AEF’s 2004 Teacher of the Year is bringing the world of aerospace to New Hampshire students.

Mr. Caron’s Opus

If you remember high school shop as the place where students spent the year making ash trays and table lamps, take another look. At Kingswood Regional High School in New Hampshire, what now is called the Technology Education Department offers courses in computer-assisted design, electricity and digital electronics, wood technology, metals technology, and graphic communications and design.

None of the department’s programs is further from the industrial arts courses of past generations, however, than the aerospace courses taught by Daniel W. Caron, who was recently named 2004 Teacher of the Year by the Aerospace Education Foundation, an affiliate of the Air Force Association.

The award itself is named for the late Christa McAuliffe, the teacher who died in the 1986 space shuttle explosion. The award is given annually to a classroom teacher in kindergarten through 12th grade who demonstrates excellence in furthering the concepts of aerospace technologies through successful, innovative classroom programs.

Caron received his award Sept. 13, 2004, at the AFA Air and Space Conference and Technology Exposition in Washington, D.C.

Making the distinction between earlier industrial arts classes and his courses, Caron said, “The old shop classes used to be for kids who could do only simple things such as cut out a piece of wood from a pattern and put it together. The aerospace courses require more imagination.”

Caron has taught at Kingswood since 1999. School administrators credit him with building the aerospace program and improving the school’s physical facilities. Earlier jobs with industry and NASA have given him valuable contacts within the space community, and his success in writing grant applications has helped him add useful teaching aids.

Each of his aerospace students is assigned an e-mail mentor from the aerospace industry. They help with problems and, at the end of the year, evaluate the teaching program and suggest changes.

Various grants have provided Kingswood with computers, projectors, air rocket launching sets, helium blimps, and a portable planetarium. One grant paid for ham radio antennas that Caron mounted on the school’s roof.

“I brought in a small mobile radio that I used to have in my truck,” he said, “and we are using it to transmit and receive with the antennas that are up there.”

Tracking Satellites

One class is now setting up a com-
computer, which the students will use to track satellites. The computer will control where the antennas are aimed, but “the antennas themselves, hooked up to the radio, work fine.”

Caron has offered three primary courses at Kingswood: Aerospace Pre-engineering, a Cooperative Satellite Learning Project, and Aerospace Studies.

The pre-engineering course calls for students to design and carry out an aerospace experiment. The project is used to compete for a flight opportunity under NASA’s Student Involvement Program or a similar competition.

The Aerospace Industries Association (AIA) started the Team America Rocketry Challenge several years back, Caron said. The students were excited about that, he said, and so, “for the past three years, we have been entering that competition.” The challenge gives students a realistic experience designing an aerospace vehicle to meet specific mission and performance requirements.

According to AIA’s instructions, “The rocket contest will challenge students to design, build, and fly model rockets that carry one or two raw eggs for precisely 60 seconds, returning the eggs to the ground safely”—that is, without breaking.

More than 16,000 students, representing every state, have participated in the last two competitions.

The contest is co-sponsored by the National Association of Rocketry, and the American Association of Physics Teachers is an educational partner this year.

The Kingswood team will practice for the event on the launch range, which is on an athletic field and includes two pads with five rails each to accommodate up to 10 rockets. “We make solid-fuel rockets,” Caron said, “with black-powder motors.”

Fail-Safe

The school’s procedures ensure safety. “Someone is always in charge of making sure that everyone is well away from the pad,” Caron said. Spotters check the airspace “to make sure that everybody is aware that you are launching. Then, your ignition system has fail-safes on it so you can’t just launch by accident.”

For an earlier AIA competition, a class designed and built a two-stage model rocket capable of reaching a specified altitude and returning safely to earth. Each student was given a specific function such as project manager, payload specialist, propulsion system worker, or safety expert.

Caron convinced a retired rocket engineer from the New England Council of the American Institute of Aeronautics and Astronautics to act as class mentor and recruited a sounding rocket engineer from NASA’s Wallops Flight Facility, Va., to serve as e-mail mentor.

This year’s team is divided into four major elements: propulsion, recovery/payload, structural/design, and management. Students have jobs such as machinist, designer, financial officer, and recovery specialist. Several also are responsible for corresponding with team mentors.

In Caron’s Cooperative Satellite Learning Project, students study the history of space exploration, rocketry, and the design of various spacecraft. The course is modeled after one Caron taught in the late 1990s at a Maryland high school. At Kingswood, he modified the approach to allow for the fact that New Hampshire is farther removed from the space industry.

In the program, students build and launch model rockets and simulate satellite launches—in addition to studying the history of rocketry and teleconferencing with NASA officials. The course is designed to give entering freshmen their first taste of the space science experience.

The Aerospace Studies course is for students who have completed the two earlier classes. Each pupil signs a contract calling for an independent study in some aspect of space interest to the student. Past students have chosen areas such as the principles of aeronautics and the nature of deep-space objects such as quasars and pulsars.

The students in all courses are required to participate in public outreach programs. Some help in another of Caron’s activities—teaching evening classes in continuing education.

“An example might be when we set up the planetarium,” he said. The aerospace students will do advance research on different constellations, and “we’ll do a night-sky presentation and talk about the various constellations that might be in the night sky at that particular time of year. I’ll have the kids explain about the different constellations and the stars in those constellations.”

In 2004, Caron’s continuing education classes included a seminar exploring the night sky and the autumn constellations using the portable planetarium.

Another class showed how to use a space explorer handbook CD and how to use the Internet to find space information. This seminar was recommended for parents who homeschool their children.

A third class was designed to explain how Global Positioning System satellites work. Participants did
hands-on work with GPS receivers to plot their positions on Earth.

A fourth class, open to parents and children, covered rocketry basics and let students build and launch their own model rockets from supplied kits and motors.

The evening courses are popular in the community.

Space Camp

Even more appealing to younger students is the Knight Space Academy, a week-long space camp for grades three through eight. Caron directs that summer camp.

“I had a couple of kids who participated in space academy who came back and took one of my classes later on,” he said.

With so many movies and TV programs set in the future, it may be difficult for some students to distinguish between what is state of the art in the aerospace world and what is Hollywood fiction. Caron does not always draw a fine distinction.

“Science fiction is all right,” he said. “Look at Leonardo DaVinci’s notebooks. When I ask students to design a space station, they have requirements that must be met.”

Caron instructs his students to design their plans using current technology. For example, a student might want to use expendable space launch rockets to deliver space station parts to orbit. “If they say they want to use a rocket that does not exist, but could, possibly, with current technology, I let it slide,” he said.

Caron doesn’t recall taking an interest in aerospace as a boy. He began working in the area while already teaching high school. “There was a physics teacher in the room right next door to me,” he explained. The other teacher “had always been interested in space, and I could hear him talking about it through the wall. He and I ended up building a space shuttle simulator.”

Another of his earlier experiences put Caron in touch with space engineers and scientists as a facilitator with a NASA educational workshop at the Goddard Space Flight Center, Md. The two-week program operated out of Goddard and at Wallops Island on Virginia’s Eastern Shore.

“I was hired as the teacher coordinator for that program at Goddard,” he said. The University of Idaho and Oklahoma State University offered credit to teachers who went to the workshop. “We had to certify that the teachers did the work, and the universities made us adjunct faculty.”

Recognition

The McAuliffe Award is not the first honor Caron has received. In 2002, he was chosen as Teacher of the Year by the Pease (N.H.) Chapter of AFA, and Educator of the Year by the American Institute of Aeronautics and Astronautics-New England Section.

When not teaching, Caron has served in numerous community positions. Since 2003, he has been aerospace education vice president for the Pease Chapter.

In 2002, he was named to the Pre-engineering Technology Curriculum and Advisory Council, a group that advises New Hampshire’s education department on technology curriculum and fund-raising.

He has also been on the Technology Education Foundation of Maryland board and chairman of its Professional Relations Committee.

Aerospace studies are still considered elective courses at Kingswood. However, Caron said he hopes eventually to see aerospace education become accepted as mainstream courses, along with the other physical sciences.

His argument is that aerospace contains many of the same elements of traditional disciplines such as physics. When his students build and fly their own model rockets, for example, they learn about Newton’s three laws of motion.

Other teachers often borrow equipment from Caron to reinforce their own lessons. The portable planetarium is a popular tool in other courses, as are some of the teaching aids that NASA has sent him, such as tiles from a shuttle.

His aerospace courses feature all types of students, who tend to have different strengths and “work together well,” he said. He noted that one autistic student was making presentations in front of the whole class by the end of one semester. His presentations “weren’t perfect, but he was up there doing it.”

Caron believes his aerospace courses have an enduring value for students.

“Having a student explain concepts to me weeks after we went over them is pretty satisfying,” he said. “I have a special education student who will explain Newton’s laws of motion and give examples. We went over this in class months ago. Would he have remembered if he learned them in a regular science class? I’m not sure, but my guess would be no.”

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