

OUT OF THE DOLPHIN

A man in a black wetsuit stands on a sandy beach, looking at a dolphin lying on the sand. The dolphin is dark grey and appears to be resting or dead. The background shows a rocky coastline with green hills under a blue sky. The water is a light greenish-blue with white foam from the waves.

& INTO THE OCEAN

by Kathryn Hulick

CAVE



HOW HIGH
SCHOOL KIDS
INVENTED
A CART TO
HELP **SAVE**
DOLPHINS

Mark Agostinelli and several of his classmates descend into the dolphin cave. It's a dark and dusty school basement in Hyannis, Massachusetts, a coastal community located on Cape Cod. Amidst the clutter of old school desks and construction equipment sits something the size of a snowmobile. It looks sort of like a gigantic child's wagon, but with oversized wheels and a canvas sling. It was designed to rescue dolphins. Today, though, the invention is the one in need of rescue. Mark and his friends are here to take it out of the basement. They plan to get it ready to make a difference in the real world.

We're Gonna Need a Better Cart

Four years earlier, in 2011, a different group of students had come together with a goal. They wanted to do something about a serious problem in their community. Every year, they noticed news stories about dolphins and other animals getting stuck on the beach. In fact, Cape Cod is one of a few places in the world where whales and dolphins frequently get stranded. Scientists and other experts work hard to try to save the animals, but many of them die. "The mortality rate is too high," Mark says. So the students asked marine rescue teams what they needed to make their job easier and safer for the animals. The answer? A better cart.

You can't just push a stranded dolphin or other marine animal back into the ocean. It needs immediate medical care, including treatment for shock, stress, and dehydration, if it is going to have a chance of recovery. But you can't call 911 for a dolphin. The organization International Fund for Animal Welfare (IFAW) handles marine mammal emergencies on Cape Cod and Rhode Island. They have a veterinary clinic inside a trailer that can travel to any location. But it needs a flat spot to park. You still have to get the dolphin from the beach to the clinic and back again. That's where the cart comes in.

The cart IFAW was using in 2011 had a flat bed. That's very uncomfortable for an animal used to floating through water all day. When workers lifted the handle to pull the cart, it tended to bonk dolphins on the nose. Also, the workers sometimes had to move the dolphin out of the cart for weight measurements. If an animal needs medication, its weight determines the correct dose.

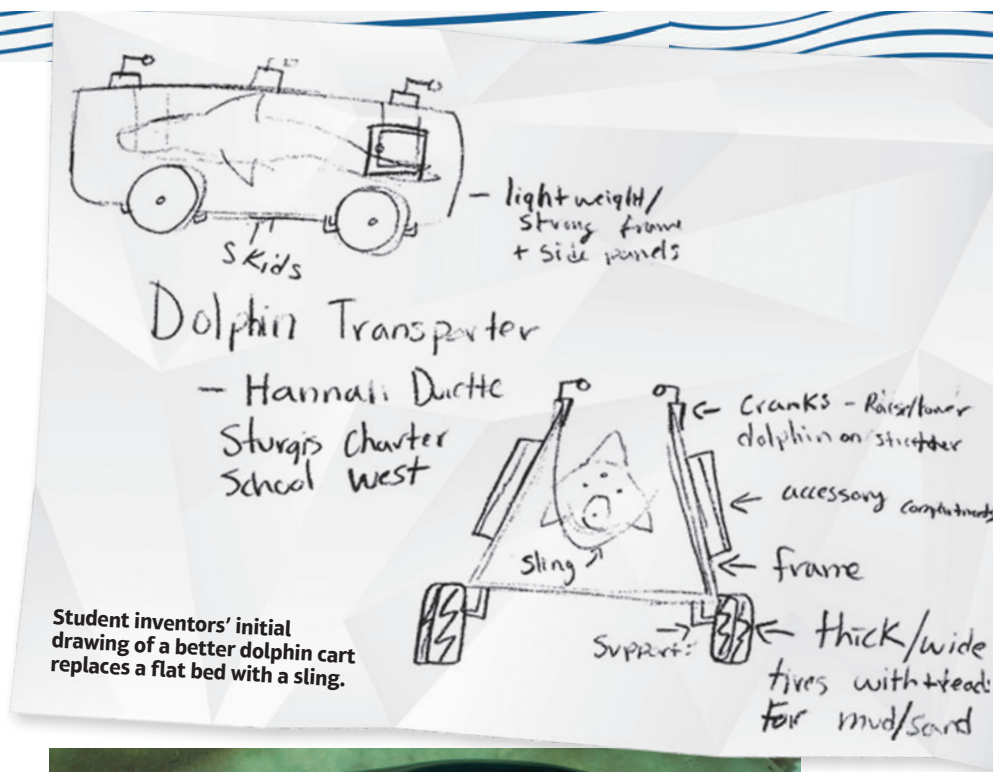
**“DON’T DOUBT
YOUR ABILITY.
ALSO ASK FOR
HELP. THERE ARE
MORE MENTORS
OUT THERE THAN
YOU THINK.”**

—inventor Molly Brennan

All in all, the students came up with a list of 16 problems with the original cart. Could they invent something that would address all of those issues? To do so, they needed help. They embarked on a year-long application process for an InvenTeam grant through the Lemelson-MIT Program, a non-profit organization that works to inspire young inventors. They did extensive research and even built a scale model of the cart, earning grant money and the title of InvenTeam in 2012.

In their school basement, dubbed the dolphin cave (a play on Batman’s bat cave), they got to work building a prototype. That’s an early model of an invention. Instead of a flat bed, they decided to use a canvas sling to hold the dolphin more comfortably. They also built in a scale to weigh an animal right there in the cart.

They needed a lot of stuff. “Fittings, motors, tubing, tires, aluminum, nuts, bolts, screws . . .” recalls Paul Fucile, the father of one of the students on the 2012 team. He is an electrical engineer at the Woods Hole Oceanographic Institution in Massachusetts and served as a mentor for the team. Some of the kids learned to use tools for the first time. “We spent a lot of time sawing into pipes in the basement,” recalls Molly Brennan, a member of that team. They also tested the cart out on the beach. With no dolphin volunteers, they put a few teammates in the sling to test it out! They also built a wooden dolphin model for testing.

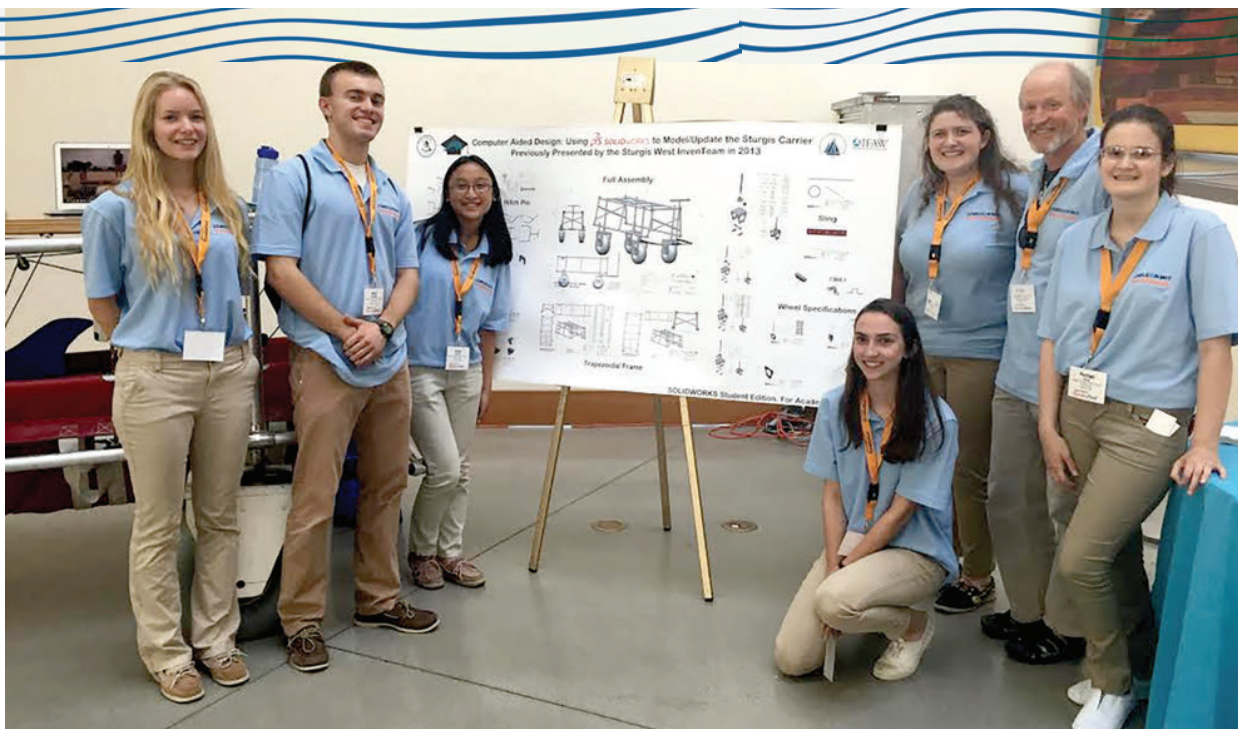


Student inventors' initial drawing of a better dolphin cart replaces a flat bed with a sling.



The original flat-bed cart





In 2016, a second Sturgis InvenTeam showed off their improved design for the Marine Mammal Rescue Transporter. Left to right: Olivia Furner, Mark Agostinelli, Emily Spinello, Caroline Sullivan, Sophie Gibson, faculty adviser Dr. Pete Sampou, and Rachel Souza.

Molly and the rest of the team presented the prototype at a Lemelson-MIT event called EurekaFest in 2013. But after that, most of the team graduated and moved on to college or university. For almost a year, the cart sat in the basement. It wasn't saving dolphins. It was gathering dust.

Another Team, Another Basement

Before Molly graduated, she mentioned the project to Mark, who was a sophomore at the time. An idea began to take hold in his mind. He told his chemistry teacher, Peter Sampou (Dr. Pete for short), that the cart could have a real impact on the world. They just had to finish what the original team had started. This meant turning the prototype into a reproducible product that anyone could build and use. "I thought it would be two weeks of my time," says Dr. Pete. That was three years ago.

Molly and Mark went to the high school Sturgis East. But the cart was at Sturgis West, a sister school that most the students on the original

"YOU CAN CHANGE THE WORLD, IF YOU ARE PATIENT AND PERSEVERE."

—mentor Peter Sampou



team had attended. The first step for the new team was to find a new dolphin cave. They settled on a space in their own school's basement. "It had no lighting and no electrical output, but it was an open space," says

Dr. Pete. They brought in tables and drill presses. They added electrical outlets.

Then they got to work. Mark and another team member taught themselves how to use computer-



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—mentor Paul Fucile



First, rescuers put the sling on the ground next to a dolphin. Then they roll the animal onto the sling and hook the sling onto the frame of the cart. Next, they winch the sling up off the ground. Now the cart can be pulled across a beach and even over dunes.



aided design (CAD) software called SolidWorks. They created “blueprints” that others could use to build a perfect replica of the cart. They also had to make sure that the cart could be easily disassembled and re-assembled for transport to stranded animals. So team member Olivia Furner came up with a new, simpler way to attach the handle to the cart. (As a bonus, it doesn’t bonk any dolphin noses.) The wheels also come off so the whole thing can fit into a standard truck bed.

Out in the Real World

When the team was ready to test the cart, they met up with an IFAW employee at a local beach. This time, they had a better test subject: a life-sized rubber dolphin that IFAW uses for training. The stability of the dolphin in the sling impressed IFAW. Dolphins had sometimes fallen off the old cart the organization had

been using, says Olivia.

Staffers at the Lemelson-MIT Program found out that a new team had taken on an old project. They invited the team to another EurekaFest in 2016 and again in 2017 to show off their work. Finally, in 2018, the students decided their design was complete. Paul Fucile and his colleagues at Woods Hole Oceanographic Institute welded together a finished version of the cart in their machine shop. At a heartwarming ceremony in the spring of 2018, students from both teams presented the cart to IFAW as a gift. Molly was there. She says, “It’s a really amazing feeling to know that something you’ve worked on can actually improve the lives of animals and the lives of workers as well.”

The cart had a positive impact on her life and the lives of the other students too. Molly says that working on the project gave her confidence

and helped her learn critical thinking skills. Now, she has graduated from MIT and is pursuing a doctorate in chemical engineering at Princeton. Mark feels that the project taught him professionalism. Also, he says, “I’m a lot more fascinated with how things work rather than just what they do.”

As this article went to press, IFAW hadn’t used the cart in a real rescue yet. But that could happen any day now. In addition, the design is freely available for anyone around the world to use in marine rescue operations. Scaling the design up could produce a vehicle for rescuing larger animals, such as orcas, says Fucile. The invention that once languished in a basement is out there in the ocean of the real world, poised to make a splash.

Kathryn Hulick vacations on Cape Cod every summer. She has seen many seals and other sea life there. At home, she invents stories and articles about science and technology.