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路桥技术

Road & Rail Technology

岔尖加热

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《经济导报》技术系列特刊，为读者提供全球行业信息及技术发展资讯
特刊分析了不同行业领域，共享全世界的知识和诀窍

This EIA bilingual magazine, supported by Cavendish in China, gives readers information on global industrial and technological developments. Special issues analyse different industry sectors, sharing knowledge and expertise from around the world.

公路堵塞情况日益严重，为此我们绞尽脑汁寻求解决方案，包括从拥挤收费到定量分配等等。尤其定量收费，可以说这是一种最为极端的解决方法。解决方案最好是联合使用这些系统，维护汽车驾驶人的选择权，同时确保交通能够得到有效管制和疏导，以实现我们的共同利益。

这种交通系统的重要性在智能交通系统世界大会上得到了众多与会代表的证实。这次大会是有关智能交通系统的世界级大型会议，于2007年10月9日至13日在北京举行。共有46个国家和163家公司的2, 000名专家出席此次大会，这些专家的研究代表了交通系统中最新发展趋势和先进技术，同时与会人员还包括来自亚太地区的约4万名来宾。

目前市场上有两种基本系统。第一种采用摄像机和计算机监控的交通流量；第二种以汽车本身为中心，通过全球定位系统（GPS）和全球移动通信系（GSM）进行工作。一旦欧洲伽利略卫星群在未来十年内全部投入使用，那么采用第二种系统的趋势就增大；目前已经发射了一枚卫星并进入了轨道，通过它的原子钟来提供准确的读数。

同时，市场上交通管理系统的数量越来越多，包括收费方案以及驾驶员必须遵从的方案。交通管理系统在市区的挑战最大，由于来自建筑物、桥梁、天桥和其他建筑物的信号会受到反射，再加上多路径和其他干扰，所以使市区的交通环境条件变得极为不利。

在这些版面中介绍的是Satellic公司提供的一种解决方案，它可以根据二氧化碳排放来实现公路收费，这是一种很先进的理念。另一种解决方案是蜂窝浮动车辆数据（CFCD），它能够追踪准确的行驶时间，在测量本地速度和检测减速时有着类似于公路传感器的性能。

具有竞争实力的技术将会变得日趋成熟，终究有一天这种技术能够在国与国之间，甚至城市与城市之间形成一种标准化。虽然这一时刻还没有到来，但是交通秩序井然有序的时代已为期不远了。

Our roads are becoming ever more congested. Varying solutions have been attempted, from congestion charges to rationing, the latter being the most extreme. The answer emerging seems to be that it is best to apply a mix of these systems, retaining powers of choice for the motorist while making sure that traffic is constrained and directed for the common good.

The importance of such traffic systems was evidenced in the strong attendance at the world's biggest congress on Intelligent Transport Systems in Beijing from 9 to 13 October. The conference was attended by 2,000 experts from 46 nations and 163 companies presenting the latest trends and technologies, and some 40,000 visitors from the Asia-Pacific region.

There are two basic kinds of systems on the market. The first works from surveillance and monitoring of traffic flow through cameras and computers; the second is centred in vehicles themselves, and operates through global positioning systems (GPS) and global systems for mobiles (GSM). The trend towards the latter systems will be accentuated once the European Galileo constellation of satellites comes fully into play in the next decade; already one satellite has been launched and is providing exact readings from its atomic clock.

There is also an increasing number of systems in the marketplace for traffic management, where tolls are seen as the answer, and where driver compliance is seen as essential. The challenge is greatest in urban areas, where multipath and other interferences create a difficult environment, due to the reflection of signals from buildings, bridges, flyovers and other structures.

Covered in these pages is one solution from Satellic which allows toll charges to be collected based on CO_2 emissions, an advanced, concept. Another solution is presented by cellular-based floating car data (CFCD), which has the capability to track accurate travel times, with a similar performance to road sensors in measuring local speed and detecting slowdowns.

There must come a time when the competing technologies are sufficiently mature to demand standardisation, from country to country, and even from city to city. Clearly that time has not yet arrived, but it must not be far off in order avoid confusion in complexity.

在上一期RRT中，我们本打算刊登有关2007年10月9日至13日召开的“智能交通大会”（Intertraffic 2007）信息，但却不慎错误刊登了2007年“北京国际交通工程技术与设施展览会”（Intertraffic China Show）的相关信息。对于我们的失误，在此深表歉意。

In the last issue of RRT we mistakenly included information on the Intertraffic China Show from 2007. Of course the intention was in fact to print information regarding the 9-13 October Intertraffic 2007. We apologise for this error.

如果您有任何意见、批评或者想给我们写信，请将电子邮件发至dy@cavendishgroup.cn
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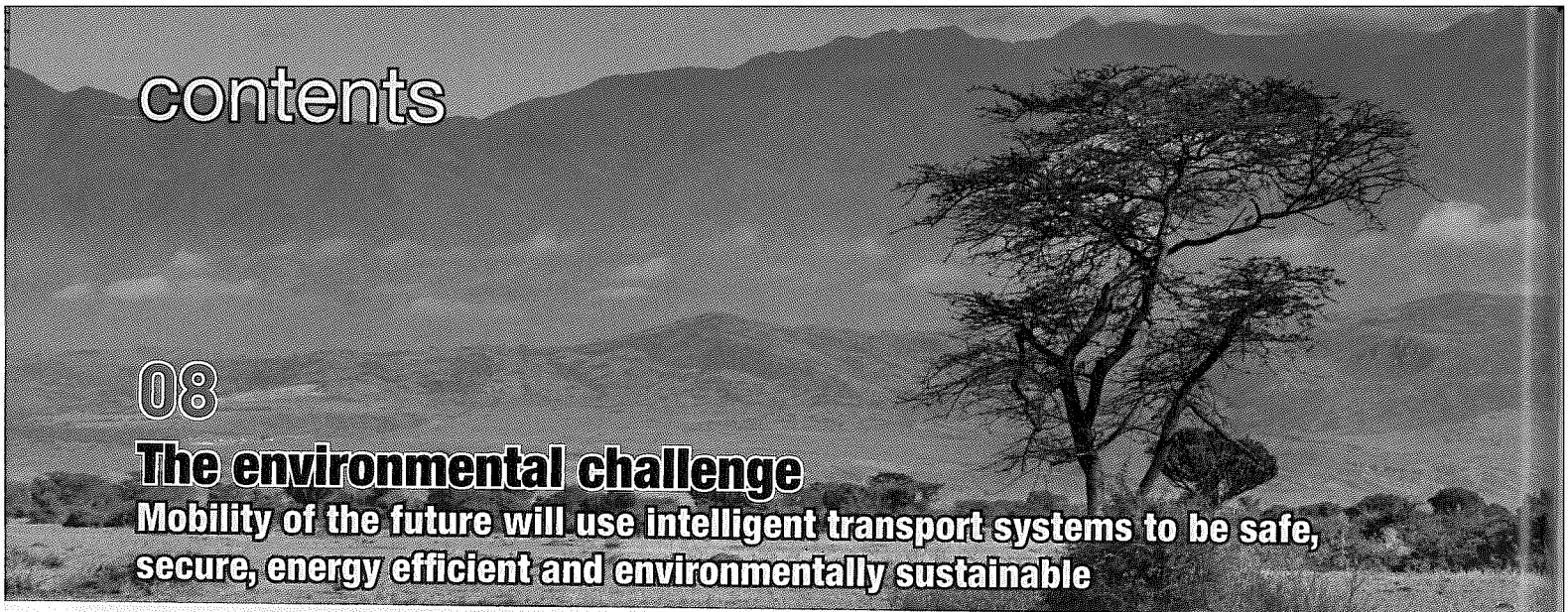

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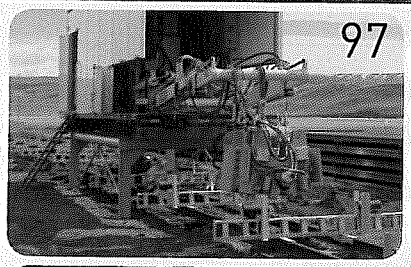
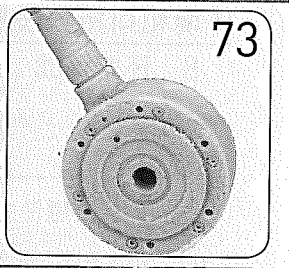
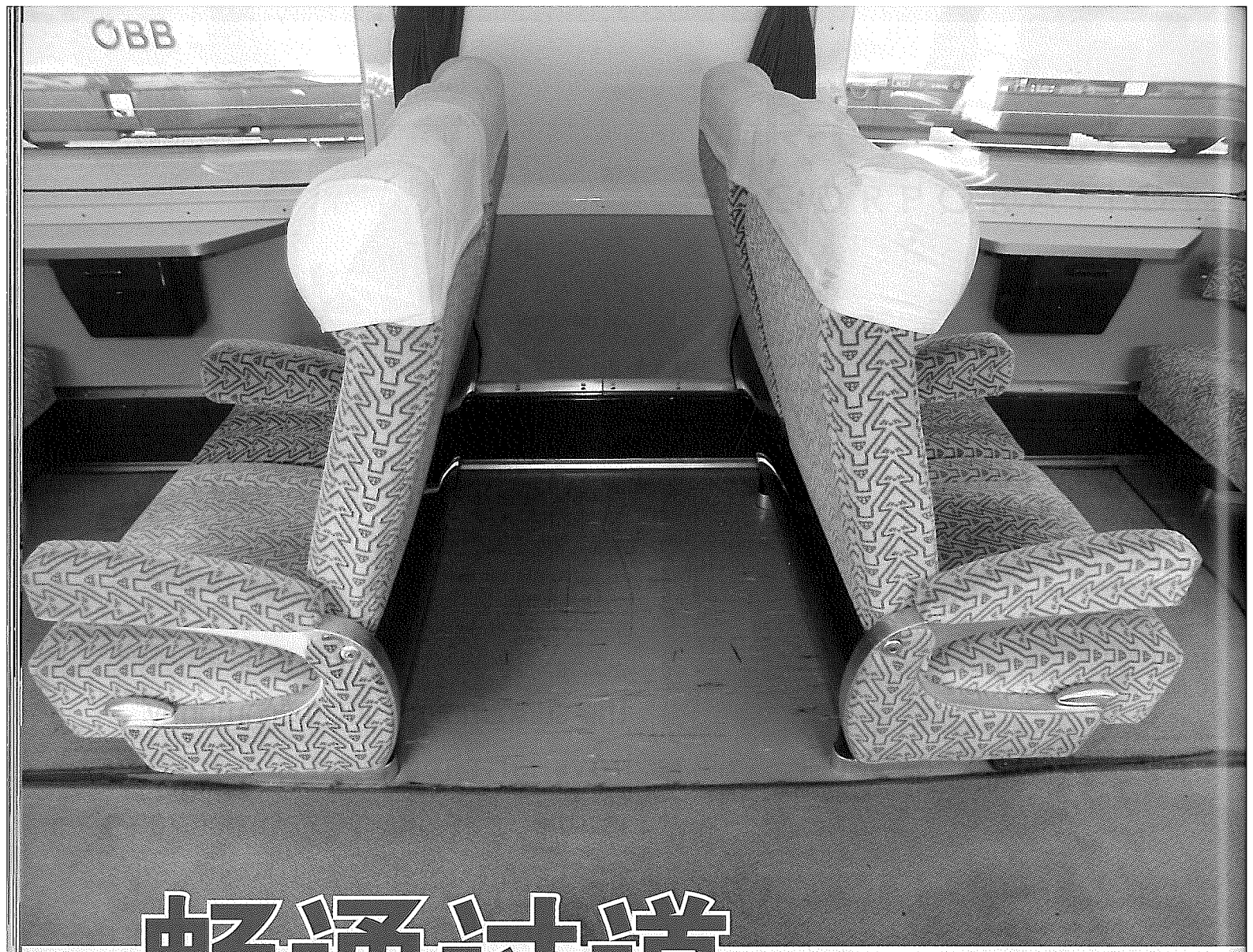
The environmental challenge

Mobility of the future will use intelligent transport systems to be safe, secure, energy efficient and environmentally sustainable







畅通过道

优化火车行李空间能减少排队、提高安全性、加快运作速度

Clearing the gangways

Optimising luggage space on trains can reduce queues, improve safety and speed up operations

为有效运营长途铁路交通，通常的做法是增加列车车厢内的座位数。但座位数最大化的结果是只有行李架上可以存放行李。

维也纳科技大学铁路工程学院在奥地利的长途列车上对旅客在各种环境下的真实行为进行了广泛研究。

研究中有两个主要发现，其中之一是旅客不愿举高行李，而是宁愿忍受给自己以及其他旅客带来的不便之处。

In order to operate long distance rail travel efficiently, attempts are often made to increase the number of seats in train carriages. The consequence, however, of maximising the number of seats is that only the overhead racks are available for luggage storage.

An extensive study at the Institute for Railway Engineering at the TU-Wien, which was carried out on long distance trains

为了避免排队，列车内部最靠近出入口的区域必须让旅客顺利上车和分流，因此这个区域不能太狭窄

第二个主要发现是旅客总是希望能看到自己的行李，所以不喜欢使用位于车厢两头的行李架。如果在列车的设计和制造中不考虑到这两个基本原则，那么在火车的整个使用期，对旅客和运营方都将造成极大的不便。这些问题不仅会导致不满意度增加，而且会导致效率降低。

超重行李

只要有可能，旅客会尽量避免举高中型和大型的行李。因此，所有地面或靠近地面的空间都被用于堆放行李。如果没有合适的空

in Austria, deals with the actual behaviour of the passengers under a great variety of conditions.

One of the two main observations from the study was that travellers like to avoid having to lift their luggage and so are prepared to put up with discomfort for other passengers as well as themselves, in order to avoid lifting luggage.

The second main observation was that passengers always want to be able to see their luggage and so like to avoid using storage racks situated at the end of carriages. If these two basic principles are disregarded when a train is being designed and built then serious disadvantages arise for the passenger and the operator during the operating life of the train. These problems lead not only to increased dissatisfaction, but also to a drop in efficiency.

Excess baggage

If at all possible, passengers will try to avoid lifting medium and large pieces of luggage. As a consequence, all the available areas on the floor, or near to the floor, are used to deposit luggage. If there are no suitable areas, like sufficient room between the seats or individual luggage

旅客在上列车时，如果发现很难找到空座位和适合的地方放行李时，排队更容易发生

When people are boarding the train, queues form even more quickly if it is difficult for passengers to find free seats and suitable areas to put their luggage

间，比如座位间足够的空间或地板上的个人行李架，旅客就会使用过道、入口、空座位以及座位前面的地板。

通常，这些堆放行李的空座位很难再空出来，结果就没法使用了。另外，旅客也只能牺牲舒适，这就意味着车厢内座位的使用率在70%-80%，以至于至少20%的座位无法使用。

行李放置不适当将阻碍旅客的流动并为列车工作人员带来很多困难。这项研究还进一步证实了另一个问题：列车过道太狭窄。过道宽度不到60厘米，旅客带着行李移动更加不便。

racks on the floor, then passengers will use the areas in the aisle and the entrance, free seats and the floor in front of seats.

As a rule, the displacement of the free seats with luggage is done in such a way that it is so difficult to free them up again, that they remain unusable. As well as the passengers having to sacrifice comfort, this also means that the maximum utilisation rate of the seats in the carriage comes to between

行李堆放在地板上还堵住了各种紧急出口，若有危险发生，将给安全带来巨大风险。紧急出口又进一步受到过于狭窄的过道的限制。车厢两端的车门布置有相同的问题，因为紧急出口对坐在车厢中间的旅客来说距离很远。

列车晚点

上述这些情况容易导致旅客在上列车时排队，特别是当旅客发现很难找到空座位和适合的地方放行李时，排队更容易发生。

列车内部设计不合理导致的排队会造成旅客在车站和旅行高峰段的换乘时间增加。高入口和台阶也是排队增加的一个因素。火车会在每一个站点多耽误几分钟。根据距离的远近，累积起来可能造成很长时间的延误。这会对前、后列车以及全天列车时刻安排造成巨大影响。

如果对该学院的调查加以关注，列车空间的有效使用将获得显著提高。这两个关键点关注于登上列车的旅客和总体座位安排。

潜在改进

新造列车应重新考虑车门的位置。如果两个出入口放在车厢四分之一处而不是在车厢两端的话，旅客可以更好的分流，这将明显减少旅客的排队现象。为了加快旅客上车速度，出入口的门宽度至少要达到90厘米。

同样重要的是从月台通往列车内部的台阶数目。根据旅客携带的行李，旅客跨越4级台阶所用的时间是跨越2级台阶的两到三倍。一名携带沉重箱子的旅客平均需要12秒跨越4级台阶，跨越2级台阶则平均需要5秒钟。

上列车的台阶坡度如果缓些的话也可以减少换乘的时间。和一辆车门宽度为80厘米、台阶高度/深度比例为23:20厘米的RIC机车车厢相比，登上一辆车门宽度为90厘米、台阶高度/深度比例为21:23厘米的内燃机列车，旅客平均需要的时间减少了15%-20%。

为了避免排队，列车内部最靠近出入口的区域必须让旅客顺利上车和分流，因此，首先这个区域不能太狭窄，带行李的旅客完全

70 and 80 per cent. In this way at least 20 per cent of the seats are unusable.

Inappropriately placed luggage blocks the flow of passengers and also causes a great deal of difficulty for the staff. A further problem ascertained by the study was that train aisles were too narrow. With a width of less than 60cm, passengers find it a great deal more difficult to carry their luggage.

Baggage placed on the floor can also block the various emergency exits, which represents a high risk to safety in cases of danger. The emergency exits are further restricted by aisles, which are too narrow. The usual layout of the doors at both ends of the carriage has a similarly problematic effect, since the emergency exits for people who sit in the middle of the wagon are a long way off.

Delayed trains

When people are boarding a train, these circumstances can easily lead to queues, which form even more quickly when it is difficult for passengers to find free seats and suitable areas to put their luggage.

Queues caused by badly designed train interiors lead to increased passenger changeover times at stations and at peak travelling times. High entrances and steps are also a factor in increased queues. The delay of a train increases a few minutes with every station. Depending on the distance, this can culminate in significant delays. This has knock-on effects on approaching and following trains and on the timetable arrangements for a whole day.

If attention is paid to the institute's investigation, a marked improvement in the effective utilisation of space on trains can be made. The two critical points concern passengers getting onto the train and the seating arrangements in general.

在一般车门位于车厢两端的普通列车内，行李架安排在车厢四分之一处、车厢的两侧，而为了优化使用率行李架应靠在一边

In normal trains with doors at both ends of the compartment, luggage racks are arranged in quarter points of the carriage, opposite each other. To get optimum efficiency they should be placed next to each other

行李堵住了过道、座位和出入口，但顶部行李架依然空着。有些座位在理论上是给旅客座的，但旅客却无法接近。乘务人员在列车上行动非常不便
Luggage blocks the aisle, seats and the entrance although over head racks are free. Some seats are theoretically free for passengers, but people are unable to reach them. People manoeuvring about the train will have great difficulty

能在此短暂停留。而为了避免过于限制旅客，另一要求就是座位之间的宽度必须至少有60厘米。

在一般车门位于车厢两端的普通列车内，行李架安排在车厢四分之一处、车厢的两侧，而为了优化使用率，行李架应靠在一边。后一种安排将保证上车旅客的尽快流动，并因此减少排队现象。

座位的最大数量不应该根据运营方的意愿来设置，而应该以旅客在各种情况下的行为为基础。大多数旅客都带有行李，有时候行李会占据大量空间。这种现象在通往机场或度假圣地的列车上尤为明显。

案例研究

这里所引用的数据表明了旅客目的地的平均分布。12%为假日旅行，15%为长途私人旅行，38%为短途旅行，剩下的是为期一天到数天的商务旅行。

每名旅客平均携带0.8件行李，包括大、中型的旅行箱、旅行袋或背包。每名旅客另外携带0.7件手提行李，有小旅行箱、旅行袋和背包，大小类似飞机上所允许携带的手提行李。

Potential improvements

The position of the doors in newly built trains should be reconsidered. If the two entrances are put at the respective quarter points instead of at the end of the carriages, the flow of passengers can be better spread, which leads to a tangible reduction in passenger queues. In order to speed up passengers getting on, the entrance doors must have a minimum width of 90cm.

Of equal importance is the number of steps that lead from the platform to the interior of the train. Depending on the luggage that is being carried, it takes a passenger two to three times longer to negotiate four steps than it does to negotiate two. A passenger with a heavy case takes, on average, 12 seconds to negotiate four steps. The same passenger needs on average five seconds to negotiate two steps.

A gentler gradient of the steps leading onto a train also contributes to a reduction in the changeover times. When getting on to an ICE train with a door width of 90cm and a step ratio (height/depth) of 21:23cm, a passenger needs on average 15 to 20 per cent less time than when getting into a RIC carriage with a door width of 80 cm and a ratio of 23:20cm.

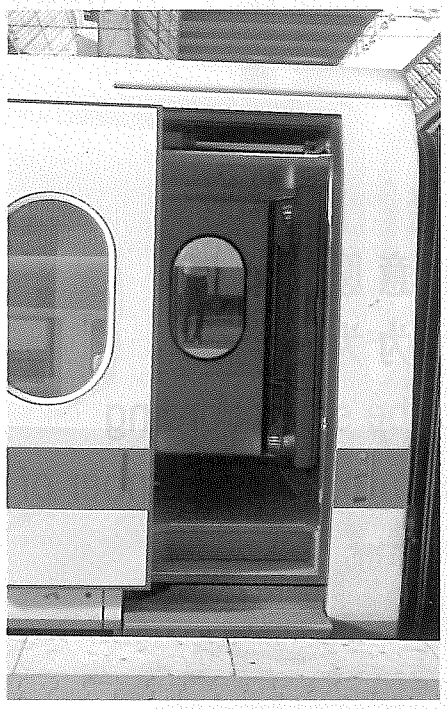
In order to avoid queues, the immediate entrance area inside the train must fulfil the function of taking on and distributing

座位的最大数量不应该根据运营方的意愿来设置，而应该以旅客在各种情况下的行为为基础

The maximum number of seats should not be set according to the wishes of the operator. The basis for the maximum number of seats should be set by passengers and their behaviour under various conditions

放行李的区域将在一辆新的、虚拟的列车上进行演示。这是一辆二等开放的客厅式车厢，里边有几个面对面的座位以及成排的座位。座椅格局分布间隙约为92厘米。充分利用座椅安排，一节车厢内可设立88个座位，而这样在地板附近就没有空间堆放行李了，只有头顶上的行李架可以放行李。

passengers. It is therefore necessary that this area is not too narrow. Passengers with luggage must be able to pause there. As a further consequence, the width for access between the seats must be at least 60cm in order that it doesn't restrict the passenger too much.



可取的入口情况：两级台阶、90厘米宽的门、台阶梯度更缓
Favourable entrance situation; two steps, 90cm door width and a gentler gradient in the angle of the steps

如果旅客的实际行为转移到这辆列车上，那么视目的地分布不同，20%-30%的座位将无法使用，因为这些座位被行李隔开了。即使所有的旅客都准备抬起自己的行李放到头顶上的行李架上，在度假者增加的时候也将没有足够的行李空间。很多旅客都不想举起沉重的行李，即使往上放，位置也不合适，他们一般只往上放轻的行李和衣物，重的行李则放在地板上、椅子上或椅子前面。

因此，这节车厢中88个座位中只有70个座位可用。在度假期间可用座位将更少。

如果减去6个座位，把空间让给3个行李架，则留下82个座位，不过最多也只有77个座位可用。这样设计比前一种多7个座位，而实际减少6个可用位置。在日常情况下，为了获得百分之百的使用率，这种类型车厢座椅的上限在80个左右。于是可以安置4个行李架，在分析旅客行为的基础上，预计可达到百分之百的座位使用率。

这样一来，通过减少理论上的88个座位中的8个，实际上反而增加了10个可用座位。这不仅提高了使用率，而且带来了经济性、旅客舒适度和顾客满意度。

行李架数量和大小的最终选择取决于包括列车目的地在内的诸多因素。事实证明，通常每节车厢内安装4个行李架，每个内部宽度至少有100厘米是最佳的。底部行李架通常是为大型沉重的行李所设计的，至少要75厘米高。之上是两层行李架，内部高度分别为55和

In normal trains with doors at both ends of the compartment the luggage racks are arranged in quarter points of the carriage opposite each other, whereas to get optimum efficiency they should be placed next to each other. The latter arrangement would guarantee the best possible flow of passengers getting on and in this way reduce the queues.

The maximum number of seats should not be set according to the wishes of the operator. The basis for the maximum number of seats should be set by passengers and their behaviour under various conditions. Most passengers have luggage with them, which sometimes takes up a lot of space. This is to be observed especially in trains which serve airports or holiday destinations.

Case study

The figures referred to here indicate the average distribution of passenger destinations. These are 12 per cent holiday journeys, 15 per cent longer private journeys, 38 per cent short journeys and the rest are business trips of one or several days.

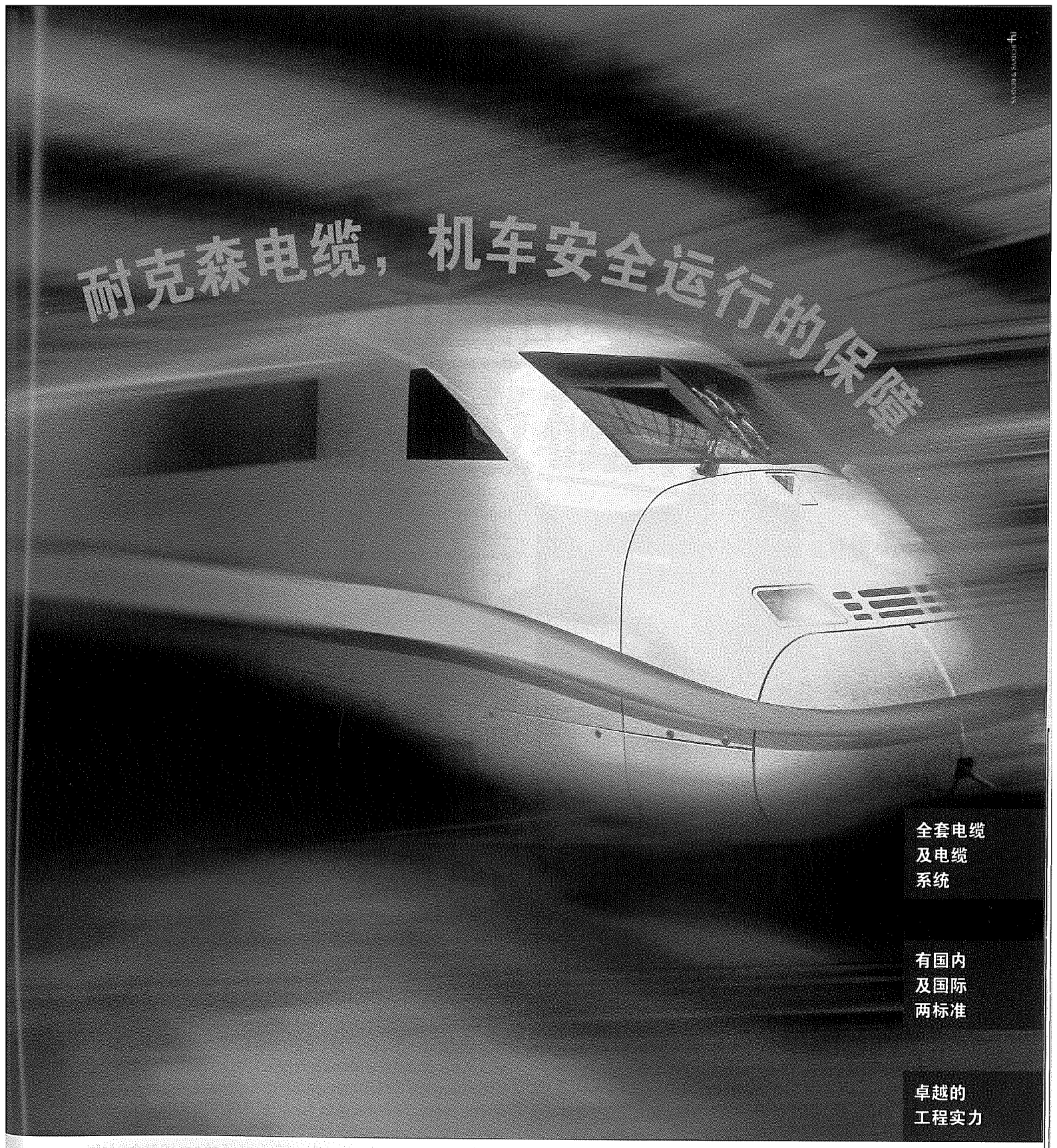
Each traveller has on average 0.8 pieces of luggage. These are big or medium sized cases, travel bags or rucksacks. Each passenger has in additional 0.7 pieces of hand luggage. These are small cases, travel bags and rucksacks with a volume like the normal hand luggage allowed for air travel.

The area needed to deposit luggage will be demonstrated on a new, fictitiously chosen train. This is a second-class open saloon coach with some face-to-face seating and some seating in rows. The seat grid pattern is about 92 cm. Making full use of the seating arrangements, a maximum of 88 seats can be built in the compartment and in this case there is no space to deposit luggage near the floor, only overhead racks are available for depositing luggage.

If the actual behaviour of passengers is transferred to this train, then depending on the distribution of the destinations, 20 to 30 per cent of the seats are unusable, since they are blocked off by luggage. Even if all passengers were prepared

旅客不愿举高行李，而是宁愿忍受给自己以及其他旅客带来的不便之处

Travellers would like to avoid having to lift their luggage and so are prepared to put up with discomfort for other passengers as well as themselves, in order to avoid lifting luggage



对所有的机车制造商，子系统供应商，或运营商，耐克森提供符合国内和国际标准的全套产品：动力电缆，通信电缆，综合布线集成系统，此外，耐克森以工程服务及度身订制的物流服务作为支撑，帮助您实现可持续的灵活性和盈利。用户化解决方案是实现您业务的重要支柱，因此，耐克森是您可以信任的声誉卓越的合作伙伴。耐克森的长期经验是您实现目标最有力的保障。

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座椅靠背之间的空间：ÖBB-2nd-Cl开放式客厅车厢，有足够的空间储放行李；SBB-2nd-Cl 开放式客厅车厢：对中大型行李来说空间太小
Space between the backrests: ÖBB-2nd-Cl open saloon coach, there is enough space for storing luggage; SBB-2nd-Cl. Open saloon coach: The space is much too small for storing medium or large luggage items

45厘米，小的上层行李架适合旅行袋和背包。在制造行李架时必须注意要有向内的坡度，这样行李就不会掉下来了。

储放行李的另一个好地方是两个座椅靠背中间的空间。这些地方很受旅客欢迎，因为这样他们就可以看着自己的行李。在设计车厢时，座位的头枕不应贴在一起，如此所留下的空间就会太小而无法使用。从地板测量，只有留下高60厘米、宽30厘米的空间，座位安排才有效。

在规划车厢内部装修时，最大可能座椅数的10%必须以行李架所取代，这是基准，才能确保接近百分之百的座椅效率。

撰稿：Bernhard Rüge

to lift their luggage and stow it in the overhead racks, there would not be enough luggage space on days with an increased number of holidaymakers. Since there are many passengers who are not prepared and often not in the position to lift up their heavy luggage, then only the light pieces of luggage and clothing are lifted up and the heavy luggage stays on the floor, or on or in front of the seat.

Accordingly, in this compartment only 70 of the 88 seats would be available. During holiday periods there would be even fewer.

If six seats were removed to create space for three luggage racks, 82 seats could be installed, but of these only a maximum of 77 could be used. Accordingly, there would be seven more seats, but in actual fact there would be 6 fewer available. The upper limit for seats, in order to get around 100 per cent efficiency, is around 80 in this type of carriage on an average travel day. In this case four luggage racks can be built and on the basis of the analysis of passenger behaviour, a possible seating efficiency of 100 per cent can be predicted.

Thus, by giving up eight of the 88 seats in theory, there will be 10 more available seats in practice. This increases not only the efficiency, and with this the economy, but also passenger comfort and customer satisfaction.

The final choice of number and size of luggage racks depends on the factors including the train's destinations. As a general rule the installation of four luggage racks each with an inside width of at least 100 cm has proven to be most advantageous. The bottom rack, which is mainly meant for large and heavy pieces of luggage, is at least 75cm height. Above this are two racks arranged with an interior height of 55cm and 45cm, and here the smaller upper rack is suitable for travel bags and rucksacks. When building the racks care must be taken to have them sloping backwards so that the luggage does not fall down.

Another opportunity for luggage storage is the space that is left between the two back rests of seats. Such storage is popular with passengers as they are able to watch their luggage. When designing the carriage, the headrests of the seats should not be next to each other, because the space left is much too small and therefore unusable. The seating arrangement is only efficient if there is space left, measuring from the floor, to a height of 60 m and a width of 35cm.

When the interior of a carriage is being planned, it is a benchmark that 10 per cent of the maximum possible number of seats must be replaced by luggage racks in order to get about 100 per cent seating efficiency. ■

This article was contributed by Bernhard Rüger, TU-Wien