IFP INTERVIEW

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In 2022, Karolyn Steranka applied for the IWMA Young Talent Award and came third. Her master's thesis deals with the protection of aircraft hangars. Initially, it had not been her plan to go into fire protection engineering. Here IFP Magazine interviews Karolyn.

From where does your interest in fire-safety engineering derive?

Unlike many people in fire-safety engineering, my older sister is actually a Fire Protection Engineer and introduced me to the industry. Originally this was a deterrent as I did not want to feel as though I was following in her footsteps;

▼ **Celebrating Karolyn's M.S graduation at the iconic McKeldin Mall at the University of Maryland.**

however, I quickly realized the fire-safety-engineering world is big enough for us both and that I actually have a huge benefit being able to collaborate with her on complex fire-safety issues. She connected me with Dr Milke and the Fire Protection Engineering Department (FPE) at the University of Maryland (UMD) during my freshman year of college. Through these connections I was able to quickly learn about the incredible and widespread opportunities within the industry. I was fascinated by the fundamental dynamics behind fire and the overall goal of fire-safety engineering to protect the general public, and I joined the program sophomore year.

On your first day at university, did you know that you would be writing your master's thesis about watermist?

Definitely not, I started out as a computer science major with no vision of my future. As mentioned previously, I ended up transferring into the FPE department sophomore year and slowly increased my presence within the department. During junior and senior year I became heavily involved with the FPE department at UMD by joining the Society of Fire Protection Engineers and being elected the President of the Fire Protection Honors Society. Through these opportunities I learned about the benefits of a master's degree and became interested in how I could contribute to the overall industry.

The University of Maryland – where you have studied – is a very popular, old and traditional institute. What were your reasons to study there?

UMD is a highly ranked university for a multitude of majors and is located close to where I grew up in Ellicott City, Maryland. Since I was mostly undecided on a major entering into college, I liked the flexibility in majors and knew regardless of what I ended up majoring in, I would walk away with a highly regarded education for the future. This also ended up providing me with the opportunity to major in FPE, which is only available as an undergraduate major at UMD. However, what I really love about the school is the warm, friendly feeling of campus, despite having over 20,000 diverse undergraduate students. Growing up I attended small schools with like-minded people – I loved the diversity of the student body at UMD, which I saw as a great opportunity to grow personally and learn new perspectives.

Have you been to other universities? Or have you carried out other activities during, before or after your time at the University of Maryland to amplify your knowledge of firefighting?

I received both my bachelor's and master's degrees from UMD. Although I have not attended other universities, I have had very unique experiences within UMD through the Sophomore research project and through an internship, both of which increased my knowledge in fire engineering. The sophomore research project allowed me the opportunity to get hands-on fire lab experience in collecting heat release rate data for development of an FDS model. My internship at Boeing provided me the opportunity to work side by side with the Boeing fire department to understand unique aviation hazards and their direct relation to fire safety. These two experiences were merged with the watermist industry in my graduate research to amplify my understanding of fire suppression.

How was your interest in water mist aroused?

Prior to entering graduate school, I did not have much experience with watermist. I really became interested in watermist through the opportunity to work on this research project with the Airforce. During the feasibility phase of my research, I delved into research studies and papers about the success of watermist for protection of car passenger tunnels, aircraft hangars in Europe, and many other unique installations. I am interested in complex topics within FPE and the flow patterns and small-scale dynamics of modelling watermist produce a unique challenge which fascinated me.

What do you think are the great advantages of the watermist technology?

I am passionate about sustainability and protecting Earth's resources, which influences my opinion on watermist technology. Personally, I think one of the greatest advantages of watermist is the water savings through efficient cooling dynamics due to the high surface-area-to-volume ratio. Watermist is able to fight a fire through multiple complimenting extinguishing mechanisms. Watermist targets cooling the flame region as opposed to traditional sprinklers which utilize high quantities of water to wet the fuel surface and adjacent surfaces to prevent the fire from spreading.

How was the time during which you wrote your thesis? How will you look back at it in years to come?

I am incredibly grateful for my time spent writing my thesis. I learned a lot about fire dynamics, watermist, technical writing and general organization. I had the opportunity to connect with many professionals in the global watermist industry, including FDS specialists, manufacturers and researchers. The lessons that I learned and connections I made while writing my thesis will stay with me forever.

What do you think the future of watermist will look like?

I think the future of watermist is promising and it has the potential to become widely used in the future. Currently, watermist designs are not as common in the commercial industry as traditional sprinklers; however, I think decreasing water supplies, increased acceptance of performance-based design, and continual research into watermist extinction mechanisms may create a greater interest in watermist in the near future. Additionally, watermist has exceptional cooling abilities and extinction mechanisms, which are continually being researched in order to develop more efficient and effective systems in the future.

What are your personal plans for your future regarding your career?

I am currently employed at Jensen Hughes in New York, NY, where I have the opportunity to work with subject-matter experts in a wide variety of fire-safety disciplines. In 2022, I had the opportunity to present at both the SFPE and SUPDET conferences about my watermist research and a pathfinder analysis from work completed at Jensen Hughes. In the future I plan to continue being involved in the fire-safety industry and want to continue being involved in cutting-edge issues within the industry.

Will watermist be a part of your future?

Through my research publication I have been able to connect with other watermist experts around the world. Although I am not currently working in the watermist industry, I think there is a lot of potential to collaborate with professionals in that industry. Recently, I had the opportunity to connect with a Jensen Hughes colleague in Milan and am hoping to become involved in emerging watermist projects in the area. I will continue sharing my knowledge in modelling watermist gained through my thesis experience.

▲ **Karolyn with Dr Milke, chair of the Fire Protection Engineering at UMD.**

For more information, go to www.iwma.net

Feasibility Analysis and FDS Modeling of Water Mist Fire Suppression Systems for Protection of Aircraft Hangars

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Concern about the possible impact of PFAS associated with AFFF uses in the Air Force's firefighting mission motivated a two-phase feasibility and CFD analysis of watermist systems for the protection of aircraft hangars. Phase I involved a literature study of COTS watermist technologies which identified seven watermist systems with the potential for success in extinguishing large jet fuel spills in aircraft hangars. Phase II utilized a computational fluid dynamic model, Fire Dynamic Simulator (FDS), developed by NIST to evaluate the performance of three watermist nozzles identified in Phase I. The three nozzles included a ceiling-mounted low-pressure nozzle (Nozzle A), a floor-mounted low-pressure nozzle (Nozzle B) and a ceiling-mounted high-pressure watermist nozzle (Nozzle C). A series of validation simulations was completed to verify the combustion, pyrolysis, radiation, evaporation, lagrangian particle, and extinction models in FDS for the development of a comprehensive full-scale simulation. The results of Phase II determined key parameters in modeling extinction with watermist nozzles in large spaces, which include gas phase grid resolution for air entrainment into the watermist pattern, DROPLETS_PER_SECOND, and PARTICLE_CFL. Full-scale simulations modeled a 26m x 26m x 12m hangar with a 12m x 24m JP-8 jet fuel spill, and a deluge watermist design. The simulations evaluated the impact of detection and activation times for the effectiveness of watermist. The results found the high-pressure mist system (Nozzle C) was able to extinguish the fire and earlier activation times lead to less damage to the aircraft and hangar compartment.