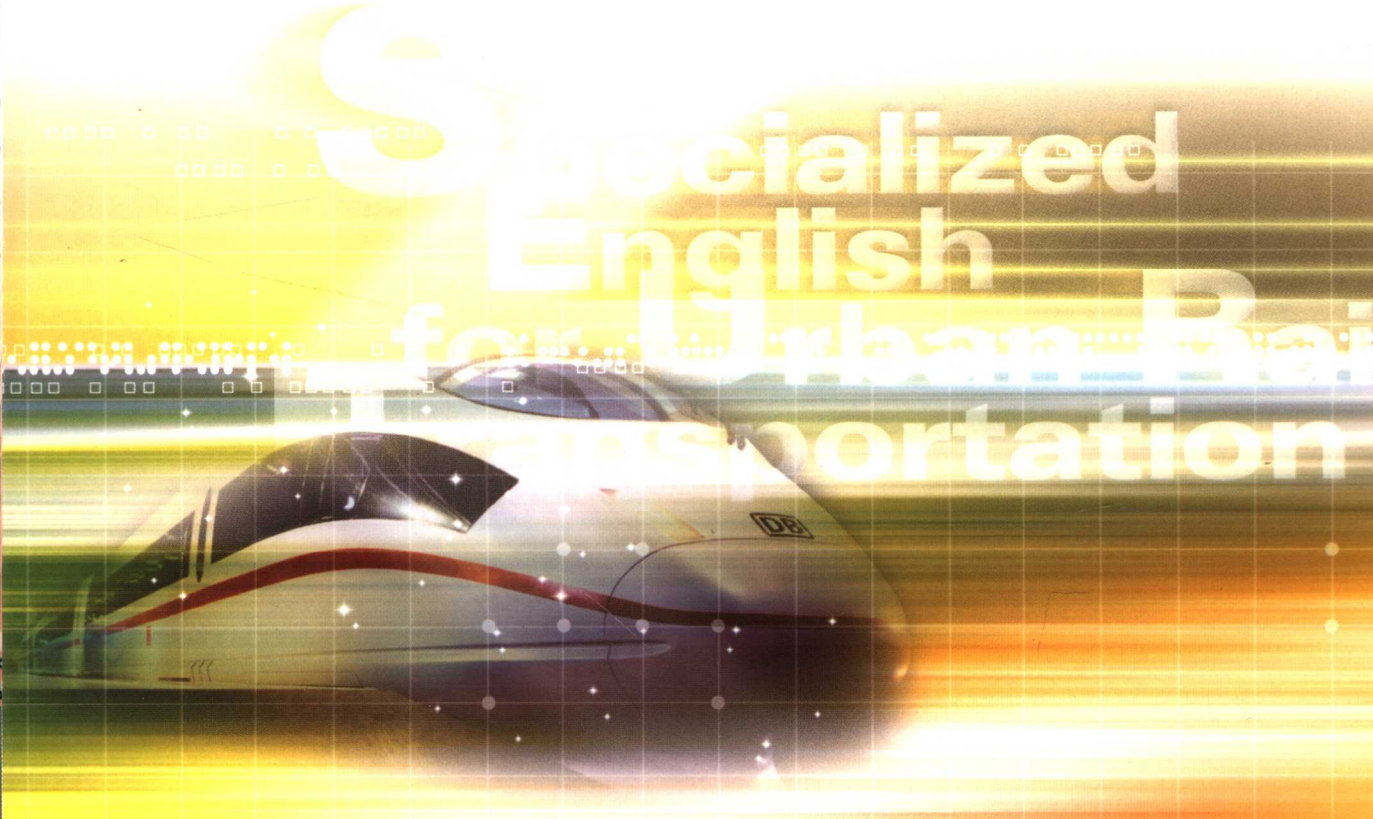
高等职业教育城市轨道交通专业系列教材

城市轨道交通专业英语

闵丽平 主编



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高等职业教育城市轨道交通专业系列教材

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内 容 简 介

本书在广泛收集资料和多年教学的基础上，对城市轨道交通专业英语进行了系统地归纳和介绍，内容包括地铁、轻轨、高速铁路、磁悬浮等。

本书共有十六个单元。每一单元由课文A、课文B、生词、注释、练习、阅读材料、会话等七部分组成。课文全部选用原文材料，略有删改。全书题材多样，结合图片，内容丰富有趣，并具有一定的启发性。生词释义采用英、汉结合的方式，主要用英语释义，并酌情加注汉语；注释全部用英语，主要介绍有关背景知识，说明一些特殊的语言现象，供学生预习和老师备课时参考。课后有针对课文内容的问答题、填空、英译汉和写作练习；泛读课文后附有讨论题。为提高学生的阅读能力，书中精选有阅读材料，并附有常用的专业词汇。

本书内容涉及面广、语言规范、实用性强，可作为城市轨道交通、铁道运输与管理、交通运输等专业的专业英语教材或拓宽专业知识的参考书。

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前　言

本教材根据高等职业专科学历城市轨道交通专业英语教学大纲编写。在编写过程中充分考虑专业培养目标，专业英语的实用性以及学生的知识结构和能力特点，并且根据就业需要，增加了听说能力训练，以强化学生的口语能力。课文的内容力求选择国内外城市轨道交通领域的新技术、新工艺、新方法、新设备等"四新"内容，详细介绍地铁、轻轨、高速铁路、磁悬浮等不同交通方式的特点和行车组织方式，从而达到专业英语学习和专业知识相结合的目的。

英语教师编写专业英语教材，不懂专业知识，而专业人员编写此类教材，英语水平又受到限制；教材在使用过程中难免会遇到对专业知识的深度和广度把握不准，或英语语言不规范等问题。本教材由长期从事专业英语教学的英语教师和城市轨道交通专业的专业教师联合编写，保证了教材内容专业知识适度、英语语言规范，因而避免了上述问题。书中根据学生知识结构和就业情况，编写了有关铁路、地铁、磁悬浮运营方面的客运英语会话（Learn to Say），既提高了学习的趣味性，又丰富了教学内容。

本教材将语言运用能力的培养与专业新知识相结合，借助专业英语平台，介绍了最新的专业知识，在英语学习和专业知识及时更新方面进行了有益的尝试，选材新颖、题材广泛、语言规范、练习形式多样。

本教材的编写弥补了城市轨道交通专业没有专业英语教材的空白。它是在西安铁路职业技术学院铁道运输专业、交通运输专业、城市轨道交通等专业多年使用的专业英语自编教材基础上，不断完善编成的，由闵丽平担任主编，涂小勇任副主编，兰州交通大学宋建业教授担任主审。

在编写过程中，我们得到西安铁路职业技术学院电信运输系主任韩买良同志的大力支持，在此表示感谢。

由于水平有限，书中难免有错误和不足之处，恳请读者给予批评指正。

编　者

2005 年 10 月

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Unit One

Text A Technology of Maglev

A magnetic levitation train, or maglev, is a type of train that is suspended in the air above a single track, and propelled using the repulsive and attractive forces of magnetism. Because of the lack of physical contact between the track and the vehicle, the only friction is that between the carriages and the air. As a result maglev trains can potentially travel at very high speeds with reasonable energy consumption and noise levels. Although the very high maximum speeds make maglev trains potential competitors to airliners on many routes, the high cost of the lines has limited their current commercial application to one line in Shanghai that takes people 30 kms (18.6 miles) to the airport in just 7 minutes 20 seconds (top speed of 431 km/h or 268 mile/h, average speed 250 km/h or 150 mile/h). Other maglev applications worldwide are being investigated for feasibility.

Technology

There are three main types of maglev technology: one that relies on superconducting magnets (electrodynamic suspension or EDS), one that relies on feedback controlled electromagnets (electromagnetic suspension or EMS), and a newer potentially more economical system that uses permanent magnets (Inductrack).

Japan and Germany are active in maglev research, producing several different approaches and designs. In one design, the train can be levitated by the repulsive force of similar poles or the attractive force of opposite poles of magnets. The train can be propelled by a linear motor on the track or on the train, or both. A lot of electrical induction coils are placed along the track in order to produce the magnetic field necessary to propel the train, leading some to speculate that the cost of constructing such tracks would be enormous.

Unmoving magnetic bearings using purely electromagnets or permanent magnets are unstable on account of Earnshaw's theorem; on the other hand diamagnetic and superconducting magnets can support a maglev stably. Conventional maglev systems are stabilized with electromagnets that have electronic stabilization. The electromagnets and electronics tend to be large, power-hungry and expensive.

The weight of the large electromagnet is a major design issue. A very strong magnetic field is required to levitate a large train, so conventional maglev research is using superconductor research for an efficient electromagnet.

The effect of a powerful magnetic field on the human body is largely unknown. For the safety of the passengers, shielding might be needed, which would add supplementary weight to the train. The concept is simple, but the engineering and design aspects are complex.

A newer less-expensive system is called "Inductrack". The technique has a load-carrying ability related to the speed of the vehicle, because it depends on currents induced in a passive electromagnetic array by permanent magnets. In the prototype, the permanent magnets are in a cart; horizontally to provide lift, and vertically to provide stability. The array of wire loops is in the track. The magnets and cart are unpowered, except by the speed of the cart. At first inductrack was developed as a magnetic motor and bearing for a flywheel to store power. With only slight design changes, the bearings were unrolled into a linear track. Inductrack was developed by physicist Richard Post at Lawrence Livermore National Laboratory.

Inductrack uses Halbach arrays for stabilization. Halbach arrays are arrangements of permanent magnets that stabilize moving loops of wire without electronic stabilization. Halbach arrays were originally developed for beam guidance of particle accelerators. They also have a magnetic field on the track side only, therefore reducing any potential effects on the passengers.

At present, some space agencies, such as NASA, are researching the use of maglev systems to launch spacecraft. In order to do so, the space agency would have to get a maglev-launched spacecraft up to escape velocity, a task that would otherwise require elaborate timing of magnetic pulses or a very fast, very powerful electric current. Maglev-launching could also be used to make conventional launches more efficient: accelerating a craft up to Mach 1 before firing the main engines can save 30% of the weight of the launch vehicle.

Pros and Cons of Different Technologies

Each implementation of the magnetic levitation principle for train-type travel involves advantages and disadvantages. Time will tell which principle and whose implementation wins out commercially.

Technology	Pros	Cons
EMS (Electromagnetic)	continuously suspended when power is provided; proven, commercially available technology	narrow gap between track and vehicle; not inherently fail-safe
Superconducting EDS (Electrodynamic) systems	large gap between track and vehicle	currently (2005) reliant upon low-temperature superconductors that must be refrigerated with liquid helium; vehicle must be wheeled for travel at low speeds
'**Inductrack**' system	failsafe; good suspension distance; no power required to be provided to the magnets	new technology still under development (2005)

New Words and Expressions

magnetic adj. of magnetism 磁性的,磁的

levitation n. rising and floating in the air, esp. by means of supernatural powers 升空飘荡(尤

指超自然力）

repulsive adj. （physics）causing repulsion; repelling 排斥的;斥力的

magnetism n. （science of the）properties and effects of magnetic substances 磁性;磁性作用;磁学

potential adj. ① that can or may come into existence; possible 可能存在或出现的;可能的
② in existence and capable of being developed or used 潜在的;有潜力的

reasonable adj. moderate; acceptable; tolerable 适度的;可接受的;还可以的

practical adj. suitable for the purpose for which it was made; useful 切合实际的;实用的

superconductivity n. property of certain metals, at temperatures near absolute zero, of having no electrical resistance, so that once a current is started it flows without a voltage to keep it going 超导电性

electromagnet n. piece of soft metal that becomes magnetic when an electric current is passed through the coil surrounding it 电磁铁;电磁体

economical adj. careful in the spending of money, time, etc. and in the use of resources; not wasteful 经济的;节俭的;省时间的;节约的

permanent adj. lasting or expected to last for a longtime or forever 永久的;永恒的;长久的;长期的

pole n. （physics）either of the two ends of a magnet or the terminal points of an electric battery 磁极,电极

linear adj. of or in lines 线的;线状的

speculate v. form opinions without having definite or complete knowledge or evidence; guess 思考;思索;推断;推测

bearing n. 轴承

diamagnetic adj. 抗磁的

stabilization n. 稳定

shield v. protect sb./sth. from harm; defend sb./sth. from attack, etc. 保护或庇护某人（某事物）

induce v. bring about, cause 引起,产生

array n. 一系列

unroll v. （cause sth. to）open out from a rolled position by rolling （使某物）（由卷曲状态）展开

Mach n. （followed by a number）ratio of the speed of sth.（esp. an aircraft）to the speed of sound 马赫

spacecraft = spaceship n. vehicle manned or unmanned for travelling in space 航天器;宇宙飞船;太空船

pulse n. ① single vibration of sound, light, electric current, etc.（声波、光波、电流等的）一次脉动
② （usu. sing）series of these 连续的脉动;脉冲波

implementation n. putting into effect; carrying out 使（某事物）生效,履行;实施;贯彻

inherent adj. existing as a natural or permanent feature or quality of sb./sth. 内在的;固有

的;本来的

fail-safe adj. (of equipment, machinery, etc.) designed to compensate automatically for a breakdown or failure (指设备、机器等)设有自动保险装置的

wheel v. move in a curve or circle 转动,旋转

helium n. a chemical element, a light colourless gas that does not burn, used in airships 氦

repulsive forces 斥力

linear motor 线性电动机

induction coil 感应线圈

magnetic field 磁场

Earnshaw's theorem 厄恩肖定理

permanent magnet 永磁铁

particle accelerators 离子加速器

escape velocity 脱离速度

Notes

1. In physics, **magnetism** is one of the phenomena by which materials exert an attractive or repulsive force on other materials.

2. In physics, **friction** is the non-conservative resistive force that occurs when two surfaces travel along each other when forced together. It causes physical deformation and heat buildup.

3. **Superconductivity** is a phenomenon occurring in certain materials at low temperatures, characterised by the complete absence of electrical resistance and the damping of the interior magnetic field (the Meissner effect.) Superconductivity is a quantum-mechanical phenomenon that is different from perfect conductivity.

4. **Electrodynamic Suspension** (EDS) is one method that can be used for maglev trains. Superconductor electromagnets on the train generate a magnetic field. Propulsion coils on the guideway are used to exert a force on these magnets, and make the train move forwards.

5. **Electromagnetic Suspension** (EMS) in Maglev trains is a system whereby a powered electromagnet maintains a train at a constant distance from a track. It is distinguished from electrodynamic suspension (EDS).

6. **Inductrack** is a completely passive magnetic levitation train system, using only unpowered loops of wire in the track and permanent magnets (in Halbach arrays) on the train to achieve levitation. Inductrack was invented by Lawrence Livermore National Laboratory physicist Richard E. Post. The only power required is to push the train forward, with increasing levitation force generated as the velocity of the train increases over the loops of wire.

7. A **linear motor** is essentially an electric motor that has had its stator "unrolled" so that instead of producing a torque (rotation), it produces a linear force along its length.

Many designs have been put forward for linear motors, falling into two major categories, low-acceleration and high-acceleration linear motors. Low-acceleration linear motors are suitable for maglev trains and other ground-based transportation applications. High-acceleration linear motors are nor-

mally quite short, and are designed to accelerate an object up to a very high speed and then release the object. They are usually used for studies of hypervelocity collisions, as weapons, or as mass drivers for spacecraft propulsion.

When a linear motor is used to accelerate beams of ions or subatomic particles, it is called a particle accelerator. The design is usually rather different as the particles move close to the speed of light and are usually electrically charged.

8. An **induction coil** (archaically known as a **Ruhmkorff coil**) is a type of disruptive discharge coil. These coils are passive electrical device used to produce high voltage pulses from a low voltage DC supply.

9. In physics, a **magnetic field** is an entity produced by moving electric charges (electric currents) that exerts a force on other moving charges. (The quantum-mechanical spin of a particle produces magnetic fields and is acted on by them as though it were a current; this accounts for the fields produced by "permanent" ferromagnets.) A magnetic field is a vector field: it associates with every point in space a vector that may vary in time. The direction of the field is the equilibrium direction of a compass needle placed in the field.

10. **Earnshaw's theorem** states that a collection of point charges cannot be maintained in an equilibrium configuration solely by the electrostatic interaction of the charges. This was first stated by Samuel Earnshaw in 1842. It is usually referenced to magnetic fields, but originally applied to electrostatic fields, and, in fact, applied to any classical inverse-square law force or combination of forces (such as magnetic, electric, and gravitational fields).

11. **Diamagnetism** is a very weak form of magnetism that is only exhibited in the presence of an external magnetic field. It is the result of changes in the orbital motion of electrons due to the external magnetic field. The induced magnetic moment is very small and in a direction opposite to that of the applied field. When placed between the poles of a strong electromagnet, diamagnetic materials are attracted towards regions where the magnetic field is weak. Diamagnetism is found in all materials; however, because it is so weak it can only be observed in materials that do not exhibit other forms of magnetism. Also, diamagnetism is found in elements with paired electrons. Oxygen was once thought to be diamagnetic, but a new revised molecular orbital (MO) model confirmed oxygen's paramagnetic nature.

12. An **electromagnet** is a type of magnet in which the magnetic field is produced by a flow of electric current. The magnetic field disappears when the current ceases.

13. The **Lawrence Livermore National Laboratory** (**LLNL**) is a United States Department of Energy national laboratory, managed by the University of California, in Livermore, California. Along with Los Alamos National Laboratory, it is one of the USA's two laboratories whose mission has included the design of nuclear weapons.

14. A **Halbach array** is a special arrangement of permanent magnets which augments the magnetic field on one side of the device while cancelling the field to near zero on the other side. In the diagram, the magnetic field is enhanced on the bottom side and cancelled on the top side (a one-sided flux). The pattern (on the front face; left, up, right, down) of permanent magnets can be continued indefinitely and have the same effect. It is roughly similar to many horseshoe magnets placed

adjacent to each other, with alternating polarity.

The effect was discovered by Mallinson in 1973, and described as a "magnetic curiosity" although he recognized that this magnetization pattern could make significant improvements in magnetic tape technology. Mallinson showed that any magnetization pattern in which the x and y components of the magnetization are $\pi/2$ out of phase will cause a "one-sided" flux, the simplest being sin (kx), -cos(kx). It was later (and independently) discovered by Halbach, who used the arrangement in particle accelerators.

This device is the fundamental principle behind the Inductrack maglev system, a levitating train that requires no power to levitate; power is only used to create forward motion. The Halbach arrays repel buried loops of wire after they have been accelerated to speed, lifting the train. Halbach arrays were originally developed in a cylindrical shape, known as the Halbach cylinder.

15. A **particle accelerator** is a device that uses electric and/or magnetic fields to propel electrically charged particles to high speeds.

16. The **National Aeronautics and Space Administration** (**NASA**), which was established in 1958, is the agency responsible for the public space program of the United States of America. It is also responsible for long-term civilian and military aerospace research.

17. In physics, for a given gravitational field and a given position, the **escape velocity** is the minimum speed an object without propulsion, at that position, needs to have to move away indefinitely from the source of the field, as opposed to falling back or staying in an orbit within a bounded distance from the source. The object is assumed to be influenced by no forces except the gravitational field; in particular there is no propulsion, as by a rocket, there is no friction, as between the object and the Earth's atmosphere (these conditions correspond to freefall) and there is no gravitational radiation. This definition may need modification for the practical problem of two or more sources in some cases. In any case, the object is assumed to be a point with a mass that is negligible compared with that of the source of the field, usually an excellent approximation. It is commonly described as the speed needed to "break free" from a gravitational field.

18. In electricity, **current** refers to electric current, which is the flow of electric charge. Lightning is an example of an electric current, as is the solar wind, the source of the polar aurora. Probably the most familiar form of electric current is the flow of conduction electrons in a metallic wire. This is how utility companies deliver electricity. In electronics, electric current is most often the flow of electrons through conductors and devices such as resistors, but it is also the flow of ions inside a battery or the flow of holes within a semiconductor.

19. **Mach number** (Ma) (pronounced as "mack" in International English or "mock" in the American English) is defined as a ratio of speed to the speed of sound in the medium in case. The Mach number is commonly used both with objects travelling at high speed in a fluid, and with high-speed fluid flows inside channels such as nozzles, diffusers or wind tunnels. As it is defined as a ratio of two speeds, it is a dimensionless number. At standard sea level conditions, Mach 1 is 1,225 km/h (765.6 mile/h) in the atmosphere.

Exercises

I. Answer the following questions according to the text.

1. What's the definition of maglev?
2. How much time does Shanghai maglev take people to the airport?
3. How many primary types of maglev technology are there? What are they?
4. What does inductrack use for stabilization?
5. What are the pros and cons of EMS?
6. What are the pros and cons of EDS?
7. What are the pros and cons of inductrack?

II. Choose the best answer to each question.

1. A maglev is a type of train that is _____ in the air above a single track.
   A. suspended B. propelled C. operated D. travelled
2. The train can be levitated by the repulsive force of _____ poles.
   A. opposite B. unlike C. like D. dislike
3. A new, perhaps less-expensive, system is called _____ .
   A. EDS B. inductrack C. EMS D. none of the above
4. _____ has narrow gap between track and vehicle.
   A. EMS B. EDS C. Inductrack D. none of the above
5. The top speed of Shanghai Maglev is _____ km/h.
   A. 250 B. 431 C. 268 D. 650

III. Translate the following sentences into Chinese.

1. A maglev is a type of train that is suspended in the air above a single track, and propelled using the repulsive and attractive forces of magnetism.
2. Japan and Germany are active in maglev research, producing several different approaches and designs.
3. The effect of a powerful magnetic field on the human body is largely unknown.
4. Some space agencies are researching the use of maglev systems to launch spacecraft.
5. Inductrack was originally developed as a magnetic motor and bearing for a flywheel to store power.

IV. Summary writing.

In no more than 80 words give an account of this passage. Use your own words as far as possible.

Learn to Say

Everyday English I 日常生活用语(一)

A. Greetings 问候

1. Welcome to China! 欢迎到中国来!
2. Welcome to our city! 欢迎到我们的城市!

3. Welcome to our train! 欢迎乘坐本次列车!
4. Glad to take your train! 我很高兴乘坐你们这次列车!
5. A: Glad to meet you. 见到你很高兴!
   B: Glad to meet you, too. 见到你,我也很高兴!
6. A: How do you do? 你好!
   B: How do you do? 你好!
7. A: How are you? 你好吗?
   B: I'm fine (very well), thank you. And you? 我很好,谢谢。你呢?
   A: I'm fine, too. 我也很好。
8. Glad to see you again. 又见到你很高兴。
9. Haven't seen you for a long time. 好久没有见到你了。
   Or: Long time no see. 很久不见。

B. Farewell 告别

1. Goodbye, everybody! 各位再见!
2. Good night! 晚安!
3. See you again. 再见。
   Or: See you later. 再见。
4. See you tomorrow. 明天见。
5. A: Wish you a pleasant journey! 祝你旅途愉快!
   Or: Hope you'll have a fine trip. 希望你有个愉快的旅行。
   Or: Happy journey! 旅途愉快!
   B: Thanks, see you again. 谢谢,再见。
6. Hope you'll come again. 希望你以后再来。
7. Hope you'll come to China again. 希望你再来中国。
8. A: I hope to see you next journey. 希望下次旅行再见到你。
   Or: I hope to take your train next time. 希望下次乘坐你的列车。
   Or: I hope to meet you next time. 希望下次遇见你。
   Or: Hope you'll take our train next time. 希望您下次乘坐我们的列车。
   B: I hope so. 我也希望如此。
9. Give my best regards to your family. 问候你家里人。
10. May we meet again some day! 希望我们将来再见面。
11. I hope we shall meet again soon. 希望我们不久再见。

C. Introduction 介绍

1. A: May I know your name? 可以告诉我你的名字吗?
   Or: May I ask your name? 我能知道你的名字吗?
   Or: Your name, please. 请告诉我你的名字。
   B: My name is … 我的名字叫……
2. A: Are you Chief Conductor? 你是列车长吗?

B: Yes, what can I do for you? 是的,有什么事吗?

3. A: Are you a conductor? 你是列车员吗?

B: No, I am a station attendant. 不,我是车站服务员。

4. A: Where is Station Master? 站长在哪儿?

B: Maybe Station Master is at the platform. 站长可能在站台上。

5. A: Let me introduce the chief conductor to you. This is Chief Conductor , Mr. Li. And this is Mr. Smith.

让我介绍你认识一下这位列车长。这是列车长李先生。这是史密斯先生。

B: It's my pleasure to know you, Mr. Smith. If you have any difficulty in traveling, please let us know. We shall try our best to help you and wish you a pleasant journey.

很高兴认识您,史密斯先生。如果您在旅途中遇到什么困难,请告诉我们。我们将尽力帮助您,祝您旅途愉快。

C: Thank you. 谢谢。

6. A: Have a cigarette, please! 请抽烟。

B: No, thank you. 不,谢谢。

7. May I introduce myself? 我可以介绍一下我自己吗?

Or: Let me introduce myself. 请让我介绍自己。

Text B Existing Maglev Systems

In Berlin, the M-Bahn was built in the 1980s: a driverless maglev system with a 1.6 km track connecting three U-Bahn (metro) stations. Testing in passenger traffic started in August 1989, and regular operation started in July 1991. On account of traffic changes after the fall of the Berlin Wall, deconstruction of the line began only two months later and was completed in February 1992. The line was replaced by a regular U-Bahn line.

The world's first commercial automated system was a low-speed maglev shuttle that ran from the airport terminal of Birmingham International Airport (UK) to the nearby Birmingham International railway Station from 1984 to 1995. The length of the track was 600 m, and trains "flew" at an altitude of 15 mm. It became effective for nearly eleven years, but the out-of-date electronic systems made it unreliable in its later years and it has now been replaced with a cable-drawn system.

Transrapid, a German maglev company with a test track in Emsland, constructed the first operational high-speed conventional maglev railway in the world, the Shanghai Maglev Train from Shanghai to new Shanghai airport at Pudong. It was inaugurated in 2002. The highest speed achieved on the Shanghai track has been 501 km/h (311 mile/h), over a track length of 30 km. Transrapid uses EMS technology.

Japan has a test track in Yamanashi prefecture where test trains have reached 581 km/h (363 mile/h), faster than wheeled trains. These trains use superconducting magnets which allow for a larger gap, and repulsive-type "Electro-Dynamic Suspension" (EDS). In comparison Transrapid uses conventional electromagnets and attractive-type "Electro-Magnetic Suspension" (EMS). These "Superconducting Maglev Shinkansen", developed by the Central Japan Railway Co. ("JR Cen-

tral") and Kawasaki Heavy Industries, are presently the fastest trains in the world, achieving a record speed of 581 km/h on December 2, 2003. If a proposed Chuo Shinkansen is built, connecting Tokyo to Osaka by maglev, this test track would be part of the line.

The world's first commercial automated "Urban Maglev" system commenced operation in March 2005 in Japan. This is the nine-station 8.9 km-long Tobu-Kyuryo Line Linimo, otherwise known as the Nagoya East Hill Line. The line has a minimum operating radius of 75 m and a maximum gradient of 6%. The linear-motor magnetic-levitated train has a top speed of 100 km/h. The line serves the local community as well as the Expo 2005 Fair site. The trains were designed by the Chubu HSST Development Corporation, which also operates a test track in Nagoya. Urban-type maglev trains patterned after the HSST has been constructed and demonstrated in Korea, and a Korean commercial version is proposed by Rotem.

In the US, the Federal Transit Administration (FTA) Urban Maglev Technology Demonstration program has funded the design of several low-speed urban maglev demonstration projects. It has assessed HSST for the Maryland Department of Transportation and maglev technology for the Colorado Department of Transportation. The FTA has also funded work by General Atomics at California University of Pennsylvania to demonstrate new maglev designs, the MagneMotion M3 and of the Maglev 2000 of Florida superconducting EDS system. Other US urban maglev demonstration projects of note are the LEVX in Washington State, the Massachusetts-based Magplane, and a design similar to HSST by American Maglev Technology of Florida at Old Dominion University in Virginia.

On December 31, 2000, the first crewed high-temperature superconducting maglev was tested successfully at Southwest Jiaotong University, Chengdu, China. This system is based on the principle that bulk high-temperature superconductors can be levitated or suspended stably above or below a permanent magnet. The load was over 530 kg and the levitation gap over 20 mm. The system uses liquid nitrogen, which is very cheap, to cool the superconductor.

Questions for Discussion

1. *What are the existing maglev systems that this passage has mentioned?*
2. *Which company constructed Shanghai Maglev Train? What kind of technology does transrapid use?*

Reading Material

Train Operations I

Definitions

First, it is important to set out some definitions. A train is defined here as one or more railway vehicles capable of being moved. It may be made up of a locomotive (sometimes more than one) to provide power with various unpowered vehicles attached to it. It may consist of a multiple unit, i. e. several vehicles formed into a fixed formation or set, which carry their own power and do not require a locomotive. A train may be only a locomotive running light (deadheading) to a point elsewhere on