Is There a Christian Engineering?

Dr. David Vader, chair of Messiah's Engineering Department

Persons outside of the profession, and sometimes engineers themselves, do not fully understand the nature of engineering work. Ron Howard's film about the troubled Apollo 13 moon expedition depicts the response of engineers to crises. In one scene, astronauts lives are in jeopardy as carbon dioxide accumulates in a disabled spacecraft. Ground crew engineers, working under severe time constraints and using only those supplies available to the astronauts, must make square filtration canisters work in round receptacles. Confined to an office with the available material resources, the engineers craft a solution from, among other things, duct tape, plastic bags, and pieces of the flight plan document. This is engineering at its best. When needs, goals, time constraints, and available resources are clearly specified, engineers can solve problems.

Rarely, however, are the scope and boundary of an engineer's work so well defined. In the United States, the Accreditation Board for Engineering and Technology (ABET) describes engineering as devising components, systems, and processes to meet needs and applying mathematics and science to "convert resources optimally to meet a stated objective."** Even this abstract definition of engineering points to needs, resources, and optimums: how much more subjective is actual engineering practice? Subjective ideals not only motivate an engineer's work, they alter the culture from which those ideals arise. Cultural activities shape our work, and our work is itself shaping cultural activity.

Planting and harvesting crops, conducting business, starting and raising families, and communicating with other human beings.

Christians are, or should be, especially aware that good engineering always demands more than technical competency. The work of every Christian is ultimately the work of an ambassador, an agent of Jesus' ministry of reconciliation to the world. And this work is not a curse of the fall! Before sin, God called us to apply our own intelligence and efforts to His work. At the dawn of creation, everything was good and filled with possibilities, and God gave to Adam and Eve the task of bringing these treasures to fruition. Engineering is a creative cultural activity, not just a matter of technique. We participate in God's creative work, bringing out features that are ever more intricate and increasing beauty in the creation. What began in a garden will end in a city, the New Jerusalem.°

Several years ago, at a national meeting for engineering educators, I posted an invitation to a Christian Engineering Education Conference. A day later, I discovered that someone had penned into the margin of my flyer the question: "What is Christian engineering?" Beneath this in another hand was

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The Flying Club has had a busy semester, with approval of our charter by the Messiah College Student Association at the top of the list of accomplishments. Another exciting development was the completion and maiden flight of our AirBike ultralight project. Construction of the aircraft took about 18 months and involved many hours of work by students under the watchful eye of the club's advisor (and test pilot), Dr. Don Pratt. According to Dr. Pratt, the plane flies beautifully, and he has been able to put almost 50 hours on it since it was completed in August of 1998. The plane has been used for a wide range of activities, including dropping candy at the first-year engineering student party, held at Professor Erikson's farm, and taking aerial photography of the campus. The next club project is the construction of a similar aircraft, called the TTandem. Students are currently building wing ribs and doing fabric work on the tail surfaces.

The club has continued to work with area missionaries to promote missionary aviation. One recent meeting featured a video of missionary pilot work in Papua, New Guinea, and a talk by Randy Pearson, a missionary pilot. The club has been in contact with Moody Aviation and has acquired a video showcasing that program. Students are also working on sponsoring a Missions Awareness day at a local airport sometime next year.

Another development has been the signing of an agreement with a local soaring club, the Mid-Atlantic Soaring Association (M-ASA). Under the terms of the agreement, M-ASA will provide use of their equipment and flight training by FAA-certified instructors for selected students in the Messiah Flying Club. This is an exciting new venture for us, as it will not only get our students in the air, but also provide opportunities for students to be witnesses to members of M-ASA.

In conjunction with the flight training program, the club has begun ground school classes. These classes are teaching the basics of flight, equipment, maintenance, navigation, etc., necessary for safe operation of an aircraft. The club is sponsoring these classes free of charge to any interested students.
Update on Genesis '99

by J. Laurel Cocace '00

The Genesis Solar Racing Team continues its work as the completion date of March 1, 1999, approaches. Early last summer, the decision was made to rebuild most of the vehicle, including the shell, chassis, and solar array, in order to make improvements in handling, aerodynamics, and weight savings. The partnership with Harco Corporation has allowed us the flexibility to make major design changes, but the work of actually building a new car has been a daunting task, to say the least.

The same plug (a full-scale model of the car that is used to make the molds for the shell) has been used, yet the task of completing a new shell occupies most of the team. Certain improvements and modifications needed to be made, as well as repairs of damage that had been suffered in storage. The basic geometry of the shell has not changed though, and the car will look much the same from the outside. One major difference will be in the vehicle's chassis, which is now a space frame constructed out of aircraft grade steel, as opposed to the carbon composite monocoque chassis of the '97 vehicle. Also, a change in Sunrayce regulations this year necessitated the addition of a fourth wheel, which significantly altered the geometry of the suspension and drive systems.

The team itself has also changed, with the addition of several new team members who assist in the business and logistics aspects of the project. Whereas the old team was made up mostly of engineers, the team for '99 includes business and accounting majors, public relations specialists, and a business advisor, Mr. Terry Earhart. Their help is much appreciated in making the details of such a complex project run smoothly.

As mentioned earlier, the car is due to be completed by the first of March. This date, much earlier than the two previous cars were assembled, was set to allow time for testing and training. The lack of adequate testing and training hurt the team's finish placement in the 1997 race, and the team is determined to correct this. We plan to learn the most efficient way to run the vehicle well, before setting out on the actual race route. The reduction in the overall weight of the car, aerodynamic improvements, and experience of team members leave the '99 Genesis Team with high hopes for this summer's race from Washington, D.C., to Orlando. May the fruits of our labors bring glory to the Lord!
Introduction to Engineering Design

With the largest enrollment ever (57 students), the Introduction to Engineering (ENGR 102) course this past fall semester challenged students with two design projects and kept our students, professors, and facilities very busy. The first project was the Edible Scale Project. The objective was to make a scale out of edible materials which measured masses between 0–100 grams accurately to within ±1 gram. All kinds of materials were used in the construction of the students’ scales: pretzels, lasagna noodles, licorice, graham crackers, vegetables, rice cakes, etc. The counterweights were typically candies like M&M’s or Skittles. In addition to the technical considerations, students learned about teamwork, project management, prototype testing, dealing with conflicts, and writing reports. They also learned that engineering can be fun... sometimes! After the final testing was completed, the students celebrated by eating their projects!

The second project was designing a scaled version of a prototype solar car. Each project team of three students was given two solar cells, a dc motor, and a block of wood. The budget for additional new materials was $15. All other materials needed to be recycled. Each team was required to develop a Specification/Design Review Report and a presentation. The cars were judged for creativity of design, quality of construction, use of recycled materials, aesthetic appeal, and functionality. At the end of the project, a race was held. The cars were timed over a 20-meter course. The winning team’s time was 18 seconds. Each team member won $10. !!!!

Don Biever ’02, Tom Boley ’00, and Colleen Croun ’99 test their “ice cream cone and pretzels” edible scale.
All students deserve recognition for creativity, ingenuity, and team effort. Shown on this page are other teams with their solar cars. The winners are featured on the back page.
Y2K-2, Y2K-1, ... And Counting!

Update from Dr. Harold Underwood

What's new with the Messiah College Engineering Department as we near the new millennium? Our first Engineering Department Chapel of the decade brought us together on November 19 at the new Graothanum Brethren In Christ (BIC) sanctuary. The theme, Engineering for Christ shaped our gathering. Professor Erikson opened with prayer. After sharing a mission statement, Dr. Vade called for students who participate in activities associated with our department to identify themselves. Next, led jointly by student/alumni musicians and myself, we worshiped the Lord in song, using the hymns I Sing the Mighty Power of God and This Is My Father's World, followed by There Are Many Gifts and Asidhi: Amen. Student instrumentalists included Peter Tasch on trumpet, Jonathan Owen on French horn, Jeremy Ross on trombone, Michael Foster on tuba and David Owen on guitar. Other faculty and staff also helped with aspects of the program.

Our guest speaker, John Brubaker, practiced civil engineering in the local area for five years with Modjeski & Masters. More recently, he returned from Thailand where he and his family lived for ten years while he was employed at an international school, most recently as the director of Human Resources. John now serves off campus at the BIC headquarters as the associate director of BIC World Missions. Using often humorous illustrations from his experience, John captured our attention as he spoke about "Obeying the Voice of God." He told of closet Bible studies he had with coworkers on the premises of his work site. Once, when he "showed up" an immediate superior to his boss, he realized he needed to apologize. Another time, he remained silent when two bosses argued over his assignment. Finally, reminding us of Moses' rod, he shared how the Lord can transform the tools and/or talents in our hands for His higher purposes when we listen and respond to Him in faith. For the spring of 1999 and beyond, we hope to have even more student/alumni involvement and leadership in our department chapel.

Fall 1998 also found me planning active group learning opportunities for students in my classes, coordinating a reception for alumni, learning from the experts what it takes to be a consultant, and meeting and preparing to help a new group of advisees. To you alumni I missed at the fall reception, I sincerely apologize. I wish the timing of the AICN conference I attended that day in Chicago could have been better. AICN is the Alliance of IEEE Consultants Networks that I jokingly call the "Mother" of all consulting networks for electrical-type engineers. While I have enjoyed meeting each of my new advisees this year, I also enjoy hearing what you alumni are doing. From your contacts and experiences, you have something valuable to share with our present students. The Engineer's Guide to Lifelong Employability recently published by the IEEE stresses networking through personal contacts and via the Web as keys for finding jobs and building a long-term career. I highly recommend this guide to you as a resource in whatever status of employment you find yourself right now.

For spring and summer 1999, besides classes, I look forward to attending at least two conferences: the annual conference of the American Society of Engineering Educators (ASEE) in Charlotte, N.C., and the Mid-Atlantic Section Spring Regional Conference in West Long Branch, N.J., where I plan to present a paper, "Active Group Learning in Physics and Engineering Courses." My presentation will be based on my experience in using active group learning with students in my classes over the past school year.

Hope you have a happy spring!
Coming Events

Paper to be presented at the 1999 ASEE Annual Conference in Charlotte, N.C.

A paper titled "Cross-Cultural Service Learning for Responsible Engineering Graduates" will be given as part of the 1999 American Society for Engineering Education Annual Conference in June. The co-authors are Dr. David Vader, Mr. Carl Erikson, and Dr. John Eby. Dr. Vader and Mr. Erikson are members of the Engineering Department, while Dr. Eby is Director of the Agape Center for Service and Learning at Messiah College. The paper is based on appropriate engineering being a distinctive of the Engineering Department, and highlights opportunities to encourage, promote, develop, and implement appropriate engineering principles with our engineering students, the Messiah College community, and the worldwide community. Service-learning and cross-cultural engineering are presented through the recently completed work by students in Burkina Faso on the West African Solar Project. If you are interested in a pre-publication copy of this article, please contact either Dr. Vader (dvader@messiah.edu) or Mr. Erikson (erikson@messiah.edu).

CEEC-99
1999 Christian Engineering Education Conference

"The Mission of Christian College Engineering Programs for Y2K and Beyond"
June 23-25, 1999, Winsham, North Carolina

Christians engaged in engineering education and/or other engineering activity are invited to gather for a time of reflection, discussion, and fellowship on June 23-25, 1999, at the JAARS facility of Wycliffe Bible Translators in Winsham, North Carolina, immediately following the 1999 ASEE Annual Conference in nearby Charlotte. Dr. Vernon Ehlers, a former professor of physics at Calvin College and a member of Congress from Michigan’s 3rd Congressional District, is the keynote speaker. Dr. Ehlers is presently Vice-chair of the House Science Committee and also serves on the Transportation and Infrastructure Committee and the House Oversight Committee. His address to the conference will be "A Christian Perspective on National Science and Technology Policy." The conference web page is located at http://ergr.calvin.edu/ces/ceec99.htm. The CEEC 1999 Conference Chair can be contacted at the following address:

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Senior Project Presentations on April 30, 1999

The senior engineering class of 1999 will showcase the results of their two-semester projects on Friday, April 30, 1999. These formal presentations are open to high school students, parents, industry representatives, and other colleges in the area. The projects include the following:

Electric Conversion of Gasoline-Powered Car
Designers: Robert Bognall
Joshua Coleman
Geoffrey Ring
Jeffrey Lesoine

Thermoacoustic Engine
Designers: Aaron Alexander
Ritchie Javier

Friction Welder Modifications
Designers: Jonathan Knight
Daniel Hallowell

Manufacturing Laboratory Modifications
Designers: Wesley Horst
Michael McFalls

Autonomous Instrumentation Package
Designers: Phillip Sorensen
Benjamin Claggett

Land Mine Detonator
Designers: Paul Mantalano III
Timothy Skar

Wind Generator Modification
Designers: Christy Ficarra
Douglas Wever

Telephony Data Collector
Designers: Brian Wenger

These 17 seniors hope to see you there as they share their work. Refreshments will be served. For more information, contact dpriatt@messiah.edu.
And the winner is ...