

HUMAN FACTORS IN AVIATION

ENAS 414

Lecture : 2
Tutorial : 0
Practical : 0

Year : IV
Part : I

Course Objectives:

The objective of this course is to develop students' understanding of human factors in aviation, with particular emphasis on human error, its causes, consequences, and potential risks in aircraft operations and maintenance.

1 Introduction (2 hours)

- 1.1 Historical development
- 1.2 Human reliability, error and factor: Facts and figure
- 1.3 Terms and definitions
- 1.4 Human reliability, error and factor: Useful information

2 Basic Mathematical Concept (5 hours)

- 2.1 Boolean algebra laws and probability properties
- 2.2 Terminologies and definitions
- 2.3 Probability distribution
- 2.4 Solving first order differential equation

3 Human Factors, Reliability and Error Concepts (8 hours)

- 3.1 Human factor objectives and man- machine system types and comparisons
- 3.2 Human sensory capacities and typical human behavior and their corresponding design consideration
- 3.3 Human factors related formula
- 3.4 Useful human factors guidelines and data collection sources
- 3.5 Human performance effectiveness and operator stress characteristics
- 3.6 Operational stressor and general stress factors
- 3.7 Human performance reliability and correct ability functions
- 3.8 Human error occurrences reasons, consequences, ways and classification
- 3.9 Human reliability and error data collection sources and quantitative data

4 Human Reliability and Error Analysis in Aviation Maintenance (5 hours)

- 4.1 Failure Modes and Effects Analysis (FMEA)
- 4.2 Man machine systems analysis
- 4.3 Root Cause Analysis (RCA)
- 4.4 Error caused removal program (ECRP)

- 4.5 Ishikawa (Fishbone diagram) cause and effect
- 4.6 Probability tree method
- 4.7 Fault tree analysis
- 4.8 Markov method

5 Human Error in Maintenance (5 hours)

- 5.1 Occurrence of maintenance error in equipment life cycles and elements of a maintenance
- 5.2 Persons Time (Person-Hours)
- 5.3 Maintenance environment and causes for the occurrence of maintenance errors
- 5.4 Types of maintenance errors
- 5.5 Common maintainability design errors and useful design improvement guidelines to reduce equipment errors
- 5.6 Maintenance work order (Instructions)
- 5.7 Maintenance error analysis methods

6 Human Factors in Aviation Maintenance (5 hours)

- 6.1 Need for human factors in aviation maintenance and its impact
- 6.2 Human factors in aviation maintenance: Challenge
- 6.3 Practical guide human factor: Aviation maintenance
- 6.4 Integrated maintenance human factor management system (IMMS)
- 6.5 Training program and areas for human factor: Aviation maintenance
- 6.6 Regulatory requirement: Human factor in aviation

7 Human Error in Aviation Maintenance (6 hours)

- 7.1 Aviation safety data and incident Statistics
- 7.2 Causes of human error in aviation maintenance
- 7.3 Major categories of human errors in aviation maintenance and inspection tasks
- 7.4 Common human errors in aircraft maintenance activities
- 7.5 Aircraft maintenance error analysis methods
- 7.6 Maintenance Error Decision Aid (MEDA)
- 7.7 Guidelines for reducing human error
- 7.8 Case studies in human error: Aviation Maintenance: British Airways, Continental Express Aloha Airlines.

8 Safety (6 hours)

- 8.1 Aviation maintenance safety statistics
- 8.2 Causes of maintenance safety problems and factors
- 8.3 Factors influencing safety behavior and culture in maintenance personnel
- 8.4 Good safety related practices and measures

8.5 Safety question: Manufacturers

8.6 Guidelines for aircraft engineering designers to improve safety in maintenance

9 Human Reliability and Error Analysis

(3 hours)

9.1 Mathematical models for predicting maintenance personnel reliability in normal and fluctuating environment

9.2 Models for performing single system maintenance error analysis

9.3 Models for performing redundant systems maintenance

Final Exam

The questions will cover all the chapters in the syllabus. The evaluation scheme will be as indicated in the table below:

Chapters	Hours	Marks distribution*
1, 2	7	10
3	8	10
4, 5	10	15
6, 7	11	15
8, 9	9	10
Total	45	60

* There may be minor deviation in marks distribution.

References

1. Dhillon, B. S. (1986). Human reliability: With human factors (Latest ed.). Pergamon Press.
2. Dhillon, B. S. (2017). Human reliability, error, and human factors in engineering maintenance: With reference to aviation and power generation. CRC Press.
3. International Civil Aviation Organization. (2024). Annex 18 to the Convention on International Civil Aviation: The safe transport of dangerous goods by air. International Civil Aviation Organization.
4. International Civil Aviation Organization. (2022). Annex 19 to the Convention on International Civil Aviation: Safety management. International Civil Aviation Organization.
5. Reason, J., Hobbs, A. (2003). Managing maintenance error: A practical guide. Routledge.
6. Federal Aviation Administration. (2023). Aviation maintenance technician handbook-General (FAA-H-8083-30B). Federal Aviation Administration.