



ENGINEERING NEWS

Update on Light Sport Aircraft project

by Don Pratt

The Light Sport Aircraft (LSA) project was begun about a year and a half ago with the idea that a small, low-cost aircraft designed specifically for use on the mission field would be useful and cost-effective. This aircraft would be able to carry two people (or a pilot and a stretcher), have the ability to operate off short, rough landing fields, be inexpensive to build and operate, and have folding wings for easy storage and transport. During the first year of the project, students in the Messiah College Flying Club completed the basic layout and sizing of components along with an initial fuselage design, which was computer analyzed. An engine was purchased and a reduction drive system was designed and built as a senior engineering design project (see *Engineering News*, Spring 2006). Much of this work was sponsored by an Exploration Grant from the Collaboratory for Strategic Partnerships and Applied Research.

Since then, much progress has been made. The fuselage design has been finished and a full scale prototype has been constructed to finalize the details of seating and control layout. An airfoil has been chosen and a full scale wing section constructed for testing. Last spring, the Materials Engineering class selected the rib to spar connection as a class project and performed numerous tests comparing riveted and glued connections. They found that glued connections were

stronger than rivets, if attention was paid to avoiding peel in the glued joint. As a result, the LSA design team plans to use glue in part of the rib construction process. In addition, a test stand for the Rotamax Wankel engine has been constructed and instrumented so that the engine/redrive configuration can be fully bench-tested for reliability and optimized for prop pitch, cruise speed, and fuel consumption.

Currently, students are completing the Finite Element computer analysis (FEA) of the final fuselage design, finishing the wing testing and final design, and doing detailed parametric studies of the tail geometry to insure pitch and yaw stability. Two senior engineering design projects are being carried out on the LSA this year, one having to do with the wing folding mechanism and flight controls, and the other focusing on engine instrumentation and testing. The latter project is creating an inexpensive "glass panel" display using a Pocket PC to display engine parameters and flight data. One other interesting development since last year has been the transformation of the Genesis Solar Racing Team into the Collaboratory's new Transportation Group, which has taken on the responsibility for developing the engine and redrive system for the LSA project.

During the coming year, students in the Flying Club plan to begin construction of the fuselage, which will be made out of welded



LSA project team including students David Brown '08, Joshua Joyce '08, Matthew Tomix '10, Tim Burgeois '09, Brian Dahl '08, Jon Shenk '08

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Letter and update from Messiah College engineering alumnus

by John Meyers '04

Dear Messiah College Faculty,

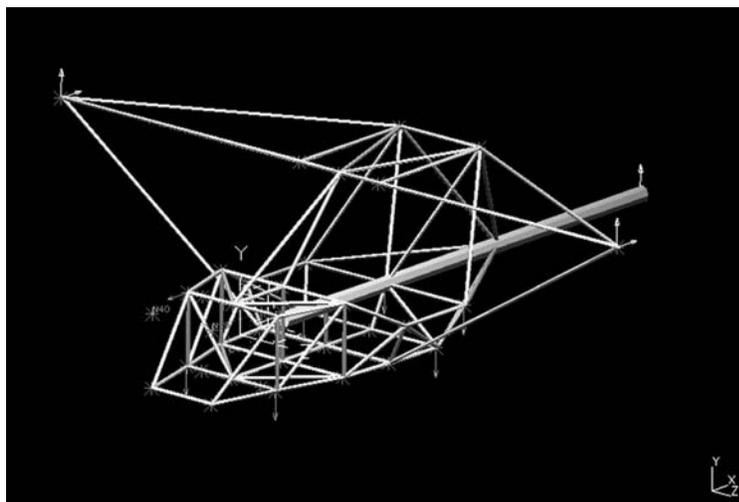
I was a 2004 graduate of Messiah College with a concentration in electrical engineering, and I would like to thank you for the way that your curriculum prepared me for a job in engineering. After I graduated Messiah I joined the Air Force as a second lieutenant in acquisitions. I was assigned to the Air Force Research Lab at Hanscom Air Force Base located in Lexington, Mass. My job is research, and I am studying high altitude turbulence over a mountain range, clear air turbulence, and other atmospheric work. I have been in my position for about a year and the work that I do is truly amazing. I am a contributing author on a paper entitled "In Situ Measurement of Waves and Turbulence in the T-REX Campaign" delivered on January 8 at the 45th AIAA Aerospace Science and Meeting Exhibit. I have also used the majority of the engineering and math courses at Messiah in my job. In addition to this paper, my supervisor and I wrote a UNIX program used by the Massachusetts Institute of Technology Lincoln Lab to calculate the density of clouds from GOES data that we receive. I also maintain and archive data from GOES, DMSP, and NOAA. We have receivers set up on the roof so I have to make sure everything is set up correctly and that all the computers are collecting data correctly. The majority of my time is spent developing a better way to forecast and model high altitude turbulence over mountain ranges and clear air turbulence. There is so much about turbulence that we do not know, and the results have ripped wings off of planes. This summer I had the privilege to work with a professor from St. Clouds and one from the University of Puerto Rico on understanding the physics behind high altitude turbulence. The course that I took at Messiah and the senior project prepared me for what I do at work. Again, thanks for everything.

John

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aircraft steel with an aluminum tail boom tube. After tests are completed on the prototype wing section, construction of the wings can begin. We expect to have a rolling fuselage by the end of the spring semester and hope to finish constructing the wings by fall of this year. Installation of the engine and flight controls is slated for next spring, with the potential for flight tests during the summer of 2008.



FEA screen shot of an LSA structure.

Note from the Editor



I would like to thank all of the Messiah College engineering alumni who have contributed to past issues, with updates on your life and work, including words of encouragement. If you have not sent an update recently, we would like to hear from you! We will do our best to include your contributions, as they fit, in future issues. Deadlines for submission are the end of January for the spring issue and the end of August for the fall issue. Please submit news to me at HUnderw@messiah.edu. A high-resolution picture is also welcome!

—Harold R. Underwood

Update on ACTS activities: advisor acquires amateur radio license; expects grant to fund growth of communications group

by Harold Underwood

The Communications Group, one of the primary areas identified in the newly formed Integrated Projects Curriculum (IPC), seeks to strengthen its services and expand its membership by helping students become licensed, active amateur radio operators, enabling them to gain experience in a range of practical, technical, and competitive aspects. The Communications Group now subsumes Antennas, Communications, and Telemetry Services (ACTS) as one of its project areas. For more details, please see the wiki page http://www.ergatai.com/wiki/index.php/Communications_Group. As the Communications Group faculty advisor, I recently took and passed the test to acquire a technician level amateur radio license (call sign KB3OOM), and plan to upgrade to the general and extra levels in the near future. I am looking for students who wish to enter and work in the area of communications, exploding with opportunities, who are willing to prepare themselves similarly. Over the past few years, students of the Antennas, Communications, and Telemetry Services (ACTS) group have served Mission Aviation Fellowship (MAF), Mission Safety International (MSI), and UIM (United Indian Mission) International, as clients, by developing inexpensive, appropriate tracking and messaging technology between the pilot and home-base. To sustain these partnerships and enhance creative solutions in the area of communications, students will benefit from a broader background in amateur radio, and may even require a license to conduct legal testing. To become active amateur radio operators, students need resources including radio equipment, relevant references, and other calculation/test tools. Such resources will enable students to more fully engage in amateur radio activities and will stimulate them to upgrade their licenses. To facilitate acquisition of such resources, the Communications Group expects funding from a grant provided by the Keck Foundation. As radio amateurs, students will meet others with a service-oriented spirit, engaging in volunteer, non-profit, educational activities such as emergency message handling, educational training events, and contests including long-distance contacts (DX), low-power contacts (QRP), and fox (transmitter) hunts. Such contests not only develop engineering knowledge and technical experience, but practical skills useful during crisis situations.

Department of Engineering's involvement in the 2007 Pennsylvania MATHCOUNTS®

by Carl Erikson

On Friday evening March 23, 2007, engineering faculty and engineering students will be involved with the Pennsylvania State MATHCOUNTS® competition at the Sheraton Harrisburg — Hershey Hotel. MATHCOUNTS is a national math enrichment, coaching, and competition program that promotes middle school mathematics achievement through grassroots involvement in every U.S. state and territory. With over 23 years experience, MATHCOUNTS is one of the most successful education partnerships involving volunteers, educators, industry sponsors, and students.

The Pennsylvania Society of Professional Engineers has asked our department to develop an activity to make the MATHLETES aware of engineering activities/solutions, engineering careers, and team building. A short overview of what engineering is all about, what types of engineering disciplines exist, and what engineers do to make a difference in the world today will be given through a PowerPoint presentation. Recommended high school courses will also be shared so those desiring engineering careers can prepare properly for typical engineering colleges' entrance requirements. Approximately 60 MATHLETES will be able to assemble a unique educational kit and take it home with them. The department's faculty and students will help supervise the activity, aid in assembling the kit, and answer questions of the MATHLETES and their parents or guardians.

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ENGINEERING NEWS • SPRING 2007 OUR MISSION

The mission of Messiah College is to educate men and women toward maturity of intellect, character, and Christian faith in preparation for lives of service, leadership, and reconciliation in church and society. Graduates of the engineering program will therefore be technically *competent* and broadly *educated*, prepared for interdisciplinary work in the global workplace. The character and conduct of Messiah engineering graduates will be *consistent* with Christian faith commitments. We accomplish this mission through engineering instruction and experiences, an education in the liberal arts tradition, and mentoring relationships with students.

Black & Decker donates money and equipment to Messiah College engineering program



The Messiah College engineering program was presented with a check from two representatives from Black & Decker. Pictured left to right: Dwayne Keiffer of the Career Center for Vocation and Development, Stephen Phillips '02 (an alumnus of our program), Danny Brotto from Black & Decker, Carl Erikson, chair of the Department of Engineering, and Donald Pratt, professor in the Department of Engineering.

Black & Decker's North American Power Tools organization, headquartered in Towson, Maryland, recently donated \$15,000 to Messiah's engineering program, to purchase equipment for student labs, and for engineering curriculum development. Two representatives from Black & Decker, Danny Brotto and Stephen Phillips '02 (an alumnus of our program), presented the check to Carl Erikson and Donald Pratt of the Department of Engineering, and Dwayne Keiffer of the Career Center for Vocation and Development. Black & Decker has been supporting our program for many years with monetary gifts and by hiring our graduates. This year, several pieces of equipment and hand tools have also been donated. On behalf of students and faculty in our engineering program, a big "THANK YOU" is extended to Black & Decker for these contributions.