Engineering Innovation Showcase

May 1, 2PM-5:40PM

The Engineering Innovation Showcase Event is comprised of five Zoom meetings running in parallel. Each team will have a twenty minute time slot in one of these meetings. They will make a short presentation (including a demonstration) of their project accomplishments. After the presentation, the (virtual) floor will be open to questions from showcase attendees.

Instructions for joining a Zoom meeting:
https://support.zoom.us/hc/en-us/articles/201362193-Joining-a-Meeting

List of Projects

List of Industrial Partners

Andersen Corporation: Team 49
Arizona Hearing Center: Team 44
ASU: Team 58
ASU – NASA Psyche Mission: Team 30, Team 31
BAE Systems: Team 51
Collins Aerospace: Team 12, Team 13, Team 14, Team 15, Team 16
Discount Tire: Team 37, Team 38
Elbit Systems of America: Team 27
Evelyn Ford, Inc.: Team 50
General Dynamics Mission Systems: Team 52
Honeywell: Team 4, Team 5, Team 7, Team 8, Team 9, Team 10
Hydrodynam Jetmix: Team 43
L&H Industrial: Team 3
Maricopa County Department of Transportation: Team 1
Mayo Clinic: Team 17
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Medtronic: Team 18, Team 19, Team 20
Moog: Team 34, Team 35
National Fluid Power Association: Team 56
NMG Aerospace: Team 40
Northrup Grumman: Team 28, Team 29
Ping Golf: Team 27
Raytheon Missile: Team 11
StandardAero: Team 57
Summit Automation: Team 45, Team 46, Team 47, Team 48
TPI Composites: Team 21, Team 22, Team 23
TurbineAero Repair: Team 41, Team 42
West Pharmaceutical Services: Team 39
WoolfTech: Team 55
Zodiac Planetary Services: Team 32, Team 33

01 Robotic system for automated traffic cone placement to support traffic control
Maricopa County Department of Transportation
Time: 2:00PM–2:20PM
Zoom Meeting: https://asu.zoom.us/j/907545117

The semi-autonomous robotic cone placement device was created as a solution for MCDOT REACT personnel, who specialize in highway related traffic incidents. The device was made to make the lives of the REACT staff safer compared to their standard methods of securing areas of traffic flow to allow first responders access to incident sites. Current standards for MCDOT are dangerous and have claimed some highway workers' lives who were following those protocols. This device will automate the process with proper personnel operating the device within the safety of their vehicle, reducing the risk of being struck and killed.

03 Steady rests for manufacturing/rebuilding of large industrial shafts
L&H Industrial
Time: 2:20PM–2:40PM
Zoom Meeting: https://asu.zoom.us/j/635439253

L&H Industrial is a machining company based out of Tempe, AZ. Among many other services they provide, they machine large industrial shafts used in mining processes. These shafts can weigh upwards of 120,000 pounds with overall lengths up to 255 inches. L&H currently has the capacity to machine the shafts based on the overall lengths, however, the weight of the shafts are limiting L&H's machining capabilities. This has created an opportunity for our team at Arizona State Polytechnic campus to work with L&H Industrial to develop a stronger steady rest and allow them to safely machine large mining shafts on their industrial-sized lathe.

04 Quick disconnect Fuel Control Unit (FCU) test setup
Honeywell
Time: 2:20PM–2:40PM
Zoom Meeting: https://asu.zoom.us/j/907545117

The Honeywell Facility at Sky Harbor validates numerous engine pump components for aircraft. However, the main test stand that they use to test the fuel control units is over-sized and outdated. Furthermore, it is difficult to operate and is currently handled by a single technician. Team 04's objective is to create a new test stand design that will minimize the turnaround time it takes for each component to ensure an increase in production while achieving a smaller design footprint. The design will be constructed with an 8020 aluminum frame and digital analogs to control or maintain the flow of oil within the pipes. The new design will ultimately lessen Honeywell's negative revenue and improve their productivity.

05 Automated pneumatic flowline teststand
Honeywell
Time: 3:20PM–3:40PM
Zoom Meeting: https://asu.zoom.us/j/216591808

Team 5 is working with Honeywell to develop a retrofit to existing flowline test stands. This retrofit includes replacing manually operated gate valves and regulators with electronically controlled variants. The overall goal being to reduce time spent on each tested part with these automated components. Not only will this save time for individual operators, but save money and produce more accurately tested pneumatic valves for deployment in aircraft. With the use of value stream mapping and analysis of current testing methods, Team 5 will demonstrate the potential time and cost savings of automation.

07 UAM/VTOL performance study
Honeywell
Time: 3:40PM–4:00PM
Zoom Meeting: https://asu.zoom.us/j/216591808

This project revolves around building and testing a drone for the future of transportation, sponsored by Honeywell. Urban Air Mobility vehicles will change the way people navigate in the near future, but some data collection and analysis are still to be done in order to make these "flying cars" a reality. Team 07 has built a scaled-down VTOL (vertical take-off and landing) drone in order to collect and analyze data from flights that may be useful to Honeywell for developing UAM technology.

08 Space programmable power supply
Honeywell
Time: 2:40PM–3:00PM
Zoom Meeting: https://asu.zoom.us/j/635439253

This is a nominal 5V input DC/DC converter that can provide both a 1.25V output with 8A maximum load current or a 3.3V output with 6A maximum load current using a TI Step-Down Converter. The output voltage is selected through PMBus programming without any component value adjustments. Issues that are mitigated with this device include switching from the 1.25 output to the 3.3V output and visa-versa and efficiency based on power input vs power output.

09 Alternative manufacturing to optimize avionics/electronics designs
Honeywell
Time: 3:00PM–3:20PM
Zoom Meeting: https://asu.zoom.us/j/635439253

The need to push the envelope for new and cutting edge alternative manufacturing technologies exists in today's market. The overall need to optimize cost and weight are at the forefront of that need. Honeywell's customers are directly affected by unoptimized parts because they cost more and the heavier weight negatively impacts aircraft performance. Through optimizing a given product ASU has created a case study in alternate manufacturing for Honeywell to create value by streamlining future engineering design decisions. As with any optimization process, the requirements of the original part must be met or exceeded.

10 Advanced retractable hand stabilization for avionic touch displays
Honeywell
Time: 4:00PM–4:20PM
Zoom Meeting: https://asu.zoom.us/j/216591808

This team was tasked by Honeywell to developing a method to stabilize a user's hand while they interact with an aviation touch screen during turbulence. As requested, the team developed multiple solutions as static and dynamic prototypes. After testing the various prototypes and using the data we collected we chose the flip brace as the best suited to satisfy the deliverables set out by our industry partner.

11 Smart factory control and visualization
Raytheon Missile
Time: 5:00PM–5:20PM
Zoom Meeting: https://asu.zoom.us/j/5210793753

In a world of increasingly complex machine based processes that are running a variety of proprietary software and hardware. Having a single piece of software that allows a person, company or entity to monitor these machines is crucial in having efficient, predictable and tightly integrated systems. This integrated software is known in the industry as high level supervisory process management and control software platforms which allow the monitoring of Industrial, Infrastructure, and Facility Processes as well as data storage and processing. SCADA for short, this project aims at comparing and benchmarking and older version of the software, Factory Talk, to the new kid on the block, Ignition 8.0.

12 Redesign of aircraft evacuation slide aspirator
Collins Aerospace
Time: 3:20PM–3:40PM
Zoom Meeting: https://asu.zoom.us/j/635439253

ASU Team 12, in partnership with Collins Aerospace, worked to design and develop a new Airline Emergency Evacuation Slide Aspirator. An Aspirator is a flow-compounding component that entrains ambient air using a high-velocity stream of gas. Based on Bernoulli's Principle, this device is capable of tripling the volumetric flow of gas that enters the inflatable evacuation slide. This, in turn, vastly reduces the time required to inflate the slide compared to using purely compressed gas, ultimately saving lives in the event of an aircraft emergency. Using advanced manufacturing technology, this Aspirator introduces a reduced volume and weight design that still maintains flow characteristics as required by the FAA.

13 Aircraft water tank continuous level sensor
Collins Aerospace
Time: 4:00PM–4:20PM
Zoom Meeting: https://asu.zoom.us/j/5210793753

Collins Aerospace is currently a leading manufacturer for aircraft sensors. They design and manufacture aircraft wastewater tank level sensors for a variety of commercial aircraft. Collins Aerospace and the ASU Engineering Capstone Team 13 have partnered together to generate a design solution for sensing the fluid level of aircraft wastewater tanks. Through this partnership, an industry level design was created which will be integrated onto the avionics of commercial aircraft. This project primarily consisted of creating an embedded system using industry level software such as Cadence, Microchip's MPLAB, Multisim and SolidWorks.

14 Low cost high reliability retractable aircraft landing light
Collins Aerospace
Time: 4:20PM–4:40PM
Zoom Meeting: https://asu.zoom.us/j/5210793753

Currently in the field of aerospace, lighting for aircrafts is often a neglected area of research until the late stages of the aircraft's design. This is when Collins Aerospace comes in to implement lighting into the aircrafts. Team 14 has been tasked with designing a conventional rotorcraft landing light that fully extends and retracts into the aircraft's body and is the team's primary focus for the project. In order to create a successful system for Collins Aerospace, the landing light shall maintain functionality for 30 years in service without maintenance. This includes no lubrication or replacement of any parts of the landing gear excluding the optic lens/reflector as they will need to be replaced regularly to maintain light performance. The optic of the landing light has been engineered by Collins Aerospace and has only been used during this project for size referencing. There must also be a focus on aerodynamics as the drag created by the extension of the light can affect the aircraft. This presentation will provide viewers with detailed information and visuals of the current developed solution.

15 Lifting solution for F35 inverter converter controller
Collins Aerospace
Time: 3:00PM–3:20PM
Zoom Meeting: https://asu.zoom.us/j/664636481

Collins Aerospace has defined a problem in the testing process of the Inverter Converter Controller (ICC) unit. The ICC unit weighs around 77lbs and must be lifted approximately four feet to be placed into the testing chamber. A solution is needed due to the weight and ergonomic safety restrictions that the technicians must follow. The solution developed, will not only assist the technician to lift the ICC unit but also rotate it at a 90-degree angle. It will also help the technicians move the ICC unit around the factory floor following the safety regulations.

16 3-axis vibration fixture for JSF units
Collins Aerospace
Time: 3:40PM–4:00PM
Zoom Meeting: https://asu.zoom.us/j/635439253

Collins Aerospace supplies the military with many units for the Lockheed Martin F-35 Lightning II. To provide the highest quality product to their customers, extensive testing takes place with each unit manufactured. These extensive tests include a set of three vibration test performed in three different orientations covering the XYZ planes. Team 16 was tasked with designing an innovative multi-axis vibration test fixture that could simultaneously test the units in all three planar directions, a massive improvement from the current single-axis vibration test fixture that would save the Phoenix aerospace company both time and money.

17 Remote imaging to manage ocular conditions
Mayo Clinic
Time: 3:00PM–3:20PM
Zoom Meeting: https://asu.zoom.us/j/216591808

At the request of Mayo Clinic, Team 17 has sought to create an imaging device that will compress the episode of care for patients by reducing triage times. Team 17 has designed an affordable, modular, easy to use device with the intent to capture high quality images of both the retina and the cornea. Our 3D printed design attaches to common smart devices to provide Mayo clinic with a smooth transition to the new method while maintaining the connectivity and efficiency of the traditional medical system. This device will save Mayo Clinic, and by extension their patients, both time and money. The device will also improve positive medical outcomes by streamlining the diagnosis process.

18 Next generation medical device manufacturing and handling
Medtronic
Time: 2:00PM–2:20PM
Zoom Meeting: https://asu.zoom.us/j/664636481

Medtronic is currently developing a next generation implantable cardiac device with unique capabilities to give doctors access to patient data and diagnostic information. The new device will require an improved manufacturing line and technologies. Manual handling throughout this manufacturing process can be challenging and can create yield fallout as Medtronic is preparing to launch their new device. For our EGR 401 capstone project, our team has been tasked with identifying the opportunities for error throughout the fabrication process. By understanding the automated and human generated forces that interact with the material and equipment, we have proposed solutions to refine the device manufacturing. Our team has completed tests to simulate these challenges and analyzed the results to validate our proposed improvements. These verified solutions will significantly increase yield and reduce errors for Medtronic's latest implantable cardiac device.

19 IIOT sensor integration for medical device manufacturing
Medtronic
Time: 2:20PM–2:40PM
Zoom Meeting: https://asu.zoom.us/j/664636481

As the global manufacturing industry begins embracing industry 4.0, the need for a simple, accurate and easy to maintain system of sensors is needed to connect to non-network enabled manufacturing equipment. In response to this need, the team researched a wide variety of sensors on the market, investigated existing IIoT solutions provided by major players already established in the field. Using this research, the team then designed a test bench highlighting various manufacturing processes and the possible sensor solutions for these processes in the context of IIoT. This project was made possible through a partnership of ASU and Medtronic- one of the world's largest medical device manufacturers to integrate IIoT sensors to the current manufacturing equipment, which will be used to drive analytics, quality control, and predictive maintenance in the facilities.

20 Automated stand-alone solution to removing bond pad array lids on PCBs
Medtronic
Time: 2:40PM–3:00PM
Zoom Meeting: https://asu.zoom.us/j/664636481

Team 20 worked on automating a manufacturing process of microelectronics. Having a manual process in the assemble line, gives room to costly errors in further steps. Additionally, this process currently consumes employee time and company resources. Team 20 conducted a feasibility study to determine whether the chosen End of Arm Tooling and our final design would maintain performance at the manufacturing floor. Team 20 was able to provide an offline simulation of what our system would have been implemented as.

21 Robotic non-destructive inspection of utility-scale wind turbine blades
TPI Composites
Time: 2:00PM–2:20PM
Zoom Meeting: https://asu.zoom.us/j/216591808

This project was created for TPI Composites with the goal of replacing their manual turbine blade inspection process with an automated alternative capable of providing the same level of quality and speed or better. The key problems with the current process lie in the number of people required to move and operate the existing equipment and the time spent moving the equipment into position before continuing the inspection. Our goal is to provide an automated rover that can be deployed by a single operator capable of carrying out the entire inspection process with minimal input and supervision.

22 Robotic paste dispensing for assembly of utility-scale wind turbine blades
TPI Composites
Time: 2:20PM–2:40PM
Zoom Meeting: https://asu.zoom.us/j/216591808

We are working with TPI Composites to design a system to reduce the complexity involved in the bond paste application process on utility scale wind turbines. Our designed solution is a 4 wheeled portable rover guided by computer vision that will pull along the past shoe on the utility scale wind turbine blade. The system is a collaborative robot working in conjunction with an operator to maintain a constant travel speed, pressure, and orientation during the application processes. The rover is designed to be made of off the shelf interchangeable parts allowing for quick repair cycles to minimize downtime. Successful application of the rover has the potential to reduce the errors and rework in the bond paste application process and reduce the overall cost of utility scale wind turbines.

23 Robotic carbon fabric placement and verification
TPI Composites
Time: 2:40PM–3:00PM
Zoom Meeting: https://asu.zoom.us/j/216591808

ASU's Team 23 has partnered with TPI Composites to improve the quality assurance process of their manufacturing process for Carbon Fabric Automotive Parts. The team has researched and recommended a camera, designed a test stand for use with the system, and created a prototype to demonstrate the process flow changes that are now possible with the implementation of the camera system. The team will be discussing the capabilities of the recommended solution, the Cognex Vidi Camera System, and detailing the software prototype along with the recommended process flow improvements to TPI's manufacturing cycle.

26 SA227 lightweight seat
Elbit Systems of America
Time: 2:00PM–2:20PM
Zoom Meeting: https://asu.zoom.us/j/635439253

The purpose of an aircraft is to transport cargo from one place to another quickly. It is important that maximum payload be achieved by reducing weight of aircraft components. Elbit Systems of America has had customers reach out to them about increasing the payload capacity of their Fairchild SA227 aircraft. Elbit has identified the 19 passenger seats as items which have high weight due to their outdated manufacturing methods. The ASU team has worked to redesign the seat focusing on lightening the seat frame, and production cost.

27 Automated cutting mechanism for composite material systems
Ping Golf
Time: 2:40PM–3:00PM
Zoom Meeting: https://asu.zoom.us/j/907545117

This project is to create a solution for cutting a multitude of thin composite materials. These materials are used in compression laminating. The solution is to have an automated cutting device that will meet the required tolerances for the cuts by using a CNC gantry coupled with an ultrasonic cutting tool.

28 High efficiency medium volume satellite production line design
Northrop Grumman
Time: 4:00PM–4:20PM
Zoom Meeting: https://asu.zoom.us/j/635439253

The team examined the current state of practice in medium volume satellite production within Northrop Grumman's Satellite Manufacturing Facility. The end goal was to generate both a parameter-based simulation and production plan for capacity and throughput (duration). This simulation was based upon data from previous satellite production contracts within Northrop Grumman and this data was used to create an adaptable production line model. Assembly and test processes were assessed for efficiency, value and speed. Once the production line design was established, the team ran simulations to highlight failure points, vulnerabilities, and areas to improve performance. The resulting simulation and factory floor plan will measurably increase the efficiency of the production cycle and will allow Northrop Grumman to make accurate predictions of total production time.

29 Support for high efficiency satellite production and test
Northrop Grumman
Time: 4:20PM–4:40PM
Zoom Meeting: https://asu.zoom.us/j/635439253

Our project is focused around the design, iteration, development, and analysis of mechanical ground support equipment for specific use during satellite testing and integration operations in a space-restricted area. This presented several design challenges, which our team evaluated, accounted for, and developed comprehensive solutions to overcome. This then led us into the analysis of our design, done mostly through CAD software, which resulted in alterations and improvements to the preliminary design to meet all necessary structural and safety requirements. Due to sudden changes caused by the COVID-19 pandemic that impacted our access to on-campus facilities, our final deliverable consists of a comprehensive design with corresponding engineering drawings and raw materials which can be used to construct the final prototype.

30 Psyche hypothesized surface explorers
ASU – NASA Psyche Mission
Time: 2:20PM–2:40PM
Zoom Meeting: https://asu.zoom.us/j/5210793753

Psyche, an asteroid orbiting the Sun between Mars and Jupiter, is the target of an ASU/NASA mission planned for 2022. This Capstone project is a hypothetical follow-up to that mission, presenting a possible design for an explorer designed to traverse the asteroid's metallic surface. The prototype, adapted to approximate a real rover design, demonstrates a range of movements and tools that could one day help collect data from Psyche.

31 Psyche hypothesized surface sampling system
ASU – NASA Psyche Mission
Time: 2:40PM–3:00PM
Zoom Meeting: https://asu.zoom.us/j/5210793753

In less than a decade, mankind's first mission to a metal world will begin. A spacecraft will settle into a gentle orbit around the asteroid 16 Psyche between Mars and Jupiter and begin taking measurements. It will be equipped with a battery of the finest scientific instruments NASA and its partners can provide. But it will not land. Like at a museum, Psyche's mission is "Look, but don't touch." But what if we wanted to do more than look? What if we wanted to touch? What if we wanted to bring back pieces of a metal world--of a protoplanet core? Enter the Psyche Sampler, by the De Gasparis Capstone Team! It bores, it cores, it's got storage galore! Mounted on the end of a rover, this system will extend humanity's reach by some two hundred million miles to wrench knowledge from the heart of a dead planet!

32 Final design, fabrication and test of a sample collecting penetrator
Zodiac Planetary Services
Time: 3:20PM–3:40PM
Zoom Meeting: https://asu.zoom.us/j/664636481

Zodiac Planetary Services is creating a lunar sample retrieval system using an orbiting satellite and tether system with a goal of retrieving water samples from the permanently shadowed regions of the lunar poles. Team 32 is responsible for designing, constructing, and testing the "penetrator" which will be launched straight into the lunar surface at over 55 meters per second before collecting a sub-surface sample and being winched back in a matter of seconds.

33 Ejector housing system for Zodiac prospecting satellite system
Zodiac Planetary Services
Time: 3:40PM–4:00PM
Zoom Meeting: https://asu.zoom.us/j/664636481

Zodiac Planetary Services has the mission to penetrate the lunar surface with retractable tethered penetrators for the purpose of identifying lunar resource locations. Team 33 has prototyped a design for Zodiac Planetary to serve the purpose of ejecting these penetrators. The penetrators are ejected using springs that are compressed here on Earth, and reeled back in to the ejection chamber before the next cycle continues. The design is inspired by the revolver and has ten ejection cylinders that rotate about a center axis.

34 Moog's manufacturing flow evaluation
Moog
Time: 3:00PM–3:20PM
Zoom Meeting: https://asu.zoom.us/j/5210793753

Moog believes their current process lacks efficiency due to high production costs, excessive production time, and poor first-time yield performance. As a result, Moog has tasked our team with analyzing and providing recommendations on how to improve their current manufacturing process. These recommendations may include improved processes, staffing, training, and or the addition of new equipment to the manufacturing line. The team set out to understand the existing manufacturing process in place at Moog. We used in-person data acquisition techniques to gain insight into the process. We then proceeded with lean and six-sigma methods to identify areas of waste and seek improvement. Through Value Stream Mapping and the creation of a simulation using Arena modeling software, our team was able to model Moog's entire manufacturing process. We then researched specific practices within Moog's manufacturing line to develop recommendations for alternatives. These improvements were added to our Arena simulation which was run repeatedly based on the data we gathered. The simulation output data was analyzed statistically to provide ROI information to Moog and deliver useful information to them about potential paths for improvements.

35 Moog's test flow evaluation
Moog
Time: 3:20PM–3:40PM
Zoom Meeting: https://asu.zoom.us/j/5210793753

Moog is a high-end aerospace supply company for satellite avionics. Our team was brought in to evaluate their test flow process, identify root causes of problems, and to make beneficial recommendations. Using the Lean Six Sigma methodology, we analyzed their flow and found several deficiencies. We worked to develop and test solution plans for solving these issues with the ultimate goal of providing positive returns for Moog!

36 Low cost crash absorbing safety barrier
Mechanical Systems Startups, LLC
Time: 4:00PM–4:20PM
Zoom Meeting: https://asu.zoom.us/j/664636481

Team 36's Crash Barrier project is to modify or replace ordinary roadway barriers that are currently implemented on public streets as well as other force-absorbing applications. The main outcomes for this project is to design, test, and analyze the results of the barrier and to compare those results to a Simulink model that has been used to create a one dimensional simulation for the physics of the barrier absorbing an impact. The test is at a subscale level, and will be used to attract investors to test the designs at full scale. The barrier design and the method of testing were all in the scope of this project. The barrier assembly is filled with water as a means of dampening and will experience the impact of a fifty pound weight dropped onto its front face at a height of seven feet. Instrumentation will measure the pressure inside the barrier throughout the impact, the g-forces experienced in the impact, and the speed of the weight at the moment of impact. These results will be compared to the Simulink model and analyzed based on the testing outcomes and the Industrial Partner's success criteria.

37 Hands free air chuck
Discount Tire
Time: 3:00PM–3:20PM
Zoom Meeting: https://asu.zoom.us/j/907545117

Current air chucks in stores fail prematurely, due to wear and tear causing a delay in customer service as well as an added cost to Discount Tire. Operators must hold the air chuck on the wheel assembly to allow for proper inflation, taking away time from other tire services. Our newly designed air chuck allows for a true hands-free service to allow for proper inflation, while allowing the operator to conduct other tire services creating an environment for efficiency to satisfy customer needs. Happy employees create happy returning customers, that's the Discount Tire Dream!

38 Tire assembly lift
Discount Tire
Time: 3:20PM–3:40PM
Zoom Meeting: https://asu.zoom.us/j/907545117

Discount Tire Co. is one of the largest tire companies in the world. Every year, they experience a large number of back injuries due to improper lifting of tire and wheel assemblies that can weigh up to 150 pounds. Due to this, Discount Tire Co. has asked our team to design, develop, and fabricate a tire and wheel assembly lift. This lift will be able to lift assemblies up to 300 pounds, be powered by an electrical battery and will be able to accommodate assemblies with various diameters. Our solution aims to help reduce the yearly number of back injuries by eliminating the use of manual lifting and incorporating a mechanical lift to raise and lower a tire and wheel assembly.

39 Pushrod collaborative robot automation – medical device assembly
West Pharmaceutical Services
Time: 4:20PM–4:40PM
Zoom Meeting: https://asu.zoom.us/j/664636481

In the age of growing automation, simple yet taxing manufacturing processes are moving towards having collaborative robots, instead of humans, doing tedious actions. For instance, placing a small and thin pushrod less than 1/16 of an inch in diameter into a small target area is an ideal task for automation. Incorporating a collaborative robot to execute this task requires understanding of regulations, needs for the existing product line, and to account for all possible errors and plan/program accordingly.

40 Aerospace battery powered pressure and temperature indicator
NMG Aerospace
Time: 4:40PM–5:00PM
Zoom Meeting: https://asu.zoom.us/j/664636481

NMG Aerospace needs a device that can accurately measure pressure and temperature in an enclosed area that can withstand extreme temperatures. This device will need to have a way of visually communicating the information measured with the user. Their current system that they manufacture is solely mechanical, so they also seek to upgrade their current design with modern technology.

41 Additive manufacture of turbine engine compressor diffuser
TurbineAero Repair
Time: 4:40PM–5:00PM
Zoom Meeting: https://asu.zoom.us/j/5210793753

The rapid development of Additive Manufacturing (AM) technologies has allowed the manufacturing of parts that were not possible before. AM is capable of manufacturing complex geometries that are beyond the abilities of conventional manufacturing methods. AM has the potential to change how engineers design the world, but like any other manufacturing method AM needs specifications for the industry to follow. Specifications are needed to standardize and to ensure safety engineering designs. Due to AM being a relatively new technology, specifications are still scarce. Our team's project is to 3D print AM specimens in Inconel 718, subject them to a developed heat treatment process, and test them to eventually create industry specifications for this new manufacturing method in this material.

42 Multi-Jaw Rotary Aerospace Hardware Positioner for use in Special Processes.
TurbineAero Repair
Time: 5:00PM–5:20PM
Zoom Meeting: https://asu.zoom.us/j/664636481

Our team worked with TurbineAero to provide a solution to increase the throughput of the electron beam welding department. This solution is based around the previous hardware positioner that has degraded to sub-par performance. To meet requirements, the design was required improve the efficiency per vacuum cycle by allowing more parts to be welded within the given cycle. The redesign of this positioner included the evaluation of the pain points found for our customers being TurbineAero and the electron beam welders. The design benefits our customers by providing ease of work for the welders and creating an increase of net profit for TurbineAero in that department.

43 Violent cavitation to render disease-causing biological objects inert
Hydrodynam Jetmix
Time: 4:20PM–4:40PM
Zoom Meeting: https://asu.zoom.us/j/216591808

This project's goal is to eliminate bacteria through the violent means of cavitation. The hope is to achieve this without any additional energy input to the system. If bacteria reduction can occur without an increase of energy then hopefully water sanitation can become more efficient, more portable, and cheaper to achieve.

44 Portable economical hearing screener
Arizona Hearing Center
Time: 5:20PM–5:40PM
Zoom Meeting: https://asu.zoom.us/j/664636481

Most people are not aware of what “normal” hearing is and how the hearing screening process is conducted. Team 44 was partnered with Dr. Mark J. Syms of the AZ Hearing Center in order to research and develop a solution for this particular issue. The main priority of this capstone project was to determine a solution that would enhance the hearing screening process, while being cost efficient.

45 Automated bi-folding residential door automation system
Summit Automation
Time: 3:40PM–4:00PM
Zoom Meeting: https://asu.zoom.us/j/907545117

To solve the problem of closing residential bi-folding doors so that Summit Automation can market a system to fully automate them, we developed a motorized arm to press the folds of the doors into their closed position. The arm operates off of Summit Automation’s stock motor systems and can be covered by decorative paneling as to not intrude on the visual appeal of the door that it will operate. Due to the nature of bi-folding doors, the one system will be needed to operate every pair of panels that a door has, and the movement of each unit would be synced up to create the illusion of a single system. Because our solution is several simple systems linked together, it can be easily adapted to a wide variety of sizes and styles of doors without considerable difficulty.

46 Lift-and-slide sliding door locking motor
Summit Automation
Time: 4:00PM–4:20PM
Zoom Meeting: https://asu.zoom.us/j/907545117

Our project begins with Summit Automation, our Industry Partner. Summit Automation dominates the market of automated doors and windows in the United States and they are the leading manufacturer and innovator of creating suitable systems for any sliding door or window application. Summit Automation wants to continue being the leader of the market by being the first to automate the movement of huge, 600 to 1,200-pound doors by only using electromechanical systems without the physical involvement of their customers. One of their challenges in creating automation systems has been with the Lift-and-Slide Patio Door. This tall (up to 8+ feet) patio door can contain multiple sliding panels that sit parallel to each other and they are all required to lift simultaneously to be able to slide open. Our mission was to design and integrate the system that will lift the panels and engage the rollers to allow Summit Automation's current sliding mechanism to take over the sliding motion of the door. Due to the weight of Lift-and-Slide Doors, the biggest difficulty was to develop the system to be retrofitted inside the panel to automate the lifting and dropping of these elegant patio doors.

47 Linear magnetic motor for barndoors
Summit Automation
Time: 4:20PM–4:40PM
Zoom Meeting: https://asu.zoom.us/j/907545117

A linear magnetic motor is like a traditional rotating electric motor, but instead of the windings wrapped around the magnetic core, it is laid flat, with the rotor and stator moving parallel to each other. Our project is to breakdown an existing linear motor and provide its theory of operation, draft technical documentation, and proof of concept. We have created our own motor controller PCB and software to drive the original stator and rotor.

48 Miniature motor for window automation
Summit Automation
Time: 4:40PM–5:00PM
Zoom Meeting: https://asu.zoom.us/j/907545117

Do you ever wish to spend more time outdoors? Bring fresh air into your home with this 8-foot automated drop down window. This designed system brings the window down safely and seamlessly into your everyday countertop. Elegance can be added into any room and will make this window the gathering point for all your parties. Come see how this 120 pound window can be discreetly dropped into a countertop to create an 8-foot opening for any home.

49 Large unit finished goods handling
Andersen Corporation
Time: 5:00PM–5:20PM
Zoom Meeting: https://asu.zoom.us/j/907545117

Team 49 has been dedicated to developing a cart system to make the storage area of the Anderson Corp's Heritage Facility more efficient by significantly cutting the use time. We have done this by creating a comb cart design to hold multiple finished glass windows and doors safely and independently of each other, using a transfer stand to insert panels in and out. This overall helps the company use their storage space more effectively to save time and money. The solution we provided can boost the efficiency of the business to fulfill the increasing customers' demands. Come and see how we were able to exceed our requirements!

50 Testing the comfort zone of women's shoes
Evelyn Ford, Inc.
Time: 4:40PM–5:00PM
Zoom Meeting: https://asu.zoom.us/j/216591808

Although high heels are always on high demand by society's standards, they often cause a great deal of discomfort that may eventually lead to medical issues after extended periods of use. Because of this issue, Evelyn Ford created a footwear brand that focuses on improving the comfort of heels with the use of insoles and strategic heel designs. Evelyn Ford now wants to redirect their focus exclusively to making their arch support inserts compatible with shoes from other luxury footwear partners. In order to successfully negotiate this deal, Evelyn Ford first requires proof that their inserts genuinely make a difference on high heel comfort and are compatible with the partners' shoes. Therefore, for this project we investigated ways to provide this proof so that it can be passed along to Evelyn Ford's potential business partners.

51 Additive ballistic defeat mechanism
BAE Systems
Time: 4:40PM–5:00PM
Zoom Meeting: https://asu.zoom.us/j/635439253

Today, defeat mechanisms in ballistics armor are built with materials that are effective, but inefficient at stopping armor piercing projectiles. These materials are dense and thickened to reduce the lethality of any armor piercing projectile at the cost of weight and volume. Additive manufacturing offers a potential solution to replace current ballistic defeat mechanism geometries in a way that has not been done before. This project aims to utilize additive manufacturing to create unique geometries to efficiently influence a projectile's orientation such that a secondary armor has a higher surface area to dissipate impact energy, reducing the projectile's penetrating ability.

52 Quantum detection of eavesdropping
General Dynamics Mission Systems
Time: 3:40PM–4:00PM
Zoom Meeting: https://asu.zoom.us/j/5210793753

Due to the increased need for security in communication, the General Dynamics Quantum Communications Lab in Scottsdale, Arizona seeks to develop a proof-of-concept demonstration setup for quantum detection of eavesdropping. The lab has optical equipment capable of polarization encoding and detection of single photons. It will be configured to detect eavesdropping on a single photon communications channel by using principles of quantum mechanics. The team's task was to design and implement control and data processing systems for this optical equipment. This demonstration helps the Quantum Communications Lab prove that quantum enhanced technologies are effective. It helps provide justification for further research and development in next generation secure communications technology.

55 WoolfTech front toss machine
WoolfTech
Time: 5:00PM–5:20PM
Zoom Meeting: https://asu.zoom.us/j/635439253

WoolfTech, Inc. is a company that is looking to bring robotics and data analytics to the sport of baseball in order to help players achieve their highest potential. The current prototype is still very rudimentary and WoolfTech would like to see the prototype redesigned to bring a new and improved prototype into the market. Based on research and mathematical analysis, the team has been able to draft a concept that will meet all the needs and desires outlined by WoolfTech, Inc. This concept features a robotic arm that will be fabricated and programmed by the team creating a more human-like resemblance in its physical look and throwing motion. A sleek redesign of the stand and of the hopper system, while improving on the overall success rate of the ball transferring to the hand. The machine will also have the ability to pitch to nine different quadrants in the outlined strike zone. The Bluetooth/Wi-Fi capability will help with the data analytics as well as connecting to an app on the user's phone.

56 NFPA Fluid Power Vehicle Challenge
National Fluid Power Association
Time: 5:00PM–5:20PM
Zoom Meeting: https://asu.zoom.us/j/216591808

This capstone project took on the challenge of creating a bicycle with a hydraulic drivetrain. Sponsored by the National Fluid Power Association and set to compete against 14 American universities; come see the progress made by team 56 towards converting a traditional bicycle into a hydraulic vehicle. We will present our design solution, as well as the hydraulic, mechanical and electrical technology employed to make this design a reality.

57 Robotic inspection and robotic blending of turbine engine fan cases
StandardAero
Time: 2:00PM–2:20PM
Zoom Meeting: https://asu.zoom.us/j/5210793753

StandardAero is a maintenance, repair, and overhaul (MRO) company that repairs downstream turbine fan cases with various types of defects on both their inner and outer diameters. This manual inspection process is inefficient in terms of both time and money. Consequently, they are looking into fully automating said process while identifying and measuring surface defects within the FAA approved inspection limits specified in the CFM56-5B engine manual. This project explores the feasibility of using different technologies available on the market in an automated inspection process aimed at lowering the cost and increasing the efficiency of inspection.

58 Vehicle Navigation Assistant
ASU
Time: 5:20PM–5:40PM
Zoom Meeting: https://asu.zoom.us/j/5210793753

The main focus for our project is to develop and test a system that will alert the driver of a vehicle of possible obstacles in the vehicle's general path. These obstacles can include road hazards, weather phenomenon, and physical obstruction. Our system, we have provided possible solutions to our Industrial partners and potential customers of this technology. Some of the components are detrimental to the success of our project is the tracking capability, the data transfer relay, take-off/landing, and vehicle recovery. Our team with the collaboration with our Industrial Partner has developed the necessary project requirements and outline. These requirements include the drone must track via optic or GPS sensor, must return designated home location, choose a drone that satisfies our project requirement, and the drone must be fully electric.