Alicia Williamson

STEM Research Area:

Engineering has always been an interest of mine since I was a little girl. While searching through the videos on the Naval Horizons page my eyes stopped on “Fluid Mechanics with Dr. Karen Flack.” I decided to watch the video because I wanted to learn about something I am not familiar with and it seemed interesting. Fluid mechanics is the study of fluid but mainly the forces caused by them, Dr. Flack studies drag and predicts as it pertains to how much drag is in the moving system by doing various experiments. An example is measuring how much drag there is on a ship, measuring the ship’s surface texture like the paint job on the ship and barnacles are significant. Measuring these components is important to the Navy and Marine Corps of today because it affects the cost of fuel and the ship’s performance. This topic inspired me because I hope to one day become a Mechanical Engineer, fluid mechanics, thermofluids, and thermodynamics is a big part of mechanical engineering. We are surrounded by fluids and fluid flow can be noticed in our everyday lives as we look at the ships vessel and illustrated by this article, Modeling breaking ship waves for design and analysis of naval vessels by Gabriel Weymouth, Kelli Hendrickson, Dick KP Yue, Thomas O'Shea, D Dommermuth, Paul Adams, Miguel Valenciano. The article talks about robust stimulation and steep waves, these two challenges circle back to fluid mechanics, I quote. “One of the remaining challenges involved in modern naval ship design and analysis is to account for the effects of breaking waves, spray and air entrainment on the performance and non-acoustical signature of a surface ship. The near field flow about a surface ship is characterized by complex physical processes such as: (i) spray sheet and jet formation; (ii) strong free-surface turbulence interactions with (large-amplitude) breaking waves; (iii) air entrainment and bubble generation; and (iv) post-breaking turbulence and dissipation. The challenges associated with this task are twofold. The first is robustly simulating the large-scale problem which involves the flow about an entire surface ship. The second is the development of physics-based closure models for steep breaking waves in the presence of turbulence.”

Modeling breaking ship waves for design and analysis of naval vessels G Weymouth, K Hendrickson, DKP Yue, T O'Shea… - 2007 DoD High Performance Computing …, 2007

People:

The engineer that inspired me was Dr. Karen Flack with Fluid Mechanics, because she is a woman in STEM and we have something in common, a love for science and math. Dr. Flack loves STEM because she “likes to figure out how devices, gadgets and items work, it is the same reason why I love STEM. I look up to her and what she does because you can tell she’s passionate and dedicated to her work, studying fluid mechanics but also giving back and teaching at the US Naval Academy. Dr. Flack studies fluid flow using wind tunnels, toe tanks, and flow channels. Dr. Flack takes the data information she gets, she sends it to another group of people to do a computer simulation on the same experiment and hope to get the same results. This inspires me because it shows how many parts it takes to solve a problem, improve inventions, and complete a project flawlessly. This aligns with my career goal because mechanical engineers study fluid mechanics, when designing a machine that has flow the engineers job is to know how the liquid will operate in relation to the machine. I enjoy STEM because it gives me a road to travel through Engineering, I went from making a 20 piece Lego set as a five year old child to a 4,500 piece Lego set and beyond to designing a mask like the N95, a Space Shuttle to travel to Mars, a Sea Perch as a movable robot in water, a Moveable Classroom and, designing engineering drawings using Solid Works as a teenager. STEM is ground breaking, creative and modern. By using my

engineering mastery, I was able to develop more STEM skills. Dr Flack's work on Fluid Mechanics gives me the will to work in the STEM field because it impacts millions of people everyday. Engineers are part of the reason the world is changing and I want to be part of the change. Engineering activities in school and extracurricular activities helped shape, develop and influence me to thrive in the STEM field.

Future:

In the next 15-20 years new innovative technology can aid the Navy and Marine Corps in every aspect. In the year 2040 technology will advance by Artificial Intelligence (AI), Telecommunication will advance to high speed, and Biotechnology will move fast forward in the world as it relates to customized applications. I can imagine the Navy becoming more significant as it designs and develops its vessels for the future. Both the Navy and Marines will embrace 4D printing, Smart Dust for large information or areas like land and sea, and Digital Twin in the waterways of the world for research and security to name a few. The new and innovative future technology will enable all of us to intelligently plan a smarter world through STEM.