ME Connections

A publication of The University of New Mexico's Department of Mechanical Engineering

Fall 2022

FROM THE CHAIR

I hope you will enjoy reading the Fall 2022 issue of *ME Connections*, published by the Department of Mechanical Engineering at The University of New Mexico. We showcase some of our recent accomplishments and present a sampling of our educational initiatives, cutting-edge research, and community engagement.

Special thanks go to Christos Christodoulou, dean of the School of Engineering, for his strong support of the ME department, and to Kim Delker, School of Engineering marketing manager, for her invaluable help in preparing this publication.

Yu-Lin Shen
on behalf of the entire ME family

Professor awarded Department of Defense grant for rocket injection simulation research

Daniel Banuti, an assistant professor of mechanical engineering at The University of New Mexico, has been selected as the principal investigator of a three-year, $600,000 grant from the Department of Defense. In a collaboration with Robert A. Frederick Jr. of the University of Alabama in Huntsville, the project will study new ways to understand and simulate high-pressure injection.

While the target application is rocket engines, gained insight can be applied to other fields from car engines to green energy due to the similarity of the physical processes.

"It doesn't matter if it's happening in a rocket engine or a solar-thermal receiver, if we understand one of these systems better, we understand all of them better," Banuti said.

The project, called "A new paradigm for transcritical injection simulation and understanding," began July 1, 2022, and ends June 30, 2025. Its key feature is a strong interaction between experiments and simulations, where Banuti is responsible for the modeling and simulation part, and Frederick, director of the Propulsion Research Center at the University of Alabama in Huntsville, leads the experimental efforts.

Huntsville is also home to the NASA Marshall Space Flight Center, which has roots from the beginning of the Apollo program 60 years ago.

"I cold-called, and I'm excited he wanted to collaborate," Banuti said. "There aren't that many

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people doing the very difficult experimental research in this area. The UAH Propulsion Research Center has facilities to test and expand our understanding of what is going on in a rocket engine."

Banuti specializes in modeling how the injection process works in engines, studying fluid mechanics with complex thermodynamic behavior, such as supercritical fluids, high-pressure real-fluid behavior and combustion. He calls his research group "thermo-fluids under extreme conditions."

This DEPSCoR project involves fundamental research that will expand upon work that was conducted in the 1990s that revolutionized the field.

He said that before, it was believed that when fluids were injected into an engine at high pressures that there would always be droplets, much like from spraying a garden hose. However, about 20 years ago, that was found to not be the case in all super-critical environments, even though researchers didn't know the details of why that wasn't the case. "We still cannot reliably predict when there will be droplets and when not," Banuti said.

Today, new modeling and simulation techniques could shed light on exactly what is going on inside an engine at high pressure and temperatures.

"There is still a lot we don't understand about how rocket engines work," Banuti said. "We can build engines, we can run simulations that give reasonable results, but fundamentally we don't understand many of the underlying physical details. The current state-of-the-art model was groundbreaking at the time, and we now are seeking a different approach. The hope is we can get a better understanding and ideas for new injector designs and modeling techniques."

"There is still a lot we don't understand about how rocket engines work. We can build engines, we can run simulations that give reasonable results, but fundamentally we don't understand many of the underlying physical details."

The modeling can then be translated into real-life tests in the specialized rocket labs in Alabama, which in turn can be used to validate the models.

Banuti said getting this grant is one of the high points of his career so far. Before joining UNM in 2019, he was a postdoctoral scholar at the NASA Jet Propulsion Laboratory in California/Caltech, Stanford's Center for Turbulence Research, and a staff scientist at the German Aerospace Center.

"I am super excited to get this grant and to be able to start the collaboration with Huntsville," he said. "It means a lot to me personally and professionally, and it came at just the right time."

He said he hopes it's the first of many large-scale projects. Banuti is currently part of a U.S. Department of Energy initiative to promote clean hydrogen technology.

UNM professor part of team that won Space University Research Initiative award

Claus Danielson, assistant professor in mechanical engineering, is a part of a multi-institute team which won one of two (among 40 proposals submitted) Space University Research Institute (SURI) awards funded by Air Force Research Laboratory (AFRL). The SURI program supports multidisciplinary research efforts, ideally creating synergies to speed Department of Defense-relevant research and development by directing basic research toward applications that meet the U.S. Space Force needs and challenges.

The winning proposal, Breaking the "Launch Once, Use Once" Paradigm, was submitted by Carnegie Mellon University as the lead institute, along with other partners from Texas A&M, University of New Mexico, and Northrop Grumman Corporation. Using their combined expertise in artificial intelligence, robotics (hard and soft), additive manufacturing, astrodynamics, estimation theory, control, and space systems, the team seeks to address the non-existent capability of On-orbit Servicing, Assembly, and Manufacturing (OSAM) in the geosynchronous equatorial orbit (GEO) belt. Success for this team means advancing transition-capable fundamental and applied research for OSAM and preparing it to transition to the AFRL Space Vehicles Directorate and Northrop Grumman Corporation.

Jackson NSME director; Pleil heads MTTC

Nathan Jackson, assistant professor of mechanical engineering, has been selected to direct the Nanoscience and Microsystems Engineering (NSME) Program at UNM.

Jackson

UNM's Nanoscience and Microsystems Engineering Program is a graduate program offered jointly by the College of Arts and Sciences and the School of Engineering, evolving from the traditional disciplines of solid state physics, chemistry, biology, materials science and engineering. The program has produced more than 100 graduates in master's and Ph.D. programs since 2009.

In addition to his role in NSME, Jackson is also the associate director of UNM's Manaufacturing Engineering Program.

Matthias Pleil, senior lecturer III and research professor of mechanical engineering, is now the director of the UNM Manufacturing Training and Technology Center (MTTC) and its affiliated Manufacturing Engineering Program.

Pleil

Manufacturing Engineering Program (MEP) is a multi-disciplinary masters-level academic program that prepares students for real-world manufacturing and management. The program integrates manufacturing theory with manufacturing practice by bringing industry experts into the classroom and by giving students actual industry projects. In addition, the MEP supports state-of-the-art hands-on robotics and semiconductor laboratories, world-class research, and novel training paradigms.

Department faculty active in clean-energy research

This summer, The University of New Mexico was the host of the 51st annual American Solar Energy Society (ASES) national solar conference. The event highlighted the current and future potential of solar energy, as well as other clean-energy technologies.

Addison Portman, 2023 FSAE project manager, works with the media while sitting in the electric vehicle at the Solar Fiesta.

One of the sponsors of the conference was the School of Engineering, and the School also had strong representation at the Solar Fiesta and electric vehicle (EV) car show, which was held in conjunction with the conference on its final day. Two Department of Mechanical Engineering programs were represented at the Solar Fiesta:
the electric car from the Formula SAE program and the solar-powered boat from the Solar Splash program.

This year, FSAE competed with an EV for the first time at a national competition (see more on Page 6). The program has been led by **John Russell**, professor of mechanical engineering, since 1998.
UNM has competed in the solar-powered boat collegiate competition since 2016, and that program is led by Peter Vorobieff, professor of mechanical engineering.

In addition to leading these two widely recognized student design programs, UNM Department of Mechanical Engineering has a long history in solar and renewable energy research, including:

- **Peter Vorobieff,** together with **Jane Lehr,** a professor of electrical and computer engineering, are embarking on research that involves looking at ways to convert container ships to run on clean-energy solar rather than polluting diesel.

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- Albuquerque is home to Sandia National Laboratories, which features the National Solar Thermal Test Facility, operated in conjunction with the U.S. Department of Energy. It is the only test facility of this type in the United States. Vorobieff is taking advantage of this nearby resource, collaborating with **Gowtham Mohan**, an assistant professor of mechanical engineering, with the concentrating solar power team at Sandia on research to minimize the heat loss from high-temperature particle receivers. This research could enable next-generation concentrating solar thermal power systems that can achieve higher temperatures to enable more efficient power cycles, lower system costs and new applications.

- Mohan is also taking the lead on a project announced this spring called "Semi-transparent Bifacial Agrivoltaic System with Machine Learning." This involves the new field of agrivoltaics — combining agriculture with PV systems — which has only been effective for a limited group of crops due to the high amount of shading under the solar panels. To address this challenge, this project will develop an agrivoltaic system using semi-transparent, plastic bifacial solar panels. Since these panels are semi-transparent, they will let more light through to the crops than traditional solar panels. They can also use light reflected from the plants to produce more electricity since they are bifacial. A machine learning model will be developed to predict the performance of the agrivoltaic system, and these predictions will be used to improve the system. The team will evaluate both the PV system performance and the agricultural crop yields.

- **Sakineh Chabi,** an assistant professor in the Department of Mechanical Engineering, has been focusing on artificial photosynthesis and solar fuels. She explains that basically, solar fuels technology uses sunlight, water and carbon dioxide to produce valuable chemicals/fuels such as hydrogen, ethanol, and methanol. The current focus of her group's solar fuels research is on producing hydrogen for use as a source of energy. Although the process of making hydrogen via artificial photosynthesis has many environmental benefits, it is more expensive and less efficient than making hydrogen from fossil fuels. To address these issues, they are making new catalysts for solar fuels formation and new membranes to make the entire process more efficient and less expensive.

Sorrentino chosen as associate editor of 'IEEE Control Systems Letters'

Francesco Sorrentino, professor of mechanical engineering and Regents' Lecturer, has been selected as an associate editor of *IEEE Control Systems Letters*. The three-year appointment began Jan. 1, 2022, and continues through December 31, 2024.

Sorrentino is widely published in the area of control theory and its various applications, with more than 3,000 Google Scholar citations. In 2020, he was awarded the National Institutes of Health Trailblazer Award from the National Institute of Biomedical Imaging and Bioengineering for a research project that could improve the way drugs for diseases are timed and delivered to patients.

UNM's first EV car places No. 16 in Formula SAE contest

The well-known saying "Don't let perfect be the enemy of good" might be an accurate way to sum up this year's UNM LOBOmotorsports team's performance in the latest international contest of collegiate electric cars.

The University of New Mexico's Formula Society of Automotive Engineers (FSAE) team came in No. 16 out of 65 teams from programs around the world in the June 15-18, 2022, competition at the Michigan International Speedway near Detroit.

And while UNM did not actually get an opportunity to run the car at competition due to not passing the technical inspection, the team is proud of the fact that they were able to place so highly despite some challenges, especially since this is the team's first time with an EV at competition after almost 25 years of building internal combustion cars.

As FSAE director **John Russell** said, only 12 of the teams were able to race at all (and only five were able to compete in the acceleration event), the fact that UNM's team placed 16 speaks to how well-prepared the team was.

"There were a lot of teams that couldn't get ready, including many from large and prestigious engineering programs," Russell said. "It's a challenging competition. We're basically designing and building a Tesla from scratch. If just one wire is bad, it kills you. A small change in circuitry could mean a total redesign." The team was able to garner points from the design, business and cost presentations and got through the mechanical, battery accumulator and recharging tests, but it was a 5V relay switch that stopped the team in its tracks during the electrical inspection.

According to the rules, if there is a fault in the system, the car should shut down and only be able to restart

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manually for safety. Instead, the UNM car restarted automatically once the fault went away. To be within the rules, they needed a 5V relay switch, which was not able to be acquired at competition.

"Many cars don't pass, so we certainly weren't alone, but it's frustrating," Russell said. "It was one of our best cars and received a lot of compliments from judges on the design."

In results released after the event, the UNM team placed No. 7 in the sales presentation, No. 15 in cost and tied for 19th place in design.

With various challenges related to supply chains, the ongoing pandemic and the fact that the team was designing and building an entirely new kind of car, Russell was not sure they would even have a car to take to Michigan. But many long hours by the team paid off, and although the team did not finish in time to do testing and driving of the car (which affected the overall scoring because they lacked validation data), the car was ready and running.

Russell said he credits project manager Rhianna Oakley, who recently graduated with a bachelor's degree in mechanical engineering, with ensuring that the 18-person team was ready for competition, no matter how difficult it was. And he said that 2023 project manager Addison Portman is already making leadership decisions for next year.

"Our program creates leaders, not just managers who oversee things," Russell said. "That is why so many employers love to hire our students. They already know how to get things done."

Even though he knew that this year's car would not be perfect, Russell wanted to make sure the car made it to competition because it's such a learning experience for students.

"We still learned a lot even though we didn't know if the car would run," he said.

The main lesson learned is that the team needed more time to test and run the car. He believes that the issue with the relay switch would have been caught in testing.

"Our goal next year will be to have the car done two months in advance so we can run the car and have validation data," he said. "But we're heading in the right direction."

Russell points out that most successful EV programs have taken several years to get that way, so continuing to compete, adapt and perfect will ensure that future years' EVs compete well.

Russell is also in the process of reaching to other departments to grow the team and gain knowledge that could be helpful on the EV. The three-semester program has been based in the Department of Mechanical Engineering, but now with the electrical component, students in the Department of Electrical and Computer Engineering will be able to take a senior design course, ECE 419, as part of the program. And he is reaching out to the Department of Chemical and Biological Engineering to integrate FSAE into their senior design curriculum as well.

Russell said he is proud of the team, who ventured into uncharted territory in this contest, especially the 16 members who traveled to Michigan.

"They were never not working on the car and making it better," he said.

UNM retains its No. 3 position in national Solar Splash competition

For the second year in a row, The University of New Mexico Solar Splash team placed third overall in a contest that pits solar-powered boats from universities around the country against each other in a variety of challenges.

The annual UPS Battery Center Solar Splash competition was held June 7-11, 2022, in Springfield, Ohio. This is the seventh year in a row that UNM has participated in the contest.

This year's field was relatively small (eight teams made it to the competition) due to multiple registered teams having to withdraw at the last moment because of pandemic-related challenges (including supply-chain issues).

In addition to the overall third-place award, the UNM team also placed first in qualifying and was awarded the Outstanding Electrical System Design award and the Most Improved Team award. Also, UNM was second place in the slalom, third place in solar endurance, third place for the technical report and third place for the video presentation.

Peter Vorobieff, a professor of mechanical engineering, is the team's faculty advisor. He said that he felt the team did very well, especially considering the supply chain problems.

For instance, this year's team hoped to have a new carbon fiber hull in place to replace the wooden one to improve speed, but materials ordered in October 2021 arrived just days before the team left for Ohio in June 2022. Instead of replacing the hull, the team did what they could to lighten the boat. This

included redesigning the drivetrain, making the boat a few inches shorter and drilling holes into the inside supports to reduce weight.

Also, the team, which usually practices at Cochiti Lake, was not able to get much training time there, due to firefighters using the lake for efforts to combat wildfires burning in the state.

Despite those obstacles, Vorobieff said the team persevered. "This has been the best result for the UNM Solar Splash team since we began competing in 2016, and for two days, we were actually in the lead," he said.

Sponsors of the UNM Solar Splash this year were UNM, Sandia National Laboratories, IEEE and ExxonMobil. Special recognition goes to Roger Koerner, a UNM alumnus from mechanical engineering, who financially supported the team. His funding made possible the refurbishment of the trailer that allows the team to transport the boat and equipment across the country.

2022 Lobo Launch team in Las Cruces. Photo courtesy of Roger Koerner.

Lobo Launch rocket team competes in Spaceport America Cup

After a two-year hiatus due to the COVID-19 pandemic, The University of New Mexico's Lobo Launch rocket team competed in the Spaceport America Cup near Las Cruces this summer.

The competition, which was held June 21-25, 2022, featured more than 150 university teams from around the nation and the world, including groups from as far away as Turkey, Greece, Poland and India. **Fernando "Doc" Aguilar** is the UNM rocket engineering professor and directs the rocket program at UNM.

The UNM team placed 15 overall and ninth in the 10,000-foot Commercial Off-the Shelf (COTS) category.

In 2019, the team made its debut in the competition, placing No. 5 overall and No. 3 in its rocket class, out of 225 teams from 14 countries. Aguilar said the team made some changes after the results of the 2019 competition, in which the rocket overshot the 10,000-foot target altitude by 600 feet. To reduce the apogee, they added another fin this year.

This year, the team was also outfitted with some new aerospace ground equipment, thanks to generous donations from mechanical engineering alumnus Roger Koerner. Koerner's donation allowed the team to purchase a large, deployable climate-controlled enclosure that the team can set up on site at the Spaceport America Cup. This shields the rocket and delicate payload from the triple-digit heat in June. The donation also allowed the team to purchase a "mobile command post" trailer, outfitted with electrical power, drawers, cabinets and tie-downs for equipment, as well as computer hookups. This high-tech trailer serves as a mobile rocket assembly facility and allow the team to safely transport the rocket and spare parts to competition.

Doctoral candidate develops open-source GPU-capable fluid dynamics code

When **Brian Romero** began his doctoral research in the Advanced Fluids Lab, led by Professor **Svetlana Poroseva** in the Department of Mechanical Engineering, he quickly realized that the tool he needed to complete his work had not yet been developed.

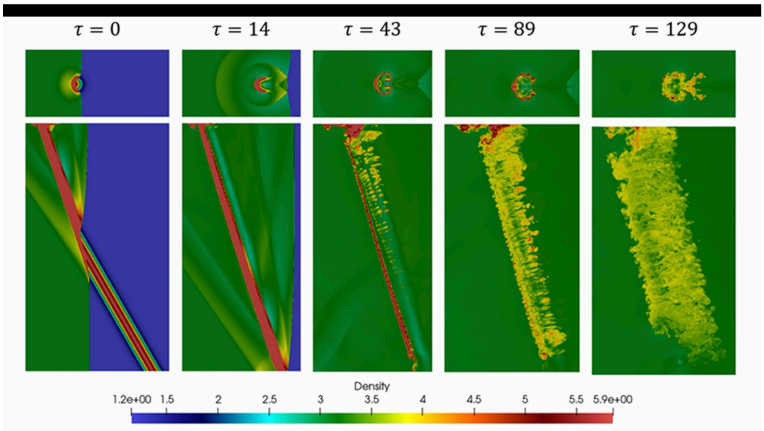
He needed a computational fluid dynamics solver capable of simulating supersonic flows with shock waves but "couldn't find one that I liked, that was fast enough, or that was open source and available to me" Romero said.

With oversight from Poroseva, and with partial support from Defense Threat Reduction Agency and Los Alamos National Laboratory (LANL) contracts, Romero turned to UNM's Center for Advanced Research Computing (CARC) and set out to construct the necessary tool.

Romero designed FIESTA©, and he designed it with the future in mind. Thinking beyond the use for his own work, he wanted to develop code that was user and developer friendly, and could accommodate researchers' ever evolving use of GPUs, high-performance computing (HPC) systems, and exascale supercomputers.

Although initially designed for atmospheric simulations, as well as some smaller laboratory scale experiments, this future thinking built into the code allows FIESTA© to do a wide range of simulations.

"I designed FIESTA© for exascale systems with neat technology built in to enable that. I used a framework called Kokkos, from Sandia Labs. Kokkos is a performance portable ecosystem, which enables



me to run FIESTA© on any GPU machines. FIESTA© also has advanced features for parallel file systems using HDF5® and a unique input file system using an embedded scripting language called Lua.

Romero is working closely with UNM's Shock Tube Lab, an experimental group in UNM's Mechanical Engineering department led by Professor **Peter Vorobieff,** to verify data and check the accuracy of FIESTA©. Recently, FIESTA© simulations were compared to shock-tube experiments to verify the mechanism behind the shock-driven Kelvin-Helmholtz instability, a phenomenon useful for mixing fuel and air in certain types of scramjet engines.

"FIESTA© is a great example of modern scientific applications design in both its state-of-the-art numerical algorithms and its use of Kokkos," said Professor Patrick Bridges, CARC director and principal investigator at UNM's Predictive Science Academic Alliance Program. "As a result, it's been a great example for us to use to understand and optimize the communication requirements of next-generation high-performance applications."

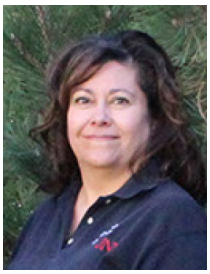
ME Connections

STUDENT, FACULTY, STAFF AWARDS

Tariq Khraishi

Svetlana Poroseva

Natalina Prlich Cotter



Cindi Sanchez

The following mechanical engineering faculty and staff have won the 2022 School of Engineering awards:

Senior Faculty Teaching Excellence Award: Tariq Khraishi

Harrison Faculty Recognition Award: Svetlana Poroseva

Outstanding Staff Award: Cindi Sanchez

The following mechanical engineering students won the School of Engineering outstanding student awards in 2022:

Siavash Nikravesh

Chad Nathe

Abu Bakar Siddique

Outstanding Sophomore award: Natalina Cotter

Outstanding Junior: Levi Premer

Outstanding Senior: Chad Nathe

Outstanding Graduate Students: Abu Bakar Siddique and Siavash Nikravesh

Levi Premer

2022 departmental outstanding student awards:

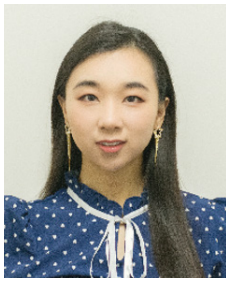
Undergraduates: Skyler Oglesby and Lana Hoover

Graduate (master's level): Nelson Longmire

Graduate (doctoral level): Pallavi Sharma

NEW FACULTY

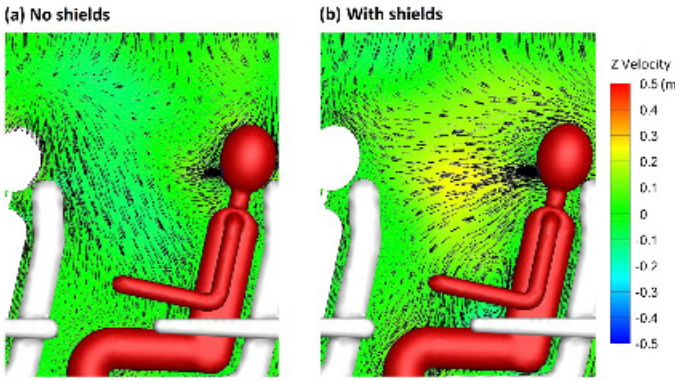
Heng E. Zuo has joined the faculty of the Department of Mechanical Engineering at UNM this semester. Her research interests lie at the junction of optics, mechanics, micro-/nano-engineering, computational modeling and astronomy, with a focus on furthering the development and applications of high-performance space optical engineering systems. She is focused on designing and developing methods for fabricating and correcting space optical components, in combination with the implementation of advanced micromachining technologies such as femtosecond laser micromachining, assisted with finite element analysis and material testing. Her past research includes advancing technologies to aid in fabricating thin-shell high-resolution X-ray space telescope mirrors in the sub-half arcsecond HPD domain, including mirror figuring and correction technology, coating stress compensation techniques, and metrology development.



Before coming to UNM, she was affiliated with MIT Kavli Institute for Astrophysics and Space Research, Research Laboratory of Electronics at MIT, MIT Microsystems Technology Laboratories and MIT Materials Research Science and Engineering Centers. She has also been members of multiple professional societies including SPIE, OSA, APS, ASPE, AIAA and SWE.

Research led by UNM finds product lowers transmission of airborne infections

From Business Wire



Air-Clenz Systems™ (Air-Clenz™) announced that independent research conducted by The University of New Mexico's Department of Mechanical Engineering concluded that a seat-based ventilation approach in aircraft can significantly lower the transmission of airborne viral and bacterial infections, including COVID-19.

The research modeled more than 300,000 exhaled particles and showed that the Air-Clenz™ seat-based, air-purification system – which blocks, captures, and cleans exhaled air before it has time to spread through the cabin – can reduce by 90 percent or more the risk of infection by airborne-transmitted viral and bacterial pathogens. The Air-Clenz™ invention was recently granted U.S. Patent 11,324,850 and covers multi-seated venues and vehicles of all types, including aircraft.

The University of New Mexico research team, led by **Svetlana Poroseva**, associate professor in the Department of Mechanical Engineering, conducted a series of computational fluid-particle dynamic simulations, which are commonly used to investigate and optimize ventilation systems on aircraft, to improve air quality for passengers and reduce pathogen transmission. The research was selected to be presented at the Indoor Air 2022, the 17th International Conference of the International Society of Indoor Air Quality & Climate, in Kuopio, Finland, June 12-16, 2022.

The University of New Mexico research study illustrated a 90 percent reduction in cross infection in a 60-unmasked passenger section of a Boeing 737-800 cabin which included two passengers infected and contagious before boarding the flight when the Air-Clenz™ new seat-based ventilation technology was used in conjunction with the aircraft's existing ventilation system. These results were contrasted in simulations utilizing the same parameters, but this time relying on solely the existing aircraft ventilation system. The difference was striking. By utilizing the proprietary Air-Clenz™ seat-back technology, the number of infected passengers was reduced from between one to five people, depending on how Air-Clenz™ technology was installed. However, when the ventilation system of the same aircraft was utilized without Air-Clenz™, as many as nine of 60 unmasked passengers would be infected with COVID-19 over a six-hour flight.

The research showed that cross-infection can occur within the first 20-50 seconds of exhaling an infectious breath, cough, or sneeze on an aircraft. Aircraft cabin air using state-of-the-art ventilation is changed only every 150 seconds on average.

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AIRBORNE

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Many viral and bacterial infections are airborne, in that they spread via particles (aerosols and droplets) exhaled by an infected person when breathing, talking, coughing, or sneezing.

Poroseva and her Ph.D. student, Mohamed Abuhegazy, stated "our simulations of the Air-Clenz™ technology, implemented in a cabin of a Boeing 737-800 aircraft with an existing state-of-the-art aircraft ventilation system, show that a certain configuration of Air-Clenz™ may reduce the risk of infection between passengers by about 90 percent versus what may occur on the same flight without using this new technology."

This is the second study conducted at The University of New Mexico. The first was performed by. Poroseva and **Osman Anderoglu**'s teams from the departments of Mechanical and Nuclear Engineering, in collaboration with Omar Mahfoze, from the Imperial College, in London, and published in *Physics of Fluids* in 2021. That paper concluded that only 24 percent of pathogen particles were removed via the aircraft's ventilation outlets; the remaining 76 percent were deposited on passenger clothing and the aircraft seats, walls, and floor. This same comprehensive model was then applied by Poroseva's team, utilizing a specific configuration of Air-Clenz™, and showed the possibility of a 90 percent or more reduction in airborne cross infection.

Anita Broach, chief scientist at Air-Clenz™, adds that "With Air-Clenz™ in each seatback of a Boeing 737-800, cabin air is cleaned every 30 seconds, four-to-six times faster than the rate of every two-to-three minutes found in modern aircraft. In addition, the Air-Clenz technology captures and cleans each seated passenger's exhaled breath, cough, or sneeze in 10 seconds or less."

"Given The University of New Mexico's positive research findings with regards to the Air-Clenz™ technology, it is anticipated that similar most positive effects will occur if Air-Clenz™ is utilized in trains, buses, or automobiles."

Broach continued, stating "Our research confirms that the longer the flight time, the greater the chance of airborne viral or bacterial transmission. Also, that within the first 20-50 seconds following an exhaled breath, cough or sneeze the damage is done regarding the spread of COVID or other highly infectious airborne-transmitted respiratory viruses and bacteria to other passengers within the cabins of modern aircraft. We found that even state-of-the-art ventilation systems on modern aircraft are potentially lacking when considering a highly infectious airborne-transmitted pathogen and no mask wearing. Given the University of New Mexico's positive research findings with regards to the Air-Clenz™ technology, it is anticipated that similar most positive effects will occur if Air-Clenz™ is utilized in trains, buses, or automobiles."

Alumnus creates scholarship to help bridge funding gaps

Merrick Olives, ’85, has built a successful career and a thriving company by leveraging many of the key skills he first learned at the School of Engineering. His UNM story, like so many others, began with the generosity of donors who helped provide scholarship funds for students with financial need.

Born in Santa Rosa, New Mexico, Olives is one of nine children of Robert and Crecencia Olives, and one of four Olives siblings to graduate from the University of New Mexico as first-generation college students. “At the time, I chose UNM because, with a tuition scholarship, it was the only affordable option for me,” Olives said. “I owe a deep debt of gratitude to UNM. My degree served as a solid foundation of skills for a very fortunate career.”

In 2010, Olives co-founded and served as CEO of Candid Partners, an Atlanta-based technology company providing cloud solutions for fortune 500 clients. In 2020, after a decade with Olives at its helm, Candid was purchased by strategy advisory firm McKinsey & Company. He currently serves as partner in the firm, which is one of the three largest global strategy consultancies.

Olives serves McKinsey & Company as an expert in large-scale, complex cloud transformations. Prior to founding Candid, Olives provided performance optimization and efficiency consultancy as a vice president for The North Highland Company and developed a specialty for financial modeling of complex enterprises as a senior manager at Ernst & Young. Olives earned his degree in mechanical engineering from UNM in 1985 and an MBA from Cornell University in 1991.

“I’m deeply appreciative of the school and the faculty for their help in giving me a solid professional foundation to build upon,” Olives said. “At UNM I learned how to solve complex problems, overcome adversity, and communicate ideas – all core skills that I have used throughout my career.”

In honor of the support he received at UNM through scholarship gifts from generous donors and alumni who came before him, Merrick Olives has established the Olives Family Foundation Mechanical Engineering Endowed Scholarship. “It’s important to leave things better than you found them,” he said. “I want to pass this gift on to the next generation.”

Olives says, with this scholarship, he intends to help undergraduate students who may not meet federal qualifications for need-based aid but still lack the resources to have a full college experience at UNM. The scholarship will provide supplemental funds for expenses not typically covered by tuition scholarships, including housing and other living expenses. The Olives Family Foundation Mechanical Engineering Endowed Scholarship will serve as a bridge in the funding gap for entering freshman mechanical engineering students in their first semester, in anticipation of their receiving their New Mexico Lottery Scholarship second semester freshman year.

Olives hopes that by creating an endowed scholarship, it will encourage more UNM alumni to do the same and, over time, continue to boost the strength and competitiveness of the mechanical engineering department and the School of Engineering.

“If all of us who have benefited from the school give back just a little, the school will continue to develop and flourish, and it will be able to reach and serve more and more students.”

Alumna 'honored to be succeeding as a woman in the national security field'

Sheryl Hingorani grew up in middle America — Nebraska, specifically — and didn't give much thought to national security, nuclear policy or proliferation. However, she did enjoy math, which led her into the world of engineering.

The daughter of an Indian immigrant, Hingorani was told that her talents would be best utilized in one of two careers.

"My dad asked me if I wanted to be a doctor or an engineer," she said. "My sister is a doctor, and my brother also got a degree in engineering and then went on to start his own companies.

I liked drafting, chemistry and had an interest in agricultural engineering, so I chose engineering."

She earned her bachelor's degree in mechanical engineering from the University of Nebraska- Lincoln, then made the jump to the Southwest for graduate school. She found multiple opportunities were available to her as a newly minted engineering graduate, especially a female in a male-dominated field. So she decided to enroll at UNM for her master's degree in mechanical engineering, primarily attracted by the options that Sandia National Laboratories held for her.

After she earned her degree in 1988, she joined Sandia, first as a mechanical engineer, then she transitioned into a variety of key positions in nuclear deterrence and homeland security programs, as well as strategic planning and executive staff support.

Then, after 33 years at Sandia, Hingorani made a big career move in 2020 when she took a position with Lawrence Livermore National Laboratory in California as chief of staff for the director's office. This position allows her to work closely with the lab director and senior management team to enhance institutional planning, communications, as well as sponsor and partner relations. She coordinates Laboratory interactions on governance, strategic planning, new initiatives and priorities to meet the Laboratory's missions.

In more than three decades in the national security arena, Hingorani says that as the world and nation have changed, she has had a front-row seat to the evolution of the nation's security policy, from entering the field in the waning days of the Cold War to the many realignments of the world in the decades since.

She said in her current role at Lawrence Livermore, she has access to variety of high-level information and key players, so her rich history in engineering, national security, policy and strategy is helpful in connecting all the dots.

"It's an amazing moment when the stars have aligned," she said. "I really enjoy my job because it's a great opportunity to support the Laboratory in a significant way."

Hingorani is particularly proud to be leading the way for other women in engineering and national security.

"Sometimes it feels like I'm the only woman in the room, but I hope to be a role model," she said. "I'm proud to be succeeding as a woman in the national security field."

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Department offers online master's program in space systems engineering

The Department of Mechanical Engineering offers a fully-online master's program in space systems engineering, leading to a master of science in mechanical engineering. This program is one of the first master's-level space systems engineering programs in the country. The space systems engineering concentration was developed to provide graduates with the advanced skills to further their career in the aerospace industry. All courses for the space systems engineering program are offered in an eight-week format.

The program is ranked No. 1 nationwide in a list of the 2020 Most Affordable Online Master's Programs in Mechanical Engineering by OnlineU. The same program is also ranked No. 1 for the 2020 Most Affordable Online Master's in Aerospace Engineering Programs, and No. 6 for the 2020 Best Online Master's in Mechanical Engineering Degrees.