STORIES OF SUCCESS
WOMEN ENTREPENEURSHIP CHALLENGE 2017

"WE HAVE A REVOLUTIONARY TECHNOLOGY THAT COULD CHANGE THE WAY THE GLOBAL AVIATION INDUSTRY WORKS."

Dr. Sarah Qureshi
Founder and CEO
Aero Engine Craft (Pvt.) Ltd.

The soft-spoken Dr. Sarah Qureshi is a qualified Aerospace Engineer with a passion for aviation and flying. She holds Ph.D. degree in Aerospace Propulsion and a master's degree in Aerospace Dynamics. Sarah's father, Masood Latif Qureshi, is an inventor and a scientist with decades of experience while her mother, Dr. Rumana Qureshi, is a Chemistry Professor. Sarah recalls that the family "had very scientific discussions at the dinner table... My parents shared their interests with us," says Sarah, "And now my six-year-old daughter accompanies me when I'm travelling or delivering lectures; there's a lot of invisible learning going on."

Sarah decided to become a mechanical engineer and was the only girl in her class at the National University of Science and Technology, Rawalpindi. "It was not easy," she says, "But my family and teachers were supportive and that gave me the confidence and courage that I needed to go on." After graduating, Sarah worked for the automotive and engineering industry in Pakistan. Meanwhile she started taking flying lessons and obtained her private pilot license. She won a scholarship to study for her Masters at Cranfield University, a hub of aerospace research in the United Kingdom. After returning to Pakistan in January 2009, Sarah got married a couple of months later, in March. She went back to Cranfield University to study for a Ph.D. in 2010. She also continued with her interest for flying and learnt acrobatic flying while at Cranfield.

Sarah's daughter was born during her M.Phil. studies and she was granted permission to do her research work back home in Pakistan. Her research question focused on the subject of jet engine contrails and their environmental impact.

Water vapour and Carbon-di-oxide are the two main combustion by-products in engine fuel burn. For aircraft cruising at high altitudes, when this water vapour is released into the cold atmosphere as engine exhaust emission, it freezes into an artificial cloud known as a "condensation trail" or" contrail" for short. It is visible as a trailing white line of vapour behind an aircraft.

These artificial clouds affect the Earth's radiation budget by either reflecting sunlight back to space or by trapping infra-red emitted by the Earth and hence contribute to the greenhouse effect. Scientists estimate that their contribution to the aviation induced global warming is at least five times that of carbon-di-oxide.

At the time, most ongoing research in the field focused on contrail mitigation or avoidance. Sarah followed another line of enquiry, working on the research question with her father, Masood Latif Qureshi who invented a device that eliminates contrails at source. The device condenses water vapour into liquid water within the engine that can be carried on board the aircraft, to be discharged later. The aim is contrail capture, rather than suppression. "This work is ahead of its time; it is a first attempt to create water within an engine during flight," says Sarah. 'We have a revolutionary technology that could change the way the aviation industry works."

One advantage of the device is that it does not require modification and can simply be added on as an attachment to any jet engine. In an age of water scarcity, it can also help to mitigate shortages, as the liquid on board can be discharged as artificial rainfall.

Dr. Sarah Qureshi developed a complete engineering model for the device as part of her Ph.D. thesis. After completing her Ph.D., she, along with the inventor of the technology has set up Aero Engine Craft (Pvt.) Ltd. to launch the device on a commercial scale.She realized the project needed financial support and the development of a business model in order to move ahead. Sarah's husband, Asim Naseer, is a Lahore University of Management Sciences (LUMS) MBA graduate and thought it would be a good idea for her to train at the National Incubation Centre (NIC) – Lahore established at LUMS for the commercial aspect of the project. Sarah recalls coming across a Karandaaz announcement about the Women Entrepreneurship (WEC). She applied for and won a place in the WEC at NIC - Lahore. "Coming from an engineering background," she says, "There were a lot of business elements I had to learn and the programme provided that environment and formal training."

"We aim to create business value for the market players," says Dr. Sarah. "A lot of work has been done on emission trading and carbon trading by the aviation industry. They could have a similar model for contrail trading." She is confident that the industry will be inclined to adopt a device that is easy to manufacture and does not require it to change all its parameters.

The design and engineering model for the device are ready. Patents have been granted. Now the company needs to prototype the device, develop the technology and test it. The father-daughter duo hopes to partner with global engine manufacturers and airframe manufacturers to test the device on commercial aircraft engines. Businesses are now focused on clean technologies and there is huge potential for sales, considering the number of aircraft in the skies. "Whatever contribution we can make to save our planet for ourselves, and our future generations is important, we must go ahead with it," says Dr. Sarah Qureshi as she moves ahead with her mission.