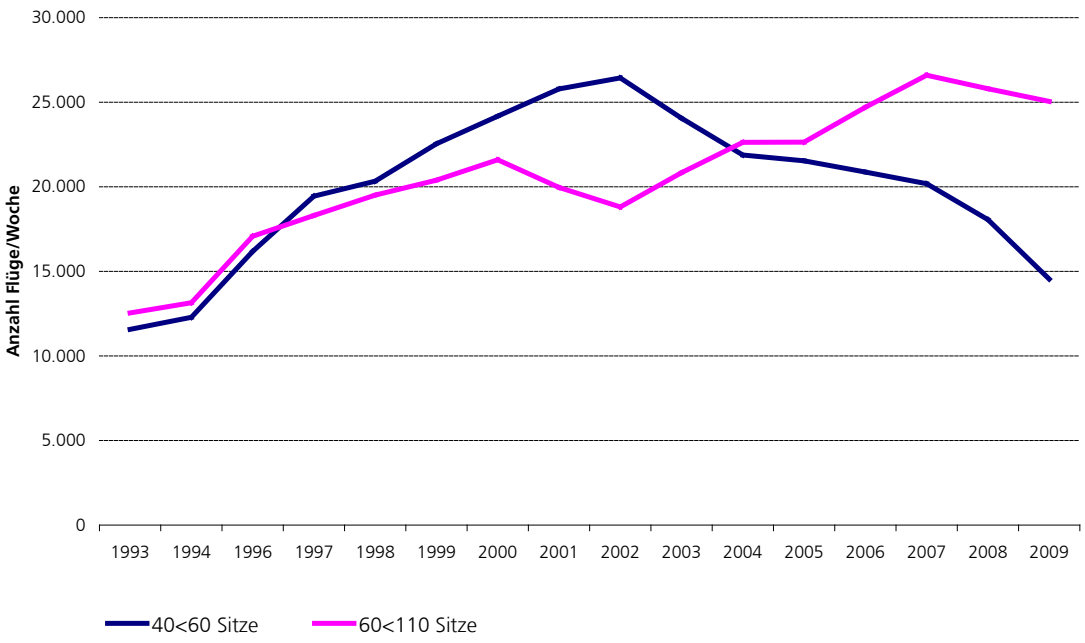

Figure 3 Weekly departures in Europe by seat category, 1993-2009.
Source: OAG

There are a number of reasons assumed to stand behind this trend. New aircraft like the 50-seater Canadair Regionaljet 100 and the Embraer 135/145 family emerged, allowing for faster

and quieter regional air transport at competitive unit costs. As a consequence, legacy carriers, which had to improve their financials, could replace larger, more "thirsty" 2nd generation jet aircraft (such as Boeing 727-200, 737-200, MD-80) or outdated propliners on low to medium-density inter-European routes and, where necessary, increase frequencies at affordable cost and lower risk of large capacities remaining unsold. In this context, existing regional subsidiaries were strengthened or new investments in regional affiliations were undertaken to establish cheap(er) operating platforms. One example here is Lufthansa's decision to rename its affiliation DLT in Lufthansa Cityline in 1990. Other new aircraft types that sold well in the 1990's include the 46-seat ATR 42 and the larger 70-seat ATR72, Bae 146/Avro RJ and – at last in the first years of that decade, Fokker 50/70/100.

From the early 2000's, then, the structure of regional air transport has changed again: The number of weekly flights operated by aircraft with 40-60 seats began to decline massively from about 26,000 in 2002 to only 15,000 movements in 2009, while larger regional aircraft managed to remain their growth momentum (Figure 3). These trends are also illustrated in Figure 4 which shows the development of yearly departures by aircraft class from 2000 to 2014. The very small 1-20 seat category also belongs to the air transport segments losing market shares.

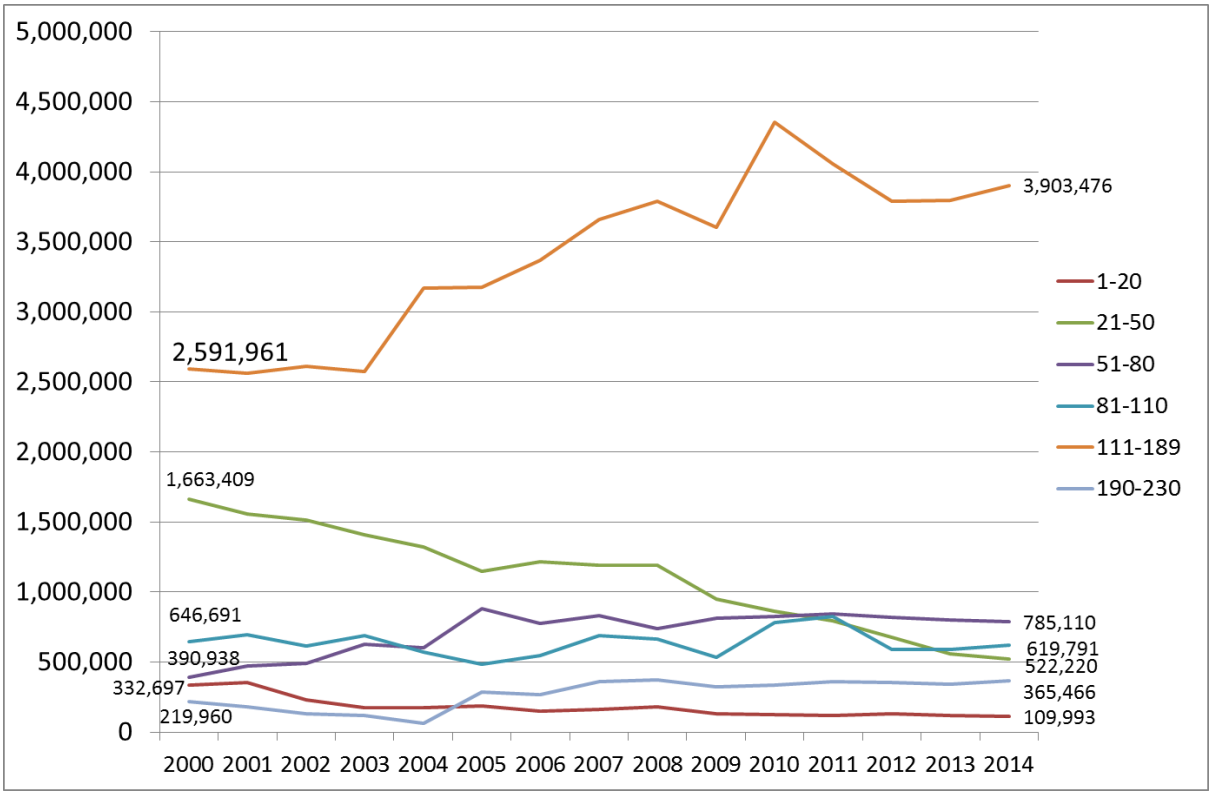

Figure 4: Weekly departures in Europe by seat category, 2000-2014.
Source: Sabre-ADI

Albeit to a lesser extent, this demise of small(er) regional air traffic can also be observed on a worldwide level: From 2007, a significant decline of the 40-60 seat segment can be observed, from about 95,000 weekly movements in 2005 to only 85,000 in 2007, while the 60-110 seat segment has grown from 42,000 in 2003 to about 75,000 in 2009.

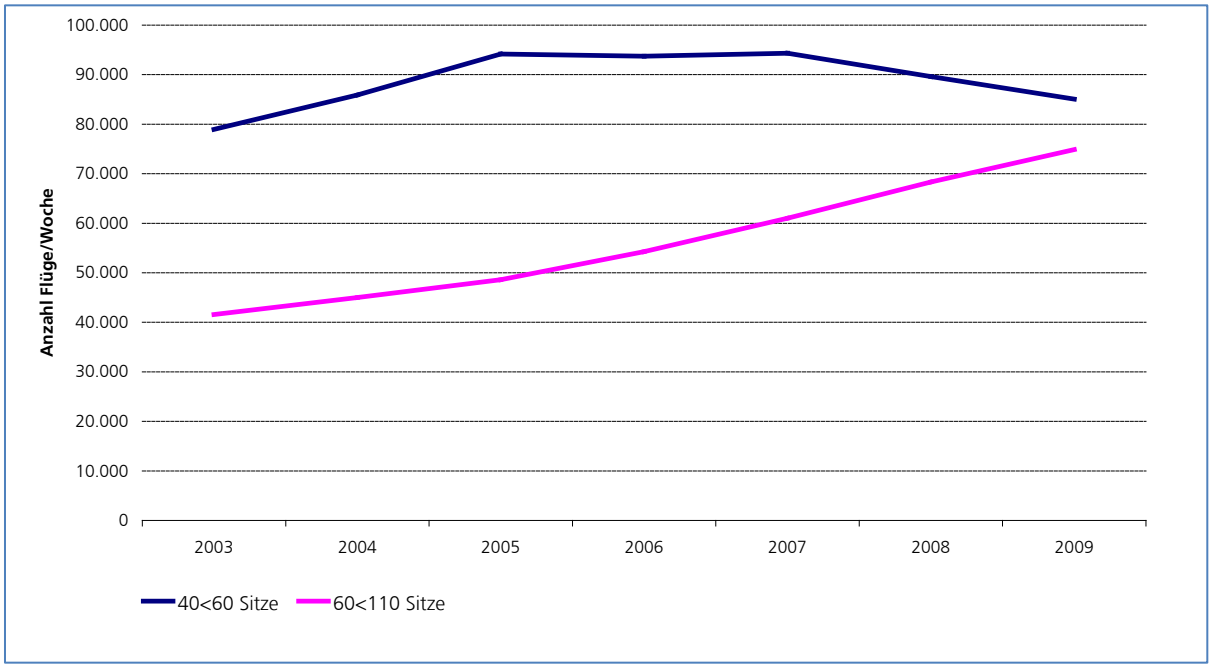

Figure 5 Weekly departures by seat category, worldwide, 2003-2009.
Source: OAG

The described trend regarding the number of movements by aircraft size category also mirrors when it comes to the global fleet size. While the number of 40-60 seat aircraft has been stagnating from about 2004 at around 2,100 units, the number of active 60-110 seat aircraft has been rising from 1,300 to 2,100.

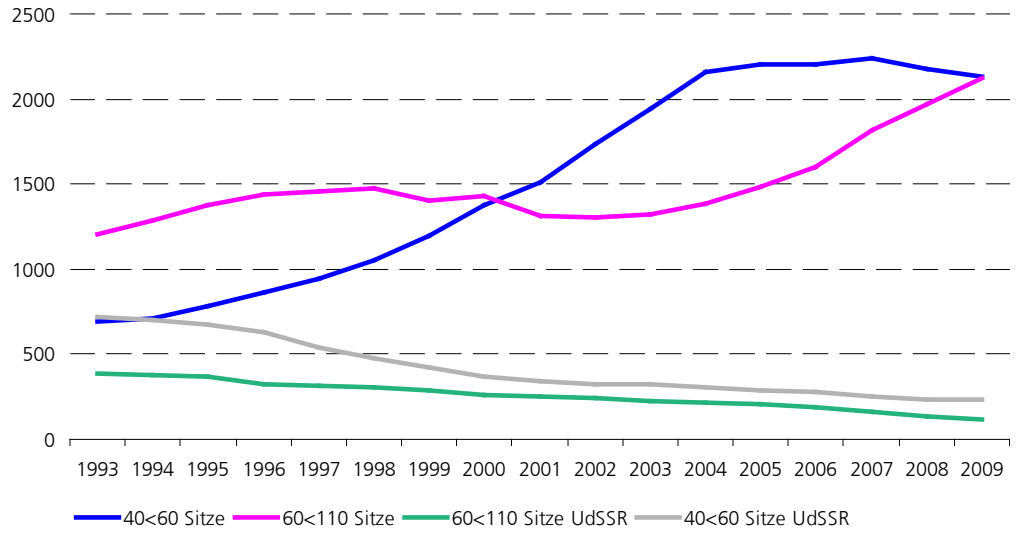

Figure 6: Global fleet size development of the 40-60 and 60-110 aircraft categories (Dash 8 not counted)
Source: Ascend

On the business model level, we can currently differ between the following main groups of regional air traffic in Europe (see Table 1):

- Operations on behalf of legacy carriers on either hub feeder or decentralized routes by
  - either subsidiaries or
  - financially independent franchise operators,
- and fully independent, mostly small to medium-scale regional operations.

By far the highest share of the European regional airline seat capacity is currently represented by affiliated operations, be it on a franchise basis or by subsidiaries, while independent regional networks are more considered being a niche (out of the global top 100, independent regional operations represent only about 256/(189+226+256) = 38% of the fleet; see Table 1).

Business Model and Financial affiliation	**Financially independent from legacy carrier**	**(Partly or fully) owned by legacy carrier**
Hub feeder services for legacy carrier **Total fleet: 189** (of carriers out of the global Top 100 only)	Augsburg Airways (52/15)	Lufthansa Cityline (8/57) KLM Cityhopper (11/49) Flybe Nordic (49/28) Air Dolomiti (57/17) Blue1 (58/11) Eurolot (79/12)
Regional/specialized network in close cooperation with legacy carrier **Total fleet: 226** (of carriers out of the global Top 100 only)	Air Nostrum (IB-Franchise) (21/42) BA Cityflyer (66/16) (BA-Franchise)	Eurowings (for Lufthansa / germanwings) (44/23) Cityjet (60/30) (until 2014) Régional (24/49)** Brit Air (25/36)** Olympic Air (32/18)*** Binter Canarias (43/12)
Fully independent operations **Total fleet: 256** (of carriers out of the global Top 100 only)	Flybe (12/67)* Air Baltic* (30/30) Wideroe (38/41) Air Corsica (56/11) *Cityjet (60/30) (from 2014)* Malmö Aviation (61/11) Braathens Regional (70/19) Air Arann (71/13) Loganair (91/26) Eastern Airways (96/29) Aurigny (99/9)	
*) Air Baltic and Flybe operate “low fare” regional airline business models **) In the meantime, Régional, Britair and – much smaller – Airlinair have been merged into Hop! ***) Part of Aegean This table includes all European regional carriers (not including Russia and non-EU/EWR countries) out of the TOP 100 worldwide as reported by Airline Business (2013). The first number in brackets shows the position among the worldwide Top 100, and the second number the 2013 fleet size).		

Table 1: Business model and ownership of largest (and selected other) regional airlines in Europe

Source: Own categorization; ranking taken and flee size data taken from Airline Business (2013).

The described trends towards large regional air traffic also mirrors in the order book and forecasts of the leading commercial aircraft manufacturers.

Table 2 gives an overview of the future sales potential of regional aircraft as estimated by the manufacturers (as of 2009). The estimations vary considerably. For instance, the number of 50-seaters to be delivered between 2008/2009 and 2027/2028 has been estimated as between 300 (Bombardier) and 2,468 (Airbus). More detailed information have been published by Rolls-Royce. According to its outlook, 1,695 new deliveries will face 2,785 retirements, resulting in the active fleet to be reduced from 2,599 by net 1,090 units to 2,599 units.

Manufacturer	**Timeframe**	**Small a/c**	**Medium a/c**	**Large a/c**
Airbus	2009-2028	50 seats: 2,468	70/85 Seats: 3,610	100 Seats: 2,243
ATR	2008-2027	30-60 seats: 710	61-90 Seats: 3,875	91-120 Seats: 3,400
Bombardier	2009-2028	20-59 Seats: 300	60-99 Seats: 5,800	100-149 Seats: 6,300
Embraer	2009-2028	30-60 Seats: 650	61-90 Seats: 2,450	91-120 Seats: 3,650
Rolls Royce	2009-2028	30-50 Seats: 1,695	70-90 Seatsr: 4,843	n/a

Table 2: Future deliveries of regional aircraft as estimated in 2008/2009.
Sources:
http://www.airbus.com/en/corporate/gmf2009/,
http://www.atr.fr/public/atr/html/media/downloadcenter.php#_,
http://www.bombardier.com/files/en/supporting_docs/BCA_2009_Market_Forecast.pdf,
http://www.embraercommercialjets.com/hotsites/market-outlook-2009/english/content/home/downloads/pdfVersion.zip, 5http://www.rolls-royce.com/Images/brochure_MarketOutlook2009_tcm92-14291.pdf

3. Reasons for the declining market share of regional air traffic / key problems of regional air traffic

There are number of possible reasons for the described trends, including the growing importance of low cost carriers and – presumably – a resulting increased price awareness of the customers, all of which apparently forced:

- (more expensive) regional carriers to withdraw from many routes; and
- legacy carriers to transfer inter-European routes to cheaper, regional operating platforms for larger regional aircraft, like the Embraer 170/190 family.

We look at the key problems of regional air traffic in a bit more detail and differ between a) supply-related and b) demand-related and other external factors that have been making the business environment for regional operators increasingly difficult.

A) Supply-side factors for the increasing use of larger aircraft and the withdrawal of small regional routes

Hereunder we understand factors that weaken the relative cost position of smaller regional aircraft, e.g. the 50-seater, in relation to larger aircraft) employed on intra-European services. In general, it can be observed that aircraft operation costs grow disproportionately with aircraft size, resulting in decreasing unit costs (economies of scale of aircraft size). Reasons on the cost type level include the following:

- **Capital and maintenance cost grow** disproportionately with aircraft size as some components (and their maintenance) are – to some extent or within an aircraft family (e.g. A318-321, ATR42/72, …) – independent from the number of seats (cockpit, wings, engines, tail, flaps, gears, etc.).
- The same might apply to **fuel cost** as an aircraft's weight usually often develops disproportionally to the number of seats (at least for aircraft of the same family / geographical range). E.g., the weight per seat for ATR42 aircraft is 422kg, compared to 331kg for the – larger ATR72.
- **Labor cost:** Flight deck crew usually is two, irrespectively of the aircraft size. Minimum cabin crew number is one person per 50 seats or part thereof. Hence, it might economicly be more viable to operate a 95-seater than a 60-seater.
- **Airport cost:** At many airports, landing fees per MTOM decline with increasing aircraft size, e.g. due to "flat-fees". At Dusseldorf airport, for instance, a flat fee of 178 EUR per movement applies to all aircraft between 10 and 40 tons MTOM (see Dusseldorf Airport, 2015), which equals to e.g. 4.05 EUR per seat for an ATR-42 (44 seats, 16 tons) and 1.98 EUR per seat for a Canadair Regional Jet 900 (90 seats, 36 tons. Airport charges per passenger, in contrast, are usually constant at first sight. Airlines with large passenger numbers, however, are often entitled to kick-backs (see e.g. for Dusseldorf Airport Chapter I. 6 of the Tariff Regulation ("Volume rebates").

The described cost disadvantage of (small) regional aircraft has become most obvious in the post-deregulation phase when competition by cheaper LCC increased on many markets (airport-pair, city-pair, sometimes even region-pair). This forced many regional air services to be terminated – a phenomenon already described by e.g. Kirby (2010). Figure 7 shows the (exemplary) development of LCC services (number of routes) from Germany between 2003 and 2014.

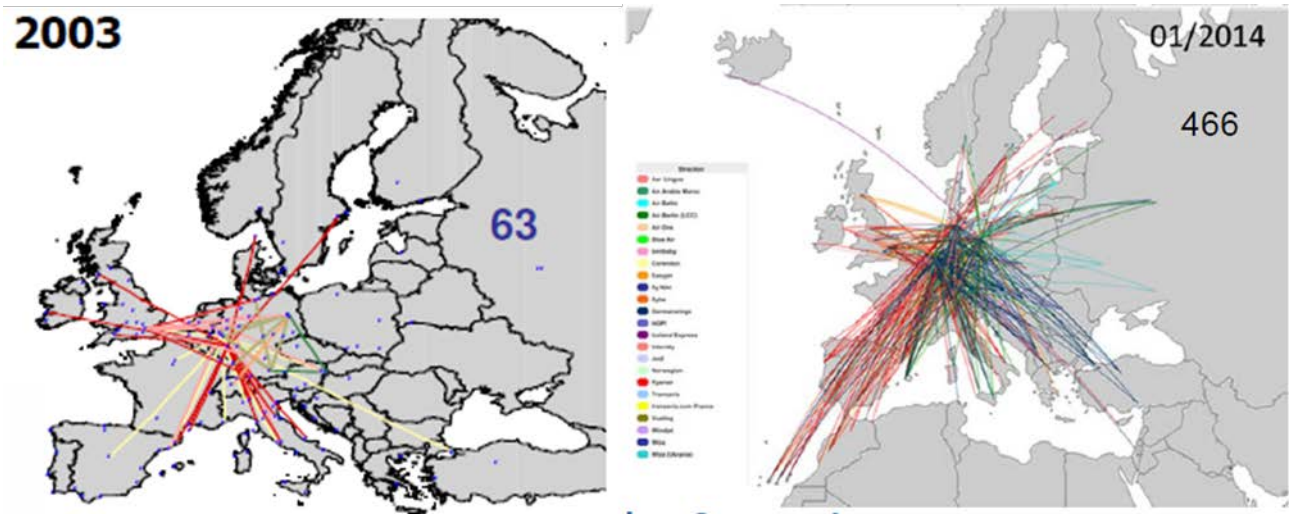

Figure 7: Development of LCC services from Germany
Source: OAG

B) Demand-side and other outside factors for the increasing use of larger aircraft

Besides the operating cost issue, there are demand-side and other external factors that are supposed to have played a significant role in the described demise of classic, decentralized regional air traffic in Europe.

- **Capacity constraints** at (major) airports: According to Gelhausen et al. (2013), 6-15% of global air traffic is operated in capacity constrained conditions, especially in Europe and the US. Airports that now operate close to capacity at most times of the day include Berlin-Tegel, Düsseldorf, London Heathrow, or Frankfurt. The only way to increase passenger numbers at those airports would be increasing average aircraft size. However, the literature shows that airlines do not automatically increase aircraft size at capacity constraint airports, as other factors also play a role. For example, Givoni/Rietveld (2009) show that aircraft size is largely influenced by route characteristics, such as distance, demand and competition, and hardly by airport characteristics, such as the number of runways and the airport's capacity situation. Nevertheless, it is obvious that small regional aircraft have almost disappeared from most capacity constraint airports. With regard to terminal airspace capacity, this might especially be true for slow(er) turboprop aircraft.

- **Passenger comfort and velocity:** Jet aircraft have the advantage of higher speed and lower sound levels in the cabin. Nowadays, many regional aircraft are jets.

- **An assumed increased price awareness** of the passengers due to cheap LCC offerings.

- **Adverse operating conditions** for (very) short flights at many airports: Given the relatively high price level compared to ground transport modes, it is reasonable to assume that regional air traffic will only be successful if it has a competitive advantage

over its competitors, such as e.g. a significant reduction of overall travel time. Airport access and airport passenger processing are hence crucial factors on overall, door to door travel time. However, most airports have so far failed to provide time-conscious passengers with opportunities for quick check-in, security control, boarding and de-boarding processes. For instances, even at many small commercial airports in the 0.5-2 Mio. p.a. passenger range, regional flights are often boarded by time-consuming and costly bus transfers[1], and check-in deadlines usually amount to 30min or more. This easily translates a 40min regional flight into a 2-3 hours door-to-door trip, encouraging potential passengers to use the car or high-speed trains instead.

- **Insufficient airfield infrastructure:** In theory, many forms of small regional air transport could also use small airports and airfields that are – on the one hand – not served by scheduled air transport and holiday charters for various reasons (runway length, missing IFR, insufficient terminal facilities, insufficient operating approval…) but that would – on the other hand – provide the passenger with many advantages like ultra-late check-in deadlines, very short walking distances, and often more suitable locations from major conurbations.

[1] The author took a regional flight BRE-FMO on a 16-seater Jetstream 32 aircraft and was transferred from the aircraft to the terminal by bus over a distance of merely 100m.

4. Connectivity impacts

While the above described reduction in regional air services might have been overcompensated by e.g. new low cost services on the Europe-wide level, the actual connectivity impacts at the airport and regional levels may be more diverse. In the last 10-15 years, many regions have lost connectivity in form of reliable air transport access to other regions – which may probably contradict the EC Flightpath 2050 connectivity goal that 90% of travelers within Europe should be able to "complete their journey, door to door, within 4 hours." (European Commission, 2011, p. 13)

Many regional airports losing money due to overcapacities have started to focus on low cost carriers. While these usually boost overall passenger numbers (which however usually come at a cost as airport charges have to be lowered) and hence may often have resulted in net capacity growth at the airport level, frequencies per route are usually low, and many daily or double-daily routes suited for business travelers have vanished. The following figure shows the average number of frequencies by route and week for selected LCC and regional airlines: With an average frequency of about 4 per week and route, Ryanair (FR) offers the lowest average number of flights per week, followed by fellow LCC EasyJet (U2; 5.9). Both carriers hence do not even fly on a daily basis on the average route. All regional carriers in our sample offer higher frequency averages, especially KLM Cityhopper (WA; 16.5), People's Vienna Airline (PE; 17.1), BA Cityflyer (CJ; 9.5) and Flybe (BE; 7.9).

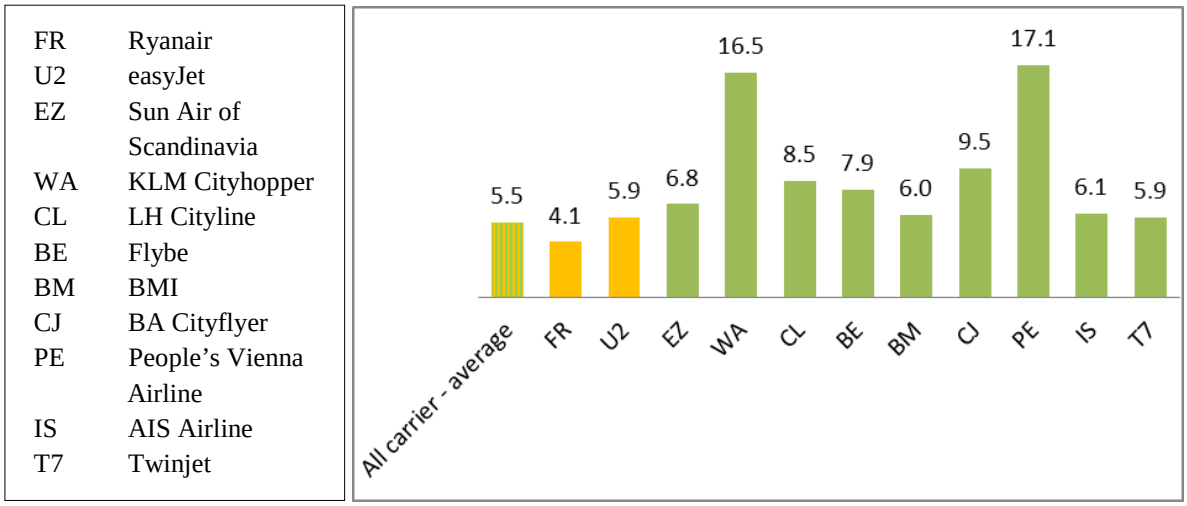

Figure 8: Average number of weekly frequencies by route of selected low cost and regional airlines
Source: Sabre-ADI.

What is more, at many smaller airports, LCC supply has not really proofed to be sustainable neither since these carriers have started to focus more and more on larger airports, resulting in a stagnation of capacities at the original, smaller LCC airports.

A declining number of reliable business connections can however have adverse impacts on a region's connectivity and, potentially, its economic development. Also, airport subsidies

could become more difficult to justify if declining connectivity levels result in lower catalytic effects for the region.

In the following, we have a brief, exemplary look at the airport level in Germany where commercial (scheduled and charter) movement numbers at most regional airports (at least for our case Germany) have massively declined over time, as figures 9 (for the ”larger” airports with up to 30,000 movements) and 10 (for the smaller regional airports with up to 5,000 movement) show. It becomes also evident that the peak in movements in 2010 was not sustainable either.

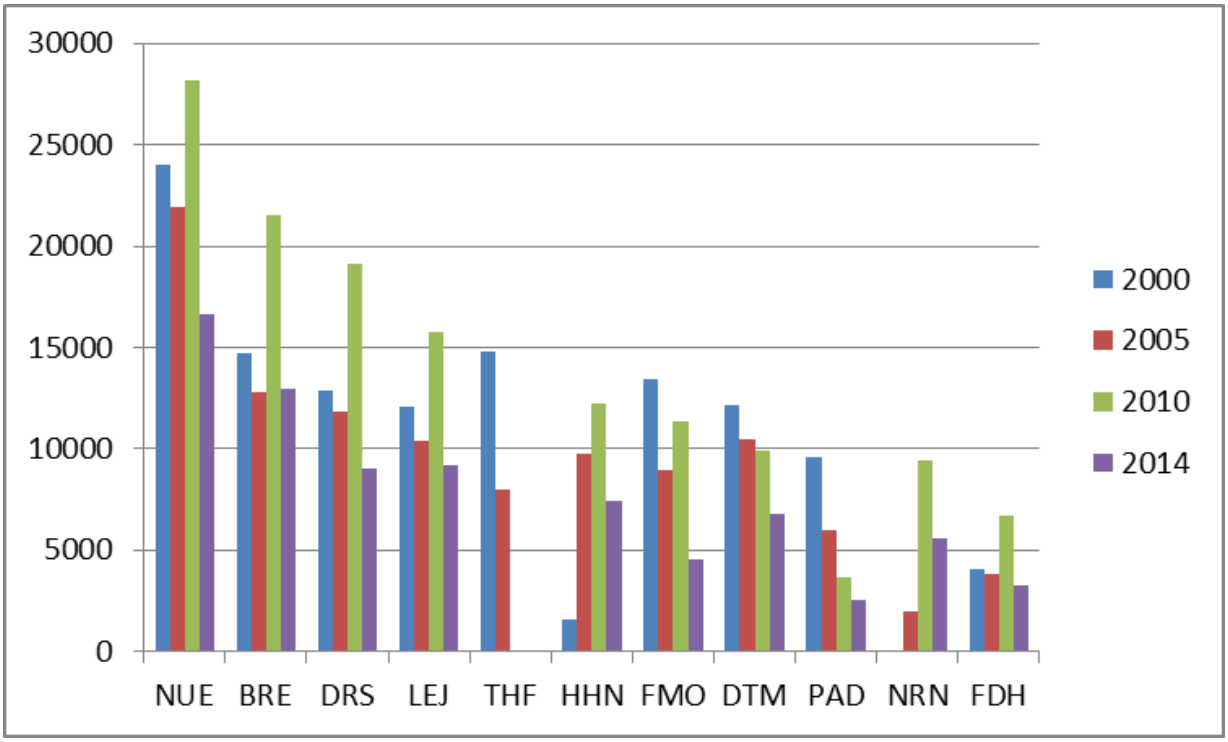

Figure 9: Annual movement numbers at “larger” German regional airports, 2000-2013.
Source: Sabre-ADI; considered are all airports with a maximum in commercial movements in the 2000-2014 period between 1,000 and 30,000

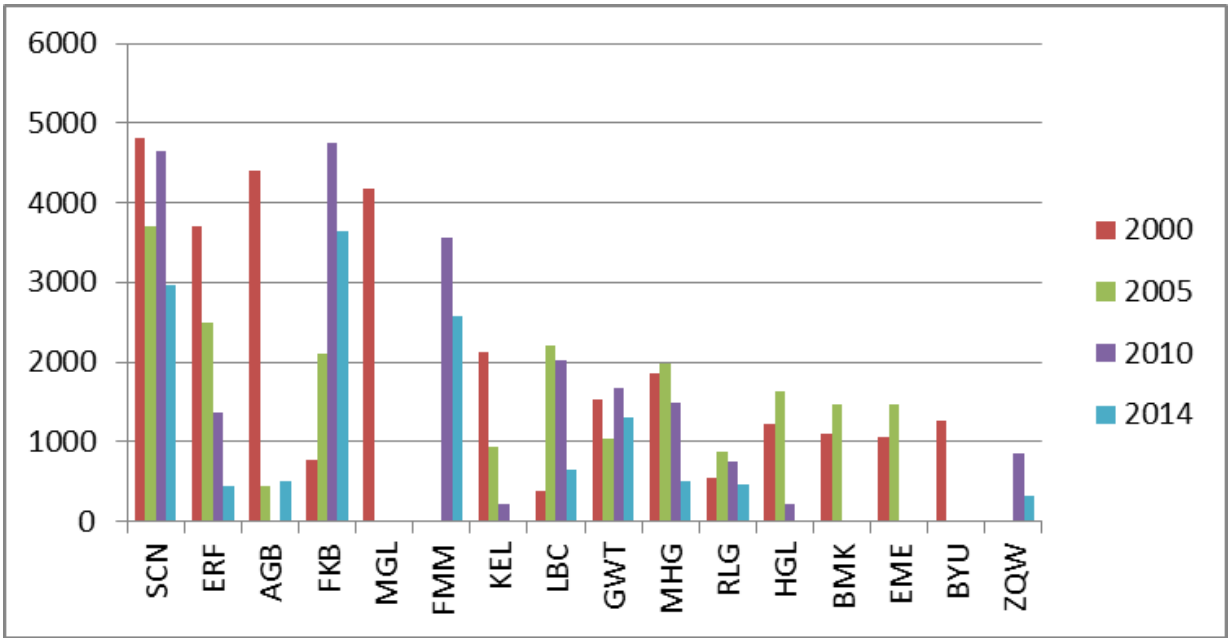

Figure 10: Annual movement numbers at "smaller" German regional airports, 2000-2014. Source: Sabre-ADI; considered are all airports with a maximum in commercial movements in the 2000-2014 period between 1,000 and 30,000

The German regional airports have not only been suffering from declining overall movement numbers, but also from a heavy loss in route supply suited to business travelers. The following figures show the declining development of high-frequency (daily/double-daily) routes at our selected sample of German airports. Daily or – better – double-daily connections are important to guarantee for time-efficient business trips.

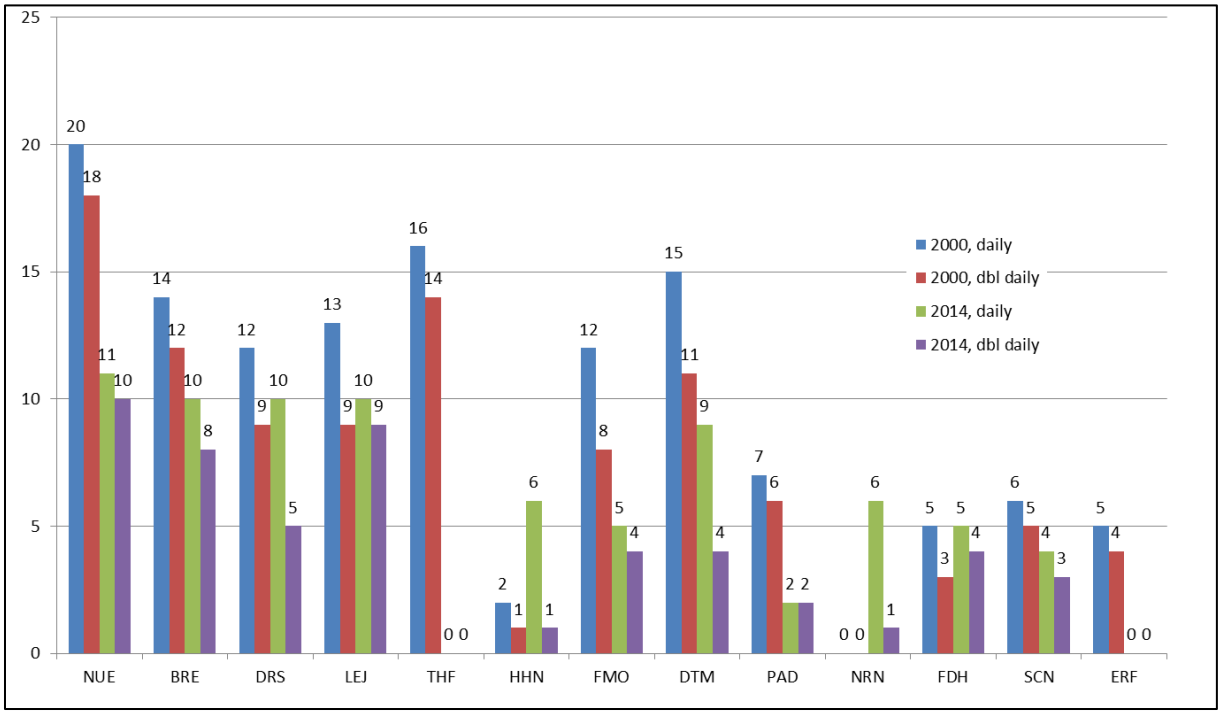

Figure 11: Number of „high-frequency“ destinations by airport I, 2000/2014
Sources: Sabre-ADI; daily (double daily) = minimum of 5 (10) departures in a “normal” week = 225 (450) departures per year (base = 45 “normal” weeks)

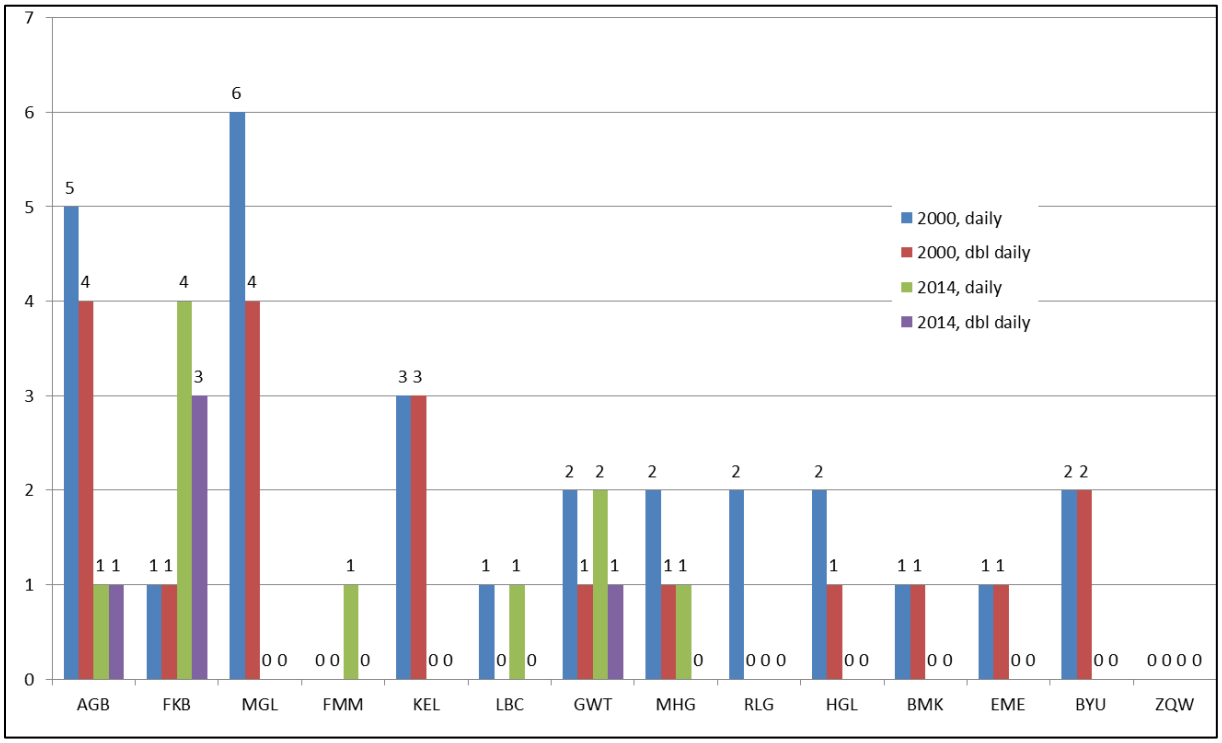

Figure 12: Number of „high-frequency“ destinations by airport II, 2000/2014
Sources: Sabre-ADI; daily (double daily) = minimum of 5 (10) departures in a “normal” week = 225 (450) departures per year (base = 45 “normal” weeks) s”)

The figures show that e.g. from Nürnberg (NUE), the largest regional airport according to our definition, the number of destinations served at least daily / twice daily (225 / 450 departures per year) has plummeted from 20/18 in 2000 to 11/10 in 2014. Similar – or even worse developments can be observed for Bremen (14/12-10/8), Dresden (12/9-10/5), Leipzig (13/9-10/9), Münster/Osnabrück (12/8-5/4), Dortmund (15/11-9/4), Paderborn (7/6-2/2) and Saarbrücken (6/5-4/3). In addition, some airports have almost completely lost all of their high-frequency routes: Examples are Erfurt (5/4-0/0), Augsburg (5/4-1/1), Mönchengladbach (6/4-0/0), Kiel (3/3-0/0), Mannheim[2] (2/1-1/0), or Rostock (2/0-0/0).

[2] In the meantime, new services Mannheim-Berlin and Mannheim-Hamburg have been inaugurated.

5. Summary and Identification of potential areas of innovation

We have found that:

- Regional air traffic in Europe is a declining sector. This applies primarily to independent, decentralized regional air traffic, while regional aircraft are still widely employed on e.g. hub feeder routes on behalf of legacy carriers.
- Average aircraft size of regional operators has been increased considerably.
- As a consequence, more and more regional air transport links have disappeared, leaving many small(er) airports without any, or with fewer high-frequency (business) routes, which may contradict as well as the Flightpath 2050 connectivity goal.
- Also, an airport without a good supply in direct flights to destinations relevant for business travelers will cause les catalytic effects and hence be of lower use for the regional economy.
- Low cost services are typically not a sufficient substitute for former regional air services as LCC focus on high(er) density and/or leisure/holiday routes served at relatively low frequencies. If niche destinations are served, frequencies are usually very low (e.g. 1-3 times/week), making day-return trips virtually impossible.

Hence, a question for future research is if there would be ways to re-vitalize (small) regional air traffic in Europe.[3]

In this remaining part of the paper, and as a basis for such future research, we aim at identifying pillars for a potentially sustainable new and innovative regional air transport "2.0" in Europe, from the technical, operational and economic perspectives, tackling the current core problems for the sector.

- A **technology view** shall help analyzing current and future small aircraft technologies with regard to their potential to significantly reduce unit costs.
- An **operational perspective** may be taken to identify new measures for the reduction of operational costs, like flat-fee landing charges and ATM cost, that are not directly related to the aircraft technology level. We also propose to look at the regional airport level where dramatic potentials for cost reductions might exist, such as GLS (GBAS).
- An **economic view** may be taken to discuss new institutional set-ups that could help to strengthen regional air transport. In addition, we propose to estimate potential supply patterns and demand levels of regional air transport 2.0 operations to assess the overall commercial viability of such services, as well as resulting social-economic impacts, such as on connectivity and airport financials.

[3] Remote regions (e.g. in rural Norway) where small regional sector has always remained strong shall not be the focus of this research question.

I) Technological view (vehicle-perspective)

Unit costs of regional aircraft are relatively high. While this might be less of an issue in monopolistic markets on O&Ds without intermodal competition, many routes are contested in several aspects, be it other airlines serving the same airport-, city- or region-pair directly or indirectly, or competition from ground transport modes such as (high speed) rail or motorways. Regional air services might even be in danger in cases in which competitors, for instance LCC, serve the same market at low frequencies only, as the pure existence of LCC might result in increased price awareness and reduced willingness to pay. Also, the loss of few passengers per week might already turn a profitable route into a loss-making one. Hence, one prerequisite for re-vitalizing small regional air transport will be bringing down its unit costs.

On the European level, new concepts like the Cleansky Green Regional Aircraft are currently under development, aiming at reducing the weight and emissions (and hence major cost drivers) of regional aircraft (Cleansky, 2015).

In the shorter run, the cost disadvantage of regional air transport could probably be reduced to some extent by employing new, fuel-efficient regional turboprop aircraft such as the new ATR-600 series, which apparently allows for unit costs savings of about 30% compared to jet aircraft of the same size (see ATR, 2014, p. 21).

Other, more fundamentally innovative concepts for the reduction of unit costs of regional air transport could e.g. include ideas like single-crew cockpits, as for instance envisaged by Thales and Embraer (Flightglobal, 2010), or single-engine regional aircraft, which could probably emerge from Pilatus' PC-12. Both concepts could probably be implemented in small regional aircraft much easier than in larger airliners.

In forthcoming, more detailed research on these issues, we plan to speak to industry experts and researchers to assess the likelihood of such – or other – concepts to become reality, as well as the resulting cost impacts.

II) Operational view

The operational environment in today's air transport set-up seems to be relatively adverse for regional air services, resulting in higher operational costs for airlines and increased time-costs for the users:

- Airports, including most secondary and regional ones, are not sufficiently designed for (small) regional air transport. For example, boarding is usually done by bus as aircraft tend to be parked away from the terminals. This results in longer ground times and hence fewer daily block hours for the carriers and increased time-costs for the passengers, reducing the relative competiveness of the regional air services compared to e.g. high speed rail. Examples for time-consuming boarding procedures of regional aircraft by bus include not only Amsterdam Schiphol, Düsseldorf or Frankfurt, where regional aircraft are parked at remote stands (and where regional aircraft are not

actively promoted by the airport managements), but also small regional airports like Münster/Osnabrück where parking positions in walking distance from the terminal would usually be available.

- In addition, most airports, including smaller ones like Münster/Osnabrück or Dortmund, have relatively large, oversized terminal buildings, resulting in long walking distances from e.g. the car parking facilities to the gate.
- At most airfields or small airports preliminary used by general and business aviation, in contrast, processes are simple and ways are short. However, at such places, key infrastructural facilities like ILS are usually scarce, making it virtually impossible to use such airports for scheduled services.

In forthcoming research we will conduct stakeholder interviews with the following groups of experts to assess their overall expectations on the future of regional air transport, and their assessments of the impact of the above described (or other) adverse operational factors.

Potential areas of innovation may e.g. tackle e.g. the terminal airspace level, where e.g. GLS (GBAS) could be implemented at small airports instead of more expensive ILS. Other, simpler measures could be joined use and hence financing of airport fire brigades together with nearby communities.

III) Economic view

In a first step, the outcome of the measures to be identified in the tasks above shall be translated into actual effects on operating costs. Also, the economic perspective should be taken to identify additional, regulative or institutional measures that could help re-vitalizing regional air transport, and their efficiency. For instance, the current regime applied in many European countries to first build expensive and over-sized regional airport infrastructure and then subsidize services (PSO) at high bureaucratic cost could be questioned.

In a second step, based on the outcome of the operating cost exercise, estimations for potential supply patterns and demand levels of regional air transport 2.0 operations could be undertaken to pre-assess the overall commercial viability of such services, as well as resulting social-economic impacts, such as on connectivity and airport financials.

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