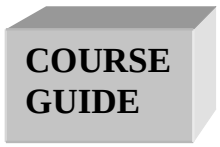
NATIONAL OPEN UNIVERSITY OF NIGERIA

SCHOOL OF ARTS AND SOCIAL SCIENCES

COURSE CODE: CSS342

COURSE TITLE: SAFETY MANAGEMENT FOR LOSS PREVENTION



CSS342
SAFETY MANAGEMENT FOR LOSS PREVENTION

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Introduction

CSS342 Safety Management for Loss Prevention is a 3-credit unit course. It is a compulsory course for both undergraduate and postgraduate students in the field of Criminology and Security Studies of the University. The course is also recommended to other students, particularly those in the school of Arts and Social Sciences, who may have interest in the study and survey of Safety Management for Loss Prevention. The course can also be taken as elective or required course by other Students whose main fields of discipline are not Criminology and Security Studies. However the course shall consist of 20 units which include:

- Concept of safety
- Safety Culture
- Key Health Issues
- Responsibility for Managing Safety
- Understanding Safety
- The Concept of Risk, Safety and the Human Factor
- Human Error and Aviation Safety
- Basics of Safety Management
- Risk Management
- Strong Safety Culture and Highway Agencies
- Enhancing Security of Hazardous Materials
- Safety and Security
- Comparable Indicators of Violence
- Collapse of Buildings in Nigeria
- Building Deterioration Phenomena and Maintenance Concept
- Building Maintenance in Nigeria, Principles
- Diagnosis and cure of defective Buildings
- Factors Responsible for Structural Failures and Collapse of Buildings
- Gating
- Private Security and Public Space
- Safety Measures on Construction Companies in Lagos
- Promoting Urban Crime Prevention Strategies in Africa
- Political, Religious and Ethnic Conflict in Nigeria**.**

The knowledge industry and information technology are given special attention with the aim of stimulating effective knowledge of the overall safety and security situations and agenda in the world so that students can identify, analyse, and proffer solutions to various aspect of conventional, modern and traditional safety management and loss prevention in the work place and at other civil arena.

The course has no compulsory prerequisite for it to be registered for. The course guide informs us on what this course is all about, what students should appreciate in each unit, what text materials we shall be using and how we can make best use of these materials. This course guide also emphasises on the need for students to take tutor marked assignments seriously. However, necessary information on tutor marked assignments shall be made known to students in a separate file, which will be sent to each of them at appropriate the time. This course is also supported with periodic tutorial classes.

What You will Learn in This Course

CSS342 Safety Management for Loss Prevention as a course in Criminology and Security Studies at the National Open University of Nigeria focuses on issues that bother on ways to effect basic safety measures and policies as well as identification of basic technicalities involved in safe managing and events, life and properties vis-à-vis other mode of threats that can jeopardise the safety of any people, industry, community or nation. In this course we will carefully analyse and assess various safety management and loss prevention strategies and measures.

Nevertheless, the essence of these control and management measures is at least to provide the students with various ways through which he/she can minimise losses from any incident, if it cannot be prevented from occurring. Knowing the impact that active involvement of civilians in security and safety management in an IT world can have in complementing and increasing the capacity of the security personnel to carry out their duties effectively, the course explores the strategic importance of safety security policies and how it can contribute to effective safety management and loss prevention. The issue of work policies and insurance is very germane in safety management studies. For this reason, it is not surprising to see a great number of countries expending huge resources in human, technical and financial terms to fortify their environment against or in readiness for any imagined or perceived threats and abnormal technological or electronic warfare; and owing to the fact that security discourse cannot be complete without looking at issues of science and technology, the course covers a wide range of issues regarding technicalities and human errors in the proliferation of disasters in form of loss of lives and properties and closure of industries.

Course Aims

The overall aim of CSS342: Safety Management for Loss Prevention as a course is to introduce you to the basic definitions of concepts relating to safety management of losses and where possible complete loss prevention. It is also aimed at exposing students or readers to knowing most of the existing aspects of safety management especially in the industrial and construction companies, which may be categorised. In furtherance of its overall aim, the study will also help us to explore some other issues like information on modern safety practices, warning signs in mitigating losses. It also presents the conceptual meaning, case studies and the impact assessment of these issues to illuminate on the need for adequate safety in our environment.

Undoubtedly, the way the course draws its references from industries such as aviation, construction and maritime industries of the West in the analysis of various safety measures makes it astounding and thought provoking to providing a pathway for African Students and Scholars in the field of Security Studies to help engender analytical consciousness on the aspects of general practice of security which are vulnerable to human livelihood with the hope of energising them towards developing viable frameworks through which safety hiccups ravaging Nigeria and Africa as a whole can be addressed. As you may be aware disaster issues are always to be considered important and should be given attention.

The course is also aimed at understanding:

- Concept of safety,
- Safety Culture
- Key Health Issues,
- Responsibility for Managing Safety,
- Understanding Safety,
- Concept of Risk,
- Safety and the Human Factor,
- Human Error and Aviation Safety,
- Basics of Safety Management,
- Risk Management,
- Highway Agencies,
- Security of Hazardous Materials,
- Safety and Security:
- Indicators of Violence,
- Collapse of Buildings in Nigeria,
- Building Deterioration Phenomena and Maintenance Concept,
- Building Maintenance in Nigeria,
- Principles, diagnosis and cure of defective Buildings,

- Factors Responsible for Structural, Failures and Collapse of Buildings,
- Gating, Private Security and Public Space
- Safety Measures on Construction Companies in Lagos,
- Urban Crime Prevention Strategies in Africa,
- Political, Religious and Ethnic Conflict in Nigeria.

Course Objectives

With utmost desire to achieve the aims set out above, the course has some set objectives as demonstrated in all the units of the course. Each unit has its own objectives. Objectives are always included at the beginning of every unit to assist the student in appreciation of what he or she will come across in the study of each unit to facilitate his or her better understanding of the course CSS 342: Safety Management for Loss Prevention. Students are therefore advised to read these objectives before studying the entire unit(s). Thus, it is helpful to do so. You should always look at the unit objectives after completing a unit. In this way, you can be sure that you have done what was required of you by the unit. Stated below are the wider objectives of this course as a whole. By meeting these objectives, you should have achieved the aims of the course as a whole.

At the end of the course, you should be able to:

- explain the concept of safety ,
- highlights issues in safety culture:
- understand key health issues,
- define concept of risk,
- explain safety and the human factor,
- examine the basics of safety management and risk management,
- safety and security in Nigeria :
- explain some indicators of violence,
- discuss safety management in relation to building maintenance in Nigeria,
- explain public space and private security in the 21st century
- examine safety measures on construction companies
- examine urban crime prevention strategies in Africa,
- discuss political, religious and ethnic conflict in Nigeria**.**
- lastly explain the relevance of conflict management in safety management and loss prevention

Working through This Course

In completing this course, students are required to study the whole units, and try to read all (or substantial number of) the recommended textbooks, journals and other reading materials including electronic resources. Each unit contains Self-Assessment Excercise (SAE) and students are required to submit their assignments for the purpose of assessment. At the end of the course, student(s) shall be examined. The time of the final examination and venue shall be communicated to all the registered students in due course by relevant school authorities-study centre management. Below are the components of the course and what you are required to do:

Course Materials

Major components of the course include:

1. Course Guide
2. Study Units
3. Textbooks
4. Assignments Files
5. Presentations Schedule

It is incumbent upon every student to get his or her own copy of the course material. You are also advised to contact your tutorial facilitator. If you have any difficulty in getting any of the text materials recommended for your further reading.

Study Units

In this course there are twenty units, divided into four modules, (five in each module). Below are the units:

Module 1

Unit 1 Concept of safety
Unit 2 Safety Culture: Key Health Issues
Unit 3 Responsibility for Managing Safety
Unit 4 Understanding Safety: The Concept of Risk
Unit 5 Safety and the Human Factor

Module 2

Unit 1 Human Error and Aviation Safety
Unit 2 Basics of Safety Management
Unit 3 Risk Management

Module 3

Unit 1 Safety and Security: Comparable Indicators of Violence
Unit 2 Collapse of Buildings in Nigeria
Unit 3 Building Deterioration Phenomena and Maintenance Concept
Unit 4 Building Maintenance in Nigeria
Unit 5 Principles, diagnosis and cure of defective Buildings

Module 4

Unit 1 Factors Responsible for Structural Failures and Collapse of Buildings
Unit 2 Gating, Private Security and Public Space
Unit 3 Safety Measures on Construction Companies in Lagos, Nigeria
Unit 4 Promoting Urban Crime Prevention Strategies in Africa
Unit 5 Political, Religious and Ethnic Conflict in Nigeria

Text books and References

The following Text books and Journals are course material recommended to each student taking the course:

Ross, A. & Nwiraria, M. (1990). Road Safety: A Lethal Problem in the Third World Urban Edge. Washington (DC): Urban Edge.

Jacobs, G.D. & Cutting C.A. Further Research on Accident Rates in Developing Countries. *Accid Anal Prev* 1986; 18: 119-127.

Hobbs, F.D. (1987).Traffic Planning and Engineering: Institution of Highways and Transportation, Accident Reduction and Prevention (2nd ed.). United Kingdom: Pergamon Press.

Smeed, R.J. Some Statistical Aspects of Road Safety Research. *J Royal Stat Society,* 1949; 12: 1-34.

Carlsson, G.; Hedman, K. A. (1990). Systematic Approach to Road Safety in Developing Countries. Technical Paper, Report INU63, the World Bank, Infrastructure and Development Department, January.

Cox, S.J. & Cox, T. (1991). *The Structure of Employee Attitudes to Safety: A European Example. Work and Stress.* 5(2): 93-106.

Eckhardt, R. (1996). Practitioner's Influence on Safety Culture: Professional Safety. 41(7): 23-26.

Fazio, R.H. (1986). How do Attitudes Guide Behaviour? In Sorrentino, R.M. eds. The Handbook of Motivation and Cognition: Foundations of Social Behaviour. New York:

Guilford Press. Glendon, A.I. & McKenna, E.F. (1995). Human Safety and Risk Management. London: Chapman & Hall.

Ross A. & Nwiraria M. (1990). Road Safety-Review of World Bank Experience: Need for Action. *A General Operational Review Paper for the World Bank. Issue 14*. Washington (DC): Urban Edge.

Mekky A. (1984). Road Traffic Accidents in Rich Developing Countries: The Case of Libya. *Accid Anal Prev*; 16: 263-277.

Zogby, J. J.; R. R. Knipling, & T. C. Werner. Undated. *Transportation Safety Issues*. A3B01: Committee on Transportation Safety Management. Transportation Research Board. http://onlinepubs.trb.org/onlinepubs/millennium/00132.pdf.

Alvazzi, Del; Frate, A. & Van Kesteren, J. N. (2004). Criminal Victimisation in Urban Europe. Key findings of the 2000 International Crime Victims Survey (Turin, UNICRI).

Anderson, B. (1991). Imagined Communities (Revised ed.). London: Verso.

Banerjee, M. (2001). The Pathan Unarmed. Oxford: James Curry.

Barron, P.; Diprose, R. & Woolcock, M. (2006). Local Conflict and Community Development in Indonesia: Assessing the Impact of the Kecamatan Development Program (KDP) on Local Conflict and Conflict Management Capacity (CPR Working Paper, Washington, D.C: World Bank).

Son, L.H. & Yuen, G.C.S. (1993). Building Maintenance Technology. London: Macmillan Press Ltd.

British Standards Institution (1974). BS 3811: Glossary of General Terms used in Maintenance Organisation. London: BSI.

Smith, R. (2003). Best Maintenance Practices. *Journal for Maintenance and Maintenance Management, 16(01), 9-15.*

Ikpo, I.J. (1990). Deterioration Phenomena of Selected Housing Estates in South Western Nigeria. Unpublished PhD Thesis, Dept. of Building, O.A.U., Ile-Ife, Nigeria.

Akinsola, O.E.; Adenuga O.A. & Iyagba R.O. (2004). Strategic Maintenance Practices: Effective Loots for Improved Productivity and Efficiency of Plants and Equipments in Construction Industry. *Journal of Building Quarterly*, 3(1), 10-15.

Lee, R. (1995) Building Maintenance Management. Oxford, U.K.: Blackwell Science Ltd.

Olubodun, F. (2000). A Factor Approach to the Analysis of Components' Defects in Housing Stock. Structural Survey, 18(1), 46-57.

Adenuga, O.A. (1999). Building Maintenance in Nigeria: Structural Deterioration, Recognition Diagnosis of Causes and Remedies. (01), 5-25).

Iyagba, R. O. & Azunmo, O.M. (1995). Housing Crisis in Nigeria's Urban and Rural Areas: A Challenge to the Construction Industry and Technology. The Lagos Journal of Environmental Studies (LJES), Faculty of Environmental Scenarios, University of Lagos.

Blandy, S.; Lister, D.; Atkinson, R. and Flint, J. (2003). *Gated Communities: a Systematic Review of Research Evidence, CNR Summary 12.* Sheffield Hallam University & University of Glasgow. www.neighbourhoodcentre.org.uk (accessed 3rd November 2006).

Caldeira, T. (2000). *City of Walls: Crime, Segregation and Citizenship in Sao Paulo.* Berkeley: University of California Press.

Low, S. (2003). *Behind the Gates: Life Security and the Pursuit of Happiness in FORTRES America.* London: Routledge.

Amin, A. & Thift, N. (2002). *Cities: Reimagining the Urban.* Cambridge: Polity Press.

Agboola, T.T. (1997). "Architecture of Fear: Urban Design and Construction Response to Violence in Lagos. Nigeria, Ibadan: IFRA.

Aina, O.; Odebiyi, A.; Sesay, A. and Ukeje, C (2003). "Ethnic Militias and the Future of Democracy in Nigeria. Ile-Ife: Obafemi Awolowo University Press.

Albert, O. (2003). "The Concept of Security in the Context of Urban Crimes and Segregation. In L. Fourchard & O. Albert. (Eds.). *Security, Crime and Segregation in West African Cities since the 19th Century*. Karthala: IFRA 53-69.

Akinwumi, O.; Okpeh (Jr.) O. O. & Gwamna, J. D. (2006). *Inter- Group Relations in Nigeria during the 19th and 20th centuries*. (eds.) Ibadan: Aboki Publishers.

Alkali, A. (2004). *Federalism and Democratic Governance.* In H. A. Saliu (ed.) Nigeria under Democratic Rule (1999-2003). Ibadan: University Press PLC. Vol. 1. Pp. 45-57.

Elaigwu, J. I. (2005). *Crises and Conflict Management in Nigeria since 1980* in A. M.

Yakubu, R. T. Adegboye, C. N. Ubah & B. Dogo (eds.) Crisis and Conflict. Management in Nigeria since 1980: Causes and Dimension of Conflict. Kaduna: Nigerian Defense Academy. Vol. 1.

Global Internal Displacement Project (2005). I*nternal Displacement in Nigeria: A Hidden Crisis.* Report of the Global IDP Project. Geneva, Switzerland.

Human Rights Watch (2003). *Testing Democracy: Political Violence in Nigeria.* Human Rights Watch Publication. 15 (8).

Assignment File

In this file you will find the necessary details of the assignments you must submit to your tutor for assessment. The marks you get from these assignments will form part of your final assessment in this course,

Assessment

There are two aspects to the assessment of the course. First are the tutor-marked assignment; second there is the written examination. In tackling the assignments, you are expected to apply information and knowledge acquired during this course. The assignments must be submitted to your tutor for assessment in accordance with the deadlines stated in the Assignment file. The work you submit to your tutor for assessment will

count for 30% of your total course work. At the end of the course, you will need to sit for a final three-hour examination. This will also count for 70% of your total course mark.

Tutor- Marked Assignment

There are twenty Tutor-Marked Assignments (TMAs) in this course. You need to submit four assignments out of which the best three will be used for your assessment. These three assignments shall make 30% of your total course work. Assignment question for the units in this course are contained in the assignment file. You should be able to complete your assignments from the information and materials contained in your set textbooks, reading and study units. However, you are advised to use other references to broaden your view point and provide a deeper understanding of the subject. When you have completed each assignment, send it together with the TMA file to your tutor. Make sure each assignment gets to your tutor on or before the deadline. And in case of being unable to complete your work on time, contact your tutor or better still your study centre manager (overseer) before the submission deadline of assignments elapses to discuss the possibility of an extension**.**

Final Examination and Grading

The final examination of CSS342 shall be of three hours duration and have a value of 70% of the total course grade. The examination shall consist of questions which reflect the type of self-testing. Practice exercises and tutor-marked problems you have come across. All areas of the course will be assessed. You are advised to revise the entire course after studying the last unit before you sit for the examination. You will find it useful to review your tutor-marked assignments and the comments of your tutor on them before the final examination.

Course Marking Scheme

This table shows how the actual course marking is broken down.

Table 1: Course Marking Scheme

Assessment	Marks
Assignment 1-4	Four assignments are to be submitted, out of which the three best shall be considered at 10% each, making 30% of the overall scores
Final Examination	70% of overall course marks
Total	100% of course marks.

Course Overview

The table brings together the entire units contained in this course, the number of weeks you should take to complete them, and the assignments that follow them.

Table 2: Course Overview

Unit	Title	Week's Activity	Assessment (end of unit)
	Course Guide	1	
	Module 1		
1	Concept of Safety	1	Assignment 1
2	Safety Culture: Key Health Issues	2	Assignment 2
3	Responsibility for Managing Safety	2	Assignment 3
4	Understanding Safety: The Concept of Risk	3	Assignment 4
5	Safety and the Human Factor	4	Assignment 5
	Module 2		
1	Human Error and Aviation Safety	5	Assignment 6
2	Basics of Safety Management	6	Assignment 7
3	Risk Management	6	Assignment 8
	Module 3		
1	Strong Safety Culture and Highway Agencies	7	Assignment 9
2	Enhancing Security of Hazardous Materials	7	Assignment 10
3	Building Deterioration Phenomena and Maintenance Concept	10	Assignment 13
4	Building Maintenance in Nigeria	11	Assignment 14
5	Principles, Diagnosis and Cure of Defective Buildings	11	Assignment 15
	Module 4		
1	Factors Responsible for Structural Failures and Collapse of Buildings	12	Assignment 16
2	Gating, Private Security and Public Space	13	Assignment 17
3	Safety Measures on Construction Companies in Lagos, Nigeria	14	Assignment 18
4	Promoting Urban Crime Prevention Strategies in Africa	15	Assignment 19
5	Political, Religious and Ethnic Conflict In Nigeria	16	Assignment 20
	Revision	17	
	Examination	**18**	

Presentation Schedule

The presentation schedule included in your course materials gives you the important dates for the completion of tutor-marked assignments and attending tutorials. Remember you are required to submit all your assignments by the due date. You should guard against falling behind in your work.

How to Get the Best from This Course

In distance learning the study units replace the university lecturer. This is one of the great advantages of distance learning; you can read and work through specially designed study materials at your own pace, and at a time and place that suit you best. Think of it as reading the lecture instead of listening to a lecturer. In this same way that a lecturer might set you some reading to do, the study units tell you when to read your set of books or other materials. Just as a lecturer might give you an in-class exercise, your study units provide exercises for you to do at appropriate points. Each of the study units follows a common format. The first item is an introduction to the subject matter of the unit and the course as a whole. Next is a set of learning objectives. These objectives shall let you know what you should be able to do by the time you have completed the unit. You should use these objectives to guide your study. When you have finished the units, you must go back and check whether you have accepted the objectives. If you have a habit of doing this you will significantly improve your chances of passing the course. The main body of the unit guides you through the required reading from other sources.

Reading Section

Remember that your tutor's job is to assist you. Whenever you need help, do not hesitate to call and ask your tutor to provide it.

1. Read this Course Guide thoroughly.

2. Organise a Study Schedule. Refer to the 'Course Overview' for more details. Note the time you are expected to spend on each unit and how the assignments related to the units. Whatever method you choose to use, you should decide on and write in your own dates for working on each unit.

3. Once you have created your own study schedule, do everything you can to stick to it. The major reason why students fail is that they get behind with their course work. If you get into difficulties

with your schedule, please let your tutor know before it is too late for help.

4. Turn to unit 1 and read the introduction and the objectives for the unit.

5. Assemble the study materials. Information about what you need for a unit is given in the 'Overview' at the beginning of each unit. You will almost always need both the study unit you are working on and one of your set books on your desk at the same time.

6. Work through the unit. The content of the unit itself has been arranged to provide a sequence for you to follow. As you work through the units you will be instructed to read sections from your set books or other materials. Use the unit to guide your reading.

7. Review the objectives for each study unit to confirm that you have achieved them. If you feel unsure about any of the objectives, review the study materials or consult your tutor.

8. When you are confident that you have achieved a unit's objectives, you can then start on the next unit. Proceed unit by unit through the course and try to pace your study so that you keep yourself on schedule.

9. When you have submitted an assignment to your tutor for marking, do not wait for its return before starting on the next unit. Keep to your schedule. When the assignment is returned pay particular attention to your tutor's comments, both on the tutor-Marked Assignment form and also on what is written on the assignment. Consult your tutor as soon as possible if you have any questions or problems.

10. After completing the last unit, review the course and prepare yourself for the final examination. Check that you have achieved the unit objectives (listed at the beginning of each unit) and the course objectives (listed in this Course-Guide).

Facilitators/Tutors and Tutorials

There are between eight (8) and twelve (12) hours of tutorials provided in support of this course. The dates, time and venue of these tutorials shall be communicated to you. The name and phone number of your tutor will be made available to you immediately you are allocated a tutorial group. Your tutor will mark and comment on your assignments,

keep a close watch on your progress and on any difficulties you might encounter and provide assistance to you during the course. You must mail your tutor marked assignments to your tutor well before the due date (at least two working days are required). They will be marked by your tutor and returned to you as soon as possible. Do not hesitate to contact your tutor by phone, e-mail, or discussion board if you need help. You will definitely benefit a lot by doing that. Contact your tutor if:

- You do not understand any part of the study units or the assigned readings;
- You have difficulty with the self-tests or exercises; and ;
- You have a question or problem with an assignment, with your tutor's comment on an assignment or with the grading of an assignment.

You should make an effort to attend the tutorials. Thus, it is the only opportunity you have to enjoy face contact with your tutor and to ask questions which are answered instantly. You can raise any problem encountered in the course of your study. To gain the maximum benefits from the course tutorials, prepare a question list before attending them. You will learn a lot from participating in discussion actively.

Summary

CSS342 aims to expose you to issues, ideas and methodologies, framework in engaging some common technicalities in Safety Management for Loss Prevention as well as policies as internationally demanded in safeguarding human life. As you complete this course, you should be able to answer and discuss reasonably the following:

- The concept of safety
- Issues in Safety Culture
- Key Health Issues
- Concept of Risk
- Safety and the Human Factor
- The basics of safety management and risk management
- Safety and Security in Nigeria
- Some Indicators of Violence
- Safety management in relation to building maintenance in Nigeria
- Public space and private security in the 21st century
- Safety Measures on Construction Companies
- Urban Crime Prevention Strategies in Africa
- Political, Religious and Ethnic Conflict In Nigeria
- The relevance of conflict management in safety management

Finally, you are advised to read the course material appreciably well in order to prepare fully and not to be caught pants down by the final examination questions. So, we sincerely wish you success in your academic career as you will find this course, CSS342 very interesting. You should always avoid examination malpractices!

Course Code CSS342
Course Title Safety Management for Loss Prevention

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MODULE 1

UNIT 1 CONCEPT OF SAFETY

CONTENTS

1.0 INTRODUCTION

In order to understand safety management, it is necessary to consider what is meant by "safety". Depending on one's perspective, the concept of safety may have different connotations, such as:

a) zero accidents (or serious incidents), a view widely held by the travelling public;
b) the freedom from danger or risks, i.e. those factors which cause or are likely to cause harm;
c) the attitude towards unsafe acts and conditions by employees (reflecting a "safe" corporate culture);
d) the degree to which the inherent risks in aviation are *"acceptable";*
e) the process of hazard identification and risk management; and
f) the control of accidental loss (of persons and property, and damage to the environment).

2.0 OBJECTIVES

At the end of this unit, you should be able to:

- explain the concept and acceptable level of safety
- explain the need for safety management
- requirements to achieve safety targets and safety indicators include.

3.0 MAIN CONTENT

3.1 Concept of Safety

While the elimination of accidents (and serious incidents) would be desirable, a hundred per cent (100%) safety rate is an unachievable goal. Failures and errors will occur, in spite of the best efforts to avoid them. No human activity or human-made system can be guaranteed to be absolutely safe, i.e. free from risk. Safety is a relative notion whereby inherent risks are acceptable in a "safe" system. Safety is increasingly viewed as the management of risk. Thus, for the purposes of this study, safety is considered to have the following meaning:

Safety is the state in which the risk of harm to persons or of property damage is reduced to, and maintained at or below an acceptable level through a continuing process of hazard identification and risk management.

3.1.1 Aviation Industry and Safety Management

Major air disasters are rare events, less catastrophic accidents and a whole range of incidents occur more frequently. These lesser safety events may be harbingers of underlying safety problems. Ignoring these underlying safety hazards could pave the way for an increase in the number of more serious accidents. Accidents (and incidents) cost money. Although purchasing "insurance" can spread the costs of an accident over time, accidents make bad business sense. While insurance may cover specified risks, there are many uninsured costs. In addition, there are less tangible (but no less important) costs such as the loss of confidence of the travelling public. An understanding of the total costs of an accident is fundamental to understanding the economics of safety. The air transportation industry's future viability may well be predicated on its ability to sustain the public's perceived safety while travelling. The management of safety is therefore a prerequisite for a sustainable aviation business.

3.1.2 International Civil Aviation Organisation (ICAO)

Safety has always been the overriding consideration in all aviation activities. This is reflected in the aims and objectives of ICAO as stated in Article 44 of the *Convention on International Civil Aviation* (Doc 7300), commonly known as the Chicago Convention, which charges ICAO with ensuring the safe and orderly growth of international civil aviation throughout the world. In establishing States' requirements for the management of safety, ICAO differentiates between safety programmes and safety management systems (SMS) as follows:

- A ***safety programme*** is an integrated set of regulations and activities aimed at improving safety.
- A ***safety management system (SMS)*** is an organised approach to managing safety, including the necessary organisational structures, accountabilities, policies and procedures. A safety programme will be broad in scope, including many safety activities aimed at fulfilling the programme's objectives. A State's safety programme embraces those regulations and directives for the conduct of safe operations from the perspective of aircraft operators and those providing air traffic services (ATS), aerodromes and aircraft maintenance. The safety programme may include provisions for such diverse activities as incident reporting, safety investigations, safety audits and safety promotion. To implement such safety activities in an integrated manner requires a coherent SMS. As a minimum, such SMS shall:

a) identify safety hazards;
b) ensure that remedial actions necessary to mitigate the risks/hazards are implemented; and
c) provide for continuous monitoring and regular assessment of the safety level achieved.

An organisation's SMS accepted by the State shall also clearly define lines of safety accountability, including a direct accountability for safety on the part of senior management. ICAO provides specialised guidance material, including **a manual on** safety management, for the fulfilment of the Standards and Recommended Practices (SARP). This manual includes a conceptual framework for managing safety and establishing an SMS as well as some of the systemic processes and activities used to meet the objectives of a State's safety programme.

3.2 Acceptable Level of Safety

In any system, it is necessary to set and measure performance outcomes in order to determine whether the system is operating in accordance with expectations, and to identify where action may be required to enhance performance levels to meet these expectations. The introduction of the concept of *acceptable level of safety* responds to the need to complement the prevailing approach to the management of safety based upon regulatory compliance, with a performance-based approach. Acceptable level of safety expresses the safety goals (or expectations) of an oversight authority, an operator or a service provider. From the perspective of the relationship between oversight authorities and operators/service providers, it provides an objective in terms of the safety performance operators/service providers should achieve while conducting their core business functions, as a minimum acceptable to the oversight authority. It is a reference against which the oversight authority can measure safety performance. In determining an acceptable level of safety, it is necessary to consider such factors as the level of risk that applies, the cost/benefits of improvements to the system, and public expectations on the safety of the aviation industry. In practice, the concept of acceptable level of safety is expressed by two measures/metrics (safety performance indicators and safety performance targets) and implemented through various safety requirements. The following explains the use of these terms in this unit:

- ***Safety performance indicators*** are a measure of the safety performance of an aviation organisation or a sector of the industry. Safety indicators should be easy to measure and be linked to the major components of a State's safety programme, or an operator's/service provider's SMS. Safety indicators will therefore differ between segments of the aviation industry, such as aircraft operators, aerodrome operators or ATS providers.

- ***Safety performance targets*** (sometimes referred to as goals or objectives) are determined by considering what safety performance levels are desirable and realistic for individual operators/service providers. Safety targets should be measurable, acceptable to stakeholders, and consistent with the State's safety programme.

- ***Safety requirements*** are needed to achieve the safety performance indicators and safety performance targets. They include the operational procedures, technology, systems and programmes to which measures of reliability, availability, performance and/or accuracy can be specified. An example of a safety requirement is *deployment and upgrade of the radar*

system in all international airports in Nigeria a 98 per cent availability of critical equipment.

A range of different safety performance indicators and targets will provide a better insight of the acceptable level of safety of an aviation organisation or a sector of the industry than the use of a single indicator or target. The relationship between acceptable level of safety, safety performance indicators, safety performance targets and safety requirements is as follows: *acceptable level of safety* is the overarching concept; *safety performance indicators* are the measures/metrics used to determine if the acceptable level of safety has been achieved; *safety performance targets* are the quantified objectives pertinent to the acceptable level of safety; and *safety requirements* are the tools or means required to achieve the safety targets. This unit focuses primarily on safety requirements, i.e. the means to achieve acceptable levels of safety.

Stakeholders in Safety

Given the total costs of aviation accidents, many diverse groups have a stake in improving the management of safety. The principal stakeholders in safety are listed below.

A. Aviation professionals (e.g. Flight crew, cabin crew, air traffic controllers (atcos) and aircraft maintenance engineers (ames);
B. Aircraft owners and operators;
C. Manufacturers (especially airframe and engine manufacturers);
D. Aviation regulatory authorities (e.g. Caa, easa and asecna);
E. Industry trade associations (e.g. Iata, ata and aci);
F. Regional ats providers (e.g. Eurocontrol);
G. Professional associations and unions (e.g. Ifalpa and ifatca);
H. International aviation organisations (e.g. Icao);
I. Investigative agencies (e.g. United states ntsb); and
J. The flying public.

Major aviation safety occurrences invariably involve additional groups which may not always share a common objective in advancing aviation safety, for example:

- next of kin, victims, or persons injured in an accident;
- insurance companies;
- travel industry;
- safety training and educational institutions (e.g. FSF);
- other government departments and agencies;
- ` elected government officials;
- investors;

- coroners and police;
- media;
- general public;
- lawyers and consultants; and
- diverse special interest groups.

Approaches to Safety Management

With global aviation activity forecast to continue to rise, there is concern that traditional methods for reducing risks to an acceptable level may not be sufficient. New methods for understanding and managing safety are therefore evolving. Safety management may therefore be considered from two different perspectives - traditional and modern.

Traditional perspective

Historically, aviation safety focused on compliance with increasingly complex regulatory requirements. This approach worked well up until the late 1970s when the accident rate levelled off. Accidents continued to occur in spite of all the rules and regulations. This approach to safety **reacted** to undesirable events by prescribing measures to prevent recurrence. Rather than defining best practices or desired standards, such an approach aimed at ensuring minimum standards was met. With an overall fatal accident rate in the vicinity of 10–6 (i.e. one fatal accident per one million flights), further safety improvements were becoming increasingly difficult to achieve using this approach.

Modern perspective

In order to keep safety risks at an acceptable level with the increasing levels of activity, modern safety management practices are shifting from a purely reactive to a more proactive mode. In addition to a solid framework of legislation and regulatory requirements based on ICAO SARPs, and the enforcement of those requirements, a number of other factors, some of which are listed below, are considered to be effective in managing safety. It must be emphasized that this approach complements, or is in addition to, the obligations of States and other organisations to comply with ICAO SARPs and/or national regulations.

i. application of scientifically-based risk management methods;
ii. senior management’s commitment to the management of safety;
iii. a corporate safety culture that fosters safe practices, encourages safety communications and actively manages safety with the same attention to results as financial management;
iv. effective implementation of standard operating procedures (SOPs), including the use of checklists and briefings;

v. a non-punitive environment (or just culture) to foster effective incident and hazard reporting;
vi. systems to collect, analyse and share safety-related data arising from normal operations;
vii. competent investigation of accidents and serious incidents identifying systemic safety deficiencies (rather than just targets for blame);
viii. integration of safety training (including Human Factors) for operational personnel;
ix. sharing safety lessons learned and best practices through the active exchange of safety information (among companies and States); and
x. systematic safety oversight and performance monitoring aimed at assessing safety performance and reducing or eliminating emerging problem areas.

No single element will meet today's expectations for risk management. Rather, an integrated application of most of these elements will increase the aviation system's resistance to unsafe acts and conditions. However, even with effective safety management processes, there are no guarantees that all accidents can be prevented.

SELF-ASSESSMENT EXERCISE

What do you understand by safety management programmes?

4.0 CONCLUSION

The inevitability of risk taking place in any industry can not be overemphasised. Considering the fact that in an aviation setting, losses occurring in any single incident are usually huge, all hands must therefore not only be on deck to avoid any slight occurrence but continuous measures and institutional checks and balances ranging from human to technical concerns are inbuilt in all aviation operations to forestall at least in any eventuality a reasonable amount of damage and losses achievable through measures emphasizing acceptable level of safety.

5.0 SUMMARY

This unit commenced with the explanations of the concepts of safety and safety management with particular focus on the aviation safety. Agencies and technical bodies involved in ensuring that the aviation industry maintains an acceptable level of safety globally. Other relevant aspects of this unit highlight the various stakeholders and approaches to safety management from the traditional and modern perspectives.

6.0 TUTOR-MARKED ASSIGNMENT

1. Discuss the concept of acceptable level of safety and measures involved.
2. What are the factors to be considered in determining an acceptable level of safety in any industry?

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UNIT 2 SAFETY CULTURE: KEY HEALTH ISSUES

CONTENTS

1.0 INTRODUCTION

Culture is said to be the very heart of an organisation. It is one of the most stable and substantial forces within organisations, shaping the way members think, behave, and approach their work. In short, it represents an organisation's unique style of operation. Why the recent focus on culture? There is an urgent call to action for healthcare entities to re-engineer their work processes, placing safety as a paramount institutional objective. However, it is clear that no lasting or substantive changes can be made without successfully remaking an organisation's culture. The “patient safety movement” is now underway. In the face of new mandates, it is believed that culture can play a key role in helping organisations respond to the many challenges they now face.

2.0 OBJECTIVES

At the end of this unit, you should be able to:

- examine the elements of an organisational culture
- discuss the barriers to creating a desired culture
- suggest ways to crystallise a culture of safety within your organisation.

3.0 MAIN CONTENT

3.1 Key Issues in Safety Culture

External Forces

Catalysed by the Institute of Medicine reports *“To Err is Human: Building a Safer Health System”* and *"Crossing the Quality Chasm: A New Health System for the 21st Century”* , the imperative to improve safety in healthcare is acquiring powerful political and economic

muscle. A floodgate of external initiatives have begun, giving healthcare entities a clear mandate and agenda for addressing medical error in health care. It cannot be disregarded. New legislation and governmental programs are being proposed, accreditation standards for healthcare entities have been revised, the Leapfrog Group comprised of Fortune 500 companies and other private and public health care benefit providers is now mandating patient safety standards, and coalitions are being formed in an effort to promote patient safety best practices.

Accreditation standards

For hospitals accredited by The Joint Commission (TJC), new Patient Safety standards effective July 1, 2001 imposed a mandate to take greater accountability for patient safety and risk reduction. TJC has placed before hospitals a challenge to recognize and acknowledge any vulnerabilities in their organisational systems that contribute to safety risks. The new standards also speak to the need to create a culture that is conducive to organisational learning and to share any lessons learned within organisations and between organisations. A special emphasis is being placed on the essential role of leadership in fostering an environment of learning, on the need for interdisciplinary collaboration and communication among members of an organisation, and on the integration of patient safety priorities into the new design and redesign of all relevant organisational processes, functions, and services. The expectation is that these patient safety initiatives play out through formal and informal structures with the "coaching" of leadership and the commitment of necessary institutional resources**.**

Ethical principles

Over the years, professional organisations have developed Codes of Ethics that have served as guidelines for their membership, setting forth expectations for the manner in which they are to make decisions and conduct themselves while undertaking their work. These principles represent the core values and highest aims of each profession. Born out of the traditions espoused in the Hippocratic Oath, the maxim *"do no harm"* is intended to guide the ethical sensibilities of physicians. In its *Ethics Manual*, the American College of Physicians - American Society of Internal Medicine affirms *"…the duty to do no harm to patients."* The American Medical Association's Council on Ethical and Judicial Affairs states *"The practice of medicine, and its embodiment in the clinical encounter between a patient and a physician, is fundamentally a moral activity that arises from the imperative to care for patients and to alleviate suffering."*

The Code of Ethics of Pharmacists states *"A pharmacist places concern for the well-being of the patient at the center of professional practice."* The Code of Ethics for Nurses states, *"The nurse promotes, advocates for, and strives to protect the health, safety, and rights of the patient...including the responsibility to preserve safety..."* Clearly, the intent of these statements of principle by multiple healthcare professional groups is perfectly aligned with the goal of patient safety.

Defining safety culture

Organisational culture is a manifestation of internalised assumptions or "taken for granted" understandings that are shared by an organisation's members on such matters as the interactions between humans, institutions, and their environment. These assumptions enable them to find common ways of making sense of situations - of finding meaning in one's professional and personal existence. They are expressed in many ways, such as through the values, beliefs, attitudes, behaviours, language, customs, goals, policies, and operations of an organisation**.** Culture creates a sense of identity and establishes a vital link between an organisation's members and its mission, and is considered the strongest determinant of the success or failure of an organisation. It strengthens commitment to organisational goals and gives direction by clarifying and reinforcing standards of behaviour**.** Culture is not static but is the product of dynamic interactions between various elements within an organisation. Hence, a "safety" culture is one that integrates the Hippocratic maxim of "first do no harm" into the very fibre of its identity, infuses it into the norms and operations of an entire organisation, and elevates it to the level of a top priority mission. This mission is enshrined in formal corporate statements and visibly put before its members as a guiding principle that governs the work of an organisation and is applied to its day-to-day practices. A safety culture is what emerges as a result of a concerted organisational effort to move all cultural elements towards the goal of safety, including an organisation's members, its systems, and work activities**.** Some of the more concrete features of a safety culture will be discussed in this chapter within the context of the current "patient safety movement".

How culture evolves

Culture is born out of the founding ideologies of an organisation, which set the direction of its mission and vision. Over time, as a result of the organisation's interaction with its external environment, certain values and practices emerge as more effective than others. Culture is further shaped by the internal interactions between members of an organisation and the meanings that they ascribe to the many actions and events that transpire within the organisation. Collectively, this generates the

underlying spirit that will drive the culture. The vehicles that serve to transmit and sustain culture are the use of statements of principles, symbols, stories, jargon, ceremonies and rituals, effective leadership, the process of socialising members, and the setting of goals. Visible statements of principle convey the desired cultural attributes and clarify the vision of the organisation. Symbols represent the visible embodiment of the culture. The telling of stories can inspire action and change. Jargon becomes a common language of the culture, which helps to define cultural context. Ceremonies celebrate and give expression to organisational values. Rituals bring a rhythm to the work of an organisation and reflect the character of the culture. Solid leadership helps to shape organisational vision and bring it to fruition. The process by which an organisation acclimatises its members, both formally and informally, integrates them into the desired culture. Finally, through the establishment of strategic, safety-directed goals, members of an organisation are guided towards the attainment of the super-ordinate goal of the organisation - which in this case would be the attainment of a true "safety culture".

Safety as an organisational priority

“Improved safety must be our specific, declared, and serious aim, beginning at the top of our organisations.” One of the dominant characteristics of organisations with cultures of safety is their perception of the importance of safety and their overriding commitment to safety as an organisational priority.

Leadership

"Leadership is defined as the art of accomplishing change through people. Good leadership provides the motivation for achievement of goals. Leaders inspire their people through personal example, good management practices, and sense of moral responsibility." Experts in the field of organisational change affirm that no substantive transformations will take place within an organisation without the skill, visible commitment, and guiding example of leadership. Effective leadership sets the expectation and tone for an organisation by articulating the institutional vision through empowering messages and by reinforcing "doing the right thing" as a corporate priority. Effective leaders "walk the talk" and achieve safety by modelling the behaviour that is expected of their membership. Given the sweeping changes that will be necessary to bring about organisational safety, now more than ever, good leadership from both clinical and non-clinical arenas is an essential prerequisite to transforming an organisation’s culture.

Visible commitment to safety and process improvement

Research suggests that the more committed leaders are to safety and process improvement, the greater is the level of commitment of the workforce. This in turn has a positive influence on employee performance and on the prevention of adverse incidents. Visible commitment includes the provision of adequate human and financial resources in a sustained effort towards safety. Desired behaviours are often developed by emulating the observed behaviours of others and by picking up on cues that give subtle messages about the acceptability of certain behaviours. Thus, if there is a visible commitment to safety within the organisation that is evident in the actions of its leaders, in the work environment, and in the behaviours of its members, it is more likely that a safety mindset will be established and safe work practices will be followed.

Integration of safety priorities

Safety must be the dominant characteristic of all high-risk industries, including healthcare. The manner in which a healthcare organisation balances the issue of safety with other organisational priorities will shift its culture towards or away from a safety orientation. Safety cannot be treated as an adjunct to the strategic decision-making process, but must be front-and-center and implemented at all levels of the organisation**.** The Joint Commission's expectation is that safety be *"…integrated into the new design and redesign of relevant organisational processes, functions, and services across the organisation".* Safety initiatives cannot be viewed just as a means of complying with yet another external mandate, but must be perceived by the entire membership as being integral to the organisation's mission and vision. To this end, the organisation must set safety goals and objectives that apply across the institution and down to the departmental level. Patient safety issues should appear as regular agenda items for discussion and implementation at all levels of the organisation in order for safety to be sustained as a priority.

Shared responsibility and accountability

Leaders must redefine the meaning of shared responsibility and accountability, by first removing its punitive connotations. The paradox of adopting such an approach is that all members of an organisation actually assume an even greater responsibility and accountability for safety. No longer wasting time pointing fingers at one another, the onus is now on everyone to be vigilant in identifying and disclosing systems weaknesses that create unsafe conditions and to collaborate in improving processes and preventing errors. A culture that is quality and

safety oriented is characterized by a strong, broad-based working alliance that shares ownership of the organisation's vision. The alliance is strengthened by the collaboration of "centers of power" within the organisation, represented by critical segments of the hierarchy, including executive and medical staff. The greater the solidarity and sense of ownership across the organisation, the greater the willingness to share responsibility and accountability for achieving the vision of safety.

Systems and human factors influences

Aided by research in other high-risk industries, the application of new theoretical concepts to healthcare is contributing to a richer understanding of the influence of systems and human factors on organisational safety.

Systems theory

Systems theory affirms the notion that most errors are not caused by negligence or incompetence, but by underlying flaws in systems that create an error prone work environment. Error is viewed not as a cause but as a consequence or symptom of latent conditions that generally originate at that level of an organisation that is more removed from its front line operations. Latent conditions typically stem from deficiencies in organisational functions such as developing policies and procedures, budgeting, staffing, maintaining equipment, and managing processes. These latencies can create work conditions that exacerbate human fallibility and stress the limits of human performance. In fact, the points of origin of many latent conditions can be found even further upstream, beyond the sphere of the individual organisations, to include the activities of external entities such as healthcare payers and drug/device manufacturers.

Human factors theory

"We cannot change the human condition, but we can change the conditions under which humans work." Human Factors theory seeks ways to understand and enhance human performance by taking into account known human strengths and weaknesses that manifest at the point of interface between humans and other elements in work processes. These other elements include machinery, technology, and the work environment itself. The goal of applying this approach is to then modify these other elements to be compatible with the human element. The relevance of Human Factors theory to creating a culture of safety translates into three principles that guide system design: (a) Preventing errors by designing systems to compensate for predictable human weaknesses, making it more difficult at every hand off in the system to

make mistakes; (b) Making errors visible so that they can be intercepted; and (c) Developing strategies to mitigate the effects of errors once they occur.

Medical uncertainty

The practice of medicine takes place within a realm of multiple uncertainties. Clinicians encounter uncertainty arising from their own human limitations, the complexities of human physiology and disease, individual patient characteristics, multiple treatment modalities, and the magnitude and limits of scientific knowledge. Given the range of variability in circumstances surrounding medical activity, it is often difficult for clinicians to define the boundaries between avoidable and unavoidable mistakes. Therefore, in order to develop effective safety strategies, it is important to consider how clinicians think about medical error. Some general notions, drawn from various studies, are presented here. One study suggests that medical students learn early to adapt to the realities of medical practice. These realities include managing an ever increasing knowledge base, the need to often work with probabilities because of the limits of medical knowledge, and the difficulties of distinguishing between one's own limitations and those of the knowledge itself. How these uncertainties are dealt with early on will affect thinking and behaviour as future professionals. Other sociological research reveals that from these uncertainties may grow an awareness of one's own inevitable fallibility and personal vulnerability. This feeling comes to be shared by clinicians alike, all of whom can strongly identify with the mutual experience of uncertainty and the risk of error. This research further suggests that mutual empathy nurtures in clinicians a sense of shared understanding and forgiveness for error, which may further evolve into a norm of non-criticism. As a result, clinicians may come to believe that only their peers can be the true judges of one another's errors.

There is no dispute around the fact that uncertainty is an ever-present reality of medical work and that medical practice is often imprecise. Yet, the attitudes of clinicians that sometimes develop in response to uncertainty can stifle the creation of a safety culture. Rather than finding effective ways of managing medical uncertainty and remaining open to discussing ways of preventing avoidable errors, the response may be to hide behind these uncertainties and to excuse away error. Having an understanding of clinicians' experiences and knowing the reality of their world is vital in order to *"…encourage healthcare professionals to self-insight. Increased understanding of this reality will promote closer and continual scrutiny of knowledge and practice, and the continual reduction in the boundaries of uncertainty where possible."* Strategies for proactively managing medical uncertainty include altering

professional development and enhancing professional school curriculum to include training in collaboration, communication, problem-based learning, evidence-based practice, and techniques for investigating and learning from error.

Interdisciplinary collaboration and communication

"Collaboration in providing patient care is more important than preserving an individual provider's professional boundaries or roles." Teamwork that fosters interdisciplinary collaboration and communication is promoted by The Joint Commission as an error prevention strategy to be adopted by organisations seeking a safety culture. Referred to as a "collaborative care model", this form of delivering care functions as a check and balance system that encourages professional scrutiny of the actions and decisions of each team member. It has the effect of equalizing power relations between team members by flattening the hierarchy. The collaborative relationship extends to patients and their families as well by empowering them to be active, not passive participants in the care planning process. High functioning teamwork is also characterized by respectful, open communication between team members. Good communication facilitates the processes of planning, decision making, problem solving, and goal setting, and promotes the sharing of responsibility for patient care. Collaboration that is driven by cooperation and communication is a key determinant of positive patient outcomes. *"Organisations with a positive safety culture are characterized by communications founded on mutual trust."* Trust is a product of the synergistic relationship that emerges from positive and respectful interactions between individuals who maintain open channels of communication. While it is true that collaboration cannot be imposed nor does it arise merely from the creation of a specific organisational infrastructure, it is recognised however that the culture of an organisation can have the effect of impeding or enhancing collaboration by the environment that it creates.

Organisational learning

Safety has been described as the final result of a process of organisational learning that involves all elements of an organisation working collectively towards this end. A learning organisation is one that is *"…skilled at creating, acquiring, and transferring knowledge and at modifying its behaviour to reflect new knowledge and insights."*

Open, non-punitive environment

"Punishment drives reporting of errors underground, preventing the very systems examination that is needed to discover and correct the underlying causes." An environment in which the main objective of analysing adverse events is not to punish human error but to understand systems weaknesses, serves to enhance critical learning. This is evidenced by a study of equally experienced operating room teams whose rates of learning varied based on whether or not they were free to openly contemplate and discuss their adverse experiences. The team with less communication barriers excelled at learning. Creating a learning environment is premised on an understanding of the nature of complex systems. While on the one hand, systems create a synergy that facilitates outcomes that individuals could not achieve independently, complex systems are also known to create undesirable by-products and unsafe conditions that likewise cannot be attributed to individual behaviour. *"An organisation will never improve its process, if it believes its people are the problem."*

Flexible thinking

Organisations with a greater capacity for learning are those that maintain an open mind and a sense of curiosity, accepting that there is always something to learn because of the uncertainties, complexities, and fluidity of their environment. These organisations are neither overly confident nor overly cautious in their pursuit of knowledge, since the former implies they have learned all there is to learn and the latter does not lend itself to innovation. Flexible thinking is important in understanding error causation, since the confluence of factors creating error-prone situations can continuously reconfigure itself. Organisations can never be too certain about the types of problems they may confront, which problem-solving approaches will work best, or who will be involved in the investigative process. As organisations gain more knowledge about safety, they must also be open to expanding their conceptual base around principles of safe design, including such concepts as simplifying processes and designing procedures for rapid recovery from error. Flexible thinking enables organisations to learn by *"…figuring out how to use what you already know in order to go beyond what you currently think"*.

Learning to learn

Organisational learning is not a natural process but requires a conscious effort to acquire knowledge and understanding. This process involves a continuous cycle of reflecting on information and taking action to

achieve organisational goals. An organisation's potential for learning is enhanced if:

- more importance is placed on taking the time to achieve long-term fixes to problems
- the range of outcomes is broadened to include larger issues such as safety, quality, and systems improvement
- there is concern for the impact of problems on a wider population including, for example, patients, staff, visitors, and the community at large
- an organisation is open to breaking customary practice and taking a broader view of the interdependencies among individuals, teams, tasks, systems, and cultural meanings.

Integrating evidence-based knowledge

"One of the objectives of a health care organisation committed to learning should be to improve the match between scientific knowledge and clinical practice." Medical errors are still prevalent, due partly to the failure to broadly disseminate and implement evidence-based knowledge within the healthcare industry.

Historically, the practice of medicine has been somewhat inexact, relying as much on art as on science. Through the process of trial and error, the medical profession developed what it believed to be the most appropriate practices in response to particular illnesses based on known probabilities derived from a limited knowledge base. As a result, much unfounded theory emerged due to lack of evidence, only to be later replaced with new theory. Over time, with expanding knowledge, certain practices emerged as "tried and true", based on sound evidence. However, even with the increase in evidence to support certain practices, there still exists a marked disparity between the average quality of care that is being provided and the best that is available. Many procedures continue to be performed that have no scientific basis and are considered to be inappropriate or of questionable benefit. There are also a large number of patients who do not receive care that is highly indicated and of proven scientific benefit. The objective of evidence-based medicine is not to impinge on sound clinical judgement or to stifle innovation, but to standardise certain tasks that are known to be critical steps in the patient's care process, that, if performed are proven to have positive outcomes. Though clinical practice variations are known to contribute to systems complexity and error, they still persist for a variety of reasons. This may be partly due to a reluctance to relinquish habitual practice patterns, traditional autonomy, and outmoded paradigms about how medical work should proceed, for what is perceived as "cook book"

medicine. Some believe that guidelines are not being implemented because organisational systems are not sufficiently amenable to change.

Other plausible reasons are that practitioners may simply not be aware of specific new guidelines, they may not have been instructed on how or when to integrate them into practice, they may disagree with the findings, or they may have greater confidence in alternative practices. Experts assert that *"it is more effective to create systems that support desired clinical behaviour than to focus on changing the behaviour of individual physicians."* Yet, even if there is willingness on the part of organisations to adopt guidelines, there can be some real challenges translating them into practice. Guidelines may need to be adapted to fit local circumstances. To determine the potential success of guideline transferability, organisations should assess factors such as resources, internal capabilities, patient preferences, implementation infrastructure, and applicability to all patient sub-groups.

Another factor that may contribute to poor adoption of evidence-based practice could be the ineffectiveness of the strategies used to implement practice guidelines. It is known that certain implementation strategies are more effective than others and that using multiple integrative strategies, instead of singular approaches, produce greater success when implementing change in complex systems. Adherence to guidelines also improves when implementation strategies are custom designed to address known barriers. The sources of the barriers could include deficiencies in the competencies, attitudes or skill levels of clinicians, resistance from patients, and the structures and processes of care delivery. Examples of strategies to overcome barriers include integrating guidelines into the process of care by establishing protocols with standing orders for patients to receive certain medications and incorporating reminders into decision support systems. Another source of resistance arises from the fundamental difference between evidence-based medicine and the process of academic learning. Organisations, especially teaching hospitals, are faced with the challenge of integrating some degree of evidence-based standardisation without impeding scientific curiosity and discovery. The same traditional cultural values that encourage autonomy and the attainment of individual expertise in support of innovation can also foster a mindset that inhibits the information sharing, open inquiry, and collective learning necessary for guideline implementation. Organisations must accept and incorporate some level of evidence based knowledge, with an understanding that it represents the best scientifically based practices of the day, while at the same time continuing to challenge assumptions through innovation. *"There should be a commitment to evidence-based health care with processes put in place to systematically re-evaluate established*

practices." A safety culture is one that reliably and consistently assesses quality care in the interest of patient safety.

The quality culture-safety culture interface

Creating a safety culture may be an easier task for organisations that have already integrated a continuous quality improvement (CQI) orientation into their existing organisational cultures. Hospitals with a CQI program in place may not encounter as many barriers to implementing safety initiatives because both approaches share a similar philosophy and methodology. The CQI approach entails looking at work processes and how members interact. It empowers those who are closest to where the care is provided to take a critical look at certain dimensions of healthcare quality, such as its efficacy and effectiveness. The goals of this exercise are to uncover any deficiencies in quality, to analyse the underlying processes that contribute to these deficiencies, and to then redesign these processes to eliminate or at least mitigate the potential for error. A powerful CQI tool is the PDCA (Plan-Do-Check-Act) model that draws on inductive learning by testing changes and assessing the effectiveness of those changes in real work settings. This small-scale learning can then become a model for larger scale learning. Literature supports that, overall, organisations with a quality culture perform at higher levels of organisational effectiveness. Organisations with the highest effectiveness are those that focus on error prevention and on pursuing innovative approaches to improving quality performance. The ideal integration of both cultures is to adopt safety as the primary dimension of quality and to combine quality and safety techniques in a comprehensive, organisational strategy.

SELF-ASSESSMENT EXERCISE

What is the importance of accreditation to medical and health safety?

4.0 CONCLUSION

Creating a safety culture takes a lot of commitment in any organisation, irrespective of some human and technical difficulties; it must be emphasised. Continuous quality improvement orientation must be in place recognising the fact that human culture is diverse in any organisational structure, also in any work process. Therefore the ideal integration of both cultures (human and organisation) is to adopt safety as the primary dimension of quality and to combine quality and safety techniques in a comprehensive, organisational strategy.

5.0 SUMMARY

This unit highlights some key issues regarding the evolvement of safety culture; safety as an organisational priority, leadership roles and visible commitment to safety through shared responsibility and accountability. It also explains the safety from two major perspectives of the system and human theories. Lastly knowledge of organisation and quality culture interface were discussed.

6.0 TUTOR-MARKED ASSIGNMENT

1. Define and explain Safety as an Organisational Priority
2. Succinctly highlight the basic assumptions of:

a) System theory
b) Human factor theory

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UNIT 3 RESPONSIBILITY FOR MANAGING SAFETY

CONTENTS

1.0 INTRODUCTION

The responsibility for safety and effective safety management is shared among a wide spectrum of organisations and institutions, including international organisations, state regulatory authorities for civil aviation, owners and operators, service providers for air navigation services and aerodromes, major aircraft and power plant manufacturers, maintenance organisations, industry and professional associations, and aviation education and training institutions. In addition, third parties that provide aviation support services (including contracted services) also share in the responsibility for managing safety. Generally, these responsibilities fall into the following areas:

a) defining policies and standards affecting safety;
b) allocating resources to sustain risk management activities;
c) identifying and evaluating safety hazards;
d) taking action to eliminate hazards or reduce the associated level of risk to what has been decided as being an acceptable level of risk;
e) incorporating technical advances in the design and maintenance of equipment;
f) conducting safety oversight and safety programme evaluation;
g) investigating accidents and serious incidents;
h) adopting the most appropriate best industry practices;
i) promoting aviation safety (including the exchange of safety-related information);
j) updating regulations governing civil aviation safety.

The systematic procedures and practices for the management of safety are generally referred to collectively as a safety management system (SMS).

2.0 OBJECTIVES

At the end of this unit, you should be able to:

- mention the parties responsible for managing safety in the aviation industry as well as their relationships and contributions.

3.0 MAIN CONTENT

3.1 Parties Responsible for Managing Safety

From a regulatory perspective, ICAO's role is to provide procedures and guidance for the safe conduct of international aircraft operations and to foster the planning and development of air transport. This is largely achieved by developing Standards and Recommended Practices (SARPs), which are contained in the Annexes to the Chicago Convention and reflect the best operational experience of States. The Procedures for Air Navigation Services (PANS) contain practices beyond the scope of the SARPs, where a measure of international uniformity is desirable for safety and efficiency. The Air Navigation Plans detail requirements for facilities and services specific to ICAO regions. In essence, these documents define the international framework for promoting safety and efficiency in aviation. In addition to this regulatory framework, ICAO contributes to safety management by promoting best safety practices. More specifically, ICAO:

1. provides guidance material for States and operators covering most aspects of aviation safety (including flight operations, airworthiness, air traffic services, aerodromes and airport security). Generally this guidance material is in the form of manuals or circulars;
2. develops this manual which outlines the principles of safety management and provides guidance for the conduct of effective safety management programmes;
3. defines international procedures for accident and incident investigation and reporting;
4. promotes aviation safety by:

a. disseminating accident and incident information through the Accident/Incident Reporting (ADREP) system and by other means;
b. disseminating aviation safety information in publications and, more recently, in electronic formats; and
c. participating in conferences, seminars, etc. addressing specific aspects of aviation safety (i.e. accident investigation, accident prevention and Human Factors); and
e) conducts audits under the Universal Safety Oversight Audit Programme (USOAP).

1. States

States bear significant responsibility for establishing an environment conducive to safe and efficient flight operations. Irrespective of any risk management methods they may employ, such as those described in this manual, States, as the signatories to the Chicago Convention, have an obligation to implement ICAO SARPs. To this end, each State must:

a. provides the legislative and regulatory provisions needed to govern the State's aviation system. Some of the areas requiring a legal framework for effective safety management are listed below:

i. Aviation legislation establishes a State's objectives for aviation — both commercial and private. Typically, this legislation includes the State's vision for aviation safety and delineates the broad responsibilities, accountabilities and authorities for fulfilling those objectives.
ii. Manufacturing and trade laws govern the production and sale of safe aeronautic equipment and services.
iii. Labour laws (including Occupational Safety and Health (OSH) laws) set the rules for the work environment in which aviation employees are expected to perform their duties safely.
iv. Security laws contribute to safety in the workplace; for example, they govern who may enter into operational areas and under what terms. Also, they may protect sources of safety information.
v. Environmental laws affecting the sighting of airports and navigation aids impact on flight operations (such as noise abatement procedures).

b. Establish an appropriate state body, usually referred to as the Civil Aviation Administration (CAA), with the necessary powers to ensure compliance with the regulations. This responsibility includes:

i. establishing the necessary statutory authority and delegations to regulate the aviation industry;
ii. ensuring it is adequately staffed with competent technical officials; and
iii. maintaining an effective system of safety oversight to assess how well regulatory requirements are being met; and

c. Establish appropriate safety oversight mechanisms to ensure that operators and service providers maintain an acceptable level of safety in their operations.

Safe and efficient aviation requires significant infrastructure and aeronautic services, including airports, navigation aids, air traffic management, meteorological services, and flight information services. Some States own and operate their own air navigation services and major airports; others own and operate their own national airline. However, many States have corporatised these operations and they operate under the oversight of the State. Regardless of the approach taken, States must ensure that the infrastructure and services in support of aviation are maintained to meet international best practices and the needs of the State. Where the regulatory function and the provision of particular services are both under the direct control of one State body (such as the CAA), a clear distinction must be maintained between these two functions, i.e. service provider and regulator. Also, States have a responsibility to be "good citizens" in the international aviation community. They can best do this by ensuring conformity with the Chicago Convention and ICAO SARPs. When a State cannot adapt its national legislation and regulations to the SARPs, it is required to file a "difference". ICAO publishes these differences so that other States may be aware of departures from internationally agreed Standards. The ICAO USOAP is used to determine States' compliance with safety-critical SARPs.

2. Civil Aviation Administrations (CAAs)

Having developed appropriate legislation governing aviation, a State must establish a CAA to set the rules, regulations and procedures by which the State implements its safety programme. Chapter 3 (State Safety Programme) of this manual outlines the principal functions and activities of the CAA for delivering an effective safety programme. Basically, the CAA provides the necessary oversight for compliance with the State's laws and regulations for air safety and for the fulfilment of the State's safety goals.

3. Manufacturers

Each new generation of equipment incorporates improvements based on the latest "*state of the art"* and operational experience. Manufacturers produce equipment that complies with the airworthiness and other standards of domestic and foreign governments, and meets the economic and performance requirements of purchasers.

Manufacturers also produce manuals and other documentation to support their products. In some States, this may be the only guidance material available for the operation of a specific aircraft type or piece of equipment. Thus the standard of documentation provided by the manufacturer is important. Additionally, through their responsibilities

for providing product support, training, etc., manufacturers can provide the safety record of a particular piece of equipment, or the in-service record of a component. In addition, the major aircraft manufacturers have active safety departments whose roles include monitoring in-service experience, providing feedback to the manufacturing process and disseminating safety information to customer airlines.

4. Aircraft operators

Major airlines usually employ many of the safety management activities outlined in this manual. Such activities are often carried out by a safety office which monitors overall operating experience and provides independent advice to company management on the action needed to eliminate or avoid identified hazards, or reduce the associated risk to an acceptable level. The safety management concepts outlined in this manual are in addition to existing requirements to comply with ICAO SARPs and/or national regulations.

5. Service providers

Safe and efficient flight operations depend on the effective delivery of a variety of services separate from the aircraft operators, for example:

- air traffic management;
- aerodrome operations, including airport emergency services;
- airport security; and
- navigation and communication aids.

Traditionally, such services have been provided by the State — usually through its civil or military aviation authorities. However, civil aviation authorities in some States have discovered the potential conflicts of interest in the dual roles of the State as both a regulator and a service provider. Moreover, some States believe that there are operational efficiencies and economies to be gained from the corporatisation (or privatisation) of many of these services, particularly ATS and aerodrome operations. As a result, a growing number of States have delegated responsibility for the provision of many of these services. Regardless of the ownership or management structure of any aviation service, responsible managers are expected to develop and implement SMS within their areas of expertise. The guidance material provided in this manual applies equally to flight operations and the provision of aviation services, regardless of whether they are governed by the State or corporate management.

6. Third party contractors

The provision of services supporting flight operations often involves private contractors in such areas as refuelling; catering and other aircraft ground services; aircraft maintenance and overhaul; runway and taxiway construction and repair; crew training; and flight planning, flight dispatch and flight following. Whether a large corporate contractor or small entrepreneur, the contracting authority (e.g. an airline, aerodrome operator or air navigation service provider) holds the overall responsibility for managing the safety risks taken by the contractor. The contract must specify safety standards to be met. The contracting authority then has the responsibility for ensuring that the contractor complies with the safety standards prescribed in the contract. An SMS must ensure that the level of safety of an organisation is not eroded by the inputs and supplies provided by external organisations.

7. Business and Professional Associations

Business and professional associations also play a vital role in safety management. International, national and regional stakeholder associations are usually formed to advance commercial interests; however, stakeholders increasingly recognise the strong links between aviation safety and profitability. Stakeholders realise that an accident by one airline can compromise their own business. Thus, for example, airline associations maintain an active watch on industry's developments in technology, procedures and practices. Their members collaborate in the identification of safety hazards and in the actions required for reducing or eliminating those deficiencies. Through such associations, many airlines are now sharing safety-related data with a view to enhancing safety management. In a similar manner, professional associations representing the interests of various professional groups (e.g. pilots, ATCOs, AMEs, and cabin crew) are active in the pursuit of safety management. Through study, analysis and advocacy, such groups provide subject matter expertise for identifying and ameliorating safety hazards.

Increasingly, airlines are joining partnerships or alliances with other airlines to extend their effective route structure through code-sharing agreements. This can result in a flight segment being operated by an airline other than that expected by the passenger. These arrangements can have safety implications. No airline wants to be associated with an unsafe partner. To protect their own interests, the alliance partners conduct mutual safety audits — thereby enhancing airline safety. The general aviation community has a system of national and international associations that have been formed to enhance safety and further their

interests in the aviation community. The business aviation sector is also active in SMS and in pursuing safety issues for its members.

8. Management's Special Responsibility for Safety

The management teams of operators and service providers bear a special responsibility for safety management. In a major study of airlines around the world, it was found that the safest airlines had a clear safety mission, starting at the top of the organisation and guiding actions right down to the operational level. Lautman and Gallimore found that in the safest airlines:

"Flight operations and training managers recognise their responsibility to flight safety and are dedicated to creating and enforcing safety-oriented policies. … There is a method of getting information to the flight crews expeditiously and a policy that encourages confidential feedback from pilots to management. …The management attitude … is a dynamic force that sets the stage for the standardisation and discipline in the cockpit brought about by a training programme oriented to safety issues."

The safest organisations are often the most efficient. Although trade-offs between safety management and costs may occur, management needs to recognise the hidden costs of accidents and that safety is good for business. By taking a systematic approach to corporate decision-making and risk management, accidental losses are reduced.

Management has the authority and the responsibility to manage safety risks in the company. This is achieved by establishing a systematic method for identifying hazards, assessing risks, assigning priorities to these risks and then by reducing or eliminating those hazards which pose the greatest potential loss. Management alone has the ability to introduce changes in the organisation's structure, staffing, equipment, policies and procedures. Above all, management sets the organisational climate for safety. Without its wholehearted commitment to safety, safety management will be largely ineffective. By positively reinforcing safety actions, management sends the message to all staff that it really cares about safety and that they should too. Management needs to establish safety as a core value of the organisation. It can accomplish this by setting objectives and safety goals, then holding managers and employees accountable for achieving those goals. Staff look up to management for:

a) ***clear direction*** in the form of credible policies, objectives, goals, standards, etc.;

b) ***adequate resources***, including sufficient time, to fulfil assigned tasks safely and efficiently; and

c) ***expertise*** in terms of access to experience through safety literature, training, seminars, etc.

This onus on management applies regardless of the size or type of organisation providing the aviation service. The role of management in managing safety is a recurring theme throughout this manual.

3.2 Responsibilities and Accountabilities

Responsibility and accountability are closely related concepts. While individual staff members are responsible for their actions, they are also accountable to their supervisor or manager for the safe performance of their functions and may be called on to justify their actions. Although individuals must be accountable for their own actions, managers and supervisors are accountable for the overall performance of the group that reports to them. Accountability is a two-way street. Managers are also accountable for ensuring that their subordinates have the resources, training, experience, etc. needed for the safe completion of their assigned duties. A formal statement of responsibilities and accountabilities is advisable, even in small organisations. This statement clarifies the formal and informal reporting lines on the organisational chart and specifies accountabilities for particular activities with no overlap or omission. The contents of the statement will vary depending on organisational size, complexity and relationships.

The Need for Global Cooperation

Although the organisational elements described above have specific roles and responsibilities for safety management, the international nature of aviation demands that their individual efforts be integrated into a coherent, global aviation safety system, requiring cooperation and collaboration at all levels. Global collaboration occurs in international fora such as:

a) corporate associations (e.g. IATA, ACI, ATA and CANSO);
b) national and international aviation associations (e.g. NBAA, EBAA and IBAC);
c) international federations of national associations (e.g. IFALPA and IFATCA);
d) international safety bodies (e.g. FSF and ISASI);
e) industry/government groups (e.g. CAST and GAIN); and
f) major manufacturers' safety forums.

Such organisations are able to provide "subject matter experts" for meetings and studies. For example, manufacturers may invite input through "user" groups, and the users themselves may consult the manufacturers to better understand particular operating practices. As a result, there is a healthy crosspollination of safety-related information and knowledge. Such collaborative efforts not only are safety oriented but also make good business sense for the following reasons:

a) The air transport industry is strongly interdependent. The consequences of a major air disaster can affect many of the stakeholders. Mutual concern over damage to the industry's reputation, goodwill and public confidence tends to promote collective action over the parochial pursuit of special interests.
b) There is strength in collective action.
c) Globalisation of markets has transcended State borders and authority.

Examples of the ways in which global collaboration improves the efficiency and effectiveness of safety management efforts include:

a) harmonisation, coherence and interoperability through universal design standards, SOPs and terminology;
b) global sharing of safety-related information;
c) early identification and resolution of global systemic hazards; and
d) back-up and mutual reinforcement through overlapping effort and sharing of specialist resources

SELF-ASSESSMENT EXERCISE

The responsibility for safety and effective safety management is shared among a wide spectrum of organisations and institutions. Discuss.

4.0 CONCLUSION

A wide range of responsibilities exist in any organisational setting, depending on the size, structure and potential magnitude of risk envisaged. It is in this regard the responsibility for safety and effective safety management is shared among a consortium of organisations and institutions, including international organisations, State regulatory authorities, owners and operators, service providers and other stakeholders in the Aviation sector like any other structure of similar kind.

5.0 SUMMARY

This unit pinpoint the stakeholders in the aviation industry whose responsibilities are paramount in the maintenance of safety in the sector. The state ensures a conducive environment is provided, Having developed appropriate legislation governing aviation, also the State must establish a regulatory body to set the rules, regulations and procedures by which the State implements its safety programme. The manufacturer is expected to produce equipment that complies with the airworthiness and other standards of domestic and foreign governments. Finally the links between aviation safety and profitability are key roles and expectations that all stakeholder associations must ensure to advance both public, private and commercial interests.

6.0 TUTOR MARKED ASSIGNMENT

With relevant example discuss the role of the State as a key player in organisational safety.

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UNIT 4 UNDERSTANDING SAFETY: THE CONCEPT OF RISK

CONTENTS

1.0 INTRODUCTION

As discussed in this module, safety is a condition in which the risk of harm or damage is limited to an acceptable level. The safety hazards creating risk may become evident after an obvious breach of safety, such as an accident or incident, or they may be proactively identified through formal safety management programmes before an actual safety event occurs. Having identified a safety hazard, the associated risks must be assessed. With a clear understanding of the nature of the risks, a determination can be made as to the "acceptability" of the risks. Those found to be unacceptable must be acted upon. Safety management is centred on such a systematic approach to hazard identification and risk management — in the interests of minimising the loss of human life, property damage, and financial, environmental and societal losses.

2.0 OBJECTIVES

At the end of this unit, you should be able to:

- explain the concept of risk
- explain the cooperate safety models
- explain the culture in safety management
- explain the concepts of accidents and incidents in safety management.

3.0 MAIN CONTENT

3.1 Concept of Risk

Since safety is defined in terms of risk, any consideration of safety must therefore involve the concept of risk. There is no such thing as absolute safety. Before any assessment can be made as to whether or not a system is safe, it is first necessary to determine what the acceptable level of risk is for the system. Risks are often expressed as probabilities; however, the concept of risk involves more than probabilities. To illustrate this with a hypothetical example, let us assume that the probability of the supporting cable of a 100-passenger cable car failing and allowing the cable car to fall was assessed as being the same as the probability of a 12-passenger elevator failing and allowing the elevator to fall. While the probabilities of the events occurring may be the same, the potential consequences of the cable car accident are much more severe. Risk is therefore two-dimensional. Evaluation of the acceptability of a given risk associated with a particular hazard must always take into account both the **likelihood** of occurrence of the hazard and the **severity** of its potential consequences. The perceptions of risk can be derived from the following three broad categories:

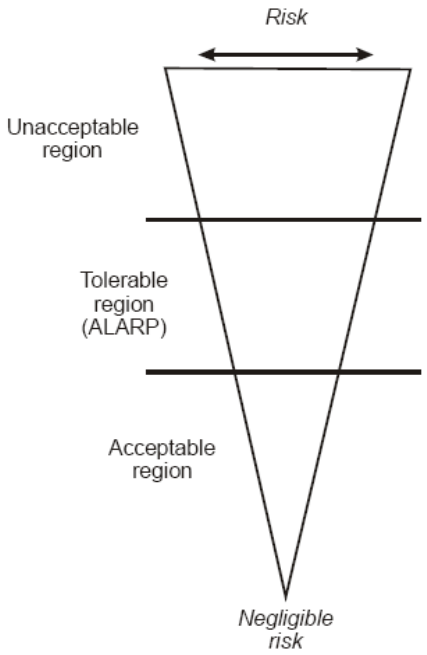
a) risks that are so high that they are unacceptable;
b) risks that are so low that they are acceptable; and
c) risks in between the two categories (a and b), where consideration needs to be given to the various trade-offs between risks and benefits. If the risk does not meet the predetermined acceptability criteria, an attempt must always be made to reduce it to a level that is acceptable, using appropriate mitigation procedures. If the risk cannot be reduced to or below the acceptable level, it may be regarded as tolerable if:

- the risk is less than the predetermined unacceptable limit;
- the risk has been reduced to a level that is as low as reasonably practicable; and
- the benefits of the proposed system or changes are sufficient to justify accepting the risk.

Note. — All three of the above criteria should be satisfied before a risk is classed as tolerable.

Even where the risk is classed as acceptable (tolerable), if any measures that could result in the further reduction of the risk are identified, and these measures require little effort or resources to implement, then they should be implemented. The acronym ***ALARP*** is used to describe a risk that has been reduced to a level that is ***as low as reasonably practicable***.

In determining what is "*reasonably practicable"* in this context, consideration should be given to both the technical feasibility of further reducing the risk, and the cost; this could include a cost-benefit study. Showing that the risk in a system is ALARP means that any further risk reduction is either impracticable or grossly outweighed by the costs. It should, however, be borne in mind that when an individual or society "accepts" a risk, this does not mean that the risk is eliminated. Some level of risk remains; however, the individual or society has accepted that the residual risk is sufficiently low that it is outweighed by the benefits. These concepts are illustrated diagrammatically in the Tolerability of Risk (TOR) triangle in Figure 1 below. (In this figure, the degree of risk is represented by the width of the triangle.) **Tolerability of Risk (TOR) triangle**



Accidents versus Incidents in the Aviation Sector

Definitions of accidents and incidents may be summarised as follows:

a) An **accident** is an occurrence during the operation of an aircraft which entails:

1) a fatality or serious injury;
2) substantial damage to the aircraft involving structural failure or requiring major repair; or
3) the aircraft is missing or is completely inaccessible.

b) An **incident** is an occurrence, other than an accident, associated with the operation of an aircraft which affects or could affect the

safety of operation. A serious incident is an incident involving circumstances indicating that an accident nearly occurred.

The ICAO definitions use the word “occurrence” to indicate an accident or incident. From the perspective of safety management, there is a danger in concentrating on the difference between accidents and incidents using definitions that may be arbitrary and limiting. Many incidents occur every day which may or may not be reported to the investigation authority but which come close to being accidents — often exposing significant risks. Since there is no injury, or little or no damage, such incidents might not be investigated. This is unfortunate because the investigation of an incident may yield better results for hazard identification than the investigation of an accident. The difference between an accident and an incident may simply be an element of chance. Indeed, an incident may be thought of as an undesired event that under slightly different circumstances could have resulted in harm to people or damage to property and thus would have been classified as an accident.

3.2 Accident Causation

The strongest evidence of a serious breach of a system’s safety is an accident. Since safety management aims to reduce the probability and consequences of accidents, an understanding of accident and incident causation is essential to understanding safety management. Because accidents and incidents are closely related, no attempt is made to differentiate accident causation from incident causation.

3.2.1 Traditional view of causation

Following a major accident, the questions listed below may be asked:

a) *How* and *why* did competent personnel make the errors necessary to precipitate the accident?
b) Could something like this happen again?

Traditionally, investigators have examined a chain of events or circumstances that ultimately led to someone doing something inappropriate, thereby triggering the accident. This inappropriate behaviour may have been an error in judgement (such as a deviation from SOPs), an error due to inattention, or a deliberate violation of the rules. Following the traditional approach, the investigative focus was more often than not on finding someone to blame (and punish) for the accident. At best, safety management efforts were concentrated on finding ways to reduce the risk of such unsafe acts being committed in the first place. However, the errors or violations that trigger accidents

seem to occur randomly. With no particular pattern to pursue, such safety management efforts to reduce or eliminate random events may be ineffective. Analysis of accident data all too often reveals that the situation prior to the accident was *"ripe for an accident"*. Safety-minded persons may even have been saying that it was just a matter of time before these circumstances led to an accident. When the accident occurs, often healthy, qualified, experienced, motivated and well-equipped personnel were found to have committed errors that triggered the accident. They (and their colleagues) may have committed these errors or unsafe practices many times before without adverse consequences. In addition, some of the unsafe conditions in which they were operating may have been present for years, again without causing an accident. In other words, an element of chance is present. Sometimes these unsafe conditions were the consequence of decisions made by management; it recognised the risks, but other priorities required a trade-off. Indeed, front-line personnel often work in a context that is defined by organisational and management factors beyond their control. The front-line employees are merely part of a larger system. To be successful, safety management systems (SMS) require an alternative understanding of accident causation — one that depends on examining the total context (i.e. the *system*) in which people work.

3.2.2 Modern View of Causation

According to modern thinking, accidents require the coming together of a number of enabling factors — each one necessary but in itself not sufficient to breach system defences. Major equipment failures or operational personnel errors are seldom the sole cause of breaches in safety defences. Often these breakdowns are the consequence of human failures in *decision-making*. The breakdowns may involve *active failures* at the operational level, or *latent conditions* conducive to facilitating a breach of the system's inherent safety defences. Most accidents include both active and latent conditions. Figure 1.2 portrays an accident causation model that assists in understanding the interplay of organisational and management factors (i.e. system factors) in accident causation. Various "defences" are built into the aviation system to protect against inappropriate performance or poor decisions at all levels of the system (i.e. the front-line workplace, the supervisory levels and senior management). This model shows that while organisational factors, including management decisions, can create latent conditions that could lead to an accident, they also contribute to the system's defences.

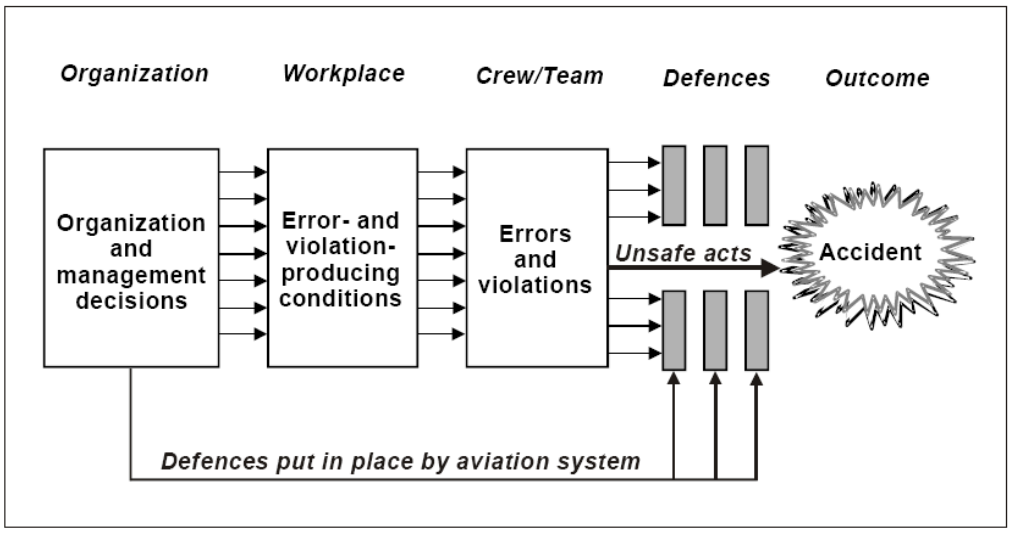


Fig 1.2: Accident causation model (Adapted from Prof. James Reason)

Errors and violations having an immediate adverse effect can be viewed as ***unsafe acts***; these are generally associated with front-line personnel (pilots, ATCOs, AMEs, etc.). These unsafe acts may penetrate the various defences put in place to protect the aviation system by company management, the regulatory authorities, etc., resulting in an accident. These unsafe acts may be the result of normal errors, or they may result from deliberate violations of prescribed procedures and practices. The model recognises that there are many error- or violation-producing conditions in the work environment that may affect individual or team behaviour. These unsafe acts are committed in an operational context which includes ***latent unsafe conditions***. A latent condition is the result of an action or decision made well before an accident. Its consequences may remain dormant for a long time. Individually, these latent conditions are usually not harmful since they are not perceived as being failures in the first place. Latent unsafe conditions may only become evident once the system's defences have been breached. They may have been present in the system well before an accident and are generally created by decision-makers, regulators and other people far removed in time and space from the accident. Front-line design; conflicting goals (e.g. service that is on time versus safety); defective organisations (e.g. poor internal communications); or bad management decisions (e.g. deferral of a maintenance item).

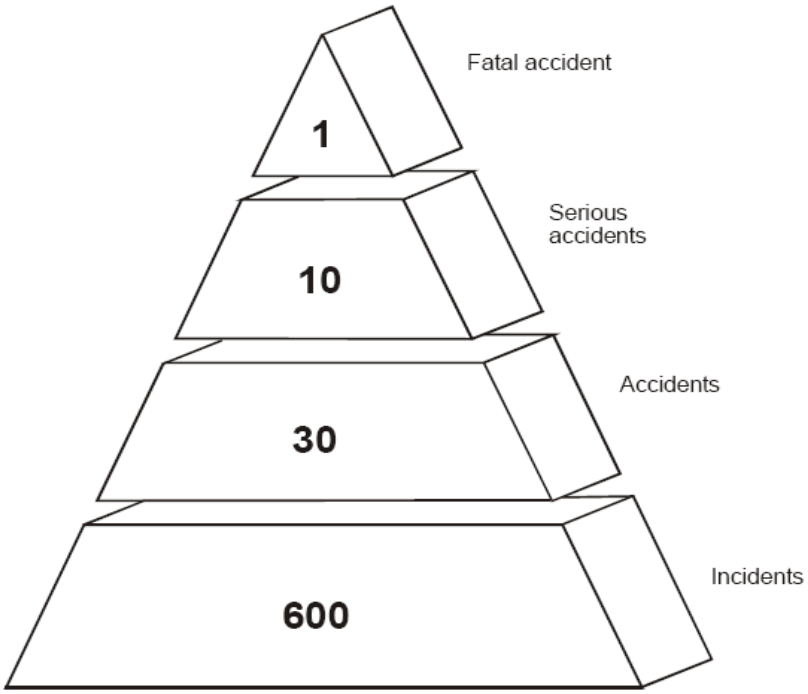
Effective safety management efforts aim to identify and mitigate these latent unsafe conditions on a system-wide basis, rather than by localised efforts to minimize unsafe acts by individuals. Such unsafe acts may only be symptoms of safety problems, not causes. Even in the best-run organisations, most latent unsafe conditions start with the decision

makers. These decision-makers are subject to normal human biases and limitations, as well as to very real constraints of time, budget, politics, etc. Since some of the unsafe decisions cannot be prevented, steps must be taken to detect them and to reduce their adverse consequences. Fallible decisions by line management may take the form of inadequate procedures, poor scheduling or neglect of recognizable hazards. They may lead to inadequate knowledge and skills or inappropriate operating procedures. How well line management and the organisation as a whole perform their functions sets the scene for error- or violation-producing conditions. For example, how effective is management with respect to setting attainable work goals, organising tasks and resources, managing day to- day affairs, and communicating internally and externally? The fallible decisions made by company management and regulatory authorities are too often the consequence of inadequate resources. However, avoiding the costs of strengthening the safety of the system can facilitate accidents that are so expensive as to bankrupt the operator.

3.3 Incidents: Precursors of Accidents

Regardless of the accident causation model used, typically there would have been precursors evident before the accident. All too often, these precursors only become evident with hindsight. Latent unsafe conditions may have existed at the time of the occurrence. Identifying and validating these latent unsafe conditions require an objective, in-depth risk analysis. Although it is important to fully investigate accidents with high numbers of fatalities, it may not be the most fruitful means for identifying safety deficiencies. Care must be taken to ensure that the *"blood priority"* (often prevalent in the media after significant loss of life) does not detract from a rational risk analysis of latent unsafe conditions in aviation. While using accident investigations to identify hazards is important, it is a reactive and costly method to improve safety. Research into industrial safety in 1969 indicated that for every 600 reported occurrences with no injury or damage, there were some:

- 30 incidents involving property damage;
- 10 accidents involving serious injuries; and
- 1 major or fatal injury.



The 1-10-30-600 ratio shown in Figure above is indicative of a wasted opportunity if investigative efforts are focused only on those rare occurrences where there is serious injury or significant damage. The factors contributing to such accidents may be present in hundreds of incidents and could be identified —before serious injury or damage ensues. Effective safety management requires that staff and management identify and analyse hazards before they result in accidents. In aviation incidents, injury and damage are generally less significant than in accidents. Accordingly, there is less publicity associated with these occurrences. In principle, more information regarding such occurrences should be available (e.g. live witnesses and undamaged flight recorders). Without the threat of substantial damage suits, there also tends to be less of an adversarial atmosphere during the investigation. Thus, there should be a better opportunity to identify why the incidents occurred and, equally, *how* the defences in place prevented them from becoming accidents. In an ideal world, the underlying safety deficiencies could all be identified and preventive measures to ameliorate these unsafe conditions could be initiated before an accident occurs.

SELF-ASSESSMENT EXERCISE

1. Differentiate between traditional and modern view of causation in safety management.
2. With the aid of a diagram explain the accident causation model

4.0 CONCLUSION

The concept of safety is most times defined in terms of the level of risk involved which makes it a relative term depending the organisation or environment. The need for assessment becomes paramount in safety Study irrespective of causation either from the traditional or the modern point of view.

5.0 SUMMARY

This unit highlights the various views of accident causation in understanding safety. The term accident was differentiated from incident. Tolerability of Risk (TOR) and the acronym *ALARP was* used to describe risk that has been reduced to a level that is *as low as reasonably practicable*. In this context, consideration was given to both the technical feasibility of reducing risk, and the cost-benefit study.

6.0 TUTOR-MARKED ASSIGNMENT

Risks are often expressed as probabilities; however, the concept of risk involves more than probabilities. Discuss

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UNIT 5 SAFETY AND THE HUMAN FACTOR

CONTENTS

1.0 INTRODUCTION

In a high-technology industry such as aviation, the focus of problem solving is often on technology. However, the accident record repeatedly demonstrates that at least three out of four accidents involve performance errors made by apparently healthy and appropriately qualified individuals. In the rush to embrace new technologies, the people who must interface with and use this equipment are often overlooked. The sources of some of the problems causing or contributing to these accidents may be traced to poor equipment or procedure design, or to inadequate training or operating instructions. Whatever the origin, understanding normal human performance capabilities, limitations and behaviour in the operational context is central to understanding safety management. An intuitive approach to Human Factors is no longer appropriate. The human element is the most flexible and adaptable part of the aviation system, but it is also the most vulnerable to influences that can adversely affect its performance. With the majority of accidents resulting from less than optimum human performance, there has been a tendency to merely attribute them to human error. However, the term “human error” is of little help in safety management. Although it may indicate *where* in the system the breakdown occurred, it provides no guidance as to *why* it occurred. An error attributed to humans may have been design-induced or stimulated by inadequate equipment or training, badly designed procedures, or a poor layout of checklists or manuals. Furthermore, the term “human error” allows concealment of the underlying factors that must be brought to the fore if accidents are to be prevented. In modern safety thinking, human error is the starting point rather than the stopping point. Safety management initiatives seek ways of preventing human errors that might jeopardize safety, and ways of minimizing the adverse safety consequences of the errors that will inevitably occur. This requires an understanding of the operating context in which humans err (i.e. an

understanding of the factors and conditions affecting human performance in the workplace).

2.0 OBJECTIVES

At the end of this unit, you should be able to:

- highlight the importance of Safety in Aviation industry using the SHEL Model
- explain some of the more important factors affecting individual actions and resultant effect of disaster and safety in the workplace
- recognise influence of organisational behaviour in safety management.

3.0 MAIN CONTENT

3.1 SHEL Model of Safety Management

The workplace typically involves a complex set of interrelated factors and conditions, which may affect human performance. The SHEL model (sometimes referred to as the SHELL model) can be used to help visualise the interrelationships among the various components of the aviation system. This model is a development of the traditional *"man-machine-environment"* system. It places emphasis on the human being and the human's interfaces with the other components of the aviation system. The SHEL model's name is derived from the initial letters of its four components:

a) ***Software (S)*** (procedures, training, support, etc.); and
b) ***Hardware (H)*** (machine and equipment);
c) ***Environment (E)*** (the operating circumstances in which the rest of the L-H-S system must function); and
d) ***Liveware (L)*** (humans in the workplace).

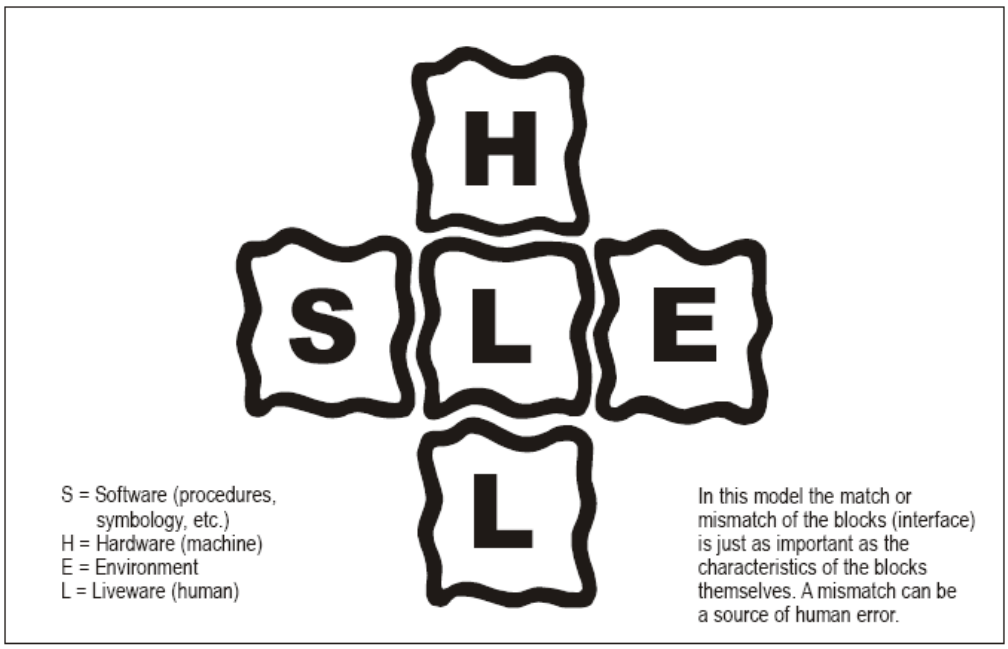

Figure 1: SHEL model

Figure 1. depicts the SHEL model. This building block diagram is intended to provide a basic understanding of the relationship of the human to other factors in the workplace.

Liveware: In the centre of the SHEL model are those persons at the front line of operations. Although people are remarkably adaptable, they are subject to considerable variations in performance. Humans are not standardized to the same degree as hardware, so the edges of this block are not simple and straight. People do not interface perfectly with the various components of the world in which they work. To avoid tensions that may compromise human performance, the effects of irregularities at the interfaces between the various SHEL blocks and the central Liveware block must be understood. The other components of the system must be carefully matched to humans if stresses in the system are to be avoided. Several factors put the rough edges on the Liveware block. Some of the more important factors affecting individual performance are listed below:

a) ***Physical factors:*** These include the individual's physical capabilities to perform the required tasks, e.g. strength, height, reach, vision and hearing.

b) ***Physiological factors:*** These include those factors which affect the human's internal physical processes, which can compromise a person's physical and cognitive performance, e.g. oxygen

availability, general health and fitness, disease or illness, tobacco, drug or alcohol use, personal stress, fatigue and pregnancy.

c) ***Psychological factors:*** These include those factors affecting the psychological preparedness of the individual to meet all the circumstances that might occur, e.g. adequacy of training, knowledge and experience, and workload. The individual's psychological fitness includes motivation and judgement, attitude towards risky behaviour, confidence and stress.

d) ***Psycho-social factors:*** These include all those external factors in the social system of individuals that bring pressure to bear on them in their work and non-work environments, e.g. an argument with a supervisor, labour-management disputes, a death in the family, personal financial problems or other domestic tension.

The SHEL model is particularly useful in visualising the interfaces between the various components of the aviation system. These include:

- ***Liveware-Hardware (L-H)***. The interface between the human and the machine (ergonomics) is the one most commonly considered when speaking of Human Factors. It determines how the human interfaces with the physical work environment, e.g. the design of seats to fit the sitting characteristics of the human body, displays to match the sensory and information processing characteristics of the user, and proper movement, coding and location of controls for the user. However, there is a natural human tendency to adapt to L-H mismatches. This tendency may mask serious deficiencies, which may only become evident after an accident.

- ***Liveware-Software (L-S)***. The L-S interface is the relationship between the individual and the supporting systems found in the workplace, e.g. the regulations, manuals, checklists, publications, SOPs and computer software. It includes such *"user friendliness"* issues as currency, accuracy, format and presentation, vocabulary, clarity and symbology.

- ***Liveware-Liveware (L-L)***. The L-L interface is the relationship between the individual and other persons in the workplace. Flight crews, ATCOs, AMEs and other operational personnel function as groups, and group influences play a role in determining human behaviour and performance. This interface is concerned with leadership, cooperation, teamwork and personality interactions. The advent of crew resource management (CRM) has resulted in considerable focus on this interface. CRM training and its

extension to ATS (team resource management (TRM)) and maintenance (maintenance resource management (MRM)) promote teamwork and focus on the management of normal human errors. Staff/management relationships are also within the scope of this interface, as are corporate culture, corporate climate and company operating pressures, which can all significantly affect human performance.

- ***Liveware-Environment (L-E)***. This interface involves the relationship between the individual and the internal and external environments. The internal workplace environment includes such physical considerations as temperature, ambient light, noise, vibration and air quality. The external environment (for pilots) includes such things as visibility, turbulence and terrain. Increasingly, the 24/7 aviation work environment includes disturbances to normal biological rhythms, e.g. sleep patterns. In addition, the aviation system operates within a context of broad political and economic constraints, which in turn affect the overall corporate environment. Included here are such factors as the adequacy of physical facilities and supporting infrastructure, the local financial situation, and regulatory effectiveness. Just as the immediate work environment may create pressures to take short cuts, inadequate infrastructure support may also compromise the quality of decision-making. Care needs to be taken in order that problems (hazards) do not "fall through the cracks" at the interfaces. For the most part, the rough edges of these interfaces can be managed, for example:

a) The designer can ensure the performance reliability of the equipment under specified operating conditions.
b) During the certification process, the regulatory authority can define the conditions under which the equipment may be used.
c) The organisation's management can specify SOPs and provide initial and recurrent training for the safe use of the equipment.
d) Individual equipment operators can ensure their familiarity and confidence in using the equipment safely under all required operating conditions.

3.2 Culture and Safety Management

Culture influences the values, beliefs and behaviours that we share with the other members of our various social groups. Culture serves to bind us together as members of groups and to provide clues as to how to behave in both normal and unusual situations. Some people see culture as the "collective programming of the mind". Culture is the complex, social dynamic that sets the rules of the game, or the framework for all

our interpersonal interactions. It is the sum total of the way people conduct their affairs in a particular social milieu. Culture provides a context in which things happen. For safety management, understanding this context called culture is an important determinant of human performance and its limitations. The Western world's approach to management is often based on an emotionally detached rationality, which is considered to be *"scientifically"* based. It assumes that human cultures in the workplace resemble the laws of physics and engineering, which are universal in application. This assumption reflects a Western cultural bias.

Aviation safety must transcend national boundaries, including all the cultures therein. On a global scale, the aviation industry has achieved a remarkable level of standardisation across aircraft types, countries and peoples. Nevertheless, it is not difficult to detect differences in how people respond in similar situations. As people in the industry interact (the Liveware-Liveware (L-L) interface), their transactions are affected by the differences in their cultural backgrounds. Different cultures have different ways of dealing with common problems. Organisations are not immune to cultural considerations. Organisational behaviour is subject to these influences at every level. The following three levels of culture have relevance to safety management initiatives:

a) ***National culture*** recognises and identifies the national characteristics and value systems of particular nations. People of different nationalities differ, for example, in their response to authority, how they deal with uncertainty and ambiguity, and how they express their individuality. They are not all attuned to the collective needs of the group (team or organisation) in the same way. In collectivist cultures, there is acceptance of unequal status and deference to leaders. Such factors may affect the willingness of individuals to question decisions or actions — an important consideration in CRM. Work assignments that mix national cultures may also affect team performance by creating misunderstandings.

b) ***Professional culture*** recognises and identifies the behaviour and characteristics of particular professional groups (e.g. the typical behaviour of pilots vis-à-vis that of ATCOs or AMEs). Through personnel selection, education and training, on-the-job experience, etc., professionals (e.g. doctors, lawyers, pilots and ATCOs) tend to adopt the value system of, and develop behaviour patterns consistent with, their peers; they learn to *"walk and talk"* alike. They generally share a pride in their profession and are motivated to excel in it. On the other hand, they frequently have a sense of personal invulnerability, e.g. they

feel that their performance is not affected by personal problems and that they do not make errors in situations of high stress.

c) ***Organisational culture*** recognises and identifies the behaviour and values of particular organisations (e.g. the behaviour of members of one company versus that of another company, or government versus private sector behaviour). Organisations provide a shell for national and professional cultures. In an airline, for example, pilots may come from different professional backgrounds (e.g. military versus civilian experience, and bush or commuter operations versus development within a large carrier). They may also come from different organisational cultures due to corporate mergers or layoffs. Generally, personnel in the aviation industry enjoy a sense of belonging. They are influenced in their day-to-day behaviour by the values of their organisation. Does the organisation recognise merit? Promote individual initiative? Encourage risk taking? Tolerate breeches of SOPs? Promote open two-way communications, etc.? Thus the organisation is a major determinant of employee behaviour.

The greatest scope for creating and nourishing a culture of safety is at the organisational level. This is commonly referred to as ***corporate safety culture*** and is discussed further below. The three cultural sets described above determine, for example, how juniors will relate to their seniors, how information is shared, how personnel will react under stress, how particular technologies will be embraced, how authority will be acted upon and how organisations react to human errors (e.g. punish offenders or learn from experience). Culture will be a factor in how automation is applied; how procedures (SOPs) are developed; how documentation is prepared, presented, and received; how training is developed and delivered; how work assignments are made; relationships between pilots and Air Traffic Control (ATC); relationships with unions, etc. In other words, culture impacts on virtually every type of interpersonal transaction. In addition, cultural considerations creep into the design of equipment and tools. Technology may appear to be culture-neutral, but it reflects the biases of the manufacturer (e.g. consider the English language bias implicit in much of the world's computer software). Yet, there is no right and no wrong culture; they are what they are and they each possess a blend of strengths and weaknesses.

3.2.1 Corporate Safety Culture

As seen above, many factors create the context for human behaviour in the workplace. Organisational or corporate culture sets the boundaries for accepted human behaviour in the workplace by establishing the

behavioural norms and limits. Thus, organisational or corporate culture provides a cornerstone for managerial and employee decision-making — *"This is how we do things here!"* Safety culture is a natural bi-product of corporate culture. The corporate attitude towards safety influences the employees' collective approach to safety. Safety culture consists of shared beliefs, practices and attitudes. The tone for safety culture is set and nurtured by the words and actions of senior management. Corporate safety culture then is the atmosphere created by management that shapes workers' attitudes towards safety.

Safety culture is affected by such factors as:

a) management's actions and priorities;
b) policies and procedures;
c) supervisory practices;
d) safety planning and goals;
e) actions in response to unsafe behaviours;
f) employee training and motivation; and
g) employee involvement or "buy-in".

The ultimate responsibility for safety rests with the directors and management of the organisation — whether it is an airline, a service provider (e.g. airports and ATS) or an approved maintenance organisation (AMO). The safety ethos of an organisation is established from the outset by the extent to which senior management accepts responsibility for safe operations and for the management of risk. How line management deals with the day-to-day activities is fundamental to a sound safety culture. Are the correct lessons being drawn from actual line experiences and the appropriate actions taken? Are the affected staff constructively involved in this process, or do they feel they are the victims of management's unilateral action? The relationship that line management has with the representatives of the regulatory authority is also indicative of a healthy safety culture or not. This relationship should be marked by professional courtesy, but with enough distance so as not to compromise accountability. Openness will lead to better safety communications than strict enforcement of regulations. The former approach encourages constructive dialogue, while the latter encourages concealing or ignoring the real safety problems.

3.2.2 Positive Safety Culture

Although compliance with safety regulations is fundamental to safety, contemporary thinking is that much more is required. Organisations that simply comply with the minimum standards set by the regulations are not in a good position to identify emerging safety problems. An effective way to promote a safe operation is to ensure that an operator

has developed a positive safety culture. Simply put, all staff must be responsible for, and consider the impact of, safety on everything they do. This way of thinking must be so deep-rooted that it truly becomes a *"culture"*. All decisions (for example, whether by the Board of Directors, by a driver on the ramp, or by an AME) need to consider the implications on safety. A positive safety culture must be generated from the *"top down"*. It relies on a high degree of trust and respect between workers and management. Workers must believe that they will be supported in any decisions made in the interests of safety. They must also understand that intentional breaches of safety that jeopardise operations will not be tolerated. There is also a significant degree of interdependence between the safety culture and other aspects of an SMS. A positive safety culture is essential for the effective operation of an SMS. However, the culture of an organisation is also shaped by the existence of a formal SMS. An organisation should therefore not wait until it has achieved an ideal safety culture before introducing an SMS. The culture will develop as exposure to, and experience with, safety management increases.

3.2.3 Indications of a Positive Safety Culture

A positive safety culture demonstrates the following attributes:

1. Senior management places strong emphasis on safety as part of the strategy of controlling risks (i.e. minimising losses).
2. Decision-makers and operational personnel hold a realistic view of the short- and long-term hazards involved in the organisation's activities.

3. Those in senior positions:

a. foster a climate in which there is a positive attitude towards criticisms, comments and feedback from lower levels of the organisation on safety matters;
b. do not use their influence to force their views on subordinates; and
c. implement measures to contain the consequences of identified safety deficiencies.

3. Senior management promotes a non-punitive working environment. Some organisations use the term "just culture" instead of "non-punitive".
   The term non-punitive **does not** imply blanket immunity.
4. There is an awareness of the importance of communicating relevant safety information at all levels of the organisation (both within and with outside entities).

5. There are realistic and workable rules relating to hazards, safety and potential sources of damage.
6. Personnel are well trained and understand the consequences of unsafe acts.
7. There is a low incidence of risk-taking behaviour, and a safety ethic that discourages such behaviour.

Positive safety cultures typically are:

a) ***Informed cultures***. Management fosters a culture where people understand the hazards and risks inherent in their areas of operation. Personnel are provided with the necessary knowledge, skills and job experience to work safely, and they are encouraged to identify the threats to their safety and to seek the changes necessary to overcome them.

b) ***Learning cultures***. Learning is seen as more than a requirement for initial skills training; rather it is valued as a lifetime process. People are encouraged to develop and apply their own skills and knowledge to enhance organisational safety. Staff are updated on safety issues by management, and safety reports are fed back to staff so that everyone can learn the pertinent safety lessons.

c) ***Reporting cultures***. Managers and operational personnel freely share critical safety information without the threat of punitive action. This is frequently referred to as creating a corporate reporting culture. Personnel are able to report hazards or safety concerns as they become aware of them, without fear of sanction or embarrassment.

c) ***Just cultures***. While a non-punitive environment is fundamental for a good reporting culture, the workforce must know and agree on what is acceptable and what is unacceptable behaviour. Negligence or deliberate violations must not be tolerated by management (even in a non-punitive environment). A just culture recognizes that, in certain circumstances, there may be a need for punitive action and attempts to define the line between acceptable and unacceptable actions or activities. Table 1 summarises three corporate responses to safety issues that range from a poor safety culture through the indifferent (or bureaucratic) approach (which only meets minimum acceptable requirements), to the ideal positive safety culture.

Table1: Characteristics of different safety cultures

Safety Culture: ⇨ ***Characteristics*** ⇩	***Poor***	***Bureaucratic***	***Positive***
Hazard information is:	Suppressed	Ignored	Actively sought
Safety messengers are:	Discouraged or punished	Tolerated	Trained and encouraged
Responsibility for safety is:	Avoided	Fragmented	Shared
Dissemination of safety information is:	Discouraged	Allowed but discouraged	Rewarded
Failures lead to:	Cover-ups	Local fixes	Inquiries and systemic reform
New ideas are:	Crushed	Considered as new problems (not opportunities)	Welcomed

Blame and punishment

Once an investigation has identified the *cause* of an occurrence, it is usually evident who "*caused"* the event. Traditionally, blame (and punishment) could then be assigned. While the legal environments vary widely between States, many States still focus their investigations on determining blame and apportioning liability. For them, punishment remains a principal safety tool. Philosophically, punishment is appealing from several points of view, such as:

- seeking retribution for a breach of trust;
- protecting society from repeat offenders;
- altering individual behaviour; and
- setting an example for others.

Punishment may have a role to play where people intentionally contravene the "rules". Arguably, such sanctions may deter the perpetrator of the violation (or others in similar circumstances). If an accident was the result of an error in judgement or technique, it is almost impossible to effectively punish for that error. Changes could be made in selection or training processes or the system could be made more tolerant of such errors. If punishment is selected in such cases, two outcomes are almost certain. Firstly, no further reports will be received of such errors. Secondly, since nothing has been done to change the situation, the same accident could be expected again.

Perhaps society needs to use punishment in order to mete out justice. However, the global experience suggests that punishment has little, if any, systemic value on safety. Except in wilful cases of negligent behaviour with deliberate violations of the norms, punishment serves little purpose from a safety perspective. In much of the international aviation community, a more enlightened view of the role of punishment is emerging. In part, this parallels a growing understanding of the causes of human errors (as opposed to violations). Errors are now being viewed as the *results* of some situation or circumstance, not necessarily the *causes* of them. As a result, managers are beginning to seek out the unsafe conditions that facilitate such errors. They are beginning to find that the systematic identification of organisational weaknesses and safety deficiencies pays a much higher dividend for safety management than punishing individuals. (That is not to say that these enlightened organisations are not required to take action against individuals who fail to improve after counselling and/or extra training.) While many aviation operations are taking this positive approach to the management of safety, others have been slow to adopt and implement effective "non-punitive policies". Others have been slow to extend their non-punitive policies on a corporate-wide basis.

SELF-ASSESSMENT EXERCISE

Explain the concept 'Corporate safety culture' and the role of culture in Safety management.

4.0 CONCLUSION

Generally, every organisation is made up of personnel from diverse backgrounds who enjoy a sense of belonging, best explained by the individual as well as the organisational corporate culture. It goes a long way in determining how work ethics are prepared, viewed and adhered to and the general operations in ensuring safety in the workplace, a situation only possible with the cooperation and the joint efforts of all in any organisation.

5.0 SUMMARY

The workplace typically involves a complex set of interrelated factors and conditions, which may affect human performance and limitations through cultural influences: values, beliefs and behaviours shared with the other members of our various social groups. Culture therefore serves to bind workers together as factor necessary in both ensuring effective operations and organisational safety in the workplace. The SHEL model explains man, machine and his environment from the traditional point of view with emphasis on the various components of the aviation industry.

6.0 TUTOR- MARKED ASSIGNMENT

The SHEL model is particularly useful in visualising the interfaces between the various components of the aviation system. Discuss the impact of the model to safety management.

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MODULE 2

Unit 1 Human Error and Aviation Safety
Unit 2 Basics of Safety Management
Unit 3 Risk Management

UNIT 1 HUMAN ERROR AND AVIATION SAFETY

CONTENTS

1.0 INTRODUCTION

Human error is cited as being a causal or contributing factor in the majority of aviation occurrences. All too often competent personnel commit errors, although clearly they did not plan to have an accident. Errors are not some type of aberrant behaviour; they are a natural bi-product of virtually all human endeavours. Error must be accepted as a normal component of any system where humans and technology interact. *"To err is human."* Given the rough interfaces of the aviation system (as depicted in the SHEL model), the scope for human errors in aviation is enormous. Understanding how *normal* people commit errors is fundamental to safety management. Only then can effective measures be implemented to minimise the effects of human errors on safety. Even if not altogether avoidable, human errors are *manageable* through the application of improved technology, relevant training, and appropriate regulations and procedures

2.0 OBJECTIVES

At the end of this unit, you should be able to:

- explain human error and types of error
- discuss safety cycle and cost consideration in safety management
- examine some strategies for managing errors in aircraft maintenance.

3.0 MAIN CONTENT

3.1 Human Error and Error Types

Most measures aimed at error management involve front-line personnel. However, the performance of pilots, ATCOs, AMEs, etc. can be strongly influenced by organisational, regulatory, cultural and environmental factors affecting the workplace. For example, organisational processes constitute the breeding grounds for many predictable human errors, including inadequate communication facilities, ambiguous procedures, unsatisfactory scheduling, insufficient resources, and unrealistic budgeting — in fact, all processes that the organisation can control. Above discussion summarises some of the factors contributing to human errors — and to accidents.

Errors may occur at the planning stage or during the execution of the plan. ***Planning errors*** lead to ***mistakes***; either the person follows an inappropriate procedure for dealing with a routine problem or builds a plan for an inappropriate course of action to cope with a new situation. Even when the planned action is appropriate, errors may occur in the execution of the plan. The Human Factors literature on such errors in execution generally draws a distinction between slips and lapses. A ***slip*** is an action which is not carried out as planned and will therefore always be observable. A ***lapse*** is a failure of memory and may not necessarily be evident to anyone other than the person who experienced the lapse.

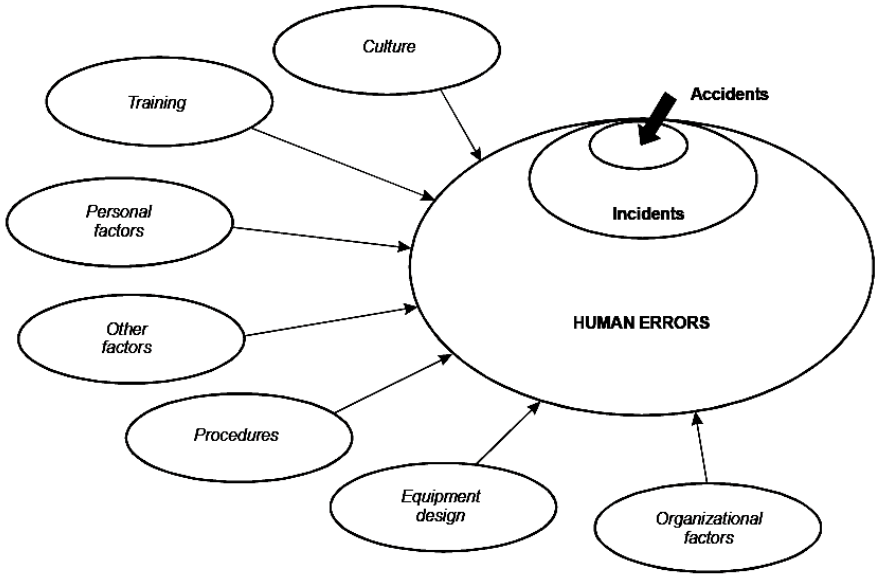

Fig. 1: Contributory factors to human errors

Planning errors (mistakes)

In problem solving, we intuitively look for a set of rules (SOPs, rules of thumb, etc.) that are known and have been used before and that will be appropriate to the problem in hand. Mistakes can occur in two ways: the application of a rule that is not appropriate to the situation, or the correct application of a rule that is flawed.

1. **Misapplication of good rules.** This usually happens when an operator is faced with a situation that exhibits many features common to the circumstances for which the rule was intended, but with some significant differences. If the significance of the differences is not recognised, an inappropriate rule may be applied.

2. **Application of bad rules**. This involves the use of a procedure that past experience has shown to work but that contains unrecognised flaws. If such a solution works in the circumstances under which it was first tried, it may become part of the individual's regular approach to solving that type of problem. When a person does not have a ready-made solution based on previous experience and/or training, that person draws on personal knowledge and experience.

Developing a solution to a problem using this method will inevitably take longer than applying a rule-based solution, as it requires reasoning based on knowledge of basic principles. Mistakes can occur because of a lack of knowledge or because of faulty reasoning. The application of knowledge-based reasoning to a problem will be particularly difficult in circumstances where the individuals are busy, as their attention is likely to be diverted from the reasoning process to deal with other issues. The probability of a mistake occurring becomes greater in such circumstances.

Execution errors (slips and lapses*)*

The actions of experienced and competent personnel tend to be routine and highly practiced; they are carried out in a largely automatic fashion, except for occasional checks on progress. Slips and lapses can occur as the result of:

a) **Attentional slips**. These occur as a result of a failure to monitor the progress of a routine action at some critical point. They are particularly likely when the planned course of action is similar, but not identical, to a routinely used procedure. If attention is allowed to wander or a distraction occurs at the critical point

where the action differs from the usual procedure, the result can be that the operator will follow the usual procedure rather than the one intended in this instance.

b) **Memory lapses.** These occur when we either forget what we had planned to do, or omit an item in a planned sequence of actions.

c) **Perceptual errors**. These are errors in recognition. They occur when we believe we saw or heard something which is different from the information actually presented.

Errors versus Violations

Errors (which are a normal human activity) are quite distinct from violations. Both can lead to a failure of the system. Both can result in a hazardous situation. The difference lies in the intent. A violation is a deliberate act, while an error is unintentional. Take, for example, a situation in which an ATCO allows an aircraft to descend through the level of a cruising aircraft when the DME distance between them is 18 NM, and this occurs in circumstances where the correct separation minimum is 20 NM. If the ATCO made a mistake in calculating the difference in the DME distances advised by the pilots, this would be an error. If the ATCO calculated the distance correctly and allowed the descending aircraft to continue through the level of the cruising aircraft knowing that the required separation minimum did not exist, this would be a violation. Some violations are the result of poor or unrealistic procedures where people have developed “work arounds” to accomplish the task. In such cases, it is very important that they be reported as soon as they are encountered in order that the procedures can be corrected. In any event, violations should not be tolerated. There have been accidents where a corporate culture that tolerated or, in some cases, encouraged the taking of short cuts rather than the following of published procedures was identified as a contributory cause.

Control of human error

Fortunately, few errors lead to adverse consequences, let alone accidents. Typically, errors are identified and corrected with no undesirable outcomes, for example, selecting an incorrect frequency or setting the altitude bug to the wrong altitude. On the understanding that errors are normal in human behaviour, the total elimination of human error would be an unrealistic goal. The challenge then is not merely to prevent errors but to learn to safely manage the inevitable errors. Three strategies for managing errors in aircraft maintenance are briefly discussed below:

a) **Error reduction** strategies intervene directly at the source of the error by reducing or eliminating the contributing factors to the error. Examples of error reduction strategies include improving the access to an aircraft component for maintenance, improving the lighting in which the task is to be performed, reducing environmental distractions and providing better training. Most error management strategies used in aircraft maintenance fall into this category.

b) **Error capturing** assumes the error has already been made. The intent is to *"capture"* the error before any adverse consequences of the error are felt. Error capturing is different from error reduction in that it does not directly serve to reduce or eliminate the error. Examples of error-capturing strategies include cross-checking to verify correct task completion and functional test flights.

c) **Error tolerance** refers to the ability of a system to accept an error without serious consequence. Examples of measures to increase error tolerance are the incorporation of multiple hydraulic or electrical systems on an aircraft to provide redundancy, and a structural inspection programme that provides multiple opportunities to detect a fatigue crack — before it reaches critical length.

3.2 Safety Cycle

Given the number and potential relationships of the factors that may affect safety, an effective SMS is required. An example of the type of systematic process required is shown in Figure 2. A brief description of the safety cycle follows:

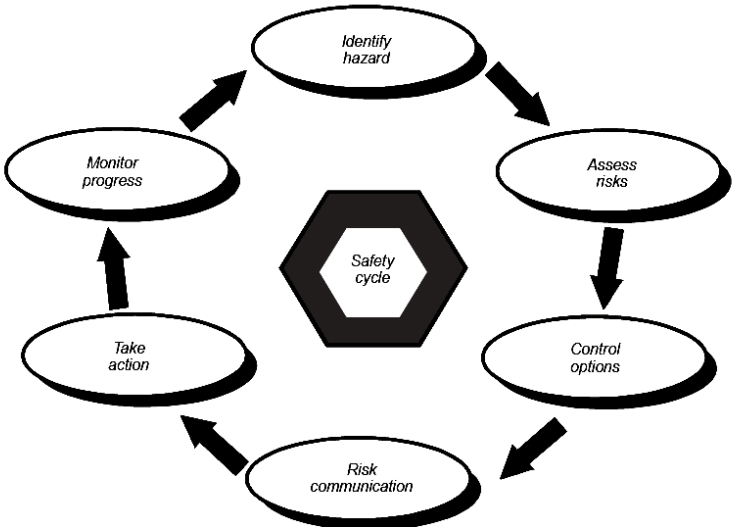

Fig 2: Safety Cycle

Hazard identification is the critical first step in managing safety. Evidence of hazards is required and may be obtained in a number of ways from a variety of sources, for example:

a) hazard and incident reporting systems;
b) investigation and follow-up of reported hazards and incidents;
c) trend analysis;
d) feedback from training;
e) flight data analysis;
f) safety surveys and operational oversight safety audits;
g) monitoring of normal operations;
h) state investigation of accidents and serious incidents; and
i) information exchange systems.

Each hazard identified must be evaluated and prioritised. This evaluation requires the compilation and analysis of all available data. The data is then assessed to determine the extent of the hazard; is it a "one-of-a-kind" or is it systemic? A database may be required to facilitate the storage and retrieval of the data. Appropriate tools are needed to analyse the data. Having validated a safety deficiency, decisions must then be made as to the most appropriate action to avoid or eliminate the hazard or reduce the associated risks. The solution must take into account the local conditions, as "one size" does not fit all situations. Care must be taken that the solution does not introduce new hazards. This is the process of risk management.

Once appropriate safety action has been implemented, performance must be monitored to ensure that the desired outcome has been achieved, for example:

a) The hazard has been eliminated (or at least the associated risks have been reduced in probability or severity).
b) The action taken permits coping satisfactorily with the hazard.
c) No new hazards have been introduced into the system.

If the outcome is unsatisfactory, the whole process must be repeated.

3.3 Cost Considerations

Operating a profitable, yet safe airline or service provider requires a constant balancing act between the need to fulfil production goals (such as departures that are on time) versus safety goals (such as taking extra time to ensure that a door is properly secured). The aviation workplace is filled with potentially unsafe conditions which will not all be eliminated; yet, operations must continue. Some operations adopt a goal of *"zero accidents"* and state that *"safety is their number one priority"*.

The reality is that operators (and other commercial aviation organisations) need to generate a profit to survive. Profit or loss is the immediate indicator of the company's success in meeting its production goals. However, safety is a prerequisite for a sustainable aviation business, as a company tempted to cut corners will eventually realise. For most companies, safety can best be measured by the absence of accidental losses. Companies may realise they have a safety problem following a major accident or loss, in part because it will impact on the profit/loss statement. However, a company may operate for years with many potentially unsafe conditions without adverse consequence. Without effective safety management to identify and correct these unsafe conditions, the company may assume that it is meeting its safety objectives, as evidenced by the *"absence of losses"*. In reality, it has been lucky. Safety and profit are not mutually exclusive. Indeed, quality organisations realise that expenditures on the correction of unsafe conditions are an investment towards long-term profitability. Losses cost money. As money is spent on risk reduction measures, costly losses are reduced (as shown in Figure 4-7). However, by spending more and more money on risk reduction, the gains made through reduced losses may not be in proportion to the expenditures. Companies must balance the costs of losses and expenditures on risk reduction measures. Some level of loss may be acceptable from a straight profit and loss point of view; however, few organisations can survive the economic consequences of a major accident. Hence, there is a strong economic case for an effective SMS to manage the risks.

Costs of Accidents

There are two basic types of costs associated with an accident or a serious incident: direct and indirect.

A. Direct costs

These are the obvious costs which are fairly easy to determine. They mostly relate to physical damage and include rectifying, replacing or compensating for injuries, aircraft equipment and property damage. The high costs of an accident can be reduced by insurance coverage. (Some large organisations effectively self-insure by putting funds aside to cover their risks.)

B. Indirect costs

While insurance may cover specified accident costs, there are many uninsured costs. An understanding of these uninsured costs (or indirect costs) is fundamental to understanding the economics of safety. Indirect costs include all those items that are not directly covered by insurance

and usually total much more than the direct costs resulting from an accident. Such costs are sometimes not obvious and are often delayed. Some examples of uninsured costs that may accrue from an accident include:

a) ***Loss of business and damage to the reputation of the organisation.*** Many organisations will not allow their personnel to fly with an operator with a questionable safety record.

b) ***Loss of use of equipment.*** This equates to lost revenue. Replacement equipment may have to be purchased or leased. Companies operating a one-of-a-kind aircraft may find that their spares inventory and the people specially trained for such an aircraft become surplus.

c) ***Loss of staff productivity.*** If people are injured in an accident and are unable to work, many States require that they continue to be paid. Also, these people will need to be replaced at least for the short term, incurring the costs of wages, overtime (and possibly training), as well as imposing an increased workload on the experienced workers.

d) ***Investigation and clean-up.*** These are often uninsured costs. Operators may incur costs from the investigation including the costs of their staff involvement in the investigation, as well as the costs of tests and analyses, wreckage recovery, and restoring the accident site.

e) ***Insurance deductibles.*** The policyholder's obligation to cover the first portion of the cost of any accident must be paid. A claim will also put a company into a higher risk category for insurance purposes and therefore may result in increased premiums. (Conversely, the implementation of a comprehensive SMS could help a company to negotiate a lower premium.)

f) ***Legal action and damage claims.*** Legal costs can accrue rapidly. While it is possible to insure for public liability and damages, it is virtually impossible to cover the cost of time lost handling legal action and damage claims.

g) ***Fines and citations.*** Government authorities may impose fines and citations, including possibly shutting down unsafe operations.

Costs of Incidents

Serious aviation incidents, which result in minor damage or injuries, can also incur many of these indirect or uninsured costs. Typical cost factors arising from such incidents can include:

a) flight delays and cancellations;
b) alternate passenger transportation, accommodation, complaints, etc.;
c) crew change and positioning;
d) loss of revenue and reputation;
e) aircraft recovery, repair and test flight; and
f) incident investigation.

Costs of safety

The costs of safety are even more difficult to quantify than the full costs of accidents — partly because of the difficulty in assessing the value of accidents that have been prevented. Nevertheless, some operators have attempted to quantify the costs and benefits of introducing an SMS. They have found the cost savings to be substantial. Performing a cost-benefit analysis is complicated; however, it is an exercise that should be undertaken, as senior management is not inclined to spend money if there is no quantifiable benefit. One way of addressing this issue is to separate the costs of the SMS from the costs of correcting safety deficiencies, by charging the safety management costs to the safety department, and the safety deficiency costs to the line management most responsible. This exercise requires senior management's involvement in considering the costs and benefits of an SMS.

SELF-ASSESSMENT EXERCISE

Explain the concepts of human error in safety management.

4.0 CONCLUSION

Errors are inevitable in any conglomeration of people be it any organisation (involving a normal human activity). Human errors can lead to a failure of the system as a result of hazard. Using the aviation industry as an example, a service provider requires a constant balancing act between the need to fulfil production goals (such as departures that are on time) versus safety goals (such as taking extra time to ensure that a door is properly secured). The aviation workplace is said to be filled with potentially unsafe conditions which will not all be eliminated. The reality therefore is that operators (and other commercial aviation organisations) need to generate a profit to survive. Profit or loss is the

immediate indicator of the company's success in meeting its production goals. However, safety is a prerequisite for a sustainable aviation business. The safety cycle is explained to be a guide in identifying and correcting these unsafe conditions.

5.0 SUMMARY

This unit discusses the inevitability of human errors in the occurrence of hazard or disasters. It focuses as well on the various types of human errors that are capable of wrecking an organisation with specific emphasis on the aviation sector. The cost implication of accidents shows that a lot of organisations can lose their reputation and staff productivity based on improper safety management. in this regard it is expected that safety cycle frame work will serve as a guide in ensuring adequate safety environment.

6.0 TUTOR-MARKED ASSIGNMENT

1. With the aid of a diagram explain the concept safety cycle.
2. What are the basic types of costs associated with an accident?

7.0 REFERENCES/FURTHER READING

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UNIT 2 BASICS OF SAFETY MANAGEMENT

CONTENTS

1.0 INTRODUCTION

In successful aviation organisations, safety management is a core business function as is financial management. Effective safety management requires a realistic balance between safety and production goals. Thus, a coordinated approach in which the organisation's goals and resources are analysed helps to ensure that decisions concerning safety are realistic and complementary to the operational needs of the organisation. The finite limits of financing and operational performance must be accepted in any industry. Defining acceptable and unacceptable risks is therefore important for cost-effective safety management. If properly implemented, safety management measures not only increase safety but also improve the operational effectiveness of an organisation.

2.0 OBJECTIVE

At the end of this unit, you should be able to:

- explain some basic principles of safety management in a systematic, proactive and explicit manner.

3.0 MAIN CONTENT

3.1 Basics of Safety Management

Addressing safety in a systematic, proactive and explicit manner ensures that on a long-term basis safety becomes an integral part of the day-to-day business of the organisation and that the safety related activities of the organisation are directed to the areas where the benefits will be greatest. In the management of safety, three terms are paramount: a. systematic, proactive, and explicitly. These terms are explained below.

- **Systematic: This** means that safety management activities will be conducted in accordance with a predetermined plan and applied in a consistent manner throughout the organisation.

- **Proactive** means the adoption of an approach which emphasizes prevention through the identification of hazards and the introduction of risk mitigation measures before the risk-bearing event occurs and adversely affects safety performance.

- ***Explicit*** means that all safety management activities should be documented, visible and performed independently from other management activities.

Systems approach

Modern approaches to safety management have been shaped by the concepts introduced earlier and, in particular, by the role of organisational issues as contributory factors in accidents and incidents. Safety cannot be achieved simply by introducing rules or directives concerning the procedures to be followed by operational staff. The scope of safety management encompasses most of the activities of the organisation. For this reason, safety management must start at the senior management level, and the effects on safety must be examined at all levels of the organisation.

System safety

System safety was developed as an engineering discipline for aerospace and missile defence systems in the 1950s. Its practitioners were safety engineers, not operational specialists. As a result, their focus tended to be on designing and building fail-safe systems. On the other hand, civil aviation tended to focus on flight operations, and safety managers often came from the ranks of pilots. In pursuing improved safety, it became necessary to view aviation safety as more than just the aeroplane and its pilots. Aviation is a total system that includes everything needed for safe flight operation. The “system” includes the airport, air traffic control, maintenance, cabin crew, ground operational support, dispatch, etc. Sound safety management must address all parts of the system.

Factors affecting system safety

The factors affecting safety within the defined system can be looked at two ways: first, by discussing those factors which may result in situations in which safety is compromised; and second, by examining how an understanding of these factors can be applied to the design of systems in order to reduce the likelihood of occurrences which may

compromise safety. The search for factors that could compromise safety must include all levels of the organisation responsible for operations and the provision of supporting services. As outlined in Chapter 4, safety starts at the highest level of the organisation.

Active failures and latent conditions

Active failures are generally the result of equipment faults or errors committed by operational personnel. *Latent conditions*, however, always have a human element. They may be the result of undetected design flaws. They may be related to unrecognised consequences of officially approved procedures. There have also been a number of cases where latent conditions have been the direct result of decisions taken by the management of the organisation. For example, latent conditions exist when the culture of the organisation encourages taking short cuts rather than always following approved procedures. The direct consequence of a condition associated with taking short cuts would materialise at the operational level by non-adherence to correct procedures. However, if there is general acceptance of this sort of behaviour among operational personnel, and management is either unaware of this or takes no action, there is a latent condition in the system at the management level.

Equipment faults

The likelihood of system failures due to equipment faults is in the domain of reliability engineering. The probability of system failure is determined by analysing the failure rates of individual components of the equipment. The causes of the component failures may include electrical, mechanical and software faults. A safety analysis is required to consider both the likelihood of failures during normal operations and the effects of continued unavailability of any one element on other aspects of the system. The analysis should include the implications of any loss of functionality or redundancy as a result of equipment being taken out of service for maintenance. It is therefore important that the scope of the analysis and the definition of the boundaries of the system for purposes of the analysis be sufficiently broad so that all necessary supporting services and activities are included. As a minimum, a safety analysis should consider the elements of the SHEL model outlined in module one.

The techniques for estimating the probability of overall system failure as a result of equipment faults and for estimating parameters, such as availability and continuity of service, are well established and are described in standard texts on reliability and safety engineering. These issues will not be addressed further in this manual.

Human error

An error occurs when the outcome of a task being performed by a human is not the intended outcome. The way in which a human operator approaches a task depends on the nature of the task and on how familiar the operator is with it. Human performance may be skill-based, rule-based or knowledge-based. Errors may be the consequence of lapses in memory, slips in doing what was intended, or the result of mistakes which are conscious errors in judgement. A distinction should also be made between honest or normal errors committed in the fulfilment of assigned duties, and deliberate violations of prescribed procedures or accepted safe practices. As discussed in Chapter 4, some organisations use the concept of a "just culture" to assist in defining what errors are "acceptable".

System design

Given the complex interplay of human, material and environmental factors in operations, the complete elimination of risk is an unachievable goal. Even in organisations with the best training programmes and a positive safety culture, human operators will occasionally make errors. The best designed and maintained equipment will occasionally fail. System designers must therefore take into account the inevitability of errors and failures. It is important that the system be designed and implemented in such a way that, to the maximum extent possible, errors and equipment failures will not result in an accident. In other words, the system is "*error-tolerant*". The hardware and software components of a system are generally designed to meet specified levels of availability, continuity and integrity. The techniques for estimating system performance in terms of these parameters are well established. When necessary, redundancy can be built into the system to provide alternatives in the event of failure of one or more elements of the system. The performance of the human element cannot be specified as precisely; however, it is essential that the possibility of human error be considered as part of the overall design of the system. This requires an analysis to identify potential weaknesses in the procedural aspects of the system, taking into account the normal shortcomings in human performance. The analysis should also take into account the fact that accidents rarely, if ever, have a single cause. As noted earlier, they usually occur as part of a sequence of events in a complex situational context. Therefore, the analysis needs to consider combinations of events and circumstances in order to identify sequences that could possibly result in safety being compromised. Developing a safe and error-tolerant system requires that the system contain multiple defences to ensure that, as much as possible, no single failure or error will result in an accident, and that when a failure or error occurs, it will be

recognised and remedial action taken before a sequence of events leading to an accident can develop. The need for a series of defences rather than just a single defensive layer arises from the possibility that the defences themselves may not always work perfectly. This design philosophy is called “defences-in-depth”. For an accident to occur in a well-designed system, gaps must develop in all the defensive layers of the system at the critical time when that defence should have been capable of detecting the earlier error or failure. An illustration of how an accident event must penetrate all defensive layers is in the figure below:

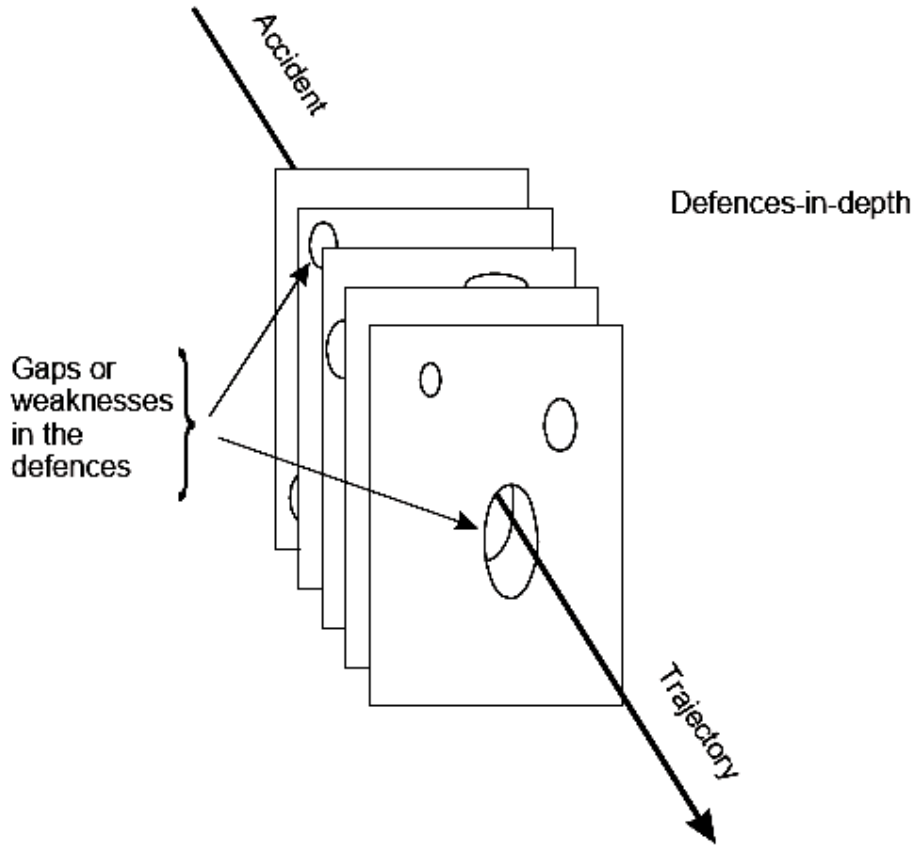

Figure 1: Defences-in-depth

3.2 Safety Management Concepts

Cornerstones of safety management

In its most simple terms, safety management involves hazard identification and the closing of any gaps in the defences of the system. Effective safety management is multidisciplinary, requiring the systematic application of a variety of techniques and activities across the aviation spectrum. It builds upon three defining cornerstones, namely:

a) *A comprehensive **corporate approach** to safety.* This sets the tone for the management of safety. The corporate approach builds upon the safety culture of the organisation and embraces the organisation's safety policies, objectives and goals, and, most importantly, senior management's commitment to safety.

b) *Effective **organisational tools** to deliver safety standards.* Effective organisational tools are needed to deliver the necessary activities and processes to advance safety. This cornerstone includes how the organisation arranges its affairs to fulfil its safety policies, objectives and goals, and how it establishes standards and allocates resources. The principal focus is on hazards and their potential effects on safety-critical activities.

c) *A formal system for **safety oversight**.* This is needed to confirm the organisation's continuing fulfilment of its corporate safety policy, objectives, goals and standards. The term safety oversight refers specifically to the activities of the State as part of its safety programme. For an operator or service provider, the term safety performance monitoring is often used to cover these activities under its safety management system (SMS).

Strategies for safety management

The strategy that an organisation adopts for its SMS will reflect its corporate safety culture and may range from purely reactive, responding only to accidents, through to strategies that are highly proactive in their search for safety problems. The traditional or reactive process is dominated by retrospective repairs (i.e. fixing the stable door after the horse has bolted). Under the more modern or proactive approach, prospective reform plays the leading part (i.e. making a stable from which no horse could run away or even want to). Depending on the strategy adopted, different methods and tools need to be employed.

***Reactive safety strategy**: Investigate accidents and reportable incidents*
This strategy is useful for situations involving failures in technology, or unusual events. The utility of the reactive approach for safety management purposes depends on the extent to which the investigation goes beyond determining the causes to include an examination of all the contributory factors. The reactive approach tends to be marked by the following characteristics:

1. Management's safety focus is on compliance with minimum requirements.
2. Safety measurement is based on reportable accidents and incidents with such limitations in value as:

a. Any analysis is limited to examining actual failures;
b. Insufficient data is available to accurately determine trends, especially those attributable to human error; and
c. Little insight is available into the *"root causes"* and latent unsafe conditions, which facilitate human error.

3. Constant "catching up" is required to match human inventiveness for new types of errors.

Proactive safety strategy*: Aggressively seeking information from a variety of sources which may be indicative of emerging safety problems*
Organisations pursuing a proactive strategy for safety management believe that the risk of accidents can be minimized by identifying vulnerabilities before they fail and by taking the necessary actions to reduce those risks. Consequently, they actively seek systemic unsafe conditions using such tools as:

a) hazard and incident reporting systems that promote the identification of latent unsafe conditions;
b) safety surveys to elicit feedback from front-line personnel about areas of dissatisfaction and unsatisfactory conditions that may have accident potential;
c) flight data recorder analysis for identifying operational exceedances and confirming normal operating procedures;
d) operational inspections or audits of all aspects of operations to identify vulnerable areas before accidents, incidents or minor safety events confirm a problem exists; and
e) a policy for consideration and embodiment of manufacturers' service bulletins.

Key Safety Management Activities

Those organisations which manage safety most successfully practice several common activities. Some of those specific activities are outlined below:

a) ***Organisation***. They are organised to establish a safety culture and to reduce their accidental losses. Organisations will normally have a formal SMS

b) ***Safety assessments***. They systematically analyse proposed changes to equipment or procedures to identify and mitigate weaknesses before change is implemented.

c) ***Occurrence reporting***. They have established formal procedures for reporting safety occurrences and other unsafe conditions.

d) ***Hazard identification schemes***. They employ both reactive and proactive schemes for identifying safety hazards throughout their organisation, such as voluntary incident reporting, safety surveys, operational safety audits, and safety assessments.

e) ***Investigation and analysis***. They follow up on reported occurrences and unsafe conditions and, if necessary, initiate competent safety investigations and safety analyses.

f) ***Performance monitoring***. They actively seek feedback necessary to close the loop of the safety management process using such techniques as trend monitoring and internal safety audits.

g) ***Safety promotion***. They actively disseminate the results of safety investigations and analyses, sharing safety lessons learned both within the organisation and outside, if warranted.

h) ***Safety oversight***. The State (regulator) and regulated organisation both have systems in place to monitor and assess safety performance. All these activities are described in more detail elsewhere in this manual.

Safety management process

Conceptually, the safety management process parallels the safety cycle described in previous unit. Both involve a continuous loop process as represented. Safety management is evidence-based, in that it requires the analysis of data to identify hazards. Using risk assessment techniques, priorities are set for reducing the potential consequences of the hazards.

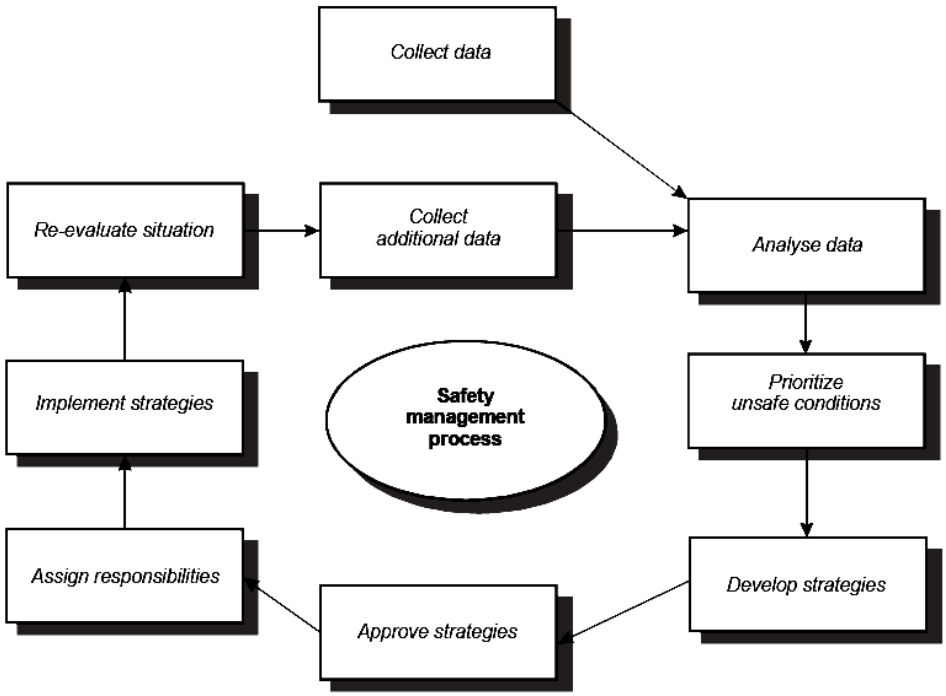

Figure 2: Safety Management Process

Strategies to reduce or eliminate the hazards are then developed and implemented with clearly established accountabilities. The situation is reassessed on a continuing basis, and additional measures are implemented as required. The steps of the safety management process outlined in Figure 2 are briefly described below:

1. ***Collect the data***. The first step in the safety management process is the acquisition of relevant safety data — the evidence necessary to determine safety performance or to identify latent unsafe conditions (safety hazards). The data may be derived from any part of the system: the equipment used, the people involved in the operation, work procedures, the human/equipment/ procedures interactions, etc.

2. ***Analyse the data***. By analysing all the pertinent information, safety hazards can be identified. The conditions under which the hazards pose real risks, their potential consequences and the likelihood of occurrence can be determined; in other words, *What* can happen? *How?* and *When?* This analysis can be both qualitative and quantitative.

3. ***Prioritize the unsafe conditions***. A risk assessment process determines the seriousness of hazards. Those posing the greatest

risks are considered for safety action. This may require a cost-benefit analysis.

4. ***Develop strategies***. Beginning with the highest priority risks, several options for managing the risks may be considered, for example:

a) **S*pread*** the risk across as large a base of risk-takers as practicable. (This is the basis of insurance.)

b) ***Eliminate*** the risk entirely (possibly by ceasing that operation or practice).

c) ***Accept*** the risk and continue operations unchanged.

d) ***Mitigate*** the risk by implementing measures to reduce the risk or at least facilitate coping with the risk. When selecting a risk management strategy, care is required to avoid introducing new risks that result in an unacceptable level of safety.

5. ***Approve strategies***. Having analysed the risks and decided on an appropriate course of action, management's approval is required to proceed. The challenge in this step is the formulation of a convincing argument for (perhaps expensive) change.

6. ***Assign responsibilities and implement strategies***. Following the decision to proceed, the "*nuts and bolts"* of implementation must be worked out. This includes a determination of resource allocation, assignment of responsibilities, scheduling, revisions to operating procedures, etc.

7. ***Re-evaluate situation***. Implementation is seldom as successful as initially envisaged. Feedback is required to close the loop. What new problems may have been introduced? How well is the agreed strategy for risk reduction meeting performance expectations? What modifications to the system or process may be required?

8. ***Collect additional data***. Depending on the re-evaluation step, new information may be required and the full cycle reiterated to refine the safety action.

Safety management requires analytical skills that may not be routinely practiced by management. The more complex the analysis, the more important the need for the application of the most appropriate analytical tools. The closed loop process of safety management also requires feedback to ensure that management can test the validity of its decisions

and assess the effectiveness of their implementation. (Chapter 9 provides guidance on safety analysis.)

Safety oversight

The term safety oversight refers to the activities of a State under its safety programme, while safety performance monitoring refers to the activities of an operator or service provider under its SMS. Safety oversight or safety performance monitoring activities are an essential component of an organisation's safety management strategy. Safety oversight provides the means by which a State can verify how well the aviation industry is fulfilling its safety objectives. Some of the requirements for a safety performance monitoring system will already be in place in many organisations. For example, States would normally have regulations relating to mandatory reporting of accidents and incidents.

Identifying weaknesses in the system's defences requires more than just collecting retrospective data and producing summary statistics. The underlying causes of reported occurrences are not necessarily immediately apparent; therefore, investigation of safety occurrence reports and any other information concerning possible hazards should go hand in hand with safety performance monitoring. The implementation of an effective safety oversight programme requires that States and organisations:

a) determine relevant safety performance indicators (see 5.3.17 to 5.3.21);
b) establish a safety occurrence reporting system;
c) establish a system for the investigation of safety occurrences;
d) develop procedures for the integration of safety data from all available sources; and
e) develop procedures for the analysis of the data and the production of periodic safety performance reports.

Safety performance indicators and targets

As described in early units, the safety management process is a closed loop. The process requires feedback to provide a baseline for assessing the system's performance so that necessary adjustments can be made to affect the desired levels of safety. This requires a clear understanding of how results are to be evaluated. For example, what quantitative or qualitative indicators will be employed to determine that the system is working? Having decided on the factors by which success can be measured; safety management requires the setting of specific safety

goals and objectives (targets). For the purposes of this manual, the following terminology is used:

- ***Safety performance indicator***. A measure (or metric) used to express the level of safety performance achieved in a system.
- ***Safety performance target***. The required level of safety performance for a system. A safety performance target comprises one or more safety performance indicators, together with desired outcomes expressed in terms of those indicators.

A distinction should be made between the criteria used to assess operational safety performance through monitoring, and the criteria used for the assessment of planned new systems or procedures. The process for the latter is known as safety assessments.

Safety performance indicators

In order to set safety performance targets, it is necessary to first decide on appropriate safety performance indicators. Safety performance indicators are generally expressed in terms of the frequency of occurrence of some event causing harm. Typical measures that could be used include:

a) aircraft accidents per 100 000 flight hours;
b) aircraft accidents per 10 000 movements;
c) fatal aircraft accidents per year; and
d) serious incidents per 10 000 flight hours.

There is no single safety performance indicator that is appropriate in all circumstances. The indicator chosen to express a safety performance target must be matched to the application in which it will be used, so that it will be possible to make a meaningful evaluation of safety in the same terms as those used in defining the safety performance target. The safety performance indicator(s) chosen to express global, regional and national targets will not generally be appropriate for application to individual organisations. Since accidents are relatively rare events, they do not provide a good indication of safety performance — especially at the local level. Even at the global level, accident rates vary considerably from year to year. An increase or decrease in accidents from one year to the next does not necessarily indicate a change in the underlying level of safety.

Safety performance targets

Having decided on appropriate safety indicators, it is then necessary to decide on what represents an acceptable outcome or goal. For example,

ICAO has set global safety performance targets in the objectives of the Global Aviation Safety Plan (GASP). These are:

a) to reduce the number of accidents and fatalities worldwide irrespective of the volume of air traffic; and
b) to achieve a significant decrease in accident rates, particularly in regions where these remain high. The desired safety outcome may be expressed either in absolute or relative terms. ICAO's global targets are examples of relative targets. A relative target could also incorporate a desired percentage reduction in accidents or particular types of safety occurrences within a defined time period. For example, under a State safety programme, a regulatory oversight authority may determine that an acceptable level of safety will be achieved by specifying the following safety performance targets:

i) **for airline operators:** less than 0.2 fatal accidents per 100 000 hours. A further target may be that the number of EGPWS warnings be reduced by 30 per cent in the next 12 months;
ii) **for aircraft maintenance organisations:** less than 200 major aircraft defects per 100, 000 hours flown;
iii) **for aerodrome operators:** less than 1.0 bird strike per 1 000 aircraft movements; and
v) **for ATS providers:** less than 40 airspace incidents per 100 000 flights.

In each sector of the industry, various safety requirements would be utilized to achieve the required safety performance, as measured by safety indicators. The graphs in Figures 5-3 to 5-5 may help to explain the relationship between safety performance indicators and safety performance targets. Figure 5-3 depicts the airspace incident rate (safety indicators) of two categories of aircraft over a defined period. In this graph, no targets are set, but the graph indicates a slight reduction in both rates over the period. The graph in Figure 5-4 could indicate the number of bird strikes (or any other metric) over a defined period. A trend line is shown. In this case, the trend line and final figure have remained below the target line — a desirable situation.

SELF-ASSESSMENT EXERCISE

Explain how the safety management process functions.

4.0 CONCLUSION

This unit concludes that the basic strategies in safety management and underlining concepts will go a long way in preparing students in the task

of not only envisaging events that may necessitate safety management or prevention techniques in loss management that are most times unpredictable. Using risk assessment techniques, priorities are better set for reducing the potential consequences of any hazards.

5.0 SUMMARY

This unit examines basic safety management, concepts and various strategies and approaches in safety management such as the system approach, the proactive approach, and the explicit approach. Other underlining factors in the process of safety management were discussed relating to safety oversights, strategies for safety management and cornerstones for safety management.

6.0 TUTOR-MARKED ASSIGNMENT

Safety oversight or safety performance monitoring activities are an essential component of an organisation's safety management strategy. Discuss.

7.0 REFERENCES/FURTHER READING

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UNIT 3 RISK MANAGEMENT

CONTENTS

1.0 INTRODUCTION

The aviation industry faces a diversity of risks every day, many capable of compromising the viability of an operator, and some even posing a threat to the industry. Indeed, risk is a by-product of doing business. Not all risks can be eliminated, nor are all conceivable risk mitigation measures economically feasible.

2.0 OBJECTIVES

At the end of this unit**,** you should be able to explain**:**

- the meaning and importance of risk management and
- the various aspect of hazard identification.

3.0 MAIN CONTENT

3.1 Risk Management and Hazard Identification

The risks and costs inherent in aviation necessitate a rational process for decision-making. Daily, decisions are made in real time, weighing the probability and severity of any adverse consequences implied by the risk against the expected gain of taking the risk. This process is known as *"risk management"*. For the purposes of this manual, *risk management* can be defined as follows:

Risk management*. The identification, analysis and elimination (and/or mitigation to an acceptable or tolerable level) of those hazards, as well as the subsequent risks, that threaten the viability of an organisation.* In other words, risk management facilitates the balancing act between assessed risks and viable risk mitigation. Risk management is an integral component of safety management. It involves a logical process of

objective analysis, particularly in the evaluation of the risks. An overview of the process for risk management is summarized in the flow chart in Figure 1. As the figure indicates, risk management comprises three essential elements: hazard identification, risk assessment and risk mitigation. The concepts of risk management have equal application in decision making in flight operations, air traffic control, maintenance, airport management and State administration.

Hazard Identification

Given that a hazard may involve any situation or condition that has the potential to cause adverse consequences, the scope for hazards in aviation is wide. The following are some examples:

a) ***Design factors***, including equipment and task design;

b) ***Procedures and operating practices***, including their documentation and checklists, and their validation under actual operating conditions

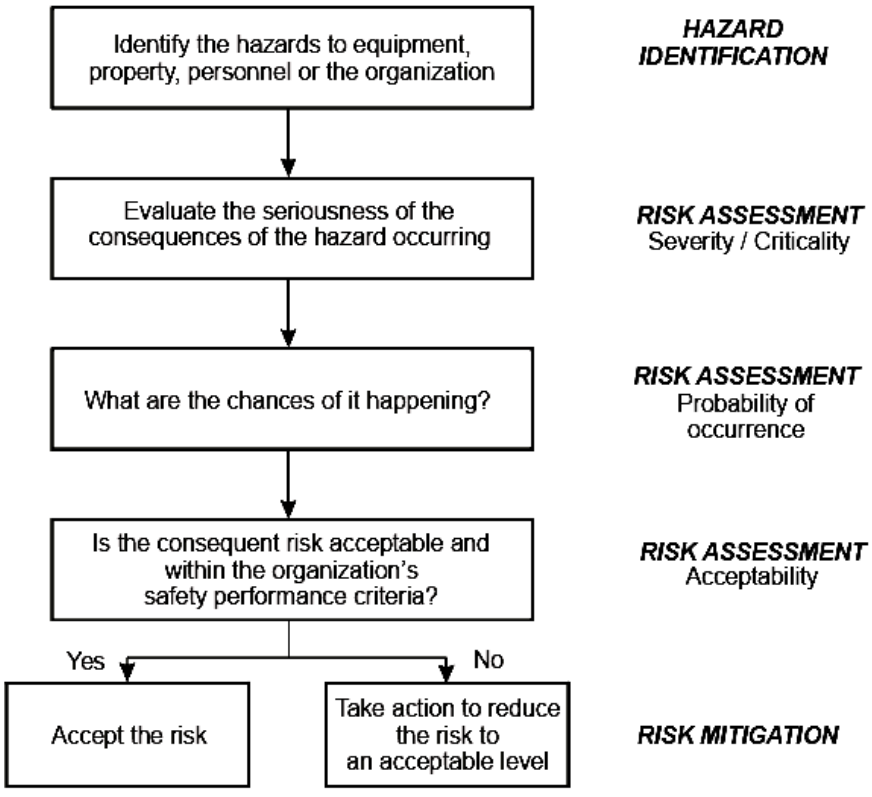

Fig. 1: Risk management process

c) ***Communications***, including the medium, terminology and language;

d) ***Personnel factors***, such as company policies for recruitment, training and remuneration;

e) ***Organisational factors***, such as the compatibility of production and safety goals, the allocation of resources, operating pressures and the corporate safety culture;

f) ***Work environment factors***, such as ambient noise and vibration, temperature, lighting and the availability of protective equipment and clothing;

g) ***Regulatory oversight factors***, including the applicability and enforceability of regulations; the certification of equipment, personnel and procedures; and the adequacy of surveillance audits; and

h) ***Defences***, including such factors as the provision of adequate detection and warning systems, the error tolerance of equipment and the extent to which the equipment is hardened against failures.

Safety events are clear evidence of problems in the system and therefore provide an opportunity to learn valuable safety lessons. Safety events should therefore be investigated to identify the hazards putting the system at risk. This involves investigating all the factors, including the organisational factors and the Human Factors that played a role in the event. In a mature safety management system, hazard identification should arise from a variety of sources as an ongoing process. However, there are times in an organisation's life when special attention to hazard identification is warranted. Safety assessments provide a structured and systemic process for hazard identification when: a) there is an unexplained increase in safety-related events or safety infractions; b) major operational changes are planned, including changes to key personnel or other major equipment or systems; c) the organisation is undergoing significant change, such as rapid growth or contraction; or d) corporate merger, acquisition or downsizing is planned.

3.2 Risk Assessment

Having confirmed the presence of a safety hazard, some form of analysis is required to assess its potential for harm or damage. Typically, this assessment of the hazard involves three considerations: a) the ***probability*** of the hazard precipitating an unsafe event (i.e. the probability of adverse consequences should the underlying unsafe conditions be allowed to persist); b) the ***severity*** of the potential adverse consequences, or the outcome of an unsafe event; and c) the rate of

exposure to the hazards. The probability of adverse consequences becomes greater through increased exposure to the unsafe conditions. Thus, exposure may be viewed as another dimension of probability. However, some methods of defining probability may also include the exposure element, for example, a rate of 1 in 10 000 hours.

Risk is the assessed potential for adverse consequences resulting from a hazard. It is the likelihood that the hazard's potential to cause harm will be realized.

Risk assessment involves consideration of both the probability and the severity of any adverse consequences; in other words, the loss potential is determined. In carrying out risk assessments, it is important to distinguish between *hazards* (the potential to cause harm) and *risk* (the likelihood of that harm being realized within a specified period of time). A risk assessment matrix (such as the one provided in Table 1) is a useful tool for prioritizing the hazards most warranting attention.

There are many ways — some more formal than others — to approach the analytical aspects of risk assessment. For some risks, the number of variables and the availability of both suitable data and mathematical models may lead to credible results with quantitative methods (requiring mathematical analysis of specific data). However, few hazards in aviation lend themselves to credible analysis solely through numerical methods. Typically, these analyses are supplemented qualitatively through critical and logical analysis of the known facts and their relationships.

Considerable literature is available on the types of analysis used in risk assessment. For the risk assessments discussed in this manual, sophisticated methods are not required; a basic understanding of a few methods will suffice. Whatever methods are used, there are various ways in which risks may be expressed, for example:

a) number of deaths, loss of revenue or loss of market share (i.e. absolute numbers);
b) loss rates (e.g. number of fatalities per 1, 000, 000 seat kilometres flown);
c) probability of serious accidents (e.g. 1 every 50 years);
d) severity of outcomes (e.g. injury severity); and
e) expected value of losses versus annual operating revenue.

Problem definition

In any analytical process, the problem must first be defined. In spite of identifying a perceived hazard, defining the characteristics of the hazard

into a problem for resolution is not always easy. People from different backgrounds and experience will likely view the same evidence from different perspectives. Something that poses a significant risk will reflect these different backgrounds, exacerbated by normal human biases. Thus, engineers will tend to see problems in terms of engineering deficiencies; medical doctors as medical deficiencies; psychologists as behavioural problems; etc. The anecdote in the following box exemplifies the multifaceted nature of defining a problem:

Charlie's Accident

Charlie has an emotional argument with his wife and proceeds to the local bar where he consumes several drinks. He leaves the bar and drives away in his car at high speed. Minutes later, he loses control on the highway and is fatally injured. We know WHAT happened; we must now determine WHY it happened.

The investigation team consists of six specialists, each of whom has a completely different perspective on the root safety deficiency.

The sociologist identifies a breakdown in interpersonal communications within the marriage. An enforcement officer from the Liquor Control Board notes the illegal sale of alcoholic beverages by the bar on a "two-for-one" basis. The pathologist determines that Charlie's blood alcohol was in excess of the legal limit. The highway engineer finds inadequate road banking and protective barriers for the posted speed. An automotive engineer determines that Charlie's car had a loose front end and bald tires. The policeman determines that the automobile was travelling at excessive speed for the prevailing conditions.

Each of these perspectives may result in a different definition of the underlying hazard.

Any or all of the factors cited in this example may be valid, underlining the nature of multicausality. How the safety issue is defined, however, will affect the course of action taken to reduce or eliminate the hazards. In assessing the risks, all potentially valid perspectives must be evaluated and only the most suitable pursued.

Probability of adverse consequences

Regardless of the analytical methods used, the probability of causing harm or damage must be assessed. This probability will depend on answers to such questions as:

a) Is there a history of similar occurrences, or is this an isolated occurrence?
b) What other equipment or components of the same type might have similar defects?
c) How many operating or maintenance personnel are following, or are subject to, the procedures in question?

d) What percentage of the time is the suspect equipment or the questionable procedure in use?
e) To what extent are there organisational, management or regulatory implications that might reflect larger threats to public safety?

Based on these considerations, the likelihood of an event occurring can be assessed, for example, as:

a) ***Unlikely to occur***. Failures that are "unlikely to occur" include isolated occurrences, and risks where the exposure rate is very low or the sample size is small. The complexity of the circumstances necessary to create an accident situation may be such that it is unlikely the same chain of events will happen again. For example, it is unlikely that independent systems would fail concurrently. However, even if the possibility is only remote, the consequences of concurrent failures may warrant follow-up.

Note that there is a natural tendency to attribute unlikely events to "coincidence". Caution is advised. While coincidence may be statistically feasible, coincidence should not be used as an excuse for the absence of due analysis.

b) ***May occur***. Failures that "may occur" derive from hazards with a reasonable probability that similar patterns of human performance can be expected under similar working conditions, or that the same material defects exist elsewhere in the system.

c) ***Probably will occur***. Such occurrences reflect a pattern (or potential pattern) of material failures that have not yet been rectified. Given the design or maintenance of the equipment, its strength under known operating conditions, etc., continued operations will likely lead to failure. Similarly, given the empirical evidence on some aspects of human performance, it can be expected with some certainty that normal individuals operating under similar working conditions would likely commit the same errors or be subject to the same undesirable performance outcome.

Severity of the consequences of occurrence

Having determined the probability of occurrence, the nature of the adverse consequences if the event does occur must be assessed. The potential consequences govern the degree of urgency attached to the safety action required. If there is significant risk of catastrophic consequences, or if the risk of serious injury, property or environmental

damage is high, urgent follow-up action is warranted. In assessing the severity of the consequences of occurrence, the following types of questions could apply:

a) How many ***lives are at risk****? (Employees, passengers, bystanders and the general public.)*
b) What is the likely extent of ***property*** or ***financial damage****? (Direct property loss to the operator, damage to aviation infrastructure, third party collateral damage, financial impact and economic impact for the State.)*
c) What is the likelihood of ***environmental impact****? (Spill of fuel or other hazardous product, and physical disruption of natural habitat.)*
d) What are the likely ***political implications*** and/or ***media interest****?*

Risk acceptability

Based on the risk assessment, the risks can be prioritized relative to other, unresolved safety hazards. This is critical in making rational decisions to allocate limited resources against those hazards posing the greatest risks to the organisation. Prioritising risks requires a rational basis for ranking one risk vis-à-vis other risks. Criteria or standards are required to define what is an *acceptable* risk and what is an *unacceptable* risk. By weighing the likelihood of an undesirable outcome against the potential severity of that outcome, the risk can be categorized within a risk assessment matrix. Many versions of risk assessment matrices are available from literature. While the terminology or definitions used for the different categories may vary, such tables generally reflect the ideas summarized in Table 1.

In this version of a risk assessment matrix:

a) ***Severity*** of risk is ranked as *Catastrophic*, *Hazardous*, *Major*, *Minor* or *Negligible* with a descriptor for each indicating the potential severity of consequences. Other definitions can be used, reflecting the nature of the operation being analysed.
b) ***Probability*** (or ***likelihood***) of occurrence is also ranked through five different levels of qualitative definitions, and descriptors are provided for each likelihood of occurrence.
c) ***Values*** may be assigned numerically to weigh the relative importance of each level of severity and probability. A composite assessment of risk, to assist in comparing risks, may then be derived by multiplying the severity and probability values.

Having used a risk matrix to assign values to risks, a range of values may be assigned in order to categorise risks as acceptable, undesirable or unacceptable. These terms are explained below:

- ***Acceptable*** means that no further action needs to be taken (unless the risk can be reduced further at little cost or effort).
- ***Undesirable*** (or ***tolerable***) means that the affected persons are prepared to live with the risk in order to have certain benefits, in the understanding that the risk is being mitigated as best as possible.
- ***Unacceptable*** means that operations under the current conditions must cease until the risk is reduced to at least the *Tolerable* level.

A less numeric approach to determining the *acceptability* of particular risks includes consideration of such factors as:

a) ***Managerial***. Is the risk consistent with the organisation's safety policy and standards?
b) ***Affordability***. Does the nature of the risk defy cost-effective resolution?
c) ***Legal***. Is the risk in conformity with current regulatory standards and enforcement capabilities?
d) ***Cultural***. How will the organisation's personnel and other stakeholders view this risk?
e) ***Market***. Will the organisation's competitiveness and well-being vis-à-vis other organisations be compromised by not reducing or eliminating this risk?
f) ***Political***. Will there be a political price to pay for not reducing or eliminating this risk?
g) ***Public***. How influential will the media or special interest groups be in affecting public opinion regarding this risk?

Risk assessment matrix

SEVERITY OF CONSEQUENCES			LIKELIHOOD OF OCCURRENCE		
Aviation definition	***Meaning***	***Value***	***Qualitative definition***	***Meaning***	***Value***
Catastrophic	Equipment destroyed. Multiple deaths.	5	Frequent	Likely to occur many times	5
Hazardous	A large reduction in safety margins, physical distress or a workload such that the operators cannot be relied upon to perform their tasks accurately or completely. Serious injury or death to a number of people. Major equipment damage.	4	Occasional	Likely to occur sometimes	4
Major	A significant reduction in safety margins, a reduction in the ability of the operators to cope with adverse operating conditions as a result of an increase in work-load, or as a result of conditions impairing their efficiency. Serious incident. Injury to persons.	3	Remote	Unlikely, but possible to occur	3
Minor	Nuisance. Operating limitations. Use of emergency procedures. Minor incident.	2	Improbable	Very unlikely to occur	2
Negligible	Little consequence	1	Extremely improbable	Almost inconceivable that the event will occur	1

Risk Mitigation

Where risk is concerned, there is no such thing as absolute safety. Risks have to be managed to a level “as low as reasonably practicable” (***ALARP***). This means that the risk must be balanced against the time, cost and difficulty of taking measures to reduce or eliminate the risk. When the *acceptability of the risk* has been found to be *Undesirable* or *Unacceptable*, control measures need to be introduced — the higher the risk, the greater the urgency. The level of risk can be lowered by reducing the severity of the potential consequences, by reducing the likelihood of occurrence or by reducing the exposure to that risk. The optimum solution will vary depending on the local circumstances and exigencies. In formulating meaningful safety action, an understanding of the adequacy of existing defences is required.

Defence analysis

A major component of any safety system is the defences put in place to protect people, property or the environment. These defences can be used to:

a) reduce the probability of unwanted events occurring; and
b) reduce the severity of the consequences associated with any unwanted events.

Defences can be categorised into two types, namely:

a) ***Physical defences***. These include objects that discourage or prevent inappropriate action, or that mitigate the consequences of events (for example, squat switches, switch covers, firewalls, survival equipment, warnings and alarms).

b) ***Administrative defences***. These include procedures and practices that mitigate the probability of an accident (for example, safety regulations, SOPs, supervision and inspection, and personal proficiency).

Before selecting appropriate risk mitigation strategies, it is important to understand *why* the existing system of defences was inadequate. The following line of questioning may pertain:

a. Were defences provided to protect against such hazards?
b. Did the defences function as intended?
c. Were the defences practical for use under actual working conditions?
d. Were the affected staff aware of the risks and the defences in place?
e. Are additional risk mitigation measures required?

Risk mitigation strategies

There is a range of strategies available for risk mitigation, for example:

a) ***Exposure avoidance***. The risky task, practice, operation or activity is avoided because the risk exceeds the benefits.

b) ***Loss reduction***. Activities are taken to reduce the frequency of the unsafe events or the magnitude of the consequences.

c) ***Segregation of exposure*** (separation or duplication). Action is taken to isolate the effects of the risk or build in redundancy to

protect against the risks, i.e. reduce the severity of the risk (for example, protecting against collateral damage in the event of a material failure, or providing back-up systems to reduce the likelihood of total system failure).

Brainstorming

Generating the ideas necessary to create suitable risk mitigation measures poses a challenge. Developing risk mitigation measures frequently requires creativity, ingenuity and, above all, an open mind to consider all possible solutions. The thinking of those closest to the problem (usually with the most experience) is often coloured by set ways and natural biases. Broad participation, including by representatives of the various stakeholders, tends to help overcome rigid mindsets. Thinking *"outside the box"* is essential to effective problem solving in a complex world. All new ideas should be weighed carefully before rejecting any of them.

Evaluating risk mitigation options

In evaluating alternatives for risk mitigation, not all have the same potential for reducing risks. The effectiveness of each option needs to be evaluated before a decision can be taken. It is important that the full range of possible control measures be considered and that trade-offs between measures be considered to find an optimal solution. Each proposed risk mitigation option should be examined from such perspectives as:

1. ***Effectiveness***. Will it reduce or eliminate the identified risks? To what extent do alternatives mitigate the risks? Effectiveness can be viewed as being somewhere along a continuum, as follows:

a) ***Level One*** (Engineering actions): The safety action **eliminates** the risk, for example, by providing interlocks to prevent thrust reverser activation in flight;

b) ***Level Two*** (Control actions): The safety action accepts the risk but adjusts the system to **mitigate** the risk by reducing it to a manageable level, for example, by imposing more restrictive operating conditions; and

c) ***Level Three*** (Personnel actions): The safety action taken accepts that the hazard can neither be eliminated (Level One) nor controlled (Level Two), so personnel must be taught how to **cope** with it, for example, by adding a warning, a revised checklist and extra training.

2. ***Cost/benefit***. Do the perceived benefits of the option outweigh the costs? Will the potential gains be proportional to the impact of the change required?

3. ***Practicality***. Is it **doable** and appropriate in terms of available technology, financial feasibility, administrative feasibility, governing legislation and regulations, political will, etc.?

4. ***Challenge***. Can the risk mitigation measure withstand critical scrutiny from all stakeholders (employees, managers, stockholders/State administrations, etc.)?

5. ***Acceptability*** to each stakeholder. How much buy-in (or resistance) from stakeholders can be expected? (Discussions with stakeholders during the *risk assessment* phase may indicate their preferred risk mitigation option.)

6. ***Enforceability***. If new rules (SOPs, regulations, etc.) are implemented, are they enforceable?

7. ***Durability***. Will the measure withstand the test of time? Will it be of temporary benefit or will it have long-term utility?

8. ***Residual risks***. After the risk mitigation measure is implemented, what will be the residual risks relative to the original hazard? What is the ability to mitigate any residual risks?

9. ***New problems***. What new problems or new (perhaps worse) risks will be introduced by the proposed change?

Obviously, preference should be given to corrective actions that will completely eliminate the risk. Regrettably, such solutions are often the most expensive. At the other end of the spectrum, when there is insufficient organisational will or resources, the problem is often deferred to the training department to teach staff to cope with the risks. In such cases, management may be avoiding hard decisions by delegating responsibility for the risk to subordinates.

Risk Communication

Risk communication includes any exchange of information about risks, i.e. any public or private communication that informs others about the existence, nature, form, severity or acceptability of risks. The information needs of the following groups may require special attention

a) Management must be appraised of all risks that present loss potential to the organisation.
b) Those exposed to the identified risks must be appraised of their severity and likelihood of occurrence.
c) Those who identified the hazard need feedback on action proposed.
d) Those affected by any planned changes need to be appraised of both the hazards and the rationale for the action taken.
e) Regulatory authorities, suppliers, industry associations, the general public, etc. have potential information needs regarding specific risks.
f) The stakeholders can assist the decision-maker(s) if the risks are communicated early in a fair, objective and understandable way. Effective communication of the risks (and plans for their resolution) adds value to the risk management process. Failure to communicate the safety lessons learned in a clear and timely fashion will undermine management's credibility in promoting a positive safety culture. For safety messages to be credible, they must be consistent with the facts, with previous statements from management and with the messages from other authorities. These messages need to be expressed in terms the stakeholders understand.

Risk Management Considerations for State Administrations

Risk management techniques have implications for State administrations in areas ranging from policy development through to the *"go/no-go"* decisions confronting front-line State civil aviation inspectors, for example:

a. ***Policy***. To what extent should a State accept the certification paperwork of another State?
b. ***Regulatory change***. From the many (often-conflicting) recommendations made for regulatory change, how are decisions made?
c. ***Priority setting***. How are decisions made for determining those areas of safety warranting emphasis during safety oversight audits?
d. ***Operational management***. How are decisions made when insufficient resources are available to carry out all planned activities?
e. ***Operational inspections***. At the front line, how are decisions made when critical errors are discovered outside of normal working hours?

Occasions warranting risk management by State administrations

Some situations should alert state aviation administrations to the possible need for applying risk management methods, for example:

a) start-up or rapidly expanding companies;
b) corporate mergers;
c) companies facing bankruptcy or other financial difficulties;
d) companies facing serious labour-management difficulties;
e) introduction of major new equipment by an operator;
f) certification of a new aircraft type, new airport, etc.;
g) introduction of new communication, navigation or surveillance equipment and procedures; and
h) significant change to air regulations or other laws potentially impacting on aviation safety.

However risk management by State administrations will be affected by such factors as:

a) *time available* to make the decision (grounding an aircraft, revoking a certificate, etc.);
b) *resources available* to effect the necessary actions;
c) *number of people* affected by required actions (company-wide, fleet-wide, regional, national, international, etc.);
d) *potential impact* of the State's decision for action (or inaction); and
e) *cultural and political will* to take the action required.

Benefits of risk management for State administrations

Applying risk management techniques in decision-making offers benefits for State administrations, including:

a) avoiding costly mistakes during the decision-making process;
b) ensuring that all aspects of the risk are identified and considered when making decisions;
c) ensuring that the legitimate interests of affected stakeholders are considered;
d) providing decision-makers with a solid defence in support of decisions;
e) making decisions easier to explain to stakeholders and the general public; and
f) providing significant savings in time and money.

SELF-ASSESSMENT EXERCISE

1. What are the range of strategies available for risk mitigation?
2. explain some of the perspectives that can foster a good risk mitigation options

4.0 CONCLUSION

It is expected that students are able to identify and recommend some strategies of risk mitigation, as discussed, such as: exposure avoidance, loss reduction and segregation of exposure. In doing this it is first and foremost assumed that the individual evaluates risk mitigation options at various levels for risk management to be effective by brainstorming.

5.0 SUMMARY

This unit explains seven key events in risk management ranging from hazard Identification, risk assessment, risk mitigation, mitigation options, and risk communication. It discusses risk management consideration for government policies, the benefits therein and occasion warranting risk management techniques

6.0 TUTOR-MARKED ASSIGNMENT

Discuss any Risk management process that you think is feasible.

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MODULE 3

UNIT 1 SAFETY AND SECURITY: COMPARABLE INDICATORS OF VIOLENCE

CONTENTS

1.0 INTRODUCTION

One of the greatest impediments to human security in the post-Cold War era is not interstate wars resulting in mass destruction fought by the armed forces of nation states, but violence, perpetrated by individuals, groups, and state actors within the internal borders of nations. Violence, resulting from everyday crime, large-scale communal conflicts and insurgencies or through state repression can and does undo the development gains achieved in education, health, employment, capital generation and infrastructure provision. Violence is a public health problem, a human rights problem, a community problem, and a problem for the state and the international community. It impedes human freedom to live safely and securely and can sustain poverty traps in many communities. However, violence is not always an inevitable part of human interaction. Many multi-ethnic, multi-religious, and poor people manage human interaction and channel conflict and the propensity for violence in peaceful ways.

2.0 OBJECTIVES

At the end of this unit, you should be able to:

- explain the various perceptions of security and safety
- examines violence and poverty as an inextricable link in the study of safety and loss management
- capture data on the incidence of violence and other threats to safety and security (predominantly theft) between people with the exclusion of self-harm.

3.0 MAIN CONTENT

The World Report on Violence and Health states that self-inflicted, interpersonal or collective violence kills more than 1.6 million people every year with an overall age-adjusted rate of 28.8 per 100 000 population. An estimated 5.06 million people die each year as a result of injury (both accidental and intentional) (WHO, 2004). According to data from high-income countries alone, for every person killed from injury, approximately 30 times as many people are hospitalised from injury, and 300 times as many are treated in hospital emergency rooms and then released. Self-inflicted injuries are estimated to be the fourth leading cause of death and the sixth leading cause of ill-health and disability within the 15-44 age group (WHO, 1999). The vast majority of these deaths occurred in low- to middle-income countries with less than 10% of all violence-related deaths occurring in high-income countries. Nearly half of these 1.6 million violence-related deaths were suicides, almost one-third were homicides and about one-fifth were war related. These figures, while horrifying, are vulnerable to gross under-reportage due to poor data availability, but do give some indication as to the seriousness of the problem, particularly in developing countries. To provide some context, tuberculosis kills 1.7 million people a year (UN, 2006), the number of AIDS-related deaths increased in 2005 to 2.8 million across the world, despite greater access to antiretroviral treatment and improved care in some regions (UN, 2006), and 10.5 million children died before their fifth birthday in 2004 – mostly from preventable causes (UN, 2006). These figures do not include injury rates, which in many cases sustain poverty traps.

According to the United Nations Statistics, in 1990, more than 1.2 billion people 28% of the developing world's population lived in extreme poverty. By 2002, the proportion decreased to 19% (UN, 2006). The laudable Millennium Development Goals (MDGs) aim to target poverty, and in particular, address the special needs of the least developed countries, landlocked countries and small island developing states; to achieve a significant improvement in the lives of at least 100

million slum-dwellers by 2020; to halve, between 1990 and 2015, the proportion of people who suffer from hunger; and to halve, between 1990 and 2015, the proportion of people whose income is less than $1 a day. However, it is precisely the people suffering from poverty who are most vulnerable to the devastating impacts of violence which can undermine the achievements made in reaching these goals.

3.1 Violence: Safety and Security as a Dimension of Poverty

There are many ways of defining violence, which is a long-researched and complex phenomenon found across the world. The World Health Organisation (2004), defines violence as "the intentional use of physical force or power, threatened or actual, against oneself, another person, or against a group or community, that either results in or has a high likelihood of resulting in injury, death, psychological harm, mal-development or deprivation." This paper draws on the WHO definition, although the indicators necessarily only capture a part of it. As this definition implies, violence may be physical, resulting in harm to person or property, or psychological, resulting in and from fear and oppression. Violence can be collective, where the perpetrators are a group or mob; or individual where one person is responsible for inflicting harm on a person or property; or it can be perpetrated by state actors acting in either official or unofficial capacities. Violence may be sexual, forcing people to commit acts of a sexual nature against their will, or it may be symbolic, including the desecration of cultural and religious symbols inciting group reprisals. Violence may be defined by the realm in which the act takes place (inter-personal, communal, state-society), or the way the violence is inflicted (property destruction, intentional injuries, crime, kidnapping), or by how the violence is inflicted (gunshot, stabbing, burning, bombing, rape, incest, and so on). Violence may be subject to cultural relativism where different cultures define acts as violent or not depending on local value systems, customs and social organisation. Often, the way data are collected on physical safety and security depends on how the institution or analyst defines violence or a problem associated with violence. At the broadest level, data on threats to physical safety and security in the form of violence can be disaggregated between violent crime (infringements on the state laws against person or property, perpetrated by individuals or small groups of individuals which could be identified with adequate information usually with motive) and conflict (also infringements on state laws, but usually perpetrated on a group basis which may be triggered by infringements on group or moral codes or motivated by political and other factors). When the justice system of individual states functions effectively, the incidence of both types of violence may be captured and recorded in police and court records. However, in many states in transition this is not the case, particularly in conflict situations where the state may cease

to function or the justice sector may be weak. A report on forms of insecurity and crime in Latin America identifies violence in the realms of crime, ethnic violence and racial intolerance, political violence in repressive democracies, drug-related narco-traffic, violence against children, domestic and gender violence, kidnappings, death threats, and violence perpetrated by police squads, and violence between indigents (Perez-Valero, 2002). The *World Report on Violence and Health* (WHO, 2002), reports on youth violence, child abuse and neglect by parents, violence by intimate partners, abuse of the elderly, sexual violence, self-directed violence, and collective violence. These are just two examples of the multitude of ways in which violence can be viewed, with categorical typologies often overlapping, including with respect to perpetrators, victims, root causes, politics, crime, and so on.

Indicators of violent conflict include injuries/deaths and destruction of property or goods. These indicators are also crimes in themselves, but in conflict contexts, the group nature of violence makes it unlikely that the perpetrators may be identified, captured, and/or prosecuted, leaving a serious gap in reporting of violence. Furthermore, the way in which people are targeted can vary between crime and conflict. In conflict situations, the targeting of victims may be indiscriminate, based on some broader identity. The victims of crimes, in contrast, may be (but are not always) based on personal relationships and grievances among particular individuals, as in the case of many homicides and assaults, but this can also occur in conflict situations. Previous research has shown that forms of conflict tend to be related and that small disputes act as triggers for bigger conflicts (Esman and Herring, 2001), with early triggers sometimes occurring in the form of everyday crime. Yet the appropriate policy responses for each form of threat to human security may be very different. Often the two areas overlap in reports on human security and safety but the two aspects are rarely both included in the same instrument of data collection. Given that the aim of this paper is to look at designing a module of a household survey which can measure incidents of violence and threats to human safety and security as a dimension of poverty, then both aspects, violent crime and violent conflict, need to be included in the survey module. Yet, while the data collected should cover incidents of both violent crime and broader conflicts, it should be detailed enough in each respect for disaggregation by the broad identity groupings of victims and perpetrators, the location and form of the incidents, and responses by the state and society to such incidents so that policy responses can be designed to combat the two broader realms.

Some definitions of violence, including the WHO definition above, include the threat of harm, not just the actual act. Wherever possible, this paper advocates the use of international definitions of the terms

associated with violence, but separates out the threat of violence from actual acts. The threat of violence is an important aspect of security and safety; however, threats can be real and perceived, incorporating many other psychological elements. The *Human Security Report* argues that fear seems to bear little relation to objective risks (Human Security Centre, 2005). Thus for the purposes of the measurement, these two aspects of violence, the actual acts and perception of threats, will be measured separately. They can be combined to create indicators which meet the WHO definition of aspects of violence.

3.2 Types of Violence: Bridging Conflict and crime Analyses

In order to Bridge the conflict-crime nexus, this unit uses a typology of violence which pertains to both violent conflict and crime occurring between people. The WHO (2004) identification of four types of intentional or deliberate violence resulting in injury or death is useful in considering how to design the survey module:

1. Interpersonal violence (e.g. assault, homicide, intimate partner violence, sexual violence
2. Self-directed violence or self-harm (deliberate overdose on drugs and alcohol, self-mutilation, self-immolation, suicide
3. Legal intervention (action by police or other law enforcement personnel)
4. War, civil insurrection and disturbances (e.g. demonstrations and riots)

It is important to highlight at the outset that these are major omissions, given that suicides account for such a large proportion of violence. However, this module seeks to bridge violent crime and conflict conceptually through the lens of interpersonal occurrences of either form of violence. Questions on self-harm would necessarily involve a different style of questioning and categorisation, overall leaving the module unwieldy and difficult to implement as a part of a larger survey on poverty. Thus, self-harm is not included in the module. The bridging typology underpinning the module allows for data to be collected on violent crime, violence in conflict contexts, the household and that perpetrated by the state (although this is not asked about directly). While the module can adequately capture data on the incidence of crime, it cannot adequately capture full information on the incidence of conflict where there are large numbers of perpetrators. However, it can adequately capture data on injuries and deaths associated with both crime and conflict.

3.2.1 Violence and its Impacts

One of the surprises of the comprehensive *Voices of the Poor* Study **(Narayan et al, 2000)** based on 78 Participatory Poverty Assessments (PPA) across countries, was the prominence of concerns for physical safety and security among the poor. The study finds that poverty is multi-dimensional, where 'Poverty never results from the lack of one thing but from many interlocking factors that cluster in poor people's experiences and definitions of poverty.' Violence and a lack of physical safety and security are among the dimensions of poverty not adequately addressed in most poverty measures which focus on income levels, or access to education and health facilities. The following excerpt from the Voices of the Poor Study highlights the importance given to this issue by the poor from around the world. It shows that problems differ across countries and that, for comparability, indicators used have to be flexible enough to accommodate the many dimensions that threats to physical safety through violence can take: Poor women express fear of increased crime, both in public and at home. In Ukraine, women and old people say they no longer leave their homes after dark, and "worry when their children return late from school or work" (Ukraine 1996). In Moldova, women are afraid to work the night shift because of fear of assaults (Moldova 1997). In South Africa, case studies document "rapes of teenage girls, unfiled claims of child support by mothers due to fears of being beaten by the fathers, and even the crippling of a woman following a drunken argument among the couple" (South Africa 1998). The South Africa PPA also describes gang-related and political violence. Women report of feeling vulnerable to physical attacks and sexual assaults when they are out collecting firewood. In India and in Pakistan, women spoke about the dangers of sexual assault and harassment by forest officials and others when collecting firewood. In Pakistan, absence of latrines forces women to use the bush before dawn and after dusk exposing them to snake bites, sexual harassment and attacks **(Pakistan 1993). In Bangladesh (1996),** provision of toilets and bathing places were high priority among adolescent girls and women because of fear of harassment and inconvenience.

Similarly, in a four-district intensive study on *Perceptions of the Poor* (Pal, 2001) conducted in Sri Lanka; ending civil conflict was amongst the five key poverty challenges highlighted by the study. Again the poor in this study perceive poverty to be multi-dimensional and speak of how they are poor as well as why they are poor, describing the threats of armed conflict and acts of violence they encounter everyday. For example, the overwhelming cause of poverty in the Trincomalee district was perceived to be the armed conflict. The conflict has disrupted or destroyed their livelihoods and increased the lack of security and mobility. Out of a total of some 83,829 families in the district, 40,437

had been displaced during the armed conflict during the 1990s, while over 30,960 houses, comprising one third of homes in the district, were damaged or destroyed. Physical safety and security were not just a concern in the district most affected by violence, but an everyday threat to citizens in the study in all four districts. See for example the following excerpt from Moneragala District (Pal, 2001)

> When an 18-year old girl was walking back from school, a drunken man raped her on the way. She had to be hospitalized. So our parents stopped us from going to school after we became big [reached puberty]. The man belonged to a rich family. Although the girl's family went to the police they didn't take any action against the man.
>
> Jayawathi Menike, farmer, Moneragala district

A lack of physical safety and security are a part of the general state of deprivation of these people and thus a part of their poverty. Violence is not the outcome of poverty but rather the reason for poverty according to this study. Thus it should be included in measures of poverty As stated previously, the *World Report on Violence and Health* (WHO, 2002) states that self-inflicted, interpersonal and collective violence kills more than 1.6 million people every year. However, there are considerable regional differences in rates of violent death: "In the African Region and the Region of the Americas, homicide rates are nearly three times greater than suicide rates. However, in the European and South-East Asia Regions, suicide rates are more than double homicide rates (19.1 per 100 000 as against 8.4 per 100 000 for the European Region, and 12.0 per 100 000 as against 5.8 per 100 000 for the South-East Asia Region), and in the Western Pacific Region, suicide rates are nearly six times greater than homicide rates (20.8 per 100 000 as against 3.4 per 100 000) ", (WHO, 2002). The report argues that these statistics are just the tip of the iceberg, with the majority of violent acts being committed behind closed doors and going largely unreported. It also demonstrates how the different forms of violence feed on each other. People who were subjected to child abuse or violence from an intimate partner are much more likely to commit acts of self harm. Collective violence fractures normal social bonds and often leads to sexual violence and heightened violence in young people. Almost every form of violence predisposes victims and perpetrators to another.

Civil wars are estimated to have killed 5 million people in the 1990s. Conflicts also force populations to migrate suddenly as internally displaced persons and as refugees. 'War and internal conflicts in the 1990s forced 50 million people to flee their homes.' Displacement

affects people's health and livelihoods, and may disrupt children's families and education. According to the *Human Security Report* (HSR) (HSC, 2005), civil wars, genocides, and international crises have all declined sharply in the past dozen years, and international wars together with military coups have been in steady decline for a much longer time period, particularly since the end of the cold war. The HSR finds that wars have fewer victims today, with battle-related deaths amounting to nearly 700,000 in 1950, compared to 20,000 in 2002, with sub-Saharan Africa becoming the world's most violent region today. While the number of wars is decreasing, some 60 wars are still being fought around the world with deadly consequences (HSC, 2005). However, the HSR indicates that there has been a huge increase in refugees and displaced persons over time since the major wars of the 1950s, 1960s and 1970s. The HSR also highlights that while the costs of war may be obvious, in the form of battle-deaths, displacement, flattened cities, destroyed infrastructure and so on, less obvious are the high numbers of indirect costs and 'excess' deaths such as those which would not have occurred had there not been excess fighting (HSC, 2005) including disease and malnutrition. Disease and malnutrition, this paper argues, can be captured in health modules of household surveys and correlated with the findings of modules on security and safety if these modules are also included in the survey instrument. However, such data needs to be treated cautiously as a first step, as panel data sets would need to be created to determine to what extent the disease and malnutrition is a direct result of conflict, and to what extent this would have resulted if the conflict had not happened at all.

Both violence and civil wars come at great economic and financial costs. According to Gleditsch et al (1994) from the PRIO in Oslo, in 1994 for example, at the peak of several conflicts, the world spent: "about 1,000,000 million USD annually on armaments. This is almost 5% of the total global output, and represents about one-sixth of total public spending. Arms expenditure exceeds world spending on public education by 10% and health spending by 25%. Global arms' spending is 20 times higher than foreign aid and more than 2000 times higher than what is spent on international peacekeeping." In 2001, for example, the poorest 41 countries had *increased* their armed forces by 80% since 1985 and the poorest five countries had nearly tripled their armed forces (300%). In contrast the OECD nations' armed forces had *decreased* by 25%. The WHO report, The Economic Dimensions of Interpersonal Violence (WHO, 2004), finds that estimates of the cost of violence in the United States of America reach 3.3% of the gross domestic product, while in England and Wales, the total costs from violence – including homicide, wounding and sexual assault – amount to an estimated $40.2 billion annually. The report also highlights that interpersonal violence disproportionately affects low- and middle-income countries. The

economic effects are also likely to be more severe in poorer countries. However, as this report shows, there is a scarcity of studies of the economic effects of this violence in low- and middle-income countries. However, evidence indicates that in low- and middle-income countries, it is probable that society absorbs much of the costs of violence through direct public expenditures and negative effects on investment and economic growth. Importantly, there are inadequate data on the costs of treating the consequences of interpersonal violence, be it crime or conflict-related. The modules presented in this paper are a first step to measuring the incidence of violence, but do not seek to measure the direct and indirect costs of conflict. However, such data, when collected over time, can be used to correlate with other measures of changing public expenditure and impacts of violence on investment and economic growth.

3.2.2 Correlations between Poverty, Conflict and Crime-Related Violence

Violence against the property and person in the form of crime, vigilantism, communal conflicts, insurgencies, civil wars, and intra-state wars is interlinked with poverty and underdevelopment, although it is generally agreed that the causality goes both ways. Major civil wars are associated with markedly worse performance in economic growth, food production per capita and human indicators, such as infant mortality rates, school enrolment, and so on. For example, Stewart and Fitzgerald found that **conflict is a major source of poverty and underdevelopment (Stewart and Fitzgerald, 2001), given that low incomes lead to conditions that are conducive to violence. Elbadawi (1999)** also finds that civil wars and poverty are inextricably linked. Civil wars directly affect poverty by destroying physical, human and social capital, resulting in a disruption of productivity, heightened unemployment, social displacement and increased physical insecurity. **Collier and Hoeffler (1998**) identify the economic impacts of war on growth and poverty by identifying three main impacts of civil war: (1) a disruption to capital or transaction intensive activities (roads, production, and financial services, for example); (2) a diversion of expenditure and resources from economic to war efforts; and (3) a reduction of domestic savings through consumption and capital flight. Meanwhile, numerous investigations have shown that low incomes lead to conditions which are conducive to violence. Famine and severe impoverishment have very often been associated with military activities and violent encounters. Wars and the associated insecurities tend to disrupt normal economic and social activities, undermine democracies and public discussions, and frustrate the development of a well-functioning market economy **(Drèze and Sen, 1989). Yet, Easterly (1999, 2001, 2002) also established that incom**e poverty alone does not

necessarily engender conflict. However, when combined with high income and asset inequality, particularly along ethnic or communal lines, poverty can lead to violent conflict. Thus, the evidence of numerous studies demonstrates a two-way relationship between poverty and conflict, and that it is likely to be worse in low-income countries. Thus it is important to measure the magnitude of violence along with other aspects of poverty, not only because it is an important part of poverty, but also because it may worsen other aspects of poverty and vice versa.

3.2.3 Data Collection: What are Available and what are the Issues?

There is consensus in many fields that given the nature of violence and the location (national or sub-national) of violent incidents, the internationally comparable data on conflict, physical safety, and security are inadequate. There are a variety of ways of collecting data on violence, threats to physical safety, and conflict, which include but are not limited to household surveys. For example data on mortality and injuries can be and are collected from hospitals and police records, but do not encompass those incidents which may be treated outside hospitals or not treated at all, such as rape, intimate partner violence, genital mutilation and other problems of physical safety which may result in social shame and humiliation; incidents of violence in communal conflicts that go unreported; injuries treated outside the formal health sector; and so on. Similar kinds of data may be missing or underreported by administrators of the justice sector such as the police (particularly if there are political or merit reasons not to do so) and the courts (where cases of injury and even death do not reach the courts), due to human error, inadequate training in reporting and file keeping, and other related reasons. The WHO report (2005) on *Milestones of a Global Campaign for Violence Prevention* argues that an 'ongoing supply of national and local-level information about the causes and about the consequences of violence is essential to building a comprehensive understanding of the problem and for designing, developing, and monitoring effective solutions'. In a different report (WHO, 2004) WHO argues that 'injuries and violence are ranked amongst the leading causes of death and disability…particularly true in the case of the low income and middle income countries where injuries and violence are growing in significance, largely as a consequence of the epidemiologic, demographic and socioeconomic transitions that have characterised the development of these countries in recent decades.' Thus, it is important to include both injuries and deaths in indicators of security and safety to truly gauge the size and nature of the problem which may be disguised by only including indicators of deaths in survey instruments.

3.2.4 Data on Violence and Threats to Security in the Form of Crime

The Division of Policy Analysis and Public Affairs of the United Nations Office on Drugs and Crime (UNODC) has implemented a series of surveys over time on Crime Trends and Operations of Criminal Justice Systems. The ninth survey covers the period 2003–2004 and requests that permanent missions of the UN fill in a questionnaire which summarises the statistics of national justice providers, such as the police and the courts, on crimes, using international standardised definitions (UNODC, 2005). Such information is useful in collating statistics on crime, violence, and prosecution in a format which is standardised across nations. However, this survey relies on the statistics provided by national government offices which is vulnerable to underreporting, missing many of the incidents of violence as has been outlined above. The implementation of International Crime Victim Surveys (ICVS), supported by the Ministry of Justice in the Netherlands, The Home Office in the United Kingdom, the Department of Justice in Canada, the United Nations Office of Drugs and Crime (UNODC) and the European Commission, is useful as it seeks to supplement the data made available by national governments from police and prosecution records. It is also useful as it provides a standardised tool of data collection in terms of definitions, methodology, and reference periods on types of crime. There is also an African version of the ICVS implemented in African nations conducted in collaboration with the United Nations African Institute for the Prevention of Crime and the Treatment of Offenders (UNAFRI). The survey asks about where the crimes took place, if they were reported to the police, satisfaction with the police response, reasons for dissatisfaction, the seriousness of the incident for the household, and if it was not reported, why it was not reported. It also asks questions on the weapons used in robberies, the number of people involved in sexual offences and their relationship with the offender, as well as whether weapons were used and whether the person classifies the incident as a crime. However, it does not seek to measure how far conflict-related violence is group based, or ask questions about rural crime and conflict (with the exception of a few questions in the African ICVS).

3.2.4 Data on Conflict and Related Forms of Violence

The Human Security Report **(HSC, 2005)** identifies the inadequacy of available comparable year-on-year data on global security as a significant barrier to research and policy design. There are no ‘official’ data sets on armed conflicts, genocide and core human rights abuse, nor are easily comparable measures of criminality made available from state based institutions. Furthermore, the UN does not have any comparable

data on armed conflicts to help it formulate and evaluate its security policies. The HSR highlights that governments may not be willing to divulge the incidence of violence and violent conflict within their own borders. It also argues that while violent crime is a threat to human security, attempts to track global and regional trends in criminal violence are hampered by a lack of data, underreporting and under-recording, conflicting definitions and so on (HSC, 2005). Identifying types of violence is important for policy prescriptions; for example a study in Sierra Leone found that displaced women were twice as likely to be raped as those who remained in their homes. The Human Security Centre (HSC) at the University of British Columbia has reviewed and compiled its report based on data from research institutions around the world as well as commissioning a major opinion poll on popular attitudes to security in 11 countries, and a new dataset by the Uppsala University Conflict Data Program. There are a variety of data sources on violence, conflict, wars, insurgencies, political terror, and so on identified by the HSC. Each has both benefits and limitations. For example, the Political Terror Scale (PTS) at the University of North Carolina records the global and regional trend data on human rights abuse in the developing world using a composite indicator that captures core human rights abuses such as torture, extra-judicial executions, and 'disappearances' backed by death squads. However, the central focus of the PTS is state repression, although the identity of the perpetrators of the violence is not always clear and hence the indicator sometimes captures violence not perpetrated by the state.

The Uppsala University's Conflict Data Program and the International Peace Research Centre in Oslo (PRIO) track the armed conflict trends in the post- World War II period, in what is known as the Correlates of War project. Their definition of armed conflict, however, does not include conflicts between non-state actors, such as the communal conflicts in Indonesia, Nigeria, and many other parts of the world. Thus the HSC commissioned Uppsala to collect this data including smaller conflicts as well as genocides and massacres for 2002-3 with the threshold being at least 25 battle-related deaths in each calendar year (HSC, 2005). However, this work relies on newspaper reports and reports from agencies such as the UN and civil society organisations, again leaving it vulnerable to underreporting on frequency of incidents, as well as involving very stringent rules on how to count battle deaths. The HSR (HSC, 2005) argues that given the huge variation in the numbers of deaths reported in such sources and the conservative estimates which they use in their database, this database while useful, is susceptible to underreporting of battle deaths, particularly in the database on armed conflicts involving the state (the threshold is 1,000 in a calendar year, thus countries such as Northern Ireland miss the threshold). Injuries are not recorded at all. As part of its efforts to

promote disaster prevention and mitigation as an integral part of development activities, the World Bank's Disaster Management Facility (DMF), under the umbrella of the ProVention Consortium, undertook a study of the quality and accuracy of disaster data. The three databases reviewed also include data on violence and conflict. These were NatCat maintained by Munich Reinsurance Company (Munich); Sigma maintained by Swiss Reinsurance Company (Zürich) and EM-DAT maintained by the Centre for Research on the Epidemiology of Disasters (CRED, Université Catholique de Louvain, Brussels). There were significant differences in the incidents recorded in the databases, however they fell over time. Records that date from the 1980s had greater discrepancies than those from the 1990s, with press sources being the least reliable, and standardised definitions being a key issue for redress amongst the databases if results from these databases are to be compared

SELF-ASSESSMENT EXERCISE

What is the correlation between poverty, conflict and crime-related violence?

4.0 CONCLUSION

With this information, ideally programmes and policy across a variety of contexts will be better informed allowing for better targeting and ultimately one form of poverty alleviation. Numerous indicators of security and safety could be generated from these data, in combination with the other modules typically found in household surveys. These include: the incidence of the different types of violence (normally calculated per 100 000 individuals); the risk and vulnerability of different groups to violence depending on their identity, age, gender and location; victims and perpetrator profiles disaggregated by type of violence; rates of reporting violence; perceptions and attitudes towards violence; and the relationship between violence and other dimensions of poverty. This information should serve to inform policy to alleviate poverty generally and bolster human safety and security in particular.

5.0 SUMMARY

Violence impedes human freedom to live safely and securely and can sustain poverty traps in many communities. One of the challenges for academics, policy makers, and practitioners working broadly in programmes aimed at poverty alleviation, including violence prevention, is the lack of reliable and comparable data on the incidence and nature of violence. This unit highlights the incidence of violence against property and the person, as well as perceptions of security and safety.

Violence and poverty are inextricably linked, although the direction of causality is contested if not circular.

6.0 TUTOR-MARKED ASSIGNMENT

1. Succinctly discuss the nexus between violence, poverty and safety.
2. With adequate data discuss the socio-economic implication of violence and civil wars.

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UNIT 2 COLLAPSE OF BUILDINGS IN NIGERIA

CONTENTS

1.0 INTRODUCTION

Although, incidents of collapsed buildings have received professional and public criticisms, some of the cases do not make headline news hence the general public may not know the gravity of the situation. Naturally, shelter in form of building is amongst the three basic needs of life universally accepted and recognised as essential for life sustenance and survival. However, it is the desire of every human being to live a life of comfort, security, physical and mental development without hints of possible mishaps of collapse or failure associated with his place of abode. It is therefore a social responsibility of the government to ensure that the wish of the people is achieved within limited resources and constraints. The past few years in Nigeria witnessed the collapse of many buildings in various stages of completion, wherein, many lives were lost and properties worth millions of naira destroyed.

2.0 OBJECTIVES

At the end of this unit, you should be able to:

- discuss the concept of sick buildings
- explain health related symptoms
- enumerate measures in detecting unhealthy and dangerous buildings.

3.0 MAIN CONTENT

3.1 The Concept of Sick Building Syndrome (SBS)

Sick Building Syndrome can be treated in two perspectives. The first perspective is from the user perspective: an occurrence of discomfort or unease or illness felt by the user of the building. The second perspective

is when there are defects in the building structure, envelope and internal environment. The indoor environment is a creation of the modern era. Column Slab Substructure Foundation Previously, buildings were notable for the extent to which they were really open to the outside air, a system that could be referred to as natural ventilation. But, technological advances have permitted us to seal buildings tightly, rearticulate the air within them and fill them with a variety of particle-and chemical-emitting materials and objects. People spend most of their time indoors with some estimates being that humans spend more than 90% of their lives inside constructed environments. Over time, the construction of buildings has increasingly focused on energy efficiency and comfort. Central heating and cooling systems are the norms, and home and office construction has moved toward minimising heat or cool air loss by making buildings more airtight and at the same time, more complex. Materials are being used for furniture, clothing fabrics, cleaners, detergents, and preservatives. Compared, these and other parallel trends have created buildings where exposure to foreign proteins, dusts, gases through inhalation has gone far beyond what historically has been the case. The concept of the "sick building syndrome", the types of allergens or stimuli most likely to be found in today's buildings, and how individuals can better cope with contemporary construction of indoor environments are going to be discussed in this lecture. In the 1970's, health care providers were faced with increasing numbers of people having headaches and allergic-like reactions to unspecified stimuli. Some of the reactions included lethargy, fatigue, headache, dizziness, nausea, irritation of mucuous membranes, eye and/or nasopharyngeal irritation and sensitivity to odours. Through exploration over several years, these reactions were linked to common symptoms of people in specific buildings and a lack of symptoms when these people were not in the buildings. This spectrum of specific and non-specific complaints, when tied to a particular building, became known as the "Sick Building Syndrome". It is what may be compounded by a variety of sources including rat/cockroach infestations, sanitary conditions, as well as indoor air pollution.

- **Pollutants**

Pollutants are major contributors to "Sick Building Syndrome" and they are as follows:

1. Major Combustion Pollutants

Malfunctioning or inappropriate, inefficient use of heating devices can produce pollutants at harmful levels. Carbon-monoxide (CO), which is an asphyxiate, nitrogen dioxide (NO2) and sulphur dioxide (SO2), which are irritants are three of the more common products of

combustion pollutants in the home. Methelyne chloride, which is in some household products such as paint strippers, can also be metabolised to form CO.

2. Biological Air Pollutants

Found everywhere, dander, moulds, dust mites, and other biological substances are carried by animals and people into and throughout homes and buildings. High relative humidity, flooding, inadequate exhaust of bathrooms or kitchens, humidifiers, dehumidifiers, air conditioners, drip pans under cooling coils, pets, and components of heating, ventilation and air conditioning (HVAC) systems are all sources of biological air pollutants. Three types of human diseases which involve specific activity of the immune system, and toxicosis in which biologically produced chemical **toxins** cause direct effects. In many cases "sick building syndromes" may be related to microbial contamination in buildings such as environmental and industrial fungal infestations with moulds, fungi etc. We will come back to these details in discussion under Building Defects.

3. Volatile Organic Compounds (VOCs)

At room temperature, volatile organic compounds or VOCs are emitted as gases, certain solids and liquids. These include formaldelycle, pesticides, solvents, cleaning agents, benzene, and perchloroethylene. A wide array of potential sources of VOCs exists in the home and in the office. Scents and hair sprays, household products such as finishes, rug and oven cleaners, paints, thinners, dry cleaning fluids, some copiers and printers, some glues and adhesives and photo solutions are among some common products that may emit VOCs. One of the major irritants in "sick building syndrome" is formaldehyde. Although urea formaldehyde foam solution is no longer used, buildings which had the full blown foam in the 1970s may still have VOCs from the insulation. Formaldehyde is also found in resins in finishes, in plywood, panelling, fibre board and particle board and in some of the backings and adhesives for carpets. New installations, carpets, wall coverages, paints, or construction all heighten problems with VOCs.

4. Heavy Metals

Over the past several decades, the potential for caused exposure to heavy metals in buildings has been significantly reduced. Although still a concern, the likelihood of inhalation of heavy metals in most buildings is minute. The concern about heavy metals as an indoor air pollutant is greatest in older, deteriorating housing or during rehabilitation or reconstruction projects of older buildings. Complaints and antidotes

regarding illnesses produced by life inside such buildings have become common place. The illnesses include both specific and non-specific ones.

A. Specific Illnesses

- Indoor transmission of standard infection diseases such as tuberculosis or legionellosis.
- Allergic reactions to indoor allergens such as dust mites, plant products, or fungal products.
- Irritation due to (volatile) chemical released from the environment.
- Carbon monoxide poisoning related to re-circulation of cigarette smoke or exhaust fumes.

B. Non-Specific Illnesses

- This is a diverse group of work-related symptoms that include irritation of the skin, mucous membranes (mouth, nose, and throat), headache, fatigue, and difficulty concentrating. A variety of factors have been associated with increased rates of these complaints; younger age, female sex, cigarette smoking, type of work (e.g., working near a photocopier), level of office overcrowding, presence of carpets, and type/volume of ventilation.

3.2 Health Reaction to Sick Building

There are three components in identifying a sick building. The first is that the reactions or types of reactions are shared by several or many of the people who also inhabit. The second is that the reactions are triggered when not in the building. Individuals however, may have greater sensitivities to some stimuli than other people. For these individuals, something or things in the building may be triggering a reaction, but the building may not be “sick”. This is often the case when a certain office or part of a building is rehabbed or reconfigured and decorated. That particular area of the building may create reactions in individuals, but the building itself is not problematic. The third and final component is to neglect maintenance of a building to the stage of structural failure, or disaster resulting to collapse of the building. At this stage it can be said that the building is not only “sick” but is dead. Loss of lives is usually more associated with this stage than the other two stages. Lack of maintenance culture is a major problem in Nigeria as we fail in maintaining our buildings, roads, and the drains/gutters and the entire environment. Sick Building Syndrome is recognized by the World Health Organisation. It is not only a concern to the sufferer, but has

commercial/economic implications in terms of increased absenteeism, reduced productivity, increased staff turnover, low morale etc.

Generally, there are five symptoms associated with Sick Building Syndrome and these are:

a. Mucus membrane irritation, which usually effects the eyes, nose and throat;
b. Neuropsychiatric disturbances, such as fatigue headache, confusion and dizziness;
c. Skin disorders, for example itchiness, dryness and rashes;
d. Asthma – like symptoms, such as tight chest and difficulties in breathing and;
e. Unpleasant odour and taste sensations.

While the population as a whole generally exhibit these symptoms, with SBS, certain patterns evolve:-

i The symptoms disappear or decline away from work
ii They are more prevalent in clerical staff
iii They occur more in public buildings
iv They are most common in office buildings with air conditioning
v People with most symptoms have little individual control over their environment.

3.2.1 Causes of Sick Building Syndrome (User Perspective)

SBS is generally considered to result from one or more of the following factors:

1. Uncomfortable working environment due to poor lighting, high temperature and inadequate air movements/stuffiness.
2. Low relative humidity
3. Odours
4. Air-borne dusts and fibres
5. Chemical pollutants

We should watch out for these in any building we are using as homes or offices and places of worship.

a. Ventilation

The ventilation system is often regarded as the most significant factor in affecting buildings which are sealed and have mechanical ventilation or air-conditioning. The assumption is that lack of fresh air is the major cause of SBS. Fresh air is required for various reasons, the main ones

being to supply air for respiration and to dilute carbon-dioxide (CO2), odours, cigarette smoke and other contaminants. Ventilation, although not necessarily fresh air, may also be required to maintain personal comfort. The impetus to seal buildings and increase the control over the environment is usually motivated either by necessity for open plan deep offices which are difficult to ventilate naturally or by a desire to save energy (and money). The practice of tight control over the indoor environment poses problems if the ventilation or air conditioning system is in any way imperfect. Mechanical ventilation of buildings is less satisfactory than natural ventilation because mechanical ventilation and air conditioning allow more precise overall environmental control but little personal or local control. The air supply into mechanical ventilation systems can often be varied during operation, in order to increase the proportion of air that is re-circulated, and to reduce the quantity of fresh air drawn in from outside ankle height should show less than 3oC variation; Floor surface temperature 19-26oC (29oC with floor heating systems)

Mean air velocity is less than 0.15m/s. Dissatisfaction with the thermal environment is a greater problem in large air conditioned buildings than in small and naturally ventilated buildings. In a building with opening windows and radiators the occupants are able to vary thermal environment to some extent. If the air conditioning or heating system in a large "tight" building fails to control the thermal environment, there is often little that the occupants can do to improve conditions. A sensation of stiffness may play a part in promoting SBS indicating dissatisfaction with the working environment.

b. Visual Environment

Potential problems in the visual environment are inadequate illumination, uniform or dull lighting, discomfort glare, flicker from luminaries and tinted windows which reduces the amount of daylight. These cause eye strain and headaches and are a major contributor to SBS. It is generally accepted that there is a link between the level of workers satisfaction and their perceived ability to control the environment.

c. Contaminants

The potential range of contaminants in offices is enormous. The main sources of air-borne contaminants are:

- **Building occupants:** Pollutants released by occupants of the building include carbon-dioxide (CO2), water vapour and micro-

organisms and matter. Smoking is a considerable source of air-borne pollution.

- **Building fabric and furnishings:** The main sources of pollution are from releases from the fabric and furnishings of the building; dust and fibres from carpets, and furnishings; solvent vapours and organics from various sources, including adhesives used in furniture and for sticking carpet, floor tiles etc. Office machinery: Photo copiers have been suggested as a cause of building sickness, and pollutants such as ozone can collect in very poorly ventilated photocopying rooms.
- **Ventilation and air conditioning systems.** Ventilation and air-conditioning systems can transmit air-borne disease including humidifier fever and various infections. Even where air conditioning systems do not contain humidifiers, items of plants can act as breeding sites for organic growth.

d. Noise

Noise in itself has not generally been considered to be a main cause of SBS. It is clear, however, that both office workers' productivity and comfort levels can be affected by a poor acoustic environment. Most noise sources from both fixed plant and machinery and office equipment can normally be silenced by appropriate physical measures. In open plan offices, the maintenance of conversational privacy is important, and can often be achieved by the positioning of appropriate screens. The need for privacy suggests that cellular offices or several groupings of up to five workers in open plan offices helps reduce the symptoms of SBS.

e. Poor Management and Maintenance

Efficient planning, particularly with the organisation of office space and storage, means less clutter and overcrowding. Untidy piles of papers and books not only create dust, but also collect dust as these areas are not easily cleaned. Management should be sensitive and people oriented, as this will promote goodwill and higher levels of satisfaction. Proper maintenance and regular cleaning of mechanical plant and ductwork are essential. The cleaning regime for soft furnishings, carpets and curtains should be carefully considered. Agents used should be chosen to eliminate potential sources of SBS and not inadvertently add to it. Files should be vacuum cleaned in order to remove paper and other dust as thoroughly as possible. Vacuum cleaners generally should be fitted with high efficiency final filters. Cool shampooing of carpets, chairs and other fabrics should be undertaken periodically. If symptoms persist, steam cleaning should be considered.

3.2.2 The Consequences of SBS for the Human Resources Function

If a poorly functioning working environment is experienced as unpleasant and unhealthy by those working in it, their reactions to this can prove costly for the organisation. We can discuss these under the headings of individual and collective responses.

a. Individual Responses

- **Staying off sick:** Repeated colds and headaches **point** to the fact that a personnel department might have problem with the working environment which leads to a rise in the sickness absence rate.
- **Productivity:** Not all ill-health will result in absence as there may be heavy pressure on the employee to minimise absences. Also some SBS symptoms (dry eyes, stuffy nose, lethargy), though debilitating when experienced over a long period, may not seem sufficiently severe to warrant staying off work. However, employees who drag themselves into an unpleasant and dislike work-place will not do much for productivity. If workers believe the office environment affects their productivity this belief will affect overall commitment and attachment to the organisation whether it is justified or not.
- **Turnover:** if unhealthy environmental conditions persist, or remain unresolved then often things may get so unpleasant that the employee wants to leave, and this will be evidenced in a rise in the company's figure for labour turnover.
- **Commitment:** Human resource management strategy is frequently aimed at raising and sustaining the level of employee commitment to the organisation. Failure on the part of management to do something about a disliked and unhealthy working environment is clearly counterproductive.
- Altering the environment in the context of centralised control is understandable if individual workers attempt to override the system to assert some sort of localised control over their immediate working environment by bringing in their own fans, heaters or ions. This response can often take the form of a low-tech solution to a high-tech environment.

b. Collective Responses

Responses such as absence and turnover are both individual responses to an unpleasant work situation – they do not in themselves change that situation but simply withdraw the worker from it. In a unionised working place, a more collective response is more likely, usually based

on an attempt to persuade management to accept that a problem exists for their members and to remedy it. In an observed poorly functioning working environment, the union has to negotiate for better condition and where the situation persists or negotiation fails to reach any mutually agreeable solution, a further outcome may take the form of collective industrial action.

SELF-ASSESSMENT EXERCISE

Highlight and briefly explain some of the symptoms associated with the 'Sick building' Syndrome.

4.0 CONCLUSION

The first step in minimising Sick Building Syndrome and defective buildings is the realisation and utilisation of the complementary roles of construction industry professionals. The professionals include the architect, builders, engineers, surveyors, urban and regional planners. At the heart of the design and construction process is the professional builder who is trained to carry out building ability and maintainability analysis of a building design. He is also the specialist trained in and recognised for the efficient and effective production management of buildings that advertently reduces maintenance problems and consequently the Sick Building Syndrome.

5.0 SUMMARY

This unit started by defining the concept of Sick Building Syndrome (SBS), and various emanating health problems and issues such as illnesses and symptoms that are related to SBS (include irritation of the skin, mucous membranes (mouth, nose, throat), headache, fatigue, and difficulty concentrating). Causes of these diseases were discussed as well as their consequences from both the individual and community responses. It concluded with some recommendation regarding good building and maintenance culture.

6.0 TUTOR-MARKED ASSIGNMENT

1. With relevant examples explain the concepts of Sick Building Syndrome.(SBS)
2. Discuss the causes of SBS and various perspectives.

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UNIT 3 BUILDING DETERIORATION PHENOMENA AND MAINTENANCE CONCEPT

CONTENTS

1.0 INTRODUCTION

Though highly desirable, it has not yet been possible to produce maintenance-free buildings. The reality is that all the elements and components that make up a building unavoidably, deteriorates with time due to inherent defects in design and construction and the effects of environmental agents and user activities. All buildings are subject to aging, wear and tear in the performance of their functions and deterioration by exposure to the operating environment. Hence left to themselves, buildings will eventually become inefficient, unreliable and fail.

2.0 OBJECTIVES

At the end of this unit, you should be able to:

- explain the causes of building defects
- list the factors influencing building maintenance requirements and costs
- discuss the environmental Problems in 3rd World Cities.

3.0 MAIN CONTENT

Building defects results from failure or shortcomings in the function, performance, statutory or user requirements of the structure, fabric, services or other facilities (How and Wee, 2001). However Org (1997) states that building defects may be an issue only if they are major or excessive. When a building reaches a certain level of deterioration, economic or safety requirements may demand a slowdown, a halt or intervention at this stage to make it possible to preserve building and their technical installations for the length of their functional lifespan.

However, maintenance can only reduce the rate of deterioration but cannot eliminate or reverse it as a structure cannot maintain, let alone improve itself. This explains why despite maintenance intervention, a point is reached when the quality of a building ceases to meet with the acceptance of the owner and the users and with safety/statutory requirements. Vijervaberg (2000) opined that the moment a building's acceptance threshold has been passed, a building owner, user or manager has a limited number of option-function extension, function change or function termination. Even if the owner decides to sell the building, the buyer will then face several options for the future of the building as did the original owner. Only repair or rehabilitation can bring a building back to an improved state or as good-as-new state. Amarilla (2002) states that housing structures depreciate at a rate varying between 6% and 10% depending on their physical conditions in a period of 10 years. When maintenance is ignored (delayed or not executed at all) the effect is to aggravate the rate of building deterioration from year to year. In housing therefore, maintenance is "a stitch in time saves nine".

3.1 Defects Generation Factors and Maintenance Requirements

In the face of Nigeria's declining economic fortunes, building/housing authorities (especially in the public sector) have had to cope with the need for ever increasing budgetary allocation for maintenance over the years. For maintenance managers to be able to cope with this constraint, Mole and Olubodun (1995) suggest that they shoud make efforts to reduce maintenance expenditure. El-Waram and Horner (2002) stated that this can be achieved by reducing or controlling the impact of the factors that may have effect on maintenance costs. By identifying the causes of defects, it is possible to investigate maintenance strategies to reduce the occurrence of defects or eliminate their consequences. This perhaps informed the opinion that although budget is a major parameter in maintenance management, the interplay of other influential factors cannot be overlooked. He suggests that a cause and effect evaluation of all relevant factors is required to optimise maintenance management. Ashworth and Au-Yeun (1987) have identified physical characteristics, performance characteristics, environmental characteristics and user characteristics as some of the determinants of maintenance costs. They however, failed to demonstrate how the factors individually and collectively affect overall maintenance costs. Honstede's (1990) study identified four groups of factors which influence housing stock conditions as:

- quality of the building at completion,
- the ageing process,

- maintenance and improvement on the housing stock conditions and the mode of use by the occupants.

Gambatdella and Moroni (1990) have identified three sets of factors which influence maintenance requirement and costs. These are:

1. Internal parameters pertaining to intrinsic characteristics of the building such as design and construction and the interdependence of building components and elements.
2. Usage and environmental effects which exert stress on the Building
3. The effects of previous maintenance actions. This has to do with users and owners' response to maintenance needs

Olubodun (2000) listed nine factors in decreasing order of influence as follows:

- Dwellings external influence
- Design integrity standard of dwelling
- Tenant's lack of care index
- Influence of changing and evolving standards
- Ageing influence
- Vandalism-design fall effect
- Design-construction inadequacy
- Accidental damage restricted to building envelope
- Dwelling orientation and soil conditions.

This unit will address a few of the factors because of space and its vastness.

a. Environmental Factors

The environmental factors in building maintenance can be viewed from two perspectives. The first perspective is the effect of environmental agencies which act upon the building and cause it to decay. Among these are climatic conditions such as rainfall, humidity, wind, temperature, and soil and ground water conditions (Idris 1998). Chemical agents like chlorides and sulphates present in the soil affect building foundations. Al-Shaikh et al (1992) have reported that most of the deterioration in buildings in Riyadh, Saudi Arabia, result from soil problems and rising water levels, soil salinity in the presence of high ground water levels affects concrete in foundations and other parts of a building. According to Lee (1998) the effects of rainfall, wind, humidity and temperature vary in severity according to the location and orientation of the building and are greatest on the external elements of the building.

Geological phenomena such as earthquakes, tsunamis, faults, subsidence and landslides also affect a building (Brumarn 2002). This group of environmental agents, unlike the former, usually cause instantaneous collapse of the buildings rather than progressive deterioration. Incidences of these geological phenomena have not been recorded as significant in frequency and severity in the study area of Lagos state, South Western Nigeria. (Iyagba, 2004, Adeyemi, 2004, Ikpo, 1990). Brumaru (2002) also includes atmospheric pollution as agents of building decay, especially in industrialised urban areas. The second perspective is the effect of building maintenance activities on the environment. For instance, from the point of view of environmental protection, it may not be acceptable to demolish buildings. Thus in some cases maintenance and conservation may be preferred to massive demolition and reconstruction because of the high costs involved in protecting the environment from pollution. Apart from the effects of building materials and activities on the environment, there is also the problem of the "Sick Building Syndrome" inside building which may result from inadequate maintenance of slums neighbourhoods (Sour and Yuen 1993, Iyagba, 2004). This means that more stringent environmental and public health legislation may generate a greater need for maintenance and increase the volume of maintenance works.

b. Design Deficiencies and Construction Faults

Design is the pre-planning process requiring knowledge, ability and selection of materials and determining performance. For designers to achieve this, Son and Yuen (1993) believe that they must possess a good knowledge and understanding of the properties of materials as well as the interactions that building materials will have with the environment in service. Although it is hardly feasible to produce maintenance-free buildings, much can be done at the design stage to reduce the amount of subsequent maintenance works. This is why Seely (1987) takes this notion further. He stated that for developing countries (including Nigeria) where there is deep-rooted ignorance of the importance of maintenance and where the construction industry may not be capable of meeting the increased demand arising from maintenance, the most effective maintenance strategy should be one that minimises the incidence of maintenance works through appropriate design. The reality, however, is that traditionally construction projects are planned, designed and built and delivered to the owner or user with very little attention given to maintenance over the lifespan of the facility.

Maintainability is a measure of the ease of maintaining a building or its elements and components, which depends not only on the design and the technical aspects but also on the availability of the building or components/element when required for maintenance. The nature of

design of some building hinders their maintainability. This may result from:

- inaccessibility of some elements and components for maintenance works
- inadequacy of available technological know-how to remedy defects, or
- non-availability of replacement parts and components as in the case of many imported lifts and air-conditioning systems used in Nigeria today.

Design and maintenance are two core activities in the building cycle which directly contribute to the quality and performance of construction. Unfortunately, however, there is deep-rooted separation of design and maintenance which (Amairilla et al, 2002) put bluntly this way: “In the field of architecture, we are primarily … to create new objects, relegating maintenance and preventive actions to a secondary and almost shameful place.” The fact that design and maintenance are undertaken by professionals, operated through conflicting criteria and objectives, are often counter-productive leading to unacceptable quality of building performance.

In reality, buildings usually differ from what the designers intend. The extent of variations depends on the technical and managerial competence of the contractor. Some construction site problems that accelerate building decay have been identified as:

- defective materials and over-emphasis on first costs
- inadequate soil compaction and incorrect setting out resulting in excessive soil settlement and building movement
- poor site practices and supervision
- lack of training and skill on part of site operatives
- lack of motivation and care by site operatives, and
- defective documentation Many lessons can be learned from maintenance to improve design and construction.

One of the lessons is the feedback to the designer and the contractor as well as the manufacturer of materials and components. For instance, the designer requires feedback from maintenance to review and judge his previous design with a view to eliminating potential flaws in future designs. To stress the importance of maintenance feedback, Rooley (1993) advocates the use of a database extracted from litigation and analysis of failed buildings as a basis for design. Unfortunately, however, communication problems in the building industry hinder the flow of feedback information and its utilization.

c. Vandalism

Vandalism is another generator of maintenance need in buildings. It is wilful damage to a building or structure. The causes of vandalism have their roots in the social fabric of the community (Son and Yuen 1993) and it is motivated by an intention to cause damage. Contrary to popular belief, vandalism is not a product of senseless and random acts, but often a calculated intention to express dissatisfaction to authority or society at large. A Building Research and Establishment (BRE) report suggests that some of the factors that endanger the feeling of dissatisfaction culminating in acts of vandalism are boredom and indiscipline among youths, and unsettled conditions of occupancy which they, by instinct, blame on society at large. Sonand and Yuen (1993) also believe that lack of security, wrong choice of materials, poor space layout, poor lighting arrangement and failure to promote awareness of social responsibility are other factors which can increase the incidence of vandalism in housing stocks. Vandalism mostly affects the aesthetic appearance of component building and reduces its lifespan. Ultimately this generates maintenance needs and costs which could be very significant in their study of factors affecting housing maintenance costs. El- Haran and Horner (2002) ranked external (third party) vandalism and internal (tenant) vandalism eight and twelfth respectively among twenty-four significant factors. Against this background, it is not surprising that the annual cost of vandalism in England and Wales has been estimated to be $30 million (Seeley, 1987).

d. Environmental Problems in 3rd World Cities: Houses, Workplace and Neighbourhood

There are three kinds of environmental problems in relation to the house, workplace and neighbourhood:

a. pathogens or pollutants in the environment (air, water, soil and food) which can damage human health.
b. shortage of natural resources essential to human health (e.g., insufficient fresh air and water)
c. physical hazards within the city (e.g., risk of flooding for houses built on floodplains or of mudslides or landslides for houses built on steep slopes).

These are all environmental problems amenable to human intervention. There are other environmental problems such as noise pollution, lack of provision for public space and facilities of urban environment which contribute to stress and psycho-social problems. The department of Urban and Regional Planning, University of Lagos is finding solution to the above problems in addition to the impact of city-based production,

consumption or waste generation on health of rural dwellers and on natural resources and ecosystems. Also broader issues about the aggregate impact of cities and urban systems on global climate and natural resources are been researched. The study revealed very serious environmental problems in terms of diseases, disablement, premature death and damage or destruction of natural resources. The fact that a high proportion of the third world's urban population live and work in very poor conditions is too well known to need elaboration. In most cities of the third world, between one third and two thirds of the population live in inadequate housing units. These people live in unsafe structures without adequate protection from the elements, sufficient space (relative to the number of people living there), piped water supplies, provision to remove excreta, household liquids and solid wastes, drainage and all-weather roads. Despite the many different forms of housing used by poorer groups from rooms rented in tenements or illegal settlements, beds rented in boarding houses or sharks built on illegally occupied or subdivided land or rudimentary shelters on some piece of open space – almost all are characterized by three factors which contribute to poor environmental health. The first is the presence in human environment of pathogens because of lack of basic infrastructure and services such as drains or services to collect solid and liquid wastes and safely dispose them. The second is a lack of safe and sufficient water supply. The third is overcrowded cramped living conditions which increase the risk of transmission of airborne infections and increase the risk of accidents, and since water is very heavy, consumption levels are influenced by the distance that it has to be carried. Low-income people often work very long hours, so queuing at a tap or carrying water. Limited quantities of water mean inadequate supplies for washing and personal hygiene, and for washing food, cooking utensils and clothes. Eye and ear infections, skin disease, scabies, lice and fleas are very difficult to control without sufficient supplies of water. So too is a good standard of personal hygiene.

SELF-ASSESSMENT EXERCISE

Examine some Geological phenomena that are capable of creating the destruction of buildings and measures to be taken to contain such destruction.

4.0 CONCLUSION

This unit further emphasised the importance of building maintenance in line with the facts that with age and other factors buildings are bound to deteriorate. It is in this regard that various measures are necessary to prolong one's building to avoid risk of damage or loss of lives.

5.0 SUMMARY

In this unit, our focus has centred on Building Defects, Design Deficiencies, Construction Faults, Factors, Maintenance Requirements and costs and Environmental Problems in houses, workplace and neighbourhood. Emphasis was also made on some construction site problems that accelerate building decay as well as other geological phenomena capable of wrecking buildings and lives.

6.0 TUTOR-MARKED ASSIGNMENT

What are the determinants of building maintenance culture and costs?

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UNIT 4 BUILDING MAINTENANCE IN NIGERIA

CONTENTS

1.0 INTRODUCTION

A lot of works have been done on maintenance in Nigeria. One of our greatest economic and social problems as a nation is the general absence of a maintenance culture. There is unpardonable neglect and laxity in all spheres of our national life. Our buildings (both public and private), lack adequate maintenance care or attention. It is an unfortunate but, glaring fact, that our buildings are in very poor and deplorable conditions of structural and decorative disrepairs. There are more or less refuse dumps and natural homes for rodents and vermin. In spite of millions of naira spent to erect imposing and monumental buildings, they are left, as soon as commissioned, to face premature but steady and rapid deterioration, decay and dilapidation. There is need for immediate change of attitude in connection with the problem raised above if untold national disasters and embarrassment are to be averted. Construction of new projects is important but maintaining them thereafter is equally, if not more, important; as a country that goes on building new structures but fails to effectively manage them burns its wealth and resources in a furnace.

2.0 OBJECTIVES

At the end of this unit, you should be able to:

- mention the various types of maintenance in building and architectural design
- identify the economic significance of Building Maintenance in Nigeria
- examine the Problems associated with ineffective maintenance activities in organisations
- discuss the Basic causes of defects in buildings.

3.0 MAIN CONTENT

According to Esenwa (2000), many clients establish the level of maintenance as one of the most important economic criteria, and not by performance. Little thought is given to the fact that as an asset gets older, the likelihood of additional maintenance cost is higher and would be over and above that which had already been carried out at its inception.

3.1 Planned and Unplanned Maintenance

Maintenance is usually sub-divided into planned and unplanned maintenance. The planned maintenance is further sub-divided into preventive and corrective maintenance. Planned preventive maintenance is directed to the prevention of failure of facility, carried out within the expected life of the facility to ensure its continued operation. Planned corrective maintenance is performed to restore a facility operation to an acceptable standard.

Unplanned maintenance (repairs) is work resulting from unforeseen breakdown or damage due to external causes.

Predictable and Avoidable Maintenance Maintenance has been categorised as predictable and avoidable. Predictable maintenance is regular and periodic work that may be necessary to refrain the performance characteristic of a product as well as that required to replace the product after it has achieved a useful life span. Avoidable maintenance (repairs) is work required to rectify failures caused by incorrect design, incorrect installation or use of faulty materials.

Emergency Planned Maintenance According to Adenugba (1999), much of the work done in maintenance today is done on an emergency priority, as all breakdown maintenance factors cannot be anticipated. Therefore planned work does not include emergency. The best one can do for planning relative to an emergency would be to:

- Develop a list incorporating feedback from supervisory personnel of emergencies typical to all areas in the facility.
- Establish a written procedure to address emergencies that cannot be handled incorporating normal knowledge and skill, within a reasonable time frame.
- Make provision for training personnel in emergency procedures.
- Anticipate equipment and material needs and have them in stock within reason.

Preventive Planned Maintenance

One very important way to minimising emergency maintenance is to have an effective maintenance program, which is nothing more than planned or preventive maintenance. The objective of a maintenance programme is to increase productivity of the organisation and lower the maintenance cost of its operations. Preventive maintenance includes periodic inspection of building, plant and equipment to discover conditions which may lead to production or material breakdown. It also ensures the upkeep of the asset by correcting defects while they are still in a minor stage.

3.1.1 Problems Associated with Ineffective Maintenance Activities in Organisations

According to Adenuga (1999), various problems of varying magnitudes and origins are encountered in the process of maintenance. Some of these would include:

Design Problems: Some fundamental maintenance problems originate from the design of the building. These types of problems are usually hard to solve as it may involve complete reconstruction of the entire building or large section of it. It may be avoided or, at least, drastically reduced by involving at the design stages professional experts, including highly competent and experienced maintenance managers.

Problem of Skill: Some maintenance managers and their crew of craftsmen and technicians lack the desired skills (which include experience or technical know-how) required on the job.

Research and Development Problems: There is lack of adequate funds and interest in this direction. In fact, research and development directed towards building maintenance is non-existent or at best, very minimal.

Overcrowding: Another characteristic common to most homes of poorer groups is crowded and cramped conditions. Many health problems affecting poorer groups are associated with overcrowding and household accidents. In the predominantly low-income residential areas in third world cities, there is often an average of four or more persons per room and in many instances less than one square metre of floor space per person. Acute respiratory infectious diseases such as tuberculosis, influenza, pneumonia, and meningitis are easily transmitted from one person to another. Their spread is often aided by low resistance among inhabitants due to malnutrition and by frequent contact between infected and susceptible people. Acute bacterial and viral respiratory infections and lots of others are diseases caused by overcrowding.

Indoor Air Pollution: Where open fires or relatively inefficient stoves are used indoors for cooking and/or heating, smoke or fumes from coal, wood or other biomass fuels can cause or contribute to serious respiratory problems. Chronic effects include inflammation of the respiratory tract which in turn reduces resistance to acute respiratory infections, while these infections in turn enhance susceptibility to the inflammatory effects of smoke and fumes. Exposure to carcinogens in emissions from biomass fuel combustion has been confirmed in studies in which exposed subjects wore personal monitoring equipment. Women who may spend 2-4 hours a day at the stove must be at risk. Infants and children may be heavily exposed because they remain with their mothers; the added exposure to pollutants combined with malnutrition may retard growth, leading to smaller lungs and greater prevalence of chronic bronchitis.

Disease Vectors: A large range of vectors live, breed or feed within or around houses and settlements. The diseases they cause or carry include some of the major causes of ill health and premature death in many cities – especially malaria (anopheles mosquitoes) and diarrhea diseases (cockroaches, blowflies and houseflies). But there are also many other diseases caused or carried by insects, spiders or mites including bancroftian filariasis (culex mosquitoes), Chagas disease (triatomine bugs), dengue fever (Ardes mosquitoes), hepatitis A (houseflies, cockroaches), leishmaniasis (sand-fly), plague (certain fleas), relapsing fever (body lice and soft ticks), scabies (scabies mites), trachoma (face flies), typhus(body lice and fleas), yaws (face flies), and yellow fever (Aegypti mosquitoes). Urban expansion may also change the local ecology in ways which favour the emergence or multiplication of particular disease vectors. For instance, *Aedes aegypti*, the mosquito vector for dengue fever and yellow fever is often found to breed in polluted water sources such as soak-away pits and septic tanks. Anopheles mosquitoes generally shun polluted water but certain species have adapted to the urban environment and now breed in swamps and ditches in or close to urban areas.

3.2 Economic Significance of Building Maintenance in Nigeria

Building is one of the most important activities in any economy. An economic appreciation of it is the increase in its ability to generate future cash flows. A large part of the national resources are usually used in the construction of monumental buildings but they are left, as soon as they are commissioned to face premature but steady and rapid deterioration, decay and dilapidation. The final products of the building industry are vital to the growth and proper functioning of the economy. The built environment expresses in physical form the complex, social

and economic factors which give structure and life to a community. The condition and quality of buildings reflect public pride or indifference, the level of prosperity in the area, social values and behaviour and all the many influences both past and present which combine to give a community its unique character. Construction of new projects is important but maintaining them after is equally, if not more important; a country that goes on building structures but fails to effectively manage them burns its wealth and resources in a furnace (Udo-Akagha, 1983).

Historically in both the public and private sector, maintenance was seen by many as an avoidable task which was perceived as adding little to the quality of the working environment, and expending scarce resources which could be better placed elsewhere (Higher Education Backlog Maintenance Review 1998). When viewed on a national scale it is quite clear that maintenance is an activity of primary importance. The total value of buildings and works accounts for two-thirds of the nation's capital stock. Not only does this represent wealth accumulated over many years and utility of the stock of buildings is therefore essential to the economic well being of the country. It is on this vein that one feels that as a means of revamping the economy, maintenance should have been one of the policy packages like the privatization of public enterprises or the deregulation of the oil industry. Change, they say, is the only constant thing in life – a philosophy borne out of the obsession of man with his never-ending research for ways in which to evolve, to improve himself, advance himself technologically, regardless of how far he has arrived or believes he has arrived. For him, there is always room for improvement. It is consequently remarkable that despite this constant drive to change, man has never really lost sight of pricelessness of preserving things the way they are sometime, a phenomenon we know as "maintenance".

3.2.1 The Economic Significance of Building Maintenance to Building Owners

Building maintenance activities have numerous advantages for any individual/building owner. But from an economic point of view, we seek to know what financial benefits directly or indirectly can be obtained from the regular maintenance of buildings. Some of these are discussed below.

Retaining the Economic Value of Buildings

Unless proper building maintenance operations are carried out on a building, it might not be able to command its full economic value due to the imminent poor state of repair of its numerous components. Thus occupiers will not be able to generate as much resources as would have

been possible as the state of repair of a building is an important element in determining its capital and rental value.

Prolonging the Economic Life of the Building

Economic life here refers to the earning power of a building within the period of its effective life before replacement. The sum total of income a building can generate is a factor of its physical/effective life, which is to a large extent, determined by the level of maintenance of the building. Thus, a well maintained structure is bound to have a long economic life.

Maximizing rental value

The amount of rent that a building can command is largely determined by its level of maintenance. Thus to optimise rental values, it is advisable for building owners to practice regular maintenance activities on properties.

Reducing risk of voids

Once a building is in a good state of repair as a direct result of proper and regular maintenance activities, the risk or probability of voids is effectively reduced. This is because the building will be in good tenable condition.

Increases investment in real estate

Once a building owner is enjoying good returns from property due to good maintenance, it further motivates investment in property. This has resulted in increased investments in the property market which is evident in the number of property development options in existence today such as building and occupational leases, build, operate and transfer, etc.

Effective management of overhead costs

A well-managed and maintained building requires minimal comparative overhead. This is because all the building components are in proper functioning order. This minimises the amount of money spent on corrective maintenance and replacements. This also increases the net revenue from rental incomes receivable by the building owner.

Significance to the Economy

Apart from the above listed individual benefits, the economic significance of building maintenance also has relevance to the

community as a whole. This is because the collective individual benefit of this activity eventually influences the community. Some of these reasons are listed below:

Improving the quality of the built environment

Regular building maintenance activities carried out on housing units and other facilities ensures the preservation of the communities housing stock and enable buildings, as a factor of production to function as efficiently as possible. This goes a long way in improving the quality of the built environment thereby enhancing the demand for facilities in the particular community. Also, the environmental loading caused by constructions and buildings is substantially reduced and decision-making connected with the built environment and design, construction and maintenance of buildings will be based on life-cycle thinking. The environmental awareness of property owners, property developers and users of buildings will increase.

Enhancing property value The consistency with which building maintenance activities are undertaken ensures that buildings are kept in good and tenantable condition thereby improving the value of properties in the community as property values are affected more and more by buildings' life-cycle costs and expectations of return. This is achieved by the resultant fact that overheads spent on corrective maintenance operations will be at a minimum and also due to the fact that the building will be in an excellent state of repair as being situated in a favourable location. These factors are major determinants of property value.

Protecting lives and property

As regular building maintenance ensures that buildings are in a good state of repair and prolongs a building's physical lifespan, it follows that incidents such as fire outbreaks, building collapse, etc which are direct offshoot of poor maintenance will be reduced to the barest minimum thereby preventing unnecessary loss of lives and properties that run into billions of naira.

3.3 Basic Causes of Defects in Buildings

Defects in buildings occur because the original design was inadequate, or the building was not constructed in accordance with the design or with accepted good practice, the workmanship was below standard, or because the building has been subjected to forces and agents not allowed for in the design.

Basically, the majority of defects result from:

i) the application of forces, either externally or internally, greater than those which the building as a whole, or the components or materials of which it is made, can withstand.
ii) the effects of materials, whether in a gaseous, liquid or solid state, including those which contribute to the external climatic conditions and those which result from the occupancy of the building.
iii) the effect of biological agents, e.g., fungi.
iv) changes in temperature.

These may lead to:

a) Changes in the composition or condition of the materials used in the construction of the building: such changes may then render the materials more susceptible to applied forces, although they were adequate before the changes took place
b) Changes in the construction, ranging from slight cracking not affecting stability to complete destruction.
c) Changes in shape, size or weight
d) Changes in appearance, including colour. Slight changes from the original condition may not be considered as defects but this depends upon the circumstances. Major changes will usually be considered as defects, but may not, if they do not affect the appearance. In general, changes in composition result from fire, effects of gases, liquids and solids, biological agents and sunlight. Changes in the structure due to applied physical forces (including those from ground movements, climatic conditions etc) and changes in shape, size and weight from applied physical forces, effects of gases, liquids and solids, changes in temperature and changes in appearance from wear.

From the more practical aspect, however, the majority of defects can be placed in one of three main groups. The boundaries of these are by no means clear-cut and there will often be overlapping. These groups are:

1. defects caused by dampness which is visible as such or, as in the case of dry rot, provides the conditions for other agents to operate.
2. defects caused by applied forces, generally leading to the appearance of cracks; and
3. defects caused by changes in size.

The defects often occur because the designer has not appreciated that changes can take place in the construction or in the materials used and

has therefore not provided sufficient safeguards in his design. Materials are blamed for defects but the fault lies in the choice of unsuitable materials for the conditions to which they will be subjected. It is also sometimes claimed that considerations of costs determined the choice of materials which have failed but almost any materials can be used satisfactorily if their limitations are recognised and taken into account in the design. What is really needed is a better understanding of the inherent properties of materials. Designs would be improved if the concept of "trouble-shooting in advance" was employed more often and this would undoubtedly lead to a reduction in the numbers of defects which occur in buildings. Poor workmanship, especially non-compliance with the instructions given in the specification, is also responsible for the occurrence of defects. The lack of maintenance, or incorrect maintenance, can often reduce the effective life of the material far below that which should be achieved.

Dampness: The presence of excessive amounts of water in a building is almost certainly the cause of a greater proportion of defects than any other single cause or agent. The appearance of damp patches on the interior surfaces of building is at the least a nuisance or an annoyance, but at its worst the consequential damp conditions may affect the health of the occupants and cause much damage to the building materials. Three broad effects of dampness on building materials are: (i) material strength, (ii) change in size, (iii) chemical action.

The Effect of Weather

Defects in buildings and building materials are often said to be caused by the weather, especially when severe or unusual conditions have been experienced. However, careful research shows that faulty design, wrong choice of materials or faults on site are usually the root causes as the weather only provides the appropriate conditions for the failure to occur. These conditions lead to the various physical and chemical changes described above. The durability of materials may be reduced by exposure to weather, some by surface erosion and some by chemical changes but it is usually a slow process and an early breakdown is more likely to be due to other factors.

Biological Action Water is required to provide the right conditions for the growth of fungi, such as dry and wet rot, moulds, algae, etc. The amounts of water may be critical but it should be assumed that if such growths are present, the part of the building at which they occur is, or has been damp. Water is often responsible for the redistribution of dirt on the face of a building, leading to streaking on the surfaces and other unsightly effects. It may also redistribute constituents of materials which in turn may produce defects. A particular example of this is the

migration of soluble sulphates from bricks either into other materials where they may cause damage or simply to the face of the brick where they appear as unsightly efflorescence.

Cracks in Buildings

Cracks result from applied forces greater than those which the building or part of it can withstand. These forces may have been applied externally to the building, internally within the building, or have been built up in the materials of the building as a result of chemical changes. There may be a single force or a combination of forces, having a single cause or several causes. Much of the cracking that occurs early in the life of a building is due to the internal forces built up in many materials as the water used in the construction process dries up. Such cracking is generally superficial and, if so, it is easily repaired and will cause little trouble later on. Where it is more significant, the repair work may have to be repeated periodically as subsequent dimensional changes of the materials due to thermal and moisture content variations are likely to be accommodated at the cracks, the opening and closing of which will adversely affect the stability of the materials used as fillers. The structural significance of cracks tends to be exaggerated; this is a natural reaction of the owners or occupiers of a building. Obviously some cracks will be an indication of instability of the structure, but many others which look quite serious may have little or no effect on the stability either because the building has a high factor of safety or because the affected area does not contribute to the stability of the structure. Cracking generally has an adverse effect on appearance, though it is surprising for how long cracks can go unnoticed; sometimes for several years. In consequence statements made about the date of occurrence of a crack must be treated with considerable suspicion. The extent to which a crack allows rain penetration will depend upon various factors such as the construction of the building and the degree of exposure. The part played by capillarity in the passage of water is much greater with fine cracks than with wide cracks where it may be non-existent. Wide cracks may be susceptible to wind-driven rain but this will depend largely on whether the construction will allow the passage of air. Cracking in the outer leaf of a properly built cavity brick wall may not lead to rain penetration into the interior of the building, but if there are dirty wall ties, water may be transferred across the cavity to the inner leaf. Cracks can result from any of the following causes; though it does not necessarily follow that cracking will inevitably occur.

Movements of the ground: For example, mining subsidence, landslips, earthquakes, or moisture changes of shrinkable clay soils. The cracks form or appear because a part of the building has become displaced from the rest without any change in actual size of the materials. It is thus

theoretically possible to re-connect the displaced parts so as to bring the building back to its original condition, but in practice this can seldom be done. The point is however of importance when making the diagnosis. It should be noted that the ground above old mine working can sometimes be purposely lowered without causing the buildings on it to be damaged in any way.

Overloading: Cracks may result from overloading of the ground on which the building rests; or of the building itself or parts of it. For example, floors may deflect and cause cracks to appear on the underside. Releasing the load does not necessarily allow the building to revert to its original state since the overloading may have been partially accommodated by a permanent compaction of the materials. The forces responsible for the overloading may be external origin, such as excessive wind or snow loads; or they may be internal, such as those arising from the installation of excessively heavy equipment for which the building was not designed. A change of occupancy may have disastrous results.

The Effect of gases, liquids and solids: The only gas likely to lead to cracking is carbon dioxide, a normal constituent of air, which causes carbonation of porous Portland cement products leading to an overall shrinkage and showing as crazing cracks. The magnitude of these cracks may also be affected by shrinkage resulting from the drying out of construction water. Water is, of course, the commonest liquid likely to be involved in buildings, either in the construction process or in the subsequent usage of the building. There are exceptions where buildings are used for the storage of liquids, such as oil. The effects of water may be either physical, such as those produced by a change in water content; or chemical, due directly or indirectly to the presence of water. Chemical changes leading to cracking include those in which the products of the chemical reactions occupy a volume substantially different to that of the original material. Examples of these changes are the corrosion of steel and the part played by water in the attack of Portland Cement by sulphates. The resultant increase in volume produces a pressure which is relieved by the bursting of the affected material itself or of the materials in which it may be embedded. The commonest solids likely to cause expansion leading to cracking are soluble sulphates which attack Portland cement products. The sulphates may have their origin in the materials themselves or may be transferred from other materials or from the ground.

The effect of changes of temperature: The part played by water in changing the size of building materials has already been discussed. Changes in size are also caused by changes in temperature; for some materials these can be appreciable. Small buildings are usually

unaffected but in larger buildings the change in size of one part will cause cracking although not necessarily in the expanded part; often this will be in adjoining parts which are pushed out of their original position. It is probable that thermal expansion is given as the cause of cracking more often than it should be. This is because a crack, whatever its origin, provides a convenient observation point. It is possible to see with the naked eye the effects of changes in size by the opening and closing of cracks over a period of some hours, whereas it is not similarly possible to observe the overall expansion in the length of a wall. In fact it requires very special equipment to do so. Cracks can close up completely as a result of changes of temperature. The changes in size resulting from changes in temperature and moisture content (where applicable) are given in Table 1 for the more commonly used building materials. It has been taken from BRS Digest 75, "Cracking in buildings" and refers to unrestrained movements. In practice there is often some restraint so that the figures would generally be lower.

General: Vibrations from machinery, traffic, sonic booms, etc., are frequently put forward as causes of the cracking of buildings, but all the available evidence and experience suggests that this is likely only if the amplitude of the vibrations is considerable. One has only to consider the magnitude of the force required to move one part of a building away from an adjacent part to appreciate that this is unlikely. If cracks have actually been caused by vibrations it is likely that there are also other damages to the building. In the majority of cases the cracking has resulted from defects for which there is a straight forward explanation if the evidence is looked for. The increase in the number of very heavy vehicles may however alter the present situation.

SELF-ASSESSMENT EXERCISE

1. What are the problems associated with ineffective maintenance activities in organisations?
2. Explain the concepts of planned and unplanned maintenance.

4.0 CONCLUSION

Maintenance culture is a key determinant of the number of years a building stays. However it is important to note that the economic imperative of maintenance is to the advantage of both the owner of the buildings as well as occupier in the light of increasing cost of building materials. Like the human body it is expected that building will face with both biological and non-biological stressors like rain, sunshine, earth tremors and quakes and causing wear and tear. Other factors such as inadequate planning and proper usage of houses are possible causes of collapse building.

5.0 SUMMARY

In this unit, we continued on our discussion on building and losses. Specific emphasis is placed on the maintenance of edifice, the economic importance to owners, individuals and organisations; factors causing cracks in buildings among others were discussed. Consequently, the prevalence of adverse effect following lack of maintenance was highlighted and explained.

6.0 TUTOR- MARKED ASSIGNMENT

Write a short essay on the:

i. significance of maintenance culture to nation building.
ii. basic causes of defects in buildings.

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UNIT 5 PRINCIPLES, DIAGNOSIS AND CURE OF DEFECTIVE BUILDINGS

CONTENTS

1.0 INTRODUCTION

This section deals with principles of diagnosis and remediation taking some possible options of defects. The diagnosis of defects can be one of the most interesting aspects of building maintenance or indeed of building construction in general if it is approached in the right spirit. It can, in fact, be compared with crime detection for one starts with the symptoms of the defect as the first clues and proceeds to build up the evidence by careful investigation, eliminating the red herrings in the process, before finally marshalling all the data to solve the mystery or diagnose the probable cause of the fault. The building detective requires a sound knowledge of both building construction and the chemistry of building materials and can in truth be considered an expert.

2.0 OBJECTIVES

At the end of this unit, you should be able to:

- highlight some of the challenges of defect diagnosis
- examine relevant principles of diagnosis of defective building
- remediation of defective building.

3.0 MAIN CONTENT

3.1 Essentials in Diagnosis and Cure of Defective Buildings

One of the challenges of defect diagnosis is the wide variety of circumstances and causes which can confront the investigator. Nevertheless, the observance of certain procedures and the adoption of a systematic approach can greatly ease the detection process. This unit endeavours to give some guidance on these general requirements. The first essential is to discard any preconceived ideas of the cause of the

defect in question. Never use the diagnosis as a means of confirming an opinion already formed but start with an unbiased mind ready to assess impartially all the data available.

Collection of data

As much data as possible should be collected. The amount of time available for doing this will vary with the circumstances but it should be appreciated by all concerned that if the information collected is incomplete, more time will be wasted later. Therefore even when speed is vital time should be made for the collection of all the essential information. Do not jump to conclusions; you may be hopelessly wrong. Information may be obtained from a visual inspection of the defect and the surrounding area; site tests; laboratory examination of samples of materials; construction, maintenance and occupation of the building; and from the drawings, specification and other documents relating to the building.

Observation

Everything which would appear to be relevant should be observed and recorded. However, sight is not the only sense which should be used in the investigation. Some defects have a characteristic smell while for others, touch may reveal a looseness: no facility should be ignored in the detection process. A close inspection of the affected area should be made and where it is not possible to obtain access use should be made of a good pair of binoculars. Much detailed information concerning the upper parts of buildings can be obtained in this way, often with a considerable saving of time. Records of the data may be made by taking notes, by the use of a portable tape recorder or by using a camera. Photographs are especially worthwhile as they provide a permanent record, useful when an example is required of a particular defect for educational or feed-back purposes or when the collected information has to be passed on to another person to make the diagnosis. They are valuable as evidence in cases of dispute.

A small triple-lens magnifying glass is also extremely useful. It will help to establish whether a crack is new or old revealing the amount of dirt and debris in the crack, or the presence of paint on its sides, a certain indication that the crack was present before the wall was last decorated. Mould growths, woodworm holes and their accompanying debris are other items which can be more readily examined and identified by magnification. Measurements to gauge the extent of out-of-level, out-of plumbness and out-of-squareness can often be useful and may be necessary, but care must be taken to ensure that any such inaccuracies have occurred subsequent to the erection of the building. It may be

helpful to make repeated measurements, but if this is done it is essential to have accurate datum points. Many defects are caused by dampness and useful information may be obtained by using a moisture metre. Some metres give the moisture content of timber but only a more general indication of the wetness or dryness of such materials as plasters and concretes. Corroborative evidence can be obtained by taking a sample and placing it in an air-tight container for transfer to a testing house. Sometimes it is useful to know whether metals are present within the structure or in the ground on which the building rests and metal detectors may be helpful. Instruments are also available for determining the depth of the reinforcement in concrete. Always remember that it is better to have too much information than not enough.

Oral Information

Much information can often be obtained from those connected with the design, construction and subsequent occupation of the building, especially regarding the history of the defect. It must be appreciated that this may only relate to the time when the person first saw the defect and not necessarily to when it actually occurred. All oral information should be recorded as statements made for later confirmation if necessary. This applies particularly if the defect is likely to be the subject of a dispute, when the informant may be trying to protect his own interests. Second-hand information should be treated with reserve and, if it seems to be significant, every effort should be made to confirm it from other sources.

Recorded Information

Efforts should be made to see the drawings of the building. These should reveal details of the construction, so saving much of the exploratory work required to expose hidden detail and the further damage this will cause. A distinction must however be drawn between “as designed” and “as built” drawings, for variations made during the course of construction are often not recorded. The existence of a maintenance manual will be of great assistance as it should, if properly prepared, contain both details of the hidden construction and be up-to-date with a record of alterations, additions and maintenance carried out since the building was occupied which will be helpful in establishing the history of the defect. The production of a Maintenance Manual should always be regarded by designers as essential and those taking over a building should press for one to be produced. The specification for the building is sometimes useful and may be vital if there is a question of liability involving design or construction. Any reports on the defect which have already been produced should be obtained and studied since

they may contain information and opinion which should be considered in the light of the further evidence available.

Deduction of the cause of the defect

Having obtained as much information as possible about the building and the symptoms of the defect, it is then necessary to compare the symptoms with the known behaviour of the materials involved when subject to all the various conditions to which they have been exposed including contact with all the agents which may have been present. In many cases the probable cause of the defect will then be apparent but in others it may still be difficult to arrive at the solution. Symptoms which appear to be similar may have different causes and some defects may have more than one cause contributing to them at the same time. Sometimes there will be a shortage of information and it will then be necessary to balance the probability of one cause against another. It is, however, always important to keep an open mind when weighing up the evidence. Occasionally, there may be no information about the behaviour of the material under the particular conditions of the defect. When this is so outside, help will be required and although this may not provide the answer immediately, it may set in motion work to find out why the defect occurred. Let us follow the deductive principles described above by starting from the visible or other symptoms for each defect, then proceeding to the investigation and the data which should be acquired and finally to its interpretation so as to reach the probable cause by eliminating those which do not fit the evidence.

4.0 CONCLUSION

Evidences abound showing that there are usually preconceived views and opinions held by individuals and in some cases self acclaimed experts and quacks alike in the building industries about procedures and techniques guiding proper detection of defects building. It therefore implies that the knowledge of detection are usually viewed as common, but it nevertheless requires a scientific expertise, rulers and regulations involving documentation and information gathering in detecting and recommending a proper solution to building problems to avoid loss of properties and lives which are monumental and irrecoverable.

SELF-ASSESSMENT EXERCISE

What is the relevance of early diagnosis to building maintenance?

5.0 SUMMARY

This unit has given some guidance on the general requirements and principles in detecting defective building structurally and physically.

Various methods and processes involved were discussed, such as collection of relevant data, observational techniques, oral and secondary information. These are measures that will eventually lead to reliable generalisation and scientific deduction of the cause of building defects**.**

6.0 TUTOR-MARKED ASSIGNMENT

As building expert what are the guide to proper diagnosis of building defects?

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MODULE 4

UNIT 1 FACTORS RESPONSIBLE FOR STRUCTURAL FAILURES AND COLLAPSE OF BUILDINGS

CONTENTS

1.0 INTRODUCTION

Every building is prone to deterioration (i.e., wear and tear). This is traceable amongst other factors to the materials, elements as well as composites used in constructing them. Thus there is need for adequate design works by an expert. Quality control check at intervals with constant maintenance during construction works prolong their longevity.

2.0 OBJECTIVES

At the end of this unit, you should be able to:

- examine some common causes of structural defects
- highlight reported cases of collapse buildings in Nigeria.

3.0 MAIN CONTENT

3.1 Causes of Structural Defects

Buildings exhibit different reactions to environmental elements, man-made conditions and other types of uses. . Other causes of structural defects according to Oloyede (1991), and Adenuga (1999) are attributed to the following:

i. Socio-Economic Habits of Nigerians

It is often discovered that non-professionals design buildings and after the design by these quacks, for fear of paying appropriate fees to qualified people, they are passed on to the local planning authorities. Again the right professionals are not appointed into the right positions in local authorities responsible for checking building designs.

ii. Owner Contractor Syndrome

The owner in a bid to save cost wants to build by himself and using the so-called direct labour work force, purchases cheap and inferior building materials with little or no idea of the type of materials that are suitable for a particular part of a job. As reported by Warnang (1990) and Babatunde (1990), the failure of the five storey building adjacent to 109, Western Avenue, Iponri, Lagos State which collapsed was partly attributed to the owner-contractor syndrome.

iii. Improper Supervision of Project during Construction

As reported by Akeju (1984), involvement of competent professionals to handle the planning and design of a project does not entirely guarantee its stability. Every stage of the work must be supervised and managed by an appropriate qualified professional. A structure is said to be as good as its construction and not just its design. Therefore the project competently created on paper must be faithfully and accurately reproduced on the site.

Construction Problems

Ekanimoh (1995) reported that the use of poor materials and low standard of workmanship creep into construction in an attempt to lower the overall cost of construction. Some developers wrongly believe that by compromising slightly on materials quality, the overall effect on the structure will be little and the monetary gain will be large. This is wrong, the gain, money wise will be small and the danger to the structure will be enormous and destructive. Good materials in the hands

of experienced artisans are the best ways of saving cost. Investigations into the collapsed building at Akinhanmi Street, Ojuelegba as reported by Warnang (1990) and Babatunde (1990) revealed that the same foundation used for the first building that was demolished following a fire disaster, was the very one used for the new construction not minding the increased number of floors.

iv. Failure caused by Foundation Problems

Foundation failures are never due to a single cause, but there will always be one major cause. Ajayi (1988) considered that foundation failure may be due to any or a combination of the following:

a. Absence of a proper investigation of the site or wrong interpretation of the results of such investigation.
b. Faulty design of the foundation.
c. Bad workmanship in the construction of the foundation.
d. Poor construction materials during the construction of the foundation due to financial constraints.
e. Insufficient provisions in the design construction for exceptional natural phenomena such as thermal and biological conditions, rainfall and floods, greater than those hitherto recorded at the site.

v. Site Development Error

This is often the case when construction is carried out with insufficient or non-existent geotechnical studies. Inadequate soil investigation before embarking on a new building work may result in structural failure and eventual collapse. Steep slopes may be subjected to creep under heavy super imposed pressure. Sulphate in clay soil is deleterious to buried concrete, iron and steel. High water-table, which is seasonal, produces a lower soil bearing capacity than when the soil is dry, hence rendering construction inundated soils very expensive.

vi. Design Error

These include errors in concept, assessment of loading, calculation errors, improper elemental assembles, interrelationship errors, connection details errors, inability to visualise the mode of construction, maintainability, mis-use of computer software and detailing errors. Design errors can result in a collapse but often times, failure due to design errors are easily traceable when not compounded by construction errors. Designers must take into consideration the mode of construction in arriving at practicable designs.

vii. Operational Errors

These occur when alterations made to the structure are not taken into consideration during design. This usually occurs when there is an upward change in the economic value of the building location. A building that has been designed and constructed as residential might be converted into a school or supermarket requiring large free space or sometimes, more floors may be added thereby leading to overloading the existing foundation. Foundation and structural inadequacy are usually the causes of collapse in this regard. An example is the collapsed Port Harcourt building claiming over 50 lives.

viii. Inadequate Maintenance

Maintenance is a stitch in time that saves nine. Generally, much attention is not paid to maintenance and the government is the most guilty as observed by Adenuga (1999). The Sacred Heart Primary School building which collapsed in River States suffered a total neglect which led to the crash. Also, the house that collapsed along Shetima Avenue, Kano State in July 1991 during heavy downpour was the Climax of the consequence of the neglect of the roof leakage. Adenuga (1999) suggested that maintenance of a structure should start from the day the excavation is dug. For instance, if the foundation excavation shears before or after placement of concrete, it must be cleared and maintained because earth impurities impair the strength of concrete. Therefore, maintenance is a continuous exercise that ensures that defects are rectified as soon as they appear before further damage is done. This type of maintenance is called curative maintenance. An improved type of maintenance is the preventive maintenance though more expensive. This, for example, involves checking of roof members of a building and replacing the bad ones at a specified or pre-determined period, even without any sign of leakage or sagging of the roof. The most expensive and elaborate type of maintenance is called planned maintenance. It is the most useful, most expensive but most cost-effective over a long period especially in industrial or commercial buildings.

3.2 Nigeria: The Fact Sheet (Selected Cases of Building Disasters and Failures)

3.2.1 Collapsed Building at Ojuelegba, Surulere

The collapsed building was erected on a plot of land. It had reached the second floor slab when it collapsed in 1999. The investigation into the collapse of this building comprised a detailed site examination of the debris and an experimental assessment of the concrete elements for strength. The findings from the investigations are as follows:-

- The quality of concrete used was very poor. The debris showed evidence of the aggregate having the presence of laterite deposits.
- There was insufficient concrete cover to reinforcements. In fact, in some places, no cover was seen at all. This attests to lack of good supervision and bad workmanship.
- The columns must have contributed immensely to the collapse. All the columns were reinforced with 4 Nos. 12mm mild steel bars. For the number of storeys, obviously, the size and reinforcement were inadequate.
- Top reinforcements to take care of negative bending moments in the slabs at the support areas were absent.
- All the beams were uniformly reinforced. 16mm diameter mild steel bars for both top and bottom reinforcements irrespective of their sizes and shapes. This may mean some beams might have been over-reinforced or under-reinforced.
- Sandcrete blocks and mortar used for the overall construction were of poor mixes. Coupled with bad workmanship, the part of the wall bulged and together with the slab and parapet wall. There was no evidence that the blocks were tested.
- There was inadequate bonding between the steel and the concrete. This is also evidenced in the manner the concrete shattered.
- The concrete structure contained honey combs. This reflects an inadequate compaction of concrete.
- Anchorages for the steel were improperly placed. A close visual observation shows that some of the hocked ends were either lying horizontally rather than vertical, or were not provided at all for certain lengths of bars.
- There was no continuity of reinforcement bars. This was evidence in the manner of the collapse where the reinforcement of the collapsed area fell apart.

3.2.2 Partial Collapse at Adenike Moyosore Close Gbagada

The collapse of part of the building in early 1989 is an unreported case. The building is a residential building, a duplex that collapsed at the roofing stage of the construction operation. The building is of masonry construction, but with reinforced concrete slabs, lintels and parapet walls. Some differential settlement was observed when work was on, but this was not immediately thought to be serious. As work continued, the movement increased and resulted in the collapse of part of the building. Planning permission was given for the building. The investigation included a study of the materials used, the workmanship and the methods adopted in the construction. Below are the observations:-

- There was differential settlement of the foundation during the construction as evidence in the cracks noticed before the collapse. This brings us to question of the adequacy of the building.
- A careful examination of the reinforcement for the slab shows that there was no top reinforcement provided at the supports.
- The owner can be considered as the contractor. He made the purchase of the materials and engaged the supervision of unqualified engineers.
- Concrete mix was very poor. The rubbles of the concrete were more of sandstone. It so disintegrated after the collapse that it was unnecessary to carry out any test to know the strength is far below any minimum requirements.
- There was no edge beam to adequately transfer loads to the columns at the external sides.
- Spacing of the columns was not adequate as some were absent in some vital positions.
- There was absence of proper investigation of the site leading to faulty choice and design of foundation.
- The columns apparently buckled on the inadequate foundation which also gave way to the enormous load from the top.
- There was evidence of premature removal of framework.

This led to a sudden load imposition on the slab and beam which had not got sufficient strength to resist the loads. This caused deflections of slabs and also imposition of bending moments at the points of support between the beams and slab. Architects, builders, engineers, surveyors and others in the industry should be held responsible and liable under a criminal law if it is proved that failure of a building takes place due to their criminal negligence. Diligent prosecution of such cases is advocated.

3.2.3 Structural Investigation on the National Art Theatre Complex, Iganmu, Lagos (2005)

The national theatre is an architectural masterpiece, cultural landmark located at Iganmu, covering 23000 square metres and over 31 metres tall. It was built in 1975 to host national and international activities which include musical concerts, dramas, dances, film shows, symposia, exhibitions, convention, workshops, archives and even sports.

The complex comprises of functioning prestigious halls:

- Conference/banquet hall having capacity of 1500 seats
- Cinema halls each having seating capacity of 700 people
- Roof gardens with roof garden lights

- Exhibition halls – 2 numbers, each covering about 1830m2
- Main hall with 500 seating capacity

Other facilities include; car park for 250 cars, post office, 250 toilets with 300 urinals in the building, boreholes/preservator, sewage treatment plant, electricity substation which generates enough power to serve a town of 500000 inhabitants.

Defects in the complex

The complex as grandiose built was kept un-maintained while many spaces remained unutilised which led to development of defects as identified below:

Main bowl: Most of the facilities like central air conditioning system and lightings are not functioning.

Roof garden: Roof felt is weak and allow water passage easily, air extractor fan (no longer working), lightings on the roof garden are spoilt.

Toilet: Majority of the toilets; more than 70% of the 250 toilets are in state of collapse, no cisterns to flush, Formica partitions removed, more privacy but opened space as shown in the picture., insufficient water pressure, while little numbers left amongst the WCs are blocked with effluents.
Ceiling: Majority of the ceiling had been damaged by leakages from the roof, condensation from the central AC due to poor lagging and insulation, ineffective maintenance work.

Wall cladding: Algae growth and decay caused by rain water/dampness, paint failures – fading, crazing and saponification due to exposure to environmental degrading agents.

Door: Most of the entrance doors had been detached completely including main entrance doors.

Floor/finishes: Surrounding environment are settling due to compaction of soil beneath causing cracks and road separation and disjoint.

Chillers/equipment room: Completely vandalised, equipment parts removed and sold, necessitating introduction of split units to some offices and area.

Sewage treatment plant: Required rehabilitation to function well.

Electrical/power station: Transformer working at intervals due to ineffectiveness and substandard spare parts used as replacement.

Fire fighting: The fire extinguishers are expired.

No gas or powder in them in case of fire outbreaks.

Hose reel have been detached from their hooks and sold with no replacement. Lack of maintenance and neglect is the culture of government to such a prestigious building. We cannot continue to build more buildings if we cannot maintain existing ones.

Federal Secretariat Phase 1 – Ikoyi The building is a 12-storey with numerous facilities like lift, sprinkler, central air conditioning system, etc. It was designed by Arc. Fola Alade and built around 1975 to accommodate all federal ministries and parastatals.

Defects

The defects in the building could be classified as defect noticed before the fire incident and defect noticed after fire incident.

Defects before fire outbreak

Lifts: Incessant breakdowns due to overload and absence of maintenance operator, non-availability of spare parts.

Central air conditioning system: No more in used.

Water: No water supply to the upper floors as supply pipes (galvanized type) were corroded and pumping machines not functioning.

Electricity supply: Some gadgets installed are already phased out and **obsolete Dilapidation:** Most doors are warped, broken and detached; window panes are broken and frame loosen bonding to the wall. Many office furniture are disused and wrecked.

Defects due to fire outbreak

Walls: Cracks are developing now but not to a level of impairing structural stability yet.
Roof: Roof carcass burnt completely and sagging is noticeable now.

Slabs: Concrete slab is spalling due to fire intensity thereby exposing the reinforcement.

Beams: deflection and shearing action are noticed on most of the beams where fire occurred.

Doors and windows: Materials used for doors are timbers and are completely razed by the fire while aluminium windows glazing are broken. Reinforcement/steel: Steel reinforcement of columns and beams were observed to have corroded due to spalling of the concrete and moisture through the cracks.

Paints: Blisters are already formed on the block work. Paint films have cracks and peeled off.

Lift failure: Most of the lifts are no longer in use after the fire outbreak due to inadequate fund for repair and maintenance.

Air conditioning ducts: Duct and pipes are destroyed by the fire and there is no replacement.

Water services: Inadequate water supply to the upper floors. Sanitary system: sanitary convenience left unused since fire event due to no fund to repair and maintain them.

Fire services: Fire outbreaks are common occurrence in tall buildings and no adequate provision for fire fighting equipments.

SELF-ASSESSMENT EXERCISE

Discuss how best to prevent structural defects in any construction venture.

4.0 CONCLUSION

The thrust of the unit is that the maintenance of buildings will have a positive effect on the health of the users and occupants of the building and an additive effect on the value of the property. Maintenance of building stock, long neglected and in fact regarded as the Cinderella of the building industry may well turn out to be the panacea for conserving our rich but depleteable resources as a nation and reposition us in a cycle and club of great and prudent nations of the world.

5.0 SUMMARY

In this unit, our focus has centred on structural defects describing and explaining the meaning of the term as it relates to loss prevention management. Emphasis was also made on the causes of structural defects such as Socio-Economic Habits of Nigerians, owner contractor

syndrome, improper supervision of project during construction, construction problems, failure caused by foundation problems, site development error, Design error, operational errors and inadequate maintenance. Also highlighted were mild cases of structural defects at Ojuelegba, Surulere, partial collapse at Adenike Moyosore Close in Gbagada Lagos state.

6.0 TUTOR-MARKED ASSIGNMENT

The term Structural defect is relevant to the study of safety management and loss prevention. Discuss.

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UNIT 2 GATING, PRIVATE SECURITY AND PUBLIC SPACE

CONTENTS

1.0 INTRODUCTION

There has been a considerable growth of interest in recent years surrounding the emergence of 'gated communities', 'fortified enclaves' and other forms of privatised public space. This interest has been found in the work of sociologists and anthropologists who have focused on the residents of these developments as well as urban and regional theorists who have linked the emergence of GRDs to wider processes of economic and urban restructuring that have been associated with globalisation.

2.0 OBJECTIVES

At the end of this unit, you should be able to analyse:

- gating as an issue in public and private security
- theoretical and empirical perspectives of gating in modern day city development.

3.0 MAIN CONTENT

3.1 Gated Residential Development

The term 'gated residential development' is preferred to 'gated community' as it does not carry the same weight of sociological baggage. Gated Residential Developments (GRDs) are generally defined as master planned neighbourhoods that have been constructed with a boundary fence or wall, which separates them from their environs.

Right of entry is controlled either by security personnel, operation of gates or by electronic entry systems (Blakeley and Snyder, 1995; van

Vliet, 1998). Areas can also be retrofitted where formerly public streets or open housing developments are enclosed behind gates. The term 'temporary' 'faux' or 'pseudo' GRDs is sometimes used in situations where the development has been designed to give the impression that roads have been closed to foot and vehicle traffic or where fake security entry systems have been installed (Low, 2003). The interest in 'gated developments', 'fortified enclaves' and other forms of privatised public space rests on a number of assumptions, all of which are subject to questioning.

The first assumption is that the growth of such developments is a relatively recent phenomenon and is representative of a new phase in the evolution of the city which is associated with the emergence of mega and global cities (Amin and Thift, 2002; Marcuse and Kempen, 2000).

Second, that it is representative of a culture of fear and risk avoidance, which has emerged in the USA, South America,South Africa and Nigeria (Davis, 1990 and Glassner, 1999).

Third, that gating provides security to elite groups, and is limited to high-income households, who isolate themselves from social problems, located outside the gates (Atkinson and Flint, 2004).

The final assumption is that these developments are inherently undemocratic and damage wider processes of social participation and social cohesion (Marcuse and Kempen, 2002). All these assumptions consequently carry a strong normative and ideological significance.

The significance of gating can be summarised in an overview of the literature which outlines a general set of criticisms. Gating thus provides an intellectual intersection at which we can locate a much wider range of social changes.It concerns…a broader trend of private decision-making that has wider and public ramifications… [where] locational choices made by affluent households affect outcomes for the poor in terms of city sustainability, security and social segregation and a kind of spatial contract, which if not balanced by public intervention, may lead to a downward spiral of urban social relations (Atkinson and Blandy, 2005).

3.2 Gating

Many writers identify a new generation of GRDs that first appeared in the USA during the 1960s as the forerunners of the current developments that are now so popular with developers and residents (for example Low, 2003). Despite the notion that they represent a new enclaves, GRDs have been a common feature of urban development for centuries (Atkinson and Blandy, 2005). The growth of the GRD and

street barriers was evident in the expansion of 18th and 19th central London (Atkins, 1993) and the creation of gated housing estates managed by Octavia Hill for London's poor; the gated suburb first appeared in Mexico City at the start of the 20th Century (Aguilera, 2004). Sea Gate, New York City's first GRD was occupied in the inter-war years mainly by middle class Jewish households after being developed as a exclusive development for rich New Yorkers (Rosen, 2003). The more recent developments of the 1960s originated in gated leisure and living complexes in Florida; primarily designed for 'retirement communities' (van Vliet, 1998). Contemporary academic debates about gating have their origin in new urban sociological perspectives, which have developed concepts of 'global city-regions' (Scott *et al* 2002) the 'partitioned city' (Marcus and Kempen, 2000 and 2002) and in Germany the '*Zwischenstadt*' – or cities without cities – and 'splintering urbanism'. These theories regard gating as a negative expression of market led global economic growth. The central problem of our societies is the division among people, and that division is increasingly reflected by walls dividing them, walls whose social weight and impact has increasingly overshadowed their physical might (Marcuse, 1994: 41).

Gating and the culture of fear

The second assumption is that GRDs are associated with a 'culture of fear' and risk experienced within city environments. The growth of the fortified enclave is treated as a spatial expression of increasing socio-economic inequalities and urban conflict; it is therefore a reaction to increasing risks engendered in such cities by the mass media reporting of young people, immigrants, drugs, and crime. These fears are seen as particularly relevant within Anglo-Saxon cultures. That is the desire for security, orderliness and control. The management of risk and the taming of chance is to be sure of an underlying theme in any culture. But in Britain and America in recent decades, that theme has become a more dominant one. This management of risk was partly reflected in an increasing level of urban 'white flight' as many families fled what they perceived to be the crammed, chaotic and crime-ridden inner cities for the 'safer' and controllable suburban environs and newly created subsections of GRDs. Fear of non-white ethnic households is an undercurrent running through the interviewee narratives in the studies of GRDs. (Blakely and Snyder 1997, Low 2003 and aldeira 2000). Low argues that respondents frequently use euphemistic terms to express fear and mistrust of the dark and potentially dangerous 'other'. Such writers view these fears as based upon misunderstandings and misapprehensions. According to these arguments, gating does not help to reduce crime; it merely creates a false impression of security: 'crime

rates are already low' (Low, 2003: 11). The results are 'cellular and parallel lives lived in, and driven by fear' (Atkinson and Blandy, 2005).

The exclusivity of the GRD

The culture of fear argument is linked to the notion that gated developments are restricted to higher income households. As these households become increasingly aware of disparities in wealth and income they choose to distance and isolate themselves from the wider public. They thus both attract as much as prevent crime, as they themselves become targets for vandalism, burglary and theft (Atkinson *et. al*., 2004). This view is now being challenged by empirical evidence from the 2000 US census (Sanchez and Lang 2002), examples of gated developments of middle and lower income groups in Santiago, Sao Paulo, Mexico City, and the black middle class of Johannesburg or London.

Many people in the US and South Africa live in GRDs with walls only 2.4 metres high and have joined to enjoy leisure facilities (such as golf and tennis) as much as to purchase additional safety and security. There is such a range of gated accommodation that the binary classification into gated and non-gated appears to be less than worthwhile. The substitution of the concept 'fortified enclave' (Caldeira, 2000) includes a wider range of phenomena, such as university campuses, shopping malls and offices. The concepts, GRD or retro-gated housing estates are useful ways of identifying residential fortification without suggesting a 'community' behind the walls.

An important feature of GRDs is that property rights have been apportioned between a freehold covering the residential unit and a different type of agreement covering the common parts of the estate for the purposes of estate and facilities management and finance. This property type is what in America is termed a Common Interest Development (CID) or what in English property law would be called a leasehold agreement (or in the future a common hold agreement). The purpose and accountability of such management entities has been one reason that GRDs have been criticized as being authoritarian (by enforcing rules about dwelling exteriors) undemocratic (renters don't have a vote normally) and destabilising of local government structures. Gated developments are therefore argued to lead to an 'undermining of local and state responsibilities to at least create equity of outcomes between neighbourhoods of different social characteristics and qualities' (Atkinson and Blandy, 2005: 181).

In addition to its physical and environmental attributes, private communal areas, walls, gates and security patrols, the gated

development entails the creation of a 'territorial organisation' of the residents 'property rights'. These can include Home Owners Associations (HOAs) or Common Interest Housing Developments (CIDs) (McKenzie, 2003). In principle, these organisations provide a vehicle of representative governance in the management of resident interests. Both Glasze and McKenzie have questioned how democratic and representative such associations are in practice. However, the additional merit of being able to directly influence the management of a common residency is one of the key objectives of any government on neighbourhood regeneration policy. Furthermore, the concept of choice has become an increasingly important aspect of housing service delivery.

Gating and social cohesion

A common perception of gated developments is that they represent a particular form of social exclusion (Atkinson and Blandy, 2005). Based mainly on the US and UK literature, these views see gates as symbols of exclusion and unreality (Low, 2003: 2-3).

Gated Residential Developments are therefore perceived to limit the 'public realm' by encouraging residents to close themselves off from social contact; abandoning the city and thereby limiting the social capital of neighbourhoods to '*bonding*' formation and because such developments limit outside encounters restricting '*bridging*' social capital formation (Blandy and Lister, 2005).

Furthermore, these developments are perceived to intensify social and spatial segregation. That is black from white,upper class from lower class and rich from poor. By limiting the use of public space, they create a privatised environment, which denies access to other residents of the surrounding area. Gating is thus seen as a political act, 'part of a deeper social transformation…a metaphor for the social processes at work in the nation's political and social landscape' (Blakely and Snyder, 1997: vii). Consequently, the debate about gated developments carries a disproportionate weight of significance. Representative of an individualistic culture it is generally presented as an irrational fear of the 'other' and consequently lacking in legitimacy (Amin and Thrift, 2002). This development is representative of a 'dramatic manifestation of a new fortress mentality growing in America'. At an area level gating is also said to 'contribute to hyper segregation by reducing access and excluding individuals on the basis of social class' (Lang and Danielsen, 1997: 876). This assumption that gating is merely the preserve of middle-class elite is widespread amongst academic commentators. Hence relations with the wider neighbourhood are seen to be adversely affected by the physical form of the GC development. This has far-

reaching implications for community cohesion. There is a danger of attitude developing amongst residents of the GC and the surrounding neighbourhood (Blandy and Lister, 2005: 300).

SELF-ASSESSMENT EXERCISE

Gating is a form of insurance and security. However it has been noted as creating social exclusion. Discuss.

4.0 CONCLUSION

The dominant concept of gating in the academic literature raises a number of questions. What examples are used to define and delineate this concept and how is this phenomenon explained? What is now emerging in many post industrial cities is the capacity and strategy of a number of individuals to combine security services inside a walled housing environment. Evidences abound showing how gated residential developments can indicate the way in which households are choosing to manage risks related to crime and prevention of access to unwanted outsiders. Gating therefore becomes an insurance mechanism to minimise exposure to the dangers of modern urban societies.

5.0 SUMMARY

This unit reviews a range of arguments and some of the evidence on the emergence of gated communities or gated residential developments (GRDs). The focus was on issues relating to public and private security in modern city, development and it takes issue with the largely negative dominant academic narratives of GRDs, that they are private sector enclaves of high income households. Lastly the unit explained the interest in GRDs as been limited from both an empirical and theoretical perspective and that this phenomenon requires more complex analysis, situating it within a broader process of securitisation.

6.0 TUTOR-MARKED ASSIGNMENT

What are the basic assumptions on which Privatised public space development rests?

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UNIT 3 SAFETY MEASURES ON CONSTRUCTION COMPANIES IN LAGOS, NIGERIA

CONTENTS

1.0 INTRODUCTION

The high technology character of construction industry results in two major impacts on the occupation safety and health of construction workers on site. In the first instance, the high levels of technology applied in the machines and process used required that special precautions must be taken to protect the workers on site. In some instance, physical barriers to protect workers can adequately guard the hazards. However, on many sites, the machines and processes involved require the workers to learn a comprehensive set of procedural steps for their safe operations.

2.0 OBJECTIVES

At the end of this unit, you should be able to examine:

- the concept of safety in construction industry
- unsafe act and conditions
- safety measure.

3.0 MAIN CONTENT

The need for construction workers to master required procedural steps imply that the workers must possess a significant level of understanding regarding the technology involved and the extensive practice in following the procedural steps necessary for safe operation. The second major problem however, is seen in the worker's exposure to a number of materials either associated with the final product or as a part of the manufacturing process for which little may be known about the long-term health effects on the workers of exposure to these materials. Since

the objectives of establishing any Company is to meet the need of the people served by the product, maximise profit and increase the capital base of the company.

3.1 Safety

Paulson (1992) states that safety is a subject to which most people are quite willing to pay lip service, but which too few are willing really to do something about. According to Construction Industry Training Board (CITB) (1990), your health, safety and welfare at work are protected by law. Your employer has a duty to protect you and to keep you informed about health and safety. You have a responsibility to look after yourself and others. If there is a problem, discuss it with your employer or your safety representative. Anderson (1992) states that proactive safety performance is assured by providing the following: Plant and equipment which is fit for the purpose of reducing risks from identified hazards as far as is reasonably practicable; system and procedure to operate and maintain equipment in a satisfactory manner and to manage all associated activities; and people who are competent, through knowledge, skills and attitude, operate the plant and equipment and to implement the system and procedure. The overall construction industry is still looking at positive way to change to a safer working environment with many researchers. Hinzer (1996), looked beyond accidents and more towards human behaviours and culture. He said that measurement would enable comparison and benchmark performance and track progress from time to time. Once the principle and the practice of measurement become the norm, this will facilitate the transformation of motivations attitudes and choices in every construction company.

3.2 Unsafe Act and Conditions

According to Akintobi (1999), any act by someone without due regards for his own safety and that of others is described as an act capable of creating an unsafe situation or condition. Paulson (1992) states that roughly 80% of all the industrial accident involves unsafe act and not just unsafe conditions. Also CITB, (1988) states that unsafe people create unsafe conditions, which cause accidents and these often result in injuries or dangers. Some unsafe acts and conditions according to Akintobi (1999) are:

- improper use of tools;
- the use of tools for a particular assignment other than what they are meant for, constitute an unsafe act
- working on electrical equipments without switching them off.

CITB (1988) states that the unsafe act and attributes could cause accidents, which can results into unsafe condition. Some of the unsafe act and conditions are: lack of knowledge of good safety techniques, incorrect methods of constructions; incorrect use of machineries; working at unsafe speeds on machines, throwing or accidentally dropping objects from heights, spillage of grease, oil etc., failure to report faulty or unsafe equipment or dangerous occurrences and incidents etc.

3.2.1 Safety Measures

According to Anderson (1992), proactive safety performance is assured by providing the following; plants and equipment which is fit for the purpose of reducing risk from identified hazards; systems and procedure to operate and maintain those equipment in a satisfactory manner and to manage all associated activities and people who are competent through knowledge, skills and attitudes to operate the plants and equipment and to implement the system and procedure. Liska et al (1993) introduces the concept of zero accident techniques as follows; safety planning including goals, personnel, policies and procedures; fire protection programmes and safety budget; safety training and orientations; safety incentives; alcohol abuse programmes; proper record keeping and follow-up; regular safety meetings; personal protective. Other safety measures include; a comprehensive safety policy statement; a review of construct ability; reliable contractor screening; pre-construction meetings (safety review); inspection; good housekeeping.

4.0 CONCLUSION

Construction is a very hazardous industry, therefore each year a lot of workers both the skilled and unskilled lose their lives, and many more are maimed and injured on construction site. Because of the attendant loss generated on any accident occurrence on site, which could be enormous, as this may result in loss of life, money, time and company reputations, safety of workers on construction site must be of paramount importance to any construction company that wants to continue to operate. Safety is a subject to which most people are quite willing to pay lip service, but which too few are willing to do something about. Law must protect the health, safety and welfare of workers. Safety is looking beyond accidents and more towards human behaviours and culture. Its measurement would enable comparison and benchmark performance and track progress from time to time, as this will facilitate the transformation of motivations, attitudes and choices in every construction company. In conclusion, stiff penalty should be put in place for any construction firm that their worker sustains fatal injury due to safety negligence. Construction companies should be encouraged

through their professional association on the need to have competent safety advisers and to train and re-train their workers in the area of health and safety. Government should provide adequate safety policy (Safety Act) to ensure workers are fully compensated when there is accident on site.

SELF-ASSESSMENT EXERCISE

What are the best safety measures to be adopted by construction companies?

5.0 SUMMARY

This unit focused on safety, unsafe act and unsafe conditions and safety measure. Emphasis was placed on how best workers can be guaranteed safety by providing plants and equipment which are necessary for the purpose of reducing risk from identified hazards.

6.0 TUTOR-MARKED ASSIGNMENT

The need for adequate safety measures cannot be overemphasised in any industry. Discuss.

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UNIT 4 PROMOTING URBAN CRIME PREVENTION STRATEGIES IN AFRICA

CONTENTS

1.0 INTRODUCTION

The growing violence and feeling of insecurity that city dwellers are facing daily is one of the major challenges of cities around the world. The building of safe communities and the support and development of inclusive mechanisms and processes through prevention policies is one of the key elements of the United Nations Centre for Human Settlements (UNCHS) Campaign for good urban governance.

2.0 OBJECTIVES

At the end of this unit, you should be able to find out:

- crime and approaches to the increase in crime
- methodology in municipal intervention and the causes of delinquency.

3.0 MAIN CONTENT

3.1 Increase in Crime Rate

In Africa, as in other countries of the world, the high levels of murder, assault, rape, robbery and other crimes are underestimated because a small share of crimes are reported to and processed by the police. Specific surveys such as victimization survey for instance, show that police data account for about twenty five percent of all crimes. In addition petty crime, which are most prevalent everywhere constitute the basis of the feeling of insecurity and have the greatest impact on residents daily life.

The growing violence and feeling of insecurity that city dwellers are facing daily is one of the major challenges to sustainable cities around the world. The building of safe communities and the support and development of inclusive mechanisms and processes through prevention policies is one of the key elements of the United Nations Centre for Human Settlements (UNCHS) Campaign for good urban governance. Observers generally agree on a number of trends affecting cities worldwide: there is a continued growth in urbanization and a widening gap between rich and poor, and the have and the have-not countries. In addition, the North and the South countries have experienced a multi-fold increase in crime over the last thirty years. Crime adds to the deleterious effects of exclusion and contributes to the deteriorating quality of life, degradation of neighbourhoods and public spaces, and architecture of fear.

Youth crime is increasing exponentially in both the cities of the North and South. Phenomena such as youth gangs and street children are growing in most of the cities in Africa and represent a new face of urban insecurity, In addition, there is growing evidence of the incidence of domestic violence, which is estimated to affect up to ninety percent of all urban families in some contexts (Yaounde, UNESCO survey) The numerous consequences of urban violence include lost investment and urban decay, fear and insecurity and links between petty and organised crime, which constitute a fertile territory for consolidation of deeply rooted crime cultures. Central business districts, such as in Johannesburg and Nairobi have experienced heavy economic loss due to insecurity in the past years. Insecurity is also generating a legitimate demand for safety among the poor and the well off alike. The development of private security systems, which are profit oriented and only affordable for ten percent of the population, is a direct effect of this growing demand. Local and multinational enterprises have entered this profitable market, creating new regulatory problems and in some cases open conflict with state bodies in charge of security.

Crime and fear of crime damage civic vitality and hinder movement and participation of residents in city life. This is particularly true for women, who limit their movement due to fear and risk of becoming victim of crime. The poor suffer most because of urban violence. Research has demonstrated that even in countries where the economic differences are most striking, such as South Africa, the poor are more vulnerable than the well off. Not only do they have difficulties in protecting themselves from crime, since private security is unaffordable, but the impact of crime and violence on the poor is higher and more difficult to recover. Unprotected by insurance or by any other social security system, the poor permanently loose income and invested capital at the occurrence of theft or injury, increasing their overall vulnerability.

Finally, feelings of insecurity and fear among the poor limit their initiatives as well as their social cohesion, social interaction and access to services. The causes of delinquency are manifold. All research undertaken at the international level show that there is no single cause of delinquency, rather a combination of causes. For analytical purposes, this unit identifies three major causes: social, institutional and those related to the physical urban environment. They are obviously interrelated, but can be presented separately for clarity.

- Social exclusion due to long periods of unemployment or marginalisation, dropping out of school or illiteracy, and the lack of socialisation within the family seem to be the most recurring factors amongst the social causes of delinquency. Although, none of these factors on their own can be regarded as sufficient explanation. Cultural and role models in the urban context are displaced and difficult to identify. Messages are contradictory, since on one side individuality and initiative is praised, while on the other side opportunities are lacking and achievements biased by the predominance of corrupt practices. In many African cities, the lack of perspectives for the youth to ever enter the job market and to develop as meaningful members of society is a dominant character of urban society, particularly of poor neighbourhoods.

- With respect to institutional causes, it is necessary to mention the role of the judiciary system, of the prison and of the police in combating crime. The Judiciary is not capable of effacing the increase in the overall number of minor offences, which damage the quality of life and perpetuate a general perception of insecurity. Justice is slow, entrenched with corrupt practices and overloaded. Being an inherited system from colonial administrators, it is expensive and uses an outdated working methodology. Court decisions cover less than ten percent of the urban crime (major and minor delinquencies included). The sentences imposed, prisons and fines, are not adapted to responding to minor law breaking and rehabilitation and reintegration of offenders are practically non-existent. Often the coexistence of traditional and modern systems of justice helps. However, structural deficiencies of the judiciary are much heavier than elsewhere. Additionally, the traditional forms of justice though complementary, have not been sufficiently considered.

Prisons, with the exception of some modern and experimental prisons, constitute technical schools for the training and development of criminal networks. In Africa, many prisons are overcrowded and do not meet their objectives of rehabilitation of inmates, and have intolerable

conditions. Police is also ill-equipped to deal with minor offences and in general concentrates its efforts on major crimes. Relations with the population are most often characterized by mistrust and abuse and there is scarce accountability to the populations. Surveys indicate corruption as a distinctive character of police activity. Among the causes related to the physical environment, poor management of the urbanization process, inadequate urban services and infrastructure, failure to incorporate security related issues in urban management policies, apparition of poorly protected non-managed open spaces are key issues since they facilitate crime. Adequate spaces for socialisation and recreation are missing from modern areas and promiscuity and lawlessness of certain districts lead to the development of zones of lawlessness and gated communities. Under-equipped neighbourhoods offer little opportunities for the youth in terms of recreation or sport facilities. The chaotic set-up of some urban spaces (such as markets and transport terminals) facilitates petty crime and creates a sense of lawlessness.

- **Approaches to the increase in crime**

Two approaches are generally observed in addressing the increase in crime. On one hand governments have attempted to reinforce security through repression and crime control. These repressive measures include increasing police manpower, increasing the term of prison sentences, and applying repressive measures which are difficult to administer and at the same time questionable, in their results (e.g. the *Commandement Opérationel* in Cameroun). The second approach favours prevention in addition to repression. This means trying to build collective responses to insecurity aimed at addressing the causes of delinquency and the creation of a culture of solidarity which incorporates a culture of prevention into the population. However, within a democratic framework, the fight against crime is based on three principles: law enforcement for all, solidarity and crime prevention. In Africa, as in most cases of young democracies, increased resources are needed for law enforcement and support. Equally, the best means of ensuring respect of laws and regulations is to eliminate their shortcomings, by eliminating the conditions that create inefficiencies, by creating the social control which guarantees their enforcement, and through education and persuasion or rehabilitation. The preventive approach however faces many challenges, including the reluctance of governments to invest in it and the absence of a legal framework to facilitate preventive actions that exceed the framework of Non Governmental Organisation (NGO) activities. Local authorities most often lack the mandate and the capacity to lead such efforts and central government can be very reluctant to devolve such responsibilities.

Nevertheless, it is demonstrated by practice that cities can have a primary role in coordinating the activities aimed at reducing crime. Local governments can be the key actors in coalitions and in the development of community-wide planning strategies for crime prevention. The international conferences on the theme of urban violence and safety held successively in Barcelona (1987), Montreal (1989), Paris (1991), Vancouver (1996), Johannesburg (1998) and Naples (2000) reaffirmed the crucial role of local authorities as leaders of local partnerships. Mayors and city councillors are in strategic positions to initiate and co-ordinate local action and adequately address the social demand while linking with national level activities aimed at improving the quality of life. A partnership between local governments and other stakeholders can enable prevention and ultimately eliminate violence, crime and insecurity. Even in Africa, where Local Authorities are so much weaker than in developed countries, decentralisation is still proving to be a good norm. It has the potential to enhance participation of the inhabitants in managing their own affairs, therefore moulding sustainable practices. Where decentralised security policies works, permanent coordination on the ground is an essential factor, which enables social accessibility to services on a human scale.

In addition, decentralisation of urban security policies permits the close linkage of crime prevention with the city government. An elected mayor or a democratically elected representative of the government has a legitimate right to convene and to champion the participation of the civil society, the private sector and the criminal justice system in the formulation and implementation of an urban security programme. The decentralised policy involves all municipal departments. In fact, a culture of prevention begins at the local government level when the various heads of the various departments, e.g. transport, education, public works and health, etc. start to integrate urban security as a cross-cutting dimension in the formulation and implementation of their departmental policy. Decentralisation maximises on the local resources available towards improving the quality of life of the people. Decentralisation of urban security in Africa is however slow due to lack of political will, perception of security as the domain of central government alone and of structural weaknesses of most Local Authorities.

3.2 The Safer Cities Methodology of Municipal Intervention

Since 1996, the Safer Cities Programme has followed a structured process designed to nurture local crime prevention capacities namely:

a) Rigorous assessment of the crime situation through a local safety appraisal based on institutional, informal and social research data,

The appraisal seeks to identify, assess and give priority to safety problems and policies. Furthermore, it aims to generate consensus among partners. If more in-depth information is required, scientific data gathering approaches are available, such as victimisation surveys, women's safety audits, youth offender profiles, etc;

b) The identification and mobilisation of key partners at the local level who can contribute effectively to the reduction and prevention of crime;

c) The creation of a local safety coalition led by a public figure and supported by a technical coordinator. The technical coordinator in partnership with the local authority, co-ordinates, ensures continuity and focuses on strategic objectives;

e) The formulation and development of a local strategy that includes a detailed plan of action, responsibilities and a calendar of the social, institutional and situational measures to be taken;

f) The implementation of the local strategy. This includes a range of short and long-term prevention initiatives or projects which address the causes, manifestations and fears of crime;

g) The institutionalisation of the participatory local crime prevention approaches through the incorporation of safety as a cross-cutting dimension throughout the structures of local government and the criminal justice system.

This could require institutional reform, including the institutionalisation of the office of a Safer Cities coordinator (technical coordinator) in the local government. The main areas of interventions at city level are situational, social and institutional prevention. Situational prevention aims at changing the physical and environmental conditions that generate crime and fear of crime through improved urban design and planning. This type of prevention is based on the strategic analysis of a given area. It seeks to identify opportunities for criminal behaviour as well as groups and situations at risk. The programme supports the development of situational prevention policies through city-wide partnerships, including local government, the police, the private sector and civil society. Social prevention is focusing on actions aimed at groups at risk. Crime affects different groups in different ways, both from the perspective of potential victims and of potential offenders. Insecurity and crime in the city particularly affect children, youth and women. The programme supports integrated youth policies at the city level in order to address the particular needs of youth) involving all

relevant urban stakeholders. Furthermore, it seeks to influence youth policies at the national level.

The development of knowledge, tools and methodologies through training activities and exchange of experiences is an important component of these youth policies. It also contributes to the development of policies addressing violence against women. These activities involve raising awareness on gender and violence issues among law enforcement actors and other stakeholders. Secondly, tools are being developed to address the issues related to violence against women. In particular, tools for the collection of disaggregated data, for the sensitisation and involvement of men and for women's safety audits. Furthermore, it aims to organise the exchange of experiences, good practices and lessons learnt in this field. The programme also encourages the creation of neighbourhood watch groups as a form of community prevention involving community members in providing increased formal control in their neighbourhood. Members collaborate with the police and local leaders in the surveillance of their specific neighbourhood. Finally, Safer Cities supports new forms of policing and new forms of justice. It aims to bring the criminal justice system closer to the population and its needs with a view to introducing restorative justice. Community policing, informal and alternative mechanisms for conflict resolution and mediation by traditional community leaders are all examples of efficient safety improvement and citizenship development. The programme identifies and documents good practices of the criminal justice system, tests their reliability, provides as well as disseminates information on new forms of policing and justice.

The local adaptation of the safer cities approach

Adaptation of the approach to the local context is key to its effectiveness. The programme proposes a "process-oriented" framework. The contents are defined locally generating sets of examples and practices as this paper will now elaborate on the cities of Dar Es Salaam and Johannesburg.

In Dar Es Salaam, the main focus in the beginning was on the sensitisation (advocacy) of local stakeholders on the prevention approach. A project team with a Safer Cities coordinator was put in place and an initial plan of action defined. By 1999, the project had set up a local coalition and agreed on a strategy in accordance with local traditions and the political context. The partnership strategy agreed on specific activities such as sensitisation and awareness on the need to respect laws, job creation for ‘idle’ youth, community policing based on the Sungusungu or Tencell traditions together with the creation of a City Auxiliary Police and a local justice system or alternative justice. The

coalition mainly involved actors from the grassroots levels. It included ward and subward leaders, the police, community members, non-governmental organisations and community based organisations (CBO's). This bottom up approach receives political and financial support from higher levels of government. The project thus effectively reached the informal settlements, the police, local government and civil society. After the sensitisation, various communities seeking assistance in working with prevention are constantly approaching Safer Cities Dar Es Salaam. In this way the communities form their own project working with prevention which is integrated into the local cultural fabric.

The projects undertaken include:

- the Kijitonyama Youth Livelihood project, phase I, which is a community crime prevention through poverty reduction strategies, involving the unemployed youth in productive activities
- sensitisation workshops contributing to the establishment of a dynamic coalition; the launching of a radio campaign to build awareness of crime and safety issues;
- the development of local justice practices (reform of the judiciary), creating tribunals at ward level ;
- a drug campaign aimed at addressing the insecurity caused by drug addicts ;
- the Ubungo Bus Terminal project, which is a situational prevention initiative; the employment and
- environment initiative (in Kawe Ward).

With a strong support from the city commission and the police, the Safer Cities project and its approach, objectives and activities were included in the municipal restructuring plan. The city has been divided into three municipalities, each having its own Safer Cities unit with staff and funding provided. This reflects the increased support to crime prevention by the Tanzanian government at all levels. It is also a response to the growing demand from civil society to initiate and guide prevention initiatives. The key to institutionalisation in Dar Es Salaam is the location of a Safer Cities unit within the city structure, which provides guidance and inputs to the Safer Cities units at municipal level. It also functions as a planning unit to facilitate replication in other cities. Arusha, Morogoro, Mbeya and Moshi that have expressed interest and have received some support for the establishment of ‘Safer Cities’ initiatives to replicate the Sungusungu model and to create city auxiliary police. A different local adaptation of the Safer Cities philosophy took place in Johannesburg.

The process was jump-started by a victimisation survey carried out in July 1997. Its impact was considerable and positive. It contradicted the prevalent perceptions existent in society by showing that blacks and not whites were the primary victims of crime and especially violence. As such, the survey allowed for a change in perceptions and gave new impetus to the search for innovative responses. In 1997, a representative partnership was created, in which eighty organisations participated. The partnership had a steering committee in which thirty organisations are represented, including city councillors, local authority departments, provincial and national government departments, the business sector, NGO's, CBO's, unions, civic movements, youth and women's organisations, the South African police service and the judiciary.

The partnership agreed on a crime prevention strategy (the First Johannesburg crime prevention strategy and action plan), which incorporated the following activities:

- establishing metropolitan and municipal police services;
- aligning resources and objectives within a crime prevention framework; initiating targeted crime prevention programmes;
- coordinating participation and preventive action within the city environment. These include the following levels of intervention;
- making environments less conducive to crime;
- developing a culture of crime prevention;
- supporting preventive policing and law enforcement;
- information and tools for assisting victims and preventing victimisation.

The strategy developed into a Safer Cities philosophy, which was adopted by the participants in the partnership and by other urban role players who took up specific initiatives and mobilised their own resources, The strategy translated into a number of pilot projects among which are the hill brow cleanup project that address crime and environmental degradation (It used municipal budgets for the financing), the car guards project, informal street surveillance by the long term unemployed and paid by the provincial government; The transformation of traffic department to a municipal police service which is a creation of a metropolitan police service to, improve by-law enforcement and develop community policing; The hawkers partnership unit which involves hawkers in by-law enforcement and crime prevention ; The Western Joubert Park project aiming at the ‘rehabilitation’ of a crime-ridden area through dynamic community based partnerships;

The community watch initiative whose functions are patrolling, surveillance, community problem solving, disaster management, first aid, mediation and negotiation, conflict resolution ; law enforcement and

relocation of hawkers and taxis programme to create special hawker and taxi markets; a safer environment for women and children in improving the lighting system, creating victim support centres) workshops on abuse of women, redesigning the area; community based victim support system to reduce levels of trauma and repeated victimisation; the Johannesburg city centre project for detection and prevention of crime, deterrence of potential criminals, maintenance of public order, reduction of vandalism, enhancement of perception of safety, identification and management of traffic problems, support to disaster management and emergency services) improvement of the quality of life. These initiatives try to involve a wide range of partners from civil society and government in a community based manner. The municipal restructuring and the activities of the national secretariat for safety and security, including the fact that a second municipal safety strategy has been developed, positively influenced the institutionalisation of the Safer Cities philosophy, which is however not yet concluded. The Safer Cities team might be placed within the metropolitan police service or within the strategic planning unit, linked to the office of the city manager. These two options show the contradiction between conceptions of prevention which stress the link with law enforcement and those that stress the wide and multi-sectoral strategic role of prevention within urban management. The second municipal crime prevention strategy will in any case ensure incorporation of the Safer Cities project in the municipal structure. It will also ensure financial support by the government.

4.0 CONCLUSION

Overtime, the Safer Cities approach has evolved through the actual implementation experience and has been progressively supported by tools and concepts developed in cities. The importance of a process-oriented approach is demonstrated to be crucial to allow local adaptation, since there is a need to build the local capacity, identify local needs and create space for negotiation and innovation.

SELF-ASSESSMENT EXERCISE

Explain the concept of safer city approach in resolving the problems associated with crime.

5.0 SUMMARY

This unit commenced with the explanations of the concepts of Safer City in the light of the increasing crime wave in the world. The need for partnership in crime management shows that government alone cannot be completely responsible. Community based initiative and approach

was discussed as a philosophy in safer city development. Insecurity and fear of crime among urban dwellers, causes of deviance as evident in all human society reflects a manifestation described as manifold.

6.0 TUTOR-MARKED ASSIGNMENT

Safer Cities Programme has a structured process. List and explain some of these prevention capacities.

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UNIT 5 POLITICAL, RELIGIOUS AND ETHNIC CONFLICT IN NIGERIA

CONTENTS

1.0 INTRODUCTION

After many years of military dictatorship, democratic governance was re-installed in May 29, 1999 in Nigeria. While some people saw the installation of democratic government in Nigeria as an opportunity for development and the time to harvest the democratic dividends, others saw it as an avenue to express their grievances. The democratic government also created new areas of conflict by the competition for political spoils (Mohammed, 2004) some of which were sponsored by the aggrieved elites in order to distort the process of governance thereby creating unnecessary tension. According to IDMC (2006), ethno-religious conflict is endemic in Nigeria, with at least 14,000 people killed and hundreds of thousands displaced since military rule ended in 1999. The following are some of the politically, ethnically and religiously motivated crises and violence since the inception of democratic governance in 1999 adapted from the work of Elaigwu (2005) and Human Rights Watch (2003).

2.0 OBJECTIVES

At the end of this unit, you should be able to:

- examines the key concepts and background of ethno–nationalism in Nigeria
- discuss some of the measures instituted to manage it.

3.0 MAIN CONTENT

3.1 Political, Religious and Ethnic Conflict

Nigeria is presently undergoing upheavals in various parts of the country. There are varied reasons for these situations such as ethnic clashes, religious intolerance and border disputes to mention but a few. Irrespective of the category, it should be admitted that all the disputes could have been avoided if the conflict situations had been resolved before escalating (Alkali; 2004; Osaghae and Suberu, 2005). According to conflict theorists, conflicts, whether political, communal, ethnic or religious are often influenced or motivated by disparity rather than similarity among the people especially unequal ones. Karl Marx wrote in 1937 in the "Communist Manifesto" that "the history of all existing society is the history of class struggle". In other words, be it agrarian, feudal or capitalist society, conflict is constant because of class differences. Arguing from this perspective, one could say that conflict is inherent in human relationships. Although this perspective has gained momentum especially among its adherents, it never suggests that every underlying relationship must be expressed with the same magnitude of hatred and jealousy neither does it suggest that such conflict cannot be minimised (Okpeh, 2006). As written by Elaigwu (2005), *every form of interaction among human beings and groups can generate conflict. Conflict is the spice of every state. It tests the fragility or otherwise of the state and creates the basis of future amelioration or adjustments. However, conflicts beyond certain thresholds are detrimental to the very survival of the state, precisely because they threaten the consensual basis of association*. Writing about the causes of conflicts Elaigwu (2005) asserted that conflicts can arise due to many factors among which are:

i actions which lead to mutual mistrust, polarization of relations, and/or hostility among groups in apparently competitive interactions;
ii frustrations arising from unsatisfied human needs which may include psychological, economic, physical, social and others forms;
iii explosion of identity as groups begin to ask for greater participation and rights;
iv seemingly cultural incompatibility among groups with different communication styles; and perceived inequality and injustice expressed through competitive socio-political, economic and cultural frameworks.

These factors are eminently important in the understanding of ethno-religious and political conflicts in Nigeria. At this point, its important to highlight the historical antecedent of ethno-religious conflict.

3.1.1 Some Major Political, Religious and Ethnic Violence since May 1999

May 31st, 1999: A carry-over of the violent clash between the Ijaw and Itsekiri communities, which had started under the Military administration in Warri, Delta State.

July 2nd, 1999: Ethnic clash between the Yorubas and the Hausa/Fulani residing in Sagamu, Ogun State.

July 22nd, 1999: A spillover of the July 2 crisis in Sagamu. The Hausa targeted the Yoruba as a vengeance on the killings of their kit and kin in Yoruba land.

November 8th, 1999: This occurred in Odi community in Bayelsa state. "The town received a shelling and bombardment with artillery from soldiers" (Elaigwu, 2005).

February 28th, 2000: A clash between Muslim and Christian extremists in Kaduna State over the introduction of Sharia in some parts of the country.

Feb. 28th, 2000: The crisis started in Abia State as a reprisal to the Kaduna crisis. This later got spread to other eastern States.

March 10th, 2000: Communal clash between Ife and Modakeke communities in Ijesha, Osun State. Although the this crisis had been on for several years the march 10th crisis was believed to have been heightened by local government council creation and the tussle over the location of the Headquarters of the newly created local government.

April 14th, 2000: Communal clash that started over the location of local government council in Agyragu, Nasarawa State.

May 4th, 2000: Another round of communal clash between the warring communities of Ife and Modakeke in Osun State.

October17th, 2000: A face-off between the militant OPC (O'Odua People's Congress) members and Ilorin community over the supremacy of Emirate system in Kwara State.

October 18th, 2000: Another face off between the militant OPC and Hausa/ Fulani in Ajegunle, Lagos.

October 21th, 2000: Ethnic crisis in Minna, Niger State after the OPC assaults on the Hausa/Fulani in both Lagos and Ilorin.

June 28th, 2001: An ethnic violence between the Tiv and the Azara origins in Nasarawa State. It started as a retaliation of the gruesome killing of an Azara traditional ruler and later spread to Tiv village.

September 7th, 2001: A serious violent ethno-religious crisis between the Muslim Hausa/Fulani and the Christian indigenes in Jos, Plateau State. It started as a politically motivated crisis between the Jasawa Development Association and Plateau Youth Council over political appointment in Jos North Local Government Council.

September 15th, 2001: A reprisal killing of Northerners in Onithsha, Anambra State.

November 2nd, 2001: The clash started on a political ground over the relocation of the Local Government Headquarters that later resulted in ethno-religious dimension in Gwantu, Kaduna State.

May 2nd, 2002: Political violence that followed the PDP ward congress but later took an ethno-religious conflict in Jos, Plateau State.

Early March, 2003: Clash between armed supporters of the Peoples Democratic Party (PDP) and All Nigeria Peoples Party (ANPP) in Sokoto State.

March 3rd, 2003: State Chairman of the ANPP reported shooting attack on him while in vehicle in Ebonyi State.

March 4th, 2003: Clash between the PDP and ANPP after PDP state governor's convoy was attacked in Edo State.

March 6th, 2003: Attack on ANPP senatorial candidate's convoy in Cross Rivers State.

March 10th and 11th, 2003: Peoples Democratic Party/All Nigeria Peoples Party clash in Kebbi State.

March 11th-12th, 2003: Clash between PDP and Alliance for Democracy (AD) in Lagos state.

March 15th, 16th, 2003: Clash between PDP and ANPP supporters in Kebbi State.

July 14th, 2003: Communal clash in Epen, a community in war ravaged Uvwie Local Government Council in Delta State. It was connected to political rivalry in the area.

February 17th, 2004: Politically triggered mayhem in Takum LG between supporters of PDP and National Democratic Party (NDP) over local elections.

May 1st, 2004: Ethno-religious crisis that claimed over 650 lives in Yelwan Shendam, Plateau state.

May 12th, 2004: Kano state crisis following Yelwan Shendam ethno-religious crisis.

November 10th, 2004: Anambra political crisis where hundreds of armed youth stormed the state capital destroying properties.

January 16th, 2005: Religious mayhem between O'odua Peoples Congress (a Yoruba militant group) and Muslims over the erection of Ogun Shrine in a Muslim praying ground in Ipakodo, Lagos State.

February, 2005: Clash between nomads and farmers over claims of invasion of farmlands and destruction of crops in Ringim, Jigawa State.

February, 2005: Blood bath caused by invasion of Ibidi and Odioma communities by armed men in military uniform in Odioma Bayelsa State.

March 5th, 2005: Communal clash between Maruta community in Jigawa State and Burmin in Bauchi State over relocation of market.

May 11th, 2005: A communal clash between the Guza and Mariri communities in Lere, Kaduna State over relocation of a secondary school.

June 2005: A renewed clash between Sunni and Shiite sects over use of mosque in Sokoto State.

3.2 Management of Nigeria's Ethnic Diversities

The heterogeneous nature of the Nigerian state and the problem it poses to nation building is well recognised by its managers. Subsequently, policy measures to accommodate the diversities were implemented in

the past to assuage feelings of marginalisation and contain deviant behaviour from aggrieved groups. Some of the policies were implemented by the colonial administration and continued by the Nigerian ruling elites that replaced them. Others were initiated by the Nigerian ruling elites. Most of these measures are tokenistic and have not only failed to address the problem of ethnicity in Nigeria but have also complicated ethnic divisions in the country. Examples include the colonial policy of *Sabon garri* which sought to separate Nigeria's internal immigrants from one another. Also, the Native Authority system instituted to create ethnic citizenship different from the civic citizenship of the urban areas by allowing each ethnic group to sustain its particular heritage in accordance with colonial interests. These colonialist policies were vital in creating new symbolic focus on ethnicity because it gave members of ethnic groups in urban areas a viable reference point for their ethnic identity (Nnoli, 2008). This closed up all avenues for cross-cultural interaction that could have promoted understanding among ethnic groups in the country. Similarly, the principle of federalism introduced in 1954 by the Littleton Constitution was a response to ethnic politics. It was initially meant to create centres for the three major ethnic groups (Hausa–Fulani, Igbo and Yoruba) to ventilate their particularistic issues within self contained regional governments, but the minority ethnic groups, which were present in all the three regions, persistently complained of domination. To satisfy those agitations as well as weaken the regions to prevent the re-occurrence of Biafra, the military administration of General Gowon arbitrarily divided the regions into twelve states (Asia, 2001). This arbitrary multiplication of federation units was to be replicated by successive military administrations in the country to 36 states plus a federal capital territory of Abuja.

This arbitrary creation of states by the military only succeeded in perverting the structure of the Nigerian federalism and making it a source of tension. The 'federal character' principle introduced by the 1979 Constitution was designed to ensure the representation of various ethnic groups in the national decision-making process as a determinant of political behaviour. It is related to the quota system applied to ensure equitable distribution of resources and opportunities among the various Nigerian groups.

However, the implementation of this principle tends to sacrifice merit for mediocrity leading to disaffection among the populace. Imposition of the two-party systems in the botched third republic was a regulatory policy initiated by Ibrahim Babangida's military administration to prevent an ethnically-based party system. The two political parties were facilitated by that administration to draw a country-wide membership support base. The goal for instituting a two-party system was to

incorporate ethnic competition into intra-party struggles as against a battle between ethnic groups camouflaged in party competition as witnessed in the First Republic. In this way it was hoped that the ethnic factor would be kept away from public consciousness (IDEA, 2000, p.96). This measure, however, had limited success going by the obvious outcome of the annulled presidential election of 12th June 1993. In the Fourth Republic, the formation and development of political parties has down played issues of ethnic identification as platform of support mobilisation as indicated in the dominance of the Peoples Democratic Party which controls most of the elective offices cutting across all the geo-political regions of the country.

3.2.1 Major Challenges in the Management of Ethnic and Religious Conflicts in Nigeria

No claim is being made to identifying cause or causes of ethno-religious conflicts whether proximate, direct or remote but we can at least itemise some challenges in the management of such conflict from the following factors:

(a) Political Factors

Perhaps, the most insidious of the conflict influencing factors is the role of political operators who invoke ethnicity and religious mobilisation to gain political relevance. Indeed most of the ethno-religious conflicts can be traced to this cause. Unless something is done to check this anti-social practice, Nigeria agenda may end up in failure as this category of evil men will stop at nothing until they have achieved their nefarious aim.

(b) Economic Factors

Diverse claims over ownership or use of land, water and other resources for other tangible or intangible interests will continue to provoke conflicts between communities and ethnic groups.

(c) Social Factors

As we have seen, disagreement over cultural, ritual and other social practices like chieftaincy matters may provoke violent conflicts.

(d) Defective Legal Frame Work

In a multi-ethnic and multi-religious country like Nigeria it should not have been permitted to invoke religious advancement as a political manifesto to contest election as we have sadly witnessed in some

northern states. It is a signal error that Nigerian citizenship is not inclusive. A citizen who is not an indigene of his state of abode is left out in the cold in terms of political benefits and favours. We need to evolve a credible criterion for membership of a state or local government. The military-imposed constitution conferred enormous powers on the President including control over the Police and the Electoral Commission and yet he is permitted to preside over his own election.

It is not surprising therefore that the 2002 Election was a farce. For ethnic groups who are out of the orbit of power this situation portend grave consequences. The "federal character" clause should have been a temporary measure. It was inserted to protect minority interest but has now become a qualification for members of the majority groups to get appointed to positions to which they have neither the requisite qualification nor the experience. With so much concentration of the nation's resources in the centre members of the minority groups or indeed of majority group left out of the orbit of power are denied opportunity for self-expression, self actualisation and self-development. The deprivation and frustration will inevitably lead to agitation and conflicts.

(e) Clumsy, blunt and near paralysed Investigatory and Law enforcement Machinery

The pervasive corruption, indiscipline and lawlessness on the part of law enforcement and investigatory agency have bastardised the dignity of law. Such a situation can only lead to loss of confidence in the government with consequential recourse to ethnic or class protective measures. It should be added that it is particularly baffling that the assassins of the Federal Chief legal officer could not be apprehended even on the face of compelling evidence. In a situation where state religion is prohibited by the constitution some state Governors blatantly introduced religious law as the general *lex loci* in their states. Indeed sharia law is only applicable under the constitution in relation to muslim personal law. While the constitution proscribes discrimination on basis of religious affiliation only muslims can be sentenced to death for adultery in some states.

(f) Failure on the Part of Government

Nigeria has so far not produced a charismatic leader with ability to galvanise the various ethnic and religious groups. No leader has demonstrated outstanding ability to lead and the capacity to inspire confidence. Indeed it seems that our leaders during the first Republic are the best we have ever had. High levels of poverty and unemployment

from mid 1980s did no credit to the successive regimes. The conspicuous extravagant life style of political operators can only evoke resentment and agitation on the part of the various ethnic groups at the other side of the fence (Global Internal Displacement Project; 2005). Insincerity on the part of government, reports of Panels set up to investigate various wrong doings continue to gather dust while government looks the other way. Government often fail to pay adequate attention to early warning signals of crises and conflicts. Failure of government to effectively check corrupt practices on the part of officials and ensure equitable distribution of the wealth of the nation can only produce disruptive and disintegrating consequences. Government's neglect or failure to mobilize the civil society towards achieving ethnic and religious harmony as a political programme is undoubtedly unhelpful.

SELF-ASSESSMENT EXERCISE

The inevitability of conflict cannot be overemphasised in the study of safety management for loss prevention. Discuss in relation to the Nigerian environment.

4.0 CONCLUSION

The foregoing account reveals the relevance and urgency of establishing appropriate machinery for conflict avoidance, conflict management conflict resolution and peace-building. Conflict in an ethnically-diverse society like Nigeria cannot be unexpected. However, strong state institutions which could prevent or reduce the violent explosion of ethno-religious conflicts were lacking. The lack of strong institutions in Nigeria notwithstanding, the manner with which the managers of the state handle the ethnic agitations impacts on the corporate existence of country.

5.0 SUMMARY

This unit discusses the inevitability of conflict in a diverse society like Nigeria, the causes of conflict, and some major political, religious and ethnic violence since May 1999 were highlighted. The implication of religious and ethnic violence on nation building showed that much is still required in the management of ethnic and religious conflicts in Nigeria, as the nation is posed with a lot of challenges politically, economically and socially in achieving a democratic state relatively free of violence.

6.0 TUTOR-MARKED ASSIGNMENT

Discuss some of the challenges in the Management of Ethnic and Religious Conflicts in Nigeria**.**

7.0 REFERENCES/FURTHER READING

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