Traffic Safety Engineering Series

交通安全工程系列丛书

交通安全工程专业英语

Traffic Safety Engineering English

金　键◎编著

中国铁道出版社
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内 容 简 介

本书是以道路交通安全工程相关基础理论为基础，结合相关专业英语知识编著而成，是为了满足高等院校安全类及交通类专业英语课程教学的需要，根据高等院校培养目标的要求而编写的。本书题材涉及安全原理、安全管理、安全运营、人机安全工程、交通心理、交通行为、事故机理、事故诊断、事故调查、事故预防、人因分析、人的可靠性以及运输网络可靠性等诸多方面。

本书可作为安全类或交通类本、专科学生和研究生教材，也可供有关专业技术人员自学使用。

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作　　者：金　键

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序 Foreword

随着城市交通的不断发展，交通安全已成为人们必须面对解决的新问题。纵观世界各国交通行业发展与交通安全局势的关系，交通安全与交通行业的科技管理水平、社会经济发展水平、居民文化素质、出行习惯等密切相关。交通安全存在一个生命周期，通常经历起步发展阶段一上升恶化阶段一下降好转阶段一稳定阶段四个时期。欧美各国基本已经进入下降好转阶段或稳定阶段。针对我国目前交通安全形势，时下我国仍然处于上升恶化阶段，这与我国交通行业整体发展水平和社会经济水平密切相关，这是事物发展的必然规律，我们必须正确面对。

2003 年 10 月 28 日《中华人民共和国道路交通安全法》得以通过，并于 2004 年 5 月 1 日起施行。《安全法》的颁布对我国交通行业的发展具有划时代的意义，对实现交通安全的科学、规范、高效管理有着重要意义。

交通安全工程系列丛书正是在这一历史背景情况下编纂的，将人的交通行为作为安全研究的基础与切入点，从交通行为学、交通安全工程、交通安全人机工程，交通安全原理、交通安全管理与运营、运输网络可靠性，以及相关交通安全专业英语等方面进行系统研究，在大量借鉴参考国外交通安全研究成果的同时，密切结合我国混行交通特点，充分研究分析交通安全中人、车、环境之间的安全链关系，对预防交通事故，提高交通安全管理的科学性、高效性具有较好的参考价值。

成都市交通安全委员会
2007 年 5 月

前言 Preface

交通安全工程专业英语（Traffic Safety Engineering English）是为了满足高等院校安全类及交通类专业英语课程教学的需要，根据高等院校培养目标的要求而编写的。希望通过本书的学习能够帮助读者掌握必要的专业词汇、培养学生专业英语阅读能力及专业英语文献翻译的初步能力，使英语学习与专业知识有机结合在一起。使用对象为已完成基础英语课程学习的安全类或交通类本、专科学生和研究生，也可供有关专业技术人员自学使用。本书在教学安排上可根据实际情况灵活掌握，选择全部或部分内容进行教学。

本书题材选自近期国外正式出版物，如专业学术著作、期刊等，选题广泛，涉及安全原理、安全管理、安全运营、人机安全工程、交通心理、交通行为、事故机理、事故诊断、事故调查、事故预防、人因分析、人的可靠性以及运输网络可靠性等诸多方面。在编写中吸取了我国相近学科其他专业英语教材的优点和基础英语教学的经验。本书在符合专业英语教学需要的同时，试图使读者在有限的篇幅内了解现代交通安全工程专业技术的主要内容。

本书共分20个单元，每个单元包括精读课文（Text）、单词词组（Words and Expressions）、练习（Exercises）、阅读材料（Reading Material）、参考译文（Interpretation）、词汇表（Vocabulary）及参考文献（References）。

由于水平所限，加之时间仓促，本书难免存在缺点和错误，恳请读者提出宝贵的批评意见。

作　者

2007年5月

Contents

Unit 1 Text

System Safety

Recent accomplishments of the space shuttle, new and advanced weapon systems, rail-transit system applications in our cities, larger and more advanced aircraft systems, nuclear power systems, and computer developments for command and control systems have all shown the need for a better understanding of system safety engineering. Nonetheless, inherent in the basic use of these systems is the recognition of hazards and their identification. The evaluation of controls that are incorporated into the system design to minimize accident potential must also he considered. With modern improvements in science and technology there is the constant need to learn about hazards and how to control them. Safety practitioners have observed the need for sound hazard identification management and a disciplined program of hazard control. The first step in this total process is hazard identification.

The hazard identification process requires a disciplined method of analyzing the product or system. The discipline of system engineering application into a systems program has been a major part of the organization for systems development. This new organizational development has emphasized a new systems methodology—that of system safety—which is established as a formal, disciplined approach to hazard management. The following are the definitions as applied to the methodology known as system safety.

HAZARD

The word hazard has many definitions listed in the dictionary; among them are

1. Risk; peril; jeopardy
2. A source of danger
3. a. Chance, b. a chance event; accident
4. Mistake
5. Something risked.

The safety person sees a hazard as an implied threat or danger, of possihle harm. It is a potential condition waiting to become a loss. A stimulus is required to cause the hazard to transfer from the potential state to the loss. This stimulus could be component failure, a condition of the system (pressure, temperature) switching condition that is out of tolerance, a maintenance failure, an operator failure, or a combination of other events and conditions. The following is a more technical definition of a hazard.

A potential condition, or set of conditions, either internal and/or external to a system, product, facility, or operation, which, when activated by a stimulus, transforms the hazard into a real condition, or series of events which culminate in a loss (an accident).

STIMULUS

The normal system has a hierarchy of subsystems, assemblies, subassemblies, and components. The number of these elements in the hierarchy will vary with the type of system and its complexity. Naturally, the components are interconnected in such a manner that they perform a specific function when input is provided from a source, such as another component or a human operator.

Thus, an action of the component will create output. This series of interconnected events cause a sequential logical action in the system design. Take as an example the action of energizing a relay, which will force closure of the relay switch as a specific performance level of the relay, dependent on its characteristics in amperage and loading requirements to the relay coils. We thus see the event, closure of the relay, resulting from the stimulus of current applied to the relay coil. We can thus define the stimulus as: a set of events or conditions that transforms a hazard from its potential state to one that causes harm to the system, related property, or personnel.

ACCIDENT

We normally think of the accident as the loss of a system or part of a system, the injury to or fatality of the operators or personnel in near proximity, and property damage of related equipment or hardware. An accident is usually a dynamic event since it results from the activation of a hazard and culminates in a flow of sequential and concurrent events until the system is out of control and a loss is produced.

While we think in terms of the events' proceeding logically, we should remember that environmental influences are part of these logical relationships. Accident events may be fire, explosion, high-energy release, destruction of parts, separation of parts of the system, and so on. We must focus on the set of events that occurs and leads to the accident, resulting in a loss. Thus, the accident can be defined as a dynamic mechanism that begins with the activation of a hazard and flows through the system as a series of events, in a logical sequence, to produce a loss. A simpler statement from another point of view is that an accident is an undesired and unplanned event.

Accidents are important to the safety professional because of the manner in which they occur and the preventive measures that must be taken.

SAFETY

If we return to the dictionary, we find safety defined as "the condition of being free from undergoing or causing hurt, injury, or loss." Put another way, total safety is freedom from potential harm. The system safety professional may use such terms as increased safety, improved safety, and safer. The difficulty with these terms is measuring increased or improved in a system that is essentially safe. Safety should be thought of as a characteristic of a system, like quality, dependability, or reliability. These characteristics are an integral part of a system. Safety in a system may be defined as a quality of a system that allows the system to function under predetermined conditions with an acceptable minimum of accident loss.

RISK

Risk is associated with likelihood or possibility of harm. Put another way, it is the expected value of loss. Just as the activation of a hazard can result in an accident from a stimulus, so the risk is related to the probability that frequency, intensity, and duration of the stimulus will be sufficient to transfer the hazard from a potential state to a loss.

Source: System Safety Engineering and Management, Harold E. Roland & Brian Morianty, John Wiley & Sons, Inc., 1983

Words and Expressions

accomplishment：n. 功绩，成就，成绩
shuttle：n. 航天飞机，梭子
application：n. 应用
nuclear power：核动力
nonetheless：adv. 虽然如此，但是
inherent：adj. 内在的，固有的
recognition：n. 认识，认知
accident：n. 意外，事故
accident potential：隐患
practitioner：n. 从业者
sound hazard identification management：声音危险源识别管理
hazard control：危险源控制、危害控制
hazard identification：危险源识别
hazard management：危险源管理
basic term：基本术语
system safety：系统安全
methodology：n. 方法论，方法
jeopardy：n. 危险
stimulus：n. 刺激
component：n. 元件
component failure：元件故障，元件失效
maintenance failure：故障维修
operator failure：操作员失误
hierarchy：n. 体系，层次
subsystem：n. 子系统
assembly：n. 组件
subassembly：n. 子组件
system design：系统设计
energize：v. 给……通电
closure：n. 闭合，关闭
relay：n. 继电器

amperage：n.（电流）安培数，电流强度
coil：v. 线圈
relay coil：继电器线圈
loss：n. 损失
injury：n. 伤害，损伤
fatality：n.（事故或疾病）死亡
property damage：财产损失
proximity：n. 靠近，亲近，邻近
concurrent：adj. 同时发生的，并存的
mechanism：n. 机械，机构，构造
preventive：adj. 预防性的
characteristic：n. 特征
quality：n. 质量
dependability：n. 可信性
reliability：n. 可靠度
predetermine：v. 预定
possibility：n. 可能性
explosion：n. 爆炸，爆发
integral：adj. 完整的，整体的
sequential：adj. 相继发生的，随之而来的
frequency：n. 频率
intensity：n. 强度
duration：n. 持续时间

Exercises

1. Complete the following paragraph by filling in the blanks with the proper words, noting that their first letters are given.

The normal system has a hierarchy of s ________, a ________, s ________, and c ________. The number of these elements in the hierarchy will vary with the t ________ of system and its c ________. Naturally, the components are interconnected in such a manner that they perform a specific f ________ when input is provided from a s ________, such as another c ________ or a h ________ operator.

2. Define the following terms both in English and Chinese.

(1) Hazard

(2) Stimulus

(3) Accident

(4) Safety

(5) Risk

3. Translate the following into Chinese.

(1) The hazard identification process requires a disciplined method of analyzing the product or system.

(2) The stimulus could he component failure, a condition of the system (pressure, temperature) switching condition that is out of tolerance, a maintenance failure, an operator failure, or a combination of other events and conditions.

(3) An accident is usually a dynamic event since it results from the activation of a hazard and culminates in a flow of sequential and concurrent events until the system is out of control and a loss is produced.

(4) Safety should be thought of as a characteristic of a system, like quality, dependahility, or reliability.

4. What do you normally think of the accident?

Reading Material

Characteristics of the System Design Process

Although representations of the system design process such as the one shown in Figure 1-1 imply an orderly, structured process, in practice the stages often overlap and are performed in iterative fashion. In the design of a system, decisions in later stages often necessitate the modification and refinement of information and decisions from earlier stages. Meister (1985) lists the following characteristics of the process:

1. Molecularization. The process works from broad molar functions to more molecular tasks and subtasks.

2. Requirements are forcing functions. Design options are developed to satisfy system requirements. (For this reason formal behavioural requirements must be included in the initial design specifications.)

3. System development is discovery. Initially there are many unknowns about

the system, and during the design process these unknowns are clarified and addressed.

4. System development involves transformation. There is a transformation from physical requirements to behavioural implications of those requirements, and from behavioural implications to the physical mechanisms (e. g., controls, displays) required for implementing the behavioural implications.

5. Time. There is never enough time for practitioners to perform the analyses, studies, and tests that they would like to do.

6. Cost. There is usually not enough money to support the design effort, and behavioural recommendations, if too costly, will be rejected automatically.

7. Iteration. Activities are repeated as more detailed information about the system becomes available.

8. Design competition. Large systems are designed by groups or teams of specialists, each with their own concerns and criteria. Less influential groups (often including human factors people) must function under constraints established by the dominant groups.

9. Relevance. Relevance to design, as perceived by engineers, is critical for the acceptance and judged value of behavioural inputs.

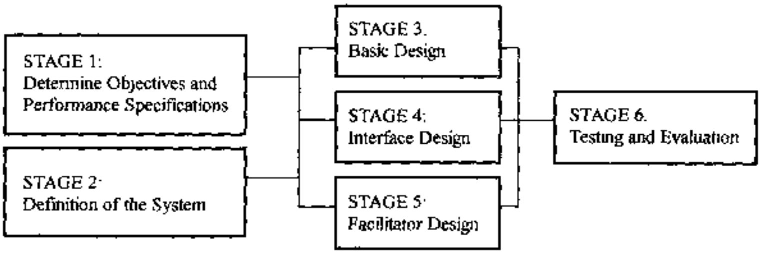

Figure 1-1 Major stages in the system design process. These stages are carried out in iterative fashion as the system develops. Later stages may modify decisions made in earlier stages. For some simple systems, these stages are carried out informally and, in some cases, not at all.

Source: Human Factors: Theory and Practice, David Meister, 1971 John Wiley & Sons, Inc., 1971

Unit 2 Text

System Life Cycle

The five common phases of a life cycle are concept, definition, development, production and deployment.

CONCEPT PHASE

The concept phase is the initial period in which historical background data and future technical forecasts are used to provide a basis for the proposed system. Critical issues related to the product are examined, system safety concerns with the types of hazard are identified, and their impacts are evaluated. A preliminary hazard analysis (PHA) is an analytical tool used during the concept phase to bring out the hazards that would be involved with a specific concept. Risk analysis (RA) on a gross level would also be performed to determine the immediate needs for hazard control and the development of safety design criteria.

The system safety management areas will be oriented to the development of a system safety program plan (SSPP), identifying the tasks to be accomplished in the total safety program for the evolution of the system. The effort to develop a SSPP at this time is of major importance to assure that safety is examined in a logical, sequential manner throughout the entire program. The PHA is performed as the initial hazard analysis in the development of the system.

Three basic questions should be answered at the close of the concept phase.

1. Have the hazards associated with the design been discovered and evaluated to establish hazard controls?

2. Have risk analysis been initiated to establish the means of hazard control?

3. Are initial safety design requirements estahlished for the concept so that the next phase of system definition can be initiated?

DEFINITION PHASE

The definition phase provides for verification of the preliminary design and engineering of the product. The SSPP should be specific in the safety tasks that are to be undertaken during this phase, particularly the identification of analyses that should be conducted. Models may be developed to allow more comprehensive investigation into the suitability of the product and identification of the preliminary design. Areas of technological risk, costs, human engineering, operational and maintenance suitability, and safety are examined in detail and reported at design reviews in this phase.

To provide a design that meets the criteria derived from the concept phase, a clear definition of the subsystems, assemblies, and subassemblies of the system must be made. An examination of the hazards of several designs may be required. An updating of the PHA is accomplished, along with initiation of the subsystem hazard analysis (SSHA) and later integration into the system hazard analysis (SHA). The fault hazard analysis (FHA) and fault tree analysis (FTA) may be used to examine specific known hazards and their potential effects. Risk analysis will help evaluate the different hazards that may be considered in the operational and maintenance suitability. An examination of the risk is the key to selection of the final design.

One or more safety analysis techniques may be needed to identify the following: safety equipment, specification of safety design requirements, initial development of safety test plans and requirements, and prototype testing to verify the type of design selected. Understanding the need for a complete evaluation of hazards to assure that controls are considered in the preliminary design of the product or system is vital. System definition will initially result in acceptance of a suitable general design, which must then be more specifically developed in the following phase. Not all hazards will be known at this time, since the design is not complete.

DEVELOPMENT PHASE

The development phase allows system definition to include environmental impact, integrated logistics support, producihle engineering, and operational use studies. Prototype analysis and testing results are used as inputs for a comprehensive operating hazard analysis (OHA) to examine human-machine hazards. Fur-