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McGowan Wins the 2000 Lawrence Sperry Award

Alberto Ayala, Member-at-Large, AIAA Young Professional Committee

The AIAA Young Professional Committee presents the annual Lawrence Sperry Award to a young member for his or her notable achievement in the field of aerospace. Notable past recipients include **Eugene Kranz, Sheila Widnall,** and **Sally Ride**. This year, we are proud to honor **Anna-Maria Rivas McGowan,** a NASA scientist who specializes in smart materials and smart structures.

Young Professional Committee (YPC): Give us some background information about yourself.

Anna-Maria R. McGowan (AMRM): I was born and raised in the Washington, D.C., area and I'm a first-generation American. My parents were born and raised in the Caribbean in the twin-island country of Trinidad and Tobago. Having that cultural background has made a wonderful impact on my life. It gives me a different view of things in general. I did my undergraduate work at Purdue University and my M.S. work at Old Dominion University part-time while working full-time at NASA Langley Research Center [NASA LaRC]. I enjoy variety in my job and outside of work. I am a wilderness backpacker and a runner.

YPC: You work for NASA LaRC as an aerospace technologist, and your work involves working with smart structures. What's the most interesting aspect of your work?

AMRM: It's so new. When we try these smart materials on aerospace structures, we're pushing the envelope, developing new theories and shifting traditional approaches to engineering. It's always fascinating and it's always a challenge. I enjoy it because it's unique; no one else is doing it.

YPC: So you like to be at the forefront of technology?

AMRM: Why not! That's what makes it fun and challenging. Also, it takes a lot of different engineers to do work in smart structures. You need engineers that specialize in materials, structures, dynamics, controls, flow, etc., so I really enjoy the feedback from all the different groups of people. It's an excellent learning experience.

YPC: Can you define a smart structure?

AMRM: A smart material or a smart structure is a material that responds in a reproducible manner to stimuli. For example, if you put electricity or heat on it, it will move, expand, contract, or put a force on something in a repeatable manner.

YPC: You have worked on the world's most advanced wings with embedded smart materials. What was your role?

AMRM: There are two main programs that I have been involved in. One is the "Smart Wing" program. It is a collaborative effort with DARPA, USAF, and Northrop Grumman as a lead contractor. My role is to serve as the NASA lead on that project and as the test engineer for the wind-tunnel testing. The other project is the "PARTI" program that was tested several years ago. I was the co-lead on that project.

YPC: How many people at NASA are involved in smart structures?

AMRM: I believe approximately a couple hundred people. It's a relatively small group, but it is growing and expanding greatly. The number of people that are involved in this area in the country is also expanding dramatically. Many universities are now offering graduate classes in this area.

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YPC: So you predict significant growth in this area?

AMRM: Absolutely. I think they're going to be similar to composites where they're not going to solve all of the problems in aerospace, but smart structures will probably find a unique niche where they are going to be very useful. They have a lot of very unique technical capabilities. And, certainly, there are problems with them; for example, they are difficult to model in some areas.

YPC: Would you like to add any information about the two advanced wings you worked on?

AMRM: Both projects were designed to demonstrate the unique capabilities of smart materials in wind-tunnel testing. The wind-tunnel models designed and tested were very unique and the first of their kind. They demonstrated capabilities that many had previously predicted would be impossible. They involved such things as reducing wing vibration without moving mechanical parts and wing warping for better aerodynamics.

YPC: How long did this effort take?

AMRM: The "Smart Wing" program has been going on since 1997 and is currently in phase two. It will be completed next year. The "PAKIT" project went on for about five to six years.

YPC: And then?

AMRM: We are planning to build more demonstration models of smart aerospace structures that are more complex, have more smart materials and sensors on them, and use some of the best technology available today. This, to me, is an exciting challenge.

YPC: When do you expect to see smart structures in real applications?

AMRM: Well, they are already used in some simple applications; for example, piezoelectric materials have been used in accelerometers for decades. In terms of aerospace applications, they will probably be used first as a passive means for control.

YPC: Recently, NATO recruited you to teach in Portugal. What was that experience like?

AMRM: It was a lot of fun and a really unique experience. The students spoke, of course, Portuguese and I don't speak the language. So I taught the classes in English and I spoke slowly in simple words that the students could translate quickly. The students were new to the area of smart materials and structures and aeroelasticity and were fascinated by these subjects. Their enthusiasm helped me greatly in teaching. They were very welcoming. The second time I was in Portugal, I taught in a very small and remote town about five hours from Lisbon in the mountains. That experience was even more extraordinary. It was a much smaller and close-knit community, so the students were very knowledgeable and proud of their history. I learned a great deal about the Portuguese culture.

YPC: Would you do it again?

AMRM: Absolutely. NATO takes a proactive effort to help countries increase their technical abilities by sending consultants and teachers. I had never taught a class before, so this was new to me. Taking the information that I use everyday at work and putting it into a concise fashion that someone else can understand was a challenge. I learned a lot by teaching—probably as much as they did, yet from a different perspective. Also, as a usually extroverted and energetic person, teaching was a unique and enjoyable way to interact with a large group of people.

YPC: How did you become interested in aerospace engineering and, specifically, smart structures?

AMRM: Growing up, I lived near a large airport and enjoyed watching the airplanes take off and land. My first aspiration was to be a pilot. I found it very fascinating. But then I became more interested in the challenge of understanding the vehicle, itself, and designing new airplanes. After a high-school report on aerospace engineering when I was thirteen, I was hooked. I knew exactly what I wanted to do.

Getting into smart structures just happened for me. It was a formative area and my boss, Dr. Thomas Noll, thought it was a good area for a young person to get involved in because it was evolving. It was an opportune time to learn.

YPC: Can you discuss your involvement in outreach activities for NASA?

AMRM: I really love working with kids. I had a lot of people who inspired and encouraged me to pursue my career and there were a few people who really made a big difference. So I enjoy getting back out and encouraging kids, particularly minorities and women, to help them understand that you can do this too—that this [engineering] is within their capabilities. I was involved in the Pre-college Commiitee in the AIAA Hampton Roads Section for several years. We went to a number of school classrooms and designed classroom demonstrations for others to use on school visits. That was fun and rewarding. I also did some recruiting for NASA for the co-op program when I was an undergraduate student. And I have been involved with the Society of Women Engineers (SWE) and some of their outreach activities. Also, the National Technical Association (NTA), which is a minority, professional technical society, does recruiting to encourage minority students, and I have enjoyed working with them as well. I think encouragement to young students is needed

They are our future. And very often, for many kids, engineering is not even presented as an option for their futures. Some have never even heard of engineering.

YPC: NASA senior management invited you to present a model for recruiting and retaining women and minorities in engineering. Can you elaborate on this?

AMRM: Sure. One of the biggest inspirations in my life was my mother. She is a human resources director who started out working for an engineering firm. Part of her job was to recruit minority engineers and she gave me lots of great tips. As a co-op student at NASA LaRC, I learned that NASA was looking for minority students. As a minority student myself, I found that many companies and agencies such as NASA were concerned that they couldn't find qualified minority engineering students—yet many failed to look in the right places or try some simple techniques; for example, having minority recruiters and people that love what they do so that their natural zest for their careers can attract students. In talking with some of the human resources people at NASA LaRC about this, they were very receptive. From there, I developed a model and presented it at several administrative conferences. NASA is actively using some of the suggestions. Many of the things suggested were simple, but perhaps not necessarily obvious to the general population. Other suggestions included advertising in minority newsletters, such as in the *Society of Hispanic Professional Engineers* (SHPE), *National Society of Black Engineers* (NSBE), or in the *SWE* newsletters or talking directly to the minority engineering program (MEP) directors at the universities.

YPC: You are a Senior Member of AIAA. How has your involvement in the Institute benefited your career?

AMRM: It has introduced me to other parts of the industry that otherwise I would not be aware of. My work is in structures, and through AIAA, I have learned more about controls, aerodynamics, fluid mechanics, etc. I've also been able to interact with other engineers through events in our local section.

YPC: What advice would you give young students to encourage them to pursue engineering as a career?

AMRM: I would tell them to make sure they enjoy it. If they like math and science, or a certain area like cars or bridges, then go toward where their interests pull them. I would also encourage them, as they study engineering, not to focus solely on the bookwork. There are other things, such as leadership, communication skills, and being able to work in a team, that are crucial to being an effective engineer. Often, I think many students overlook these needed skills and forget that you must also be well rounded. In addition, I believe that faith in God is essential.

I had a lot of positive encouragement, which was very important in developing my career. My bosses, Dr. Tom Noll and Mr. Boyd Perry, for whom I have worked for seven years, have been very encouraging and they expect high quality work from me. I think it's very important to have challenging assignments that allow you to grow professionally and to have positive encouragement to do so. My parents have also been a wonderful and invaluable resource. When I mentioned I wanted to be an engineer, they encouraged and supported me the whole way. My entire family has been very supportive. This is very helpful for anyone pursuing a challenging career, but particularly for women and minorities because there aren't very many in the engineering field. I think encouragement is needed, especially for women and minorities, because I certainly did not always have positive encouragement. Many suggested that I was not in the right field or that I wasn't qualified to do it. This sort of negative [reinforcement] is, unfortunately, still out there. I think that not only AIAA, but also SWE, NSBE, and the MEP's at various universities were very important components of my education because I learned so much through those programs and organizations. I learned how to write a resume and how to interview; I learned leadership, team building, organization, and time management skills, which are tools that I still use today and that I will use for the rest of my career. I think my involvement with these organizations was one of the most important things I did as an undergraduate student.

YPC: What does the Lawrence Sperry Award mean to you?

AMRM: I am incredibly humbled. I am honored to be among [previous winners] that, to me, are incredible. And I feel somehow undeserving. I really do. Some of the people I work with at NASA and outside of NASA are brilliant. And I feel like I am just doing my job the very best I can. The award was a shock to me. I am incredibly flattered and humbled and honored. The awards from AIAA are a tremendous encouragement. One colleague said to me "You know, we all work really hard and it's nice, for once, for someone to say 'good job, well done, keep going!'" Sometimes you need that encouragement. And to acknowledge the efforts of young people in a field where most award winners are more senior, I think is really important and positive. ✦

Alberto Ayala received his Ph.D. in aerospace engineering from the University of California, Davis in 1997. Currently, he is an assistant professor in the Department of Mechanical and Aerospace Engineering at West Virginia University. He is a current Member-at-Large of the AIAA Young Professional Committee.