

**Chances and barriers of Business Aviation in the congested economic area Frankfurt Rhein-Main as exemplified by the analysis of the infrastructure environment**

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# Agenda

## Who is ECAD?

- Mission/Shareholders
- Structure of organisaion

## Statistics (air traffic movements)

- Definition and availability of data
- Rhein-Main region

## Infrastructure

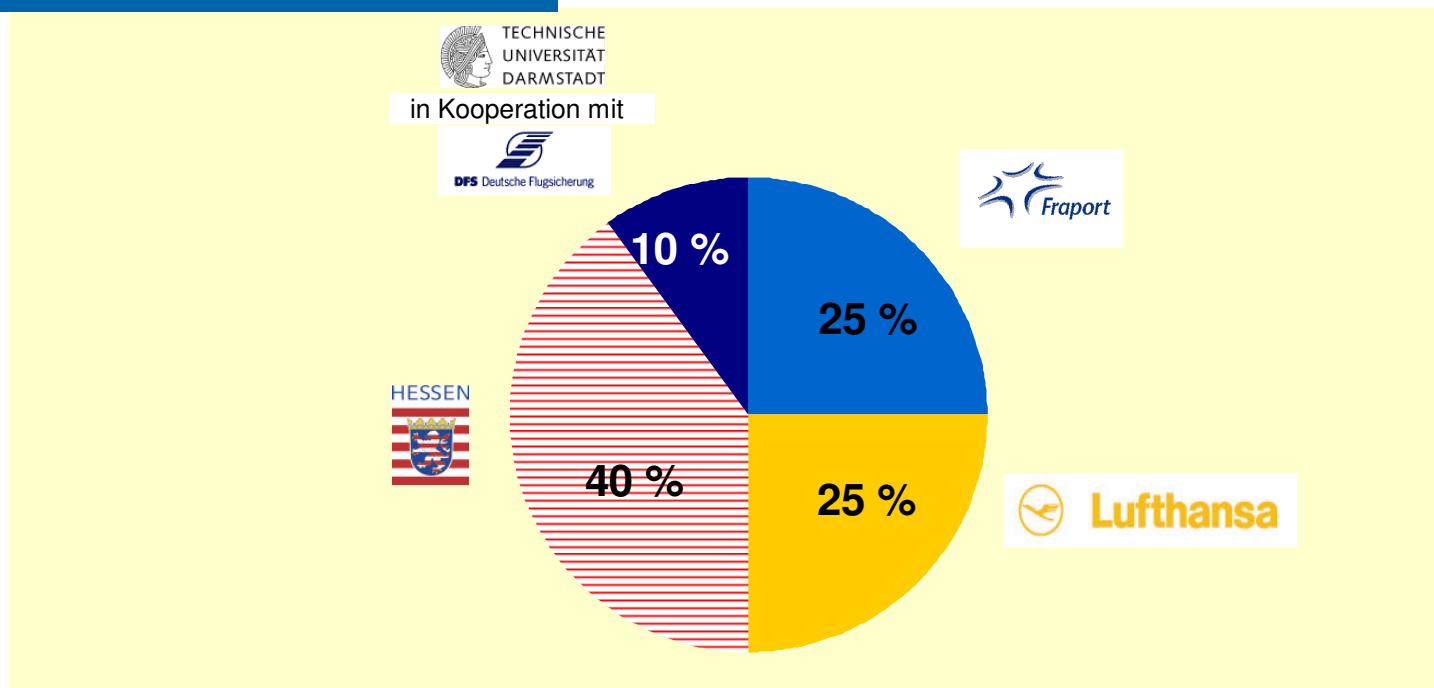
- Requirements
- Airport Frankfurt am Main
- Choice of selected airfield options

## Conclusion and possible future fields of study

## Who is ECAD (1):

- **Foundation** 2004, operative since 2005
- **Aim** is to encourage the sustainable development of the European air transport system including airlines, airports and service providers
- **Range of service** is the combination of profound interdisciplinary research and sophisticated consulting

### Shareholder



## Who is ECAD (2): structure of organisation

# ECAD

### Aviation Economics

- market-, structure- and location analysis
  - Production- and value chain
  - Business strategy
  - Corporate network
  
- Analysis of economic conditions of air traffic
  - Legal and economic framework
  - National economic effects
  
- National- and regional economic effects of air traffic
  - E.g. effects on investment and employment
  - Impact of air traffic on the competitiveness of the region

### Aviation Management

- strategy
  - Strategy simulation e.g. concerning investment decisions
  - Process optimisation
  
- Processes and infrastructure
  - Economical and operational evaluation of infrastructure and processes
  - Economic evaluation of processes
  
- Business Intelligence
  - Air traffic data: operational, economical, ecological
  - international benchmarks

Business Aviation

## Definition and availability of data(1): Very few uniform data sets exist for aviation business

### Availability of information by region

Depending on regional definition there is a limited number of data sources which can be used to describe the business aviation segment. Traffic data are not collected in a uniform way.

- **worldwide:** ACAS, JETNET (depending on operator/fleet), no traffic data
- **Europe:** ACAS, JETNET, Eurocontrol (traffic data)
- **Germany:** ACAS, JETNET, Destatis (traffic data), Eurocontrol

- Comprehensive and consistent data sets for the business aviation segment do not exist worldwide, europe-wide or for Germany (geographical basis of data)
- Available data to describe business aviation is based on information about the number of operators as well as their fleets and traffic statistics, in particular aircraft movements
- Existing specific traffic data for business aviation is based exclusively on analysis by Eurocontrol
- National business aviation traffic data is not collected by Destatis. However traffic data which is relevant to business aviation can be extracted, which can then be converted, under certain assumptions, into business aviation aircraft movement figures.

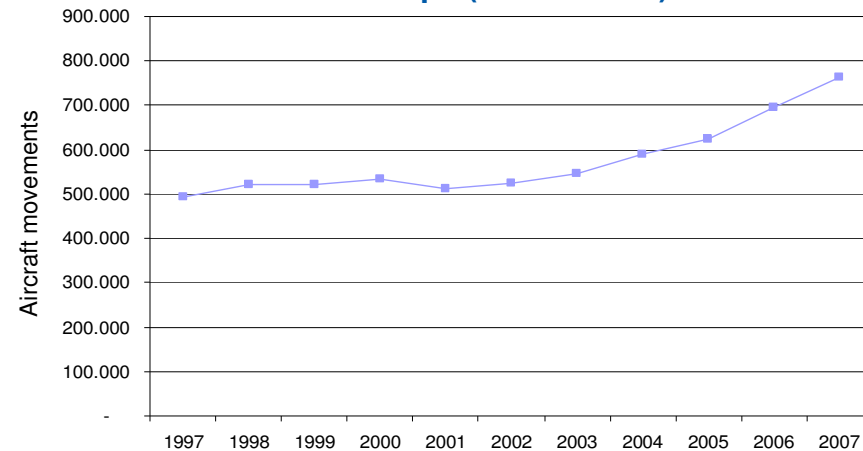
## Definition and availability of data (2): Business Aviation is marked by growth

- The analysis of the past development of business aviation in Europe shows a growth path.
- The number of aircraft movements in business aviation as well as the number of operators based in Europe and their fleets have grown significantly
- The BA-aircraft movements measured by Eurocontrol have increased from about 590.000 in 2004 to about 760.000 in 2007 (+29%)
- According to ACAS there were in total about 2.990 aircrafts and 1.228 operators at the beginning of 2008 which can be attached to business aviation

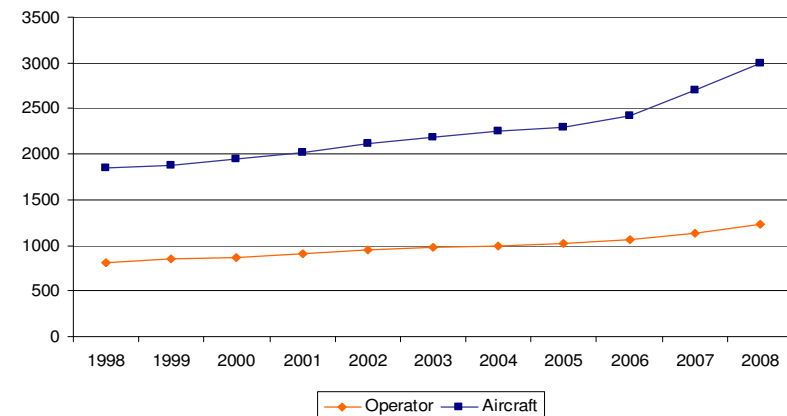


Business aviation has developed into an important part of air traffic in Europe, which has shown growth in recent years and will probably continue growing in future.

Development of BA-aircraft movements in Europe (Eurocontrol)



Development of the number of BA-operators and BA-aircraft (ACAS)



Source: ACAS, Eurocontrol

# Definition and availability of data (3): There is no standardized definition for business aviation

## Status-Quo

- There is no officially used standard definition
- For many existing definitions there is no data

## Approaches to the collection of BA-data

- Specific types of aircraft<sup>1</sup>
- Specific types of flight<sup>2</sup>,
- Purpose of flight
- Typical operators
- Weight category<sup>3</sup>

<sup>1</sup> Applied by Eurocontrol and DFS, <sup>2,3</sup> applicable to airport statistics, e.g. Destatis

## Suggested BA definition

Traffic mode:	scheduled flight	<input type="checkbox"/>	<b>N</b>	taxi flights	<input type="checkbox"/>	<b>Y</b>
	any other commercial traffic	<input type="checkbox"/>	<b>Y</b>	corporate flights	<input type="checkbox"/>	<b>Y</b>
	ambulance flights	<input type="checkbox"/>	<b>Y</b>	State flights	<input type="checkbox"/>	<b>N</b>
function:	commercial	<input type="checkbox"/>	<b>Y</b>	non-commercial	<input type="checkbox"/>	<b>Y</b>
	Transport of:	people	<input type="checkbox"/>	cargo	<input type="checkbox"/>	<b>Y</b>
Weight category:	up to 2t	<input type="checkbox"/>	<b>N</b>	2t to 5,7t	<input type="checkbox"/>	<b>Y</b>
	5,7t to 14t	<input type="checkbox"/>	<b>Y</b>	14t to 20t	<input type="checkbox"/>	<b>Y</b>
	20t to 30t	<input type="checkbox"/>	<b>Y</b>	30t to 45t	<input type="checkbox"/>	<b>Y</b>
	above 45t	<input type="checkbox"/>	<b>N</b>			
Flight rules:	VFR	<input type="checkbox"/>	<b>Y</b>	IFR	<input type="checkbox"/>	<b>Y</b>

- Existing definitions are based on different views and therefore provide differing data. Mostly this information has negative cross-overs with other segments of air traffic
- The suggested definition is not transferable to existing statistics. It can not be used as a basis for the following air traffic data, because there is not any data source which matches exactly this definiton. It provides however a basis for an common understanding and can be used for a critical review of already existing data.

# Region Rhein-Main (1): Overview airport options (in total)

## Rhein-Main region

### Selection criteria:

1. Distance by road: max. 50 km
2. Travel time by road: max. 45 minutes

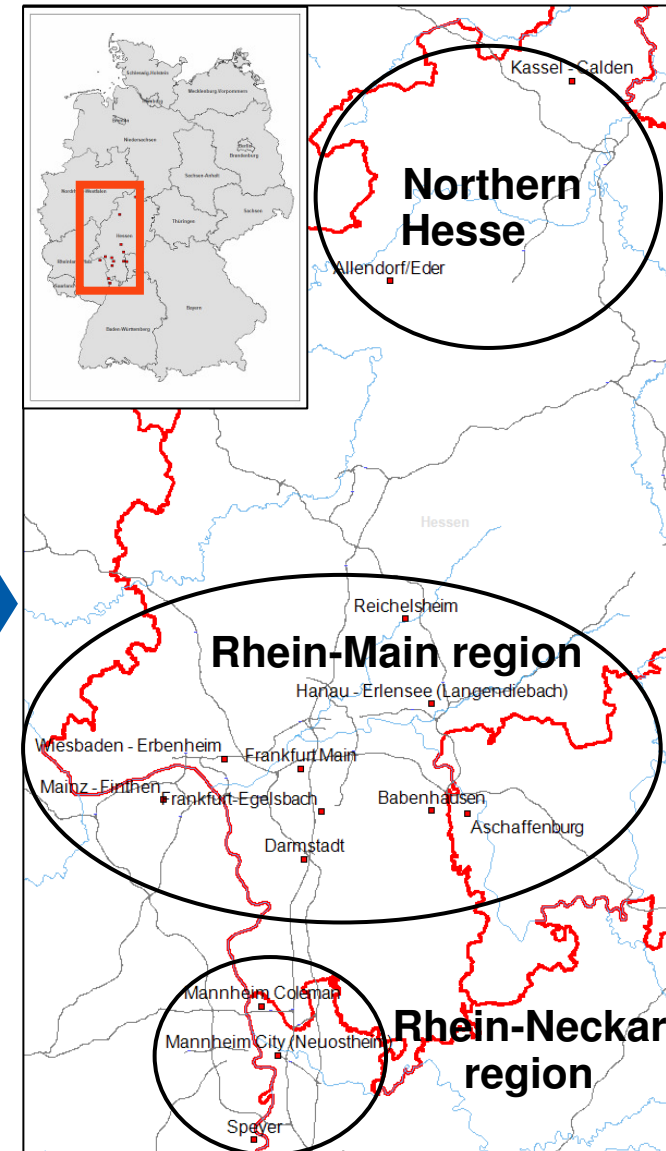
- Aschaffenburg (EDFC)
- Babenhausen (EDEF)
- Darmstadt-Griesheim (EDES)
- Frankfurt-Egelsbach (EDFE)
- Frankfurt/Main (EDDF)
- Hanau-Erlensee (ETID)
- Mainz-Finthen (EDFZ)
- Reichelsheim (EDFB)
- Wiesbaden-Erbenheim (ETOU)

## Nordhessen region

- Allendorf-Eder (EDFQ)
- Kassel-Calden (EDVK)

## Rhein-Neckar region (additionally)

- Mannheim-City (EDFM)
- Mannheim-Coleman (ETOR)
- Speyer (EDRY)



## Region Rhein-Main (2): BA traffic statistics (aircraft movement, e.g. year 2006)

Eurocontrol	Airfield	Aircraft mov.
	<b>Rhein-Main</b>	
	Aschaffenburg	121
	Babenhausen	
	Darmstadt	
	Frankfurt	8.643
	Frankfurt-Egelsbach	2.396
	Hanau-Erlensee	
	Mainz-Finthen	432
	Reichelsheim	465
Wiesbaden-Erbenheim	2.454	
<b>Rhein-Neckar</b>		
Mannheim-City	3.890	
Mannheim-Coleman		
Speyer	2.118	
<b>Northern Hesse</b>		
Allendorf/Eder	522	
Kassel-Calden	1.357	
Region	Aircraft mov.	
Rhein-Main	14.511	
Rhein-Neckar	6.008	
Rhein-Main + Rhein-Neckar	20.519	
Hessen north	1.879	

Destatis	Airfield	Aircraft mov.
	<b>Rhein-Main</b>	
	Aschaffenburg	1.560
	Babenhausen	
	Darmstadt	
	Frankfurt	7.672
	Frankfurt-Egelsbach	11.502
	Hanau-Erlensee	
	Mainz-Finthen	696
	Reichelsheim	4.960
Wiesbaden-Erbenheim		
<b>Rhein-Neckar</b>		
Mannheim-City	12.036	
Mannheim-Coleman		
Speyer	2.652	
<b>Northern Hesse</b>		
Allendorf/Eder	556	
Kassel-Calden	2.720	
Region	Aircraft mov.	
Rhein-Main	26.390	
Rhein-Neckar	14.688	
Rhein-Main + Rhein-Neckar	41.078	
Hessen north	3.276	

1 T/A-traffic 100%, air Taxi flights 100%, other commercial flights (enroute) 100%, corporate flights (enroute) 100%



- The above mentioned data is an attempt to present the number of BA-aircraft movement, summarized for the region Rhein-Main.
- Because of the different definitions of business aviation the analysis of Eurocontrol and Destatis data leads to a strongly varying volume of aircraft movements at the individual airports as well as for the defined regions
- Destatis data for the Rhein-Main region are a factor of 1.8 higher than Eurocontrol data

# Region Rhein-Main (3): Example: Traffic statistics airfield Frankfurt-Egelsbach

## Eurocontrol

- **Assumptions:** specific types of aircraft, flight rules IFR
- **Advantages/disadvantages:** (+) europe-wide comparability, (-) no consideration of VFR-traffic and types of flight
- **Aircraft movements:** 2005: 1.874      2006: 2.396      2007: 2.382

## Destatis

- **Assumptions:** T/A-traffic 100%, air taxi flights 100%, other commercial flights (enroute) 100%, corporate flights (enroute) 100%<sup>1</sup>
- **Advantages/disadvantages:** (+) detailed apportionment of single elements, (-) however no exact separation possible
- **Aircraft movements:** 2005: 10.362      2006: 11.502      2007: n/a

The statistic as handed by the „Hessische Flugplatz GmbH“ based on types of flight contained a less detailed separation compared to Destatis. This leads to a differing number of aircraft movements for business aviation. However, using the same criteria, the data of Destatis and the „Hessische Flugplatz GmbH“ are identical because they use the same information basis.



- Different approaches to the collection of data for the air traffic segment business aviation, here presented by the example of airfield Egelsbach, lead to strongly varying conclusions
- This aspect has to be considered with all existing business aviation data!
- So far BA-data is not precisely registered by the individual airports

<sup>1</sup> These assumptions are based on an estimation which has developed from discussions with ambassadors of the airfields Frankfurt-Egelsbach und Kassel-Calden. A further evaluation is advisable.

## Region Rhein-Main (4): International comparison (source: Eurocontrol)

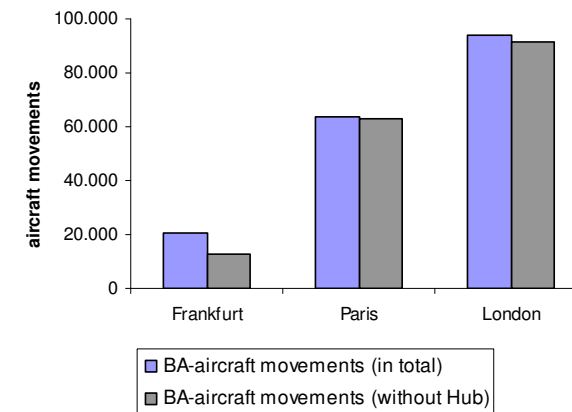
- Compared internationally by far the least aircraft movements take place in the Frankfurt region. Still the percentage of the BA-aircraft movements of the Hubs in London (3%) and Paris (1%) is marginal, compared to Frankfurt (40 %)
- Additionally the number of BA-aircraft movements per inhabitant is the lowest of all in the region Rhein-Main. The variation compared to the regions London and Paris can neither be explained by a larger market nor by touristic attraction

<sup>1</sup> Including Aschaffenburg, Frankfurt, Frankfurt-Egelsbach, Mainz-Finthen, Reichelsheim, Wiesbaden-Erbenheim, Mannheim-City, Speyer

<sup>2</sup> Including Paris Charles de Gaulle, Paris Le Bourget, Paris Orly, Toussus Le Noble

<sup>3</sup> Including Biggin Hill, Farnborough, L-City, L-Gatwick, L-Heathrow, L-Luton, L-Stansted, Southend

Comparison of the Hub-regions  
Frankfurt<sup>1</sup>, London<sup>2</sup> and Paris<sup>3</sup>  
(Jahr: 2007)

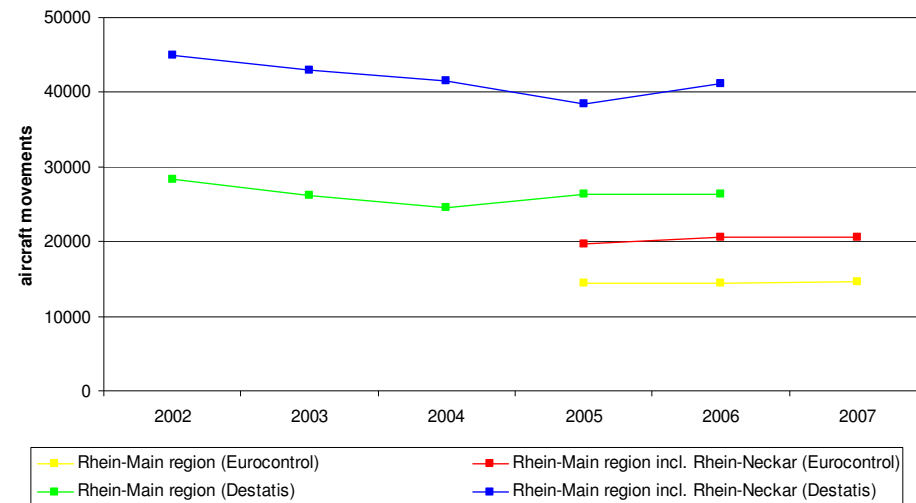


source: Eurocontrol

- A lack of infrastructure might be the reason for the fewer BA-traffic in the Rhein-Main region compared to the regions London and Paris
- The low number of BA-aircraft movements in the Rhein-Main region as well as the low number of BA-aircraft movement per inhabitant in European comparison, suggests a potential for development in this region
- Because of the insufficient infrastructure (airports, capacity) it can be assumed that there is an additional latent demand (currently not exactly quantifiable)
- The comparatively high number of BA-aircraft movements at Frankfurt airport leads to the assumption that there is a high potential of shifting traffic to a smaller airport
- Further needs for research: Benchmarking of the regions concerning; demands and their development, traffic forecasts, business cases for airfields, etc.

## Region Rhein-Main (5): difficulty of the prognosis of traffic statistics

- Existing prognoses for business aviation are mostly derived from the delivery statistics of aircraft manufacturers
- Prognoses for traffic statistics and number of companies do not exist in the sector BA
- The data of Eurocontrol and Destatis present a stagnating number of aircraft movements. Very likely the reason for this are the restrictions of the infrastructure (assumptions see sheet 8)
- On the basis of this information a well-founded prognosis for the traffic statistics of business aviation is hardly possible



source: Destatis, Eurocontrol

- The creation of a solid independent prognosis based on the available data is not possible in this analysis. In particular, the inconsistent data situation and the lack of quantifiability, e.g. the latent demand, present current hurdles. In addition the current infrastructure restrictions have a negative effect on the statistics
- Under certain circumstances a model-based updating of traffic statistics may, at present, identify possible volume ranges (see next sheet, scenario 1). This however causes a large amount of uncertainty. (problem: infrastructural shortage)
- In this situation a further well-founded regional prognosis seems to be necessary and important for any future analysis in this matter

## Region Rhein-Main (6): Prognosis scenarios

### Scenario 1:

#### Linear Updating

- Model-based linear updating of traffic statistics based on Europe-wide data from Destatis
- Considering the last 3 or 5 years, growth rates of on average 5% to 8% can be identified
- This increase also matches the German growth rates of the past two years (data Eurocontrol).
- Prognosis on aircraft movements 2013 based on the European growth (Eurocontrol):
  - **Eurocontrol**, Rhein-Main incl. south: 27.700 to 32.700 (base year: 2007)
  - **Destatis**, Rhein-Main incl. south: 57.800 to 70.400 (base year: 2006)

### Scenario 2:

#### Manufacturer's figures

- Planned delivery figures of aircraft manufacturers based on their order is, so far, the only method for prognosis in the domain business aviation known to ECAD
- Assuming availability these delivery figures can be assigned to different markets and countries
- Possible statements though are limited to the growth of fleets in certain regions
- Statements concerning the traffic development in individual regions are not possible on the basis of this data, because the usage profile of the aircraft is not sufficiently known

### Scenario 3:

#### Survey

- A regional prognosis is also possible on the basis of a provider/user interview
- Aspects to analyse:
  - Determination of the latent demand
  - Interviews with airport- and aircraft operators
  - Interviews with companies which use business aviation offers
  - Consideration of structure data (economic power, tourist attraction etc.)

## Requirements (1): Requirements on the part of costumers and providers

### Clients on the product

- safety
- flexibility
- Efficiency of time
- Individuality of the route system (in addition to scheduled flights)
- Comfort, exclusivity
- Short routes, short waiting periods
- Modern GAT, comfortable lounges
- Good connection to connecting flights
- Access to regions, which can only be reached in a time-consuming way with other carriers

### Operators on the airports

- Adequate runway length according to ICAO-recommendations and JAR-OPS regulations
- Adequate apron for the parkage of aircrafts
- Uncomplicated and quick ground handling
- Short waiting periods on ground and in the air, if so availability of slots
- low charges
- IFR procedures (CAT I)
- ICAO Fire Category 5
- Long and flexible opening hours
- Duty- and border control
- AIS, MET
- Winter operations



- Customers have different requirements on the individual flight operations. The weighting of the individual requirements may vary depending on the customer profile.
- Considering the airport needs of the operators, a wide requirement profile is presented, but focused on operational flexibility.

Source: ECAD, Fraport, Lufthansa

## Requirements (2): Suggested catalogue of infrastructure criteria

### Minimum requirements on airfield options concerning selected criteria

	distance FRA [min]	LDA	TORA	airfieldcategory	number of parking places
<b>Lufthansa</b>	<b>up to max. 30 min</b> (airport has to be attached to Frankfurt, e.g. Frankfurt/Süd).	<b>ca. 1.400m</b> (designed for the aircraft of reference CRJ 200).	<b>ca. 1.800m</b> (designed for the aircraft of reference Gulfstream V)	<b>min. CAT 1</b>	<b>adequate number</b> (sufficient for big events such as exhibitions) <b>possibility for exhibitions</b> (e.g. Business Aviation world)
<b>Fraport</b>	<b>45 min</b> (max. 30-50 km)	<b>min. 1.800m</b>	<b>min. 2.000m</b>		<b>depending on traffic volume and reference aircraft</b>
	airspace	hours of operation	MTOM	handling facilities	attendance
<b>Lufthansa</b>	<b>controlled (C oder D)</b>	<b>min. 06:00 - 24:00</b> , better: without night curfew (24/7)	<b>min. 42,5t</b>	<ul style="list-style-type: none"> <li>▪ GAT: Business Aviation character (appearance, equipment)</li> <li>▪ FBO (Fixed Base Operations)</li> <li>▪ duty</li> </ul>	required infrastructure: <ul style="list-style-type: none"> <li>▪ Hangar areas</li> <li>▪ possibility of access for maintenance staff</li> </ul>
<b>Fraport</b>	<b>C or D</b>	<b>preferably 24 h</b>	<b>25-30t</b>	<b>required</b> (quantity depending on demand)	<b>required</b> (quantity depending on demand)



The ideal alternate aerodrome might offer a 2.000m runway (MTOW: min. 42,5t), 24h service, airspace category D, all-weather-operations, operational independence to other airports (and is max. 30 minute away from FRA).

# Flughafen Frankfurt am Main: Status Quo und Auswirkungen der Business Aviation

## Infrastructural

- **Status-Quo:**
  - Separate GAT as well as apron in the southern part of the airport
  - 33 parking positions
  - GAT poorly equipped
  - Poor opportunities for parking (KFZ)
- **Expansion:**
  - Moving of the apron including hangars and maintenance facilities within the southern airport area towards runway 18
  - Temporarily no independant GAT planned
  - Less parking positions (assimilation to the aircraft mix)
  - Direct road access, more parking spaces

## Economically

- **charges:**

The income from airport charges are lower for aircraft movements of business aviation aircraft than for aircraft movements of scheduled flights.
- **Retail:**

Business aviation passengers have no positive impact on the retail business of Fraport

## Operationally

- **Slots:**

Mostly short-notice applications for slots by BA-operators, bad slot-performance (necessity of sanctions)
- **Apron traffic:**

The traffic on the apron induced by business aviation is low and can be disregarded at Frankfurt airport. There are no interferences
- **Capacity:**

BA-aircrafts can have a capacity-reducing impact on the landing rate in FRA, in particular concerning „light“-category aircraft or those which arrive additionally in a fully coordinated hour.

# Airport options (1): Currently only the airport FRA fulfills all the requirements

Requests airfield <sup>4</sup>	Rhein-Main									Rhein-Neckar			Northern Hesse	
	EDFC	EDEF	EDES	EDFE	EDDF	ETID	EDFZ	EDFB	ETOU	EDFM	ETOR	EDRY	EDFQ	EDVK
distance FRA min [max. 30 min]	X	X	Ja 28	Ja 25	Ja 20	X	X	X	Ja 22	X	X	X	X	X
LDA = 1.800m <sup>1</sup>	X 653	X 674	X 977	X 1.166	Ja 4.000	X 913	X 1.000	X 1.230	Ja 2.154	X 1.013	X 913	X 889	X 1.240	1.500 2.500 <sup>5</sup>
TORA = 2.000m <sup>1</sup>	X 780	X 674	X 1.155	X 1.166	Ja 4.000	X 913	X 1.000	X 1.230	Ja 2.154	X 1.013	X 913	X 889	X 1.240	1.500 2.500 <sup>5</sup>
ILS CAT 1	X	X	X	X	Ja Cat IIIb	X	X	X	Ja	X	X	X	X	Ja Cat I
IFR treatment / Controlled airspace	X G,C	X G,C	X G,C	X G,C	Ja C,D	X G,C	X G,C	X G	Ja C,D	Ja D	X D	X G	Ja F(HX)	Ja D
24 h service	PPR <sup>2</sup>	X	X	PPR <sup>2</sup>	Ja*	X	X	PPR <sup>2</sup>	X	PPR <sup>2</sup>	X	PPR <sup>2</sup>	PPR <sup>2</sup>	PPR <sup>2</sup>
MTOW > 42,5 t	X 5,7t	X 2,0 t	k. A.	X 20,0t <sup>2</sup>	Ja	k.A.	X 14,0t	X 8,0t <sup>2</sup>	k.A.	X 10,0t	k.A.	X 10,7t	X PCN <sup>3</sup> 40	X PCN 35



- Using the runway for commercial flights according to JAR-OPS 1 when wet as well as with max. take off weight is as an example which is only possible in Frankfurt/Main and Wiesbaden-Erbenheim for typical types of aircraft. With a dry runway and head wind conditions air traffic in Frankfurt-Egelsbach as well as Kassel-Calden is possible to a limited extent.
- With the approved expansion of Kassel-Calden to a passenger airport, the region Nordhessen will be capable of covering the demand of business aviation in future

<sup>1</sup> if existent, statements represent in each case the LDA/TORA of the runway in use, (AIP), <sup>2</sup> PPR (Prior Permission Required), <sup>3</sup> PCN (Pavement classification number – classification to describe the S/L-runway carrying capacity), <sup>4</sup> see sheet 6 concerning airportnames, <sup>5</sup> Status-Quo vs.approved airport expansion plan of the 18.07.2007

## Airfield options (2): Opportunities to develop certain airports to business aviation airports as an alternative to FRA

### 1) Frankfurt-Egelsbach

- Conservation of status-quo
- Assumptions: a. guaranteed all-weather-operations; b. commercial independence concerning other airports, in particular FRA
- Expansion as long as there are no negative impacts on FRA, interdependences must not increase

### 2) Wiesbaden-Erbenheim

- Perfect because of the runway-length, availability of IFR-procedures and autobahn connection
- Military/civil use
- examples: airbases Nordholz and Rostock-Laage

### 3) Mannheim-Coleman (option north)

- New building option: rotation and extension of runway
- Synergetic effect with region Rhein-Neckar



- Wiesbaden-Erbenheim can be considered as a possibility for a satellite airfield
- Frankfurt-Egelsbach is qualified as an alternative to Frankfurt-Main to a limited extent
- Other options: Mannheim-Coleman (option North), Mannheim-City as well as Reichelsheim

## Conclusion and further action (1)

### Statements

- A uniform statistical recording of BA-traffic data based on an approved explicit limitation (definition) does not so far take place in practice
- Existing approaches for data acquisition show inconsistencies, which involve a high amount of uncertainty for the infrastructural planning
- Despite the presented uncertainty it can be assumed that the business aviation segment will strongly grow in the next years whereby the Frankfurt Rhein-Main region bears a big potential for growth (potential to catch-up, latent and so far not satisfied potential)
- The airport Frankfurt am Main covers a significant part of business aviation aircraft movements in the Rhein-Main region. Infrastructural, functional and economic reasons however cause problems concerning the use of business aviation in future in FRA. The assumption that the present situation will not improve in the near future is likely
- The current situation in Frankfurt am Main (expansion plans) is having a negative effect on business aviation. Therefore, the pressure to provide other options in the Rhein-Main region will increase.
- None of the analysed options fulfill all the criteria for an alternative satellite airport, which is suitable. The most attractive alternatives for an overflow airport appear to be Wiesbaden-Erbenheim and Frankfurt-Egelsbach



In summary, neither the current situation (status quo) nor the future prospects for the business aviation segment in the Rhein-Main region show a completely satisfactory infrastructure perspective

## Conclusion and further action (2)

### Possible further approaches of examination

#### Detailed analysis

- Detailed simulation of functional influences of business aviation traffic at Frankfurt airport
- Benchmarking of regions with a high BA-intensity (Frankfurt, London, Paris, New York)
- Determination of the BA-demand and development of the supply side (e.g. also latent demand, potential to catch up)
- Creation of a detailed prognosis for the business aviation segment focused on the Rhein-Main region and Rhein-Neckar region respectively
- Development of a standardized operational concept for a combined civil and military usage of former military airports

**On the part of ECAD a detailed review of preferred airfield options, independent of possible deeper examinations, is necessary**

# Thank you for your attention!

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