

Changing technologies

DIVERSITY-MINDED COMPANIES ON THE LOOKOUT FOR SYSTEMS ENGINEERS

Systems engineers follow the full systems lifecycle

"We have to be Jacks of all trades and masters of all as well!"

– Jessica Mubarak, Raytheon Space & Airborne Systems

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– Claudia Mowery, General Atomics Aeronautical Systems

*By Dan Margherita
Contributing Editor*

The field of systems engineering is growing enormously," Dr Donna H. Rhodes notes with pleasure. Rhodes is director and principal research scientist for the systems engineering advancement research initiative at the Massachusetts Institute of Technology. She's also a Fellow and past president of the International Council on Systems Engineering (INCOSE, www.incose.org, San Diego, CA).

"In the past," Rhodes says, "the role of systems engineering was to transform requirements into design. Today it encompasses the full systems life cycle."

Well-respected and well-paid

Rhodes notes that some nontraditional industries are also looking for systems engineers and willing to pay to get them. "Systems engineering is a well-respected and well-paid profession," she says with satisfaction.

Beginning in the aerospace, automotive and telecom industries, systems engineering is moving into areas like energy and healthcare, Rhodes says. "And there are more opportunities for people with diverse backgrounds."

She sees relatively few BS degrees in systems engineering but more than a hundred varieties of advanced degree programs. "Usually students study a specialized field as undergrads and go into systems engineering about four to six years into their careers," Rhodes explains. "After that they often seek the advanced degree."

Rhodes notes that systems engineers are well-suited to move into advanced jobs at their

companies. "Some stay in a highly technical capacity; they might become troubleshooters. Others move into systems architecture, and this is where we seem to see more minorities and women."



Yvette Woodworth.

Yvette Woodworth: new situations at Northrop Grumman

"What I love about my job is being very interactive with other professionals, including technical people, management and customer reps," says Yvette Woodworth. At Northrop Grumman Corp (Los Angeles, CA) Woodworth's title is systems engineering, integration and test (SEIT) lead. She works in the company's aerospace facility in Aurora, CO.

As SEIT lead Woodworth is responsible for managing the program budget. She also provides technical direction and control for multi-contract programs to integrate NGC's software delivery to customers. "We specify how the system should perform and then test all the pieces to see that it does."

Woodworth's group is in the process of creating software architecture that would "let us plug and play different algorithms to optimize the results we get," she says. "We must first establish process standards and put together a step-by-step recipe for consistent and quick deliveries."

Woodworth leads a strong team of about thirty-five subject matter experts. They include software engineers, integrators and testers and former software developers. "Our team works on software deliveries from a holistic perspective," Woodworth explains. "Right now we're working twelve-hour days, seven days a week, and trying not to burn ourselves out."

Woodworth grew up in a family of engineers in Redondo Beach, CA. She got her BSCS in 1985. "CS spoke to me," she says. "I understood it."

Starting in her sophomore year at UCSB and continuing after graduation she worked for TRW, which was acquired by Northrop Grumman in 2002. After another job she returned to Northrop Grumman in 2004. While she sometimes feels like more of a manager than a technician, she tries to stay as technical as she can. "Women multitask well," she says. "The industry is heavily male, but my interpersonal skills have carried me along. New situations don't intimidate me."



Joan Sienkiewicz.

Joan Sienkiewicz: thorough and complete at General Dynamics EB

"I find flexibility in systems engineering but also structure, and that allows us to be thorough and complete in what we do," says Joan Sienkiewicz, project manager in engineering at General Dynamics Electric Boat (GDEB, Groton, CT).

Sienkiewicz is a thirty-year employee. She joined GDEB right out of MIT (Cambridge, MA), where she earned a BS in naval architecture and marine engineering in 1979.

She's spent the past eleven years involved primarily with combat weapons systems and is currently working on a \$14 billion contract for construction of eight *Virginia*-class submarines. She's part of a team of ten to twelve people heading up integration of forward electronics.

"We start with twenty-three subsystems under development," Sienkiewicz explains. "That may mean twenty-three developers representing different government agencies and responsibilities. We make sure they all talk to one another across the board."

Sienkiewicz has to resolve problems that may crop up within combat systems and other non-propulsion electronics systems. The job can include visits to Navy warfare centers, labs and shipyard test facilities, as well as working on the submarines themselves.

"We can stand in the command center and conduct all the system-level tests using stimulation and simulation equipment. Even a lot of the crew training can be done before the sub is in the water," she says.

In 1993 Sienkiewicz received an executive MBA from the University of New Haven (West Haven, CT), but "There's a lot to be said for on-the-job training and learning from different projects," she says.



Dr Sai
Kalyanarama.

Dr Sai Kalyanaraman establishes requirements for Rockwell Collins

Rockwell Collins (Cedar Rapids, IA) provides communication and aviation electronic products and services to both commercial and government customers. Sai Kalyanaraman, PhD, a senior systems engineer in navigation systems, is one of the group members working with commercial airborne global positioning system (GPS) products.

"Our group analyzes GPS system architecture for our commercial product line," says Kalyanaraman. "We are primarily concerned with the integrity of devices such as the instrument landing system, data broadcast and GPS card."

It's obviously vital for the equipment to meet industry standards. Kalyanaraman is one of the engineers representing Rockwell Collins on the Radio Technical Commission for Aeronautics, so he's both influential in establishing requirements and instrumental in making sure that Rockwell Collins achieves them.

Kalyanaraman was born in Chennai, India. He got his BS equivalent in EE and communications engineering there and came to the U.S. for a 1999 MS in EE and navigation systems from Ohio University. In 2009 he completed his PhD in EE with a navigation systems emphasis. Early in his doctoral work he spent nine months as a research intern at Honeywell Aerospace Labs (Minneapolis, MN).

Kalyanaraman considers himself a navigation systems engineer. "Rockwell Collins offers fantastic opportunities to do this!" Moving forward, he sees himself in navigation systems architecture, building systems "top to bottom."



Jennifer Logsdon.

Jennifer Novak-Logsdon enjoys challenges at AAI Corp

Jennifer Logsdon is a senior systems engineer at AAI Corp (Hunt Valley, MD). She's currently working on AAI's Shadow 200 tactical unmanned aircraft systems program for the Army. Shadow 200 can locate, recognize and identify targets some seventy-five miles away. It's operational in both Afghanistan and Iraq.

"One of my roles is to do design reviews for the program," says Logsdon. "Then, when the individual components are ready, I support the integration and make sure all of them communicate and operate with one another." She also guides the test engineering team.

"I am part of the process at each phase from initial concept through a field-ready product," she explains. "I support the entire system development lifecycle."

She has a 1992 BS in CIS from the College of Notre Dame of Maryland, and began her career at the Goddard Space Flight Center (Greenbelt, MD), working for the Hubble Space Telescope ops center. "This job opened many doors and led to many exciting adventures," she says. She went on to a 1999 masters in management from the University of Maryland, began as a contractor for AAI in 2005 and became a full-time employee in 2007.

She likes systems engineering for the chance to "be there, do it and enjoy it. The challenges make it interesting for me. I live for challenges," she says.



Sharad Mehta.

Sharad Mehta: principal systemsengineer at Goodrich Corp

"Sometimes when I take on a project I feel like systems engineering is the glue that's holding everything together," says Sharad Mehta. Mehta is a principal/lead systems engineer at Goodrich Corp (Charlotte, NC). He's part of the company's intelligence, surveillance and reconnaissance (ISR) division in Chelmsford, MA.

At Goodrich, Mehta has worked on both airborne and spaceborne ISR systems development, mainly for defense. He develops high-end cameras that take pictures of the ground from the air and from space. Mehta develops flow-down requirements for the optical, electrical, mechanical and software subsystem groups and must be sure everything all works together as a system.

Mehta grew up in India and got his BSME equivalent there. He came to the U.S. in 1988 and completed an MSME at the University of Illinois. In 1995 he got his MSEE at Purdue University (West Lafayette, IN). He's currently a distance learning student in optical sciences at the University of Arizona, Tucson.

He worked at Cummins and Rockwell Automation and joined Goodrich in 2005. "My ideal job," he says, "would be 70 percent technical and 30 percent managerial." That, of course, can be a very good description of systems engineering.



Claudia
Mowery.

Claudia Mowery: versatile at General Atomics Aeronautical Systems

"Under the systems engineering umbrella you feel like you're a mini chief engineer. You have to overcome and resolve all obstacles for your system," says Claudia Mowery. Her actual title is "extended range/multipurpose integrated lead engineer" at General Atomics Aeronautical Systems, Inc (GA-ASI, Poway, CA).

Mowery grew up in Mexico City, Mexico, and moved to the U.S. permanently in 1994. "It took me a while to get through school because I worked full-time to support myself and went to school part-time," she says. In 1999 she transferred to San Diego State University where she completed a BSME in 2001 and was class valedictorian.

As a college senior she was a work/study intern with Northrop Grumman's Global Hawk program. After graduation she worked up to mechanical subsystem engineer, then thermal analyst. In 2004 she received a systems engineering certificate from the California Institute of Technology.

In 2007 Mowery joined GA-ASI as a project engineer in the systems engineering group. Today she's integration lead for the Sky Warrior unmanned aircraft system the company is building for the Army.

Besides integrating new components into subsystems, subsystems into the vehicle, and working on a new data link and ground station, Mowery also interfaces with associate contractors, subcontractors and customers. "The key part is interacting with other companies, getting real team spirit going, and making sure there's good communication among everyone," Mowery declares.

"I've learned in this business that it's not your background that's important, it's being versatile."



Channasandra
Nagaraj.

Channasandra Nagaraj anticipates the extreme at Pratt & Whitney

As manager of engine dynamics and loads in systems engineering at Pratt & Whitney (P&W, East Hartford, CT), Channasandra Nagaraj helps guide the structural design of P&W engines. "Scenarios like bird strikes and wheels-up landings are modeled and analyzed," he explains. He works with a team of about twenty-five technical specialists.

Nagaraj was born in India, where he completed a BSCE equivalent and an MS in technical aeronautics. He came to the U.S. in 1986 and joined P&W in 1998 after working in the automotive industry. He got an MS in management from Rensselaer Polytechnic Institute (Troy, NY) in 2002.

Some of his most valuable experience, he says, came from investigating structural issues in the field. "It taught me how to work with materials groups, propulsion systems analysts, customer tech support and the program office. I consider every step in my

career as a learning experience," he says.



Elizabeth
Weaver.

Elizabeth Weaver: every R&D area of the U.S. Coast Guard

"I've already worked in every research branch of the U.S. Coast Guard R&D Center," Elizabeth Weaver declares with pride. Weaver is a project manager at the center in New London, CT.

"My responsibilities include projects on advanced communications technologies," she says.

She's proud of the work she did to support the Coast Guard's 47-foot motor lifeboat, which "conducts and executes coastal search and rescue in extremely adverse sea conditions."

Weaver was born and raised in the small town of York, ME. After high school she went to the New Hampshire Technical Institute for a year, then moved on to an apprenticeship at Portsmouth Naval Shipyard (Kittery, ME) and qualified as an equipment mechanic marine machinist.

She resigned after six years to attend Northeastern University (Boston, MA), where she completed a BSME in 1988. She has since earned MS degrees in IE in 1996 and operational research in 1997 from the University of New Haven (New Haven, CT). She's also certified by DHS as a contracting officer technical rep and has an acquisition certification as a systems planning, research, development and engineering program systems engineer. She's currently working on more certifications, in test and evaluation and project management.



Jessica
Mubaraki.

Jessica Mubaraki: master of all trades at Raytheon

Jessica Mubaraki and her sister Johanna grew up in San Diego, CA. They both work at Raytheon Space & Airborne Systems (El Segundo, CA) as systems engineers.

Jessica Mubaraki has a 2003 BS in EE and computer engineering from UCLA, and in 2008 she finished an MS in systems engineering from the University of Southern California. Before committing to Raytheon she interned at the University of Michigan, Verizon and Hewlett Packard.

In 2004 she joined Raytheon's F15C radar program antenna subsystems team. She worked on active electronically scanned array (AESA) systems which can link fighters, bombers and surveillance aircraft with service members in the air and on the ground.

Then she participated in an engineering rotation program which put her in four different departments in two years. "I wanted a systems-level view of radar design and development so I rotated from the antenna subsystems group to the radar systems engineering group," Mubaraki explains. "As a bonus, I got to work at an Air Force base with Boeing and F15 pilots."

Besides her work for Raytheon, Mubarak is college relations chair of the Society of Women Engineers (SWE). Her association with SWE began in college when she was VP of SWE-UCLA, coordinating events like Shadow an Engineer Day with Raytheon.

Mubarak knows that systems engineers have to work with many kinds of professionals, in many areas besides engineering. "Systems engineers have to be Jacks of all trades and masters of all," Mubarak says. "We tie it all together."



Tony Alfalla.

W.A. Alfalla works in aviation safety at Sikorsky Aircraft

Wilfred "Tony" Alfalla is one of only two aircraft safety mishap investigators working for Sikorsky Aircraft (Stratford, CT). He's an aviation safety operations manager, located at Sikorsky's aircraft development flight center and Florida assembly flight operations in West Palm Beach, FL. It's Alfalla's job to manage onsite aviation and product safety personnel, and manage development flight test programs for system safety, aviation safety ops, field and production safety and aviation safety investigations.

He's currently providing system safety engineering support on X2 technology and S76D helicopter flight test programs at the West Palm Beach flight test facility. "I wear many hats in systems safety engineering," he says.

One of them is undertaking aviation safety investigations and corrective actions in response to safety concerns or incidents. This work has taken him around the world. "I'm multilingual, so when a Sikorsky mishap occurs somewhere like Mexico, Colombia or Brazil, I usually support the investigative agency for that country," he says. He has provided investigation and flight operations safety support to many of Sikorsky's overseas customers, including those in hostile locations during both Gulf Wars and in Afghanistan.

Alfalla was born and raised in New York, NY; his parents are from Puerto Rico. He graduated from the College of Aeronautics & Technology (Flushing, NY) and was in the U.S. Marine Corps from 1972 to 1978, assigned as an aircrew member on the Sikorsky CH-53A/D helicopter.

After the Marines he became a Sikorsky Aircraft aviation technician/crew chief for Middle East and USN/U.S. Marine CH/RH-53 contract maintenance support. He took on increasing field service responsibilities until 1986, when "The Sikorsky Aircraft chief investigator made me an offer to transfer to the aviation safety investigations department." He's been in that department ever since.

He graduated from the University of Southern California Institute of Safety and Systems Management in 1989 and got additional training in helicopter accident investigation from the Southern California Safety Institute.

Looking ahead, Alfalla hopes to continue supporting U.S. Marine Corps helicopter ground/flight testing. "As a former U.S. Marine aircrew and Sikorsky field service rep," he says, "I have provided flight crew, technical and flight safety support on the Sikorsky CH-

53A, D, E and the Navy RH-53D. Hopefully I'll work on the new CH-53K helicopter as well."



Tamara Finley.

Tamara Finley: ethical hacker at General Dynamics C4 Systems

Tamara Finley is a certified ethical hacker. That's no joke; it's just one of the professional certifications she holds as a systems engineer in the information assurance business area of General Dynamics C4 Systems (San Antonio, TX).

"We learn how to break into computer systems using the same methods as a hacker, but we've taken an oath never to do it without customer consent," she explains.

Finley and her team test all new software for customer computing systems. This includes writing the test plan as well as actively doing the testing. Using various methods and procedures, her team looks at a computer or a network and tries to find vulnerabilities that could potentially compromise the system. "We have to be sure that what goes on the network doesn't have any holes in it," Finley explains.

The team is made up of engineers representing several disciplines, as well as Web developers and admins. Finley is also a certified information systems security professional (CISSP) and an IS security engineering professional.

Growing up in Fayetteville, AR, Finley joined the U.S. Air Force to earn money for college, working as a computer data entry specialist and, later, a Windows system admin. She joined GD C4 Systems in 1997 as a Windows system admin and then a Unix admin before getting into security.

As for the future, Finley sees the size of her ethical hacker team doubling in the next five years!



Minimol Joseph.

Minimol Joseph understands customer requirements at Bell Helicopter

At Bell Helicopter (Fort Worth, TX), Minimol Joseph supervises the systems engineering reliability group currently working on the Bell/Boeing V-22 Osprey. The Osprey, she notes, combines the vertical performance of a helicopter with the high speed and range of a fixed-wing aircraft.

"We provide technical leadership and technical analysis: reliability assessment of fuel, hydraulic, avionic systems and more," says Joseph. "We also conduct engineering investigations in the event that a part fails." When this happens, she explains, "We have to conduct a detailed investigation to uncover the root cause and take corrective action."

Joseph was born and raised in Kerala, India, received her BSEE equivalent from the University of Kerala in 1986 and spent three years helping develop power systems for the state electricity department. In 1989 she came to the U.S., worked for Lucent

Technologies, then joined Bell Helicopter in 2001.

"The more time I spent in the field, the more I realized the importance of systems engineering and the role it plays in creating high-quality products that are safe and reliable," she says.

"Systems engineers have a good understanding of customer requirements and can effectively lead a team of people with more specialized disciplines. Their contact with both customers and vendors means that everyone has a better understanding of what the others need."



Andy Pajakowski.

Cummins: meeting needs at all levels

At service engine and technologies designer/manufacturer Cummins, Inc (Columbus, IN), Andy Pajakowski, director of U.S. recruiting, notes that the company sets its systems engineers "to lead project teams to deliver new products from concept to production.

"Some of our systems/application people actually work with our customers' designers to develop the engine that best meets the customers' performance specs.

"This," he says, "requires engineers with a good balance of technical and interpersonal skills."



Rich Skelnik.

Attracting more minorities and women

INCOSE is seeing increasing proportions of minorities and especially women becoming systems engineers. "We see 10 to 15 percent women attendees at major events, and more young women are coming as well," says Dr Rhodes.

Industry leaders are working hard to make this happen. Rich Skelnik, director of talent acquisition and community relations at General Dynamics C4 Systems, says the company's talent acquisition team is focusing on recruiting systems and software engineers nationwide, "particularly those with secret and top secret clearances from the Department of Defense.

Jennifer Pollino, SVP of HR at Goodrich Corp, notes that "Goodrich is a diverse company. More than 24,000 employees at more than eighty locations around the world serve an increasingly diverse set of customers and market platforms, supported by a global supplier base. Diversity of thought, ideas and opinions can be a differentiator for Goodrich, and is necessary to maintain a competitive advantage in today's global marketplace."

Sandra Evers-Manly, VP for corporate responsibility at Northrop Grumman, says that "Diversity is a strength and an opportunity to position us for the future marketplace."

"At General Atomics Aeronautical Systems, we are committed to building and developing a diverse workforce," says Thomas J. Cassidy Jr, president of the Aircraft Systems Group.

“To sustain our current spectacular growth, we must continue to hire the best and brightest candidates.”

Robert H. Nardone, VP for HR and admin at General Dynamics Electric Boat, points out that “The U.S. Navy has relied on us for innovation for more than a century. We accomplish that by reviewing a sufficient range of ideas so that we pick the best for development. Diversity ensures that we’re looking at old problems in new ways and developing the best ideas into new capabilities.”



Anna-Maria
Gonzalez
Palmer.

AAI HR VP Anna-Maria Gonzalez Palmer says that “AAI’s commitment to customers and focus on innovation have been well served by our collective drive for diversity.”

“At Pratt & Whitney, having a diverse and inclusive workforce translates into tremendous value for our employees and our customers,” says Elizabeth Amato, HR VP.

D/C

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