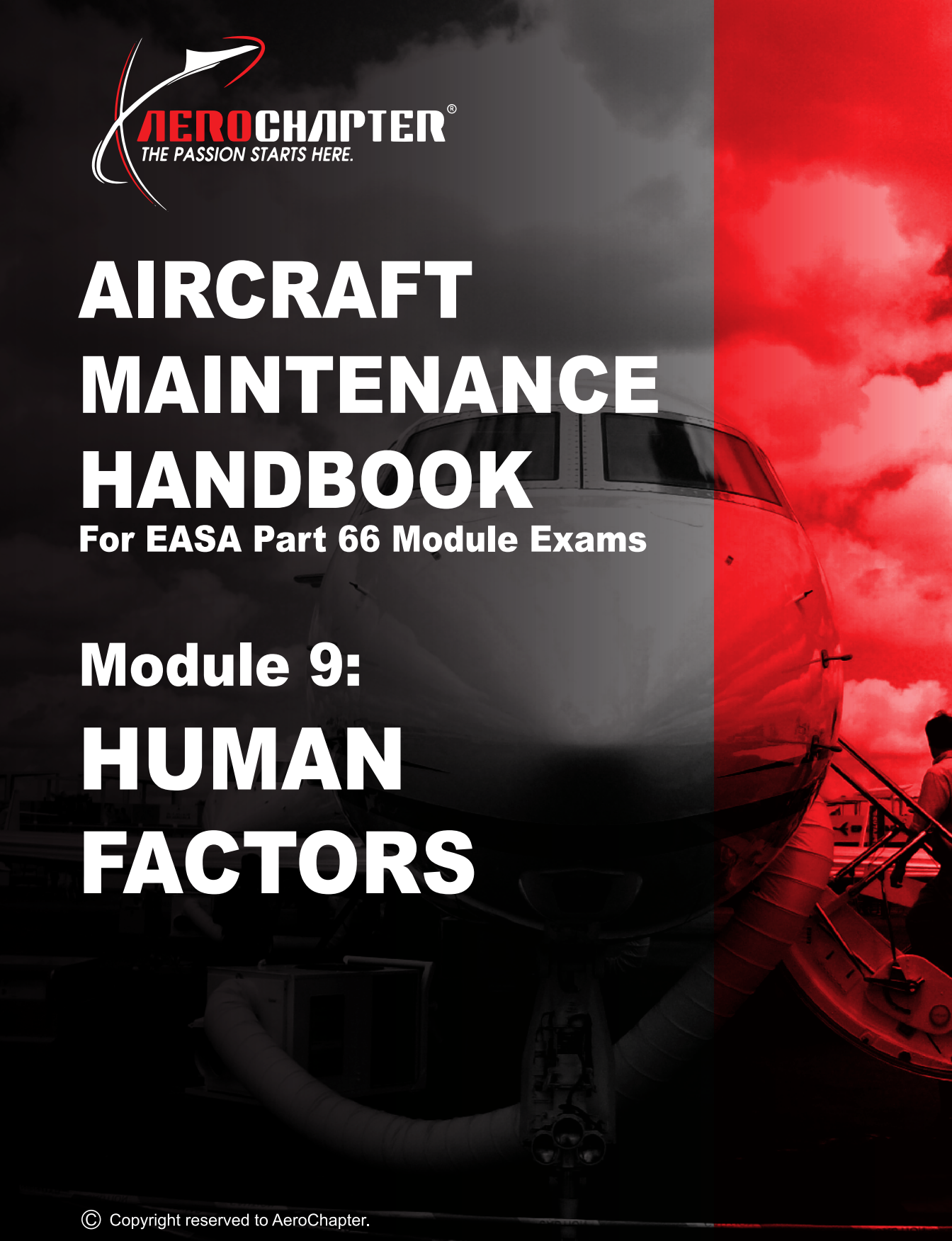
AEROCHAPTER®
THE PASSION STARTS HERE.

AIRCRAFT MAINTENANCE HANDBOOK

For EASA Part 66 Module Exams

Module 9:

HUMAN FACTORS



© Copyright reserved to AeroChapter.

AIRCRAFT MAINTENANCE HANDBOOK

For EASA Part 66 Module Exams

Module 9:

HUMAN FACTORS

Copyright © AeroChapter 2016

All rights reserved.

No part of this book may be reproduced or distributed in any form without prior written permission from AeroChapter.

It is IMPORTANT to note that this book can be used for educational/training purposes only. When carrying out a procedure, you MUST always follow instructions stated in the relevant aircraft manual or manufacturer's handbook and also follow the requirements of your national regulatory authority.

Published by AeroChapter

CONTENTS

Introduction xi

CHAPTER 1 Errors 1

Groups of Errors 1

Types of Errors 3

The Swiss Cheese Model 6

System Tolerance and Inspection Procedures 7

Causes of Errors 8

Error Management 9

CHAPTER 2 The SHELL Model 11

CHAPTER 3 Accidents 13

Murphy's Law 14

Types of Accidents 14

The Error Chain 15

Accident Statistics 16

CHAPTER 4 The Human Body 17

The Sense Organs 17

Circulatory System 28

LIST OF FIGURES

FIGURE 1.1 Reason's Bolt Model 5
FIGURE 1.2 The Swiss Cheese Model 7
FIGURE 2.1 The SHELL Model 12
FIGURE 3.1 Accident Causes 13
FIGURE 3.2 The Error Chain 15
FIGURE 4.1 The Sense Organs 18
FIGURE 4.2 Anatomy of the Human Eye 19
FIGURE 4.3 Normal vs Retinopathy 20
FIGURE 4.4 Myopia 21
FIGURE 4.5 Hyperopia 22
FIGURE 4.6 Anatomy of the Human Ear 25
FIGURE 4.7 Sensory Receptors of the Skin 27
FIGURE 4.8 Sense of Smell 28
FIGURE 4.9 Circulation Process 29
FIGURE 4.10 Molecules of the Blood 30
FIGURE 4.11 The Blood Vessels 30
FIGURE 4.12 Parts of the Respiratory System 32
FIGURE 4.13 Flight Pressurization 33

HUMAN FACTORS

Human factors and ergonomics is a multidisciplinary field incorporating contribution from psychology, engineering, biomechanics, industrial design and physiology. It is the study of designing equipment devices that fit the human body and its cognitive abilities. This scientific discipline is concerned with the understanding of human interaction and other elements of a system, and the profession that applies theory, principles, data and methods of design in order to optimize human well-being and overall human performance.

To assess the acceptance between a person and the used technology, human factors specialists or ergonomists consider two things such as the job and the user demand.

CHAPTER 1
Errors

Human beings are bound to make mistakes and chances of unintentional errors occurring in their tasks are extremely high. While total elimination of errors is difficult to achieve, yet they can be minimized. Aircraft industry depends on engineers to reassess a task by following certain standard protocol and adopting an efficient system. Even though aircrafts are designed with error tolerant systems, we follow AMM procedure, company procedure, EASA approvals and regulations.

Groups of Errors

Slips

These are the common unplanned error forms that are caused when a person diverts attention briefly. Examples: Over spilling while fuelling the aircraft (diverted attention); Entering wrong date or number on the computer (mind registering the wrong as right); Turning on the wrong switch (right action at a wrong time); Pouring hot water into a cup without a tea bag (transposing sequential steps).

Lapses

This is a skill-based error that occurs due to memory lapse. A person forgets to carry out a particular task and is very common among mentally tired workers. To minimize these type of errors, workers are encouraged to use of check list and reminders. It is mandatory for the pilots to use the checklist for starting an aircraft regardless of his work experience. Example: Missing a meeting due to failure of setting up a reminder in the calendar.

Mistakes

These are *rule-based* or *knowledge-based* or *skill-based* errors that occur when a task person believes it to be correct, when in fact it is wrong. This is based on the understanding of a particular concept. Rule-based mistakes occur when a person follows a wrong set of rules or incorrect procedures. Knowledge-based mistakes are based on the person's understanding and incorrect information. Skill-based mistakes occur when an incorrect action is engaged, although it has been automatically correct previously.

Violations

These are caused deliberately and are based on the attitude of a person. He may intentionally fail to complete a task and acts are a major threat as safety systems are designed to be followed without any deviations. In the US, violations are often called as circumventions. Though violation of the rules and regulations are common these days like exceeding speed limit on a residential area, avoiding traffic lights, parking illegally, they may have implications in terms of safety in aviation industry.

Violations can be further categorized as follows.

Routine violations: In this case, violations become a person's routine for cutting corners and a skilled worker even claims that it the right procedure. Examples: Not performing an engine run after a horoscope inspection and an incomplete pre-flight inspection.

Situational violations: Situational violations occur when a task is carried out by violating approved procedures. It may be due to time pressure, inadequate tooling, unworkable procedure, poor working condition and high work load. B747 flight incident is the best example. A technician with a tight deadline discovered that the jig required to drill off a new door torque tube is not available and decided to drill the holes by hand on a pillar drill. If he had complied with the AMM, he could not have completed the job on time, so he decided to violate the procedure. Even though his intentions were not bad, he violated his rules based on his situation which made the flight unsafe.

Optimizing violations: These are related to actions that people engage due to their personal satisfaction by breaking the rules. Example: The drivers who drive the vehicles at high speed across the airfield and gets a kick out of taking risk and driving fast.