rated tractive power of 3MW from the four driven axles. To minimise bogie weight, the electric traction motors are mounted in the power car body and each drives an axle through a cardan shaft and light-weight final-drive gear-box.

The power car tilts round curves in the same way as the passenger vehicles. The pantograph, however, is maintained over the track centre by a tilt-compensation linkage.

Train control

The braking system for APT is designed to stop the train from 250km/h within the existing signalling distances specified for conventional 160 km/h trains. Hydrokinetic (water turbine) brakes are used to meet the very high energy dissipation and power-handling levels demanded by this requirement. At the same time, this type of brake adds little mass to the axles.

At low speeds, the hydrokinetic brakes are supplemented by simple hydraulic friction brakes acting on the wheel treads.

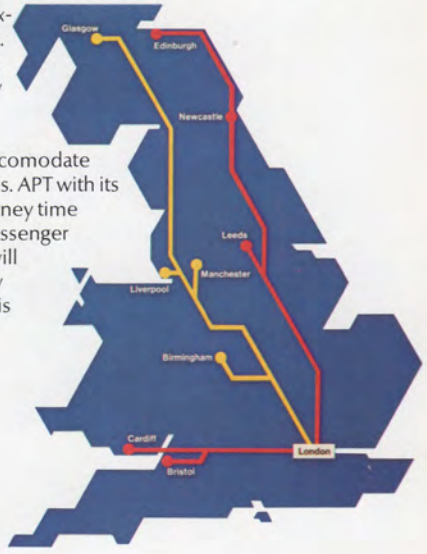
Because of the body tilting facility, APT has a higher maximum speed through curves than that indicated at the trackside for conventional trains. As a result a special display has been added to the driver's control console. This gives a continuous indication of the permitted maximum speed of the train and indicates when braking should start for speed restrictions. The information for display is provided by passive transponders on the track which are interrogated as the train passes over them. The coded speed limit information from the transponders is converted into a digital display by on-board microprocessors. The system is programmed to be fail-safe in service.

Inter-City Service

British Rail's Inter-City network provides fast and efficient services between major cities.

The Autumn of 1979 will see the first pre-production 14-vehicle Advanced Passenger Train (APT) introduced into commercial service between London and Glasgow, initially at a maximum speed of 200km/h.

The Inter-City route from London to Glasgow is fully electrified and requires only minimal additional facilities to accomodate APT and its higher speeds. APT with its significant savings in journey time and high standards of passenger comfort and amenities will further enhance the daily passenger services on this route.



Van Trailer Car (1st Class) Intermediate Trailer Car (2nd Class) Driver Trailer Car (2nd Class)

Published by British Railways Board CM & EE Dept GM310/A55/579
Printed in Great Britain by Alpine Press, Watford.

British Rail's Advanced Passenger Train

InterCityAPT

APT concept

In planning the development of its Inter-City services, British Rail has specified shorter journey times as a major objective. Instead of building expensive new high-speed lines, the potential of existing tracks is being exploited through the development of new high-performance trains.

Significant growth in passenger traffic is already being generated by the 200km/h diesel-powered High Speed Train (HST). The next phase will be the introduction of the Advanced Passenger Train (APT).

The APT is designed for a top speed of 250 km/h. It is also capable of taking curves 20-40% faster than conventional trains by tilting each vehicle body inward to maintain passenger comfort. The APT represents a major advance in rail technology. Three pre-production 25kV electric-powered trains (APT-P)have been built following an extensive research and development programme.

Train performance

For minimum journey times with maximum economy, APT is streamlined and lightweight.

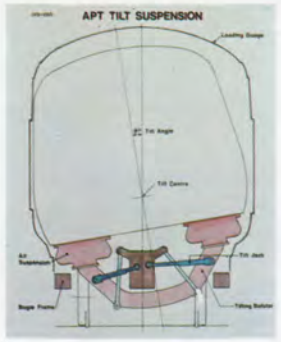
Low aerodynamic drag is achieved by streamlined nose and tail profiles, reduced vehicle cross section and general surface smoothness. This results in an energy saving of 33% compared with conventional rolling stock with equivalent passenger capacity. Improved aero-dynamics also attenuate pressure pulses when passing through tunnels.

Low train-mass is achieved by constructing the passenger vehicle shells in aluminium alloy, by fitting lightweight equipment, and by the adoption of articulation with adjacent vehicles sharing a common bogie. Articulation also reduces costs and generates less noise.

Advanced suspension design, with minimum unsprung and bogie masses, provides stable running, good ride quality and low track wear.

Vehicle tilting

Each APT vehicle tilts by up to 9° to maintain passenger comfort when running round curves at high speeds. The need to remain within the British Rail loading guage when tilted has resulted in the charac teristic body profile of the APT.



Each vehicle is tilted individually by hydraulic jacks. These actuate tilting mechanisms within each bogie. Tilting is controlled by spirit-level sensors which measure the lateral acceleration experienced by passengers. This information is converted into tilt command signals which are processed electronically and hydraulically causing the vehicles to tilt until the lateral forces are fully counterbalanced.

The hydraulic tilt equipment is contained in under-floor-mounted modules which can be withdrawn easily for repair by replacement.

Vehicle construction

APT passenger vehicles are constructed in aluminium alloy for light weight. The outer shell is built up from a series of very wide commercial-grade extrusions which run the full length of the vehicle. The extrusions are automatically seam-welded together. The resulting structure is 40% lighter than a conventional steel body-shell and no more expensive.

The APT body-shell is capable of withstanding the 200 tonne buffing load specified for main line passenger vehicles. In addition, the structure is designed for a very highly flexural stiffness for good ride quality at high speed.

Passenger accommodation

Each APT passenger vehicle can accommodate up to 72 second class passengers or 47 first class passengers at standard British Rail seat spacings. This is achieved within a vehicle length of 21m by the provision of only two, very-wide, doors for each vehicle, located at diagonally-opposite corners.

A visually-attractive environment is complemented by comfortable seating, double-glazing, air conditioning with de-odourising carbon filters and automatic sealing from external pressure pulses. The catering vehicles provide both a full meals service and buffet and bar services.

Substantial weight savings have been achieved through the use of a chemical toilet, lightweight seats and a low-energy air-conditioning system.

Power car

The pre-production 25kV, ac electric APT incorporates one or two power cars positioned centrally between two sets of articulated passenger vehicles. This arrangement enables current to be collected from a single pantograph when two power cars are installed.

The power car body shell is of lightweight steel monocoque construction. The thyristor-controlled electrical equipment gives a