International Society of Safety Professionals

The ISSP is a US registered Non Profit Organization
10600 S. Penn St. Suite 16-553 – Oklahoma City – Oklahoma - 73170

The International Certified Registered Safety Professional

"ICRSP"

Information & Study Guide

Version 2, May 2018

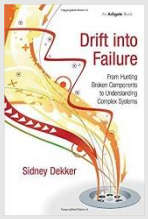
A Global Voice for
Safety Professionals

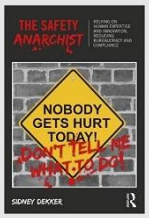
Recommended reading for every ICRSP Candidate

Meet some of our major contributors and supporters

Dr. Sidney Dekker

Griffith University, Brisbane Australia
Website: https://www.sidneydekker.com

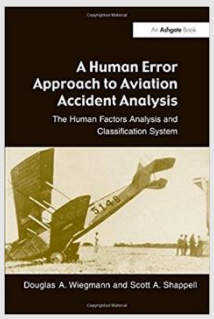




Just Culture trailer https://.youtube.com/watch?v=z19Qf4MDtQ

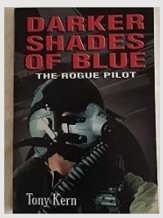
Dr. Scott A. Shappell & Dr. Douglas A. Wiegmann

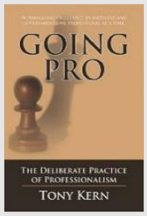
HFACS Inc.
Website: https://www.hfacs.com



Dr. Tony Kern

Convergent Performance
Website: https://www.convergentperformance.com





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Information & Study Guide

Table of Content

About The ICRSP

"The ISSP is dedicated to advancing the profession of safety management. To make that happen, safety professionals – as a community - must seek and obtain professional credentials!"
Mr. D Smith, ISSP President, June 2015

The ISSP is grateful for the work and publications of the noteworthy safety professionals and authors listed below. Without them the safety community would lack direction and substance.

Although the ICRSP exam contains only excerpts and philosophy from their publications, we highly recommend reading each publication listed in its entirety for continued professional development.

Credits and Acknowledgments

Dr. Tony Kern – Blue Threat and Going Pro
Dr. Scott Shappell & Dr. Douglas Wiegmann – Human Factors and Analysis Classification System
Dr. Bill Johnson – Human Factors P.E.A.R. Model, multiple Human Factors publications
Dr. Sidney Dekker – Safety Differently, Just Culture, The Safety Anarchist
Dr. Erik Hollnagel – Safety I and Safety II
Dr. James Reason - Managing The Risk of Organizational Accidents
Mr. D Smith – Quantum Safety Metrics
Peter M. Senge – The Fifth Discipline, The Art And Practice of The Learning Organization
Michael E. Porter – What is Strategy
Collins & Porras – Building Your Company's Vision
Kaplan & Norton – Using The Balance Scorecard As A Strategic Management System, The Execution Premium
Jeffry M. Hiatt & Timothy J. Creasey – The People Side of Change
Patrick Lencioni – The Five Dysfunctions of A Team, A Leadership Fable
West Palm Consulting LLC – How To Write A Business Case For Anything
Jeff Sutherland – The Art of Doing Twice The Work In Half The Time
Ron C. Mckinnon – Changing The Workplace Safety Culture
Joseph A. DeFeo & Joseph M. Juran – The Complete Guide To Performance Excellence
Dr. W.E. Deming – New Economics For Industry, Government Education

About The ICRSP

Credits and Acknowledgments - Continued

Dr. Stephen Covey – The Speed Of Trust
Dr. John C. Maxwell – The 21 Irrefutable Laws of Leadership
Tanya M. Anandan – The Shrinking Footprint of Robot Safety
Mouloua R. Parasuraman – Automation and Human Performance
Chris Ceplenski – HR Daily Advisor
Wayne Vanderhoof – Occupational Health and Safety Magazine
Michael Scullin, Julie Bugg, Mark McDaniel, Gilles Einstein – Prospective Memory and Aging
Diane Mitchell – Mental Workload
Phillip Smith – Human-Centered Technologies and Procedures for Future Air Traffic Management
John Lee, Katrina A. – Trust in Automation Design for Appropriate Reliance
Christopher Janicak – Safety Metrics
Mary Choy, Rebecca L. Salbu – Jet Lag
Lynn Bard – Human Factor Influencing Workplace Safety
Melissa A. Bailey – Occupational Safety and Health Law Handbook
Fred A. Manuele – Advancing Safety Management
Pat Clemens, Rodney Simmons – Systems Safety and Risk Management
Michelle M. Smith – Eight Cultural Imperatives for Workplace Safety
Mark Aldridge – History of Workplace Safety in the United States
Lynne Bard – Human Factor Influencing Workplace Safety

Thank You to the very talented team of safety professionals that contributed work to the development of the ICRSP, your countless hours of hard work, dedication and devotion to advancing the global safety initiative are greatly appreciated. Because of you our profession will advance and grow to change the world! Mr. Sonnie Bates, Mr. Scott Beck, Ms. Robin Erickson, Mr. Kevin Zemetis, Dr. Terry Taylor, Mr. Nate Predoehl, Mr. Gerold Kosbab, Ms. Sharon Grey, Dr. Don Wright, Dr. Gary Helmer, Dr. Curt Lewis, Mr. Dan McCune, Mr. D Smith, Mr. Robert J. Rendzio, Mrs. Alicia Storey, Mr. Winfred "Mitch" Mitchell, Safety Research Corporation of America and Keybridge Technologies.

About The ICRSP

ICRSP Disclaimer

The International Society of Safety Professionals makes no claim to the competency or ability of any individual. The ISSP awards the ICRSP to individuals for verification of safety management training, safety management experience, and successfully passing the ICRSP exam/test. No other claims are issued, actual or implied.

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About the ICRSP

The ***International Certified Registered Safety Professional*** "ICRSP" is an official ISSP certification offered to safety professionals of all industries and communities of practice.

To acquire the ICRSP a safety professionals must:

1) Provide proof of their safety education (digital documents only)
2) Provide proof of their safety experience (digital documents only)
3) Pass the ICRSP on-line examination.

ICRSP Prerequisites are:

- Be a current ISSP member.
- Provide electronic copies of education and experience or competencies.
- Pay a $495.00 fee for the exam. (study guide included free of charge)
- Pass the exam.

Benefits of the ICRSP are:

You receive a certificate of certification signed by our Board of Certifying Officials.
You receive a ICRSP glass desk plaque.
You receive a ICRSP lapel pin.
Your name and ICRSP designation displayed on our web site
An enhanced Safety Professional Credential backed by an international organization.

ICRSP Endorsements – As your safety career progresses you have the option of adding ICRSP endorsement certifications in specific technical areas of study, such as Human Factors, Accident Investigation, etc. or specific industry areas, such as Mining, Aviation, Healthcare, Oil and Gas, etc.

Upload your digital documents during the application process on the ISSP web site under the ICRSP tab.

Important Note – when you submit your digital documents include a cover sheet with the contact information and website of the training organization/s. Also the name, address, official title, and contact information of the management official who attested to you completing the competency requirements.

To see if you are eligible to become a ICRSP download the free Information and Study Guide from our web site at: www.isspsafety.org

For questions or additional information please call: (US) 405.694.1644

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Steps to Obtaining the ICRSP

Follow these steps to obtain and maintain the ICRSP Certification:

Step 1 – Become an ISSP member. Go to www.isspsafety.org and click on the "Join" button.

Step 2 - Download and complete the "Self Assessment" worksheet located under the International Certified Registered Safety Professional menu bar. There are three options available: Bronze, Silver or Gold. Complete the appropriate fields based on your individual knowledge and experience level.

Step 3 - If your self assessment indicates you meet the requirements, submit your application packet by clicking the "Apply to Become an ICRSP" option under the International Certified Registered Safety Professional menu button.

Note - The Application packet consists of three things:
1. Your completed self assessment
2. Certificates or transcripts to prove your training qualifications.
3. A letter from management to prove your competency qualifications.

Step 4 – Wait to hear via email that your application packet is complete and accepted.

Step 5 - Go to web site (www.isspsafety.org) and access the ICRSP Study Guide and Exam under the ICRSP menu button. Note - The exam is open book.

Step 5 - Utilize the study guide and complete the exam, receive your results immediately, and wait for your certification, desk plaque and lapel pin to arrive in the mail.

Step 6 - Begin using the ICRSP designation in your professional title.

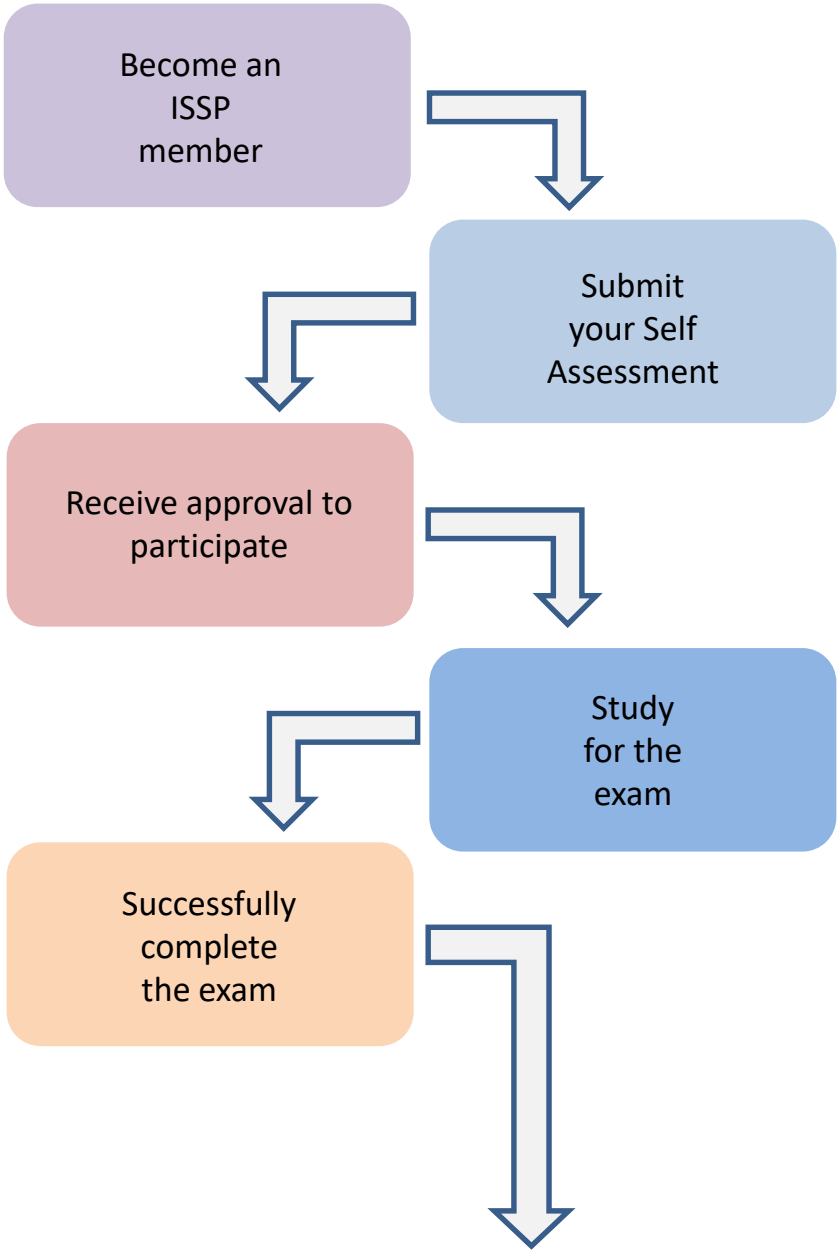
Step 7 - Continue to grow your qualifications throughout your career by adding endorsements to your ICRSP.

ICRSP Endorsements – As your safety career progresses you have the option of adding ICRSP endorsement certifications in specific technical areas of study, such as Human Factors, Accident Investigation, etc. or specific industry areas, such as Mining, Aviation, Healthcare, Oil and Gas, etc.

To find out if you are eligible to become a ICRSP visit us at: www.isspsafety.org

For questions or additional information please call: (US) 405.694.1644

Steps to Obtaining the ICRSP



Begin using the ICRSP Professional Credential &
Receive your Certificate, Desk Plaque and Lapel Pin in the mail

The International Certified Registered Safety Professional

"ICRSP"

Frequently Asked Questions
FAQ's

If you have additional questions please go to www.isspsafety.org and use the "contact" function.

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- How is the ICRSP different than other Safety professional Certifications?

1. It's an internationally recognized certification

2. The certification is developed and backed by the ISSP international membership, followers, and partners making it a consensus standard qualification for safety professionals.

3. ICRSP's have the ability to grow and advance their certification, as their career advances by adding additional certifications called "**ICRSP Endorsements"** – As your safety career progresses you have the option of adding ICRSP endorsement certifications in specific technical areas of study, such as Human Factors, Accident Investigation, etc. or specific industry areas, such as Mining, Aviation, Healthcare, Oil and Gas, etc. There is no limit as to how many special or specific endorsements you can obtain. The endorsements grow with you as your career advances.

4. We display your endorsements on our web site as a testament to the world that you have earned them.

- Who is eligible to become a ICRSP?
  - ❑ Only ISSP members who meet the prerequisites are eligible to become an International Certified Registered Safety Professional – ICRSP.

- What is the ICRSP?
  - ❑ The International Certified Registered Safety Professional (ICRSP) is a professional certification designed to recognize those individuals who have invested heavily in their skills, education and experience as a practitioner of safety management. The ICRSP is built on an industry best-practice model reflecting the attributes, competencies and experience necessary to standout in the field as a safety professional. The certification is backed by the standards, verification and testing provided by the International Society of Safety Professionals (ISSP).

- Why do I need the ICRSP?
  - ❑ For too many years, safety was viewed as a job function instead of a profession. Proof of an individuals level of achievement as a safety practitioner was difficult to obtain especially for those who carry a high level of responsibility for organizational safety management. Unlike engineering-based safety and reliability analyst roles, the successful organizational safety professional demonstrates a high level of competency in multiple domains including; human factors, occupational safety and health, hazard analysis, safety risk management, safety promotion, investigation, safety assurance, safety auditing, business management, communication, training, business acumen and more. Given this diversity it is difficult for organizations or potential employers to evaluate or validate the qualification of any safety professionals. The ICRSP certification is the solution. The ICRSP allows safety professionals to acclaim their qualified status and allows organizations to verify it.

- Who controls the ICRSP?
  - ❑ The ICRSP is developed and managed by the ISSP, a U.S.-registered Non Profit Organization founded and operated by safety professionals. One fundamental purpose of the ISSP is to promote and advance the profession of safety management, provide safety management professional development opportunities, provide industry standards for safety management best practices and to create a global, public registry of qualified safety professionals.

- The ISSP exists is to:
  - ❑ Bring enhanced credibility to the profession of safety management.
  - ❑ Have a global voice and the ability to shape our profession.
  - ❑ Educate the world about the role of the safety professional, their duties, responsibilities, education, qualification and certification requirements, and most importantly, the value safety professionals bring to an organization.
  - ❑ Demonstrate the safety professional value add to organizations through sustained and enhanced profitability.

- Who recognizes the ICRSP?
  - ❑ The ICRSP is emerging and quickly becoming a recognizable measure of professionalism and accomplishment that employers, regulators, customers and other stakeholders value in evaluating the capabilities and qualifications of safety professionals.

- Can I just pay a registration fee and get a ICRSP designation?
  - ❑ NO! The ISSP evaluates the combination of experience, education and demonstrated competency in those areas deemed critical for successful safety professionals. Experience and education are evaluated against strict ISSP standards. Competency is determined through standardized testing against a published ICRSP Standard of Key Knowledge Points. The credibility and success of the ICRSP program is dependent upon its integrity and transparency which is monitored by the ISSP Board of Directors.

- What are the ICRSP eligibility requirements?
  - ❑ There are four basic eligibility requirements:
    - Be an ISSP member
    - Meet the training/education requirements (found in the self-assessment)
    - Meet the experience/competency requirements (found in the self-assessment)
    - Pass the ICRSP exam (on line exam, download free exam study guide)

- How do I apply for the ICRSP certification?
  - ❑ ICRSP application is open to ISSP members in good standing. To apply, visit www.isspsafety.org for ISSP membership and ICRSP application details.

- What are the expenses associated with the ICRSP?
  - ❑ The qualification assessment is free of charge. Simply download the education and experience requirement documents and self assess. Contact us via the ICRSP email address for assistance.
  - ❑ The exam study guide is free of charge. Download it from our web site.
  - ❑ The exam currently cost $495.00 US. Use the study guide to prepare, pay the fee on our web site, and take up to 90 days to complete the exam.

- When will I know my exam results?
  - ❑ The exam is graded automatically upon completion. You will be notified immediately on the website of your score. Please note that you must score a minimum of 80% on each section of the exam. You are allowed one additional attempt per body of knowledge.

- What do I receive for successfully meeting all requirements and passing the exam? Newly designated ICRSP receive:
  - ❑ A ICRSP Certificate singed by our Board of Certifying Officials.
  - ❑ A tasteful ICRSP desk plaque with your name engraved.
  - ❑ An ISSP Lapel pin

- Can a ISSP Student Member become a ICRSP?
  - ❑ Yes, as long as she or he meet all the ICRSP requirements listed in the self assessment tool.

The International Certified Registered Safety Professional

"ICRSP"

Self Assessment

This self assessment is design to help you two ways:

1. Determine if you are ready to become an ICRSP.
2. Be your check list to obtain the ICRSP if you are not yet ready.

Very Important note – Meet the requirements of page one, "Bronze" level and you are eligible to become a ICRSP. Silver and Gold levels are optional.

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International Certified Registered Safety Professional, (ICRSP) Self Assessment

Complete the assessment below to determine if you are prepared to apply for the ICRSP (Bronze Level).

Important Note – Answer yes to all of the questions below and you are eligible to become an ICRSP

I can provide proof of the following safety training or education:

Note - Proof means official certificate of training from an established professional safety training organization, or a copy of university transcripts. An internal certificate of training from your organization DOES NOT qualify unless your organization is a professional safety training organization.

Training or education requirements to be eligible for the ICRSP	Yes	No	List your target goal to complete the requirement if you answered no.
Basic Safety Program Management Qualification course, or Safety Program Management education from an accredited University.			
A course of instruction for Human Factors or Human Error Prevention.			
A Course of instruction for Auditor Qualification			
A course of instruction that included Emergency Response Planning in the syllabus.			
A course of instruction that included Root Cause Analysis in the syllabus.			
A course of instruction that included Basic Accident/Incident Investigation in the syllabus.			
A course of instruction that included an overview of Basic Principles of Occupational Safety and Health.			
A course of instruction that included Safety Risk Management in the syllabus.			

I can provide proof of the following safety competencies:
Note – Proof means a letter signed by a member of management attesting to the fact that you have conducted and completed the tasks.

Competency requirements to be eligible for the ICRSP			
Draft and revised an organizational safety policy.			
Designed and conducted a complete safety risk management process.			
Conducted an organizational Internal Evaluation or safety audit.			
Lead and conducted an employee safety meeting.			
Developed an organizational safety training plan.			
Planned and conducted an organizational Emergency Response exercise.			
*** In addition to the educational and competency requirements you must:**			
* Have a current ISSP Membership.			
* Successfully pass the ICRSP Examination.			

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International Certified Registered Safety Professional, (ICRSP) Self Assessment

Complete the assessment below to determine if you are prepared to apply for the ICRSP (Silver Level).

Important Note – Answer yes to all of the questions below and you are eligible to become a Silver Level ICRSP

I can provide proof of the following safety training or education to obtain a ICRSP Silver Level:

Note 1 - Proof means official certificate of training with the course syllabus or course description that includes the required topics or subject matter from an established professional safety training organization, or a copy of university transcripts.

Note 2 – There is no requirement for an individual to advance to the "Silver" level, it is offered as a career enhancing and professional designation option.

Training or education requirements to be eligible for the "Silver" level ICRSP	Yes	No	List your target goal to complete the requirement if you answered no.
Complete the Bronze level requirements plus:			
A course of instruction that included aspects of Organizational safety Culture.			
A course of instruction that included management or leadership training.			
A course of instruction that included Instructor/Facilitator training.			
A course of instruction that included Business or Safety Administration training.			
A course of instruction that included Organizational Change Management training.			

I can provide proof of the following safety competencies:
Note – Proof means a letter signed by a member of management attesting to the fact that you have conducted and completed the tasks.

Competency requirements to be eligible for the "Silver" level ICRSP			
Have a current ISSP membership.			
Complete the Bronze level requirements.			
Prepare and administer a safety budget.			
Conduct an organizational safety culture assessment.			
Complete an organizational job hazard analysis.			

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International Certified Registered Safety Professional, (ICRSP) Self Assessment

Complete the assessment below to determine if you are prepared to apply for the ICRSP (Gold Level).

Important Note – Answer yes to all of the questions below and you are eligible to become a Gold level ICRSP

I can provide proof of the following safety training or education to obtain a ICRSP Gold Level:

Note 1 - Proof means official certificate of training with the course syllabus or course description that includes the required topics or subject matter from an established professional safety training organization, or a copy of university transcripts.

Note 2 – There is no requirement for an individual to advance to the "Gold" level, it is offered as a career enhancing and professional designation option.

Training or education requirements to be eligible for the "Gold" level CRSP	Yes	No	List your target goal to complete the requirement if you answered no.
Complete the Silver level requirements plus:			
Demonstrate at least eight (8) hours of safety professional continuing education annually.			
I can provide proof of the following safety competencies: **Note – Proof means a letter signed by a member of management attesting to the fact that you have conducted and completed the tasks.**			
Competency requirements to be eligible for the "Gold" level ICRSP			
Have a current ISSP membership.			
Complete the Silver Level ICRSP requirements.			
Author a professional safety paper, white paper, safety article, or book and be published on a national or international venue. (The ISSP web site qualifies as an international venue)			
Speak on a safety topic at a professional safety forum.			

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Study Guide

Body of Knowledge - BOK

"Business Acumen"

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Key Knowledge Point	BOK	Reference	Study Guide Material
Peter Senge in the Fifth Discipline states "Team learning starts with _____, the capacity of members of a team to suspend assumptions and enter into genuine thinking together."	Business Acumen	*Senge, Peter M. (1990), The Fifth Discipline, Doubleday/ Currency, ISBN 0-385-26094-6*	The discipline of team learning starts with 'dialogue', the capacity of members of a team to suspend assumptions and enter into a genuine 'thinking together'. To the Greeks *dia-logos* meant a free-flowing of meaning through a group, allowing the group to discover insights not attainable individually…. [It] also involves learning how to recognize the patterns of interaction in teams that undermine learning. (Senge 1990: 10)

Key Knowledge Point	BOK	Reference	Study Guide Material
Michael Porter states: In contrast [to operational effectiveness], strategic positioning means performing _____activities from rivals' or performing similar activities in _____ ways	Business Acumen	Harvard business review's 10 must reads on strategy. HD30.28.H395 2010 Michael E. Porter *What Is Strategy?*	Operational effectiveness (OE) means performing similar activities better than rivals perform them. Operational effectiveness includes but is not limited to efficiency. It refers to any number of practices that allow a company to better utilize its inputs by, for example, reducing defects in products or developing better products faster. In contrast, strategic positioning means performing different activities from rivals' or performing similar activities in different ways

Key Knowledge Point	BOK	Reference	Study Guide Material
Core ideology, the yin in Collins and Porras scheme, defines what we stand for and why we exist. Yin is _____ and complements yang, the envisioned future. The envisioned future is what we _____ to become, to achieve, to create—something that will require significant change and progress to attain.	Business Acumen	Harvard business review's 10 must reads on strategy. HD30.28.H395 2010 Collins and Porras *Building Your Company's Vision*	A well-conceived vision consists of two major components: core ideology and envisioned future. (See the exhibit "Articulating a vision.") Core ideology, the yin in our scheme, defines what we stand for and why we exist. Yin is unchanging and complements yang, the envisioned future. The envisioned future is what we aspire to become, to achieve, to create—something that will require significant change and progress to attain

Key Knowledge Point	BOK	Reference	Study Guide Material
In a balanced scorecard framework, a _____can be viewed as a set of hypotheses about cause-and-effect relationships.	Business Acumen	Harvard business review's 10 must reads on strategy. HD30.28.H395 2010 Kaplan & Norton *USING THE BALANCED SCORECARD AS A STRATEGIC MANAGEMENT SYSTEM*	The balanced scorecard supplies three elements that are essential to strategic learning. First, it articulates the company's shared vision, defining in clear and operational terms the results that the company, as a team, is trying to achieve. The scorecard communicates a holistic model that links individual efforts and accomplishments to business unit objectives. Second, the scorecard supplies the essential strategic feedback system. A business strategy can be viewed as a set of hypotheses about cause-and-effect relationships. A strategic feedback system should be able to test, validate, and modify the hypotheses embedded in a business unit's strategy. By establishing short-term goals, or milestones, within the business-planning process, executives are forecasting the relationship between changes in performance drivers and the associated changes in one or more specified goals

Key Knowledge Point	BOK	Reference	Study Guide Material
CEOs or executive leaders are the preferred senders of messages related to _____ and _____	Business Acumen	Change Management: the people side of change Jeffery M. Hiatt Timothy J. Creasey	Based on Prosci's change management research report with 650 participants, Immediate supervisors are the preferred senders of messages related to personal impact including: • How does this impact me? • How does this impact our group? • How will this change my day-to-day responsibilities? When it comes to personal issues, receivers want to hear from someone they know and work with regularly, namely their supervisor. CEOs or executive leaders are the preferred senders of messages related to business issues and opportunities including: • What are the business reasons for this change? • How does this change align with our vision and strategy • What are the risks if we don't change?

Key Knowledge Point	BOK	Reference	Study Guide Material
"The number one obstacle to success for major change projects is _____ and the ineffective management of the people side of change".	Business Acumen	http://www.change-management.com/cmp/xQnRz/PilotPro2012/presentations/Prosci-library-of-figures-v10.ppt	"The number one obstacle to success for major change projects is employee resistance and the ineffective management of the people side of change".

Key Knowledge Point	BOK	Reference	Study Guide Material
Project management ensures your project's solution is designed, developed and delivered, while change management ensures your project's solution is effectively _____.	Business Acumen	https://www.prosci.com/change-management/what-is-change-management	Organizational change management is complementary to your project management. Project management ensures your project's solution is designed, developed and delivered, while change management ensures your project's solution is effectively embraced, adopted and used.

Key Knowledge Point	BOK	Reference	Study Guide Material
According to Patrick Lencioni's *Five Dysfunctions of a Team, the first dysfunction is:*	Business Acumen	The Five Dysfunctions of a Team: a leadership fable Patrick Lencioni *ISBN 0-78796075-6*	The first dysfunction (of a team) is an absence of trust among team members. Essentially, this stems from their unwillingness to be vulnerable within the group. Team members who are not genuinely open with one another about their mistakes and weaknesses make it impossible to build a foundation of trust.

Key Knowledge Point	BOK	Reference	Study Guide Material
Which of the following is a result of a team that commits according to Patrick Lencioni's *Five Dysfunctions of a Team?*	Business Acumen	The Five Dysfunctions of a Team: a leadership fable Patrick Lencioni *ISBN 0-78796075-6*	A team that fails to commit- • creates ambiguity among the team about direction and priorities • watches windows of opportunity close due to excessive analysis and unnecessary delay • breeds lack of confidence and fear of failure • revisits discussions and decisions again and again • encourages second-guessing among team members **A team that commits**: • Creates clarity around direction and priorities • Aligns the entire team around common objectives • Develops an ability to learn from mistakes • Takes advantage of opportunities before competitors do • Moves forward without hesitation; Changes direction without hesitation or guilt.

Key Knowledge Point	BOK	Reference	Study Guide Material
The ladder of inference is a tool for:	Business Acumen	https://www.mindtools.com/pages/article/newTMC_91.htm The Ladder of Inference was first put forward by organizational psychologist Chris Argyris and used by Peter Senge in *The Fifth Discipline: The Art and Practice of the Learning Organization*	The Ladder of Inference describes the thinking process that we go through, usually without realizing it, to get from a fact to a decision or action. The thinking stages can be seen as rungs on a ladder and are shown in the image. Starting at the bottom of the ladder, we have reality and facts. From there, we: • Experience these selectively based on our beliefs and prior experience. • Interpret what they mean. • Apply our existing assumptions, sometimes without considering them. • Draw conclusions based on the interpreted facts and our assumptions. • Develop beliefs based on these conclusions. • Take actions that seem "right" because they are based on what we believe. This can create a vicious circle. Our beliefs have a big effect on how we select from reality, and can lead us to ignore the true facts altogether. Soon we are literally jumping to conclusions – by missing facts and skipping steps in the reasoning process. By using the Ladder of Inference, you can learn to get back to the facts and use your beliefs and experiences to positive effect, rather than allowing them to narrow your field of judgment. Following this step-by-step reasoning can lead you to better results, based on reality, so avoiding unnecessary mistakes and conflict.

Key Knowledge Point	BOK	Reference	Study Guide Material

A sound BUSINESS CASE will not detail:	Business Acumen	West Palm Consulting LLC. How to Write a Business Case: For Anything	A sound BUSINESS CASE will detail:
			• Absolute costs (every conceivable cost … quantitative and qualitative) of the proposed project.
			• Cost timing for the proposed project.
			• Benefits (quantitative and qualitative) for the proposed project:
			  • Tangible benefits for the proposed project.
			  • Intangible benefits for the proposed project.
			• External assistance requirements for the proposed project.
			• Risks for the proposed project.
			• Implementation plan for the proposed project.
			• Resource requirements for the proposed project.

Key Knowledge Point	BOK	Reference	Study Guide Material
A BUSINESS CASE for a proposed project is best produced by the _____.	Business Acumen	West Palm Consulting LLC. How to Write a Business Case: For Anything	A BUSINESS CASE for a proposed project is best produced by the principal stakeholder. Any proposed project / activity should build a BUSINESS CASE because it is the key to obtaining top-level commitment that will make the proposed project achievable. Value is created when benefits exceed costs.

Key Knowledge Point	BOK	Reference	Study Guide Material
The “Agile Manifesto” declared the following values: people over processes; products that actually work over documenting what that product is supposed to do; collaborating with customers over negotiating with them; and responding to _____ over_____.	Business Acumen	Sutherland, Jeff. Scrum: The Art of Doing Twice the Work in Half the Time (p. 13). The Crown Publishing Group	The “Agile Manifesto” declared the following values: people over processes; products that actually work over documenting what that product is supposed to do; collaborating with customers over negotiating with them; and responding to change over following a plan.

Key Knowledge Point	BOK	Reference	Study Guide Material
Who should the safety director or manager report to on an organizational chart?	Business Acumen	**Changing the Workplace Safety Culture** By Ron C. McKinnon	Principle of Safety reporting This principle refers to the safety department and states: The higher the level to which safety personnel report, the more cooperation they are likely to obtain. In many successful companies the safety director is on an executive level and reports directly to the CEO

Key Knowledge Point	BOK	Reference	Study Guide Material
Which of the following is **not** a characteristic of a best-practice vision.	Business Acumen	https://topnonprofits.com/examples/vision-statements/	Visions and vision statements define a desired future state. In order to move an organization, program or initiative to achieve improved results a vision must be formulated and communicated to stakeholders. The best visions are **inspirational, clear, memorable, and concise**.

Key Knowledge Point	BOK	Reference	Study Guide Material
Which of the following is **not** a characteristic of a best-practice vision.	Business Acumen	The Execution Premium; Robert S. Kaplan and David P. Norton Copyright 2008 Harvard Business School Publishing Corporation	Key Takeaways on strategy execution include • Mesh strategy and operations to attain your goals. • Most organizations try to do this in an ad hoc fashion, but that seldom works. You need a special department that is responsible for strategy implementation. • Use a deliberate six-stage systems management process to unite strategy and operations. • The stages are: Develop strategy, plan strategy, align the firm with the strategy, plan operations, monitor and learn from operations, and then test and adapt your strategy. • Balanced Scorecard, the most popular performance management system, works well in this context. • To develop sound strategy, you must understand your firm's mission, values and vision. • Achieve strategic objectives by using specific, targeted initiatives. • "Strategy maps" and scorecards present your strategy as graphic, quantified information that motivates and drives performance. • To make your strategy work, employees must understand and support it. • Meshing strategy and operations requires strong leadership from the CEO

Key Knowledge Point	BOK	Reference	Study Guide Material
Juran's Quality by Design process includes the following step:	Business Acumen	*DeFeo, Joseph A. & Juran, Joseph M. (2010). Juran's Quality Handbook: The Complete Guide to Performance Excellence 6/e. McGraw Hill.*	The Quality by Design model consists of the following steps: 1. Establish the project design targets and goals. 2. Define the market and customers that will be targeted. 3. Discover the market, customers, and societal needs. 4. Develop the features of the new design that will meet the needs. 5. Develop or redevelop the processes to produce the features. 6. Develop process controls to be able to transfer the new designs to operations.

Key Knowledge Point	BOK	Reference	Study Guide Material
Which of the following are one of W.E. Deming's 14 Points for Management of a Quality System:	Business Acumen	*DR. W. E. Deming,* **New Economics for Industry, Government, Education - 2nd Edition, The MIT Press**	Below is the condensation of the 14 Points for Management as they appeared in the book, the New Economics by Dr. W.E Deming Dr. Deming continued to edit and clarify the 14 points in his seminars and writing. They speak to the aspects of a Quality Management System. **1.** Create constancy of purpose toward improvement of product and service, with the aim to become competitive and to stay in business, and to provide jobs. **2.** Adopt the new philosophy. We are in a new economic age. Western management must awaken to the challenge, must learn their responsibilities, and take on leadership for change. **3.** Cease dependence on inspection to achieve quality. Eliminate the need for inspection on a mass basis by building quality into the product in the first place. **4.** End the practice of awarding business on the basis of price tag. Instead, minimize total cost. Move toward a single supplier for any one item, on a long-term relationship of loyalty and trust. **5.** Improve constantly and forever the system of production and service, to improve quality and productivity, and thus constantly decrease costs. **6.** Institute training on the job. **7.** Institute leadership (see Point 12 and Ch. 8). The aim of supervision should be to help people and machines and gadgets to do a better job. Supervision of management is in need of overhaul, as well as supervision of production workers. **8.** Drive out fear, so that everyone may work effectively for the company (see Ch. 3). **9.** Break down barriers between departments. People in research, design, sales, and production must work as a team, to foresee problems of production and in use that may be encountered with the product or service. **10.** Eliminate slogans, exhortations, and targets for the work force asking for zero defects and new levels of productivity. Such exhortations only create adversarial relationships, as the bulk of the causes of low quality and low productivity belong to the system and thus lie beyond the power of the work force. Eliminate work standards (quotas) on the factory floor. Substitute leadership. Eliminate management by objective. Eliminate management by numbers, numerical goals. Substitute leadership. **11.** Remove barriers that rob the hourly worker of his right to pride of workmanship. The responsibility of supervisors must be changed from sheer numbers to quality. **12.** Remove barriers that rob people in management and in engineering of their right to pride of workmanship. This means, inter alia, abolishment of the annual or merit rating and of management by objective (see Ch. 3). **13.** Institute a vigorous program of education and self-improvement. **14.** Put everybody in the company to work to accomplish the transformation. The transformation is everybody's job.

Key Knowledge Point	BOK	Reference	Study Guide Material
Which of the following is an additional constraint to be considered when managing projects in accordance with PMBOK guidance:	Business Acumen	PMBOK® Guide 5th Edition, PMI	In the traditional "Iron Triangle" or "Project Triangle" the following three constraints are often cited: • Cost • Scope • Schedule According to PMBOK® Guide 5th Edition, Project Constraint is "A limiting factor that affects the execution of a project, program, portfolio or a process". They include, but are not limited to: • Scope • Quality • Schedule • Budget • Resources, and • Risk

Key Knowledge Point	BOK	Reference	Study Guide Material
According to Stephen Covey.. In a company, high trust materially improves	Business Acumen	Stephen Covey, The Speed of trust, Free Press	The first job of any leader is to inspire trust. Trust is confidence born of two dimensions: character and competence. Character includes your integrity, motive, and intent with people. Competence includes your capabilities, skills, results, and track record. Both dimensions are vital. With the increasing focus on ethics in our society, the character side of trust is fast becoming the price of entry in the new global economy. However, the differentiating and often ignored side of trust -- competence -- is equally essential. You might think a person is sincere, even honest, but you won't trust that person fully if he or she doesn't get results. And the opposite is true. A person might have great skills and talents and a good track record, but if he or she is not honest, you're not going to trust that person either. The best leaders begin by framing trust in economic terms for their companies. When an organization recognizes that it has low trust, huge economic consequences can be expected. Everything will take longer and everything will cost more because of the steps organizations will need to take to compensate for their lack of trust. These costs can be quantified and, when they are, suddenly leaders recognize how low trust is not merely a social issue, but that it is an economic matter. The dividends of high trust can be similarly quantified, enabling leaders to make a compelling business case for trust. The best leaders then focus on making the creation of trust an explicit objective. It must become like any other goal that is focused on, measured, and improved. It must be communicated that trust matters to management and leadership. It must be expressed that it is the right thing to do and it is the economic thing to do. One of the best ways to do this is to make an initial baseline measurement of organizational trust and then to track improvements over time. The true transformation starts with building credibility at the personal level. The foundation of trust is your own credibility, and it can be a real differentiator for any leader. A person's reputation is a direct reflection of their credibility, and it precedes them in any interactions or negotiations they might have. When a leader's credibility and reputation are high, it enables them to establish trust fast -- speed goes up, cost goes down. When trust is high, the dividend you receive is like a performance multiplier, elevating and improving every dimension of your organization and your life.... In a company, high trust materially improves communication, collaboration, execution, innovation, strategy, engagement, partnering, and relationships with all stakeholders.

Key Knowledge Point	BOK	Reference	Study Guide Material
The third Law of leadership, according to John C. Maxwell, is the "law of process" which states:	Business Acumen	John C. Maxwell, The 21 irrefutable laws of leadership, Maxwell Motivation, INC	The third Law of leadership is the law of process which states "Leaders develop daily, not in a day.

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Key Knowledge Point	BOK	Reference	Study Guide Material
A poor _____ _____ has been shown to be a risk factor in safety behaviors and accidents. A. ☐ safety	OSH Theory and Philosophy	www.managementbriefs.com/_media/pdfs/safety_matters_chapter3 *Leadership and Organizational Safety Culture*	A Safety Culture consists of shared beliefs, practices, and attitudes that exist in an organization. The culture is the atmosphere created by those beliefs, attitudes etc., which shape our behavior. Managers/team leaders have a key role to play in developing such a Safety Culture. Well publicized major accidents such as Piper Alpha, Herald of Free Enterprise and Kings Cross Station have highlighted the effect of organizational, managerial and human factors on safety outcomes. Numerous reports of major disasters have identified Safety Culture as a factor that definitely influenced the outcome. Within the reports of inquiries into such major disasters as the ones mentioned, observations have been made that accidents are not only as a result of human error, environmental conditions or technical failures alone, but also they are as a result of a break down in policies and procedures that were established to manage safety.

Key Knowledge Point	BOK	Reference	Study Guide Material
What is the purpose of the hazard communication standard (29 CFR 1910.1200)?	OSH Regulations and Safety Standards	OSHA CFR 29 Part 1910 Occupational Safety and Health Standards. Subpart Z Toxic and Hazardous Substances. Standard 1200 *Hazard Communication*	**§1910.1200 Hazard communication.** *Purpose.* (1) The purpose of this section is to ensure that the hazards of all chemicals produced or imported are classified, and that information concerning the classified hazards is transmitted to employers and employees. The requirements of this section are intended to be consistent with the provisions of the United Nations Globally Harmonized System of Classification and Labelling of Chemicals (GHS), Revision 3. The transmittal of information is to be accomplished by means of comprehensive hazard communication programs, which are to include container labeling and other forms of warning, safety data sheets and employee training. (2) This occupational safety and health standard is intended to address comprehensively the issue of classifying the potential hazards of chemicals, and communicating information concerning hazards and appropriate protective measures to employees, and to preempt any legislative or regulatory enactments of a state, or political subdivision of a state, pertaining to this subject. Classifying the potential hazards of chemicals and communicating information concerning hazards and appropriate protective measures to employees, may include, for example, but is not limited to, provisions for: developing and maintaining a written hazard communication program for the workplace, including lists of hazardous chemicals present; labeling of containers of chemicals in the workplace, as well as of containers of chemicals being shipped to other workplaces; preparation and distribution of safety data sheets to employees and downstream employers; and development and implementation of employee training programs regarding hazards of chemicals and protective measures. Under section 18 of the Act, no state or political subdivision of a state may adopt or enforce any requirement relating to the issue addressed by this Federal standard, except pursuant to a Federally-approved state plan.

Key Knowledge Point	BOK	Reference	Study Guide Material
Which method does robot automation utilize to improve manufacture process safety?	OSH in Automated Systems	Anandan, Tanya M. (2014) ROBOTICS ONLINE Industry Insights Peripherals *The Shrinking Footprint of Robot Safety*	Robots are in the zone. They are cleverly focusing their movements to finely tuned angles and reshaping the robot cell, reducing its footprint, and providing robot users more creativity and flexibility in safely automating new processes. The primary enabler is safety-rated soft axis and space limiting technology. Robots are not alone in this endeavor. In conjunction with new safety standards and advanced safety peripheral devices, robots and humans are now able to go where few dared before. They're venturing into new corners of high-density, labor-intensive production and down new avenues for collaboration. "The advantage of the new standard and the new, different types of technologies is that it does allow for a degree of creativity," says Pat Davison, Director of Standards Development at the Robotic Industries Association in Ann Arbor, Michigan. "Manufacturers have more options in terms of technology, and through risk assessment, the end users have a variety of options to utilize and still achieve safety. Compare that to a prescriptive standard that essentially says put a cage around everything." **ANSI/RIA R15.06-2012, Part 1** **5.12.3 Safety-Rated Soft Axis and Space Limiting** Soft limits are software-defined limits to robot motion. Space limiting is used to define any geometric shape which may be used as an inclusionary or exclusionary zone, either limiting robot motion within the defined space, or preventing the robot from entering the defined space. In the standard, the "software-defined limits to robot motion" are realized through innovative software functions embedded in the latest robot controllers. The major robot OEMs provide this feature offered under various brand names. This replaces hardware-controlled limits and represents a significant leap in safe motion control. The benefits are many. "It's faster, it's cheaper, and it takes up less floor space," says Davison. "It's more productive, it has more uptime. You're going to spend less on hardware and have fewer mechanical devices to tinker with, a reduction in capital investment." Nelson Shea has served as chair of the R15.06 Subcommittee for Industrial Robot Safety for more than 20 years and was involved with the robot safety standard since the first committee meeting in 1982. She says the ANSI/RIA standard actually preceded the ISO and EN robot standards. The R15.06-2012 and ISO 10218:2011 robot safety standards are now harmonized. "That particular standard really tried to look at how people use the equipment and how you craft the restrictions around the design and implementation, so the robot systems can be productive, reliable, and safe for intended use." On a very basic level, explains RIA's Davison, the safety-rated soft axis and space limiting technology replaces hard stops. Think of the doorstops around your house or apartment. It's the same idea with the robot axes. "Traditionally, to limit the robot movement or limit those axes, you would have to put a physical block or obstruction in place," says Davison. "Generally, that was on axes 1, 2 and 3, or the base, the shoulder and the elbow." "The advantage is instead of just limiting three axes, you can limit every axis and then you also impose dynamic limits," explains Davison. "Imagine a building post or some sort of obstruction in the middle of the restricted space. You can tell the robot to always go around that obstruction, so it doesn't collide with it. You have a lot more flexibility in creating an allowable space or a restricted space. It can be any subset of the maximum space that you want it to be."

Key Knowledge Point	BOK	Reference	Study Guide Material
What is “clumsy automation”?	OSH in Automated Systems	Parasuraman, R., Mouloua, M. (1996) *Automation and Human Performance: Theory and Applications*	To utilize highly flexible systems, the practitioner must learn about all of the available options, learn and remember how to deploy them across the variety of real operational contexts that can occur, and learn and remember the interface manipulations required to invoke different modes or features. Monitoring and attentional demands are also created, as practitioners must keep track of which mode is active. All of this represents new burdens on the practitioner to set up and manage these capabilities and features. If the new tasks and workload created by such flexible systems tend to congregate at high workload, high criticality periods, the result is a syndrome called clumsy automation by Earl Wiener (see Wiener, 1989). Clumsy automation is a form of poor coordination between the human and machine in the control of dynamic processes where the benefits of the new technology accrue during workload troughs and the costs or burdens imposed by the technology (i.e., additional tasks, new knowledge, forcing the user to adopt new cognitive strategies, new communication burdens, new attentional demands) occur during periods of peak workload, high criticality or high tempo operations (Cook and Woods, 1994; Sarter and Woods, 1994b). Significantly, deficits like this can create opportunities for new kinds of human error and new paths to system breakdown that did not exist in simpler systems (Woods, Johannesen, Cook and Sarter, in press). The result is that we need to understand the difference between two types of flexibility in cognitive artifacts: (a) flexibilities that serve to increase practitioners’ range of adaptive response to the variability resident in the field of activity and (b) flexibilities that simply create new burdens on practitioners, especially at high tempo or high criticality periods (Woods, 1993).

Key Knowledge Point	BOK	Reference	Study Guide Material
The application of a deregulated approach to the management of OSH in the organization (the enterprise) ensures the level of prevention and protection is continuously evaluated and maintained through appropriate and timely improvements.	International OSH Theory and Philosophy	Howe, Neil (2015) British Safety Council sm.britsafe.org *Deregulation Act 'could increase risk of negligence and accidents'*	**The recent changes to the Health and Safety at Work Act 1974 to reduce bureaucracy for the self employed may lead to workers taking unnecessary risks in the workplace, endangering themselves and others.** The changes to the Health and Safety at Work Act 1974 (HSWA) for self-employed workers pose equal challenges for employers and workers. It is likely that some confusion and unintended negligence will occur when individuals aren't able to assess either if the new exemptions affect them; or whether the work they are participating in causes risk of harm to others. The government claims these amendments will formally exempt 800,000 people from safety regulation and will save businesses hundreds of thousands of pounds a year in compliance costs. This change has been portrayed as a sensible way of relieving the self employed from an unnecessary 'nanny state' legislative and administrative burden, requiring self-employed workers to look after their own health and safety. With commercial pressures forcing workers into taking risks to win and retain contracts, the danger is that poor health and safety practices may become contagious, affecting the behavior of other workers on the same site, who may feel that they need to work in the same way to protect their jobs. Under Section 1 of the Deregulation Act 2015, the government has amended section 3(2) of the HSWA which imposed a general duty on the self-employed to protect themselves and others from risk to their health and safety. The revised HSWA now states a duty lies with self-employed workers only when their undertaking is one of a 'prescribed description' such as agriculture, construction, quarrying, mining, offshore work or high-risk chemical sites; or where they carry out an activity which may pose a risk to the health and safety of other persons. Although statistics show a decline in fatal injuries year on year, HSE figures for 2012-13 alone show there were 148 fatalities in these industries, with 49 being self-employed workers. In other 'low-risk' situations, the self-employed person will have no duty to ensure their health and safety including any obligation to carry out a risk assessment under the Management of Health and Safety at Work Regulations 1999. Furthermore, the legislation will not apply to self-employed workers whose activity poses no risk to other people. However, that risk is to be assessed by the self-employed worker themselves, with the inherent danger of miscalculation or errors of judgement. There has been much criticism of the changes, particularly from trade unions who have voiced concerns that a lack of clarity and change in rules could lead to confusion among contractors, ultimately placing people at unnecessary risk. The legislation also extends the limitation on liability for employers in the construction industry who allow turban-wearing Sikhs not to wear safety headgear. Clearly, the new legislation will bring some benefits, particularly to members of the Sikh community who will see their employment opportunities improved. However, the intention to simplify administration and bureaucracy surrounding health and safety in the workplace may do more harm than good and lead to a spike in accidents, injuries and even fatalities to self-employed workers and their colleagues. Companies must ensure that sensible and consistent working practices are applied and adhered to in all workplaces, and that the new changes don't lead to a culture of haphazard and inconsistent safety rules and practices between workers of full and self-employed status. - See more at: https://sm.britsafe.org/deregulation-act-could-increase-risk-negligence-and-accidents#sthash.6DIJI8Om.dpuf

Key Knowledge Point	BOK	Reference	Study Guide Material
Why was the Sarbanes-Oxley Act of 2002 enacted?	OSH Constitutional and Case Law	107th Congress 15 USC 7201 Public Law 107–204 *Corporate Responsibility*	The Sarbanes-Oxley Act was signed into law on 30th July 2002, and introduced highly significant legislative changes to financial practice and corporate governance regulation. It introduced stringent new rules with the stated objective: "to protect investors by improving the accuracy and reliability of corporate disclosures made pursuant to the securities laws". It also introduced a number of deadlines, the prime ones being: - Most public companies must meet the financial reporting and certification mandates for any end of year financial statements filed after November 15th 2004 (amended from June 15th). - smaller companies and foreign companies must meet these mandates for any statements filed after 15th July 2005 (amended from April 15th). The act is actually named after its main architects, Senator Paul Sarbanes and Representative Michael Oxley, and of course followed a series of very high profile scandals, such as Enron. It is also intended to "deter and punish corporate and accounting fraud and corruption, ensure justice for wrongdoers, and protect the interests of workers and shareholders" (Quote: President Bush). The Sarbanes-Oxley Act itself is organized into eleven titles, although sections 302, 404, 401, 409, 802 and 906 are the most significant with respect to compliance (Sarbanes Oxley section 404 seems to cause most concern) and internal control. In addition, the Act also created a public company accounting board. Perhaps one of the most remarkable aspects of this legislation however relates to its profile. It is very much in the public and media arena. The focus is certainly intense in this respect, creating yet another clear motivation for compliance. There is simply no escaping it!

Key Knowledge Point	BOK	Reference	Study Guide Material
After the ingestion of caffeine, it takes _____ to enter the bloodstream and its effects can persist up to _____.	OSH and Environmental Sciences	www.everydiet.org *Coffee (caffeine) and its Effects in the Human Body*	There is no requirement of caffeine in the human diet for the body to function properly. Caffeine is a stimulant of the central nervous system (CNS), the cardiac muscle (increased heart rate), and respiratory system (relaxes air passages permitting improved breathing, and allows some muscles to contract more easily). It acts as a diuretic (increases the rate of bodily urine excretion) and delays fatigue (having the effect of warding off drowsiness and restoring alertness). For these reasons, caffeine is the most popular drug in use throughout the world. How Long does caffeine absorption take? Generally, it is absorbed by the body very quickly – caffeine enters the bloodstream through the mouth, esophagus, stomach, and small intestine with its effects felt as soon as 15 minutes after consumption. It is completely absorbed within 45 minutes of ingestion. Caffeine does not accumulate in the bloodstream not is it stored in the body, but it does persist – only about ½ is eliminated in the urine within 4 – 6 hours.

Key Knowledge Point	BOK	Reference	Study Guide Material
Which of the following is NOT considered to be a form of workplace violence?	OSH Constitutional and Case Law	Ceplenski, Chris (2013) HR Daily Advisor HR MANAGEMENT *4 Types of Workplace Violence*	**Reducing Workplace Violence Starts with Understanding the 4 Types** In order to mitigate the risk of violence in your workplace, it's critical for you to understand the four main types of workplace violence that could compromise employee safety. Here are the 4 types: **Criminal intent.** "The perpetrator has no legitimate relationship to the business or its employees and is usually committing a crime in conjunction with the violence. These crimes can include robbery, shoplifting, trespassing and terrorism. The vast majority of workplace homicides (85 percent of them) fall into this category." Sanchez told us. **Customer or client.** "The perpetrator has a legitimate relationship with the business and becomes violent while being served by the business." Sanchez explained. This category includes customers, clients, patients, students, inmates and any other group for which the business provides services. It is believed that a large portion of customer/client incidents occur in the health care industry in settings such as nursing homes or psychiatric facilities; the victims are often patient caregivers. Police officers, flight attendants and teachers are other examples of workers who may be exposed to this kind of workplace violence, which accounts for approximately 3 percent of all workplace homicides. **Worker-on-worker.** The perpetrator is an employee or past employee who attacks or threatens another employee(s) or past employee(s) in the workplace. Worker-on-worker fatalities account for approximately 7 percent of all workplace homicides. **Personal relationship.** The perpetrator usually does not have a relationship with the business but has a personal relationship with the intended victim. This category includes victims of domestic violence assaulted or threatened while at work and accounts for about 5 percent of all workplace homicides.

Key Knowledge Point	BOK	Reference	Study Guide Material
How would you respond to a report from an employee that one of his/her coworkers only wears required PPE when you are in the area?	OSH Management and Leadership	Vanderhoof, Wayne (2004) Occupational Health and Safety Magazine *PPE: How to Get Workers to Wear it*	**IT** is a never-ending battle to get workers to wear any type of personal protective equipment. All types of PPE have their advantages and disadvantages, comforts and discomforts. Getting workers to use it is an endless task. This article's information can be used as a guide to increasing the use of practically any type of personal protective equipment--from head protection to feet protection. A not-so-hypothetical situation: At a safety committee meeting, the discussion is about whether or not to require workers to wear a certain type of personal protective equipment all of the time, or only in areas and for tasks that are perceived as having a high risk of injury. The safety committee is made up of roughly 50 percent management and 50 percent union workers. (This varies from meeting to meeting, depending on the individuals who attend.) The discussion is lively, constructive, and informative. One comment that keeps being made is that if the certain PPE is not worn constantly, then on the night shift (and weekends) the workers will not wear it at all. The supervisors cannot watch all of the workers on their shifts all of the time, so the workers will only wear the PPE when the supervisor is in the area. **A Practical Solution** Review each area and/or task in the plant. Also, review injury and incident reports. Decide the areas and/or tasks for which you need to have a hazard analysis completed. After doing a hazard analysis of each area and/or task on the list, decide what type of PPE will be worn in certain areas and for certain tasks. Create or revise the safe work procedures incorporating this information. The workers must be trained on these new or revised procedures. This is done through a safety meeting where the workers are told of the PPE requirements by their supervisor. Also included are the reasons why this type of protection is required, citing the information from the hazard analysis. More than likely, the workers will not be receptive of the requirement to wear this PPE. Or they may forget to wear it or even quietly refuse to wear it. Remember, the supervisors have agreed to encourage and enforce the safe work procedures when they agreed to be in the position of a supervisor. **Encouragement/Enforcement** The next area to cover is the how of the enforcement, or encouraging the workers to wear the PPE. After the training is complete, the opportunity is present for observation and positive reinforcement by the supervisor. When the supervisor sees a worker wearing the proper head protection or other PPE, the supervisor says something positive to encourage the worker to continue the effort. Fellow workers contribute by encouraging one another to wear the required PPE. After a while, the employees probably will change their behavior and accept that the PPE is mandated for their own safety and protection.

Key Knowledge Point	BOK	Reference	Study Guide Material
"Prospective Memory" refers to:	OSH and Environmental Sciences	Scullin, Michael K. Bugg, Julie M. McDaniel, Mark A. Einstein, Gilles O. (2011) *Prospective memory and aging: preserved spontaneous retrieval, but impaired deactivation, in older adults*	Prospective memory refers to remembering to perform an intended action in the future, such as remembering to feed the dog before leaving for work and remembering to deliver a message to a colleague. Because a great deal of each day is spent forming and executing intentions, it is no surprise that, by some estimates, at least half of everyday forgetting is due to prospective memory failures (Crovitz & Daniel,1984). Good prospective memory may be especially important for older adults, who often have health-related prospective memory demands, such as remembering to take medication. In the typical event-based prospective memory task (e.g. Einstein & McDaniel,1990), while participants are busily engaged in an ongoing task, they also have an intended action to perform in the context of that task. Specifically, they might be asked to rate the imageability of nouns (the ongoing task) and also to remember to press the "Q" key whenever a target word (e.g., corn) appears (the prospective memory task). Successful prospective remembering requires that one switch from seeing corn as an item to be processed for the ongoing task to seeing it as a cue for performing a prospective memory action.

Key Knowledge Point	BOK	Reference	Study Guide Material
Performance and workload disassociate more often when:	OSH and Environmental Sciences	Mitchell, Diane K. (2000) Army Research Laboratory ARL-TN-161 *Mental Workload and ARL Workload Modeling Tools*	The relationship between workload and performance is complicated. It is not simply that as workload increases performance decreases. Instead, the relationship between workload and performance is traditionally described as an inverted "U" because decrements in performance may occur if workload is either too low or too high. Furthermore, there can be a disassociation between workload and performance at certain levels. This means that as workload increases, the operator's performance may not decrease because the operator has a strategy for handling task demands to compensate for the increased workload. According to the multiple resource model, two concurrent tasks will suffer greater interference to the extent that the component tasks are more difficult (demand more resources) and that the components compete for overlapping resources. Furthermore, the effects of difficulty and resource overlap interact. The greater the degree of resource overlap, the more pronounced will be the effect of the level of difficulty of one task on the level of performance of another task (Little et al., 1993, p 9).

Key Knowledge Point	BOK	Reference	Study Guide Material
What is an “envisioned world” problem, in regard to human factors research?	OSH and Environmental Sciences	Smith, Philip, et al. (1997) NASA-CR-205087 *Human-Centered Technologies and Procedures for Future Air Traffic Management*	**2. METHODS FOR THE DEVELOPMENT OF FUTURE SYSTEM REQUIREMENTS: THE ENVISIONED WORLD PROBLEM, THE FUTURE INCIDENT TECHNIQUE David Woods', Philip Elaine McCoy", AND CONCEPTUAL WALKTHROUGHS** **2.1 Discovering Requirements for Future Systems** **The Problem of Envisioned Worlds Systems** *One* important question for the AATI" program is methodological: identify system requirements for new ATM concepts and technologies, recognizing the potential for these changes to create new roles and procedures for individual participants, new forms of coordination across personnel and organizations, and new types of information to communicate, assess and integrate. Developing an envisioned world is difficult, in part, because the system of interest does not yet exist. There are no prototypes or mock-ups, and no practitioners who work in the future world. Usability testing is impossible: there is nothing to do it on and nobody to do it with. Yet, analyzing some of the cognitive ramifications and error opportunities in a future environment before any commitments to particular system designs are made is a tantalizing and potentially very fruitful prospect. How, then, can we can gain access to a world that does not yet exist? How can an envisioned world be a source of data on the cognitive demands it imposes and the error and failure potential it creates?

Key Knowledge Point	BOK	Reference	Study Guide Material
_____ leadership has been shown to influence important worker safety attitudes and outcomes.	OSH Management and Leadership	Shen, Yuzhong; Ju, Chuanjing; Koh, Tas Yong; Rowlinson, Steve; Bridge, Adrian J. (2017) International Journal of Environmental Research and Public Health *The Impact of Transformational Leadership on Safety Climate and Individual Safety Behavior on Construction Sites*	**Abstract:** Unsafe acts contribute dominantly to construction accidents, and increasing safety behavior is essential to reduce accidents. Previous research conceptualized safety behavior as an interaction between proximal individual differences (safety knowledge and safety motivation) and distal contextual factors (leadership and safety climate). However, relatively little empirical research has examined this conceptualization in the construction sector. Given the cultural background of the sample, this study makes a slight modification to the conceptualization and views transformational leadership as an antecedent of safety climate. Accordingly, this study establishes a multiple mediator model showing the mechanisms through which transformational leadership translates into safety behavior. The multiple mediator model is estimated by the structural equation modeling (SEM) technique, using individual questionnaire responses from a random sample of construction personnel based in Hong Kong. As hypothesized, transformational leadership has a significant impact on safety climate which is mediated by safety-specific leader–member exchange (LMX), and safety climate in turn impacts safety behavior through safety knowledge. The results suggest that future safety climate interventions should be more effective if supervisors exhibit transformational leadership, encourage construction personnel to voice safety concerns without fear of retaliation, and repeatedly remind them about safety on the job.

Key Knowledge Point	BOK	Reference	Study Guide Material
What are the two flawed partnership dimensions between people and automation?	OSH in Automated Systems	Lee, John D. See, Katrina A. (2004) *Trust in Automation: Designing for Appropriate Reliance*	Sophisticated automation is becoming ubiquitous, appearing in work environments as diverse as aviation, maritime operations, process control, motor vehicle operation, and information retrieval. *Automation* is technology that actively selects data, transforms information, makes decisions, or controls processes. Such technology exhibits tremendous potential to extend human performance and improve safety; however, recent disasters indicate that it is not uniformly beneficial. On the one hand, people may trust automation even when it is not appropriate. Pilots, trusting the ability of the autopilot, failed to intervene and take manual control even as the autopilot crashed the Airbus A320 they were flying (Sparaco, 1995). In another instance, an automated navigation system malfunctioned and the crew failed to intervene, allowing the *Royal Majesty* cruise ship to drift off course for 24 hours before it ran aground (Lee & Sanquist, 2000; National Transportation Safety Board, 1997).On the other hand, people are not always willing to put sufficient trust in automation. Some operators rejected automated controllers in paper mills, undermining the potential benefits of the automation (Zuboff, 1988). As automation becomes more prevalent, poor partnerships between people and automation will become increasingly costly and catastrophic. Such flawed partnerships between automation and people can be described in terms of misuse and disuse of automation (Parasuraman & Riley, 1997). *Misuse* refers to the failures that occur when people inadvertently violate critical assumptions and rely on automation inappropriately, whereas *disuse* signifies failures that occur when people reject the capabilities of automation. Misuse and disuse are two examples of inappropriate reliance on automation that can compromise safety and profitability. Although this paper describes reliance on automation as a discrete process of engaging or disengaging, automation can be a very complex combination of many modes, and reliance is often a more graded process. Automation reliance is not a simple binary process, but the simplification makes the discussion of misuse and disuse more tractable. Understanding how to mitigate disuse and misuse of automation is a critically important problem with broad ramifications. Recent research suggests that misuse and disuse of automation may depend on certain feelings and attitudes of users, such as trust. This is particularly important as automation becomes more complex and goes beyond a simple tool with clearly defined and easily understood behaviors. In particular, many studies show that humans respond socially to technology, and reactions to computers can be similar to reactions to human collaborators (Reeves & Nass, 1996). For example, the similarity-attraction hypothesis in social psychology predicts that people with similar personality characteristics will be attracted to each other (Nass & Lee, 2001).

Key Knowledge Point	BOK	Reference	Study Guide Material
Housekeeping requirements of safe construction sites include all of the following EXCEPT:	OSH Regulations and Safety Standards	Unites States Department of Labor 29 CFR – 1926.25 Safety and Health Regulations for Construction Subpart: C General Safety and Health Provisions *Housekeeping*	**1926.25(a)** During the course of construction, alteration, or repairs, form and scrap lumber with protruding nails, and all other debris, shall be kept cleared from work areas, passageways, and stairs, in and around buildings or other structures. **1926.25(b)** Combustible scrap and debris shall be removed at regular intervals during the course of construction. Safe means shall be provided to facilitate such removal. **1926.25(c)** Containers shall be provided for the collection and separation of waste, trash, oily and used rags, and other refuse. Containers used for garbage and other oily, flammable, or hazardous wastes, such as caustics, acids, harmful dusts, etc. shall be equipped with covers. Garbage and other waste shall be disposed of at frequent and regular intervals.

Key Knowledge Point	BOK	Reference	Study Guide Material
_____ and _____ are the two most important subjects to consider with respect to what must be present to achieve safety excellence.	OSH Metrics, Reporting and Statistics	Janicak, Christopher A. (2015) *Safety Metrics* Third Edition	In the past, measuring safety performance relied on measuring only a few trailing indicators such as the number of lost workdays or the amount of money spent on workers compensation claims. This translates to after-the-fact hazard detection, which (like out dated quality programs based on inspecting defects at the end of a process) does not identify organizational errors-the true cause of accidents. This measuring safety performance by counting the number of people hurt of the number of days away from work focused on end results and did not take into account safety performance activities. "Safety excellence requires daily proactive intervention by line managers and supervisors. This proactive intervention is usually a missing link that can only be corrected when the system holds managers, supervisors, and executives accountable" (Peterson 2000, 19). Traditional approaches to benchmarking risk management and safe work performance which incident rate reduction have failed to provide a strong connection between program causes and direct factors influencing risk and loss frequency (Huang, Y. & Brubaker, S. 2006, 36). Today, the methods for managing safety performance have greatly expanded and improved. Performance measurement tools and techniques have become more common place in a variety of industries including manufacturing, transportation, and chemical. Still with these advances in performance measurement, the safety professional still finds challenges in defining safety performance, tying performance indicators to safety activities, finding the balance between measurements and reaching performance goals. Safety metrics and methods for measuring the safety culture in the organization have gained importance. Safety professionals have come to understand the impact the safety culture has upon all other aspects of the safety program and the degree to which the safety culture can influence or hinder the other aspects of the program. Dan Peterson concludes that leadership and culture are the two most important subjects to consider with respect to what must be present to achieve safety excellence (Peterson 2004, 28). With this awareness regarding the importance of organizational culture and its relationship to positive SHE performance is growing as is the need for measuring its influences upon the organization as they relate to safety performance. As a result, techniques and methods for measuring the safety culture should be part of any safety performance program.

Key Knowledge Point	BOK	Reference	Study Guide Material
How long must you keep the OSHA 300 Log and Summary on file?	OSH Metrics, Reporting and Statistics	OSHA CFR 29 Part 1904 Recording and Reporting Occupational Injuries and Illness Subpart D OSHA injury and Illness Recordkeeping Requirements Standard 1904.33 Retention and Maintenance of Accurate Records	**1904.33(a)** *Basic requirement*. You must save the OSHA 300 Log, the privacy case list (if one exists), the annual summary, and the OSHA 301 Incident Report forms for five (5) years following the end of the calendar year that these records cover. **1904.33(b)** *Implementation—* **1904.33(b)(1)** *Other than the obligation identified in § 1904.32, do I have further recording duties with respect to the OSHA 300 Logs and 301 Incident Reports during the five-year retention period?* You must make the following additions and corrections to the OSHA Log and Incident Reports during the five-year retention period: **1904.33(b)(1)(i)** The OSHA Logs must contain entries for all recordable injuries and illnesses that occurred during the calendar year to which each Log relates. In addition, each and every recordable injury and illness must be recorded on an Incident Report. This means that if a recordable case occurred and you failed to record it on the Log for the year in which the injury or illness occurred, and/or on an Incident Report, you are under a continuing obligation to record the case on the Log and/or Incident Report during the five-year retention period for that Log and/or Incident Report; **1904.33(b)(1)(ii)** You must also make any additions and corrections to the OSHA Log that are necessary to accurately reflect any changes that have occurred with respect to previously recorded injuries and illnesses. Thus, if the classification, description, or outcome of a previously recorded case changes, you must remove or line out the original entry and enter the new information; and **1904.33(b)(1)(iii)** You must have an Incident Report for each and every recordable injury and illness; however, you are not required to make additions or corrections to Incident Reports during the five-year retention period.

Key Knowledge Point	BOK	Reference	Study Guide Material
The rate an individual adapts to jet lag:	OSH and Environmental Sciences	Choy, Mary, Salbu, Rebecca L. (2011) *Jet Lag. Current and Potential Therapies* US National Library of Medicine National Institutes of Health	Jet lag, also known as circadian desynchrony, is a sleep disorder in which there is a mismatch with the body's natural circadian rhythm and the external environment as a result of rapid travel across multiple time zones. This common problem affects all age groups but may have more pronounced effects on the elderly, whose recovery rate is more prolonged than that in young adults.[1] A multitude of factors, such as the number of time zones crossed and the direction and timing of flights, play a role in the severity of symptoms experienced by travelers. Individual variability accounts for the ability to adapt to a new time zone and the duration of the symptomatic period. Travelers usually experience symptoms after air travel across at least two time zones. Symptoms may include disturbed sleep, daytime fatigue, decreased ability to perform mental and physical tasks, reduced alertness, and headaches. Sleep disturbances typically last for a few days, but they can persist for as long as one week if the change in time zones is greater than eight hours. Eastward travel is associated with a longer duration of jet lag than westward travel. Although frequent desynchrony is a transient disorder, it carries the potential to lead to long-term consequences, as evidenced by epidemiological and animal studies.[2,3] Sequelae have included cognitive deficits, gastrointestinal (GI) disturbances, and an increased risk of cancer, infertility, and heart disease. As the body's internal circadian "clock" adapts to the new time zone, jet lag diminishes.

Key Knowledge Point	BOK	Reference	Study Guide Material
For most adults, after approximately _____ of continuous wakefulness, sleepiness levels increase and performance levels decrease.	OSH and Environmental Sciences	U.S. Department of Transportation Federal Aviation Administration (2010) Advisory Circular AC 120-100 *Basics of Aviation Fatigue*	**b. Elevated Sleep Drive**. For the average person, the daily upswing in alertness produced by the circadian system tends to offset the decrease in alertness produced by depletion of the sleep regulatory process. The result is roughly constant reaction time and lapses during the first 16 hours of the day 85. After about 16 hours of continuous wakefulness, most adults begin to notice reductions in the speed of performance and in alertness levels 87. However, a prior history of insufficient sleep quantity and quality can magnify the changes in behavior and alertness. Consequently, three factors can result in elevated homeostatic sleep drive: • Increasing time continuously awake, • Inadequate sleep duration for one or more consecutive days, • Physiologically disrupted (fragmented) sleep due to medical conditions (e.g., untreated sleep disorder such as obstructive sleep apnea) or environmental factors (e.g. , attempting to sleep upright or in an uncomfortable environment).

Key Knowledge Point	BOK	Reference	Study Guide Material
Which of the following assessment techniques can be utilized to assess the status of the safety climate in the workplace?	OSH Metrics, Reporting and Statistics	Janicak, Christopher A. (2015) *Safety Metrics Tools and Techniques for Measuring Safety Performance* Third Edition	Fault Tree Analysis is a top down procedure that identifies undesirable events and their contributing factors. Once a tree has been developed, probabilities of failures can be determined for individual components in the tree. With the individual probabilities, overall probabilities of failures can be calculated for the event paths using Boolean algebra. Procedure Analysis can be used to examine the steps in a procedure or task. Procedure Analysis requires the task to be broken down into individual steps. For each step, the hazards are identified and control measures for each hazard determined. Procedure Analysis can be expanded to include the use of reliabilities for individual steps that can be ultimately used to determine overall reliability for completing the job task. For a safety program to be effective, the safety climate needs to be supportive of the program. The safety climate includes management, workers, the physical equipment in the workplace, and the interfaces between the people and the environment. Perception surveys can be used to assess the status of the safety climate in the workplace. Key areas that perception surveys can assess include management support for safety and employees' attitudes and beliefs about safety. Environmental conditions and interfaces between equipment and workers can be assessed using various system safety techniques. Examples of system safety techniques include root cause analysis and failure modes and effects analysis. Failure Modes and Effects Analysis (FMEA) examines systems, element by element (System Safety Society 1997, 3-111). The analysis procedure requires the identification of the individual components that make up the system under examination. With the components identified, the modes in which the component failures as well as the effects that failure has upon the system are determined. A further step to the FMEA procedure is the examination of the risk associated with the failure. The risk, also referred to as criticality, provides the investigators with a method of ranking the hazards in the system and providing a method for prioritization of hazards.

Key Knowledge Point	BOK	Reference	Study Guide Material
Which of the following is NOT an example of a human failure (unsafe act) that often leads to major workplace accidents?	OSH and Environmental Sciences	Bard, Lynne (2013) Hazmatmag.com *Human Factors Influencing Workplace Safety*	Human factors refer to environmental, human and individual characteristics, organizational and job factors that influence the behavior at work in a way which can affect health and safety. Three interrelated aspects must be considered in assessing human factors in correlation to safety incidents: the job, the individual and the organization. The job assessment looks at the nature of the tasks, the workload, the working environment, the design, display and controls, and the role procedures play on the job. The individual assessment looks at the workers competencies, skills, personality, attitude, and risk perception. Identify what individual characteristics can be changed and what are fixed. Additionally, the organizations work patterns, culture, resources, communications, and leadership, policies, and programs are some of the organizational influences on behavior and need to be looked at in the review of the job design. In summary, human factors identify what people are being asked to do (the task and characteristics), who is doing it (the individual and their competencies), and where they're working (the organization and its attributes). A good safety management system includes human factor assessments in a similar way to any other risk management program, categorizing human failure with the different causes and influencing factors, as well as prevention strategies to reduce the failures. Three types of human failure (unsafe acts) often lead to major workplace accidents: • Errors (slips/lapses) or unintentional actions like forgetting to complete a certain step in a transaction or process. • Mistakes (also errors) but of judgment or decision-making where we do the wrong thing but believe it to be right. • Violations or intentional errors such as taking shortcuts or non-compliance with procedures. Managing human failure is essential to preventing occupational accidents both minor and major, as well as ill health, and maintaining the reputation and potential loss of revenues for the organization. Major incidents frequently involve the human error of operators or maintenance personnel, with the underlying reasons for the accident stemming from the responsibility of those more senior in the organization's inadequacies in competency assurance systems, poorly designed equipment, or lack of resources or training that influence the behaviors of everyone in the organization (leading to human error). We cannot just address safety through the foggy lens that behavioral safety programs are an alternative to ensuring that adequate engineering and safety management systems are in place; they need to work hand-in-hand together and be adequately managed. (But not until technical and systems issues have been addressed and it can be assumed that accidents are due to cultural and behavioral factors.)

Key Knowledge Point	BOK	Reference	Study Guide Material
What is the defense of preemption in relation to OSHA Standard violations?	OSH Constitutional and Case Law	Bailey, Melissa A. et al. (2016) *Occupational Safety and Health Law Handbook.* Third Edition	Section 5(a)(2) of the Occupational Safety and Health (OSH) Act, 29 U.S.C. § 654(a)(2), states that "each employer… shall comply with occupational safety and health standards promulgated under this Act." Other sections of the Act impose an implicit duty to comply with the Occupational Health and safety Administration's (OSHA) regulations. Although the duty to comply with standards and regulations seems unqualified, the courts and Occupational Safety and Health Review Commission (OSHRC or Commission) have held that the duty is qualified in various ways. The OSH standards themselves state a general principle – the more specific standard prevails over the more general. For this reason, decisions speak of the defense of preemption - that is, a citation will be vacated if the cited condition is regulated by a more specifically applicable standard. While many factors are relevant to such and inquiry, the basic question is whether application of the more generally applicable standard would defeat a rulemaking decision implicit in the more specifically applicable standard. In accordance with this principle, an employer must first determine whether his industry is specially regulated by one of the several industry-specific "parts" in Title 29 of the Code of Federal Regulations (C.F.R.). These industry-specific parts are Part 1913, which applies to shipyards; Part 1917 which applies to marine terminals; Part 1918 which applies to longshoring; Part 1926 which applies to construction; and Part 1928 which applies to agriculture. If no industry-specific part applies, then an employer must look to Part 1910, which is entitled "General Industry Standards" and which applies to all employers engaged in businesses affecting commerce. The employer must then determine whether a special, industry-specific section within Subpart R of Part 1910 or an industry-specific part within Part 1910 regulates both his industry and the particular condition cited.

Key Knowledge Point	BOK	Reference	Study Guide Material
Relating to software safety, which attributes should be avoided?	OSH in Automated Systems	Committee on Patient Safety and Health Information Technology; Institute of Medicine. Washington (DC): National Academies Press (US) (2011) ISBN-13: 978-0-309-22112-2ISBN-10: 0-309-22112-9 ***Health IT and Patient Safety*** *Building Safer Systems for Better Care*	When software is complex, it can be difficult to determine its safety properties. An analytical argument for safety is easier to make when global safety properties of the software can be inferred from an analysis of the safety properties of its components. Such inferences are more likely to be possible when different parts of the system are designed to operate independently of each other. Achieving simplicity is not easy or cheap, but simpler software is much easier for independent assessors to evaluate, and the rewards of simplicity far outweigh its costs (NRC, 2007). Pitfalls to avoid include interactive complexity, in which components may interact in unanticipated ways and a single fault cannot be isolated but it causes other faults that cascade through the software. Avoiding these characteristics both reduces the likelihood of failure and simplifies the safety case to be made. Most important to developing a plausible case for safety is the stance that developers take toward safety. A developer is better able to make a plausible safety case when it is willing to provide safety–related data from all phases in the components' or software's life cycle, to ensure the clarity and integrity of the data provided and the coherence of the safety case made, and to accept responsibility for safety failures. One report goes so far as to assert that "no software should be considered dependable if it is supplied with a disclaimer that withholds the manufacturer's commitment to provide a warranty or other remedies for software that fails to meet its dependability claims" (NRC, 2007).

Key Knowledge Point	BOK	Reference	Study Guide Material
In the EU-28, what is a key factor for the implementation of measures to address OSH issues.	International OSH Regulation and Safety Standards	EU-OSHA — European Agency for Safety and Health at Work ESENER-2 *Second European Survey of Enterprises on New and Emerging Risks*	Management involvement in OSH is a key factor for the implementation of measures to address OSH issues. ESENER-2 shows that 61% of establishments in the EU-28 indicate that health and safety issues are discussed at the top level of management regularly, the proportion increasing with establishment size. By country, this is reported more frequently in the Czech Republic (81%), the United Kingdom (79%) and Romania (75%), while the lower percentages correspond to Montenegro (25%), Estonia (32%) and Iceland and Slovenia (both 35%)

Key Knowledge Point	BOK	Reference	Study Guide Material
An Example of Psychosocial Risk factor would include:	International OSH Theory and Philosophy	EU-OSHA — European Agency for Safety and Health at Work. ESENER-2 *Second European Survey of Enterprises on New and Emerging Risks*	Significant changes which are taking place in the world of work lead to emerging psychosocial risks. Such risks, which are linked to the way work is designed, organized and managed, as well as to the economic and social context of work, result in an increased level of stress and can lead to serious deterioration of mental and physical health. As pointed out above, having to deal with difficult customers, patients, pupils, etc. (58%) and time pressure (43%) are the two most frequently reported psychosocial risk factors among establishments in the EU-28. Both risk factors share a similar sector profile, being most prevalent among establishments in education, human health and social work activities and in public administration, while their lowest proportions correspond to agriculture, forestry and fishing and to manufacturing. Both risk factors increase with establishment size, but particularly time pressure. Having to deal with difficult customers, patients, pupils, etc. is more often reported as a risk factor by establishments in Montenegro (78%) and France and Estonia (both 70%) as opposed to Turkey (28%), Italy (37 %) and Lithuania (39%).

Key Knowledge Point	BOK	Reference	Study Guide Material
What is the description of ISO 45001?	International OSH Regulations and Safety Standards	International Organization for Standardization (ISO) Management System Standards. ISO 45001. Briefing Notes. Occupational Health and Safety	An organization is responsible for ensuring that it minimizes the risk of harm to the people that may be affected by its activities (e.g. its workers, its managers, contractors, or visitors), and particularly if they are engaged by the organization to perform those activities as part of their " occupation". ISO is developing an occupational health and safety (OH&S) management system standard (ISO 45001) which is intended to enable organizations to manage their OH&S risks and improve their OH&S performance. The implementation of an OH&S management system will be a strategic decision for an organization that can be used to support its sustainability initiatives, ensuring people are safer and healthier and increase profitability at the same time. ISO 45001 is an International Standard that specifies requirements for an occupational health and safety (OH &S) management system, with guidance for its use, to enable an organization to proactively improve its OH&S performance in preventing injury and ill-health. ISO 45001 is intended to be applicable to any organization regardless of its size, type and nature. All of its requirements are intended to be integrated into an organization's own management processes. ISO 45001 enables an organization, through its OH&S management system, to integrate other aspects of health and safety, such as worker wellness/wellbeing; however, it should be noted that an organization can be required by applicable legal requirements to also address such issues. ISO 45001 does not state specific criteria for OH&S performance, nor is it prescriptive about the design of an OH&S management system. An organization's OH&S management system should be specific to meeting its own needs in preventing injuries and ill-health; consequently a small business with low risks may only need to implement a relatively simple system, whereas a large organization with high levels of risks may need something much more sophisticated. Any type of system may be capable of being in conformity with the requirements of the standard, provided it can be shown to be appropriate to the organization and is effective. ISO 45001 does not specifically address issues such as product safety, property damage or environmental impacts, and an organization is not required to take account of these issues unless they present a risk to its workers. ISO 45001 is not intended to be a legally binding document, it is a management tool for voluntary use by organizations from SME's upwards whose aim is to eliminate or minimize the risk of harm.

Key Knowledge Point	BOK	Reference	Study Guide Material
According to the WHO, which of the following are OSH matters leading to ethical consideration?	OSH Ethics	World Health Organization (WHO) EUR/02/5041181 *Good Practice in Occupational Health Services A Contribution to Workplace Health*	**Examples of matters leading to ethical considerations are:** Confidentiality of health information. Managers have no right to be given any health information, which is of confidential nature about employees. Employers have a right to know whether persons in their employment are fit for the work tasks for which they are employed; The necessity of securing the informed consent of the subject before the release to others of any individual health information of confidential nature in possession of occupational health professionals. Such information on individual client staff members is to be strictly and effectively protected; The extent and scope of the occupational health professionals' duty of care towards the employer, the individual employee, towards groups of employees served or towards the public may entail multiple loyalties; Conflicts of interest may arise over safeguarding the rights of the individual employee and those of the employers, other employers and the general public; The need for care in the handling, safeguarding and transfer of occupational health records to avoid confidential information being disclosed to unauthorized persons or organizations. **Some points to keep in mind:** Occupational health professionals honor agreements and contracts made with customers, clients or other partners giving attention to cost-effectiveness of services provided; Occupational health professionals act on the basis of best available documented scientific evidence and recognized professional experience; Occupational health professionals operate within their professional competence and do not offer judgements on issues outside their professional command

Key Knowledge Point	BOK	Reference	Study Guide Material
To be a positive change agent in a business's safety culture, the OSH professional attains the status of an integral member of the business team by?	OSH Management and Leadership	Manuele, Fred A. (2014). *Advanced Safety Management. Focusing on Z10 and Serious Injury Prevention*, Second Edition	What is the safety and health professional's role with respect to the safety culture? In an organization where safety is a core value and management at all levels "walks the talk" and demonstrates by what it does that it expects the safety culture to be superior, the role of the safety and health professional is easier in the role of a culture change agent as he or she gives advice that supports the maintains the culture. In a large majority of organizations, an advanced safety culture does not exist Then the role of the safety and health professional as a culture change agent has greater significance and requires more diligence as attempts are made to influence management to move toward achieving a superior culture. The possibility of being successful in that endeavor is enhanced if the safety professional attains the status of an integral member of the business team. That will result from giving well-supported, substantial, and convincing risk reduction advice that serves the business interests. Admittedly, convincing management that safety should be one of an organization's core values may not be easily achieved, Safety and health professionals should understand that steps forward are taken by management to improve on management system deficiencies, the result in each instance is a culture change. And the requirements to achieve a permanent culture change should be intertwined into each proposal made to improve on a management deficiency.

Key Knowledge Point	BOK	Reference	Study Guide Material
Some key factors identified for the accurate evaluation of the economic impact of an OSH intervention include:	Economic Impact of OSH	Targoutzidis, Antonis; Koukoulaki, Theoni; Schmitz-Felten, Ellen; Kuhl, Klaus; Oude, Karen M.; Rijken, Evelien; Van den Broek, Karla; Klüser, Ruth EU-OSHA *The business case for safety and health at work: cost-benefit analyses of interventions in small and medium-sized enterprises*	When is an OSH intervention profitable? The key factors identified in the literature are existing OSH practice, type of intervention (for example, organizational, technical), kind of OSH factor targeted (for example musculoskeletal disorders, accidents, skin disorders), size of investment (capital employed) and method of measurement and assessment. Some key factors identified for the accurate evaluation of the economic impact of an OSH intervention are: • Benefits and costs related to OSH must be identified, attributed and quantified properly. • Inflation and reference period must be taken into account. • Outcomes may occur over a long period after the intervention, which makes the length of the • examination period very important. • Mistaken assumptions can have a serious impact on the evaluation. These serious difficulties underline the need for a common cost model to obtain comparable and essentially reliable evaluations. Therefore, a common cost model (with common assumptions and accounting principles) was used in analyzing the new case studies carried out for this report. As well as improving the comparability of results, this was helpful for enterprises, which had remarkable success in identifying and estimating economic costs and benefits related either to absenteeism or to improved productivity, which were the two main cost categories (although they did not manage to quantify all the relevant costs and benefits).

Key Knowledge Point	BOK	Reference	Study Guide Material
In regards to logic modelling techniques, which utilizes a logic pattern flow from the bottom-up?	OSH Metrics, Reporting and Statistics	Clemens, Pat L., Simmons, Rodney J. U.S. Dept. of Health and Human Services *System Safety and Risk Management A Guide for Engineering Educators*	An event tree analysis (ETA) is a forward (bottom-up) symbolic logic modeling technique generated in both the success and failure domain. This technique explores system responses to initiating "challenge" and enables assessment of the probability of an unfavorable or favorable outcome. The system challenge may be a failure or fault, and undesirable event, or a normal system operating command [1, 2]. See http://www.Sverdrup.com/svt for a set of presentation slides that support this lesson. A generic event tree portrays all plausible system operating alternate paths from the initiating event. A Bernoulli model event tree uses binary branching to illustrate that the system either succeeds of fails at each system logic branching node. A decision tree is a specialized event tree with unity probability for the system outcome. It is important to remember that each analytical technique discussed in this module complements (rather than supplants) the others. This is because each technique attacks the system to be analyzed differently – some are top-down, others are bottom-up. Though it has long been sought, there is no "Swiss Army Knife" technique that answers all questions and is suitable for all situations.

Key Knowledge Point	BOK	Reference	Study Guide Material
The ANSI/AIHA Z-10-2012, Occupational Health and Safety Management Systems standard utilizes which concept model as an asset in continuous improvement?	OSH Regulations and Safety Standards	Manuele, Fred A. (2014) *Advanced Safety Management Focusing on Z10 and Serious Injury Prevention* Second Edition	In the introduction to ANSI/AIHA Z10-2012, the Occupational Health and Safety Management Systems standard, it is stated that the design of ANSI Z10 encourages integration with other management systems to facilitate organizational effectiveness using the elements of Plan-Do-Check-Act (PDCA) Model as a basis for continual improvement. Prominence is given in this chapter to the application of PDCA concepts as a asset in continuous improvement. Vic Toy, the vice chair for the committee that wrote the Z10 standard, wrote an article entitled "Let Your OHS Management System Do the Work: How the New Z10 Adds Even Better Value." What Toy wrote also relates to continuous improvement. The beauty of an Occupational Health and Safety Management System (OHSMS) is that it provides health and safety management in an integrated, interconnected, organic way to maintain focus on continual improvement. The Z10 standard provides a systematic framework and the tools required for continual improvement.

Key Knowledge Point	BOK	Reference	Study Guide Material
According to OSHA, which of the following make up the "Fatal Four" construction-related fatality causes?	OSH Metrics, Reporting and Statistics	U.S. Department of Labor www.osha.gov/oshstats/commonstats.html *Commonly Used Statistics* Construction's "Fatal Four"	**Worker injuries, illnesses and fatalities** 4,836 workers were killed on the job in 2015 [https://www.bls.gov/news.release/cfoi.nr0.htm] (3.4 per 100,000 full-time equivalent workers) — on average, more than 93 a week or more than 13 deaths every day. 903 Hispanic or Latino workers were killed from work-related injuries in 2015—on average, more than 17 deaths a week or two Latino workers killed every single day of the year, all year long. Fatal work injuries involving contractors accounted for 17 percent of all fatal work injuries in 2015. **Construction's "Fatal Four"** Out of 4,379 worker fatalities in private industry in calendar year 2015, 937 or 21.4% were in construction — that is, one in five worker deaths last year were in construction. The leading causes of private sector worker deaths (excluding highway collisions) in the construction industry were falls, followed by struck by object, electrocution, and caught-in/between. These "Fatal Four" were responsible for more than half (64.2%) the construction worker deaths in 2015, BLS reports. **Eliminating the Fatal Four would save 602 workers' lives in America every year**. 1. Falls — 364 out of 937 total deaths in construction in CY 2015 (38.8%) 2. Struck by Object - 90 (9.6%) 3. Electrocutions - 81 (8.6%) 4. Caught-in/between* - 67 (7.2%) (*This category includes construction workers killed when caught-in or compressed by equipment or objects, and struck, caught, or crushed in collapsing structure, equipment, or material)

Key Knowledge Point	BOK	Reference	Study Guide Material
The original OSHA Hazard Communication regulatory scheme from 1983 is being replaced by what international standard?	OSH Regulations and Safety Standards	Bailey, Melissa A. et al. (2016) *Occupational Safety and Health Law Handbook* Third Edition	The producers and importers of hazardous chemicals and the employers who use such chemicals are obligated to evaluate and communicate their hazards is certainly well known, as these obligations are firmly rooted within the business industry. Since 1983, when the Occupational Health and Safety Administration (OSHA) first implemented its standard regarding hazard communication, producers, importers, employers and workers have grown accustomed to complying with these requirements and have relied upon the resulting increased flow of information to deal properly with hazardous chemicals in the workplace. As OSHA described it, "[t]here is a whole generation of employers and employees now who have never worked in a situation where information about the chemicals in their workplace is not available." But the previous regulatory scheme of OSHA's Hazard Communication Standard (HCS) is now being displaced because of ongoing efforts to harmonize America's standards with those used internationally. As the world becomes increasingly flat, and globalization and international standardization become the norm instead of the exception, significant changes for American industry are now underway. These changes were not unanticipated given the indications by OSHA made over the years, and the length of time of the rulemaking process. Indeed, the earliest indication of a potential move toward global harmonization in this arena were made by OSHA as early as 1983, when the agency first signaled that it was committed to global unification of hazard communication. Concerns over regulatory change and increased compliance costs prompted OSHA to proceed slowly and judiciously down the path toward global harmony while recognizing the concern that there may be a great economic burden that the changes to the HCS would bring. Nevertheless, that change has arrived. After issuing its Advanced Notice of Proposed Rulemaking in 2006, OSHA promulgated its Revised Hazard Communication Standard (RHCS) six years later on March 26, 2012, to conform to the United Nations' Globally Harmonized System of Classification and Labelling of Chemicals (GHS), and the transition period for full compliance continues through June 1, 2016. Although the basic scope of and regulatory framework have remained largely the same, the definitions of what constitutes a hazard have changed, along with the requirements for labels and safety data sheets (Formerly, "material safety data sheets"), among other changes.

Key Knowledge Point	BOK	Reference	Study Guide Material
Which safety metric chart is a graphic representation of the raw data over time without the presence of the average, upper control limits, and lower control limits?	OSH Metrics, Reporting and Statistics	Janicak, Christopher A. (2015) *Safety Metrics, Tools and Techniques for Measuring Safety Performance* Third Edition	Control charts are used in safety to detect significant changes in performance measures and to ascertain whether the performance measures are within an acceptable range. The acceptable range for a control chart is established using control limits. When the data points fall outside of the control limits, a significant change has occurred and an investigation should be conducted. To reinforce this idea, it is useful to document the "owner" of each performance measure and the management decisions that have been, or will be made based upon this measure (United States Department of Energy, Hanford Site 2001). A run chart is a preliminary display of safety performance indicator data (United States Department of Energy, Hanford Site 2001). The run chart is a graphic representation of the raw data over time without the presence of the average, upper control limits, and lower control limits. When using the data from a run chart to construct a control chart, it is important that the data obtained for the control chart is coming from the same type of sample that the run chart was constructed with. If the characteristics of the subjects from which the control chart data is being constructed from differ significantly from those that the run chart was constructed from, significant values may be obtained not because of actual significantly different performance, but rather because of differences in the subjects. Attribute charts are used when the data being measured meet certain conditions or attributes. Attributes are involved when the safety measures are categorical (Griffin 2000, 434). Examples of categorical data include the departments in which accidents are occurring, the job classification of the injured employee, and the type of injury sustained. The type of attribute control chart used depends on the data format of the specific attribute measured.

Key Knowledge Point	BOK	Reference	Study Guide Material
According to NIOSH System Safety is defined as:	System Safety Design and Management	Manuele, Fred A. (2014) *Advanced Safety Management Focusing on Z10 and Serious Injury Prevention*	Unfortunately, the term *system safety* does not convey a clear meaning of the practice as it is applied. Published definitions of system safety are of some help in understanding the concept, but they do not communicate clearly. To give indications of the differences in the definitions of system safety, and to move this discussion forward, six sources are cited. In MIL-STD-882E-2012, the Department of Defense *Standard Practice for System Safety*, system safety is defined as: The application of engineering and management principles, criteria, and techniques to achieve acceptable risk within the constraints of operational effectiveness and suitability, time, and cost throughout all phases of the system life-cycle. (p. 8) In System Safety Primer, Clifton A. Ericson II gave this definition of system safety in his 2011 book: System safety is an engineering methodology employed to intentionally design-in safety into a product or system through the identification and elimination/mitigation of hazards. (p. 6) In GEIA-STD-0010, the *Standard Best Practices for System Safety Program Development and Execution*, approved in 2008, this definition is given: System safety is the application of engineering and management principles, criteria, and techniques to achieve mishap risk as low as reasonably practicable (to an acceptable level), within the constraints of operational effectiveness and suitability, time, and cost, throughout all phases of the system life cycle. Richard A. Stephans' book *System Safety for the 21st Century* was published in 2004. He defines system safety as follows: *System Safety*: The discipline that uses systematic engineering and management techniques to aid in making systems safe throughout their life cycles. (p. 11) *System Safety and Risk Management, NIOSH Instruction Module, A Guide for Engineering Educators* was developed for the National Institute for Occupational Safety and Health by Pat L. Clemens and Rodney J, Simmons in 1998. They write as follows: What is System Safety? System Safety has two primary characteristics: (1) it is a doctrine of management practice that mandates that hazards be found and risks controlled; and (2) it is a collection of analytical approaches with which to practice the doctrine. (p. 3) In *System Safety Engineering and Management*, 2nd ed., Harold E. Roland and Brian Moriarty asked in 1990: What is System Safety? In response to their own question, they give two meaningful comments and then established the system safety objective. The system safety concept is the application of special technical and managerial skills to the systematic, forward-looking identification and control of hazards throughout the life cycle of a project, program, or activity. The concept calls for safety analysis and hazard control actions, beginning with the conceptual phase of a system and continuing through the design, production, testing, use and disposal phases, until the activity is retired. (p. 8)

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According to Dr. Sidney Dekker's paper for The Joint Commission Journal on Quality and Patient Safety: Quality is about _____: safety is about_____. ?	Safety Theory & Philosophy	Dekker editorial, April 2010 "We Have Newton on a Retainer: Reductionism When We Need Systems Thinking"	Something must have gone terribly wrong when a 16-yearold patient died after a nurse accidentally administered a bag of epidural analgesia by the intravenous route instead of the intended penicillin. What was it? We typically want to find the broken parts, fix them, remove them, and make sure that they can't contribute to failure again. The root cause analysis (RCA) described by Smetzer et al. in this issue of the *Journal* 1 does precisely that. It seems as if human error is still seen as a meaningful target for intervention by itself. Failure in health care, says Gawande,2 is a result of human ineptitude. This notion is informed by a kind of Newtonian, reductionist thinking in which we hunt for the "broken part" that needs fixing or replacement. Yet "errors" come from somewhere, occurring in spite of people's continuous efforts to accommodate the enormous complexity that typifies health care today. People have to reconcile a multitude of goal conflicts, production pressures, discontinuities across specialties and departments, resource constraints, new technologies, and patient expectations. When things go well, health care tends to celebrate "good doctoring"3—acts by competent people who succeeded despite the organization and its complexity. When things do not go well—when adverse events occur— health care tends to zero in on the people at the sharp end who, for once, failed to hold that complex, pressurized patchwork together—rather than inquire about the systemic sources behind the production of all that complexity. If the system really *is* complex, let's start to act as if we really understand what that means. Complexity theory, rather than Newtonian reductionism, is where health care should look for answers. With the introduction of each new part or layer of defense, technology, procedure, or specialization, there is an explosion of new relationships *between* parts, layers, and components that spreads out through the system. Complexity theory explains how accidents emerge from these relationships, even from perfectly "normal" relationships, where nothing (not even a part) is seen as broken. The drive to make systems reliable, then, also makes them very complex—which, paradoxically, can in turn make them less safe. Redundancy—putting in extra barriers—or fixing them does not provide any protection against a system safety threat. In fact, it helps perpetuate or even heighten the threat. For example, introducing a layer of technology (point-of-care bar-coding system) for double checking a medication order against a patient identification may require novel interface management skills that can get in the way of doing the primary task: taking care of the patient.6 So quality is not safety. Quality is about parts; safety is about systems. A part by itself cannot even be safe or unsafe. Safety or its absence is an emergent property of the relationships between parts.

Key Knowledge Point	BOK	Reference	Study Guide Material
According to Dr. Sidney Dekker a Just Culture is a culture of _____, _____, and _____.	Safety Theory & Philosophy	Dr. Sidney Dekker, web site: www.sidneydekker.com	Dr. Sidney Dekker is one of the key thinkers behind Just Culture. He has surprising and inspiring ideas that you might not find elsewhere. Here you can learn about problems with a Retributive Just Culture (the approach taken by many organizations today), and the possibilities for a Restorative Just Culture—also in *your* organization. A just culture is a culture of trust, learning and accountability. It is important to have when something goes wrong in your organization. There are basically two ways: **A retributive just culture asks:** Which rule is broken? Who did it? How bad was the breach, and what should the consequences be? Who gets to decide this? **A restorative just culture asks:** Who is hurt? What do they need? Whose obligation is it to meet that need? How do you involve the community in this conversation?

Key Knowledge Point	BOK	Reference	Study Guide Material
According to Dr. Sidney Dekker there is no evidence that organizations that employee the "Retribution Just Culture" learn more of value after an incident.	Safety Theory & Philosophy	Dr. Sidney Dekker, web site: www.sidneydekker.com	**Problems with a Retributive Just Culture** "Just Culture" is a way for organizations to justly respond to mistakes and violations. Many organizations think that Just Culture is about dividing people's actions into shades of culpability: • Honest mistake, you can stay. • Risk-taking, you get a warning. • Negligence, you are let go. These organizations have mixed results with a retributive 'just culture,' because: • Who draws the line between these shades of culpability, and is she or he independent? • Does he or she know the nuances and messy details of the practitioner's work? • Is there a right of appeal? There is no evidence that these organizations learn more of value after an incident. **Can you get retribution right?** Retributive justice is about rules, violations and sanctions. It believes that wrongdoing creates guilt and that it demands something from the offender to compensate it. Here is how retribution tries to create justice, prevention and learning: • It asks who is responsible for the incident and focuses on what they deserve • It looks back on the wrongdoing and imposes consequences for it • It has the offender settle his or her account to pay off the guilt • To do so it imposes a proportional and deserved sanction • It learns and prevents by setting an example • It builds trust by reinforcing rules, advertising them and giving people authority over them • It meets hurt with more hurt This is the idea. It may not always work, for example in your organization. When retributive justice is imposed, make sure you check this: • Is the 'judge,' the one who draws the line on the practitioner's behavior, *independent*? A 'judge' (say, a nurse manager in case of a medication adverse event) who has a stake in the outcome is not independent. • Does the 'judge' or 'jury' know enough about the *messy details of practice* to know about the many unwritten rules, standards and expectations about how work actually gets done? • Is there an opportunity for *appeal*? Natural justice allows people a chance to be heard again by an unbiased party. Does that happen in your organization? • Does retributive justice in your organization promote honesty, openness, *learning* and prevention?

Key Knowledge Point	BOK	Reference	Study Guide Material
According to Dr. Sidney Dekker a "Restorative Just Culture asks "what" is responsible and isn't just focused on the offender.	Safety Theory & Philosophy	Dr. Sidney Dekker, web site: www.sidneydekker.com	**There is another way, based on restoration** A restorative just culture meets hurt with healing, welcomes multiple stories about the event, and focuses on restoring relationships and trust. In retribution, an account is something you *pay*. You repay the debt you morally owe; you settle your account with your organization, victims, community, society by receiving a proportional and deserved punishment. It asks *who* was responsible, and sets an example. In restoration, an account is something you *tell*. You, like others involved, give an account of how the event happened and what it meant to you. Together, you determine how to meet the needs that have arisen from the event. It asks *what* is responsible, and then changes what led up to the incident. Restorative justice is about hurts, needs and obligations. It believes that harms create needs, and that needs create obligations. The entire community is involved in resolving whose needs need meeting, and by whom. It isn't just focused on the offender. In fact, the so-called 'offender' may well be a victim him or herself a second victim. Here is how restoration tries to create justice, prevention and learning: • It asks who is hurt and what their needs are • It looks forward by assessing who can, or should, meet those needs • It invites all affected to *tell* their accounts of the harm and their needs. To do so it invests in relationships and repairs trust • It learns and prevents by asking why it made sense for people to do what they did • It builds trust by repairing relationships between people whose work depends on each other • It meets hurt with healing

Key Knowledge Point	BOK	Reference	Study Guide Material
According to Dr. Sidney Dekker a "Restorative Just Culture achieves accountability by:	Safety Theory & Philosophy	Dr. Sidney Dekker, web site: www.sidneydekker.com	*Neither retributive nor restorative justice let people 'off the hook'* Both retribution and restoration acknowledge that a 'balance' has been thrown off by the incident and its consequences. Both acknowledge reciprocity, an 'evening of the score.' But they differ on the 'currency' to rebalance the situation. Both impose accountability. But they go about it in different ways: Retributive justice achieves accountability by looking *back* on the harm done. The community can demonstrate that it does not accept what the person did (it would not accept such actions from *any* of its members), and demonstrates that it makes the person pay. Restorative justice achieves accountability by looking *ahead* to meet the needs and repair the trust and relationships that were harmed. It wants to understand why it made sense for the person to do what they did. For this, they an account, a story. People are accountable by reflecting on their actions and understanding *what* was responsible for producing it. This also gives them the opportunity to express remorse. The community decides whose obligation it is to meet the needs that arose from the incident, and agrees how to do this. Neither form of just culture gets 'people off the hook.' Both hold people accountable. In both, people are expected to engage with, and respond to, the community of which they are part.

Key Knowledge Point	BOK	Reference	Study Guide Material
According to Dr. Sidney Dekker we need to transition from seeing safety as an absence of _____to seeing it as the presence of a _____ capacity to make things go right.	Safety Theory & Philosophy	Safety Differently "Human Factors for New Era", Second Edition.	If we want a new era in safety, what would it look like? A new era would certainly reconsider, once again, the role of human beings in the creation of safety. Our governance of safety is often organized around bureaucratic process, driven by high modernist ideas, and held up Cartesian-Newtonian assumptions about how things go right and wrong. It supports and legitimates systems of counting and tabulating, and largely relies on vocabularies of control, constraint, and human deficit. The new era, instead, calls for a form of governance that sends power over many safety decisions back to the floor, to the projects; a form of governance that sees people there as the source of diversity, insight, creativity, and wisdom about safety, not as a sources of risk that undermine an otherwise safe system, It calls for governance that trusts people and mistrusts bureaucracy. A governance that is once again committed to preventing injury rather than insurance claims. The contrast is laid out in table 8-1. A continued pursuit of existing safety strategies is not going to lead to different outcomes, and it is unlikely that we can break through the asymptote on safety progress with them. Perhaps it is time for entirely different indicators, or measures. That said, we should probably not discontinue what we are doing all at once, and some things we should not ever discontinue – much of what we have been doing in safety is quite worthwhile. It has led to significant reductions in harm and damage. But we should not have the expectation that it will help is do much more than maintaining current levels of safety in many industries. Further progress instead hinges on a number of key transitions: We need to transition from seeing people as a problem to control to seeing people as a solution to harness. We need to transition from seeing safety as a bureaucratic accountability *up* to seeing is as an ethical responsibility *down*. We need to transition from seeing safety as an absence of negatives to seeing it as the presence of a positive capacity to make things go right.

Key Knowledge Point	BOK	Reference	Study Guide Material
According to Dr. Sidney Dekker tightening of safety bureaucracy robs us of exactly the source of human _____, _____ and _____ that can tell us how success is actually created, and where the next accident may well happen.	Safety Theory & Philosophy	The Safety Anarchist, Dr. Sidney Dekker, published by Routledge, (Taylor & Francis Group).	Work has never been as safe as it seems today. Safety has also never been as bureaucratized as it is today. Over the past two decades, the number of safety rules and statutes has exploded, and organizations themselves are creating ever more internal compliance requirements. At the same time, progress on safety has slowed to a crawl. Many incident- and injury rates have flatlined. Worse, excellent safety performance on low-consequence events tends to *increase* the risk of fatalities and disasters. Bureaucracy and compliance now seem less about managing the safety of the workers we are responsible for, and more about managing the liability of the people they work for. We make workers do a lot that does nothing to improve their success locally. Paradoxically, such tightening of safety bureaucracy robs us of exactly the source of human insight, creativity and resilience that can tell us how success is actually created, and where the next accident may well happen. It is time for Safety Anarchists: people who trust people more than process, who rely on horizontally coordinating experiences and innovations, who push back against petty rules and coercive compliance, and who help recover the dignity and expertise of human work. **Regulating the worker does not prevent catastrophes** For years *BP* had touted it's safety record, pointing to a steep decline in the number of slips, falls, and vehicle accidents that generated days away from work, a statistic that is closely followed by both the industry and it's regulators. BP had established a dizzying array of rules that burnished this record, including prohibitions on driving while speaking on the cell phone, walking down a staircase without holding a handrail, and carrying a cup of coffee around without a lid. Bonuses for *BP* executives included a component tied to these personal-injury metrics. *BP* cut it' injury rates dramatically after the AMCO merge [the previous owner of the Texas City refinery]. But *BP's* personal safety achievements masked failure in assuring process safety. In the energy industry process safety generally comes down to a single issue: keeping hydrocarbons contained inside a steel pipe or tank. Disasters don't happen because someone drops a pipe on his foot or bumps his head. They result from flawed ways of doing business that permit risks to accumulate. (Elkind, Whitford, & Burke, 2011, p.7) Take the more than 7,500 gallons of toxic waste coal ash that was dumped into the Elk River in Charleston, West Virginia, in 2014. This was the third chemical spill to be inflicted on the Kanawha River Valley, leaving 300,000 people without water for days. The 2010 collapse of at the Upper Big Branch mine, also in West Virginia, which killed 29 miners, emerge from the deeply interwoven connections between out-of-state corporate interests, political money, unsentimental mine bosses, lax enforcement and deregulation (Mader, 2016). It is likely that as long as such a political-industrial complex stays alive and well, and keeps favoring certain interest over others while declaring and negative consequence in some Appalachian state 'external to its value proposition, it will keep drifting into system disasters like Elk River and Upper Big Branch. (Dekker, 2011).

Key Knowledge Point	BOK	Reference	Study Guide Material
Safety is the state in which the possibility of harm to persons or of property damage_____.	Safety Theory & Philosophy	ICAO (2013) Doc 9859, Safety Management Manual	**2.1 The Concept of Safety** 2.1.1 Within the context of aviation, safety is "the state in which the possibility of harm to persons or of property damage is reduced to, and maintained at or below, an acceptable level through a continuing process of hazard identification and safety risk management." 2.1.2 While the elimination of aircraft accidents and/or serious incidents remains the ultimate goal, it is recognized that the aviation system cannot be completely free of hazards and associated risks. Human activities or human-built systems cannot be guaranteed to be absolutely free from operational errors and their consequences. Therefore, safety is a dynamic characteristic of the aviation system, whereby safety risks must be continuously mitigated. It is important to note that the acceptability of safety performance is often influenced by domestic and international norms and culture. As long as safety risks are kept under an appropriate level of control, a system as open and dynamic as aviation can still be managed to maintain the appropriate balance between production and protection.

Key Knowledge Point	BOK	Reference	Study Guide Material
The notion of the "**organizational accident**" considers the impact of ____ and ____ on the effectiveness of safety risk controls.	Safety Theory & Philosophy	ICAO (2013) Doc 9859, Safety Management Manual	**2.2 Evolution of Safety Thinking** The history of the progress in aviation safety can be divided into three eras. a) The technical era — from the early 1900s until the late 1960s. b) The human factors era — from the early 1970s until the mid-1990s. c) **The organizational era** — from the mid-1990s to the present day. During the organizational era safety began to be viewed from a systemic perspective, which was to encompass organizational factors in addition to human and technical factors. As a result, the notion of the "organizational accident" was introduced, considering the impact of organizational culture and policies on the effectiveness of safety risk controls. Additionally, traditional data collection and analysis efforts, which had been limited to the use of data collected through investigation of accidents and serious incidents, were supplemented with a new proactive approach to safety. This new approach is based on routine collection and analysis of data using proactive as well as reactive methodologies to monitor known safety risks and detect emerging safety issues. These enhancements formulated the rationale for moving towards a safety management approach.

Key Knowledge Point	BOK	Reference	Study Guide Material
The Reason Model (Swiss Cheese Model) proposes that all accidents include a combination of both ___ and ___ conditions.	Safety Theory & Philosophy	ICAO (2013) Doc 9859, Safety Management Manual	**2.3 ACCIDENT CAUSATION** 2.3.1 The "Swiss-Cheese" Model, developed by Professor James Reason, illustrates that accidents involve successive breaches of multiple system defences. These breaches can be triggered by a number of enabling factors such as equipment failures or operational errors. Since the Swiss-Cheese Model contends that complex systems such as aviation are extremely well defended by layers of defences, single-point failures are rarely consequential in such systems. Breaches in safety defences can be a delayed consequence of decisions made at the highest levels of the system, which may remain dormant until their effects or damaging potential are activated by specific operational circumstances. Under such specific circumstances, human failures or active failures at the operational level act to breach the system's inherent safety defences. The Reason Model proposes that all accidents include a combination of both active and latent conditions.

Key Knowledge Point	BOK	Reference	Study Guide Material
_____ conditions are generally created by people far removed in time and space from the event.	Safety Theory & Philosophy	ICAO (2013) Doc 9859, Safety Management Manual	2.3.2 Active failures are actions or inactions, including errors and violations, which have an immediate adverse effect. They are generally viewed, with the benefit of hindsight, as unsafe acts. Active failures are generally associated with front-line personnel (pilots, air traffic controllers, aircraft mechanical engineers, etc.) and may result in a harmful outcome. 2.3.3 Latent conditions are those that exist in the aviation system well before a damaging outcome is experienced. The consequences of latent conditions may remain dormant for a long time. Initially, these latent conditions are not perceived as harmful, but will become evident once the system's defences have been breached. These conditions are generally created by people far removed in time and space from the event. Latent conditions in the system may include those created by a lack of safety culture; poor equipment or procedural design; conflicting organizational goals; defective organizational systems or management decisions. The perspective underlying the organizational accident aims to identify and mitigate these latent conditions on a system-wide basis, rather than through localized efforts to minimize active failures by individuals.

Key Knowledge Point	BOK	Reference	Study Guide Material
Of the activities over which an organization has a reasonable degree of control, ____ and ____ are fundamental to safety.	Safety Theory & Philosophy	ICAO (2013) Doc 9859, Safety Management Manual	2.3.4 The Swiss-Cheese Model assists in understanding the interplay of organizational and managerial factors in accident causation. It illustrates that various defences are built into the aviation system to protect against fluctuations in human performance or decisions at all levels of the system. While these defences act to protect against the safety risks, breaches that penetrate all defensive barriers may potentially result in a catastrophic situation. Additionally, Reason's Model represents how latent conditions are ever present within the system prior to the accident and can manifest through local triggering factors. 2.3.5 The notion of the organizational accident underlying Reason's Model can be best understood through a building-block approach, consisting of five blocks. The top block represents the organizational processes. These are activities over which any organization has a reasonable degree of direct control. Typical examples include policy making, planning, communication, allocation of resources, and supervision. Unquestionably, the two fundamental organizational processes as far as safety is concerned are allocation of resources and communication. Downsides or deficiencies in these organizational processes are the breeding grounds for a dual pathway towards failure.

Key Knowledge Point	BOK	Reference	Study Guide Material
In general terms, latent conditions can be grouped into two large clusters, ____ and ____.	Safety Theory & Philosophy	ICAO (2013) Doc 9859, Safety Management Manual	2.3.6 Examples of latent conditions may include deficiencies in equipment design, incomplete/incorrect standard operating procedures and training deficiencies. In generic terms, latent conditions can be grouped into two large clusters. One cluster is inadequate hazard identification and safety risk management, whereby the safety risks of the consequences of hazards are not kept under control, but roam freely in the system to eventually become active through operational triggers. 2.3.7 The second cluster is known as normalization of deviance, a notion that, simply put, is indicative of operational contexts where the exception becomes the rule. The allocation of resources in this case is flawed to the extreme. As a consequence of the lack of resources, the only way that operational personnel who are directly responsible for the actual performance of the production activities can successfully achieve these activities is by adopting shortcuts that involve constant violation of the rules and procedures.

Key Knowledge Point	BOK	Reference	Study Guide Material
The last lines of defense in preventing an accident include all but the following:	Safety Theory & Philosophy	ICAO (2013) Doc 9859, Safety Management Manual	2.3.8 Latent conditions have all the potential to breach aviation system defences. Typically, defences in aviation can be grouped under three large headings: technology, training and regulations. defences are usually the last safety net to contain latent conditions, as well as the consequences of lapses in human performance. Most, if not all, mitigation strategies against the safety risks of the consequences of hazards are based upon the strengthening of existing defences or the development of new ones.

Key Knowledge Point	BOK	Reference	Study Guide Material
The difference between an error and violation is _____.	Safety Theory & Philosophy	ICAO (2013) Doc 9859, Safety Management Manual	2.3.9 The other pathway originating from organizational processes is the workplace conditions pathway. Workplace conditions are factors that directly influence the efficiency of people in aviation workplaces. Workplace conditions are largely intuitive in that all those with operational experience have experienced them to varying degrees, and include workforce stability, qualifications and experience, morale, management credibility, and traditional ergonomics factors such as lighting, heating and cooling. 2.3.10 Less-than-optimum workplace conditions foster active failures by operational personnel. Active failures can be considered as either errors or violations. The difference between errors and violations is the motivational component. A person trying to do the best possible to accomplish a task, following the rules and procedures as per the training received, but failing to meet the objective of the task at hand, commits an error. A person who, while accomplishing a task, willingly deviates from rules, procedures or training received commits a violation. Thus, the basic difference between errors and violation is intent. 2.3.11 From the perspective of the organizational accident, safety endeavours should monitor organizational processes in order to identify latent conditions and thus reinforce defences. Safety endeavours should also improve workplace conditions to contain active failures because it is the combination of all these factors that produces safety breakdowns.

Key Knowledge Point	BOK	Reference	Study Guide Material
According to Scott A. Snook's theory of "practical drift", baseline performance is based on three fundamental assumptions, which includes all but one of the following:	Safety Theory & Philosophy	ICAO (2013) Doc 9859, Safety Management Manual	**Practical Drift** 2.3.12 Scott A. Snook's theory of practical drift is used as the basis to understand how, in aviation, the baseline performance of any system "drifts away" from its original design when the organization's processes and procedures cannot anticipate all situations that may arise in daily operations. 2.3.13 During the early stages of system design (e.g. ATC airspace, introduction of specific equipment, expansion of a flight operation scheme), operational interactions between people and technology, as well as the operational context, are taken into consideration to identify the expected performance limitations as well as potential hazards. The initial system design is based on three fundamental assumptions: the technology needed to achieve the system production goals is available, the people are trained to properly operate the technology, and the regulations and procedures will dictate system and human behaviour. These assumptions underlie the baseline (or ideal) system performance, which can be graphically presented as a straight line from the date of operational deployment until the system is decommissioned.

Key Knowledge Point	BOK	Reference	Study Guide Material
According to Snooks theory of practical drift, despite all the reasons which lead to the drift from baseline or expected performance, people make the system work on a daily basis by ____.	Safety Theory & Philosophy	ICAO (2013) Doc 9859, Safety Management Manual	2.3.14 Once operationally deployed, the system performs as designed, following baseline performance most of the time. In reality, however, operational performance is different from baseline performance as a consequence of real life operations and changes in the operational and regulatory environment. Since the drift is a consequence of daily practice, it is referred to as a "practical drift". The term "drift" is used in this context as the gradual departure from an intended course due to external influences. 2.3.15 A practical drift from baseline performance to operational performance is foreseeable in any system, no matter how careful and well thought out its design planning may have been. Some of the reasons for the practical drift may include: technology that does not always operate as predicted; procedures that cannot be executed as planned under certain operational conditions; regulations that are not applicable within certain contextual limitations; introduction of changes to the system, including the addition of new components; the interaction with other systems; and so forth. The fact remains however that, despite all the system's shortcomings leading to the drift, people operating inside the practical drift make the system work on a daily basis, applying local adaptations (or workarounds) and personal strategies "beyond what the book says".

Key Knowledge Point	BOK	Reference	Study Guide Material
The SHELL Model is a conceptual tool used to analize the interaction of the following system components:	Safety Theory & Philosophy	ICAO (2013) Doc 9859, Safety Management Manual	2.4.2 The SHELL Model is a conceptual tool used to analyze the interaction of multiple system components. The SHELL Model contains the following four components: a) Software (S): procedures, training, support, etc.; b) Hardware (H): machines and equipment; c) Environment (E): the working environment in which the rest of the L-H-S system must function; and d) Liveware (L): humans in the workplace. 2.4.4 According to the SHELL Model, a mismatch between the Liveware and the other four components contributes to human error. Thus, these interactions must be assessed and considered in all sectors of the aviation system.

Key Knowledge Point	BOK	Reference	Study Guide Material
Safety strategies must be put into place to control the safety risks related to errors. These include the following:	Safety Theory & Philosophy	ICAO (2013) Doc 9859, Safety Management Manual	2.5.4 Safety strategies must be put into place to control or eliminate errors. The strategies to control errors leverage the basic defences within the aviation system. These include the following: a) Reduction strategies provide direct intervention to reduce or eliminate the factors contributing to the error. Examples of reduction strategies include improvement of ergonomic factors and reduction of environmental distractions. b) Capturing strategies assume the error will be made. The intent is to “capture” the error before any adverse consequences of the error are felt. Capturing strategies are different from reduction strategies in that they utilize checklists and other procedural interventions rather than directly eliminating the error. c) Tolerance strategies refer to the ability of a system to accept that an error will be made but without experiencing serious consequences. The incorporation of redundant systems or multiple inspection processes are examples of measures that increase system tolerance to errors.

Key Knowledge Point	BOK	Reference	Study Guide Material
A director sends out a memo saying the new minimum rest period is reduced to 10 hours to meet the increased mission demands. However, the company policy indicates the minimum rest period is 12 hours. The decision was made after learning that supervisors were frequently approving deviations to minimum crew rest to get the job done. Which kind of violation is this?	Safety Theory & Philosophy	ICAO (2013) Doc 9859, Safety Management Manual	2.5.6 Individuals may knowingly deviate from norms, in the belief that the violation facilitates mission achievement without creating adverse consequences. Violations of this nature are errors in judgement and may not automatically result in disciplinary measures depending on the policies in place. Violations of this type can be categorized as follows: a) Situational violations are committed in response to factors experienced in a specific context, such as time pressure or high workload. b) Routine violations become the normal way of doing business within a work group. Such violations are committed in response to situations in which compliance with established procedures makes task completion difficult. This may be due to practicality/workability issues, deficiencies in human technology interface design and other issues that cause persons to adopt “workaround” procedures, which eventually become routine. These deviations, referred to as “drift,” may continue without consequence, but over time they may become frequent and result in potentially severe consequences. In some cases routine violations are well grounded and may result in the incorporation of the routine violation as an accepted procedure after a proper safety assessment has been conducted and it is shown that safety is not compromised. c) Organizationally induced violations may be considered as an extension of routine violations. This type of violation tends to occur when an organization attempts to meet increased output demands by ignoring or stretching its safety defences.

Key Knowledge Point	BOK	Reference	Study Guide Material
The three most influential cultural components are _____.	Safety Theory & Philosophy	ICAO (2013) Doc 9859, Safety Management Manual	2.6 SAFETY CULTURE 2.6.1 Culture is characterized by the beliefs, values, biases and their resultant behavior that are shared by members of a society, group or organization. An understanding of these cultural components, and the interaction between them, is important to safety management. The three most influential cultural components are organizational, professional and national cultures. A reporting culture is a key component of these different cultures. The mix of cultural components may vary greatly among organizations and can negatively influence effective hazard reporting, collaborative root-cause analysis and acceptable risk mitigation. Continuous improvement in safety performance is possible when safety becomes a value within an organization as well as a priority at the national or professional level.

Key Knowledge Point	BOK	Reference	Study Guide Material
A safety culture cannot be effective unless it is embedded within ____.	Safety Theory & Philosophy	ICAO (2013) Doc 9859, Safety Management Manual	2.6.2 A safety culture encompasses the commonly held perceptions and beliefs of an organization's members pertaining to the public's safety and can be a determinant of the behavior of the members. A healthy safety culture relies on a high degree of trust and respect between personnel and management and must therefore be created and supported at the senior management level. 2.6.3 A healthy safety culture actively seeks improvements, vigilantly remains aware of hazards and utilizes systems and tools for continuous monitoring, analysis and investigation. It must exist in State aviation organizations as well as in product and service provider organizations. Other characteristics of a healthy safety culture include a shared commitment by personnel and management to personal safety responsibilities, confidence in the safety system, and a documented set of rules and policies. The ultimate responsibility for the establishment and adherence to sound safety practices rests with the management of the organization. A safety culture cannot be effective unless it is embedded within an organization's own culture.

Key Knowledge Point	BOK	Reference	Study Guide Material
An effective way to promote safe operations is to ensure that an organization has developed an environment where ___.	Safety Theory & Philosophy	ICAO (2013) Doc 9859, Safety Management Manual	2.6.8 The way in which management deals with day-to-day safety issues is also fundamental to improving organizational culture. Collaborative interaction between front-line personnel and their safety and quality counterparts, as well as the representatives of the regulatory authority, is indicative of a positive organizational culture. This relationship should be characterized by professional courtesy, while maintaining respective roles as necessary to ensure objectivity or accountability. 2.6.9 An effective way to promote safe operations is to ensure that an organization has developed an environment where all staff feel responsible for safety. This becomes evident when staff consider the impact on safety in everything they do, report all hazards, errors and threats and support the identification and management of all their associated risks. In addition, management must create an environment in which personnel are aware of safety risks, are given sufficient systems to protect themselves and are assured protection when they divulge safety information through the safety reporting system. An effective safety culture serves as a method to synchronize diverse national and professional cultures within the context of the organization.

Key Knowledge Point	BOK	Reference	Study Guide Material
The success of a safety reporting system depends upon_____.	Safety Theory & Philosophy	ICAO (2013) Doc 9859, Safety Management Manual	2.6.14 Reporting culture emerges from personnel's beliefs about and attitudes toward the benefits and potential detriments associated with reporting systems and the ultimate effect on their acceptance or utilization of such systems. It is greatly influenced by organizational, professional and national cultures and is one criterion for judging the effectiveness of a safety system. A healthy reporting culture aims to differentiate between intentional and unintentional deviations and determine the best course of action for both the organization as a whole and the individuals directly involved. 2.6.15 The success of a reporting system depends upon the continuous flow of information from front-line personnel. Policies that distinguish willful acts of misconduct from inadvertent errors, providing for an appropriate punitive or nonpunitive response, are essential to assure the effective reporting of systemic safety deficiencies. Not only is an "absolute no blame" culture unreasonable, it is not even feasible. While management gains safety information, the system will be ineffective if it interferes with appropriate punitive actions. Conversely, a culture that fails to distinguish unintentional errors/mistakes from acts of willful misconduct will inhibit the reporting process. If personnel avoid reporting for fear of punishment, management does not gain important safety information.

Key Knowledge Point	BOK	Reference	Study Guide Material
Personnel must believe that they will be supported in any decisions made in the interest of safety. Therefore, a voluntary reporting system should _____.	Safety Theory & Philosophy	ICAO (2013) Doc 9859, Safety Management Manual	2.6.16 Overall, personnel must believe that they will be supported in any decisions made in the interest of safety but must also understand that intentional breaches of safety policy will not be tolerated. Therefore, a voluntary reporting system should be confidential and operated in accordance with appropriate non-punitive policies. The system should also provide feedback to personnel on safety improvements achieved as a result of the reports received. This objective requires secure and easy access to safety reporting systems, active safety data collection and management's proactive treatment of the data. 2.6.17 Safety information should be collected solely for the improvement of aviation safety, and information protection is essential in ensuring the continued availability of information. This may be realized through a safety reporting system that is confidential, voluntary and non-punitive. The benefits are twofold. Often personnel are the closest to safety hazards, so the reporting system enables them to actively identify these hazards. At the same time, management is able to gather pertinent safety hazard information and also build trust with personnel. 2.6.18 Once the data have been collected and stored, that information must be processed in order to substantiate the implementation of appropriate actions that should be communicated to front-line personnel in a timely manner.

Key Knowledge Point	BOK	Reference	Study Guide Material
According to Dr. Erik Hollnagel's book "Safety I and Safety II: From a Safety-II perspective, the purpose of safety management is to ensure that as much as possible goes _____, in the sense that everyday work achieves its objectives.	Safety Theory & Philosophy	Dr. Erik Hollnagel Asgate Publishing "Safety I and Safety II.	Safety has traditionally been defined as a condition where the number of adverse outcomes was as low as possible (Safety-I). From a Safety-I perspective, the purpose of safety management is to make sure that the number of accidents and incidents is kept as low as possible, or as low as is reasonably practicable. This means that safety management must start from the manifestations of the absence of safety and that - paradoxically - safety is measured by counting the number of cases where it fails rather than by the number of cases where it succeeds. This unavoidably leads to a reactive approach based on responding to what goes wrong or what is identified as a risk - as something that could go wrong. Focusing on what goes right, rather than on what goes wrong, changes the definition of safety from 'avoiding that something goes wrong' to 'ensuring that everything goes right'. More precisely, Safety-II is the ability to succeed under varying conditions, so that the number of intended and acceptable outcomes is as high as possible. From a Safety-II perspective, the purpose of safety management is to ensure that as much as possible goes right, in the sense that everyday work achieves its objectives. This means that safety is managed by what it achieves (successes, things that go right), and that likewise it is measured by counting the number of cases where things go right. In order to do this, safety management cannot only be reactive, it must also be proactive. But it must be proactive with regard to how actions succeed, to everyday acceptable performance, rather than with regard to how they can fail, as traditional risk analysis does. This book analyses and explains the principles behind both approaches and uses this to consider the past and future of safety management practices. The analysis makes use of common examples and cases from domains such as aviation, nuclear power production, process management and health care.

Key Knowledge Point	BOK	Reference	Study Guide Material
According to Dr. Erik Hollnagel's book "Safety I and Safety II - From a Safety-II perspective, the purpose of safety management is to ensure that as much as possible goes right, in the sense that everyday work achieves its objectives. This means that safety is managed by what it achieves (successes, things that go right), and that likewise it is measured by _____ the number of cases where things go right.	Safety Theory & Philosophy	Dr. Erik Hollnagel Asgate Publishing "Safety I and Safety II.	Safety has traditionally been defined as a condition where the number of adverse outcomes was as low as possible (Safety-I). From a Safety-I perspective, the purpose of safety management is to make sure that the number of accidents and incidents is kept as low as possible, or as low as is reasonably practicable. This means that safety management must start from the manifestations of the absence of safety and that - paradoxically - safety is measured by counting the number of cases where it fails rather than by the number of cases where it succeeds. This unavoidably leads to a reactive approach based on responding to what goes wrong or what is identified as a risk - as something that could go wrong. Focusing on what goes right, rather than on what goes wrong, changes the definition of safety from 'avoiding that something goes wrong' to 'ensuring that everything goes right'. More precisely, Safety-II is the ability to succeed under varying conditions, so that the number of intended and acceptable outcomes is as high as possible. From a Safety-II perspective, the purpose of safety management is to ensure that as much as possible goes right, in the sense that everyday work achieves its objectives. This means that safety is managed by what it achieves (successes, things that go right), and that likewise it is measured by counting the number of cases where things go right. In order to do this, safety management cannot only be reactive, it must also be proactive. But it must be proactive with regard to how actions succeed, to everyday acceptable performance, rather than with regard to how they can fail, as traditional risk analysis does. This book analyses and explains the principles behind both approaches and uses this to consider the past and future of safety management practices. The analysis makes use of common examples and cases from domains such as aviation, nuclear power production, process management and health care.

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According to Dr. Erik Hollnagel's book "Safety I and Safety II – This means that safety is managed by what it achieves (successes, things that go right), and that likewise it is measured by counting the number of cases where things go right. In order to do this, safety management must be proactive with regard to how actions _____, to everyday acceptable performance, rather than with regard to how they can fail, as traditional risk analysis does.	Safety Theory & Philosophy	Dr. Erik Hollnagel Asgate Publishing "Safety I and Safety II.	Safety has traditionally been defined as a condition where the number of adverse outcomes was as low as possible (Safety-I). From a Safety-I perspective, the purpose of safety management is to make sure that the number of accidents and incidents is kept as low as possible, or as low as is reasonably practicable. This means that safety management must start from the manifestations of the absence of safety and that - paradoxically - safety is measured by counting the number of cases where it fails rather than by the number of cases where it succeeds. This unavoidably leads to a reactive approach based on responding to what goes wrong or what is identified as a risk - as something that could go wrong. Focusing on what goes right, rather than on what goes wrong, changes the definition of safety from 'avoiding that something goes wrong' to 'ensuring that everything goes right'. More precisely, Safety-II is the ability to succeed under varying conditions, so that the number of intended and acceptable outcomes is as high as possible. From a Safety-II perspective, the purpose of safety management is to ensure that as much as possible goes right, in the sense that everyday work achieves its objectives. This means that safety is managed by what it achieves (successes, things that go right), and that likewise it is measured by counting the number of cases where things go right. In order to do this, safety management cannot only be reactive, it must also be proactive. But it must be proactive with regard to how actions succeed, to everyday acceptable performance, rather than with regard to how they can fail, as traditional risk analysis does. This book analyses and explains the principles behind both approaches and uses this to consider the past and future of safety management practices. The analysis makes use of common examples and cases from domains such as aviation, nuclear power production, process management and health care.

Key Knowledge Point	BOK	Reference	Study Guide Material
According to Dr. Erik Hollnagel - The definition of Safety-I means that the manifestations of safety are the _____ outcomes	Safety Theory & Philosophy	From Safety-I to Safety-II: A White Paper, 2015, Hollnagel E., Wears R.L. and Braithwaite J. From Safety-I to Safety-II: A White Paper. The Resilient Health Care Net: Published simultaneously by the University of Southern Denmark, University of Florida, USA, and Macquarie University, Australia.	**The Manifestations of Safety-I** The definition of Safety-I means that the manifestations of safety are the adverse outcomes. A system (e.g., a general practice, a pharmacy, a care facility, or a hospital) is said to be unsafe if there is more than the occasional adverse outcome or if the risk is seen as unacceptable; similarly, it is said to be safe if such outcomes occur rarely or not at all, or if the risk is seen as acceptable. This is, however, an indirect definition because safety is being defined by its opposite, by what happens when it is absent rather than when it is present. A curious consequence is that we analyse and try to learn from situations where, by definition, there was a lack of safety. Another curious consequence is that the level of safety is inversely related to the number of adverse outcomes. If many things go wrong, the level of safety is said to be low; but if few things go wrong, the level of safety is said to be high. In other words, the more manifestations there are, the less safety there is and vice versa. A perfect level of safety means that there are no adverse outcomes, hence nothing to measure. This unfortunately makes it very difficult, if not impossible, to demonstrate that efforts to improve safety have worked, hence very difficult to argue for continued resources. To help describe the manifestations, various error typologies of adverse outcomes are available, ranging from the simple (omission-commission) to the elaborate (various forms of 'cognitive error' and violations or non-compliance). Note that these typologies often hide a troublesome confusion between error as outcome (manifestation) and error as cause.

Key Knowledge Point	BOK	Reference	Study Guide Material
According to Dr. Erik Hollnagel – While this kind of simple linear thinking (Safety I) was probably adequate for the first part of the 20th century, the increasingly complicated and intractable socio-technical systems that developed in the last half—and especially since _____— required more intricate and more powerful mechanisms.	Safety Theory & Philosophy	From Safety-I to Safety-II: A White Paper, 2015, Hollnagel E., Wears R.L. and Braithwaite J. From Safety-I to Safety-II: A White Paper. The Resilient Health Care Net: Published simultaneously by the University of Southern Denmark, University of Florida, USA, and Macquarie University, Australia.	**The mechanisms of Safety-I** The mechanisms of Safety-I are underpinned by the assumptions about how things happen that are used to explain or make sense of the manifestations. The generic mechanism of Safety-I is the causality credo—a globally predominant belief that adverse outcomes (accidents, incidents) happen because something goes wrong, hence that they have causes that can be found and treated. While it is obviously reasonable to assume that consequences are preceded by causes, it is a mistake to assume that the causes are trivial or that they can always be found. The causality credo has through the years been expressed by many different accident models. The strong version of the causality credo is the assumption about root causes, as expressed by root cause analysis. While this kind of simple linear thinking was probably adequate for the first part of the 20th century, the increasingly complicated and intractable socio-technical systems that developed in the last half—and especially since the 1970s—required more intricate and more powerful mechanisms. The best of these is the Swiss Cheese Model, which explains adverse outcomes as the result of a combination of active failures and latent conditions. Other examples are TRIPOD (Reason et al., 1989), AcciMap (Rasmussen & Svedung, 2000), and STAMP (Leveson, 2004). Yet in all cases the causality credo allows the analysis to reason backwards from the consequences to the underlying causes. But as Reason (1997) noted, “the pendulum may have swung too far in our present attempts to track down possible errors and accident contributions that are widely separated in both time and place from the events themselves.” The increasing complexity of these models has led to the somewhat puckish thought that the ‘Swiss Cheese Model has passed its sell-by date’ (Reason, Hollnagel & Paries 2006).

Key Knowledge Point	BOK	Reference	Study Guide Material
According to Dr. Erik Hollnagel - The foundation of Safety-I implies two important assumptions. One is that systems are decomposable into their constituent parts. The other is that systems and their parts either function correctly, or not—that they are bimodal.	Safety Theory & Philosophy	From Safety-I to Safety-II: A White Paper, 2015, Hollnagel E., Wears R.L. and Braithwaite J. From Safety-I to Safety-II: A White Paper. The Resilient Health Care Net: Published simultaneously by the University of Southern Denmark, University of Florida, USA, and Macquarie University, Australia.	**The foundation of Safety-I** The foundation of Safety-I represents the assumptions about the nature of the world that are necessary and sufficient for the mechanisms to work. The foundation of Safety-I implies two important assumptions. One is that systems are decomposable into their constituent parts. The other is that systems and their parts either function correctly, or not—that they are bimodal. Systems are Decomposable We know that we can build systems by putting things together (e.g., complicated instruments such as a CT scanner or a surgical robot, or complicated socio-technical systems such as a hospital populated with people and equipment) and carefully combining and organising their components. That's the normal way we create systems. The first assumption is that this process can be reversed and that we can understand systems by decomposing them into meaningful constituents (see Figure 4). We do have some success with decomposing technological systems to find the causes of accidents— medical device failures in the operating theatre, for example. We also assume that we can decompose 'soft systems' (people in organisations) into their constituents (departments, agents, roles, stakeholders, groups, teams). And we finally assume that the same can be done for tasks and for events, partly because of the seductive simplicity of the time-line (this event happened after that event, and thus the first event 'caused' it). But we are wrong in all cases.

Key Knowledge Point	BOK	Reference	Study Guide Material
According to Dr. Erik Hollnagel Industrial systems in the 1970s were relatively _____ when compared with today's world.	Safety Theory & Philosophy	From Safety-I to Safety-II: A White Paper, 2015, Hollnagel E., Wears R.L. and Braithwaite J. From Safety-I to Safety-II: A White Paper. The Resilient Health Care Net: Published simultaneously by the University of Southern Denmark, University of Florida, USA, and Macquarie University, Australia.	**The Changing World of Health Care** The Ever-Changing Demands on Work, Safety and Productivity Safety-I is based on a view of safety that was developed roughly between 1965 and 1985 in industrial safety and imported into patient safety years later. Industrial systems in the 1970s were relatively simple when compared with today's world. The dependence on information technology was limited (mainly due to the size and the immaturity of IT itself), which meant that support functions were relatively few, relatively simple, and mostly independent of one another. The level of integration (e.g., across sub-systems and sectors) was low, and it was generally possible to understand and follow what went on. Support systems were loosely coupled (independent) rather than tightly coupled (interdependent). Safety thinking therefore developed with the following assumptions: Systems and places of work are well-designed and correctly maintained. Procedures are comprehensive, complete, and correct. People at the sharp end (in health care, those on the clinical front line) behave as they are expected to, and as they have been trained to. (They work as they are supposed or imagined to.) Designers have foreseen every contingency and have provided the system with appropriate response capabilities. Should things go completely wrong, the systems can degrade gracefully because the sharp end staff can understand and manage the contingencies—even those the designers could not. While these assumptions were probably never completely correct, they were considered reasonable in the 1970s. But they are not reasonable today, and safety based on these premises is inappropriate for the world as it is in the 2010s. Health care has since the 1990s regrettably adopted these assumptions rather uncritically, even though health care in 1990 showed little resemblance to industrial workplaces in the 1970s. The situation has by no means improved, since health care in 2015 is vastly different from health care in 1990. Despite that, the assumptions can still be found in the basis for current patient safety efforts.

Key Knowledge Point	BOK	Reference	Study Guide Material
According to Dr. Erik Hollnagel - Even though things go right all the time, we fail to notice this because we become _____ ____ ___ _____. Psychologically, we take it for granted.	Safety Theory & Philosophy	From Safety-I to Safety-II: A White Paper, 2015, Hollnagel E., Wears R.L. and Braithwaite J. From Safety-I to Safety-II: A White Paper. The Resilient Health Care Net: Published simultaneously by the University of Southern Denmark, University of Florida, USA, and Macquarie University, Australia.	**The Manifestations of Safety-II: Things that go right** The definition of Safety-II means that the manifestations are all the possible outcomes, as illustrated by Figure 9, and especially the typical or high frequency outcomes that are usually ignored by safety management. A system is still deemed to be unsafe if adverse outcomes occur yet it is more important to understand how it is safe when they do not occur: safety is consequently defined by what happens when it is present, rather than by what happens when it is absent, and is thus directly related to the high frequency, acceptable outcomes. In other words, the more of these manifestations there are, the higher the level of safety is and vice versa. This makes it possible to demonstrate that efforts to improve safety have worked, hence easier to argue for continued resources. (It also resolves the possible conflict between safety and productivity, but that is another matter.) To help describe the manifestations of Safety-II, few typologies are currently available. Even though things go right all the time, we fail to notice this because we become used to it. Psychologically, we take it for granted. But since everyday performance is unexceptional, it can be explained in relatively simple terms. For instance everyday performance can be described as performance adjustments that serve to create or maintain required working conditions, that compensate for a lack of time, materials, information, etc., and that try to avoid conditions that are known to be harmful to work. And because everyday performance variability is ubiquitous, it is easier to monitor and manage.

Key Knowledge Point	BOK	Reference	Study Guide Material
According to Dr. Erik Hollnagel it is necessary to understand how such everyday activities _____ _____—how they succeed—in order to understand how they might fail.	Safety Theory & Philosophy	From Safety-I to Safety-II: A White Paper, 2015, Hollnagel E., Wears R.L. and Braithwaite J. From Safety-I to Safety-II: A White Paper. The Resilient Health Care Net: Published simultaneously by the University of Southern Denmark, University of Florida, USA, and Macquarie University, Australia.	**Transitioning to Safety-II Look for What Goes Right** A key message is: look at what goes right as well as what goes wrong, and learn from what works as well as from what fails. Indeed, do not wait for something bad to happen but try to understand what actually takes place in situations where nothing out of the ordinary seems to happen. Things do not go well because people simply follow the procedures and work as imagined. Things go well because people make sensible adjustments according to the demands of the situation. Finding out what these adjustments are and trying to learn from them is at least as important as finding the causes of adverse outcomes. When something goes wrong, such as an infectious outbreak, a communication breakdown, a medication failure, or a wrong patient-wrong procedure problem, it is unlikely to be a unique event. It is rather something that has gone well many times before and that will go well many times again. It is necessary to understand how such everyday activities go well—how they succeed—in order to understand how they might fail. From a Safety-II view they do not fail because of some kind of error or malfunction, but because of unexpected combinations of everyday performance variability. The difference between a Safety-I and a Safety-II view is illustrated by Figure 10. Safety-I focuses on events at the tails of the normal distribution, and especially events on the left tail that represent accidents. Such events are easy to see because they are rare and because the outcomes differ from the usual. They are, however, difficult to explain—the attractiveness of root causes and linear models notwithstanding. Because they are rare and because they are difficult to understand, they are also difficult to change and manage.

Key Knowledge Point	BOK	Reference	Study Guide Material
According to Dr. Erik Hollnagel many small improvements of everyday performance may count more than a large improvement of exceptional performance.	Safety Theory & Philosophy	From Safety-I to Safety-II: A White Paper, 2015, Hollnagel E., Wears R.L. and Braithwaite J. From Safety-I to Safety-II: A White Paper. The Resilient Health Care Net: Published simultaneously by the University of Southern Denmark, University of Florida, USA, and Macquarie University, Australia.	**Focus on Frequent Events A second message is** Look for what happens regularly and focus on events based on their frequency rather than their severity. Many small improvements of everyday performance may count more than a large improvement of exceptional performance. The investigation of incidents is often limited by time and resources. There is therefore a tendency to look at incidents that have serious consequences and leave the rest for some other time—that never comes. The unspoken assumption is that the potential for learning is proportional to the severity of the incident or accident. This is obviously a mistake. While it is correct that more money is saved by avoiding one large scale accident than one small scale accident, it does not mean that the learning potential is greater as well. In addition, the accumulated cost of frequent but small-scale incidents may easily be larger. And since small but frequent events are easier to understand and easier to manage (cf., above), it makes better sense to look to those than to rare events with severe outcomes.

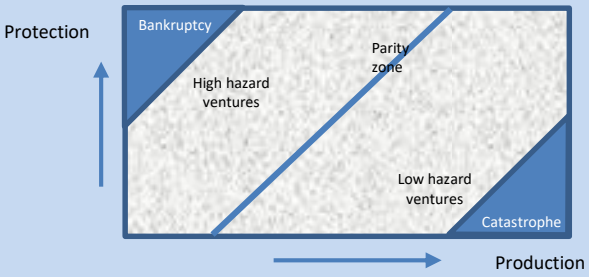
Key Knowledge Point	BOK	Reference	Study Guide Material
According to Dr. Kern in *Blue Threat: Why to Err is Inhuman,* individuals who routine blame outside factors for their situations have an (Blue Threat pg 24)	Safety Theory & Philosophy	Dr. Tony Kern, Blue Threat	Blue Threat page 24 Locus of control refers to any individual perceived level of control over their circumstances. People with high internal locus of control believe, for the most part, that they have control over the circumstances in their lives. Individuals with a high external locus of control perceive that external forces primarily control their destinies. Of course in real life, both internal and external forces are at play in all of our lives and their daily outcomes. However, in recent years, it seems to be trendier to take an external locus of control perspective – and blame outsider influence for our problems.

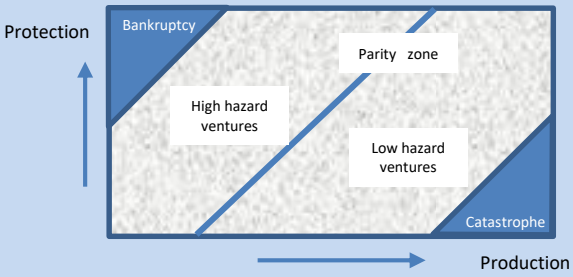
Key Knowledge Point	BOK	Reference	Study Guide Material
In Chapter two of Blue Threat, Dr. Kern states that in nearly all circumstances, _____ precedes lost situational awareness.	Safety Theory & Philosophy	Dr. Tony Kern, Blue Threat	Blue Threat page 40 Human performance experts continue to struggle to find a broad spectrum antibiotic to cure the human error disease. If we extend this metaphor another step, we shed some light on why it is not working. Human error is not an infection that can be fought with a broad spectrum antibiotic –it is more like a virus that the immune system must handle from within. Although the antibiotics can help fight other infections, when you're fighting a mutating virus, every battle is eventually an inside job, won or lost at the individual level. Over the past few years, I have review a series of personal, business, military and industrial failures from a variety of settings where highly experience and well trained individuals and teams made the most fundamental of errors with often tragic – and always embarrassing – results. These events were things like aircrew shutting down the wrong engine or inadvertently landing gear up; ships running into each other or aground in broad daylight and known waters, and project teams forgetting the most fundamental communications factors resulting in snatching corporate defeat from the jaws of victory. In each case, the reason these highly skilled and highly trained professionals did not realize what was going on with their situations, team or equipment is because they first lost awareness of what was going on with themselves. Interestingly, and not surprising, the organizational response in each case was to create more procedures and training to deal with the tactical operational scenario that caused the failure. While this is an appropriate step in error proofing that specific sequence of events, it does little to address the greater danger of lost self awareness – a far more common occurrence than we like to admit, and nearly always a precursor to lost situation awareness, (SA).

Key Knowledge Point	BOK	Reference	Study Guide Material
In Dr. Kern's *Performance Evolution Ladder concept,* he states that "Ironically, it is at the _____ level – where we think we have made it in the world – that most of us begin to die as learners."	Safety Theory & Philosophy	Dr. Tony Kern, Blue Threat	Blue Threat page 54 **The Performance Evolution Ladder** To help in combating this professional malaise, I developed the Performance Evolution Ladder, a tool to assist individuals and organizations to establish and sustain forward momentum in their improvement efforts. The Performance Evolution Ladder has two "staircases". The bottom staircase goes from the basement, or what I call "the road to hell". The top of the performance ladder is referred to as the "stairway to heaven" for many good reasons, not the least of which is that it provides the means for many to achieve their God given potential and claim the level of success that is within their grasp. As we see, this upper end of the performance staircase has two distinct performance zones. The first is where most successful people operate every day, surviving and safe. *Survival* seems like a pretty modest place to begin a hierarchy of success, yet we all live in a world full of capacity to take our last breath from us without much notice in a wide variety of ways. *Safety* is one of those "mom and apple pie" phrases that has lost its potency in our society. It is often equated to with words like timid and cautious. That is unfortunate and misleading, because safety represents our ability to sustain an effort. Without a sustainable effort, great things will never be accomplished by individuals or organizations. For that reason alone, safety needs to be considered in all aspects of our lives. *Effectiveness* is the level at which we earn our paychecks, practice our hobbies, and in general, satisfactorily conduct our day to day lives. In our professional lives, it usually means we have accomplished some level of training and achieved some sort of formal certification or evaluation of our readiness. Unfortunately, for many, perhaps even most of us – this is where we think we have made it, and we stop improving. We soldier on, meeting minimum requirements, never realizing there is so much more within our reach. Ironically, it is at the effectiveness level – where we think we have made it in the world – that most of us begin to die as learners. *Efficiency* is the first stop on the ladder for those who choose to go beyond the minimum requirements. Efficiency simply means a never ending quest to find better ways of doing things with less energy, resources, etc.

Key Knowledge Point	BOK	Reference	Study Guide Material
In Dr. Tony Kerns book *Going Pro: The Deliberate Practice of Professionalism*, Dr. Kern states that _____ is the first step in the normalization of deviance?	Safety Theory & Philosophy	Dr. Tony Kern, Going Pro – *The Deliberate Practice of Professionalism*	**Level II professionalism – Full compliance** Contrary to popular belief non-compliance is rampant in modern industry and government, as highly experienced personnel frequently "blend the rules" for a wide variety of reasons without remorse or serious consequence. Most non-compliance is of a "lesser crime" nature and often does not rise to the level of newsworthiness or action inside the organization. In todays fast paced, do more with less business world, routine noncompliance is often ignored by task saturated supervisory personnel and the system at large. Yet there is little doubt that if not corrected, noncompliance will progressive erode the integrity and quality of an organization and it's product or services. It is also the first step in the normalization of deviance sequence that can result in far greater deviations with significantly more sever results and consequences. With this realization, we arrive at *Level II Professionalism*, where men and women of integrity refuse to look the other way and hold themselves and others to a higher standard. The final stepping stone of elevated professional performance raises the bar to *level III – empowered accountability*, where the individual continuously seeks to go above and beyond established standards in the pursuit of excellence in all cases.

Key Knowledge Point	BOK	Reference	Study Guide Material
In Dr. Tony Kerns book *Going Pro: The Deliberate Practice of Professionalism*, Dr. Kern states the final stepping stone of elevated professional performance raises the bar to *level III – empowered accountability*, where the individual continuously seeks to go above and beyond _____ _____in the pursuit of excellence in all cases.	Safety Theory & Philosophy	Dr. Tony Kern, Going Pro – *The Deliberate Practice of Professionalism*	**Level II professionalism – Full compliance** Contrary to popular belief non-compliance is rampant in modern industry and government, as highly experienced personnel frequently "blend the rules" for a wide variety of reasons without remorse or serious consequence. Most non-compliance is of a "lesser crime" nature and often does not rise to the level of newsworthiness or action inside the organization. In todays fast paced, do more with less business world, routine noncompliance is often ignored by task saturated supervisory personnel and the system at large. Yet there is little doubt that if not corrected, noncompliance will progressively erode the integrity and quality of an organization and it's product or services. It is also the first step in the normalization of deviance sequence that can result in far greater deviations with significantly more sever results and consequences. With this realization, we arrive at *Level II Professionalism*, where men and women of integrity refuse to look the other way and hold themselves and others to a higher standard. The final stepping stone of elevated professional performance raises the bar to *level III – empowered accountability*, where the individual continuously seeks to go above and beyond established standards in the pursuit of excellence in all cases.

Key Knowledge Point	BOK	Reference	Study Guide Material
According to Dr. James Reason, In an ideal world the level of _____ should match the hazards of the productive operations – the parity zone.	Safety Theory & Philosophy	Dr. James Reason, Managing the Risks of Organizational Accidents, Ashgate Publishing	**Production and Protection: Two Universals** While the productive aspects of an organization are fairly well understood and their associated processes relatively transparent, the protective functions are both more varied and more subtle. Figure 1.2 introduces some of the issues involved in the complex relationship between production and protection. In an ideal world the level of protection should match the hazards of the productive operations – the parity zone. The more extensive the productive operations, the greater is the hazard exposure and so also is the need for corresponding protection. But different types of production – and hence different organizations – vary in the severity of their operational hazards. Thus low-hazard ventures will require less protection per productive unit than will high-hazard ventures. In other words, the former can operate in a region below the parity zone, whereas the latter must operate above it.  Figure 1.2 Dr. James Reason Managing The Risks of Organizational Accidents

Key Knowledge Point	BOK	Reference	Study Guide Material
According to Dr. James Reason - Since production creates the resources that make protection possible, its needs will generally have priority throughout most of an organization's lifetime. This is partly because those who manage the organization possess _____ rather than _____ skills, and partly because the information relating to production is direct, continuous, and readily understood.	Safety Theory & Philosophy	Dr. James Reason, Managing the Risks of Organizational Accidents, Ashgate Publishing	**Figure 1.2 Outline of the relationship between production and protection** Despite frequent protestations to the contrary, the partnership between production and protection is rarely equal, and one of these processes will predominate, depending on the local circumstances. Since production creates the resources that make protection possible, its needs will generally have priority throughout most of an organization's lifetime. This is partly because those who manage the organization possess productive rather than protective skills, and partly because the information relating to production is direct, continuous, and readily understood. By contrast, successful protection is indicated by the absence of negative outcomes. The associated information is indirect and discontinuous. The measures involved are hard to interpret and often misleading. It is only after a bad accident or frightening near-miss that protection comes – for a short period – upper most in mind of those who manage an organization.  Figure 1.2 Dr. James Reason Managing The Risks of Organizational Accidents

Key Knowledge Point	BOK	Reference	Study Guide Material
As illustrated in Figure 3.2 of the HFACS book, these failures can be depicted as “holes” within the different layers of the system; thereby transforming what once was a productive process into a failed or broken down one. Given the image of Swiss Cheese that this illustration generates, the theory is often referred to as the “Swiss Cheese” model of accident causation.	Safety Theory & Philosophy	The Human Factor Analysis and Classification System – Douglas A. Wiegmann and Scott A. Shappell	According to Reason, accidents occur when there are breakdowns in the interactions among the components involved in the production process. Theses failures degrade the integrity of the system making it more vulnerable to operational hazards, and hence more susceptible to catastrophic failures. As illustrated in Figure 3.2 of the HFACS book, these failures can be depicted as “holes” within the different layers of the system; thereby transforming what once was a productive process into a failed or broken down one. Given the image of Swiss Cheese that this illustration generates, the theory is often referred to as the “Swiss Cheese” model of accident causation. *The Swiss Cheese model is shown and describe in the HFACS book and adapted from Reason (1990).*

Key Knowledge Point	BOK	Reference	Study Guide Material
According to Dr. Wiegmann and Dr. Shappell Reason's model is based on the premise that aviation operations can be viewed as a complexed productive system (ergonomic perspective), that often breaks down because of ill-fated decisions made by _____ management and supervisors (organizational perspective).	Safety Theory & Philosophy	The Human Factor Analysis and Classification System – Douglas A. Wiegmann and Scott A. Shappell	**Strengths and Limitations of Reason's Model** It is easy to see how Reason's model of "Swiss Cheese" model of human error integrates the human error perspective described in chapter 2 into a single unified framework. For example, the model is based on the premise that aviation operations can be viewed as a complexed productive system (ergonomic perspective), that often breaks down because of ill-fated decisions made by upper level management and supervisors (organizational perspective). However, the impact that these fallible decisions have on safe operations may lie dormant for long periods of time until they produce unsafe operating conditions, such as poorly maintained equipment (ergonomic perspective), as well as unsafe aircrew conditions, such as fatigue (aeromedical perspective) or miscommunication among operators (psychosocial perspective). All these factors, in turn affect an operators' ability to process information and perform efficiently (cognitive perspective). The result is often "pilot error" followed by an incident or accident. A limitation of Reason's model, however, is that it fails to identify the exact nature of the "holes" in the cheese. After all as a safety officer or accident investigator, wouldn't you like to know what the holes in the "cheese" are? Wouldn't you like to know the types of organizational and supervisory failures that "trickle down" to produce failed defences at the preconditions or unsafe act level?

Key Knowledge Point	BOK	Reference	Study Guide Material
The Wiegnann/Shappell The Human Factor Analysis and Classification System or (HFACS) was specifically developed to define the _____ and _____failures implicated in Reason's "Swiss Cheese" model so it could be used as an accident investigation and analysis tool.	Safety Theory & Philosophy	The Human Factor Analysis and Classification System – Douglas A. Wiegmann and Scott A. Shappell	**Defining the Holes in the Cheese: The Human Factors Analysis and Classification System (HFACS)** The Human Factor Analysis and Classification System (HFACS) was specifically developed to define the latent and active failures implicated in Reason's "Swiss Cheese" model so it could be used as an accident investigation and analysis tool (Shappell and Wiegmann, 1997a: 1998; 1999; 2000; 2001). The framework was developed and refined by analyzing hundreds of accident reports containing thousands of human causal factors. Although designed originally use within the context of military aviation, HFACS has been shown to be effective within the civil aviation arena as well (Wiegmann and Shappell, 2001b). Specifically, HFACS describes four levels of failure, each of which correspond to one of four layers contained within Reason's model. Theses include: 1) Unsafe Acts, 2) Preconditions for Unsafe Acts, 3) Unsafe Supervision, and 4) Organizational Influence. The balance of this chapter describes the causal categories associated with each of theses levels. NOTE – The HFACS taxonomy is currently used in many industries, including; Healthcare, Mining, Aviation, Petro-Chemical, Oil and Gas, construction, rail, utilities, and others.

Key Knowledge Point	BOK	Reference	Study Guide Material
According to D Smith - Rather than measuring how well an organization can prepare and negotiate an audit, we should be measuring the current level of meaningful _____ given to safety, protection, and or accident prevention.	Safety Theory & Philosophy	Implementing Safety Management Systems In Aviation, Second Edition, Ashgate Publishing, 2011.	The basis and premise for this chapter is best explained by relaying a true account of a revolutionary experience I had many years ago. At the time I was the Director of Safety for a large international On-demand aviation operator. One of our regional operators experienced three catastrophic accidents within a 6 month period. It was after the third accident that the CEO ordered an operational stand-down and full internal audit. The Boss directed me to assemble and lead the audit team. I had two very troubling questions, both begging answers and sticking in the pit of my gut like a cheap greasy 2 pound hamburger. First of all, how did this organization pass, and with flying colors I might add an external third party audit just six months earlier, and secondly why the lack luster attitude of the regional manager? I'd chew on those questions day and night for the duration of the audit and beyond. The answers to those questions opened my eyes to some very common fundamental flaws in measuring organizational safety. When I looked closer at the previous third party audit it was apparent to me that the organization ramped up for the audit. In a manner of speaking, the audit was the mission. It received heavy management emphasis and the order went out to prepare and do well on the audit. Trouble is, once the audit was over, SOP's, process, policies and procedures were disregarded and forgotten. The one thing that impressed me was the fact that the organization could effectively pass the audit and exert zero effort toward safety, protection, or accident prevention. Seemed to me that we missed the proverbial boat and were measuring the wrong thing. Rather than measuring how well an organization can prepare and negotiate an audit, we should be measuring the current level of effort given to safety, protection, and or accident prevention

Key Knowledge Point	BOK	Reference	Study Guide Material
According to D Smith - if you want to accurately measure safety or accident prevention potential, you must determine the organizations current level of meaningful effort directed at safety assurance. You must determine the current level of meaningful Accident Prevention Effort or what I call _____.	Safety Theory & Philosophy	Implementing Safety Management Systems In Aviation, Second Edition, Ashgate Publishing, 2011.	Many months of pondering, conferring with folks smarter than me, and multiple "Throne of Knowledge" sessions yielded the following chapter on measuring organizational safety effort. Quantum Safety Metrics and measuring Accident Prevention Effort are further explained in this chapter. I invite your comments and questions. Bottom line, if you want to accurately measure safety or accident prevention potential, you must determine the organizations current level of meaningful effort directed at safety assurance. You must determine the current level of Accident Prevention Effort or what I call APE. Quantum Safety Metrics provides the means for you to accomplish that.

Key Knowledge Point	BOK	Reference	Study Guide Material
According to D Smith - the safety professional knows that the _____of accidents does not necessarily mean a solid safety program is in place. Nor does having an accident indicate a malfunctioning or nonexistent safety program.	Safety Theory & Philosophy	Implementing Safety Management Systems In Aviation, Second Edition, Ashgate Publishing, 2011.	A common problem for many safety programs and initiatives is associated with gaining management support. The valid question of "what's in it for me?" often determines the degree of safety commitment from the organization. One method safety managers can use to obtain support is found in the concept of quantum safety metrics. Measuring safety, however, is not quite as simple as one might think. We can easily measure most types of production in an organization, but in order to quantify safety we generally find ourselves trying to measure something that is not present; accidents. Even then, the safety professional knows that the absence of accidents does not necessarily mean a solid safety program is in place. Nor does having an accident indicate a malfunctioning or nonexistent safety program. Accident numbers are only part of the equation. Another (and possibly more critical) element in the formula is something I refer to as ***Accident Prevention Effort*** or A.P.E. Each organization has a distinct and quantifiable A.P.E. that can be measured, evaluated, and adjusted to obtain the maximum benefits from the safety program. Additionally, it can be used as a tool to provide management with the necessary information to make informed decisions on safety program outputs, resource needs, and areas needing additional emphasis.

Key Knowledge Point	BOK	Reference	Study Guide Material
According to D Smith - The more effective and positively yielding safety programs in place within the organization the greater the opportunity to have a _____ impact on accident prevention.	Safety Theory & Philosophy	Implementing Safety Management Systems In Aviation, Second Edition, Ashgate Publishing, 2011.	The following formula, known as the *Sierra Scale* provides a relative measure by which an organization can evaluate the effectiveness of their safety program: *(Programs X Quantifiable Effect) yields the degree of Accident Prevention Effort or (APE)* *The formula looks as thus:* *(P X QE) = APE* **What constitutes a Program (P):** Formal programs, processes, policies, or initiatives that are established and implemented by the organization to enhance or positively impact accident prevention. Examples might include: newsletters or other forms of accident prevention education and awareness; Safety Committees; Accident Prevention Awards Programs; Risk Management Programs; Monthly Safety Meetings; Emergency Action Plans; Fire Prevention Programs, FOQA, or establishing a formal system to track and analyze incidents, such as the Human Factors Analysis and Classification System or (HFACS). The more effective and positively yielding safety programs in place within the organization the greater the opportunity to have a positive impact on accident prevention. Therefore, an increase in Programs (P) will result in a higher APE. At this point in the formula the effectiveness of each program is not evaluated. Only the number of formal programs in place is considered. Of course the program must be evaluated for effectiveness, we'll discuss that later. **What constitutes a Quantifiable Effect (QE):** The number of tangible effects resulting from any given program. For example, in the Risk Management program you would count the actual number of hazards identified and corrected for any particular operation. Each hazard controlled or eliminated would be counted as 1 QE. Likewise if the organizations used the Human Factors Analysis and Classification System (HFACS) to track and analyze incidents, each incident that was tracked and analyzed would be considered a quantifiable effect of that particular program, etc.

Key Knowledge Point	BOK	Reference	Study Guide Material
According to D Smith - The number of tangible effects resulting from any given safety program are called?	Safety Theory & Philosophy	Implementing Safety Management Systems In Aviation, Second Edition, Ashgate Publishing, 2011.	The following formula, known as the *Sierra Scale* provides a relative measure by which an organization can evaluate the effectiveness of their safety program: *(Programs X Quantifiable Effect) yields the degree of Accident Prevention Effort or (APE)* *The formula looks as thus:* *(P X QE) = APE* **What constitutes a Program (P):** Formal programs, processes, policies, or initiatives that are established and implemented by the organization to enhance or positively impact accident prevention. Examples might include: newsletters or other forms of accident prevention education and awareness; Safety Committees; Accident Prevention Awards Programs; Risk Management Programs; Monthly Safety Meetings; Emergency Action Plans; Fire Prevention Programs, FOQA, or establishing a formal system to track and analyze incidents, such as the Human Factors Analysis and Classification System or (HFACS). The more effective and positively yielding safety programs in place within the organization the greater the opportunity to have a positive impact on accident prevention. Therefore, an increase in Programs (P) will result in a higher APE. At this point in the formula the effectiveness of each program is not evaluated. Only the number of formal programs in place is considered. Of course the program must be evaluated for effectiveness, we'll discuss that later. **What constitutes a Quantifiable Effect (QE):** The number of tangible effects resulting from any given program. For example, in the Risk Management program you would count the actual number of hazards identified and corrected for any particular operation. Each hazard controlled or eliminated would be counted as 1 QE. Likewise if the organizations used the Human Factors Analysis and Classification System (HFACS) to track and analyze incidents, each incident that was tracked and analyzed would be considered a quantifiable effect of that particular program, etc.

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Key Knowledge Point	BOK	Reference	Study Guide Material
A poor _____ _____ has been shown to be a risk factor in safety behaviors and accidents.	Safety Programs	www.managementbriefs.com/_media/pdfs/safety_matters_chapter3 *Leadership and Organizational Safety Culture*	A Safety Culture consists of shared beliefs, practices, and attitudes that exist in an organization. The culture is the atmosphere created by those beliefs, attitudes etc., which shape our behavior. Managers/team leaders have a key role to play in developing such a Safety Culture. Well publicized major accidents such as Piper Alpha, Herald of Free Enterprise and Kings Cross Station have highlighted the effect of organizational, managerial and human factors on safety outcomes. Numerous reports of major disasters have identified Safety Culture as a factor that definitely influenced the outcome. Within the reports of inquiries into such major disasters as the ones mentioned, observations have been made that accidents are not only as a result of human error, environmental conditions or technical failures alone, but also they are as a result of a break down in policies and procedures that were established to manage safety.

Key Knowledge Point	BOK	Reference	Study Guide Material
What is one of the biggest challenges in a major merger in relations to employees :	Safety Programs	https://blog.alaskaair.com/alaska-airlines/news/asvx-culture/ "When Merging Cultures"	When Alaska Airlines and Virgin America announced plans to merge earlier this year, one of the biggest questions was how the two airlines would blend their distinct cultures. "Culture has been a real challenge in many mergers, so we're working to do things differently," said Ben Minicucci, Alaska President and COO who will also become CEO of Virgin America today. "We are being very thoughtful about culture and are working to create an environment that reflects who we are and where we've been, that also enables us to work together, be bold, and succeed in a rapidly evolving industry." On the surface, Alaska and Virgin America might seem very different. Culture, however, isn't defined by how the airlines look to the outside world. Culture is defined by the people behind the airlines – their customs, beliefs, attitudes, behaviors and the ways they work together. While some teams are working hard to integrate the nuts and bolts of the airlines – the systems, processes and procedures – another group is focused on merging cultures.

Key Knowledge Point	BOK	Reference	Study Guide Material
Safety Culture is a term that we apply to those aspect of the organization's culture that relates to safety performance.	Safety Programs	FAA Advisory Circular AC-120-92B, 2-1 Safety Culture and Safety Management.	**2-1. SAFETY CULTURE AND SAFETY MANAGEMENT.** One key aspect that is essential to safety performance is the culture of the organization. "Safety culture" is the term that we apply to those aspects of the organization's culture that relate to safety performance. The concept of safety culture underlies safety management and is the basis for the SMS requirements of Title 14 of the Code of Federal Regulations (14 CFR) part 5.[2]

Key Knowledge Point	BOK	Reference	Study Guide Material
Research finds that there are a handful of factors that have substantial impact on creating a safe work environment, and all of them relate to the overall culture of the company. At the heart of the matter culture boils down to"	Safety Programs	Smith, Michelle M. Sept 1, 2013 "Eight Cultural Imperatives For Workplace Safety"	Culture is a big word. It's an all-encompassing concept that has broad reach and impact throughout the organization, and too often safety leaders mistakenly believe it has little to do with their sphere of influence and delegate its care and feeding to the Human Resources department. That can prove to be a costly mistake. All leaders should feel responsible for shaping the overall culture in their organizations as part of their duties as leaders, and safety leaders should especially welcome the opportunity, given the critical role culture plays in creating and maintaining a safe workplace. Research finds that there are a handful of factors that have substantial impact on creating a safe work environment, and all of them relate to the overall culture of the company. More importantly, the number of safety incidents you'll experience this year will likely be based on how your employees feel about those factors, according to a Towers Watson-ISR study. Defining a Culture that Promotes Safety At the heart of the matter, culture boils down to employees' *opinions* about the policies, procedures, and practices that affect them in the workplace

Key Knowledge Point	BOK	Reference	Study Guide Material
Public efforts to improve safety date from the very beginnings of industrialization. States established railroad regulatory commissions as early as	Safety Programs	Aldridge, Mark, Smith College "History of Workplace Safety in the United States" http://eh.net/encyclopedia/history-of-workplace-safety-in-the-united-states-1880-1970/	**Improving safety, 1910-1939** Public efforts to improve safety date from the very beginnings of industrialization. States established railroad regulatory commissions as early as the 1840s. But while most of the commissions were intended to improve safety, they had few powers and were rarely able to exert much influence on working conditions. Similarly, the first state mining commission began in Pennsylvania in 1869, and other states soon followed. Yet most of the early commissions were ineffectual and as noted safety actually deteriorated after the Civil War. Factory commissions also dated from but most were understaffed and they too had little power.

Key Knowledge Point	BOK	Reference	Study Guide Material
Safety Bulletin Boards in a lot of industries are a safety requirement set forth by the state. Another good use for a safety bulletin board is to encourage employees to post educational safety items.	Safety Programs	Washington State Department of Labor & Industries *http://www.lni.wa.gov/safety/topics/AtoZ/SafetyBulletin/default.asp*	In most industries with 8 or more workers, safety bulletin boards are required for most workplaces in Washington State. A safety bulletin board is an effective way of communicating safety required information and other safety related materials. Make sure the safety bulletin board is large enough to post workplace posters and information such as the following: Safety bulletins, newsletters, and posters. Accident statistics such as your OSHA 300A summary (required to post Feb. 1 – April 30). Citations and notices (post for 3 working days or until all violations are corrected). Appeal of citations and notices (until appeal is resolved). Other safety educational materials. Emergency phone numbers. Although some information is required to stay posted on your safety bulletin board, encourage employees to return periodically by adding new safety educational materials available free from L&I, such as posters or safety tips, and also update your safety bulletin board with the latest information. If your workforce includes non-English speaking employees, be sure to also post information in their language.

Key Knowledge Point	BOK	Reference	Study Guide Material
Safety Competencies and Training guidance is covered under which component of a Safety Management System:	Safety Programs	Federal Aviation Administration Advisory Circular AC120-92B	**Safety Promotion.** The last component, safety promotion, is designed to ensure that your employees have a solid foundation regarding their safety responsibilities, the organization's safety policies and expectations, reporting procedures, and a familiarity with risk controls. Thus, training and communication are the two areas of safety promotion. **§ 5.91 Competencies and training.** The certificate holder must provide training to each individual identified in § 5.23 to ensure the individuals attain and maintain the competencies necessary to perform their duties relevant to the operation and performance of the SMS.

Key Knowledge Point	BOK	Reference	Study Guide Material
Which component provides a decision making process for identifying hazards and mitigating risk based on a thorough understanding of the organization's systems and operating environment ?	Safety Programs	FAA Advisory Circular AC 120-92B	**Safety Risk Management (SRM).** The SRM component provides a decision making process for identifying hazards and mitigating risk based on a thorough understanding of the organization's systems and their operating environment. SRM includes decision making regarding management acceptance of risk to operations. The SRM component is the organization's way of fulfilling its commitment to consider risk in their operations and to reduce it to an acceptable level. In that sense, SRM is a design process, a way to incorporate risk controls into processes, products, and services or to redesign controls where existing ones are not meeting the organization's needs.

Key Knowledge Point	BOK	Reference	Study Guide Material
Safety risk management encompasses the assessment and mitigation of safety risks. The objective of safety risk management is to ?	Safety Programs	ICAO Doc 9859	2.15 SAFETY RISK MANAGEMENT 2.15.1 Safety risk management encompasses the assessment and mitigation of safety risks. The objective of safety risk management is to assess the risks associated with identified hazards and develop and implement effective and appropriate mitigations. Safety risk management is therefore a key component of the safety management process at both the State and product/service provider level. 2.15.2 Safety risks are conceptually assessed as acceptable, tolerable or intolerable. Risks assessed as initially falling in the intolerable region are unacceptable under any circumstances. The probability and/or severity of the consequences of the hazards are of such a magnitude, and the damaging potential of the hazard poses such a threat to safety, that immediate mitigation action is required. 2.15.3 Safety risks assessed in the tolerable region are acceptable provided that appropriate mitigation strategies are implemented by the organization. A safety risk initially assessed as intolerable may be mitigated and subsequently moved into the tolerable region provided that such risks remain controlled by appropriate mitigation strategies. In both cases, a supplementary cost-benefit analysis may be performed if deemed appropriate. Refer to 2.15.7 for further details. 2.15.4 Safety risks assessed as initially falling in the acceptable region are acceptable as they currently stand and require no action to bring or keep the probability and/or severity of the consequences of hazards under organizational control.

Key Knowledge Point	BOK	Reference	Study Guide Material
Early accidents models had one fatal flaw they focused on only one factor:	Safety Programs	https://www.outdoored.com/articles/risk-assessment-safety-management-rasm-complete-risk-management-model-outdoor-programs	A number of other models for accidents have been utilized in the past. The two best known are the Dynamics of Accidents Model© developed by Alan Hale in the early 1980's. The other is the Accident Matrix© developed by Dan Meyer (1979) and refined by Jed Williamson (1984). The limitation with these early models is that they focus primarily on the negative causative factors of the loss. While they provide a tool for examining causes *after* an accident, they don't adequately address solutions to *prevent* accidents. If the only factors you are tracking are the "negative causations" that leads one to the interpretation that reducing the possibility of the accident is accomplished only by removing or negating the negative causation. The Risk Assessment and Safety Management model (RASM) is a holistic model that combines the negative factors as well as the positive factors. This allows us to think not just on what can go wrong but also on what can go right. RASM provides program managers and field staff with a model that addresses these needs.

Key Knowledge Point	BOK	Reference	Study Guide Material
The definition of a Near Miss according to OSHA and the National Safety Council is "an unplanned event that did not result in injury, illness or damage but had the potential to do so."	Safety Programs	Safety and Health Magazine – Reporting Near Misses *http://www.safetyandhealthmagazine.com/articles/10994-reporting-near-misses*	Not all safety professionals agree on what constitutes a near miss. Among the definitions: A fact sheet from OSHA and the National Safety Council defines a near miss as an "unplanned event that did not result in injury, illness or damage – but had the potential to do so." The fact sheet stresses that although near misses cause no immediate harm, they can precede events in which a loss or injury could occur. Employers that encourage the reporting of near misses gain an opportunity to prevent future incidents. "It's a great tool," Michael Crowl said. Crowl is the director of environmental, health and safety at PIKA International, an environmental engineering and remediation services firm based in Stafford, TX. "A near miss is a leading indicator to an accident that, if scrutinized and used correctly, can prevent injuries and damages."

Key Knowledge Point	BOK	Reference	Study Guide Material
A key characteristic of a successful incentive program is:	Safety Programs	"Organization Safety: Which management practices are most effective in reducing employee injury rate?" by Alison G Vredenburgh	People are motivated to behave in ways that lead to desired consequences; they will modify their behavior to conform to a cultural norm if it is perceived that compliance will lead to a desirable outcome. Culture is learned through a connection that is made between behaviors and consequences. Thompson and Luthans (1990) state that since organizational culture occurs in an environment where there are multiple reinforcements and reinforcing agents, changing an organization involves identifying the various reinforcing agents in order to determine their effects on the change process. A correctly designed safety-incentive program reinforces the reporting of a hazard or an unsafe act that leads to an injury while giving bonuses for fewer lost-time accidents. A safety incentive program must be part of a campaign that runs parallel to safety education and training. It must be directed at the prevention of accidents, not punishment after an accident occurs (Peavey, 1995). Informational (feedback, self-recording), social (praise, recognition), and tangible reinforcers (trading stamps, cash bonuses) have been used as well as nonmonetary privileges (Komaki, Barwick, & Scott, 1978). As with any policy, the effort to develop a strong safety culture is unlikely to be effective if the organization is not reinforcing the desired behaviors (or is rewarding inconsistent behaviors such as speed or production rates). A well-designed incentive program offers recognition, which can help modify behavior. A key characteristic of a successful incentive program is that it receives a high level of visibility within the organization. Participants must be able to comprehend what the incentive program is designed to accomplish and how their performance will be measured (Halloran, 1996). Simply distributing prizes and money without pairing them with a clear, consistent set of contingencies reduces the potential to achieve the desired outcome. It may even increase the undesired behavior, more accidents (Swearington, 1996).

Key Knowledge Point	BOK	Reference	Study Guide Material
_____ reporting may take several forms according to the perceived severity of the safety hazard.	Safety Programs	www.skybrary.aero/index.php/Safety_Occurrence_Reporting	Safety reporting systems should not be restricted to accidents and incidents, but should include reporting of hazards and unsafe conditions that have not yet caused an incident. For example, some organisations have put in place a mechanism for reporting of conditions considered dangerous or unsatisfactory by the operational personnel. Such reports are usually submitted under voluntary reporting arrangements and under internal reporting systems. Most aircraft operators and air navigation service providers, aerodromes and maintenance organisations have established their own internal safety occurrence reporting system(s). Internal reporting usually includes all mandatory reportable occurrences, safety occurrences and observations subject to voluntary reporting and where available, automatic monitoring and reporting of events. A number of organisations use reporting forms based on (or the same as) those used by the national mandatory occurrence reporting scheme (MOR) in order to standardise procedures and to reduce delay if it is decided by the employer that a MOR form should be filed. Occurrence reporting may take several forms according to the perceived severity of the safety hazard: Accident and serious incident reporting in accordance with standards laid down in ICAO Annex 13; Mandatory Occurrence Reporting in accordance with national regulations (includes also accidents and serious incidents); Voluntary Occurrence Reporting established in line with existing guidance Confidential Reporting, a specific voluntary reporting scheme existing in many countries, encouraging the reporting of occurrences which would probably not be reported in the absence of such a scheme. However, heavy use of a confidential reporting scheme may indicate a deficient organisation safety culture. Self-disclosure reporting systems (data from automatic and manual capture systems such as data from FDR and CVR, EUROCONTROL's Automated Safety Monitoring Tool (ASMT) etc.) The reporting arrangements referred to above shall be used to: Identify hazards and/or notify of potential systems weaknesses Analyse the reported information to identify safety risk Identify and implement improvements to eliminate safety shortcomings, eliminate hazards or mitigate their effects and to prevent hazard recurrence Safety occurrence reporting should not be used to blame individuals or to hold them accountable for the safety occurrences or unsafe acts. It is a powerful tool for the establishment and verification of effective risk management strategies by aviation service provider organisations.

Key Knowledge Point	BOK	Reference	Study Guide Material
The investigation should be thorough and structured to avoid bias and leaping to conclusions. Don't assume you know the answer and start finding solutions before you complete the investigation. A good investigation involves a systematic and structured approach. Your analysis should include:	Safety Programs	"Investigation Accidents and Incidents" HSG 245 published 2004 http://www.hse.gov.uk/pubns/hsg245.pdf	The investigation should be thorough and structured to avoid bias and leaping to conclusions. Don't assume you know the answer and start finding solutions before you complete the investigation. A good investigation involves a systematic and structured approach. Information gathering: explores all reasonable lines of enquiry; is timely; is structured, setting out clearly what is known, what is not known and records the investigative process. Analysis: is objective and unbiased; identifies the sequence of events and conditions that led up to the adverse event; identifies the immediate causes; identifies underlying causes, i.e. actions in the past that have allowed or caused undetected unsafe conditions/practices; identifies root causes, (i.e. organizational and management health and safety arrangements – supervision, monitoring, training, resources allocated to health and safety etc. Risk control measures: identify the risk control measures which were missing, inadequate or unused; n compare conditions/practices as they were with that required by current legal requirements, codes of practice and guidance; identify additional measures needed to address the immediate, underlying and root causes; n provide meaningful recommendations which can be implemented. But woolly recommendations such as 'operators must take care not to touch the cutters during run-down' show that the investigation has not delved deep enough in search of the root causes. Action plan and implementation: provide an action plan with SMART objectives (Specific, Measurable, Agreed, Realistic and Timescaled); ensure that the action plan deals effectively not only with the immediate and underlying causes but also the root causes; include lessons that may be applied to prevent other adverse events, e.g. assessments of skill and training in competencies may be needed for other areas of the organization; provide feedback to all parties involved to ensure the findings and recommendations are correct, address the issues and are realistic; should be fed back into a review of the risk assessment. The Approved Code of Practice5 attached to the Management of Health and Safety at Work Regulations 1999 regulation 3 (paragraph 26), states that adverse events should be a trigger for reviewing risk assessments); n communicate the results of the investigation and the action plan to everyone who needs to know; n include arrangements to ensure the action plan is implemented and progress monitored. The last three steps, though essential, are often overlooked. But, without them, the full benefits of the investigation will not be realized and in the long term nothing will change.

Key Knowledge Point	BOK	Reference	Study Guide Material
HFACS was initially used by the _____ to investigate and analyze human factors aspects in aviation	Safety Programs	https://www.skybrary.aero/index.php/Human_Factors_Analysis_and_Classification_System_(HFACS)	Definition The Human Factors Analysis and Classification System (HFACS) was developed by Dr. Scott Shappell and Dr. Doug Wiegmann. It is a broad human error framework that was originally used by the US Air Force to investigate and analyse human factors aspects of aviation. HFACS is heavily based upon James Reason's swiss cheese model (Reason 1990). The HFACS framework provides a tool to assist in the investigation process and target training and prevention efforts. Investigators are able to systematically identify active and latent failures within an organisation that culminated in an accident. The goal of HFACS is not to attribute blame; it is to understand the underlying causal factors that lead to an accident. The HFACS Framework The HFACS framework (*Figure 1*) describes human error at each of four levels of failure: unsafe acts of operators(e.g., aircrew), preconditions for unsafe acts, unsafe supervision, and organisational influences. Within each level of HFACS, causal categories were developed that identify the active and latent failures that occur. In theory, at least one failure will occur at each level leading to an adverse event. If at any time leading up to the adverse event, one of the failures is corrected, the adverse event will be prevented.

Key Knowledge Point	BOK	Reference	Study Guide Material
To understand fully the cause of an accident investigators must analyze all facets and levels of a system.	Safety Programs	"A Human Error Approach to Aviation Accident Analysis" The Human Factors Analysis and classification System by Douglas A Wiegmann and Scott A Shapell, Ch 3, pg 47.	According to Reason, accidents occur when there are breakdowns in the interactions among the components involved in the production process. These failures degrade the integrity of the system making it more vulnerable to operational hazards, and hence more susceptible to catastrophic failures. These failures can be depicted as holes within the different layers of the system; thereby transforming what was once a productive process into a failed or broken down one. The theory is often referred to as the "Swiss Cheese " model of accident causation. According to the "Swiss Cheese" model , accident investigators must analyze all facets and levels of the system to understand fully the causes of an accident. For example working backwards in time from the accident, the first level to be examined would be the unsafe acts of the operators that have ultimately led to the accident. More commonly referred to in aviation as aircrew/pilot error., this level is where most accident investigations typically focus their efforts and consequently, where most causal factors are uncovered. After all , it is these active failures, or actions of the aircrew that can be directly linked to the event.

Key Knowledge Point	BOK	Reference	Study Guide Material
In Shappell and Wiegmann's book "A Human Error Approach to Aviation Accident Analysis" They list four layers contained within James Reason's model. What are the three basic error types for "Unsafe Acts"?	Safety Programs	"A Human Error Approach to Aviation Accident Analysis" The Human Factors Analysis and classification System by Douglas A Wiegmann and Scott A Shapell, Ch 3, pg 51.	Unsafe Acts of Operators The unsafe act of operators can loosely classified into two categories, error and violations. (Reason 1990). In general, errors represent the mental or physical activities of individuals that fail to achieve their intended outcome. Not surprising , given the fact that humans by their very nature make errors, these unsafe acts dominate most accident databases. Violations on the other hand, refer to the willful disregard for rules and regulations that govern the safety of flight The bane of many organizations, the prediction and prevention of these inexcusable and purely preventable unsafe acts, continue to elude managers and researchers alike. Sill distinguishing between error and violations does not provide the level of granularity required of most accident investigations. Therefore the categories of errors and violations are expanded to include these three basic error types (skill-based, decision and perceptual errors) and two forms of violations (routine and exceptional).

Key Knowledge Point	BOK	Reference	Study Guide Material
Three types of human failure (unsafe acts) are?	Safety Programs	Bard, Lynne (2013) Hazmatmag.com *Human Factors Influencing Workplace Safety*	Human factors refer to environmental, human and individual characteristics, organizational and job factors that influence the behavior at work in a way which can affect health and safety. Three interrelated aspects must be considered in assessing human factors in correlation to safety incidents: the job, the individual and the organization. The job assessment looks at the nature of the tasks, the workload, the working environment, the design, display and controls, and the role procedures play on the job. The individual assessment looks at the workers competencies, skills, personality, attitude, and risk perception. Identify what individual characteristics can be changed and what are fixed. Additionally, the organizations work patterns, culture, resources, communications, and leadership, policies, and programs are some of the organizational influences on behavior and need to be looked at in the review of the job design. In summary, human factors identify what people are being asked to do (the task and characteristics), who is doing it (the individual and their competencies), and where they're working (the organization and its attributes). A good safety management system includes human factor assessments in a similar way to any other risk management program, categorizing human failure with the different causes and influencing factors, as well as prevention strategies to reduce the failures. Three types of human failure (unsafe acts) often lead to major workplace accidents: • Errors (slips/lapses) or unintentional actions like forgetting to complete a certain step in a transaction or process. • Mistakes (also errors) but of judgment or decision-making where we do the wrong thing but believe it to be right. • Violations or intentional errors such as taking shortcuts or non-compliance with procedures. Managing human failure is essential to preventing occupational accidents both minor and major, as well as ill health, and maintaining the reputation and potential loss of revenues for the organization. Major incidents frequently involve the human error of operators or maintenance personnel, with the underlying reasons for the accident stemming from the responsibility of those more senior in the organization's inadequacies in competency assurance systems, poorly designed equipment, or lack of resources or training that influence the behaviors of everyone in the organization (leading to human error). We cannot just address safety through the foggy lens that behavioral safety programs are an alternative to ensuring that adequate engineering and safety management systems are in place; they need to work hand-in-hand together and be adequately managed. (But not until technical and systems issues have been addressed and it can be assumed that accidents are due to cultural and behavioral factors.)

Key Knowledge Point	BOK	Reference	Study Guide Material
What is the defense of preemption in relation to OSHA Standard violations?	Safety Programs	Bailey, Melissa A. et al. (2016) *Occupational Safety and Health Law Handbook.* Third Edition	Section 5(a)(2) of the Occupational Safety and Health (OSH) Act, 29 U.S.C. § 654(a)(2), states that "each employer… shall comply with occupational safety and health standards promulgated under this Act." Other sections of the Act impose an implicit duty to comply with the Occupational Health and safety Administration's (OSHA) regulations. Although the duty to comply with standards and regulations seems unqualified, the courts and Occupational Safety and Health Review Commission (OSHRC or Commission) have held that the duty is qualified in various ways. The OSH standards themselves state a general principle – the more specific standard prevails over the more general. For this reason, decisions speak of the defense of preemption - that is, a citation will be vacated if the cited condition is regulated by a more specifically applicable standard. While many factors are relevant to such and inquiry, the basic question is whether application of the more generally applicable standard would defeat a rulemaking decision implicit in the more specifically applicable standard. In accordance with this principle, an employer must first determine whether his industry is specially regulated by one of the several industry-specific "parts" in Title 29 of the Code of Federal Regulations (C.F.R.). These industry-specific parts are Part 1913, which applies to shipyards; Part 1917 which applies to marine terminals; Part 1918 which applies to longshoring; Part 1926 which applies to construction; and Part 1928 which applies to agriculture. If no industry-specific part applies, then an employer must look to Part 1910, which is entitled "General Industry Standards" and which applies to all employers engaged in businesses affecting commerce. The employer must then determine whether a special, industry-specific section within Subpart R of Part 1910 or an industry-specific part within Part 1910 regulates both his industry and the particular condition cited.

Key Knowledge Point	BOK	Reference	Study Guide Material
Relating to software safety, which attributes should be avoided?	Safety Programs	Committee on Patient Safety and Health Information Technology; Institute of Medicine. Washington (DC): National Academies Press (US) (2011) ISBN-13: 978-0-309-22112-2ISBN-10: 0-309-22112-9 ***Health IT and Patient Safety*** *Building Safer Systems for Better Care*	When software is complex, it can be difficult to determine its safety properties. An analytical argument for safety is easier to make when global safety properties of the software can be inferred from an analysis of the safety properties of its components. Such inferences are more likely to be possible when different parts of the system are designed to operate independently of each other. Achieving simplicity is not easy or cheap, but simpler software is much easier for independent assessors to evaluate, and the rewards of simplicity far outweigh its costs (NRC, 2007). Pitfalls to avoid include interactive complexity, in which components may interact in unanticipated ways and a single fault cannot be isolated but it causes other faults that cascade through the software. Avoiding these characteristics both reduces the likelihood of failure and simplifies the safety case to be made. Most important to developing a plausible case for safety is the stance that developers take toward safety. A developer is better able to make a plausible safety case when it is willing to provide safety–related data from all phases in the components' or software's life cycle, to ensure the clarity and integrity of the data provided and the coherence of the safety case made, and to accept responsibility for safety failures. One report goes so far as to assert that "no software should be considered dependable if it is supplied with a disclaimer that withholds the manufacturer's commitment to provide a warranty or other remedies for software that fails to meet its dependability claims" (NRC, 2007).

Key Knowledge Point	BOK	Reference	Study Guide Material
In the EU-28, what is a key factor for the implementation of measures to address OSH issues.	Safety Programs	EU-OSHA — European Agency for Safety and Health at Work ESENER-2 *Second European Survey of Enterprises on New and Emerging Risks*	Management involvement in OSH is a key factor for the implementation of measures to address OSH issues. ESENER-2 shows that 61% of establishments in the EU-28 indicate that health and safety issues are discussed at the top level of management regularly, the proportion increasing with establishment size. By country, this is reported more frequently in the Czech Republic (81%), the United Kingdom (79%) and Romania (75%), while the lower percentages correspond to Montenegro (25%), Estonia (32%) and Iceland and Slovenia (both 35%)

Key Knowledge Point	BOK	Reference	Study Guide Material
An Example of Psychosocial Risk factor would include:	Safety Programs	EU-OSHA — European Agency for Safety and Health at Work. ESENER-2 *Second European Survey of Enterprises on New and Emerging Risks*	Significant changes which are taking place in the world of work lead to emerging psychosocial risks. Such risks, which are linked to the way work is designed, organized and managed, as well as to the economic and social context of work, result in an increased level of stress and can lead to serious deterioration of mental and physical health. As pointed out above, having to deal with difficult customers, patients, pupils, etc. (58%) and time pressure (43%) are the two most frequently reported psychosocial risk factors among establishments in the EU-28. Both risk factors share a similar sector profile, being most prevalent among establishments in education, human health and social work activities and in public administration, while their lowest proportions correspond to agriculture, forestry and fishing and to manufacturing. Both risk factors increase with establishment size, but particularly time pressure. Having to deal with difficult customers, patients, pupils, etc. is more often reported as a risk factor by establishments in Montenegro (78%) and France and Estonia (both 70%) as opposed to Turkey (28%), Italy (37 %) and Lithuania (39%).

Key Knowledge Point	BOK	Reference	Study Guide Material
What is the description of ISO 45001?	Safety Programs	International Organization for Standardization (ISO) Management System Standards. ISO 45001. Briefing Notes. Occupational Health and Safety	An organization is responsible for ensuring that it minimizes the risk of harm to the people that may be affected by its activities (e.g. its workers, its managers, contractors, or visitors), and particularly if they are engaged by the organization to perform those activities as part of their " occupation". ISO is developing an occupational health and safety (OH&S) management system standard (ISO 45001) which is intended to enable organizations to manage their OH&S risks and improve their OH&S performance. The implementation of an OH&S management system will be a strategic decision for an organization that can be used to support its sustainability initiatives, ensuring people are safer and healthier and increase profitability at the same time. ISO 45001 is an International Standard that specifies requirements for an occupational health and safety (OH &S) management system, with guidance for its use, to enable an organization to proactively improve its OH&S performance in preventing injury and ill-health. ISO 45001 is intended to be applicable to any organization regardless of its size, type and nature. All of its requirements are intended to be integrated into an organization's own management processes. ISO 45001 enables an organization, through its OH&S management system, to integrate other aspects of health and safety, such as worker wellness/wellbeing; however, it should be noted that an organization can be required by applicable legal requirements to also address such issues. ISO 45001 does not state specific criteria for OH&S performance, nor is it prescriptive about the design of an OH&S management system. An organization's OH&S management system should be specific to meeting its own needs in preventing injuries and ill-health; consequently a small business with low risks may only need to implement a relatively simple system, whereas a large organization with high levels of risks may need something much more sophisticated. Any type of system may be capable of being in conformity with the requirements of the standard, provided it can be shown to be appropriate to the organization and is effective. ISO 45001 does not specifically address issues such as product safety, property damage or environmental impacts, and an organization is not required to take account of these issues unless they present a risk to its workers. ISO 45001 is not intended to be a legally binding document, it is a management tool for voluntary use by organizations from SME's upwards whose aim is to eliminate or minimize the risk of harm.

Key Knowledge Point	BOK	Reference	Study Guide Material
According to the WHO, which of the following are OSH matters leading to ethical consideration?	Safety Programs	World Health Organization (WHO) EUR/02/5041181 *Good Practice in Occupational Health Services A Contribution to Workplace Health*	**Examples of matters leading to ethical considerations are:** Confidentiality of health information. Managers have no right to be given any health information, which is of confidential nature about employees. Employers have a right to know whether persons in their employment are fit for the work tasks for which they are employed; The necessity of securing the informed consent of the subject before the release to others of any individual health information of confidential nature in possession of occupational health professionals. Such information on individual client staff members is to be strictly and effectively protected; The extent and scope of the occupational health professionals' duty of care towards the employer, the individual employee, towards groups of employees served or towards the public may entail multiple loyalties; Conflicts of interest may arise over safeguarding the rights of the individual employee and those of the employers, other employers and the general public; The need for care in the handling, safeguarding and transfer of occupational health records to avoid confidential information being disclosed to unauthorized persons or organizations. **Some points to keep in mind:** Occupational health professionals honor agreements and contracts made with customers, clients or other partners giving attention to cost-effectiveness of services provided; Occupational health professionals act on the basis of best available documented scientific evidence and recognized professional experience; Occupational health professionals operate within their professional competence and do not offer judgements on issues outside their professional command

Key Knowledge Point	BOK	Reference	Study Guide Material
To be a positive change agent in a business's safety culture, the OSH professional attains the status of an integral member of the business team by?	Safety Programs	Manuele, Fred A. (2014). *Advanced Safety Management. Focusing on Z10 and Serious Injury Prevention*, Second Edition	What is the safety and health professional's role with respect to the safety culture? In an organization where safety is a core value and management at all levels "walks the talk" and demonstrates by what it does that it expects the safety culture to be superior, the role of the safety and health professional is easier in the role of a culture change agent as he or she gives advice that supports the maintains the culture. In a large majority of organizations, an advanced safety culture does not exist Then the role of the safety and health professional as a culture change agent has greater significance and requires more diligence as attempts are made to influence management to move toward achieving a superior culture. The possibility of being successful in that endeavor is enhanced if the safety professional attains the status of an integral member of the business team. That will result from giving well-supported, substantial, and convincing risk reduction advice that serves the business interests. Admittedly, convincing management that safety should be one of an organization's core values may not be easily achieved, Safety and health professionals should understand that steps forward are taken by management to improve on management system deficiencies, the result in each instance is a culture change. And the requirements to achieve a permanent culture change should be intertwined into each proposal made to improve on a management deficiency.

Key Knowledge Point	BOK	Reference	Study Guide Material
Some key factors identified for the accurate evaluation of the economic impact of an OSH intervention include:	Safety Programs	Targoutzidis, Antonis; Koukoulaki, Theoni; Schmitz-Felten, Ellen; Kuhl, Klaus; Oude, Karen M.; Rijken, Evelien; Van den Broek, Karla; Klüser, Ruth EU-OSHA *The business case for safety and health at work: cost-benefit analyses of interventions in small and medium-sized enterprises*	When is an OSH intervention profitable? The key factors identified in the literature are existing OSH practice, type of intervention (for example, organizational, technical), kind of OSH factor targeted (for example musculoskeletal disorders, accidents, skin disorders), size of investment (capital employed) and method of measurement and assessment. Some key factors identified for the accurate evaluation of the economic impact of an OSH intervention are: • Benefits and costs related to OSH must be identified, attributed and quantified properly. • Inflation and reference period must be taken into account. • Outcomes may occur over a long period after the intervention, which makes the length of the • examination period very important. • Mistaken assumptions can have a serious impact on the evaluation. These serious difficulties underline the need for a common cost model to obtain comparable and essentially reliable evaluations. Therefore, a common cost model (with common assumptions and accounting principles) was used in analyzing the new case studies carried out for this report. As well as improving the comparability of results, this was helpful for enterprises, which had remarkable success in identifying and estimating economic costs and benefits related either to absenteeism or to improved productivity, which were the two main cost categories (although they did not manage to quantify all the relevant costs and benefits).

Key Knowledge Point	BOK	Reference	Study Guide Material
In regards to logic modelling techniques, which utilizes a logic pattern flow from the bottom-up?	Safety Programs	Clemens, Pat L., Simmons, Rodney J. U.S. Dept. of Health and Human Services *System Safety and Risk Management A Guide for Engineering Educators*	An event tree analysis (ETA) is a forward (bottom-up) symbolic logic modeling technique generated in both the success and failure domain. This technique explores system responses to initiating "challenge" and enables assessment of the probability of an unfavorable or favorable outcome. The system challenge may be a failure or fault, and undesirable event, or a normal system operating command [1, 2]. See http://www.Sverdrup.com/svt for a set of presentation slides that support this lesson. A generic event tree portrays all plausible system operating alternate paths from the initiating event. A Bernoulli model event tree uses binary branching to illustrate that the system either succeeds of fails at each system logic branching node. A decision tree is a specialized event tree with unity probability for the system outcome. It is important to remember that each analytical technique discussed in this module complements (rather than supplants) the others. This is because each technique attacks the system to be analyzed differently – some are top-down, others are bottom-up. Though it has long been sought, there is no "Swiss Army Knife" technique that answers all questions and is suitable for all situations.

Key Knowledge Point	BOK	Reference	Study Guide Material
The ANSI/AIHA Z-10-2012, Occupational Health and Safety Management Systems standard utilizes which concept model as an asset in continuous improvement?	Safety Programs	Manuele, Fred A. (2014) *Advanced Safety Management Focusing on Z10 and Serious Injury Prevention* Second Edition	In the introduction to ANSI/AIHA Z10-2012, the Occupational Health and Safety Management Systems standard, it is stated that the design of ANSI Z10 encourages integration with other management systems to facilitate organizational effectiveness using the elements of Plan-Do-Check-Act (PDCA) Model as a basis for continual improvement. Prominence is given in this chapter to the application of PDCA concepts as a asset in continuous improvement. Vic Toy, the vice chair for the committee that wrote the Z10 standard, wrote an article entitled "Let Your OHS Management System Do the Work: How the New Z10 Adds Even Better Value." What Toy wrote also relates to continuous improvement. The beauty of an Occupational Health and Safety Management System (OHSMS) is that it provides health and safety management in an integrated, interconnected, organic way to maintain focus on continual improvement. The Z10 standard provides a systematic framework and the tools required for continual improvement.

Key Knowledge Point	BOK	Reference	Study Guide Material
According to OSHA, which of the following make up the "Fatal Four" construction-related fatality causes?	Safety Programs	U.S. Department of Labor www.osha.gov/oshstats/commonstats.html *Commonly Used Statistics* Construction's "Fatal Four"	**Worker injuries, illnesses and fatalities** 4,836 workers were killed on the job in 2015 [https://www.bls.gov/news.release/cfoi.nr0.htm] (3.4 per 100,000 full-time equivalent workers) — on average, more than 93 a week or more than 13 deaths every day. 903 Hispanic or Latino workers were killed from work-related injuries in 2015—on average, more than 17 deaths a week or two Latino workers killed every single day of the year, all year long. Fatal work injuries involving contractors accounted for 17 percent of all fatal work injuries in 2015. **Construction's "Fatal Four"** Out of 4,379 worker fatalities in private industry in calendar year 2015, 937 or 21.4% were in construction — that is, one in five worker deaths last year were in construction. The leading causes of private sector worker deaths (excluding highway collisions) in the construction industry were falls, followed by struck by object, electrocution, and caught-in/between. These "Fatal Four" were responsible for more than half (64.2%) the construction worker deaths in 2015, BLS reports. **Eliminating the Fatal Four would save 602 workers' lives in America every year**. 1. Falls — 364 out of 937 total deaths in construction in CY 2015 (38.8%) 2. Struck by Object - 90 (9.6%) 3. Electrocutions - 81 (8.6%) 4. Caught-in/between* - 67 (7.2%) (*This category includes construction workers killed when caught-in or compressed by equipment or objects, and struck, caught, or crushed in collapsing structure, equipment, or material)

Key Knowledge Point	BOK	Reference	Study Guide Material
The original OSHA Hazard Communication regulatory scheme from 1983 is being replaced by what international standard?	Safety Programs	Bailey, Melissa A. et al. (2016) *Occupational Safety and Health Law Handbook* Third Edition	The producers and importers of hazardous chemicals and the employers who use such chemicals are obligated to evaluate and communicate their hazards is certainly well known, as these obligations are firmly rooted within the business industry. Since 1983, when the Occupational Health and Safety Administration (OSHA) first implemented its standard regarding hazard communication, producers, importers, employers and workers have grown accustomed to complying with these requirements and have relied upon the resulting increased flow of information to deal properly with hazardous chemicals in the workplace. As OSHA described it, "[t]here is a whole generation of employers and employees now who have never worked in a situation where information about the chemicals in their workplace is not available." But the previous regulatory scheme of OSHA's Hazard Communication Standard (HCS) is now being displaced because of ongoing efforts to harmonize America's standards with those used internationally. As the world becomes increasingly flat, and globalization and international standardization become the norm instead of the exception, significant changes for American industry are now underway. These changes were not unanticipated given the indications by OSHA made over the years, and the length of time of the rulemaking process. Indeed, the earliest indication of a potential move toward global harmonization in this arena were made by OSHA as early as 1983, when the agency first signaled that it was committed to global unification of hazard communication. Concerns over regulatory change and increased compliance costs prompted OSHA to proceed slowly and judiciously down the path toward global harmony while recognizing the concern that there may be a great economic burden that the changes to the HCS would bring. Nevertheless, that change has arrived. After issuing its Advanced Notice of Proposed Rulemaking in 2006, OSHA promulgated its Revised Hazard Communication Standard (RHCS) six years later on March 26, 2012, to conform to the United Nations' Globally Harmonized System of Classification and Labelling of Chemicals (GHS), and the transition period for full compliance continues through June 1, 2016. Although the basic scope of and regulatory framework have remained largely the same, the definitions of what constitutes a hazard have changed, along with the requirements for labels and safety data sheets (Formerly, "material safety data sheets"), among other changes.

Key Knowledge Point	BOK	Reference	Study Guide Material
Which safety metric chart is a graphic representation of the raw data over time without the presence of the average, upper control limits, and lower control limits?	Safety Programs	Janicak, Christopher A. (2015) *Safety Metrics, Tools and Techniques for Measuring Safety Performance* Third Edition	Control charts are used in safety to detect significant changes in performance measures and to ascertain whether the performance measures are within an acceptable range. The acceptable range for a control chart is established using control limits. When the data points fall outside of the control limits, a significant change has occurred and an investigation should be conducted. To reinforce this idea, it is useful to document the "owner" of each performance measure and the management decisions that have been, or will be made based upon this measure (United States Department of Energy, Hanford Site 2001). A run chart is a preliminary display of safety performance indicator data (United States Department of Energy, Hanford Site 2001). The run chart is a graphic representation of the raw data over time without the presence of the average, upper control limits, and lower control limits. When using the data from a run chart to construct a control chart, it is important that the data obtained for the control chart is coming from the same type of sample that the run chart was constructed with. If the characteristics of the subjects from which the control chart data is being constructed from differ significantly from those that the run chart was constructed from, significant values may be obtained not because of actual significantly different performance, but rather because of differences in the subjects. Attribute charts are used when the data being measured meet certain conditions or attributes. Attributes are involved when the safety measures are categorical (Griffin 2000, 434). Examples of categorical data include the departments in which accidents are occurring, the job classification of the injured employee, and the type of injury sustained. The type of attribute control chart used depends on the data format of the specific attribute measured.

Key Knowledge Point	BOK	Reference	Study Guide Material
According to NIOSH System Safety is defined as:	Safety Programs	Manuele, Fred A. (2014) *Advanced Safety Management Focusing on Z10 and Serious Injury Prevention*	Unfortunately, the term *system safety* does not convey a clear meaning of the practice as it is applied. Published definitions of system safety are of some help in understanding the concept, but they do not communicate clearly. To give indications of the differences in the definitions of system safety, and to move this discussion forward, six sources are cited. In MIL-STD-882E-2012, the Department of Defense *Standard Practice for System Safety*, system safety is defined as: The application of engineering and management principles, criteria, and techniques to achieve acceptable risk within the constraints of operational effectiveness and suitability, time, and cost throughout all phases of the system life-cycle. (p. 8) In System Safety Primer, Clifton A. Ericson II gave this definition of system safety in his 2011 book: System safety is an engineering methodology employed to intentionally design-in safety into a product or system through the identification and elimination/mitigation of hazards. (p. 6) In GEIA-STD-0010, the *Standard Best Practices for System Safety Program Development and Execution*, approved in 2008, this definition is given: System safety is the application of engineering and management principles, criteria, and techniques to achieve mishap risk as low as reasonably practicable (to an acceptable level), within the constraints of operational effectiveness and suitability, time, and cost, throughout all phases of the system life cycle. Richard A. Stephans' book *System Safety for the 21st Century* was published in 2004. He defines system safety as follows: *System Safety*: The discipline that uses systematic engineering and management techniques to aid in making systems safe throughout their life cycles. (p. 11) *System Safety and Risk Management, NIOSH Instruction Module, A Guide for Engineering Educators* was developed for the National Institute for Occupational Safety and Health by Pat L. Clemens and Rodney J, Simmons in 1998. They write as follows: What is System Safety? System Safety has two primary characteristics: (1) it is a doctrine of management practice that mandates that hazards be found and risks controlled; and (2) it is a collection of analytical approaches with which to practice the doctrine. (p. 3) In *System Safety Engineering and Management*, 2nd ed., Harold E. Roland and Brian Moriarty asked in 1990: What is System Safety? In response to their own question, they give two meaningful comments and then established the system safety objective. The system safety concept is the application of special technical and managerial skills to the systematic, forward-looking identification and control of hazards throughout the life cycle of a project, program, or activity. The concept calls for safety analysis and hazard control actions, beginning with the conceptual phase of a system and continuing through the design, production, testing, use and disposal phases, until the activity is retired. (p. 8)

The International Certified Registered Safety Professional

"ICRSP"

Sample Exam Questions

This sample questions on the following pages provide insight into the composition of the actual ICRSP exam.

The actual exam is a random compilation of questions and information contained in the study guide. Although the exam may not contain all questions listed in the study guide, every question in the exam comes directly from the study guide.

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Key Knowledge Point - KKP	BOK	Reference	
Peter Senge in the Fifth Discipline states "Team learning starts with _____, the capacity of members of a team to suspend assumptions and enter into genuine thinking together." a. discussion b. debate c. diatribe d. dialogue	Business Acumen	*Senge, Peter M. (1990), The Fifth Discipline, Doubleday/Currency, ISBN 0-385-26094-6*	
Answer:			

Key Knowledge Point - KKP	BOK	Reference	
Project management ensures your project's solution is designed, developed and delivered, while change management ensures your project's solution is effectively _____. a. embraced, adopted and used b. financed and completed c. closed out and documented d. delayed, deferred and discarded	Business Acumen	https://www.prosci.com/change-management/what-is-change-management	
Answer:			

Key Knowledge Point - KKP	BOK	Reference	
"Prospective Memory" refers to: A. ☐ Memory of the names of suitors. B. ☐ The ability to remember to perform actions that must be deferred. C. ☐ The ability to remember dates and names memorized for exams. D. ☐ Tendency for materials that have been bent to return to their original shape.	OSH	Scullin, Michael K. Bugg, Julie M. McDaniel, Mark A. Einstein, Gilles O. (2011) *Prospective memory and aging: preserved spontaneous retrieval, but impaired deactivation, in older adults*	
Answer:			

Key Knowledge Point - KKP	BOK	Reference	
According to the WHO, which of the following are OSH matters leading to ethical consideration? A. ☐ The need for care in handling, safeguarding and transfer of occupational health records. B. ☐ Securing informed consent of the subject before release to others of audit records. C. ☐ Honoring agreements and contracts made with customers, clients and other partners giving attention to cost-effectiveness of services provided. D. ☐ A and C E. ☐ All the above.	OSH	World Health Organization (WHO) EUR/02/5041181 *Good Practice in Occupational Health Services A Contribution to Workplace Health*	
Answer:			

Key Knowledge Point - KKP	BOK	Reference	
Safety Competencies and Training guidance is covered under which component of a Safety Management System: A. ☐ Safety Promotion B. ☐ Safety Policy C. ☐ Safety Risk Management D. ☐ All of the above.	Safety Programs	Federal Aviation Administration Advisory Circular AC120-92B. FAA Part 5.23 and 5.91.	
Answer:			

Key Knowledge Point - KKP	BOK	Reference	
To be a positive change agent in a business's safety culture, the OSH professional attains the status of an integral member of the business team by? A. ☐ Maintaining accurate and detailed safety reporting files. B. ☐ Being operationally proficient at the enterprise's main income-generating activity. C. ☐ Providing well-supported, substantial, and convincing risk reduction advice that serves the business interests. D. ☐ Being an active-regular participant in the business team's budget process meetings.	Safety Programs	Manuele, Fred A. (2014). *Advanced Safety Management. Focusing on Z10 and Serious Injury Prevention*, Second Edition	
Answer:			

Key Knowledge Point - KKP	BOK	Reference	
According to Dr. Sidney Dekker we need to transition from seeing safety as an absence of _____to seeing it as the presence of a _____ capacity to make things go right. a. Human error - compliance b. Negatives – positive c. Accidents – culture d. Negatives – safety culture	Safety Theory & Philosophy	Safety Differently “Human Factors for New Era”, Second Edition.	
Answer:			

Key Knowledge Point - KKP	BOK	Reference	
_____ conditions are generally created by people far removed in time and space from the event. A. Active B. Latent C. Human D. Technical	Safety Theory & Philosophy	ICAO (2013) Doc 9859, Safety Management Manual	
Answer:			