Assignment 4

Steve Mazza

November 4, 2011

1 Problems from *B&F*

14.7 Comfort, fatigue, human error, and productivity are all aspects of human design that should be accounted for in design-to requirements. Measures that I might apply as design-to requirements for the human elements of a system might be divided into broad categories based on *Duty*. The most obvious *Duty* categories heavilty affected by human factors arer *operation* and *maintenance*. The operator should fit comfortably within the designated space allocated for operation of the system. Screens and controls should be placed in such a way as to facilitate their location and visibility. While controls and control monitors (gauges, dials, and digital meters) should be grouped logically to reduce confusion and error, every effort should be made to position those most frequently used at the operator's easy reach. The operator's comfort and performance (productivity and error rate) are predicated on a reasonable accomodation of size and weight as well as viewing angle of screens, color and placement of other feedback mechanisms, environmental factors such as temperature, vibration, and noise and psychological factors such as stress.

Specific examples of design-to requirements might include

- The console operator's chair shall be height-adjustable within a range of 15 - 22 inches from the floor of the console.
- The console operations room shall be maintained at a temperature of at least 60 but not to exceed 80 degrees Farenheit.
- The console operations room shall be insulated from machine noise, limiting volume to no more than 50 decebles.
- The console chassis shall be hinged and hydraulically operated to provide access to internal wiring and electronics by maintenance personnel between the 95th percentile of men and the 5th percentile of women.
- The cosole chassis shall include interior lighting to improve visibility diring maintenance.

Specifically with respect to a laptop computer, the system of consideration, the major subsystems include the screen, the keyboard, power, and chassis.[1] Example allocation of design-to requirements to the major subsystems might look like:

- Screen

[1] This is not intended to be a complete list of the subsystems of a laptop, rather it is limited to items with which the end user will regularly interact.

  - The screen illumination shall be sufficient to allow viewing without the aid of external lighting.
  - The screen shall be mounted on hinges such that the operator can adjust the vertical viewing angle from 90 - 130 degrees.
  - The screen shall be polarized to facilitate viewing in direct sunlight.
- Keyboard
  - The keyboard layout shall follow the industry established QWERTY/US 101 layout.
  - To reduce operator fatigue and repetitive stress injury, pressure required to depress a key shall not exceed x.
- Power
  - Voltage and current shall be sufficient to accomodate peak system load.
  - Battery life shall be sufficient to sustain 75% of peak operational load for 4 hours continuously.
  - Head dissipatoin of the power module shall not exceed 110 degrees Farenheit.
- Chassis
  - The chassis shall be impact resistent to 10 foot-pounds of force.
  - All right angles on the chassis shall be rounded with a 3mm radius curve.

14.10 The system I will consider is a basic single-speed bicycle. The heirarchy of human activities is as follows:

Job Operations	**Duties**	**Tasks**	**Subtasks**	**Task Elements**
Ride the bicycle				
	Steer the bicycle			
		Turn handlebars		
			Grasp handlebars	
			Manipulate handlebars	
		Lean weight		
	Motivate the bicycle			
		Operate pedals		
			Rotate pedals forward	
				Bend knees
				Press pedals
	Stop the bicycle			
		Apply brakes		
			Rotate pedals backward	
				Bend knees
				Press pedals

I will focus on *Motivate the bicycle* in the development of the OTA.

(1) Function Motivate the bicycle

(2) Task Operate pedals

(3) Subtask Rotate pedals forward

(4) Action stimulus Rotational force on drive train

(5) Required action Apply rotational force to pedals

(6) Feedback Notice movement relative to the ground

(7) Task classification Operator task, rider

(8) Potential errors Fail to apply sufficient pressure to pedals; apply pressure in the wrong direction

(9) Time Dependant on skill level and environmental circumstances

(10) Work station Bicycle seat

(11) Skill levle Low

14.13 According to the text, "the safety/hazard analysis is closely aligned with the FMECA.[2] The following table depicts the relationship between the two.

FMECA	**Safety/Hazard Analysis**
Define System Requirements	
Accomlish Functional Analysis	
Accomplish Requirements Allocation	
Identify Failure Modes	Description of Hazard
Determine Causes of Failure	Cause of Hazard
Determine Effects of Failure	Identification of Hazard Effects
Identify Failure Detection Means	
Rate Failure Mode Severity	Hazard Classification
Rate Failure Mode Frequency	
Rate Failure Mode Detection probability	
Analyze Failure Mode Critically	Anticipated Probability of Hazard Occurrence
	Corrective Action of Preventative Measures

2 5 usability requirements for the ACIDS system

Anthropmetric: The MVS storage container shall require no more than two persons to transport on solid level ground for a distance no greater than 15 meters.

Human Sensory: The feedback controls on the MVS Remote Controller shall be daylight visible and have a viewing angle of at least 30 degrees both horizontal and vertical from center.

Physiolocial: The Metal-V Subsystem shall produce noise not to exceed 50 decebels during normal operation.

Psychological: The system shall require that the Vehicle Operator attend to no more than one (1) task at a time in order to facilitate distraction-free performance at critical mission components.

Personnel/Training: The system shall require no more than 150 hours of classroom and hands-on training by the Vehicle Operator to achieve certification for his/her job.

[2] B&F pp. 491.