

# Gauge-convertible high speed trainset

**SPAIN:** By the end of next year CAF plans to roll out a gauge-convertible trainset able to run at 300 km/h. The four-car prototype, which will not be articulated, represents the culmination of a three-year research programme, according to Javier Goikoetxea, Project Co-ordinator in CAF's Research Department.

Work on the AVE-2015 research programme began in 2006, the idea being to build a 'fully-interoperable' train 'capable of running from Cadiz to Warszawa', according to Goikoetxea. The programme covered research into aerodynamics, wheel-rail interaction, train dynamics, bogie and suspension design, lightweight construction, new materials, traction equipment, and signalling and train control. Advanced simulation models were used to explore wheel-rail interface and train dynamics issues.

The aerodynamics stream looked at

improving the drag coefficient by 10% compared with Spain's existing fleets of high speed train. Work included development of an ideal nose design and the use of bogie fairings — the leading two bogies of the prototype will probably be covered by fairings. Improvements are also envisaged in the inter-car area, the aim being to eliminate the problem of flying ballast. For the aerodynamics research CAF was able to make use of the CNAM Aerotechnical Institute's wind tunnel in Saint-Cyr l'Ecole near Paris and the former British Rail Research aerodynamics rig in Derby.

Researchers examining train dynamics worked on development of an 'intelligent' active suspension with adjustable stiffness. The objective was to use stiffer suspension on high speed lines and softer suspension on conventional tracks, which required the development of continuously-variable

dampers. Body tilting was also investigated.

Developing a variable-gauge bogie for high speed presented CAF's research team with a considerable challenge. A gauge-convertible bogie is typically 1 tonne heavier than a normal bogie, and research engineers were tasked with finding ways to reduce the mass. Among the components where development was needed, work centred on the design of larger bearings able to cope with higher temperatures. Longer-lasting grease for bearings and sliding components was also studied.

About two years ago CAF set up Trainelec as a subsidiary to work on new designs of traction equipment for multi-voltage and high speed trains. The results were incorporated into the programme, while research continued. Development of signalling and train control equipment is another challenge, and here too CAF plans to establish its own business unit.

Lightweight components are essential to meet requirements such as the 17 tonne maximum static axleload specified for operation in France, and CAF's prototype will incorporate new materials in several areas. These will include several structural components such as the roof. Recyclability was another area of investigation, and many components are being designed with this in mind.

The prototype is due to be completed by the end of 2009. In an initial phase it will be fitted with standard gauge bogies for trials at up to 350 km/h, and this will be followed by a second phase using variable-gauge bogies at up to 300 km/h.

Funding for the first part of the research programme was provided by Centro para el Desarrollo Tecnológico Industrial within the CENIT programme, but CAF expects to fund the cost of building the prototype train. ❏