University of New Haven

TCoE TRENDS

Newsletter of the Tagliatela College of Engineering, University of New Haven | Fall 2013

Dean's Remarks

We've made our newsletter twice as long to accommodate stories on all the exciting activities and events in the college. I hope you will find the expanded version more informative yet an easy read. We are seeing increased demand for both our undergraduate and graduate programs, and this fall we admitted the largest class of freshmen in the history of the college. The exciting programs we are offering — an interdisciplinary curriculum in the first year and a half; focus areas in modern and socially relevant areas such as renewable energy, sustainability, wireless communication, and cyber forensics; integrated programs in technical communication and entrepreneurial thinking; and two-semester long, industry-sponsored senior design projects — are having an impact in creating strong attraction. New faculty add to the excitement. We welcome Abe Baggili (cyber forensics), Amir Esmailpour (wireless communication), John Osambo (general chemistry), and Dequan Xiao (physical chemistry).

RSHarichandran

Ron Harichandran
Dean

Senior Design Expo — Fall, Winter, and Spring Training for the Big League

Although you could safely say that engineering students tend to be more focused and serious about their work than many other students, the leap from full-time student to full-time engineering professional is still a formidable one. Seeking and landing a job, and the performance pressure once it's landed, is a whole new ball game — one in which the real world plays hardball.

Senior design projects seek to make that transition into the professional engineering world an easier one. As a culminating work after years of rigorous study, the senior design project not only gives students valuable experience but also confidence in their abilities, since many of the projects come directly from sponsoring companies, accompanied by a non-negotiable, supervisor's deadline.

Typically, the company lays out the scope of a project, what they want, and funds it. The student team researches the problem, develops alternative designs, selects the optimal design, and fabricates, tests, and refines a prototype. A faculty member and an industry advisor oversee the team.

Dean Ron Harichandran summed it up: "These projects give students an experience of the real engineering world just before they enter it."

The Senior Design Expo then showcases the projects — to a much broader audience than the students are used to. Students hone their presentation skills in front of professional engineers, other industry leaders, alumni and, of course, parents.

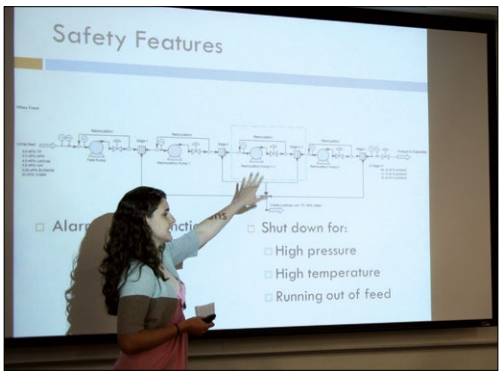
This year's Expo on May 9th was UNH's second. Students presented their design projects in two ways: by poster and oral presentation. Nine judges from the University and the Program Advisory Boards evaluated the posters and determined the winners. Sizable cash awards followed. Oral presentations were given in the afternoon.

For the first time, the students' written reports were judged — by the College's Professional Advisory Board — with the winners receiving cash prizes funded by the Davis Educational Foundation grant for the Project to Integrate Technical Communication Habits.

One design project so impressed the sponsoring company that they are moving forward with it. The company, FuelCell Energy, is a leader in the development and manufacture of stationary fuel-cell power plants for commercial, industrial, government, and utility applications. Students designed and built a high-pressure cylindrical vessel that would increase the efficiency at which fuel cells produce electricity. While withstanding high pressures, it needed to have a low thermal conductivity and allow gas and electricity to penetrate it.

Jonathan Malwitz, Senior Chemical Engineer at FuelCell Energy, enthused, "We greatly benefitted from collaboration with the UNH senior design team. In fact, we used the students' data in our written proposal to the Department of Energy and plan to deploy their design in our commercial system."

That wasn't the only homerun in the last two years. According to Dr. Ismail Orabi, the senior design project coordinator and a professor of mechanical engineering, "Senior design projects have led to patents being pursued by two companies."



In the past, each engineering and computer science program conducted its senior design courses and projects independently. But because the 21st century engineer often needs to collaborate with engineers in other disciplines to solve complex problems, Dean Harichandran worked with the faculty to coordinate the senior design courses across all programs for 2012–2013 and beyond. Identical course scheduling allowed experts from industry to talk about topics common to all programs, such

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as design constraints, environmental impact analysis, project management, and economic analysis. The coordination also allowed students from different programs to be assigned to interdisciplinary projects.

In a project for the Timex Group, for example, students created an innovative user interface/user experience watch design that uses graphic displays and sensors as alternatives to buttons. Both system engineering and computer engineering students worked on the project.

Said Frank Ramirez, Senior System Software Engineer at Timex, "This type of collaboration was not only an exciting and interesting opportunity for the students, but their ingenuity also provided the Timex team with some exciting concepts for future wearable technology devices. We hope to see some applications of these concepts in the near future as we refine their application and feasibility."

So, at the end of the day, who knocked it out of the park and went home with the awards?

The winners in the poster competition were:

First Place:
Project: "Structural Design of Andrick Stadium"
Team: Andrew Saunders and Patrick Daniele (Civil Engineering)
Faculty Advisor: Ms. Marie Bartels
Technical Advisor: Dr. Luiz Vieira

Second Place:
Project: "Design of Charger Garage"
Team: Matthew Hocking, Kristin Piester, and Joelvito Villaluz (Civil Engineering)
Faculty Advisor: Ms. Marie Bartels
Sponsor: Tighe & Bond, engineering and environmental consultants

Third Place:
Project: "Wireless DMX"
Team: Lukasz Antczak and Dariusz Pracon (Electrical Engineering); Abdulatif Alrushaid and Saud Alsuwaigh (Computer Engineering)
Faculty Advisor: Dr. Bijan Karimi
Sponsor: William Flynn/VITEC Videocom

The winners in the written report competition were:

First Place:
Project: SAE Supermileage Vehicle
Team: Daniel Bennett and Joseph A. Olenick (Mechanical Engineering)
Faculty Advisor: Dr. Ismail Orabi
Technical Advisor: Dr. Samuel Daniels
Sponsors: University of New Haven Board of Governors

Matthew Hocking and Kristin Piester, "Design of Charger Garage"

Second Place:
Project: Tri-Sol Technology
Team: Kevin Jalbert. Jr. and Tristan Cowan (Mechanical Engineering)
Faculty Advisor: Dr. Ismail Orabi
Technical Advisor: Dr. Ravi Gorthala
Sponsor: U.S. Department of Energy

Third Place:
Project: User Interface/User Experience Watch Design
Team: Grace Cotnoir (Systems Engineering); Paul Kazmierski and Michael Maguire (Computer Engineering)
Faculty Advisor: Dr. Bizan Karimi
Sponsor: Frank Ramirez, Timex Group

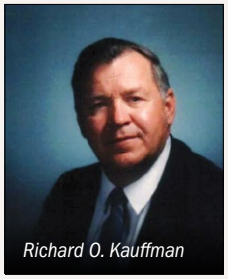
For detailed information on the projects in Senior Design Expo 2013, go to: **www.newhaven.edu/561340.pdf**

ALUMNI NEWS

Family of TCoE Alum and Entrepreneur

Richard O. Kaufmann Establish a Scholarship in His Memory

Kenneth Kaufmann and Laura Miranto, son and daughter of the late Richard O. Kaufmann, have established the "Richard O. Kaufmann Scholarship Fund for Innovative Engineering." The first scholarship will be awarded to a first-year student in the fall of 2014.



Richard O. Kauffman

The scholarship, which provides full tuition and all lab costs for the first year at UNH, is designated for first-year engineering students who have shown their creativity in an engineering competition. For the inaugural competition, UNH will invite 11th graders who placed First, Second, or Third in the Connecticut Science and Engineering Fair to present their project on the UNH campus. One student will receive the award.

When it comes to innovative engineering, contenders for this scholarship could have no better role model than Richard O. Kaufmann. Born in North Madison, Connecticut, he received his B.S. from UNH in 1967. After a stint at

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FACULTY SPOTLIGHT

Maria-Isabel Carnasciali

and the Down-to-Earth Application of Computational Fluid Dynamics

Every year, NASA and our military send billions of dollars worth of equipment and supplies into outer space and into the air. But what goes up must come down — nice and easy, please — which is why deceleration devices are routinely used to bring equipment and supplies down to terra firma. Whether it's a spacecraft touching down on Mars or supplies dropped from a plane over Afghanistan, soft landings are critical in order to prevent smash-ups.

But, there's soft — and then there's softer. That's where Assistant Professor of Mechanical Engineering Maria-Isabel Carnasciali comes in. Her ongoing project, "The Use of Computational Fluid Dynamics (CFD) for the Design and Optimization of Deceleration Devices," seeks to make those landings even gentler and kinder.

Dr. Carnasciali's Ph.D. thesis work made her the ideal person to lead the project. "My thesis was primarily experimental, but it did include a computational component. The CFD project at UNH was one that Dr. Ismail Orabi had come across. It didn't seem quite right for the Senior Capstone project in his opinion, but I thought it would be perfect as a master's- level project. He put me in contact with the company, and the rest is history."

The company is Pioneer Aerospace, and the work has been primarily for the NASA Jet Propulsion Laboratory (JPL) and the European Space Agency (ESA). Pioneer had specifically sought out UNH faculty and students to conduct analysis that would help them optimize their deceleration devices — i.e., parachutes, a feat of mechanical engineering that dates back to the Renaissance.

With the use of computational fluid dynamics to design and optimize their parachutes, Pioneer and its customers can reduce some of their dependence on expensive and impractical aerial and wind tunnel testing. Dr. Carnasciali and her student team use sophisticated modeling software that can predict parachute performance at varying altitudes and speeds, turbulence levels, Mach numbers, and heat transfer by solving mathematical equations and creating computer simulations. According to Dr. Carnasciali, "The value of computational models comes when they can be validated or verified with experimental data. Working with the industry and JPL gives us access to some very high-quality experimental data to verify and validate our models."

"One of the first things I tell students, though, is, 'This is research. I haven't done this problem. I don't know the solution or the result. We are working together — we are a team.'

"Working with Pioneer is fantastic because it puts the work in context," she added. "Students get to participate and solve real-world engineering problems — which may not have just one right answer. As for me, one of the things that makes the biggest impact is seeing how my students react when they realize that the results we obtain are actually being used to make design decisions!"

Because projects for Pioneer involve private industries and the government, the work is highly sensitive and protected under non-disclosure agreements, which limits what Dr. Carnasciali and her team can release. One thing that she freely shares, however, is that "Pioneer has been quite impressed with our students, which is one reason why they have continued the collaboration with UNH for several years on high-profile projects for customers like JPL."

The CFD project also had its lighter moments — but only in hindsight. One time, the UNH IT Department implemented new anti-virus software on all campus computers. Almost immediately, Dr. Carnasciali's team got a message while attempting to run a computation. The anti-virus software had come to the rescue like a virtual knight in shining armor by identifying a virus, encapsulating it, and summarily deleting it. Only problem was, what it identified as a virus was one of the main executable files on the software that the team uses. It rendered the software completely unusable.

And you thought the wind tunnel people had all the fun.

ALUMNI NEWS

Kauffman story, continued

Pratt & Whitney as an aerosace engineer working on burner combustion heat transfer in jet engine development, he moved to Tucson, Arizona. One day he found himself in a huge commercial laundry plant and, sensing an opportunity, asked the owner what happened to the hot, dirty water coming out of the car-sized washers. After learning it was pumped straight into the sewer, he pioneered and patented a process that recovered the heat from the water and used it to heat the cold, clean water going into the machines. The process also recycled the dirty water by cleaning it through a micro-screen.

From left: President Steve Kaplan, Laura Miranto, Kenneth Kaufmann, Board of Governors Chair Philip H. Bartels

He founded his company, Thermal Engineering of Arizona, and sold his continuous flow laundry system to commercial laundry and textile industries all over the world. His company has also built more than 1,500 large commercial laundries, including "mega-plants" that handle hundreds of thousands of pounds of linen a day.

Richard O. Kaufmann passed away on December 22, 2012. This scholarship, established so soon after, ensures that his inspiration, creativity, and energy have a new way to live on.

ALUMNI NEWS

"So, what have you been doing all these years?"

The TCoE Inaugural Alumni Dinner

Picks up Where Everybody Left Off

It was a first, but it won't be the last. The TCoE Inaugural Alumni Dinner was such an unqualified success that the College has made the dinner an instant annual tradition.

Over one hundred alums, guests, and faculty members sat down to dinner on May 11th in Bartels Hall and, between the seared tuna appetizer and the Tiramisu, strolled down memory lane, brought each other up to date, and did a little career networking, too. A presentation followed the meal, honoring four recently retired and retiring faculty members: Professors Konstantine C. Lambrakis, Stephen M. Ross, Alex N. Sommers, and Roger G. Frey.

"Very lively" and "absolutely unbelievable," were just two of the rave reviews, demonstrating that when engineers get together socially, they are quite a spirited group, applying themselves to a good time with the same dedication that they show on the job.

Professor Lambrakis declared it, "...a remarkably successful event. It brought together nearly four decades of engineering school graduates, who are now some of the most accomplished engineering practitioners in Connecticut. This dinner gave me the opportunity to meet again some of the brightest students this University has ever had."






Added Professor Ross, ""Just being there with my colleagues and former students and hearing the heartfelt speeches that were given was an experience I will never forget. My wife and I were also completely blown away by how professional the organization of the affair was."

Kudos to Dean Ron Harichandran, whose brainchild the dinner was, and to Paula Hackenjos, Assistant to the Dean, for her superb organizational talents in pulling the event together.

STUDENT NEWS

What Makes a Concrete Canoe Stay Afloat?

Some Carbon Fiber, a Light Aggregate — and Unsinkable Spirit.

If you've ever lifted (or dropped) a concrete block, you might wonder what concrete could possibly have to do with canoes. But every year, civil engineering students prove the two have plenty in common. The 2013 New England Regional ASCE Concrete Canoe Competition held April 26 and 27 — in which the UNH civil engineering team took part — was just one of 18 regional competitions in which students glide across the water in canoes made of material you would never want to drop on your foot.

Most of the competitions have taken place in lakes and rivers. This year's location was an ocean harbor in Apponagansett Park in Dartmouth, Massachusetts. There were two categories of races: a 600-meter race around the perimeter of the harbor and a 100-meter sprint straight out from shore and back. There were men's and women's races for each category and a final co-ed sprint race. The winner would be determined by a set of points, with 60% of them representing the races, and 40% the canoe's measurements, length, aesthetics, and flotation.

High spirits abounded. Especially when the other teams watched as the leading competitors in the sprint — who started out during high tide — ran aground on their return when the tide rolled back out. Shouts of encouragement mixed with hilarity ensued, a winner was announced — the University of Massachusett–Lowell — and thoughts immediately turned to the nationals which were held on June 20-22 at the University of Illinois at Urbana-Champaign.

How did UNH do? We finished in the top ten with a 230 lb craft — dubbed "The Q" — whose concrete was an ingenious mixture of white Portland cement and a light aggregate that included plastic fibers for strength and microspheres of glass to increase buoyancy. The goal was to make the concrete as light as possible but strong enough to withstand the weight of the paddlers.

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Concrete Canoe story, continued

Constructing "The Q" was a meticulous process of first building a mold out of Styrofoam, pouring concrete ribs, and then troweling on successive layers of concrete over the whole thing, with layers of carbon fiber mesh sandwiched in between for reinforcement. After curing, the Styrofoam was removed. Sanding and some pretty fancy paintwork followed, which made the UNH canoe a standout on the water. All in all, 1,200 person-hours were devoted to constructing "The Q."

Archimedes Principle — which states that an object in a liquid is buoyed up by a force equal to the weight of the liquid it displaces — is why a canoe made of concrete can float. The canoe simply has to be no heavier than the weight of the liquid it displaces. But what helps it win a race? What increases its speed? That would be the shape of the canoe. And that's what the UNH team experiments with from year to year. This year's canoe was teardrop-shaped. Next year's could be a subtle refinement of that shape or a total rethink.

For the UNH civil engineering team, the experience of entering this competition is its real value. Bill Nicole, President of the student chapter of the ASCE, said, "The competition was a fulfilling way for UNH engineering students to work as a team to accomplish a goal — and enjoy themselves while doing it."

Professor of Civil Engineering, Greg Broderick, put it this way: "The principal goal for us in participating in this competition is to give our students the experience of successfully completing a project from beginning to end — planning, designing, constructing, and delivering the final product to the site of the race while abiding by all the rules of the competition. They rose to that challenge like the professionals they will someday be."

UNH Chem-E-Car Competition Team

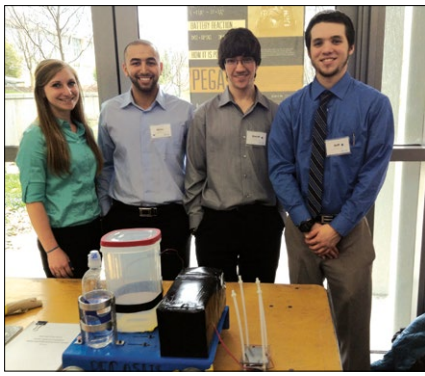
Prepping for the Nationals

After capturing second place in the Northeast Regional of the Chem-E-Car Competition, the UNH team is heading west. Next stop: San Francisco for the national competition, which will take place from November 3rd to the 8th during the 2013 annual meeting of the American Institute of Chemical Engineers.

In the regional competition, held at the University of Massachusetts Amherst, eight teams from universities throughout the northeast pitted their chemically powered cars against each other. Only Cornell outdid the UNH team, taking first place. The UNH team also took third in the poster competition, which is a pre-requisite for moving into the performance phase of the competition.

The rules governing the cars that enter the competition are simple and straightforward:

- The car must be powered by a chemical reaction and be "green" — i.e., produce no visible liquid or gas emissions.
- It must not have a mechanical stopping device (brakes).
- It must be no larger than 40 cm x 30 cm x 18 cm — about the size of a shoebox.
- It can't have cost more than $2,000 to construct.
- It must be able to travel a pre-set distance while carrying a predetermined cargo.



The required travel distance and cargo load are not divulged to the competitors, however, until they arrive at the competition — and only one hour before the competition begins. The distances range between 15 and 30 cm and the cargo load, between 0 and 500 ml of water. During the competition, the teams control their car's movements through calibration curves that they prepared in advance.

Speed and power are not factors in determining a winner. The accuracy of the chemical reaction which stops the vehicle and how close the car is to the finish line are what the judges look at. But, when the distance and cargo load aren't known until one hour before the competition, finding the optimal chemical reaction in advance — one that will work well for a range of distances and cargo loads — is a major challenge for the teams.

On the UNH team: Mina Elias, team captain, in charge of electricals; David Dupont, second in command, in charge of chemicals; Kayla Fitzgerald, in charge of mechanicals, bookkeeper; and Jeff Parsons, head assistant, in charge of stopping mechanism trials. UNH Associate Professor Arthur Gow is the team's faculty advisor.

A Bumpy Road at the SAE Supermileage Competition Shows What the UNH Team is Made Of

The UNH Supermileage Vehicle hit more than just a few speed bumps at the 2013 Annual SAE Supermileage Competition. But, it just went to show that the UNH team is in flawless working order, can rise to a challenge like seasoned pros, and even pull a rabbit or two out of a hat.

Hopes were high as the team headed out to the Eaton Vehicle Proving Grounds in Marshall Michigan on June 4th, vehicle in tow. The UNH Supermileage vehicle is a snazzy, lightweight, aerodynamic, three-wheeled car with a "tadpole" design and custom carbon-fiber composite shell donated by Vespoli USA in New Haven. The team, comprising students, faculty, and staff from the Tagliatela College of Engineering, as well as student members of the American Society of Mechanical Engineers, was about to compete against universities from around the world.

In the competition, which is sponsored primarily by the Society of Automotive Engineers, each vehicle strives for as high a mpg rating as possible. This was UNH's second trip to the competition. Long-time participants routinely reach ratings in excess of 1000 mpg, so the pressure was on.

Race Day dawned. The UNH team, led by 2013 graduates Joseph Olenick and Daniel Bennett, was one of the first in the pits. The vehicle had passed inspection and earned high marks for safety. Among the inspection criteria: vehicle stability, fire suppression, driver restraint, stop time, and the ability of the crew to extract the driver quickly from the tight confines of the vehicle in case of accident – a critical feature as these highly tuned engines burn extremely flammable Iso-Octane racing gasoline.

The car's first run with driver Brittany Albera, a sophomore mechanical engineering major, was amazingly consistent in time per lap. But the mileage was disappointing and upon checking the engine oil, the team discovered a significant amount of metal filings, pointing to serious engine problems. Blown crankshaft bearings then reared their ugly heads. The engine was finished. But "better luck next time" was not going to cut it for our intrepid crew.

With a little more than two hours left, the team resurrected a stripped-down spare test engine that lay idle in their U-Haul. Could they get it assembled and running in time? They wasted no time discussing it, but broke up into three crews: one to remove and strip the damaged engine, another to assemble the spare, and a third to swiftly swap parts and tools from one crew to the other.

Less than two hours later, the vehicle was off with a roar. The first run was respectable, basically matching the performance of the original engine. But it wasn't good enough. Some brainstorming ensued, and the decision was made to run the race at a slightly higher pace and use the added momentum to coast the straightaways. And, it was working. Things were looking just about perfect as the vehicle, engine shut off, coasted down the final straightaway to the finish line.

And then, Mother Nature threw one of her ill-timed monkey wrenches into the race: a breeze. Just strong enough to stop the vehicle within five feet of the finish line. When just one drop of this fuel is enough to take a car 50 or more miles, having to restart the engine in order to travel just five more feet cost the team enormously in their mpg rating.

When all the tallies were in, the UNH team finished tenth in a field of twenty-eight, with a best of 281 mpg. And yet, they were miles and miles away from being crestfallen, knowing they had come through in the clinch. With their mettle tested and proven, they are excitedly looking to next year, to the trophy that beckons, and how they will go about claiming it.

When Summer Camp is the Start of a Career

There's a window — often open for just a short time — when a student can become so excited by the applied sciences that he or she determines to follow that passion and make a career of it. For some students, that window opens and shuts in high school. The Team-based Engineering And Manufacturing (TEAM) Camp, however, can keep that window open.

Designed for high-school students in grades 9 through 12, the TEAM Camp's goal is to get students interested in the STEM fields — science, technology, engineering, and mathematics — earlier in their school years. This year's camp was partially funded by Sikorsky — who also provided scholarships for half of the campers — and developed by Professor Daniel Schrage of Georgia Tech. The camp took place at three locations simultaneously — UNH, Georgia Tech, and the University of Detroit — Mercy from July 8th to the 19th.

The operative word is "simultaneously." Teams comprising students from all three campuses used the "Co-Create, Design, Build, and Operate (CDBO)" methodology in which they worked on the same project at the same time, designing, building, and checking workability as they progressed.

"Engineers often work with others off site," said Amy Thompson, one of the camp's co-directors and an assistant professor at UNH. "Using this methodology gave the students a taste of the collaboration that real engineers experience every day."

Students at the UNH location were part of teams that tackled either:

1. Redesigning the wheels of a Lego® robot so that it could handle different terrains — including simulations of the variety of terrains found in outer space, or
2. Redesigning the blades for a remote-controlled helicopter so that they could lift more load than the manufacturer's version can.

At the UNH site, 20 students participated, and five local high-school teachers attended, with Georgia Tech sending two instructors and a teaching assistant.

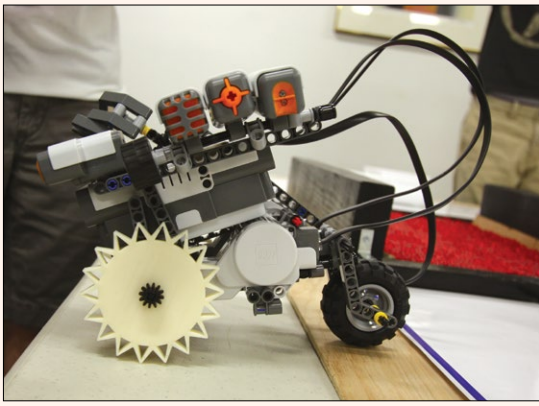
One of the things that really excited the students was the state-of-the-art technology at their disposal — the same type used at Sikorsky, Boeing, and Ford as well as other cutting-edge engineering and manufacturing companies.

The teams used CATIA® v6 computer software to design the parts in 3D, which enabled them to turn the image around and see all aspects of it. They then made their models through Rapid Prototyping — using a printer that prints in 3D by laying down successive layers of materials in various shapes.

It was trial and error, of course. "Our first set of wings [blades] was too light," said one 16-year-old student from the Engineering, Science, and University Magnet School. "Then we put tape on them so they were heavier and didn't break." When that didn't do the trick, the team refabricated them.

During their two weeks at the camp, the students enjoyed a high level of interaction with faculty, researchers, graduate and undergraduate students, and Sikorsky engineers. They even received an invitation to tour the Sikorsky plant where they saw, up close and personal, that what they were doing at camp was simply a miniaturized version of what takes place at firms like Sikorsky.

On "Commencement Day," July 19th, the teams proudly presented their work to parents, the local news outlets having gotten a sneak preview the day before on Media Day. The presentations included the team members from all three universities, made possible by webcams and the Internet.



When confronted with the idea of totally new projects at next year's camp, the students were united in nixing that idea right out of the box: "No, we want to switch and do the other project next year!" Meanwhile, the parents were thrilled that their children had learned and gotten excited about it. "When the parents asked about next year's camp, it was a sure sign of success," said UNH Assistant Professor Maria-Isabel Carnasciali, another co-director of the camp.

Carnasciali went on to sum up the two weeks this way: "The camp gave a little glimpse of how complicated things are in the real world. Things don't always work as expected. You have to re-design. You have to adapt."

That's a reality check that will serve these happy campers in more ways than one.

University of New Haven

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