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The northern end of CMK  
(view to the south)  
Photo by Bogusław Jankowski

# In Pursuit of Air-Rail-Road Integration

The “energy shake-up” announced by the European Commission on 10 January 2007 is meant to make Europe the world leader in the drive for a low-carbon economy. Whereas the Council Conclusions released on 20 February do mention, among the goals beyond 2012, “limiting transport emissions” and “addressing emissions from international aviation” [why not *domestic?*], for the time being all this is little more than a lofty idea, and it may take years before any practical measures are implemented.

In the meantime, according to recent statistics [European Energy and Transport: Trends to 2030 - update 2005 <[http://ec.europa.eu/dgs/energy\\_transport/figures/trends\\_2030\\_update\\_2005/energy\\_transport\\_trends\\_2030\\_update\\_2005\\_en.pdf](http://ec.europa.eu/dgs/energy_transport/figures/trends_2030_update_2005/energy_transport_trends_2030_update_2005_en.pdf)>, p. 37], the share of transport in EU-25 carbon dioxide (CO<sub>2</sub>) emissions is expected to grow from 26.4% in 2000 to 27.3% in 2010 and to 28.4% in 2020.

These projections foreshadowed the miscarriage of the EC grand de-

sign to restrain the disastrous impact of (road and air) transport on our environment. Anchored in the Lisbon strategy and the derivative concept of *sustainable development*, the design was laid out in the 2001 White Paper *European transport policy for 2010: Time to decide*. Trying to lay hands on the “main culprit”, i.e., road traffic, the DG Energy and Transport envisaged a “rebalancing of transport modes” in favour of Rail as the most environment-friendly and energy-efficient mode of (ground) transport. Particular benefits for the environment were to ensue from the rapid spread of *high speed railways*, which were hoped to dislodge not only long-distance motoring but also short-haul flights—the second most harmful kind of transport after Road.

Alas, five years on, the EC’s mid-term review of the White Paper (*Keep Europe moving*, June, 2006) either ignored or flouted these issues. The corollaries of this neglect were laid out in my paper “Towards an Integration of European Transport”, published in *Railway Market - CEE Review*, No 1-2007. As argued there, one of the reasons for the debacle is the progressing *compartmentalization*

in Brussels, which makes it virtually impossible for the EC Administration to think of Transport, Energy and Environment as a set of intimately inter-related problems.

## The European contingencies

Whereas the 2001 Transport White Paper of the European Commission pictured the enticing prospect of all transport modes working together in harmony, the dire realities of the intervening years seem to have pushed this concept into the background, so much so as to purge the mid-term review *Keep Europe moving* of any reference to the ultimate goal of transport integration in Europe.

Likewise, the awesome task of integrating the ‘new’ (EU-10) with the ‘old’ (EU-15) member states in terms of transport, was reduced in *Keep Europe moving* to the bare exigencies of specific programmes in action (market opening, interoperability, road tolling, Galileo satellite navigation, Marco Polo, etc.). Surely, the implementation of these programmes across the EU is one of the prerequisites of European transport integration, but in the absence of a comprehensive vision, how can we hope to achieve a true integration of

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European transport in the foreseeable future, bearing in mind the existing environmental and energy-related constraints?

On this evidence, one would expect the European Commission to draw up a full-scale programme of action, also by falling back on the results of past, and possibly future, public consultations. In the absence of such a programme, we have to live with such banalities as, for example, one of the 'main actions' for 2007, listed in *Keep Europe moving*, on p. 23 (last item): "External dimension: strategy for integrating EU's neighbouring countries into the internal transport market".

Clearly, the DG Energy and Transport is inclined to wait until the national governments and their 'incumbent' agencies and institutions come round to recognize the not-so-obvious necessities of this time and age—in contrast to the leaders of the European Union who seem determined to propose and, hopefully, enforce measures aimed at slowing the pace of climate change.

In order to give the European Commission food for thought, we'll venture here some ideas on the prospects of a *peaceful coexistence and harmonious collaboration* of three modes of transport: Rail, Road and Air.

### Strategic assumptions

1. Will the European Union succeed in the ambitious task of catching up economically with the world's leader, the United States? In fact, our hopes of ranking second in the world are shattered already, with *China's economy* soon taking that place. The current rate of growth of the upcoming superpower (well over 10 %) leaves no doubt that the most populous country on Earth will soon come to rank second in the world, and will subsequently overtake the U.S. in absolute figures.

In addition to becoming a military power of the first rank, the Kingdom of the Middle will spare no effort to raise the living standards of the people, to make them feel equal, if not superior, to Westerners. Evidence of this strategy has been provided with China's Council of State announcement of 18 March 2007: in execution of "the wish of the entire Chinese people for many years", China will start developing a civilian aircraft industry!

From Mission of DG "Energy and Transport" (Key figures)

<[http://ec.europa.eu/dgs/energy\\_transport/matthias\\_ruete/mission\\_en.html](http://ec.europa.eu/dgs/energy_transport/matthias_ruete/mission_en.html)>

- 72% of inland freight transport is carried by road, 17% by rail, 5.5% by inland waterways and 5.5% by pipelines.
- 92% of inland passenger transport is by road (of which 83% by private car and 9% by bus and coach) and 8% by rail (of which 7% by railway and 1% by tram or metro).
- 19% for freight and 13% for passengers (has been) the increase in mobility since 1995 (excluding maritime and air transport).
- 84.2% of CO2 emissions attributable to inland transport are generated by road transport.

Encouraged by the Chinese example, the well over one billion inhabitants of India will follow the path of the smaller 'Asian tigers', thus making—within a decade—for a total of three billion Asians eager to explore the outer world. Can anything prevent them from putting Europe on their itineraries?

2. Europe seems now alerted to the *environmental hazards* of our unfettered consumerism, one aspect of which is the growing mobility of the population. Well, should we encourage people to stay seated in front of their TVs, to watch the world roll past them on the screen? A more realistic and sound alternative is to make the European transport system more environment-friendly and less energy-consuming. As laid out in the 2001 Transport White Paper, this can be achieved by discouraging motorists and road hauliers from going on the road by offering them convenient transportation by rail.

3. If the White Paper's *preference for railways*, and high speed (HS) rail in particular, is not thwarted by the insanity of those who want to build more motorways, the next decades should see a rapid expansion of the HS rail network in Europe, not excluding the 'new' EU member states. The anticipated model of Rail-Road-Air integration envisages the substitution of short-haul flights as well as long-distance motoring with HS trains. In effect, the visitors from China, India etc. arriving by plane will be encouraged to undertake their European pilgrimage by HS train.

4. The millions of Asians pouring into Europe will be arriving by air, of course. The major West European airports are already choking with the quickly expanding air traffic, and environmentalists predict disastrous climatic effects from the anticipated linear growth of aviation, even without considering the prospects of the 'Asian invasion'.

Obviously, *Europe will need new airports* to cope with this deluge. Fortunately, the future growth of the European HS network will provide an alternative to (short-haul) feeder flights by offering rapid transfers to not-too-distant destinations. In effect, a rather limited number of suitably located mega-hubs, with train stations right under a mid-field terminal, will do the job.

It stands to reason that such mammoth airports operating in conjunction with an HS rail network must be built on flat, rather than hilly, terrain. One such ideal place is available in Central Poland, where an existing trunk line (CMK, built to HS specifications 30 years ago) will intersect with the future trans-European HS line, right alongside the A2 motorway.

### Economic assumptions

*Aviation* will progress considerably over the next 20 to 30 years, no doubt. What will not change, however, is the *enormous energy input* needed to make airplanes fly.

Likewise, the chances of developing environment-friendly fuel are pretty small. Consequently, airplanes will continue to *poison the atmosphere* and wreck our habitat. Another vexing aspect of aviation is *noise*.

In all those respects, the aircraft is most harassing during takeoff and climbing (ascension). Therefore, the ratio of high-altitude flying to takeoff plus climbing, calculated in terms of

- energy input,
- atmospheric pollution,
- noise, and
- time (as an economic variable) – should be a major factor in transport policy making.

In practical terms, this simply means that short-haul flights must be completely eliminated, at least as far as they can be replaced by *train services*.

*Road transport* is the main culprit, said the 2001 *White Paper* (p. 16) in reference to environment pollution.

And will remain so for quite some time! But even with far more environment-friendly fuels, the remaining distracting features of road traffic, notably of the private car variety (i.e., noise, energy input, ground occupied by roads, urban congestion), will persist.

Consequently, no efforts must be spared to reduce road traffic as far as possible. The only feasible alternative is *rail transport*, again. In addition to commuting, the obvious candidate for replacement (by HS rail) is long-distance (inter-city) motoring. Also a fair portion of road haulage could be eliminated by efficient (i.e., fast and reliable) freight rail services, some of which can be operated (at night time) on the new HS lines.

It is sometimes claimed that *new, wide and comfortable roads invite ever more traffic*. This may be true to some extent, but short of guessing, five crucial factors deserve to be considered, assuming the presence of a definite road network:

- operational costs,
- travelling time,
- convenience,
- accident rate,
- environmental impact.

From the interplay of those factors results the choice between the alternatives: *Road or Rail?*

The environmental and energy-related benefits of railways should easily translate into economic, profit-related terms, and yet the relative inertia of the European economy may slow down the process.

The European Union will be therefore entitled to *devise and implement economic tools* to facilitate the transfer of traffic (known as *modal shift*) from Air and Road to Rail.

### Two high speed rail systems

The European HS rail network already comprises two distinct topographic-operational systems: one is based on the motorway pattern, the other resembles conventional railways (and makes more use of the latter lines). The 'motorway' pattern is strictly enforced in France (with one exception: Lille), the other pattern is followed chiefly in Germany.

In the more developed economies, the 'French' model seems perfectly in place. While bypassing built-up areas, the French HS trains reach cities



The Spanish Talgo 350  
Photo by Felipe Aranda  
[www.railpictures.net/viewphoto.php?id=120497](http://www.railpictures.net/viewphoto.php?id=120497)

and conurbations by special 'feeders' (branches) or by (old) conventional lines. This principle allows trains to run non-stop at full speed over distances of up to 750 km (Paris - Marseille, where the average speed tops 250 km/h). The traffic is so voluminous that cities on the way are served by separate trains (Paris - Lyon, Lyon - Marseilles, etc.).

The choice between the 'French' and the 'German' model is obviously affected by the demographic factor. In Germany, a relatively large proportion of the population lives in small and medium-sized cities. The German railway planners may have been right, therefore, in making their first HS line between Hannover and Würzburg (327 km) run through three cities on the way: Göttingen, Kassel and Fulda. In addition to the three stops, all trains must slow down in the built-up areas. With a maximum speed of 250 km/h, the trip from Hannover to Würzburg takes two hours exactly. In France, on the other hand, the 427 km of the Paris-Lyon route are covered non-stop also in two hours—even if the train has to slow down on the outskirts of Paris and the same when entering Lyon.

In a less developed economy, and certainly in the beginning, the 'French' model may seem out of place, simply because there is—initially, at least—not enough demand to justify frequent, pair-wise services. Here the solution might be to make all, or most, trains enter the major cities on the way, leaving the laying of bypasses (through-routes) for later.

### Speed is what matters

There is a valid reason for discussing those details of running times,

bypasses, and en-route speeds. The reason is that HS trains 'stand or fall' on speed. In other words, only speed makes them competitive against Air and Road.

Indeed, the distances over which HS rail can win over both Air and Road vary with speed. To use the example discussed above, very few, if any, travellers will prefer to fly from Hannover to Würzburg when the train takes them from centre to centre in two hours. Once the HS line is extended further south, to Munich, and the train will need 90 more minutes, a train trip of 3h 30min from Hannover to Munich may prove non-competitive against the airplane, even though the distance will be less than 600 km. This contrasts with the success of the TGV which covers the 750 km from the centre of Paris to the centre of Marseilles in exactly three hours.

The compelling conclusion is that speed is the winner, also with HS railways. And this alone explains why efforts are made (notably in Spain) to build lines on which speeds of 350 km/h can be maintained over long distances.

### The cost factor

No market economy can ignore the cost factor, even in countries where railways continue to be heavily subsidised from the national budget. But are there reliable cost estimate procedures to assess the future revenues from HS lines that have not been built yet? Each line is specific by definition, as no two lines connect the same places. Likewise, cross-national comparisons are extremely risky, as each country bears its unique characteristics.

Rather than abiding by generalities, we might examine the case of the first French HS link Paris - Lyon. Naturally, the entire project was preceded by a feasibility study, which produced rather positive results.

If we were to compare the estimates of that French study with the actual traffic volume just a few years after the line was put into operation, the conclusion would be that the study was pretty useless: the real figures were much, much higher than the estimates at the stage of planning. For example, did the planners calculate back in 1976 that 20 years on Duplex trains would have to be built and operated at 3-min. intervals, to meet the demand at peak times?

To put it in a nutshell: opportunity breeds demand!

I have friends in Berlin and they come to Warschau every year for Easter, now that the train trip takes six hours. With a HS link offering a travel time of 2h 30min, they would be coming at least five times a year.

Another example: Warszawa is the (political) capital of Poland, and Cracow is the historic capital and principal cultural centre. The train now covers the distance of nearly 300 km in 2h 45min. This is too long for a day's trip—for instance, to go to the theatre. I live in Warsaw and visit Cracow very rarely, but if I have to go there, I always think first: should I not go by car? Once we have a HS service of 1h 15min, I will go there by train perhaps six times a year and will never consider going by car.



TGV Duplex with 545 seats  
Photo by Peter Schokkenbroek  
<http://members.home.nl/a.schokkenbroek>

How can you calculate (in advance) this potential growth in demand? Perhaps by making historical studies, drawing on the example of France and Japan?

This lengthy discussion of the cost factor might be considered redundant if it were not highly relevant in the context of *intermodal complementarity*. Because in the same way as the demand for HS services cannot be estimated in advance with any accuracy, the future demand for HS services, either those meant to substitute for short-haul flights, or just feeder flights, as much as those meant as a substitute for inter-city car journeys, and even those meant to supplant long-distance road haulage—is simply inestimable.

### Planning well ahead

Common sense and centuries of experience tell us that new transport routes (axes, corridors) ought to be planned at least 25 to 30 years in advance, to avoid the plight suffered by

the most congested West European countries where ever new routes have to be added at an exorbitant cost. Imagine how much money could be saved and chagrin spared if the same routes were planned a few decades ago!

The very same thing applies to airports. The planned expansion of Frankfurt Airport by another (third) terminal and a runway situated beyond the port perimeter (north of the railway and motorway) will be extremely costly (EUR 3.3 bn), whereas the resulting dispersion of landside and airside operations will make the outfit even less manageable (8 minutes on a 'people mover' to get from Terminal 1 & 2 to the new Terminal 3!). Similarly, Heathrow is putting up Terminal 5 on its western verge and contemplating to have a third runway beyond its northern perimeter.

Now imagine something of the same magnitude in a less populated and congested country, like Poland. The cost would be only a fraction of those billions. But in reality, an investment of this size would naturally be planned as a greenfield project, at even lower (total) cost.

Our *conclusion* is that whereas the ambitious programme outlined in the 2001 White Paper for 2010 seemed almost unmanageable by its breadth and depth, in the light of our present knowledge it has shrunk to just a modicum, and as such deserves to be superseded by a *long-term master plan*.

In other words, whereas the 2001 White Paper did offer a good start, the present situation calls for a *radical revision* (not just 'mid-term review') of the programme, which must now embrace a much longer period, for instance, up to 2030.



On 4 April 2007, a new (rail) speed record of 574.8 km/h was set up by Alstom's V150  
Photo by Jean-Marc Frybourg (from RailPictures.Net)