

Session Number	5-Day System Safety Management Course DESCRIPTIONS	Schedule & Time
DAY ONE		
1	General Introduction Introduction of Instructor, Introduction of Students, Course Format and Expectations, Desired Learning Objectives	0800-0830 0.5 hours
2	Lecture: Introduction to System Safety Definition of System Safety, Traditional Approaches, Standards and Guidance, Management Perspectives, Introductory View of System Safety Objectives; Safety Risk as it Effects Political, Economic, Technical and Social Risks to the Program; Unacceptable, Residual, Acceptable, Unidentified Risk; Safety Versus Risk; Introduction to Risk Management; Responsibilities to Risk (Program Manager, Safety Manager, Engineering Manager etc); Introduction to Severity and Probability	0830-1000 1.5 hours
Break		1000-1015 0.25 hours
2	Lecture: Introduction to System Safety (continued)	1015-1200 1.75 hours
Lunch		1200-1300 1.0 hours
3	Lecture: Definitions The Meaning of Words – Why it Matters; Mil-Std 882 Definitions; Other Standards – Their Definitions – How They Differ; System Engineering Terms/Definitions; Software Development Terms/Definitions; Life Cycle Phases/Definitions	1300-1400 1.0 hours
4	Lecture: Functional Hazard Analysis Purpose of Functional Hazard Analysis; SAE ARP 4761 Criteria; Safety-Critical Functions Identification; Physical and Functional Decomposition of the System	1400-1500 1.0 hours
Break		1500-1515 0.25 hours
	Functional Hazard Assessment - Exercise One Introduction to the Segway Personal Transportation System (SPTS) exercise. Setting up the Functional Hazard Analysis Worksheet format and content. Class group exercise and workshop to commence the FHA activity. Exercise One Objective: Functional and physical decomposition of the system; Documenting the decomposed system in the FHA	1515-1700 1.75 hours
DAY TWO		
	Discussion – Day One Review, FHA Exercise One Review	0800-0830 0.5 hours
5	Lecture: System Safety Standards and Compliance Existing Compliance Standards and Common Best Practice; Evaluating the Contractual Requirements; Common Elements of All Standards; Prioritizing the Breadth and Depth of the System Safety Program	0830-1000 1.5 hours
Break		1000-1015 0.25 hours
	System Safety Practices in Singapore	1015-1115 1.0 hours

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6	Lecture: The System Safety Process An In-Depth Look at the 11 Essential Elements of System Safety Engineering; Functional Analysis, Definition of Safety-Critical Functions; Tailored Safety Requirements and Constraints; PHA/SHA/SSHA; Determination of System-Level Effects; Categorization of Severity & Probability; In-Depth Causal Analysis (Hardware, Software, and Human Elements) Derivation of Mitigation Requirements; Evidence of Safety Requirements Implementation; Final Hazard Categorization; Residual Safety Risk	1115-1200 0.75 hours
Lunch		1200-1300 1.0 hours
6	Lecture: The System Safety Process (continued)	1300-1500 2.0 hours
Break		1515-1530 .25 hours
7	Lecture: The System Safety Process & Acquisition Life Cycle Overlaying the Essential Elements of System Safety Engineering and Management Over the Acquisition Life Cycle Phases; Hardware Life Cycle versus the Software Life Cycle; Acquisition Life Cycle Phases to Include Concept Refinement, Technology Demonstration, System Development and Demonstration, Production and Deployment, and Operations and Support	1530 1600 0.5 hours
	Exercise Two – Functional Hazard Assessment Objective: Finalize the functional and physical decomposition of the system; Document the function(s) of each physical subsystem and major component and identify the consequence of loss of function or malfunction. Identify Safety-Critical Functions and Safety-Significant Functions	1600-1700 1.0 hours
DAY THREE		
	Discussion – Day Two Review, FHA Exercise Two Review	0800-0830 0.5 hours
8	Lecture: Introduction to Mishap and Hazard Analysis Introduction to the common hazard analysis products (Preliminary Hazard Analysis, Subsystem Hazard Analysis, System Hazard Analysis; Operations and Support Hazard Analysis, Health Hazard Analysis; Fault Tree Analysis; Source/Mechanism/Outcome Mil-Std 882C/D/E	0830-1000 1.5 hours
Break		1000-1015 0.25 hours
	Exercise Three – Hazard Analysis Objective: Identify the mishaps and the hazards associated with the SPTS	1015-1100 0.75 hours

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9	Lecture: Software Safety Engineering Process Defined 20-Step Software Safety Process from Functional Analysis to Safety Critical Functions, Preliminary Hazards; Software Causal Factors; Preliminary and Derived Software Safety Requirements; Design Analysis; Code-Level Analysis and Testing for Software Safety; Software Configuration Management; Design Order of Precedence; Hazard Tracking Methods; Verification of Residual Safety Risk; Meeting/Exceeding Customer Expectations	1100-1200 1.0 hours
Lunch		1200-1300 1.0 hours
	Lecture: Software Safety Engineering Process (continued)	1300-1445 1.75 hours
Break		1500-1515 0.25 hours
	Exercise Four – FHA Design Assurance Level Assignments Objective: Finalize the FHA worksheet. Assign DAL's to each of the functions that are deemed safety-critical or safety-significant	1515-1700 1.75 hours
DAY FOUR		
	Discussion – Day Three review, Exercise Four review	0800-0830 0.5 hours
10	Lecture: Requirements/Criteria Analysis Introduction to the Mil-Std 882 objectives of performing a SR/CA. Introduction to preliminary safety requirements; contributing safety requirements, and mitigating safety requirements. The importance of safety requirements in the system specifications including the software specification. Introduction to fault detection, isolation, annunciation, tolerance, and recovery.	0830-1000 1.5 hours
Break		1000-1015 0.25 hours
	Exercise Five: Defining System Safety Requirements for the SPTS Objective: Define the system safety design requirements for the SPTS based upon the results of the FHA and the PHA of previous exercises.	1015-1200 1.5 hours
Lunch		1200-1300 1.0 hours
11	Lecture: System Safety Management (of a Project) Approaches to Accident and Mishap Prevention; How to Sell Safety to the Managers; The System Safety Approach; How to Integrate Software Safety Engineering; Program Objectives; Identification of Hazards; Assessment of Mishap Risk; Tailoring Definitions for the Project; Safety Design Order of Precedence; Hazard Tracking; Cost Estimating for a System Safety/Software Safety Program	1300-1400 1.0 hours

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12	Lecture: System Safety Analysis Techniques Analysis Techniques to Support the PHA, SSHH, SHA, O&SHA and HHA Deliverables; Change Analysis; Energy trace Analysis; Failure Modes & Effects Analysis; Job Safety Analysis; Sneak Circuit Analysis; Fault Tree Analysis; IMPACT Analysis	1400-1500 1.0 hours
Break		1500-1515 0.15 hours
	Exercise Six – Fault Tree Analysis Objective: Prepare a simple fault tree on one of the assigned mishaps of the SPTS. Assess whether there are additional safety requirements to be derived from the results of the fault tree analysis	1515-1645 1.75 hours
	Sharing by Singapore Chapter Alternative Fault Tree development technique	1645-1700 0.15 hours
DAY FIVE		
	Discussion: Review of Day Four and Review of Exercise Six	0800-0830 0.5 hours
13	Lecture: Software Fault Tolerance Safe Design Techniques; Fault Avoidance and Elimination; Fault Detection; Fault Tolerance; Fault Annunciation; Fault Recovery; Fault Logging and Documenting	0830 0930 1.0 hours
	Exercise Seven: Finalize Safety Analyses Objective: Complete any unfinished analysis of the SPTS	0930-1000 0.5 hours
Break		1000-1015 0.25 hours
14	Lecture: The Safety Case – Residual Safety Risk Acceptance Safety Case Outline and Content; Appendices to the Safety Case; Safety Assessment and Residual Safety Risk	1015-1200 1.75 hours
Lunch		1200-1300 1.0 hours
	Final Discussion and Wrap-up Objective: Review of each exercise, the analyses produced, the methods or techniques used, and the perceived return on investment. Discussion of how to meet or exceed customer expectations and assessment of residual safety risk.	1300-1430 1.5 hours
	Critiques	1430-1500 0.5 hours
	Singapore Chapter Closing	1500-1530 0.5 hours
	System Safety Society Singapore Chapter – Sharing Session Guest Speaker: Steven F. Mattern	1600-1745 1.45 hours

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Exercise	<p>The “running” exercise that begins on Day One and goes through to Day Five is the heart and soul of the course. It provides the student with the practical application and real-time experience of performing analysis on a system. The exercise will consist of a defined “system” that will require the following analyses to be accomplished during the group exercise time. The performed analysis will include...but, not be limited to:</p> <ul style="list-style-type: none"> • Functional Hazard Analysis • Identification of Safety Critical Functions • Allocation of Safety Critical Functions to Hardware, Software, or Human Interfaces • Preliminary Hazard Analysis • Definition of Preliminary (Generic) Safety Requirements • Fault Tree Analysis • Definition of Derived Safety Requirements • Safety Risk Assessment 	