

2020



AMELIA EARHART FELLOWS

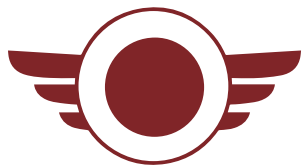
**Expanding opportunities for
women in aerospace engineering
and space sciences**



In an effort to carry out its mission that women have access to all resources and are represented in decision-making positions on an equal basis with men, Zonta International offers the Amelia Earhart Fellowship.

The Amelia Earhart Fellowship was established in 1938 in honor of Amelia Earhart, famed pilot and member of the Zonta Clubs of Boston and New York. The US\$10,000 Fellowship is awarded annually to up to 35 women pursuing Ph.D./doctoral degrees in aerospace engineering and space sciences.

Read to learn about Zonta International's 2020 Amelia Earhart Fellows.



2020 Amelia Earhart Fellow

Katiyayni Balachandran



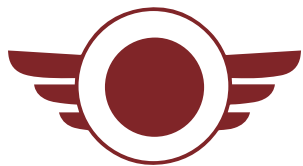
Citizenship: Canada

Proposed Program: Aerospace Engineering at the University of Texas Arlington

Ms. Balachandran's Ph.D. research goal is to better understand Triton, Neptune's largest moon. She is investigating the prediction of Triton's atmosphere expansion to uncover the secrets behind the evolution of icy objects in the solar system, including large moons, small Kuiper belt objects and dwarf planets that might share a similar history.

Ms. Balachandran's research will focus on shape modelling and attitude estimation of Resident Space Objects using photometric light curves. A light curve is the reflected brightness off an object as recorded by the observer over a duration of time. She will use data from known space objects like asteroids and spent rocket bodies to refine her techniques for classification of these objects by their shape and size. This work involves signal processing and filtering techniques and application of these techniques to Triton will include consideration of use of multiple operating probes to provide in-situ simultaneous measurements. The probes will gather data on temporal atmospheric changes and light curves, and elliptical models will be used to quantify the distortion required to reproduce the measured light curve. The result of this work will be a 3D atmospheric model of Triton.

Ms. Balachandran would like to follow a career in surveillance and security to mitigate the risk of collisions of space objects in near-Earth orbits. She is inspired by the recent announcement of Canadarm 3 for the Lunar Gateway Program and would love to inspire and encourage women to pursue careers in STEM. Ms. Balachandran is classically trained in Indian Carnatic vocal music and is an active member of a local Women in Science and Engineering chapter, and the Salvation Army.



2020 Amelia Earhart Fellow

Akanksha Baranwal

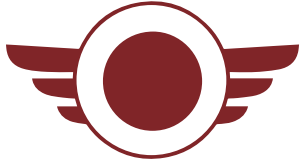


Citizenship: India

Proposed Program: Aeronautical Engineering at Texas A&M University

Ms. Baranwal's Ph.D. research will contribute to the development of hypersonic flight capabilities for civilian and military aircraft. Her goal is to better understand the fuel-air mixing in supersonic combustion and the thermo-mechanical loads associated with processes occurring in the boundary layer. She will use direct numerical simulation (DNS) techniques to solve the exact equations of fluid motion and study the details of the boundary layer in hypersonic flight. These boundary layers are generally at very high temperature and turbulent, leading to extreme drag and surface heating – two substantial challenges in hypersonic flight. Turbulence is a highly non-linear unsteady state of fluid motion that is extremely complex, and this complexity increases at elevated temperatures due to the activation of molecular energy modes in thermal non-equilibrium (TNE). In this state, the molecules are not in thermodynamic equilibrium, and understanding their interaction with turbulence is critical to the successful development of hypersonic systems. Once understood, the TNE-turbulence interaction can be used to explore new avenues for flow control that can reduce the extreme thermo-mechanical loads experienced in these systems. This could result in a game-changing strategy in the aerospace field.

Ms. Baranwal intends to pursue a career in academia, and to continue to contribute to the development of novel computational methods in high speed flow and advanced propulsion systems. She is an active member of Toastmasters and Women in Science and Engineering (WISE), and is an officer of her university's happiness program where she coordinates activities about mental well-being and stress management.



2020 Amelia Earhart Fellow

Elizabeth Benitez



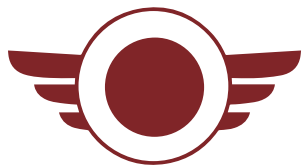
Citizenship: United States

Proposed Program: Aerospace Engineering at Purdue University

Ms. Benitez's Ph.D. thesis focuses on developing a fast, non-intrusive optical technique to better understand transition in hypersonic flow. In particular, she is focusing on understanding flow instabilities that are common at control surfaces. Previous techniques of understanding flow instabilities are limited in the extent to which they can measure the flow, and in the accuracy of their measurements.

Ms. Benitez will develop a Focused Laser Differential Interferometry (FLDI) technique to obtain high-speed, spatially resolved measurements of density fluctuations in the flow off the control surface within Purdue University's quiet wind tunnel. This technique will provide more accurate results as it reduces the impact of the boundary layer of the wind tunnel on the desired measurements. She has designed and constructed a version of the FLDI model to work on the hypersonic tunnel's unique geometry and has validated the performance of her model. The next stage of her work involves running two models, taking surface pressure fluctuation and heat transfer measurements and introducing a controlled disturbance into the flow. This will allow her to better study the entire flow-field and to observe the effect of those perturbations. She will compare her experimental work with other researcher's computations and develop a measurement capability that is fully qualified and that can be used in future research.

Ms. Benitez's goal is to become a Subject Matter Expert in hypersonics, and work for the U.S. Air Force conducting fundamental research in experimental hypersonics. Ms. Benitez enjoys reading science fiction and fantasy novels and plays the flute and piano. She has also served as a judge at local high school science fairs.



2020 Amelia Earhart Fellow

Anne Bennett



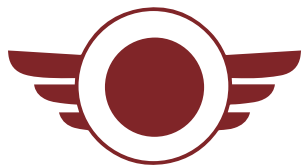
Citizenship: United States

Proposed Program: Aerospace Engineering Sciences at the University of Colorado Boulder

The aim of Ms. Bennett's Ph.D. thesis is to better understand orbital debris by developing accurate models and risk assessments for un-trackable debris. Orbital debris is an emerging research area since its increasing population threatens space missions. There have been several strikes on active missions, and anomalous events plausibly caused by debris. This debris is too small to track ($<10\text{cm}$) but large enough to damage a satellite ($>1\text{cm}$). Current models and methods for predicting debris are conservative and inadequate.

Ms. Bennett is working with NASA to develop algorithms to detect subtle debris strikes in spacecraft telemetry. She is leveraging sophisticated change detection algorithms to identify and assess these strikes, and her preliminary work has detected several strikes on operational NASA missions. She has also observed unexpected behaviors, indicative of complex interactions between spacecraft and the environment. Her research will provide a revolutionary capability to use any active spacecraft as in situ debris sensor. Her work aligns perfectly with her professional goal of developing technologies to enhance security for space operations.

Ms. Bennett is active in school outreach programs and is passionate about supporting women in STEM careers. She enjoys playing ice hockey, hiking, backpacking, rock climbing and skiing.



2020 Amelia Earhart Fellow

Valerie Bernstein



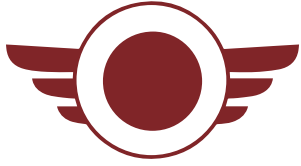
Citizenship: United States

Proposed Program: Aerospace Engineering Sciences at the University of Colorado Boulder

The main goal of Ms. Bernstein's Ph.D. research is to better understand the sources of uncertainty associated with satellite drag in Low Earth Orbit (LEO). Her aim is to mitigate collision risks and protect space-based technology in the increasingly crowded LEO region. Uncertainty primarily comes from estimates of the thermospheric mass density and the spacecraft drag coefficient. Historically, the primary focus of research in this field has been on estimating mass density, while the drag coefficient is treated as a fixed value.

Ms. Bernstein's research will focus on improving the current physical drag coefficient estimations by evaluating the different assumptions that go into modeling the energy and momentum exchange between the satellite surface and the atmosphere. She will validate her drag coefficient model assumptions by comparing densities derived from satellite drag measurements for satellites of different shapes orbiting in the same space environment. The offsets in the derived densities will be attributable to inconsistencies in the density coefficient model. Her preliminary work provides insight into the physics of the density coefficient modeling and the limitations of the current models. Future work will investigate other sources of uncertainty including understanding the variability of the Earth's upper atmosphere.

Ms. Bernstein's passion is to promote engagement with and accessibility of space science and engineering, especially for non-technical or younger audiences. She actively promotes science communication and outreach as a director of her university's STEMinar, an organization which hosts graduate student research talks from any STEM discipline. She is also active in a Women in Science and Engineering organization.



2020 Amelia Earhart Fellow

Sriramya Bhamidipati

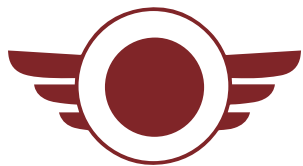


Citizenship: India

Proposed Program: Aerospace Engineering at the University of Illinois at Urbana-Champaign

Ms. Bhamidipati's Ph.D. research is on development of robust navigation solutions for Unmanned Aerial Vehicles (UAVs) operating in urban areas. Global Positioning System (GPS) signals can be blocked and/or reflected by dense urban infrastructure and can thereby lead to potentially large localization errors. To ensure safe UAV navigation, it is critical to address not only positioning accuracy but also confidence in accuracy termed as integrity. Her research utilizes formal methods and optimization techniques to characterize the measurement error modalities and to compute the statistical position error bound that complies with the integrity standards prescribed for urban UAV navigation. She is particularly interested in investigating the safety guarantees for the sensor fusion of GPS and camera on-board a single UAV, and a connected multi-UAV network each mounted with a GPS receiver.

Ms. Bhamidipati enjoys spending time with her family and friends. She likes to volunteer for non-profit organizations, teaching mathematics and English to kids. Her hobbies include traveling, reading, and playing the piano.



2020 Amelia Earhart Fellow

Celia Chari



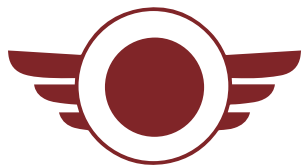
Citizenship: Canada and Spain

Proposed Program: Materials Science at the California Institute of Technology

Ms. Chari is pursuing a Ph.D. in Materials Science at Caltech, collaborating with NASA's Jet Propulsion Laboratory. Her doctoral research focuses on ceramic coatings, specifically protective and self-healing coatings that are considered for use on thrusters in electric propulsion systems. Hall-effect thrusters require a dielectric such as boron nitride (BN) that has good thermal emissivity, is chemically inert and is resistant to thermal shock; however, the brittle nature of bulk BN poses challenges under dynamic loads, such as the launch environment, where the stiff material is subject to vibration and strain that can lead to catastrophic failures. Graphite is a less expensive and more compliant (less stiff) alternative to bulk BN, with a greater resistance to thermal shock and excellent thermal emissivity.

Ms. Chari's research proposes a new concept for inclusion of a dielectric through use of BN coatings on graphite. In this way, the most desired properties for thrusters can be combined into a single composite material. Ms. Chari uses high temperature carbothermic reactions (taking place at 1600°C) to synthesize the BN coatings. In her research, she evaluates the composite by using chemical characterization methods (e.g. x-ray diffraction, energy dispersive x-ray spectroscopy), imaging methods (e.g. optical microscope, scanning electron microscope, transmission electron microscope) and electrical and mechanical tests (e.g. resistivity measurements, fracture tests, thermal shock tests). She is particularly interested in the environmental degradation of the composite in space, and in coupling the material with oxides to make novel self-healing ceramics.

Ms. Chari enjoys painting with watercolors and acrylics, binding books, visiting museums in Los Angeles and tasting cuisines from around the world. Ms. Chari is involved in a number of organizations for women in science, including the Society of Women Engineers.



2020 Amelia Earhart Fellow

Laura Chaves



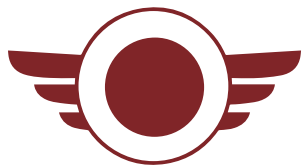
Citizenship: Colombia

Proposed Program: Planetary Sciences at Purdue University

Ms. Chaves' thesis work focuses on understanding how space weathering affects sulfide and iron oxide minerals through both returned sample analyses and laboratory experiments. Space weathering modifies the chemical and micro-structural properties of grains on the surface of planetary bodies that lack atmospheres making the characterization of these surfaces by ground-based or satellite observations difficult. These understudied minerals are an important component of asteroidal regoliths and some studies have suggested they may play a dominant role in space weathering effects.

Ms. Chaves' research involves performing laboratory experiments to simulate solar wind irradiation and micrometeorite impacts on these sulfide and oxide minerals and using coordinated analytical techniques to understand changes in their chemistry and microstructure. She will then compare her results to measurements on returned samples from the asteroid Itokawa allocated by the Japan Aerospace Exploration Agency (JAXA).

Ms. Chaves is a participant in a program called Letters for a Pre-Scientist, where she exchanges letters with students from low-income schools around the USA to encourage them to pursue careers in science. She is also using her unique perspective as a Latina, native-Spanish speaking scientist to connect with, encourage and inspire the next generation of science leaders.



2020 Amelia Earhart Fellow

Ellen Czaplinski

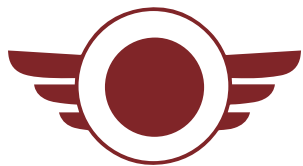


Citizenship: United States

Proposed Program: Space and Planetary Sciences at the University of Arkansas

Ms. Czaplinski will use her fellowship to study evaporites on Titan. As this moon of Saturn, which has a thick hydrocarbon atmosphere, goes through a unique methane “hydrologic” cycle, a residual layer is left over from evaporation in hydrocarbon lakes. Little is known about this layer of evaporites and experimental simulations can help constrain its composition. Ms. Czaplinski will test various compounds at Titan’s surface temperature and pressure (1.5 bar) using an experimental chamber and will then compare the results to spacecraft data acquired by the Cassini-Huygens mission to Saturn. It has been hypothesized that some of the compounds possibly found in Titan’s lakes could sustain a cell membrane-like structure, which has major implications for extraterrestrial cellular life.

Ms. Czaplinski is also part of a group that brings a portable planetarium show to various community centers and schools. She was the Geologist on Crew 202’s mission at the Mars Desert Research Station (MDRS) in the winter of 2018 where the crew lived, ate and researched as if they were on Mars. Her goal is to become an astronaut.



2020 Amelia Earhart Fellow

Anabel del Val

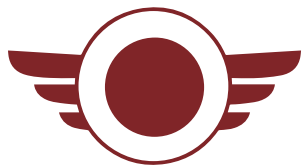


Citizenship: Spain

Proposed Program: Aeronautics and Aerospace Engineering at École Polytechnique/von Karman Institute

Ms. del Val is studying thermal protection materials essential for spacecraft entry into planetary atmospheres. In particular, she focuses on the determination of data-informed gas/surface interaction models for these materials when subjected to a plasma flow for both ablative and reusable types of atmospheric entry protection materials. Her work successfully bridges complex aerospace engineering problems with fundamental mathematical methods. Her studies have already led to important discoveries. These include: 1) the characterization of ground testing conditions in high enthalpy and plasma wind tunnels for aerospace missions, 2) the implementation of dedicated uncertainty quantification tools for the response of materials in high-enthalpy flows, 3) the development of a methodology to infer model parameters from experimental data using a Bayesian approach.

Ms. del Val is an amateur astronomer with a telescope and likes to stay up to date on the latest cosmological research. She loves to both read and write poetry and she is very involved in outreach efforts to help overcome the gender gap in the sciences.



2020 Amelia Earhart Fellow

Airin Dutta

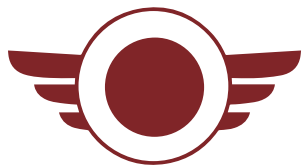


Citizenship: India

Proposed Program: Mechanical Engineering at Rensselaer Polytechnic Institute

Ms. Dutta will use her fellowship to improve fault detection and identification (FDI) and classification on multi-rotor drones. The objective is to develop a robust framework for early FDI in these multi-copters using data-driven methods, augmented with physics-based insight under different operating conditions and environmental disturbances. The ultimate goal is to move towards future intelligent and autonomous VTOL (vertical takeoff and landing) systems. These systems will be able to “feel,” “think” and “react” in real time based on high-resolution state-sensing, awareness, and self-diagnostic capabilities, allowing for superior performance, adaptability, resilience, increased safety, optimal control, reduced maintenance costs, and complete life-cycle monitoring and management.

Ms. Dutta is interested in music. She is trained in vocal Indian classical music and plays the piano. She is also interested in art history and literature.



2020 Amelia Earhart Fellow

Beatrice Fragge

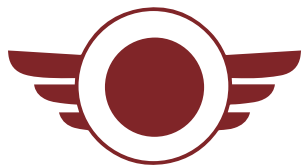


Citizenship: Germany

Proposed Program: Aeronautics and Astronomy at ISAE-SUPAERO (ONERA/Laplace)

Ms. Fragge is using her Amelia Earhart Fellowship to investigate a new approach to ignition in aircraft engines. Her goal is to replace the spark plugs, which have numerous drawbacks, with a system of time-reversed microwaves as an ignition. This is a very novel approach to the problem, and she has designed, built and electromagnetically characterized a test cavity. She is now using this apparatus to establish microwave power and ignition time thresholds. The main interest of this original technique is to enable positioning of the focus of the wave at the desired location and time for the ignition of the two-phase mixture in the combustion chamber by controlling only the time form of the wave. If successful, this technique could also be applied to control combustion after ignition, opening up promising prospects for improving engine performance.

Ms. Fragge is interested in music, plays soccer and likes to write. She has recently finished her first novel, a fantasy novel for young adults.



2020 Amelia Earhart Fellow

Anushka Goyal

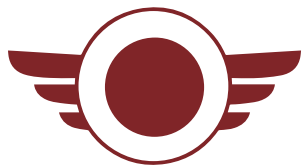


Citizenship: India

Proposed Program: Mechanical Engineering at McGill University

Ms. Goyal is studying the dynamics of trailing vortices from aircraft wingtips. Such vortices form at the ends of wings especially during take-off and landing and require a distancing between aircraft to avoid the resulting turbulence. These vortices are also linked to increased drag on an aircraft in flight, and therefore to increased fuel consumption and to increased noise. Ms. Goyal's thesis project is a continuation of her Master's degree work where she determined that serrated wingtips can have a significant effect on these vortices. The results from her experimental apparatus now need to be understood with regard to the physics behind the phenomena to better understand how initial geometries influence the evolution, decay and dynamics of tip vortices so that new designs of wingtips can be developed for commercial passenger aircraft and next-generation electric aviation vehicles.

Ms. Goyal volunteers for POWE day (Promoting Opportunities for Women in Engineering), explaining to female high school students from all around Quebec about how a wind tunnel works, hot-wire anemometry and bio-inspired wing designs. She is also trained and has obtained diplomas in the Indian classical dance form of 'Kathak.'



2020 Amelia Earhart Fellow

Annika Gustafsson

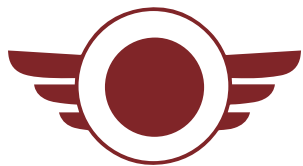


Citizenship: United States and Sweden

Proposed Program: Astronomy and Planetary Science at Northern Arizona University

Ms. Gustafsson's thesis work will focus on building an understanding of the surface properties of Near-Earth Asteroids (NEAs) as a function of object size for the most common type of asteroid found in near-Earth space. These asteroids, with orbits that take them close to the Earth, can pose potential impact hazards. There are few observations of smaller NEAs and no clear understanding of their physical properties, or if they differ from those of larger bodies which are more easily studied. As such, this project, which allows for direct measurement of their physical properties, increases our understanding of the population, and provides a unique opportunity to better inform impact hazard assessment. Ms. Gustafsson will use published asteroid and meteorite data as well as new data for small NEAs that she will collect using state-of-the-art instrumentation on the 4.3-m Discovery Channel Telescope in Flagstaff, AZ and the 3.0-m NASA Infrared Telescope Facility on Mauna Kea, HI. This work will also provide new insights into the origin and evolution of small bodies in the solar system.

Ms. Gustafsson was very involved as a college athlete and uses this background to mentor adults and students, helping them achieve better physical health and well-being.



2020 Amelia Earhart Fellow

Sarzina Hossain

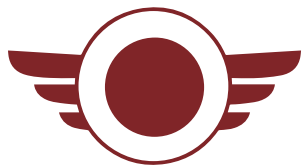


Citizenship: Bangladesh

Proposed Program: Mechanical Engineering at Michigan State University

Ms. Hossain will use her fellowship to study and improve fire safety in space missions. Of course, any fire on the International Space Station or during any other space mission would be disastrous. Since her research shows that fire behaves very differently in zero gravity than it does on Earth, such studies are of critical importance. Her work is part of a joint NASA flight project, which is a microgravity flight definition project belonging to the six-project BASS II, Burning and Suppression of Solids. She has constructed a special experimental facility called the Narrow Channel Apparatus that is capable of mimicking microgravity conditions and she is investigating the flammability of materials in this zero-gravity environment and addressing issues of ignition and fire spread. Her work will also help to build a safe operational protocol to exit a spacecraft in case of a fire emergency.

Ms. Hossain is an active member of the Society of Women Engineers at Michigan State and has been active in promoting women and girls in STEM learning throughout her academic career. She is also interested in the origin of languages and speaks both German and Spanish.



2020 Amelia Earhart Fellow

Donna Jennings

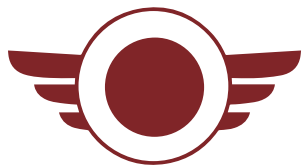


Citizenship: United States

Proposed Program: Aerospace Engineering at Missouri University of Science and Technology

Ms. Jennings is working on a program that is focused on the use of small satellites in swarms to support Mars missions and other beyond-Earth orbit missions. Her Ph.D. research is focused on the formulation of a guidance solution that maximizes the life of the mission by enabling effective station keeping and swarm formation/reconfiguration. The metrics of interest in her research include the propulsive forces required to maintain the desired formation as well as the position and velocity errors from the actual state of the spacecraft to that desired.

Ms. Jennings has long aspired to teach. Her dream of teaching is still alive with her long-term goal to secure a faculty position that allows her to serve as a role model to students in STEM, especially females, that aspire to become leaders in their respective fields.



2020 Amelia Earhart Fellow

Ashwini Karmarkar



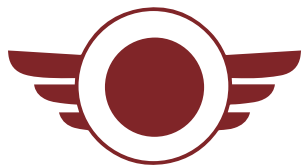
Citizenship: India

Proposed Program: Mechanical Engineering at Pennsylvania State University

Ms. Karmarkar's Ph.D. research is focused on the study of thermo-acoustic instability in jet engines. The goal of her research is to understand and characterize the physical mechanisms that drive thermo-acoustic instabilities in the combustors of gas turbine engines, particularly jet engines.

In real jet engines, there are operational regimes where the combustion process becomes unstable. This instability can result in increased emissions, reduced operability and, in extreme situations, catastrophic failure. This research is an important step toward understanding the fluid mechanics that govern the onset of instability so that better control mechanisms can be designed to ensure safe, reliable and efficient combustion. Most of the current results available for combustion instability are typically limited to low turbulence conditions whereas most jets operate in highly turbulent regimes.

The focus of Ms. Karmarkar's research is to understand and quantify the impact that turbulence intensity has on the evolution of combustion instability. Her research involves collaboration with research institutes in India and Germany. She hopes to pursue a career in academia. She enjoys cooking and drawing.



2020 Amelia Earhart Fellow

Yaeji Kim



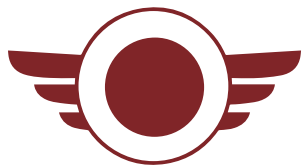
Citizenship: South Korea

Proposed Program: Aerospace Engineering at Auburn University

Asteroid research is a crucial element in understanding how our solar system has developed its current formation. The scientific community continues studying asteroids not only for the scientific value but also as preparation for potential Earth impacts.

Ms. Kim's current Ph.D. program is focused on asteroid resurfacing mechanism research and NASA Double Asteroid Redirect Test (DART) mission. Space weathering has changed the spectral slope of the asteroids' surfaces from blue to red due to exposure to the harsh space environment over time. However, there are a significant number of longstanding asteroids that seem bluer and unaffected by the space weathering process. The purpose of her research is to characterize this resurfacing mechanism on irregularly shaped asteroids during their planetary encounters by numerical simulations. She is analyzing the surface slope evolution of Apophis during the 2029 Earth flyby. This asteroid is considered to encounter the Earth in 2029, and the distance from the Earth to this asteroid is going to be closer than that to geostationary orbit satellites. Therefore, a better understanding of this asteroid is vitally important to explore issues on planetary defense.

Ms. Kim is dedicated to STEM activities in both South Korea and at Auburn.



2020 Amelia Earhart Fellow

Solène Kojtych



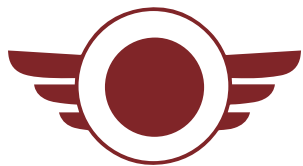
Citizenship: France

Proposed Program: Mechanical Engineering at Polytechnique Montréal

Ms. Kojtych is pursuing her Ph.D. studies to support the minimization of the airline industry's ecological footprint in order to support high long-term growth potential. The cornerstone of this new paradigm is the engineer's ability to design more efficient aircraft engines. Lower engine emissions may be achieved through the reduction of operating clearances between rotating blades and the surrounding casing.

From an aerodynamic standpoint, clearance reduction in the compressor is crucial to maximizing efficiency as it prevents parasitic leakage flow between the blades and the casing. However, from a structural standpoint, this reduction unavoidably promotes contact events that may arise due to rotor imbalance or maneuver load. These contact events may yield interactions that threaten the engine's structural integrity. The design of aircraft engine blades robust to contact interactions is of strategic importance for manufacturers.

Ms. Kojtych's research projects focus on the development of optimization algorithms dedicated to nonlinear mechanical systems with contact interfaces. Ms. Kojtych's professional goal is to work as a professor in the field of aerospace engineering. She is a dancer and has worked to support people with disabilities in dance activities.



2020 Amelia Earhart Fellow

Sarah Li



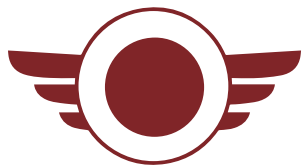
Citizenship: Canada

Proposed Program: Aeronautics and Astronautics Engineering at the University of Washington

Ms. Li's Ph.D. research is on the analysis of a theoretical gaming framework for competitive low Earth orbit (LEO) satellites. As companies continue to launch satellites into LEO, efficient traffic management becomes increasingly urgent. Satellites must compete with one another for space and avoid existing debris. The current solution for avoiding collision is to manually monitor the orbits, and contact operating companies when possible collisions are detected.

Control algorithms that inherently avoid collisions with obstacles yields easier management. Ms. Li's research proposes to design the communication network of multi-algorithmic learning dynamics with insights from geometric control and investigate how system-level designers, i.e. ground control operators, may incentivize autonomous spacecrafts, such that a prescribed subset of spacecrafts cannot be destabilized by a known source of faulty signals.

Ms. Li's extracurricular activities include ballet and outreach activities to alleviate food insecurity.



2020 Amelia Earhart Fellow

Erica Luzzi



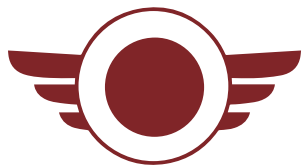
Citizenship: Italy

Proposed Program: Physics and Earth Sciences/Planetary Geology at Jacobs University Bremen

Ms. Luzzi's Ph.D. project is focused on the reconstruction of the mechanisms and history, through geological mapping, of a broad area on Mars (Chaotic terrains). Planetary geological mapping is a key point for a better understanding and the future exploration of our solar system. It also aims at investigating the minerals composing the observed deposits and unravel the processes that originated such peculiar features on the surface of Mars.

Ms. Luzzi had the intuition that the large and widespread polygonal blocks that characterize the Chaotic Terrains may be explained in a novel way—as a chaotic caldera collapse. To explore this hypothesis, she performed an analog experiment in a dedicated laboratory, reproducing the magma chamber below a certain thickness of sands and alternating cycles of inflation and deflation of the magma chamber. The resulting collapse seems to coincide perfectly with the features observed on Mars.

Ms. Luzzi feels that one of the most valuable parts of the work done while pursuing her Ph.D. is her position as a teaching assistant. She sees it as her opportunity to pay forward what her professors gave to her, making some impact on the students' formation.



2020 Amelia Earhart Fellow

Rong Ma

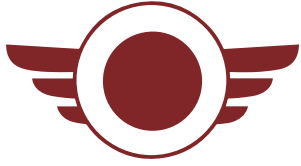


Citizenship: China, PR

Proposed Program: Aerospace Engineering and Mechanics at the University of Minnesota

In her Ph.D. program, Ms. Ma will investigate the effect of surface roughness on flow past surfaces. Surface roughness is crucially important to the design of fuel-efficient aircraft. For example, ice build-up and erosion on the wings of an airplane can form a non-homogeneous roughness distribution, which increases the fuel consumption and may cause serious damage. Simulations of flow over surfaces with distributed roughness are challenging because we must resolve a large range of scales. Only recently have computers become large enough to tackle this problem. With her research adviser, Ms. Ma has developed a code that runs on supercomputers to perform direct numerical simulation (DNS) of turbulent flow over randomly distributed rough surfaces. Her simulations provide full 3D flow data, which are extremely difficult to measure experimentally, but necessary to understand the physics.

To complete her dissertation, Ms. Ma is currently developing a predictive rough-wall model that can be used in lower fidelity simulations. Her long-term career goal is to work in a research team in the industry.



2020 Amelia Earhart Fellow

Lisa Meyer

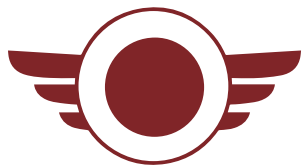


Citizenship: Germany

Proposed Program: Fluid Dynamics/Mathematics at the Universität Kassel/
German Aerospace Center

Ms. Meyer's Ph.D. program hopes to close the gap between fully incompressible and fully compressible real gas flow solvers and hence enable the accurate and time-efficient computational modeling of many interesting flow problems in space transportation. In general, fluid dynamics can be divided into an incompressible and compressible regime, containing low- and high-speed flows, respectively. The difference between the mathematical properties of the governing equations motivates this division and caused the development of flow solvers adapted to only one of these regimes while not suitable for modeling the other one. In reality, many applications contain a wide range of velocities (or more accurately of Mach numbers). For example, the stagnation flow at a planetary-entry vehicle, where a hypersonic flow is slowed down to zero within a small spatial distance or the interaction of the plume of a rocket with the surrounding air. For these examples, a compressible flow solver covering all Mach numbers is required.

After her Ph.D., Ms. Meyer hopes to have a career in research. She has been an active member of the German Red Cross since 2004, a glider pilot and a saxophonist.



2020 Amelia Earhart Fellow

Rachel Morgan



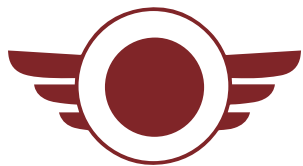
Citizenship: United States

Proposed Program: Aeronautics and Astronautics at Massachusetts Institute of Technology (MIT)

Ms. Morgan is pursuing a Ph.D. in space systems at MIT in the area of space telescope optical instrument development. She is passionate about space science and engineering, particularly optical instrumentation for exoplanet characterization with space telescopes, and her academic and research plan at MIT will give her the skills and experience needed to lead research in this area.

For her Ph.D. research, she will investigate novel optical and photonic instrumentation concepts for high-contrast imaging of exoplanets with space telescopes. Photonic devices show promise for enabling novel astronomical instrument capabilities with smaller, less expensive devices. Ms. Morgan is a NASA Space Technology and Research Fellow, which gives her the opportunity to work with government researchers as a part of her Ph.D. research.

After her Ph.D., she intends to continue conducting research at a university or other research institution developing novel astronomical instrumentation technologies for space telescopes. Ms. Morgan is a saxophonist and an active member of MIT Women in Aerospace Engineering.



2020 Amelia Earhart Fellow

Shaylah Mutschler

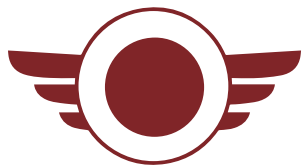


Citizenship: United States

Proposed Program: Aerospace Engineering Sciences at the University of Colorado Boulder

Ms. Mutschler's Ph.D. program is based on the hypothesis that it is possible to utilize debris objects as passive, indirect sensors of the space environment. Orbital debris poses a significant threat to our critical space systems. We must stop the continued exponential rise of the debris population by seeking and implementing solutions from both a policy and technical standpoint. The uncontrolled nature of debris objects makes them particularly sensitive to space weather variations. Ms. Mutschler's research takes advantage of this behavior by utilizing observations of debris objects to infer the space environment parameters controlling their motion. Of all cataloged space objects, 95% are rocket bodies, inactive satellites or debris; yet, their data are still not used for the benefit of updating and adjusting space weather models.

Following her Ph.D., Ms. Mutschler hopes to pursue a post-doctoral abroad to work with international leaders in the space industry. One of her career ambitions is to become an active contributor to international space policy.



2020 Amelia Earhart Fellow

Cody Paige

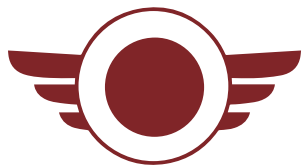


Citizenship: Canada

Proposed Program: Astronautics at Massachusetts Institute of Technology (MIT)

Ms. Paige will use her fellowship to study radiation shielding materials for space suits and systems at MIT. Current spacesuit designs provide protection for acute concerns such as pressure, temperature and micrometeoroid impacts. As we progress beyond low Earth orbit (LEO) and onto planetary surfaces, radiation and dust protection need to be included. Current shielding does not provide adequate protection from galactic cosmic rays. A 45-year-old female astronaut's exposure, using current LEO dose restrictions, would be limited to 89 days in deep space. The average Mars mission is two to three years, presenting a mission-critical problem. Ms. Paige is working on advancement for lunar and Mars exploration: an advanced thermal, radiation and micrometeoroid garment (TRMG).

Ms. Paige's ultimate goal is to enhance life on earth through space exploration. She hopes for a career in Canada in the field of space medicine to contribute to long-duration space missions. Ms. Paige is active in STEM programs and a new MIT project to spread climate change awareness to high school students through interactive lectures.



2020 Amelia Earhart Fellow

Margherita Piccinin

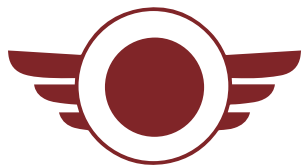


Citizenship: Italy

Proposed Program: Space Engineering at Politecnico di Milano

Ms. Piccinin's Ph.D. research tackles Autonomous Small Bodies Exploration (ASBE), the problem of mapping an unknown asteroid/comet while autonomously navigating in its proximity. Three different research fields are involved: robotic exploration, autonomous navigation and machine learning. ASBE has never been accomplished, as the space environment poses additional challenges (chaotic dynamics, low surface reflectivity, variable illumination) and unknowns (body shape, irregular gravity field, etc.). Today, ground support is necessary for navigation and mapping tasks, and a large human effort is required 24/7 for proximity operations supervision and planning. Autonomous operations would reduce the burden of routine navigational support and communication requirements on network services, thus decreasing the mission cost.

Ms. Piccinin hopes to continue a career in an academic research environment. She enjoys traditional Irish dancing and reading novels in Italian, English and modern American literature.



2020 Amelia Earhart Fellow

Jennifer Pouplin



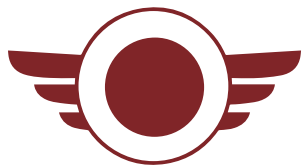
Citizenship: France

Proposed Program: Aeronautical and Astronautical Engineering at Purdue University

Ms. Pouplin's Ph.D. work focuses on understanding the origin of the two moons of Mars—Phobos and Deimos. Specifically, she is examining the formation of these moons from an impact-generated debris disk using an N-body dynamics integrator. This work will contribute to our understanding of the formation and evolution of Phobos and Deimos, an outstanding question in planetary science for which there are multiple proposed theories.

The third chapter of Ms. Pouplin's thesis will integrate the results of her research into the science planning phase for the proposed Chariot mission, being led by her Ph.D. adviser. Chariot is a small-satellite mission that proposes to explore Phobos and Deimos, analyzing their spectral characteristics to better understand the compositions of these enigmatic moons.

Ms. Pouplin is a volunteer firefighter/EMT in the Wabash Fire Department. She is also working on her pilot's license. She is an avid powerlifter and sports enthusiast.



2020 Amelia Earhart Fellow

Annika Rollock



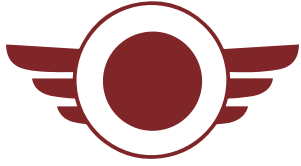
Citizenship: United States and Canada

Proposed Program: Aerospace Engineering at the University of Colorado Boulder

Ms. Rollock's research at the University of Colorado Boulder is focused on entry, descent and landing systems for spacecraft. She is studying the dynamics of vehicles during hypersonic jettison events for aerocapture. The simplest method to control the aerocapture is called drag modulation, in which the vehicle carries a drag skirt into the atmosphere to enable the braking maneuver. Once the vehicle has slowed enough to capture into orbit, the drag skirt is jettisoned away and the vehicle is free to bounce back out of the atmosphere and into the desired orbit.

Ms. Rollock's work will focus on the stability of vehicles and quantify the risk of recontact between the two bodies given nominal and off-nominal separation using computational fluid dynamics (CFD) software. Her research will pave the way for a greater understanding of hypersonic flight dynamics and as a result, will extend to national defense applications.

Ms. Rollock is chair of her graduate student association; she was captain of the MIT lightweight rowing crew during her time there and enjoys cycling and running.



2020 Amelia Earhart Fellow

Sneha Sanjeevini



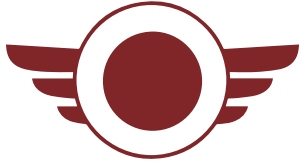
Citizenship: India

Proposed Program: Aerospace Engineering at the University of Michigan

Ms. Sanjeevini's research is aimed at a critical problem in aerospace engineering: How does an automated system determine whether one of its sensors is faulty? The failure of a single sensor on an aircraft can have egregious consequences; unfortunately, many flight tragedies can be traced to faulty sensors. This is a difficult problem, and its solution depends on deep and fundamental research in signals and systems.

Ms. Sanjeevini is focused on "input estimation." Input estimation is a technique for estimating the input of a system when you only know its output. Progress on input estimation requires careful analysis to account for all effects that can confound the ability to determine whether the sensor is truly faulty or if there is another reason, such as wind gusts or airframe damage. Her Ph.D. research is directly relevant to a real and pressing problem in autonomous aerospace systems.

Ms. Sanjeevini is trained in Indian classical music and is proficient in four Indian languages. She is active in the Society of Women Engineers (SWE).



2020 Amelia Earhart Fellow

Sarah Stirrat

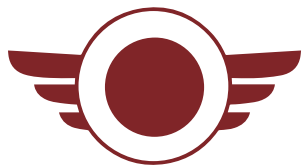


Citizenship: United Kingdom

Proposed Program: Mechanical and Aerospace Engineering at the University of Strathclyde

Ms. Stirrat's Ph.D. research is focused on the analysis and prediction of supersonic heated jet noise in axisymmetric air jets. The features of heated jet noise have not been fully understood. One feature of supersonic jet flows is the apparent quieting at a high jet temperature ratio. This feature is important to understand to aid noise abatement strategies for aircraft. Interestingly, for low subsonic acoustic Mach number jets, an increase in temperature produces an increase in sound. The turbulent flow effects are important to understanding the acoustic behavior in the jets. In her Ph.D., Ms. Stirrat will use a Large Eddy Simulation (LES) computer code to determine the turbulence correlation functions for a range of acoustic Mach numbers and jet temperature ratios.

Ms. Stirrat has been learning guitar and violin. She enjoys many creative activities and keeps fit through swimming and yoga.



2020 Amelia Earhart Fellow

Suria-Devi Subiah

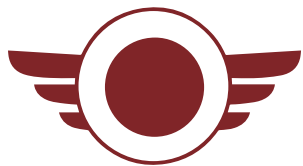


Citizenship: United Kingdom

Proposed Program: Engineering Science at the University of Oxford

In her Ph.D. program, Ms. Subiah will investigate a novel reusable thermal protection system which is critical to the design of space vehicles for interplanetary exploration. On entry into Earth or other planetary bodies, hypersonic space vehicles can travel at speeds over Mach 30 and have surface temperatures over 5,000° C. The immense heat loads experienced can destroy the vehicle if no cooling system is used. By injection of a low-temperature gas to the surface of the vehicle through a porous material, heat loads are significantly reduced. This is known as transpiration cooling and has just recently emerged as an exciting solution for the thermal protection of SpaceX's reusable spacecraft to Mars. Ms. Subiah hopes to provide a fundamental understanding of high-temperature effects when the coolant gas interacts with the flow at the surface of the vehicle. The knowledge which will come from this study is crucial to making transpiration cooling a viable reusable thermal protection system. It will also provide critical knowledge of how certain gases behave at extremely high temperatures.

Ms. Subiah volunteers as a student peer supporter at Oxford. She is also involved in STEM events to encourage women to enter aerospace engineering.



2020 Amelia Earhart Fellow

Cecily Sunday

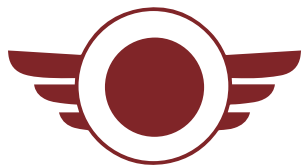


Citizenship: United States

Proposed Program: Planetary Science at the University of Toulouse/Institut Supérieur de l'Aéronautique et de l'Espace (ISAE-Supaéro)

Ms. Sunday is researching wheel-regolith interactions for a rover on Phobos, a moon of Mars, which has a diameter of about 22 km and a surface gravity approximately 1,700 times smaller than that of Earth's. Regolith is a layer of loose rock resting on bedrock. Previous observation and fly-by missions suggest that Phobos is covered by fine powder. The granular surface and the low gravity of Phobos creates a fundamental mobility issue: How can a wheeled system gain traction on such a surface? During her Ph.D., Ms. Sunday will assess the rover's wheel design using numerical simulations. She is simulating systems consisting of hundreds of thousands of particles to accurately assess the bulk behavior of regolith beds. The simulations will help engineers to develop rover operations and scientists to generate laws regarding granular flow in low gravity. She would like to help advance the state of scientific instruments that study the formation and evolution of small bodies.

Ms. Sunday hopes to move forward in her career by advocating for diversity and leveraging her experience as both an engineer and scientist.



2020 Amelia Earhart Fellow

Joana Voigt

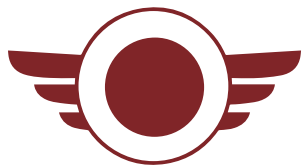


Citizenship: Germany

Proposed Program: Planetary Sciences/Planetary Geology at the University of Arizona

Ms. Voigt's Ph.D. links volcanic eruption products to their controlling mechanisms in planetary interiors and utilizes unmanned aerial systems (UAS) in planetary analog environments to develop how similar airborne vehicles can help to develop the frontier of Mars exploration. Throughout the solar system, volcanism is among the dominant processes that form and modify terrestrial landforms and atmospheres; it is an expression of the thermal evolution of planetary bodies, and is a critical factor for determining a planet's habitability.

In the future, Ms. Voigt intends to test robotic technologies for exploring volcanic terrains on the moon, and develop upon Mars Helicopter technology that will be flown with Mars 2020. This will enable new directions in aviation and aerospace exploration during the next phase of her career. Ms. Voigt participates in public outreach activities related to planetary sciences.



2020 Amelia Earhart Fellow

Shuming Wu



Citizenship: China, PR

Proposed Program: Mechanical Engineering at Xi'an Jiaotong University

Ms. Wu is working on the development of an advanced aero-engine rotor blade-health monitoring system using advanced blade tip timing. She is currently a visiting Ph.D. student at the University of Oxford and is working on the development of a system that combines structural and aerodynamic analysis in the development of an advanced condition monitoring system.

Ms. Wu has been awarded the Graduate Fellowship by IEEE Instrumentation and Measurement Society for her excellent research in blade vibration measurement this year. It is envisioned that this work will have a significant impact on the health monitoring of aero-engine blade. Ms. Wu is a student of music and is learning to play the Chinese Zither.