Airports are, by nature, interchange nodes, with connections at least to the road infrastructure.

Now, what dominates a lot of discussions today is the role of airports as central multimodal interchange nodes. With this regards, rail connections at airports are having an increasing importance because of their benefits for airport operators, passengers and regarding the external costs of transport (congestion problems and environmental costs).

Among the European airports that have already an important “background” in the area of air / rail intermodality, one could mention a number of airports of the “core area” such as Amsterdam Schiphol, Frankfurt Main or Paris CDG, because of their integration into a high speed railway network (Thalys, ICE, and TGV). We should also highlight the examples of London Heathrow and Stockholm Arlanda that are equipped with a fast and efficient connection to the city centre via dedicated local access railways link. Other airports are also linked to the suburban and/or regional railway network (underground, metro). Finally, although a lot of the airports, for which the traffic is continuously increasing, have not any experience yet, in the area of air / rail intermodality, the majority is – as a general rule – very interested in the subject.

As a matter of fact and as already shown by the study – “The Airport of the future: Central link of intermodal transport?” – many airports in Europe are already concerned by intermodality or are thinking in intermodality development. For a given airport however, the questions: “To what extent airport intermodality is developed? What is the potential of intermodality development at an airport?” are quite difficult to answer since they depend upon a large array of variables, including infrastructure, operators, services and demand variables.

In order to deal with such questions, the present study – “MODAIR” aims at elaborating a methodology as well as a tool with the objective of measuring airport intermodality and evaluating how a development in intermodality could impact airport catchment’s areas. The project has started at the beginning of year 2005 and has consisted in:

- the building of a set of indicators and the development of a software to be used, in a first step (2005), as a tool for measuring airport intermodality and in a second step (2006) for assessing the impact of intermodality on airport catchment area;
- the consultation of a list of actors having a particular interest / action on intermodality at the airports.

**Airport intermodality indicators**

With the objective of providing the measurement of both existing and potential intermodality development at the airports, we have considered four categories of indicators:

- **indicators of intermodal infrastructure:**
  This category describes the rail infrastructure connected to the airport. Two types of infrastructures are distinguished: one is the airport local...
access from the city and the other one is the airport integration into a national / international network;

- indicators of intermodal operators:

  We also have to look at the intermodal operators: do they exist? How many airlines are cooperating with rail operators through the signing of intermodal agreements? How many rail operators have intermodal agreements with airlines? What is the “intermodal” airlines market share at the airport?

- indicators of intermodal services:

  Because the customers, i.e. the passengers have expectations regarding the services associated to an intermodal agreement, we need to consider indicators of intermodal services. These indicators answer to the following questions: How many intermodal agreements exist? What is their proportion, in terms of ASKs (Available Seat Kilometres) offered regarding the overall supply provided at the airport? What are the specificities of agreements (off-airport check-in, integrated ticketing and booking, etc.)? Is there any competition between air and rail operators (in the case of an airport e.g. connected with a high speed railway network)?

- indicators of intermodal demand:

  With the aim finally of measuring both the actual activity generated by intermodal services and the demand for these services, we have defined indicators answering to the following questions: How many intermodal passengers are users of intermodal air – rail products? How many passengers are “air – rail” multimodal1 travellers? What is the potential demand for intermodal trips (i.e. what is for example the number of potential travellers living in a “3-hours access time” geographical area)?

For each of the above presented categories, four to eight different indicators have been defined with the aim of answering the questions that are presented above. As we have to distinguish two types of air – rail intermodality (airport local access and airport integration into a national or international railway network), “airport access” indicators and “airport integration” indicators are differentiated.

Two levels of analysis have also been distinguished:

1. the “macro-level” view, which provides the broad picture of intermodality and is based on a reduced list of representative indicators (1 to 3 indicators per category), is complemented by;

2. the “micro-level” or detailed view taking all the indicators in consideration and allowing to confirm or mitigate the results obtained in the “macro-level” analysis.

A description of the list of elaborated indicators is provided in Error! Reference source not found. given in annex of the document. Macro-level indicators cells are coloured in grey.

As an illustration to the above proposed methodology of analysis, a practical application2 on European airports has been made.

Intermodality indicators computed for the case of “Frankfurt Main” show for example that the airport is already highly integrated into the national and international rail network. Indeed, this is indicated either by the infrastructure indicators (e.g. 2 railway stations at the airport), the operators indicators (e.g. about 90% of the ASKs (available seat kilometre) at the airport are supplied by airlines having intermodal agreements with rail) or the services indicators (e.g. almost 6000 rail stations can be reached from the airport in the scope of intermodal agreements). Besides, high speed rail services between the airport and distant cities are used by an average of 15% of

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1 The distinction intermodal – multimodal is the following: “intermodal” passengers refers to a trip for which an intermodal agreement exits between the air and rail operators whereas “multimodal” passengers refers to all trips for which two segments – air and rail – are distinguished whether there are intermodal agreements or not.

2 Examples presented in this paragraph are just for illustration purpose. Indicators’ values presented might need to be updated / corrected according to the latest situation of the airport.
airport passengers flying from the airport.

Regarding now the local access from the city centres to the airport, the indicators show that intermodality at London Heathrow is well developed. Indeed, indicators of infrastructure highlight that the airport is equipped with two types of rail connection, a high speed “premium” link (Heathrow Express) and a link with the suburban underground rail network (Piccadilly Line). Also, the operators’ indicators show that a great proportion of ASKs (available seat kilometre) is supplied by airlines having intermodal agreements with the operator “Heathrow Express” (about 50%).

Equally, intermodal services are well developed as most of the air destinations from the airport are available in the scope of intermodal agreements (about 80% of the air destinations offered from Heathrow). Last but not least, about 30% of passengers are already accessing the airport using railway connections (either the underground or Heathrow Express), which tends to show that demand for intermodality exists, and that demand in the future should probably be growing. This depends, in particular, from the quality of service levels associated to rail transport (e.g. comfort, luggage, off airport check-in, efficiency aspects) so as to transfer passengers who are still using their private car to trains.

With the objective of developing a tool for assisting airport managers in a better understanding of their airport intermodality situation, a software is under development. The tool will have the following functionalities: computation of intermodality indicators according to the data that is input in the tool, impact on the airport catchment area using a specific geographic map as web interface, “what-if” analysis possibilities with the modification of assumptions and indicators’ levels so as to observe the impacts on the airport catchment area.

At this stage of the project, a first version of the tool is available presenting the indicators and allowing computation from data that is present or that is input in the database. The link with catchment area aspects will be developed during a second phase in 2006.

**Actors’ point of view**

Actors’ points of view, finally, have been considered, with the aim of completing / refining the methodology above presented. In particular, interviews have been arranged with Fraport, Lyon and Lisbon airport managers, with Lufthansa, with RFF (Réseau Ferré de France) and REFER (Rede Ferroviaria Nacional) and with Thalys.

These actors have a certain number of expectations and concerns with regards intermodality. From the analysis of such expectations and concerns, we have derived the following list of factors that determine or at least have an influence on the potential development of intermodality at airports:

- To what extent are (urgent) needs to alleviate a certain number of problems of road and air transport?: airside congestion (airport slots), landside congestion (road access to the airport);
- How profitable is for the operators to develop intermodal solutions? For instance, intermodality might allow to cut operational costs (replacement of some short-haul air “feeder” liaisons by trains may – under certain conditions – be more profitable);
- To what extent, intermodality allows to strengthen an airport or an airline’s position with regards competitors (increase of the catchment area)?
- The capability of actors to find solutions for the required funding of infrastructure and facilities required;
- To what extent are intermodal actors co-ordinated for the development of the intermodal products?
- Passengers’ perception regarding intermodal transport;
- Cultural specificities;
- The “external” driving forces to the development of intermodality available: “European Commission / States subsidies, exclusivity of operation guaranty;
- The number and scope of intermodal agreements signed between operators so as to formalise the actors’ co-operation towards intermodality development.

**Next steps**

MODAIR’ 2005 project has been conducted with the aim of proposing a first version of a methodological tool able to measure the extent and the potential of intermodality development
at an airport. A list of indicators is the output of the work.

One of the main concerns of the airports being related to their catchment area, future work, next year, should address this subject. Changes in intermodality indicators levels can impact airports catchment areas and consequently the level of airport traffic and flow distribution. That is why determining the influence of intermodality development on air traffic is important to analyse how this development can impact airport catchment’s areas.

An airport catchment area can be a complex concept, which depends on characteristics of the airport: the geographic location of the airport itself, the access around this airport by road or rail, the attractiveness of air and rail supply offered by the transport operators at the airport. But other things matter also: characteristics of the country (living standards, attractiveness for tourists…), location of competing airports. With the hub and spoke network, where connections become the first business of an airport, the airport catchment area may well not be an area at all, since the business of the airport become at least partly disconnected with the area around the airport. In this case it may be more correct to speak about the “business attractiveness” of the airport, comprising a “local catchment area” and a “hub catchment area”.

By reviewing the literature, and studying different cases, the objective is thus to analyse and refine this notion and identify the factors impacting on an airport catchment area or “business attractiveness”. Since intermodality is one of those factors it is important to particularly focus on its specific role.

In parallel, and considering that there is still further investigation to be done regarding the variables that have an impact on intermodality development, it is also proposed to continue the work that has been initiated in the scope of the last year CARE INO study: “The Airport of the future: Central link of intermodal transport?”. The idea would be in particular to analyse the market conditions impacting on intermodality development. How could economic instruments (such as e.g. the introduction of a kerosene tax) and political or administrative measures (such as e.g. new distribution of slots) favour airport intermodality development?

With such future work, it is expected in the end to deliver a tool (second phase of development) or some guidelines for the establishment of intermodality strategies to be applied at an airport.
Table 1: List of indicators

<table>
<thead>
<tr>
<th>Category</th>
<th>Indicator</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intermodal infrastructure</td>
<td><strong>Existence (number) of rail infrastructure in the airport area</strong></td>
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<tr>
<td></td>
<td>Access time(s) between the intermodal infrastructure and the terminal(s)</td>
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<tr>
<td></td>
<td>Airport railway station(s) capacity</td>
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<tr>
<td></td>
<td>Interest of intermodal infrastructure for airport users</td>
</tr>
<tr>
<td>Intermodal operators</td>
<td>Number of intermodal air operators and number of intermodal rail operators</td>
</tr>
<tr>
<td></td>
<td><strong>Market share of intermodal airlines</strong></td>
</tr>
<tr>
<td>Intermodal services</td>
<td>Existence (number) of intermodal agreements</td>
</tr>
<tr>
<td></td>
<td>Specificities (number of characteristics) of intermodal agreements</td>
</tr>
<tr>
<td></td>
<td><strong>Intermodal air supply (number / frequencies of intermodal air destinations)</strong></td>
</tr>
<tr>
<td></td>
<td><strong>Intermodal rail supply (number / frequencies of intermodal rail destinations)</strong></td>
</tr>
<tr>
<td></td>
<td>Competition between air and rail</td>
</tr>
<tr>
<td>Demand for intermodality</td>
<td>Number of intermodal passengers transported (passengers that benefit from intermodal agreements)</td>
</tr>
<tr>
<td></td>
<td><strong>Number of multimodal passengers transported</strong> (whether they benefit from intermodal agreements or not)</td>
</tr>
<tr>
<td></td>
<td>Potential demand for intermodal service with current service levels (number of passengers that are not in transit or potential travellers living in a “3-hours access time” geographical area)</td>
</tr>
<tr>
<td></td>
<td>Potential demand for intermodal service on existing network (potential travellers living in cities that could be directly linked to the airport via the exiting rail network in a journey time inferior to 3 hours)</td>
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</tbody>
</table>