

Developing a NASA System Safety Expert for the 34th International System Safety Conference 2016
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Abstract

This paper will provide an overview of the NASA Safety Center (NSC) focusing on NASA's success and strategies used to develop the Agency's formal safety engineering professional development system. In 2008, the NASA Safety Center began designing the NASA Safety and Mission Assurance (SMA) Technical Excellence Program (STEP) to serve as the NASA University for Safety and Mission Assurance. Today, there are eight major curriculums that develop NASA SMA Engineers at the Novice, Journeyman and Expert levels. The curricula include: System Safety; Quality Engineering; Reliability and Maintainability; Software Assurance; Operational Safety; Aviation Safety; SMA Leadership; and, Cross Discipline. All of the courses are currently available to NASA Civil Servants and contractors. The STEP program was designed to build a bridge between academics and on-the-job training, guiding learners from new safety professionals to NASA subject-matter experts.

Introduction

This paper will discuss specifically the System Safety Discipline training and development program that the NSC provides to all NASA SMA Civil Servants and contractors. The strategy used to develop the curriculum for the System Safety discipline takes a systems approach to define the competencies a System Safety professional needs and develops training around those competencies. The training curriculum was developed into a career-oriented roadmap to guide the employee through the Novice, Journeyman and Subject Matter Expert levels. This paper discusses the engineering approach used to develop 22 individual SMA curricula and the System Safety program progress to date.

NASA Safety Center

In the published reports that followed two NASA Space Shuttle accidents and other independent agency mishap assessments, several safety concerns were raised. Specifically, the Columbia Accident Investigation Board (CAIB) Report concluded, "... that NASA's current organization does not provide effective checks and balances, does not have an independent safety program and has not demonstrated the characteristics of a learning organization (ref. 1)."

To address the concerns of the CAIB, the NASA Safety Center was established in October 2006 to support the safety and mission assurance requirements associated with NASA's programs and projects. The NSC Mission is to provide SMA expertise, information, verification and analysis to enable collaboration and learning while promoting a safe workplace and successful programs and projects.

The NSC is comprised of four functional offices: the Technical Excellence Office (TEO), Knowledge Management Systems Office (KMSO), Audits and Assessments Office (AAO), and Mishap Investigation Support Office (MISO). The main responsibility of the TEO is to enhance agency safety and mission assurance technical expertise; KMSO, to facilitate Agency-wide collaboration and knowledge dissemination; AAO, to ensure agency safety-related processes and activities are effective; and MISO, to understand today's mishaps in order to prevent future mishaps.

NASA's Knowledge Retention Challenge

Demographics show that there has been a 9% net reduction in safety-focused Civil Servant workforce and a 32+% turnover in the last 5 years. In the next 5 years, 67% of the workforce will be eligible to retire. That same 67% currently retains 80% of all NASA safety and mission assurance experience. By the time NASA is ready to launch its three flagship missions, Exploration Mission 1 (EM-1), EM-2 and the James Webb Space Telescope (JWST), approximately 75% of the SMA workforce will have changed. This is a knowledge retention concern for NASA and its safety organizations.

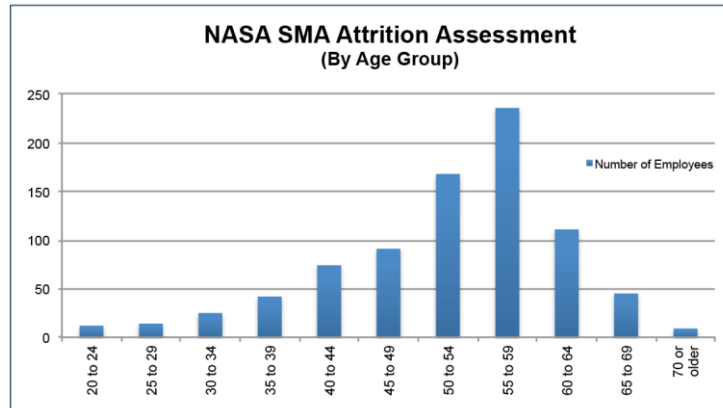


Figure 1 – NASA’s SMA Attrition (March 2016)

Strategies for Retaining SMA Knowledge

The NASA Office of Safety and Mission Assurance (OSMA) took a proactive stance geared towards providing comprehensive professional development training to the next generation of NASA’s safety workforce. To fulfill OSMA’s goal, the NSC began creating a career-oriented, professional development roadmap and system for safety professionals. The vision was “To create the NASA University for Safety and ultimately become the Harvard and MIT of NASA Safety.”

In order to provide NASA with a means to measure and continuously advance the competency and proficiency of the safety and mission workforce, the NSC leveraged lecture-capture technology. Once captured, instructor-led training was made available to all NASA Civil Servants and contractors via NASA’s web-based learning management system (SATERN). SATERN allows management to target key safety-related competencies for their employees and tailor individual development plans focused on specific disciplines.

Safety and Mission Assurance Technical Excellence Program

The SMA Technical Excellence Program (STEP) is a voluntary training program with six safety discipline focuses (System Safety, Operational Safety, Quality Engineering, Reliability and Maintainability, Software Assurance and Aviation Safety) and additional Cross-Discipline and SMA Leadership curricula. STEP was created using a systems-engineering approach. The process began by developing core competencies for each SMA discipline. Discipline-focused competency wheels were developed for each discipline to organize all of the competencies that a NASA safety professional might need to perform throughout their career. The inner ring describes major competencies while the outer ring lists each of the associated minor competencies that will target discipline-related performance (Figure 2).



Figure 2 — System Safety Competency Wheel

Using Bloom’s taxonomy, performance objectives were created for each minor competency to describe performance expectations for each level of career progression: Novice, Journeyman and Expert. Readings, courses and application exercises were identified to help SMA employees meet the performance objectives.

The NSC conducted extensive research to see what training systems already existed and benchmarked known programs such as NASA Marshall Space Flight Center’s Professional Development Road Map, Johnson Space Center’s SMA Basic Program, the Army CP-12 Program, Board of Certified Safety Professionals Certifications, and Defense Acquisition University’s career-oriented development programs. Available NASA courses (being taught at various centers) were reviewed and a list of courses that matched the competencies was compiled for each level. From this process, courses for each discipline were identified. A curriculum structure was designed for each discipline that included academics, on-the-job training and NASA resource documents familiarization.

The complete curriculum plan, or course of study, was developed for each discipline and defines each level of the career-oriented, learning process. The STEP course of studies are very similar to college course handbooks and include the full list of requirements for each level: courses, on-the-job training, readings, qualification requirements/process, course descriptions, elective courses and items of peripheral interest.

The NASA STEP Framework was then designed to standardize all of the discipline training strategies (Table 1).

Table 1 — NASA STEP Framework

		Novice	Journeyman	Expert	
STEP QUALIFICATION ELEMENTS	LEVEL 1	LEVEL 2	LEVEL 3	LEVEL 4	
Core Training	3	24	24	N/A	
Discipline Training	21.5	100	137	137	
Domain Training	4	40	N/A	N/A	
TOTAL ACADEMIC HOURS	28.5	164	161	137	490 Hours of Academics
On-the-Job Training	N/A	180	360	360	
Enrichment Experience	N/A	20	40	40	
TOTAL OJT/ENRICHMENT HOURS	N/A	200	400	400	1000 Hours of OJT
Minimum Years of Experience	N/A	1	3	8	
Reading Material	N/A	Yes	Yes	Yes	
LEVEL COMPLETION REQUIREMENTS					
Comprehensive Level Test	N/A	N/A	Yes	N/A	
Peer Review Panel	N/A	N/A	N/A	Yes	
Qualification Board	N/A	N/A	Yes	Yes	

All STEP curricula incorporate 490 hours of academic training, 1,000 hours of OJT, required years of experience, and Policy/Related Document reading. Learners complete a Comprehensive Test at Level 3 and appear before a Senior NASA Peer Review Panel at Level 4. Once the learner has completed all of the requirements for a specific level, a qualification package is generated and a Qualification Panel or Board is convened.

Completion of all four levels of STEP is intended to be a journey, not a sprint and will likely take someone 8 to 10 years to accomplish at a 50-hour per year academic pace. The OJT is designed to be able to be accomplished during the course of normal project activities and should not require travel to another NASA center. In addition to fundamental and advanced discipline training, STEP includes Core, Domain and Enrichment training. Core training includes Risk Management and Decision Analysis at Level 2 and NASA Systems Engineering Overview at Level 3. Domain training is designed to help acclimate new SMA learners to the aerospace environment that their systems will operate in and the technological/design strategies that their systems typically use. Enrichment Training allows the learner to stretch the boundaries beyond traditional safety engineering job tasks (e.g., serving on a temporary detail assignment; working with a peer from another NASA center on an SMA-related activity; serving on a mishap board, audit team or source evaluation board; delivering a paper or presentation at a conference or meeting; etc.).

The System Safety Curriculum

The competency wheel for the System Safety curriculum has five core competencies: System Safety in Acquisition, System Safety in Organization Management, Mathematical Skills, System Safety Rationale and System Safety Analytical Methods. Each core competency is divided into several sub-competencies (Figure 3). Each sub-competency has a specific set of skills required to become competent in that area. One-page performance objectives were created for each sub-competency.

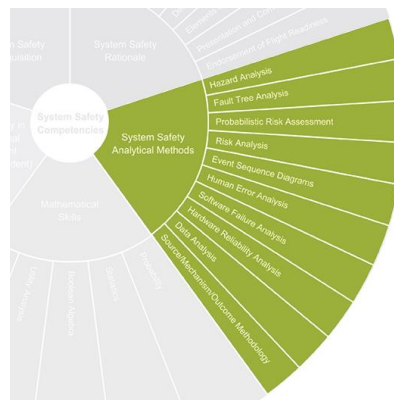


Figure 3 — System Safety Analytical Methods Competencies

As an example, there are 10 sub-competencies associated with System Safety Analytical Methods: Hazard Analysis, Fault Tree Analysis, Probabilistic Risk Assessments, Risk Analysis, Event Sequence Diagrams, Human Error Analysis, Software Failure Analysis, Hardware Reliability Analysis, Data Analysis and Source/Mechanism/Outcome Methodology. For each of these performance objectives, several individual learning objectives were created for each STEP Level using Bloom’s taxonomy. Table 2 presents the System Safety Performance Objectives for the Hazard Analysis sub-competency. The level of knowledge and experience increases as the learner progresses through the curricula, from Level 2 (Novice); to Level 3 (Journeyman); and finally, to Level 4 (Subject Matter Expert). This process incorporates the ideology of Bloom’s six levels associated with the Hierarchy of Learning. From these performance objectives, the STEP System Safety curriculum was developed to create a logical progression of learning through formal courses and specific OJT requirements. The System Safety curriculum focuses on developing a healthy balance of both qualitative and quantitative methods.

Table 2 — System Safety Performance Objectives for Competency of Hazard Analysis

System Safety Performance Objectives

Competency: Hazard Analysis		
Description: The analytical method and approach used to identify, mitigate, and manage safety hazards found in systems.		
Performed by: System Safety Engineer		
STEP LEVEL 2	STEP LEVEL 3	STEP LEVEL 4
<ul style="list-style-type: none"> • Understand and explain the basic engineering principles, steps, and elements of a Hazard Analysis (HA). • Identify and explain NASA policy and procedures governing the conduct of HA. • Prepare a qualitative HA on a simple, isolated NASA space subsystem. • Document and present an HA to a senior official. • Understand and explain the relationships of HA to fault tree analysis and the relationship of the HA with other SMA disciplines. 	<ul style="list-style-type: none"> • Prepare a quantitative HA on a NASA space subsystem or system. • Prepare a Hazard Report (HR) with all required content. • Identify, document, and monitor requirements associated with an HR. • Monitor the implementation and performance of Hazard Controls throughout the lifecycle. • Evaluate HR/HA prepared by contractors. • Present a HA/HR to decision makers. 	<ul style="list-style-type: none"> • Monitor the performance of HA management systems and processes used by the organization. • Conduct analysis of supporting HA data for trends, indicators, and pitfalls. • Interpret, apply, communicate, and monitor requirements related to HA for NASA programs and projects. • Influence policy or procedures to improve the conduct of HA/HR.

System Safety – STEP Level 2: The System Safety Level 2 curriculum consists of 164 hours of academic training: 24 hours of STEP Core training (Decision Analysis and Risk Management), 100 hours of Discipline training and 40 hours of Domain training. In addition, 180 hours of OJT are required (including attending two types of design reviews and observing the development of a hazard analysis and fault tree). The learner must complete the required reading list which includes 19 NASA policies and reports. Once all of the requirements are complete (including 1 year of relevant experience) a qualification package is presented to a STEP Level 2 Qualification Panel chaired by the learner’s Center SMA Director and supervisor.

Discipline Training - 100 Hours (Minimum Required)

Course Title

- STEP Level 2 Preview – 1 hour
- Basic Fault Tree Analysis I – 8 hours
- Basic Fault Tree Analysis II – 16 hours
- Probability and Statistics I – 8 hours
- Risk Informed Decision Making (RIDM) – 8 hours
- System Safety Fundamentals – 36 hours
- System Safety I – 8 hours
- Level 2 Elective Courses – 15 hours

Required OJT - 180 Hours

- Under appropriate supervision, observe/support conduct of hazard analysis in support of a technical project or program (40 hours).
- Observe a team creating a fault tree in support of a technical project or program (40 hours).
- Observe/support at least two different types of design reviews in support of a technical project or program (20 hours).
- 80 Elective Hours (any combination and amount of the following that equal the total elective hours required):
 - Demonstrate understanding, interpret, apply, or modify SS policy, methodology, and practices.
 - Under appropriate supervision, observe/support completion of a system safety checklist in support of a technical project or program.
 - Read and Review program and project System Safety and Mission Assurance Plans.
 - Demonstrate knowledge of independent Technical Authority and System Safety Engineering Discipline’s role in SMA Technical Authority.
 - It is recommended that you join and participate in a relevant professional society by attending meetings or conferences and/or participating in discussions and activities related to that Society. You may substitute any local professional activity (E.g., attending local discipline-related working groups, brown-bag lunch speaker sessions, guest lectures, etc.) for this OJT.

- The participant may perform additional hours from the Required OJT items.
- Custom/Tailored OJT - The participant, by approval of the Supervisor, may partake in any custom/tailored OJT activity that supports the participant's actual or anticipated job responsibilities or unique learning objectives.

Required Reading

Reference #	Resource Title
NPD 8700.1	NASA Policy for Safety and Mission Success
NPR 8705.6	Safety and Mission Assurance Audits, Reviews, and Assessments
NPR 8000.4	Risk Management
NPR 8705.2	Human Rating Requirements for Space Systems
NPR 8715.3	NASA General Safety Program Requirements
NPD 7120.4	NASA Engineering and Program/Project Management Policy
NPR 7120.5	NASA Space Flight Program and Project Management Requirements
NPR 7123.1	NASA Systems Engineering Processes and Requirements
HOWI 8700-GC035	Management of the SMSR Process
HOWI 8710-GD000017	OSMA Management of NASA Safety Reporting System (NSRS)
NASA-STD 8709.22	Safety & Mission Assurance Acronyms, Abbreviations & Definitions
NASA/SP-2010-576	NASA Risk-Informed Decision Making Handbook
NASA/SP-2010-580	NASA System Safety Handbook Vol 1, System Safety Framework and Concepts for Implementation
	Fault Tree Handbook with Aerospace Applications
NPD 1000.0	NASA Governance and Strategic Management Handbook
NPD 1001.0	NASA Strategic Plan
NPD 1000.3	The NASA Organization
	Rogers Commission Report (Chap. 5, 6 and 7)
	Columbia Accident Investigation Report

System Safety – STEP Level 3: The Level 3 System Safety curriculum consists of 161 hours of academic courses (including STEP Core Training — NASA Systems Engineering Overview), 360 hours of OJT, required reading and 3 years of cumulative relevant experience. After completing all coursework and OJT, the learner must complete a 60-question comprehensive exam (online, open-book) to prove their holistic knowledge. Similar to Level 2, the final step is to convene a Qualification Board but this time the board consists of the Center SMA Director, the employee's supervisor and a discipline expert.

Discipline Training - 137 Hours (Minimum Required)

Course Title

Accident Precursor Analysis I – 8 hours
 Accident Precursor Analysis II – 16 hours
 Completing The Investigation And Mishap Report – 1 hour
 Mishap Investigation Roles And Responsibilities – 1 hour
 Probabilistic Risk Assessment Methods (PRAM) for Practitioners and Managers – 24 hours
 Probability and Statistics II – 16 hours
 Quality Management Overview – 5 hours
 Reliability, Availability, And Maintainability (RAM) Planning for Programs and Projects – 12 hours
 Root Cause Analysis – 1.5 hours
 Software Failure Modes, Effects, and Criticality Analysis, and Fault Tree Analysis – 8 hours
 System Safety II – 16 hours
 Level 3 Elective Courses – 28.5 hours

Required OJT – 360 Hours

- Conduct (or participate in a team conducting) a hazard analysis in support of a technical project or program (40 Hours).

- Attend (or participate on a team performing) at least three different types of design reviews (including at least one preliminary design review or later in the project life cycle) in support of a technical project or program (40 Hours).
- Create (or contribute to a team creating) a fault tree in support of a technical project or program (40 Hours).
- Help create or critique a program or a project System Safety and Mission Assurance Plan or any other similar document(s) (40 Hours).
- Present Hazard Reports or any other safety products to Review Boards or similar decision makers (40 Hours).
- Conduct (or participate in a team conducting) a hazard analysis in support of a technical project or program (40 Hours).
- 160 Elective Hours (any combination and amount of the following that equal the total elective hours required):
 - Mentor other personnel in your discipline to help them improve their skills and expertise.
 - This can be done as an informal coach in your daily work.
 - Contribute to relevant professional society (e.g.: System Safety Society) activity via discussions, committee/subcommittee work or writing/presenting a paper, topic, or idea in any professional venue.
 - Under appropriate supervision, prepare and defend Go/No-go flight rationale for a risk issue that is being assessed by a project.
 - Support lessons learned effort, including communicating lessons learned or incorporating lessons learned into the work product.
 - General SS Products: Create, as a contributing team member or as a lead, the SS products and services that are required of your work assignments.
 - The participant may perform additional hours from the Required OJT items.
 - Custom/Tailored OJT - The participant, by approval of the Supervisor, may partake in any custom/tailored OJT activity that supports the participant's actual or anticipated job responsibilities or unique learning objectives.

System Safety – STEP Level 4: The Level 4 System Safety curriculum consists of 137 hours of academic courses, 360 hours of OJT, required reading and 8 years of cumulative relevant experience.

Discipline Training - 137 Hours (Minimum Required)

Course Title

Application of Bayesian Probability Inference to Probabilistic Risk Assessment of Space Systems – 24 hours
 Data Collection and Analysis I – 8 hours
 Modeling and Simulation in Probabilistic Safety Analysis – 8 hours
 Safety and Mission Assurance in the Acquisition Process – 20 hours
 System Safety Engineering – 28 hours
 Workshop in SAPHIRE code and Probabilistic Risk Assessment for Space Systems – 24 hours
 Level 4 Elective Courses – 25 hours

Required OJT – 360 Hours

- Lead a team conducting a hazard analysis in support of a technical project or program (40 Hours).
- Regularly lead or proactively participate in design reviews, and support program and project reviews (40 Hours).
- Participate in, and contribute leadership to, a team creating a fault tree in support of a technical project or program (40 Hours).
- Demonstrate in depth understanding of the purpose of a FMEA/CIL, and the relationship to a hazard analysis (40 Hours).
- Present safety analyses to Review Boards (40 Hours).
- 160 Elective Hours (any combination and amount of the following that equal the total elective hours required):
 - Lead a team creating a system safety checklist in support of a NASA project or program.
 - Become a mentor for others in System Safety. Guide other team members, including design team

- members, to understand the importance and benefits of upfront System Safety efforts, to influence the design and to provide high value contribution to the program.
- Demonstrate the understanding and the linkage between FMECA, event and fault trees, and hazard analysis and reports in an analytical setting.
 - Conduct, lead or contribute to benchmarking studies within NASA, DOD or industries to achieve superior S&MA system safety processes.

After completing these requirements, a Peer Review Panel (PRP) is scheduled and conducted. The purpose of the PRP is to serve as a formal assessment of the participant's technical capabilities and to validate that the participant has indeed achieved technical competence and proficiency to be recognized as a discipline subject-matter expert. The PRP is comprised of five members including, the Discipline Technical Fellow and at least two Subject Matter Experts. A scenario is developed by the PRP which is a set of facts, data and circumstances of a real or mock technical situation related to the participant's technical domain area. The subject matter for the scenario shall be, at least partly, based on the participant's technical resume and work experience summary. The participant has a minimum of 2 hours to evaluate the scenario and develop a technical response based on immediate knowledge using the criteria provided.

The participant then conducts an oral presentation of their prepared response and answers questions from the PRP. The PRP members then use the criteria-based score sheets to record their evaluations and convene as a board to discuss if the participant demonstrated the technical capabilities to pass the PRP.

Upon passing the PRP, a final Qualification Board is convened chaired by the NSC Director, the employee's supervisor and a discipline expert. The Qualification Board recommends final approval of the candidate to NASA's Chief of Safety and Mission Assurance. All Level 4 candidates must be approved at this level.

NASA SMA Technical Excellence Results

With 18 full-time Civil Servants and contractors, the NSC team was able to conceive, design, develop, deploy and begin to refine the entire STEP system in less than 3 years. All courses were developed and/or acquired in less than 6 years. STEP development was not the team's only responsibility, there were many other duties and accomplishments during the same timeframe.

Formal program development began in January 2009 and 9 months later, STEP Level 1 was rolled out (1 curriculum, 22 online modules, 26 hours). By the end of 2015, the advanced safety engineering training included 22 curricula, 400+ courses and 1,600 hours of training that was developed in-house. An additional 1,500+ hours of content was leveraged externally to support NASA SMA discipline training.

STEP changed the NASA learning paradigm virtually overnight with a very high quality, web-based training system. The safety and mission assurance community averaged ~5,000 course completions a year between 2006 and 2008. With STEP Level 1 deployment, NASA SMA course completions peaked at 25,000 in 2009. The course completion rate has reached a steady-state rate of 10,000+ course completions for the past 5 years. Additionally, with the deployment of the STEP training system and shrinking training/travel budgets, there has been an annual decrease in instructor-led training hours and a corresponding increase in online training hours. In 2015, over 25,000 hours were completed online compared to less than 200 hours in 2006 (Figure 5).

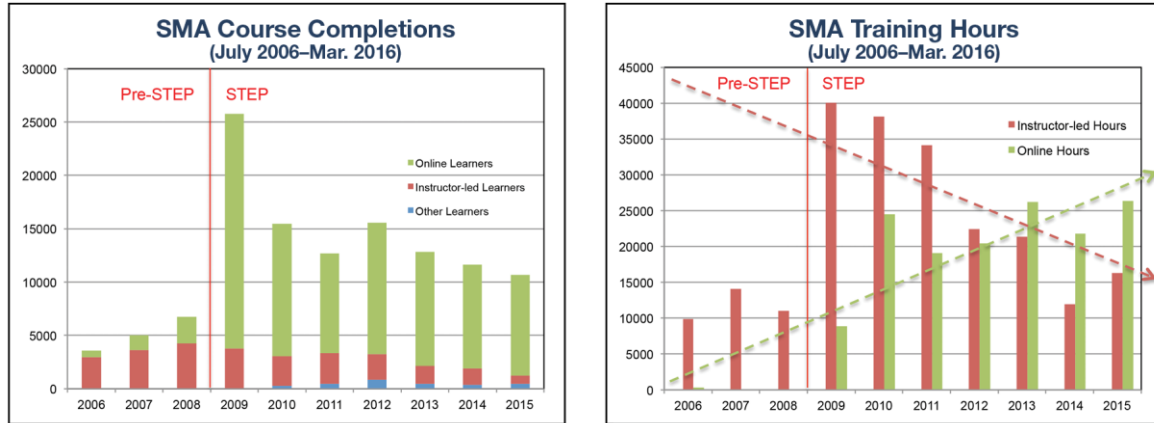


Figure 5 — Total Number of SMA Course Completions (Pre and Post STEP) and Total Number of SMA Training Hours (Pre and Post STEP)

Return on Investment: Distributed learning environments and shrinking or non-existent training budgets are a reality in today’s technical work environment. Brick and mortar classrooms are a quickly becoming a thing of the past, but convincing management to take the big leap forward to an e-learning environment is a huge challenge for corporate and government training leaders everywhere. Therefore, strategic approaches of leveraging technology and deploying web-based training have become very important. It is imperative to justify the investment to senior leadership/investors in the most convincing way possible. Those who are able to show real data associated with successful Return on Investment (ROI) figures will be the most successful.

In 2012, the NSC team began collecting and analyzing the ROI impact associated with the first 45 STEP courses (546 hours of advanced engineering training content) that used lecture-capture technology. These 45 lecture-capture web-based courses provided over 12,000 hours of training during fiscal year 2012 (FY12) alone and saved NASA over \$1.2M in development costs (over traditional development methods). With learners located at 10 NASA centers nationwide, these courses directly saved the Agency over \$1.0M in FY12 training-related travel costs (web-based vs. instructor-led) and another \$1.3M in avoidance of lost work days that would have resulted from extensive employee travel. The net result at the end of the first year was a demonstrated 4:1 ROI with the cost for traditional instructor-led training methods at \$2,904,000 versus the STEP Lecture-Capture Development at \$672,800. Now that the system is fully developed, the NSC has brought 205 web-based, advanced safety engineering courses online (1,570 hours of training content) that are available to NASA learners on-demand (at any given moment) and at no cost to the learner or their organization. These courses can be completed as part of a curriculum, individually on an as needed/desired basis or as refresher training.

Given that the average age of the current safety and mission assurance workforce is slightly over 50 years of age, many of those employees will likely retire in the next 5 to 10 years. In addition to STEP being designed to strengthen the NASA SMA competency and credibility, it was also designed as a tool for new employees transferring to and/or entering the safety workforce. New employees complete Level 1, which provides an overview of NASA and NASA safety. Then they select the discipline closest to their job description and begin to work their way through Levels 2 through 4. The vision for STEP qualification is a normal distribution curve where 10% of the workforce is always entering and completing STEP Level 1, 80% is working on Levels 2 and 3 (with a slightly higher portion working on Level 3) and 10% of the SMA workforce qualified at STEP Level 4.

To date, there are currently 2,646 Level 1, 200 Level 2, 24 Level 3 and 7 Level 4 graduates.

Summary

STEP continues to evolve and all of the training content is evaluated annually to ensure the highest priority course material and experiences remain relevant to the SMA disciplines. In addition, the STEP system can provide just-in-time competency development capabilities to support the SMA leader/organization training priorities and focus.

These courses also support individual competency training for learners outside of the safety community since they are available in SATERN. To support easy access, the NSC has created a SMA Learning Catalog that is searchable online and through a mobile app that can be downloaded via smart phone. The NSC can tailor learning programs for individuals and/or organizations as needed.

The NSC continues to work on completing the puzzle for the SMA Technical Excellence community including hosting guest lectures, webinars and discussion forums for each discipline. Practitioner training is being developed to teach the application of the proven methods and best practices being learned in the online environment. The needs of the community are continually assessed and new programs/initiatives are evaluated. The NSC is ensuring that the NASA safety organization is set up to be a continuous learning organization.

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Biography

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Ms. Harmony Myers is the former Executive Director of the NASA Aerospace Safety Advisory Panel and Branch Chief for Launch Vehicle Processing Safety Engineering and Assurance at the Kennedy Space Center. Ms. Myers has 15 years of experience in the System Safety discipline.

She received her undergraduate degree at the University of Central Florida in Electrical Engineering and her Master's Degree at the University of Miami in Industrial Engineering. Ms. Myers is a recipient of the NASA Space Flight Awareness Leadership Award.

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Mr. John D. Marinaro currently serves as the Executive Director, NASA Safety Technical Excellence leading an agency organization responsible for the delivery of safety-related technical excellence initiatives and development/operation of the NASA University for Safety (serving the needs of 3000+ safety employees Agency wide). Mr. Marinaro entered the Federal Senior Executive Service in 2009 and previously served as the Executive Director of the NASA Aerospace Safety Advisory Panel in the wake of the Space Shuttle Columbia mishap. He led the NASA Independent Verification and Validation (IV&V) Program and had the responsibility for more than 40 major NASA mission IV&V projects, including Space Shuttle and the International Space Station. His career spans 32 years and includes service with the Federal Aviation Administration, Naval Air Systems Command and he is a Veteran of the United States Marine Corps, Navy Reserves, and Army National Guard. Mr. Marinaro is former Army Helicopter pilot and FAA Certified Flight Instructor with over 4000 hours flight time in more than 40 types of airplanes and helicopters.

For the past seven years, Mr. Marinaro has led STEP, which has had incredible initial success bringing advanced engineering-oriented safety training to the SMA community and beyond using SATERN. STEP is responsible for accomplishing over 200,000 hours of safety and engineering-related training to date. STEP Level 1 received NASA's prestigious Group Achievement Award in 2010 and other industry professional development awards.

He is a graduate of Georgetown University's Senior Executive Leadership Program, received his undergraduate degree at Southern Illinois University in Electrical and Computer Engineering and his Master's Degree at Embry-Riddle Aeronautical University in Aeronautics. Mr. Marinaro is also the recipient of the NASA Exceptional Service Medal.