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Introduction

The purpose of this document is to provide the user with general EASA Human Factors requirements. Our EASA Human Factors Matrix (on the last page of this document) serves as a general guide to harmonize our courses with the EASA requirements.

Blue Tuna's Human Factors are currently composed of 7 courses for a total of 8 hours of on line training. The training includes 12 case studies, up to date Human Factor Models, Accident Investigation and In Depth Review of Key Human Factors (the Dirty Dozen).

Repair Stations with **EASA Human Factors Requirements** may refer to the Human Factors Matrix on the *last page* of this document. The document also includes course descriptions and outlines.

General/Introduction to Human Factors

Need to address Human Factors and Statistics Incidents

Safety Culture/Organizational Factors Human Error

Error Models and Theory Types of Error in Maintenance Tasks Violations Implications of Error Avoiding and Managing Errors Human Reliability

Human Performance and Limitations

Vision Hearing Information Processing Attention and Perception Situational Awareness Memory Claustrophobia and Physical Access Motivation Fitness/Health Stress Workload management Fatigue Alcohol Physical work Repetitive Tasks / Complacency

Environment

Peer Pressure Stressors Time Pressure and Deadlines Workload Shift Work Noise and Fumes Illumination Climate and Temperature Motion and Vibration Complex systems Hazards in the Workplace Lack of Manpower Distractions and Interruptions

Procedures, Information, Tools and Practices

Visual Inspection Work Logging and Recording Procedure – Practice / Mismatch / Norms Technical Documentation - Access and Quality

Communication

Human Performance & Limitations Shift / Task Handover Dissemination of Information Cultural Differences

Teamwork

Responsibility Management, Supervision and Leadership Decision Making

Professionalism and Integrity

Keeping up to Date; currency Error Provoking Behavior Assertiveness.

Organization's Human Factors Program

Reporting Errors Disciplinary Policy Error Investigation Action to Address Problems Feedback

Course Title

Human Factors Introduction

Designed to meet the FAA's requirement for Human Factors Training, the training focuses on the foundations of the Shell Model, the Reason Model and Contributing Links in the Chain of Events. The Reason Model(s) examine the difference between latent and active errors and their relationship to the local maintenance organization. The MEDA presents a basic understanding of the mechanic in the maintenance setting. The Heinrich Ratio emphasizes the need to look for accident data at a much lower level. Using the Dryden Disaster as a case study the student will gain an understanding in how human factors impacts maintenance and service personnel. (Viewing length 50 minutes, 20 question quiz, 9 page student guide, total estimated training time 1.5 hour.)

Outline:

- 1. What is Man? Understanding the components
 - a. Fallibility man's leaning
 - b. MEDA components
 - c. United Flight 171 case study
 - d. Air Florida Flight 90
- 2. Historical Development of Human Factors
 - a. Crew Resourced Management
 - b. Human Factors Defined
 - c. The Development of the SHELL Model
 - d. Historical Demographics
 - e. Leading Causes of Error
- 3. The Heinrich Ratio as a means of capturing accident data
- 4. Contributing Links in the Chain of Events
 - a. Latent and Active events
- 5. Dryden the Case Study
- 6. Preventing Accidents
 - a. Link Busters
 - b. James Reason's Swiss Cheese Model
- 7. The Goal of Training

Topics

Understanding the psychological, psychosocial and physicality components of man. Man's leaning towards fallibility. MEDA Maintenance Error Decision Aid contributing factors are under management control. United Flight 171 distraction, Air Florida Flight 90 deviation from sop; pilot deficiencies, HF defined SHEL(L) James Reason, software, hardware, environment, liveware, Statistics, Contributing Causal Factors, Heinrich Ratio, Trending, Contributing Links in the Chain of Events, James Reason, Swiss Cheese Model, James Reason, Organization Factors, Dryden Case Study, corporate safety culture, organizational problems, latent and active errors.

The Dirty Dozen of Human Factors

12 factors that lead to maintenance errors have been identified, they are entitled The Dirty Dozen. The Dirty Dozen of Human Factors are realized in a state of too much or not enough, excess or deficiency. Both sides of the equation are examined. The introduction examines the basic principle associated with each factor and then presents strategies for reducing and eliminating error. These strategies have often been referred to as safety nets.1 hour, presentation, study guide and test.

Outline

- 1. The Dirty Dozen explained in the context of the condition of balance, too much and not enough.
 - a. Pressure
 - b. Stress
 - c. Norms
 - d. Fatigue
 - e. Distraction
 - f. Communication
 - g. Resources
 - h. Assertiveness
 - i. Awareness
 - j. Teamwork
 - k. Knowledge
- 2. Identifying each Human Factor that makes up the Dirty Dozen.
 - a. Each Human Factor defined
 - b. Each Human Factor exemplified
 - c. Each Human Factor reviewed in the context of balance / imbalance
- 3. Building Safety Nets of each Human Factor
 - a. Case Study Aloha Airlines Flight 243

Topics

Stress, Pressure, Norms, Fatigue, Distraction, Communication, Recourses Assertiveness, Awareness, Teamwork, Knowledge, Achieving Balance, Safety Nets, Latent and Active errors, the organization as a contributing factor.

The Curse of Complacency

Identified as one of the Dirty Dozen of Human Factors, complacency is a key problem in the aviation maintenance industry. Blue Tuna interviewed Repair Station Managers, technicians, quality managers and FAA Inspectors and across the board Complacency ranks as one of the dirtiest dozen. This presentation will introduce you to a general review of complacency in everyday life and then tighten up the focus of the lesson to examine how complacency finds a footing in aviation maintenance. The lesson also contains graphic footage of a retelling of Aloha Flight 243 to drive home the problem with complacency in aviation maintenance. Cures for the Curse of Complacency offers practical advice on guarding against this deadly human factor. 1 hour, viewing presentation, Study Guide and Test.

Outline

- 1. Complacency defined and illustrated in all parts of our lives.
 - a. The Statistics of Complacency
 - b. Complacency at work in a Company
- 2. Three Primary Factors at Work to Produce Complacency
 - a. Fatigue
 - b. Too many things happening simultaneously
 - c. Too few Things happening
- 3. Mental Workloads
 - a. Inspection procedures
 - b. Case Study Aloha Flight 243
- 4. Overcoming Complacency the Art of Creative Tension
 - a. The problems associated with out of balance living
 - b. Living and working in the top of the performance curve
- 5. Cures for Complacency
 - a. Rediscover your Passion for Work
 - b. Release the Power of Repetition
 - c. Guard Against Selective Attention

Topics

Mental Models, Creative Tension - Senge's 5th Discipline, Statistics, Complacency, Fatigue, Inspection Procedures, Case Study Aloha Flight 243 Creative Tension, Distraction, Performance Curve, Selective Attention Cocktail Part Effect, Balance in work and living, Cognitive Psychology Sensory Stores, Sensory Filters, Divided Attention.

Driven to Distraction

Distractions have been identified as one of the Dirty Dozen of Human Factors. Utilizing three case studies the cause and outcomes of distraction are clearly identified. Multitasking is closely examined as a culprit in the maintenance environment. Case studies include two aircraft maintenance occurrences and the MetroLink train disaster. Valuable research concerning multitasking performed by the FAA is included in this course. This course is fast paced, the case studies and overview of problems associated with distractions makes this a must course for any company involved in production or maintenance in the aviation environment. 1 hour, presentation, study guide and test.

Outline

- 1. Deadly Consequences resulting from Distraction
 - a. Case Study Metro Link Commuter Train
 - b. American Airline Flight 1400
- 2. The problems associated with multi-tasking
 - a. Scientific studies and the hidden cost and consequence of multitasking.
- 3. The many forms and sources of Distractions
 - a. Recovering from a Distraction
 - b. Distraction's impact on detection of variables in the workplace
- 4. Distractions and the Chain of Events
- 5. The Two Sides of Distraction
 - a. Lack of attention
 - b. Focused attention
- 6. Strategies for Countering Distractions
 - a. Implementing Controls
- 7. Problems with Multitasking
 - a. Executive Controls
 - b. Case Study NWA Flight 188
- 8. The relationship between distraction, complexity and criticality in tasks

Topics

Taking Shortcuts, Texting and Operating Machinery, Cocktail Party Effect, Cockpit Distractions, Engineering Controls, Suspending Rules, Cognitive Black Holing, Multitasking, Lack of Attention, Too Much Attention, Texting during a task, Cocktail Party Effect.

Situational Awareness

Identified as one of the Dirty Dozen of Human Factors, Situational Awareness (SA) is at the core of making good decisions in the workplace. Blue Tuna has created this Situational Awareness training for managers, supervisors, engineers, and quality control personnel who may be involved in designing processes and / or training in the maintenance environment. Situational Awareness reviews cognitive theory associated with SA and the complexities of mental models and the impact of memory processes and other dynamics at work in the environment. The value of Team Situational Awareness is examined. 1 hour total includes viewing, handout and test.

Outline

- 1. Situational Awareness defined and explained a. Components of Situational Awareness
- 2. Finding, sorting, integrating and process data
- 3. The Mechanics of Situational Awareness
 - a. Level 1 SA Perception of Cues
 - b. Level 2 SA Comprehension
 - c. Level 3 SA Projection
 - d. Decision
 - e. Performance
 - f. Information Processing (short and long term memory)
 - g. Automation
- 4. Situational Awareness Illustrated
 - a. Real World
 - b. System Knowledge
 - c. Interface Knowledge
- 5. The Role Memory plays in Situational Awareness
 - a. Processes
 - i. Perception
 - ii. Attention
 - iii. Pattern Matching
 - iv. Synthesis, Analysis & Meta Cognitive Processes
 - b. Memory Long Term
 - i. Goals
 - ii. Expectations
 - iii. Mental Models
 - iv. Schema
 - v. Product/Output & Closed Loop Processes
- 6. Attention Narrowing Case Study 1972 Eastern 401
- 7. Mental Models
 - a. Schema as scripts
 - b. Pattern Matching
 - c. Feedback Loops

- 8. Automaticity Short Circuit the Process
- 9. Application of Situational Awareness
 - a. The Value of Mental Models
 - b. Training "scripting" impacts Long Term Memory
 - c. The Inherent Problem ... Individuals still make poor decisions with good SA!
 - i. In the design process allow for this inherent problem by building checklists, double inspections, recursive processes to ensure good decisions.
 - ii. Stress has a cascading effect on memory recall.
- 10. Good Team Situational Awareness
 - a. Verbalization of Decisions
 - b. Better Team Meetings
 - c. Teamwork and Feedback
 - d. Individual Situational Awareness Training
 - e. Shared Mental Models

Topics

Situational Awareness, Long Term Memory, Short Term Memory, Decision Making, Automation, Cognitive Theory, Automaticity, Schema, Mental Models, Attention Narrowing, Meta Cognitive Theory, Checklists, Double Inspections Recursive Processes, Team Work, Team Situational Awareness, Collective Situational Awareness, Feedback Loops, Closed Loop Processes, Shared Mental Models.

FAA P.E.A.R. Model for Human Factors

The FAA has developed a memory aid called PEAR and it makes recognition and mitigation of Human Factors even easier. PEAR is a simplified version of the SHELL model. This course will compare the PEAR and SHELL models and then explain the components of the PEAR model, which are, People, Environment, Actions and Resources. This study includes the role of the five human senses in aviation maintenance. Of special concern is the study of the eye, ear and touch. The objective of this course is to explain the function of the senses and organs used daily in our lives and work. The course is built around the PEAR Model developed by Dr. Johnson. This course is 60 minutes in length with a quiz.

Outline

- 1. Models
 - a. Mental Models
 - b. SHEL(L)
 - c. PEAR Model
 - i. People who perform the job
 - ii. Organizational and Physical Environments
 - iii. Actions (tasks) performed as part of the job
 - iv. Tools, procedures and other resources
- 2. People
 - a. Anthropometrics
 - b. Psychological Self
 - c. Anthropometry
 - i. 5% 92% Fit
 - ii. The 5 Senses
- 3. Environment
 - a. Physical
 - b. Organizational
- 4. Actions
 - a. Task Analysis
 - b. Communication
- 5. Resources
 - a. Test Equipment
 - b. Procedures

Topics

SHEL, People Measurements, Performance, Ergonomics, Anthropometrics, Environment, Organizational, Task Analysis, Communication, Test Equipment, Hardware, Software, Procedures, the five senses of sight, smelling, touch, hearing and tasting.

Aggravators, the Human Factors of Stress, Pressure & Fatigue

The Aggravators are identified as Stress, Pressure and Fatigue. 12 human factors that lead to maintenance errors have been identified and they are entitled the Dirty Dozen. The Dirty Dozen is typically realized in an out of balance condition where there is too much or not enough that tips the scales towards errors. Three of the human factors, stress, pressure and fatigue may aggravate, distort, or amplify the effects of the remaining 9 factors. This course will focus on stress, pressure and fatigue. Through recognition of these 3 human factors we can develop strategies to overcome their negative consequences. 1.5 Hours includes the presentation, Study Guide and Test.

Outline

- 1. The Three Aggravators of Human Factors
 - a. Stress
 - b. Pressure
 - c. Fatigue
- 2. Stress as a Response vs. Stress as a State
 - a. Stress and Creative Tension
 - b. Chronic Stress
 - c. Case Study Costa Concordia January 13, 2012
 - d. The Upside to Stress
 - e. Managing Stress
- 3. Pressure
 - a. The Pressure to Fly
 - b. Case Study Dryden
 - c. Peer Pressure, The Power of Norms
- 4. Fatigue
 - a. Definition of Fatigue ICAO
 - b. The Biological Clock
 - c. Cologan Air Flight 3407
- 5. FoxConn A Cautionary Tale

Topics

Stress, Pressure, Fatigue, Creative Tension, Managing Stress, The Pressure to Fly, Norms, Circadian Rhythms, Chronic Stress, Work Arounds, Performance Curves, Aggravating the Factor, Amplifying the Consequences, Assertiveness, Balance, Stress as a State, as a Response, Stacking Stress, Accumulative Effects, Dissention in the Team, Apathy, Eustress vs. Distress.

EASA Requirements	Human Factors Intro	Dirty Dozen	Situational Awareness	Curse of Complacency	Driven to Distraction	The Aggravators - Stress, Pressure and Fatigue	PEAR Model
General/Introduction to Human Factors	x						
Need to address Human Factors and Statistics	x						
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Safety Culture/Organizational Factors Human Error							
Error Models and Theory	x						
Types of Error in Maintenance Tasks	x	x		x	x	x	x
Violations	x						
Implications of Error	x						
Avoiding and Managing Errors		х	х	x	x	x	
Human Reliability	x	х	х			x	х
Human Performance and Limitations	х						
Vision		x					
Hearing		x					
Information Processing			х				
Attention and Perception			x	x			
Situational Awareness			x				
Memory	x		х		x		
Claustrophobia and Physical Access							
Motivation	x			х		x	х
Fitness/Health	х					x	
Stress		x				x	х
Workload management			x				
Fatigue	х	x				x	
Alcohol	x	x					
Physical work	х	x				x	
Repetitive Tasks / Complacency				x			
Environment							
Peer Pressure	х	x					
Stressors		x				x	
Time Pressure and Deadlines						x	
Workload				х		x	
Shift Work		x					
Noise and Fumes							
Illumination	х	x					
Climate and Temperature	х	x					
Motion and Vibration		x					
Complex systems			x				
Hazards in the Workplace	x	x				x	
Lack of Manpower	х	x	x				
Distractions and Interruptions					x		
· · · · · · · · · ·							
Procedures, Information, Tools and Practices	x	x					
Visual Inspection	x			х			
Work Logging and Recording	x	x					
Procedure – Practice / Mismatch / Norms		x	x				
Technical Documentation - Access and Quality	x	x					x
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Communication	x	x	x				
Human Performance & Limitations Shift / Task Handover	х	x					
Dissemination of Information		x					
Cultural Differences							
						x	
Teamwork		x	x				
Responsibility	x	x	x				
Management, Supervision and Leadership	х	x	x				
Decision Making	х	x					
5							
Professionalism and Integrity	x						
Keeping up to Date; currency		x					
Error Provoking Behavior					x		
Assertiveness		x					
		~					
Organization's Human Factors Program	x	x					
Reporting Errors	x	<u>^</u>					
Disciplinary Policy	x						
Error Investigation	 ¥	x	x	x	x	x	
Action to Address Problems	Ŷ	x	Ŷ	Ŷ	Ŷ	Ŷ	x
Feedback	x	x	<u>^</u>	Ŷ	~	<u>^</u>	n
	~	~		~			