RAILWAY TRANSPORT

Cut-price Fast Trains

BRITISH Rail's answer to the aircraft has been on show for the past month at the Design Centre in London. Potential passengers have been inspecting a full-scale model interior of the Advanced Passenger Train which should be coming into service on inter-city journeys during the 1970s, and which embodies several new features that will make possible a greatly increased operating efficiency and speeds 50 per cent faster than the current limits. A speed of 150 miles per hour may not exactly rival the Concorde, but is respectable enough when compared with the amiable trundles to which travellers were resigned not so long ago, and should provide journey times that actually undercut those of air travel unless transit times from city centre to airport decrease considerably.

This latest attempt to escape from the Victorian image of steam and pistons has emerged from the work of experienced aircraft engineers in conjunction with the staff of the British Rail Technical Centre at Derby. Not much information about the underlying technical advances is available at the London exhibition, but there have been articles in the *Railway Gazette* during the past few years which illuminate the situation. The most prized of the innovations is a new kind of suspension which is reckoned to have great export potential. The most spectacular, on the other hand, is a hydraulically powered mechanism which can tilt the bodywork of the train up to 9° in order to get round bends faster. This in turn has required a redesigned cross-section of the body which loses as little width as possible at seat level (see Fig. 1). The whole body shape is carefully chosen to reduce aerodynamic drag, which varies as the cube of the speed and so absorbs considerable power at high speeds.

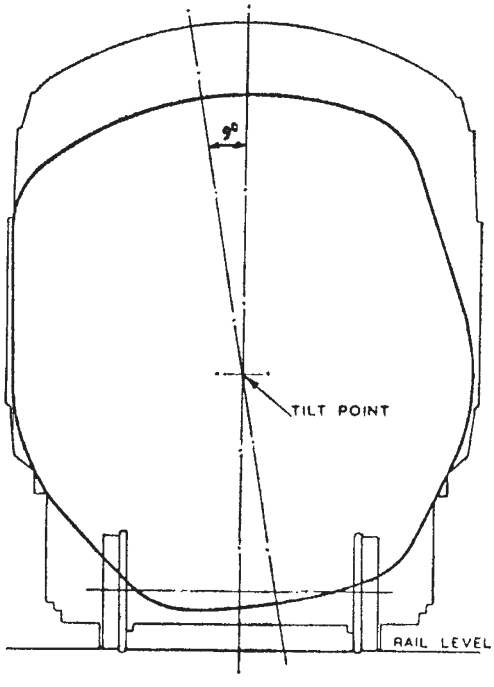


Fig. 1. How the new body shape compares with a conventional railway coach: 9° tilting is possible within the allowed space limits. (From *Railway Gazette*.)

The wheel and bogie structure is also rather different from that of conventional trains. Coaches are linked by a single bogie which, in conjunction with the suspension, makes each coach behave like a two-axled vehicle at high speeds—this has the advantage of reducing the frictional wear on the wheels at curves in the track. The wheels themselves have a different profile from older designs, approximating to the shape produced when the tyres of normal wheels become worn, which paradoxically improves the conditions of contact between wheel and rail.

Much of the time-saving capacity of the advanced passenger train comes from rapid acceleration and braking. Where lines are not electrified, the best power-to-weight ratio can be obtained with a gas turbine engine, for which a contract has been awarded to Leyland Gas Turbines, Ltd. The engines will be incorporated in the front and rear coaches of the train, and the other coaches will be trailers, although it will be possible to add further power cars if they are required for a particular route. Hydrodynamic brakes will enable the train to stop from 150 miles per hour in a shorter distance than present-day trains need to come to a halt from 100 miles per hour. For the final slowing-down from a low speed, they will be supplemented by disk brakes.

When a test train has been built, it will be sent for trial runs on a stretch of disused track between Melton Mowbray and Nottingham which is being brought up to normal main line standards for this purpose. Individual carriages will undergo more intensive testing in a new Test Hall to be built at Derby by Taylor Woodrow Construction (Midlands), Ltd. Little apparently needs to be done to the present state of the British Rail main lines in preparation for the new train's arrival, and it is anticipated that trains will reach Newcastle from London in 160 minutes, compared with the present schedules of 230 minutes, although a programme of relatively minor track works would further reduce this figure. It may thus be that British Rail have solved the problem of raising maximum speeds without the drastic expense of totally rebuilding the whole rail system—£400 million for the Tokyo–Osaka line in Japan, for example.

COMMUNICATIONS SYSTEMS

Goonhilly Looks East

TELECOMMUNICATIONS have gone a long way since the first transatlantic television pictures were picked up at Goonhilly in July 1962. One tangible sign of this was the opening of the GPO Space Communication Station at Goonhilly on August 6 by the Postmaster General, Mr John Stonehouse. Mr Stonehouse also inaugurated the direct television link between Britain and Japan, which uses the Intelsat III satellite over the Indian Ocean, on exile duty after the performance over the Pacific proved less than satisfactory. Naturally there was nothing in what Mr Stonehouse had to say that indicated the degree of anxiety which must now afflict the international carriers. With the failure of the Intelsat III launching last month, there is now only one space satellite to replace that now out of action over the Atlantic.

The renovation of the Goonhilly station has been quite drastic. The original terminal, known as Goon-

hilly 1, has been electronically renovated, and shares duty with Goonhilly 2. The old Atlantic aerial now faces east and the new aerial serves the busier Atlantic side. The Goonhilly 2 terminal has a dish of 27·5 m in diameter and facilities to carry up to 400 telephone circuits and a television programme between Europe, North America, Africa and the Middle East. The web of countries which can communicate directly with Goonhilly will soon be extended to include Kenya, Bahrain and Hong Kong, where terminals are now under construction.

One novel feature of the restyled Goonhilly 1 terminal is the low loss elliptical waveguide which takes the signals from the central control building to the aerial site, a distance of 525 m. The use of a transmitter system with such a long waveguide makes it possible to concentrate the maximum amount of equipment in one place and to switch between the two aerials direct from the central building.

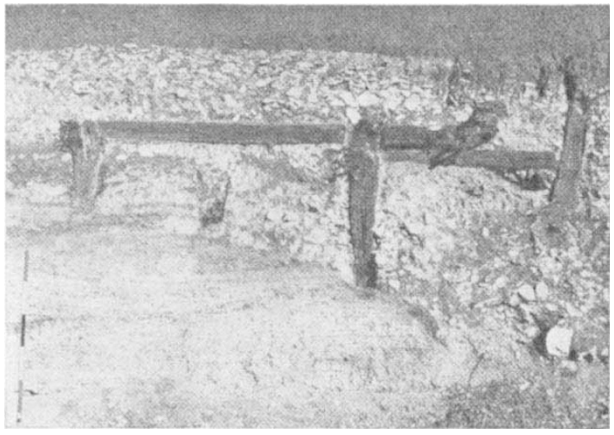
There have also been developments in the Soviet Union, which has been operating its own space communications system independently of Intelsat. The Molniya-1 satellite system has been beaming radio and television signals across the Soviet Union for about four years, and Professor Vladimir Minashin, head of the Space Communications Department of the Soviet Ministry of Communications, announced last week the linking of regular colour television broadcasts to the satellite network later this year. The distribution of populations in the Soviet Union is particularly suited to the use of communications satellites, which apparently relay newsprint and weather charts as well as television and radio programmes. Professor Minashin also announced the building of a station for the Orbita system in Ulan Bator, Mongolia. This is the first station of Soviet design to be built outside the Soviet Union.

ARCHAEOLOGICAL EXCAVATIONS

Ministry as Rescuer

BUSINESS at the ancient monuments division of the Ministry of Public Building and Works is booming too quickly for comfort. For the past half dozen years, the annual catalogue of rescue excavations mounted by the ministry at sites threatened with imminent destruction has grown fatter. This year is no exception and the catalogue for 1968 also has a new title, *Archaeological Excavations 1968*, a new price (7*s*, HMSO), and for the first time a glossy cover, which smacks above all else of putting a brave face on things. Like second sons of second sons, the ministry's archaeologists and those contracted to do specific excavations are expected to work with small budgets backed up by a conservation laboratory hopelessly overwhelmed by the amount of material dug up at the 91 sites excavated during the year. During 1968, according to the report, all the available resources were needed to meet the demand for excavating sites threatened with immediate destruction, which meant, of course, that numerous field monuments had to be left to the gradual erosion of ploughing and other agricultural activities.

Even the sites that are selected for excavation sometimes present problems beyond the resources of the ministry. One of the great ironies of the situation is that the larger the site, the less able the ministry is to deal with it. "The heavy demand already placed on the ministry's services has given rise to problems of organization and staffing, particularly with regard to the excavation of larger sites where camps have had to be arranged to house the necessary labour and volunteers. Though it will be possible to continue to organize these operations through excavation committees the ministry itself has not staff available to mount camps of the requisite size and order." Given all the difficulties under which the archaeologists are forced to work, it would be churlish to be anything but grateful for the amount of material they rescue. But it is time that landowners and the Government accepted their responsibility for ensuring that archaeological sites are not neglected and that excavations are adequately financed.



Remains of a Roman timber bridge across the River Nene at Aldwincle in Northamptonshire.

NOBEL PRIZE

Chance for the Economists

Now that the Swedish Central Bank, to mark its tercentenary last year, has put up the money for a Nobel Prize for Economic Sciences, only the engineers are left in the cold. Why Alfred Nobel left engineering off his prize list at the turn of the century—a time when the public reputation of engineering was probably at its peak—is something of a mystery. Certainly engineers had then and for that matter still have as great a claim to be honoured by Nobel prizes as any of their contemporaries in other fields. Perhaps Saab or Volvo or some other Swedish engineering company will come to the rescue. Meanwhile, from this autumn onwards the world's economists will be able to join the intriguing game of spotting the prize-winners.

Already the economists' papers are speculating on the names on the short list for the first prize, worth £28,000 to the winner like all the other Nobel prizes. The Swedish economic weekly *Veckans Afferer* suggests that the field has been narrowed down to nine or ten from an original entry of about 200. It is strongly tipping Professors N. Kaldor and J. E. Mead of Britain, Professors M. Friedman and P. A. Samuelson of the United States, the Russian mathematician Professor L. V. Kantorovitch and Professor F. Parroux of France. Such detailed speculation contrasts with the surprise and secrecy that surround the awards to