

SCANFAX

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— Chicago Section —

First Steps in Biomechatronics

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DeVry DuPage, Room TBA, 1221 N. Swift Rd., Addison, IL
No Registration Needed

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Progress in Biomechatronics

Organic control of circuits makes new generation of artificial limbs possible

By Paul Zukowski

It almost sounds too good to be true: just by thinking about it, a man can move a robotic arm. But that's what has been accomplished at the Rehabilitation Institute of Chicago recently.

In other labs, muscle cells are used to activate a swimming robot, and artificial legs are made to feel and act more like living ones.

These developments are taking place in the emerging field of biomechatronics. It builds on mechatronics, the synergistic integration of mechanical engineering with electronics and intelligent computer control in the design and manufacture of products and processes.

Biomechatronics is the integration of biological components with artificial devices. The biological component contributes a significant functional capability to the system, often through specific cellular and tissue interfaces that aid the functional adaptation of the mechanical component. Embedded microprocessor control is another important component.

The robotic arm story from Chicago starts with an electrician, Jesse Sullivan, who lost both arms up to the shoulders after grabbing a high-tension line. Doctors rewired four nerves that once connected to his left arm and reconnected them to certain chest muscles. When Sullivan's brain sends signals down the nerves, the muscles react and that triggers electrodes attached to his chest, and a computer converts the signals

into motion for the artificial arm that is harnessed to his body.

Made of aluminum and carbon fiber, the bionic arm weighs just 1.8 pounds and is powered by a lithium battery. It has six motors and sends fingertip sensations back to Sullivan. The limb design and the surgery to connect the nerves were developed by Todd Kuiken, Director of the Amputee Program at the Rehabilitation Institute of Chicago.

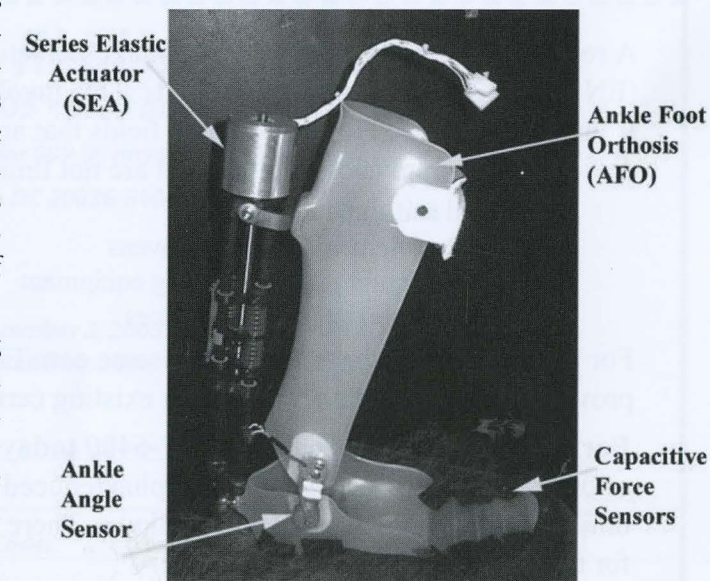
At the Massachusetts Institute of Technology, the Media Laboratory has a Biomechatronics Group that is conducting both scientific and technological programs. One of the scientific programs involves a swimming robot actuated by living muscle tissue. The thought was that muscle is potentially an excellent mechanical actuator based on its function, but there are many scientific and engineering challenges to overcome. The swimming robot was a proof of concept experiment.

Using muscles from frog legs mounted on a Styrofoam float in a tank of supportive solution, the muscle tissue was stimulated by an embedded microprocessor in various ways so

that the robot performed basic maneuvers such as starting, turning, stopping, and straight-line swimming.

According to the group's website, the development of functional biomechatronic prototypes with integrated musculoskeletal tissues is the first critical step toward the long-term objective of controllable, adaptive and robust biomechatronic robots and prostheses.

One of the technological programs of the Biomechatronics Group involves an ankle-foot device known as an active orthosis to assist drop-foot gait. With drop-foot or "slap foot" gait, as the name implies, the foot is not supported as the leg moves forward in taking a step, and the forefoot



continued on page 4...

bumps into the ground instead of the heel, making walking an extremely difficult and slow process.

There are three phases to a step, and the ankle-foot device adjusts to each. During the swing phase, a torsional spring-damper control lifts the foot to provide toe clearance. When the foot is being planted, the torsional spring control is actively adjusted to minimize forefoot collisions with the ground. As the weight is put on the foot, joint impedance is minimized.

The device consists of a plastic ankle-foot orthosis or brace that is equipped in the back with a spring and an elastic actuator. Signals for adjusting the tension of the spring come from an ankle-angle sensor and capacitive force sensors under the foot.

By actively adjusting the joint impedance with a variable-impedance orthosis, the researchers found their device had certain clinical benefits for the treatment of drop-foot gait compared to conventional ankle-foot braces having zero- or constant-stiffness joint behaviors.

Another of the Biomechatronics Group's technological programs involves making

artificial legs react the user in a lifelike way. Conventional above-the-knee prostheses tend to make amputees walk with abnormal gaits, often stumbling and falling. There are already prosthetic knees on the market that have built-in microprocessors that can be programmed to help the limbs move more naturally. But MIT Professor Hugh Herr went one step further and added sensors that can measure how far the knee is bent, as well as the amount of force the user applies to it while walking. He then programmed a computer chip to analyze the sensor data and create a model of the user's gait so that the mechanical knee can adjust accordingly. This version is available commercially.

Herr is working to distribute sensors beyond the knee joint so that they can detect neural signals from the muscles near the joint as well as the gross mechanical forces of the body. The goal is to create robotic prostheses that communicate with a user's own nervous systems. One day such biomechatronic devices could mean that someone with a spinal-cord injury could move their limbs again by controlling a robotic exoskeleton with thoughts

that trigger into nerve signals that are translated in mechanical movements.

Work in advancing artificial limb technology is being given increased attention and funding due to the number of injured U.S. soldiers returning from Iraq. Herr, who leads the MIT Media Lab's Biomechatronics Group, is part of a \$7.2 million research project run by the U.S. Department of Veterans Affairs.

Herr uses himself in the research, since he lost both lower legs to frostbite in his youth. He will have small sensors implanted in the muscles of one of his legs below the knee. The hope is that as he flexes his leg muscles in ways that once moved his ankle, these sensors will measure electrical activity in the muscles and transmit data to a computer chip in the prosthetic ankle, giving instructions to motors so the ankle flexes in a natural way. There is also a chance Herr could get feedback and feeling from the circuitry.

One day the evolution of biomechatronics and tissue engineering could lead to the creation of limbs that contain of both artificial materials and human tissue. ■

D.L.S. Offers

Free EMC/Product Safety Testing for New Low Frequency Magnetic Requirement EN 50366:2003 for HHA Equipment

Required as of February 2006

A recent change to the HHA Low Voltage Directive added Household and Similar Electrical Apparatus (EN 50366:2003) testing requirements. This involves low frequency testing from 10 Hz to 400 kHz for magnetic fields that are emanating from electrical devices. Items applicable include, but are not limited to:

- Household and similar appliances
- Restaurant equipment, fryers and ovens
- Commercial scrubbers and cleaning equipment
- Water heaters and amusement devices

For a complete listing, go to www.dlsemc.com/EN50366.htm. There is no provision for a grandfather clause on existing certifications.

For more information call 847-537-6400 today. D.L.S. is offering a free test of one product from each company, plus reduced pricing for additional products until February 2006 as availability allows. There will be a nominal charge for test reports.



EN 50366:2003 Testing



Day Meeting

IEEE Chicago/Rockford Consultants' Network A joint Affinity Group of the IEEE Chicago and Rock River Valley Sections

The 2005 Alliance of IEEE Consultants' Network Workshop

Saturday, December 3, 2005 • 8:00 a.m. – 4:30 p.m.

This workshop will be a valuable aid to both practicing and first-time consultants, and for potential consultants. You will be able to network with renowned consultants and with current and former officers and staff members of IEEE-USA. Program topics include:

- Overview of Consulting in Today's Business Environment
- Licensure and Professional Development
- The Importance of Networking
- Offshoring Impact on Consultants
- IEEE Consulting Fee Survey
- Business Structures
- Setting Appropriate Fees
- Managing Your Projects
- AND OTHER SECRETS TO SUCCESSFUL CONSULTING

Location:

The workshop will be held in the state-of-the-art Wojcik Conference Center at William Rainey Harper College, 1200 W. Algonquin Rd., Palatine, IL 60067-7398. Abundant free parking is available. Further facility information, including

maps and directions, can be found at the conference center's web site: <http://www.harpercollege.edu/wcc>

For our Longer-Distance Participants and their Guests:

Overnight stay arrangements, if required, are the responsibility of each participant. Several fine hotels are available within 5 miles of the workshop. The network suggests you consider the Holiday Inn Rolling Meadows, 3405 Algonquin Rd, Rolling Meadows IL for your overnight / weekend accommodations. The network has arranged free shuttle transport to and from the Wojcik Conference Center for workshop participants staying at this Holiday Inn. For more details, visit their web site at www.ichotelsgroup.com/h/d/hi/1/en/hd/chirm?amenitylink=true

Registrations and Professional Development Credit Information:

The program and registration fee is \$99.00 per participant, payable by check mailed in with the printable registration form found below. The fee includes a classic continental breakfast and a corporate buffet lunch in the conference center's executive dining room.

All mail-in registrations must be received at IEEE-USA by Wednesday, November 30, 2005. Registrations received by close of business Monday November 28th will be eligible to win a valuable business-related door prize. Participants may register on site at the conference; however, meal availability is not assured.

Attendance at the workshop will earn 7.0 Professional Development Hours (based on 50 minutes / PDH), which can be applied to calendar year 2007 Professional Engineer (PE) renewal requirements.

Additional information:

For the latest information please visit our workshop web site at www.bmillerengineering.com/aicn/

Additional information is also available by contacting a member of the program committee: Ben Miller at consultnet@bmillerengineering.com, Joe Auer at JAuerConsulting@worldnet.att.net, or Richard Gillette at rf.gillette@ieee.org

2005 AICN Workshop Registration Form

Saturday, December 03, 2005 • 8:00 am – 4:30 pm

Please complete the below registration form and mail it with a check for \$99.00 payable to IEEE-USA to:

Marnie James • IEEE-USA • 1828 L Street NW, Suite 1202 • Washington DC 20036-5104

Please print "2005 IEEE AICN Workshop" in the Memo of your check.

PLEASE PRINT ALL INFORMATION LEGIBLY!

☐ YES, I will attend the 2005 IEEE AICN Consultants Workshop on December 3, 2005. My check for \$99.00 payable to IEEE-USA is enclosed with this form. I understand that overnight / weekend accommodations and associated costs are my responsibility and are not included in this registration.

Full Name:

Street Address:

City:

State:

Zip Code:

Contact E-Mail:

Contact Phone # (Optional):

Evening Meeting

IEEE Electronics in Medicine and Biology Society

Medical Claims Excellent Adventure

Monday, December 12, 2005

About the Topic:

My personal Medical Information went to Asia and all I got was this lousy bill!

When many Americans sign the release to allow for processing of their insurance claim, they have just authorized foreign

nationals to be privy to their most intimate information. How is your information being handled? Where is it going? Why should you care? Join EMBS for a frank discussion of healthcare transaction processing in the twenty-first century.

Location:

DeVry-DuPage Campus
1221 N Swift Road
Addison, Illinois

Time:

7:00 – 9:00 pm

Lunch Meeting

Chicago Chapter of the IEEE Power Engineering Society

Interrupting Technology of High-Voltage Circuit Breakers

Wednesday, December 14, 2005

Thomas J. Tobin, S&C Electric Co.

About the Topic:

High-voltage circuit breakers and interrupter switches are critical components in the operation, control, and protection of utility and industrial power systems from 4 kV to 765 kV. While they perform the simply stated functions of energizing and de-energizing a circuit, the technology associated with interruption of high-voltage circuits is very complex requiring sophisticated engineering to meet today's performance requirements. Mr. Tobin will review high-voltage interrupting technologies explaining the physics of different interrupting media and the associated characteristics of the switching and protective devices. You may be surprised to learn what paper, plastics, beach sand, and eyewash have in common with air, oil, sulfur hexafluoride gas, and vacuum circuit breakers.

About the Speaker:

Thomas J. Tobin received a BEEE in 1968 and a ME in Electric Power Engineering in

1969, both from Rensselaer Polytechnic Institute. He joined S&C Electric Company in 1969 and has worked on fusing, load-switching, and fault-interrupting devices with ratings from 15 kV through 500 kV, and has received numerous patents. High-voltage and high-power testing, switchgear applications, and switching transients calculations are a particular area of interest and expertise. He is currently Vice President of R&D, responsible for new product development for S&C Electric Company. Mr. Tobin is active in the IEEE Switchgear Committee and the High-Voltage Circuit Breaker Subcommittee. He is on several IEC Working Groups and is also a member of working groups of CIGRE Study Committee 13 for switching equipment. He is a Registered Professional Engineer in Illinois.

Location:

Chicago Bar Association, 321 South Plymouth Court, Chicago, IL (near the intersection of Jackson and Dearborn)

Time:

11:30 Social
12:00 Lunch (optional)
12:00 Presentation
1:00 Adjourn

Continuing Education:

IEEE technical meetings may be acceptable as continuing education where required for maintenance of professional engineering licensure. Refer to the individual state's requirements for details.

Reservations:

Please call the IEEE Business Office by noon on Monday 12 Dec 2005 at (630) 493-4333 or (800) 898-IEEE to make your reservation. Or, submit your data via the Online Reservation Form.

Lunch tickets can be purchased in the lobby bookstore (\$12.00).

For more information:

For more information, including the Online Reservation Form, please visit the IEEE PES Chicago Chapter web site: <http://peschicago.org>

Evening Meeting

Chicago Chapter of IEEE EMC Society

IEEE EMC Society Holiday Party

Tuesday, December 20, 2005

About the Topic:

The Chicago Chapter of the IEEE EMC Society will hold its annual Holiday Party at Dave and Busters in Addison Illinois. Join in celebrating a truly great year for the Chicago EMC Society. As with past holiday parties, we will enjoy a great dinner, socialize with chapter members, and hold a winner-take-all billiards tournament.

Location:

Dave & Busters
1155 N. Swift Rd., Addison, IL 60101,
630-543-5151

Reservations:

RSVP by Monday, December 5th, 2005 to Carla Robinson, U.S. Robotics Corporation

Phone: 847-874-2063 or email: carla_robinson@usr.com

Time:

7:00pm-10:00pm
(Dinner served at 7:30pm)

More information:

This event is limited to the first 60 attendees. Collections (cash or check) will be accepted at Dave and Busters upon arrival. Cash bar only.

Concerns about magnetic field exposure addressed by new HHA requirement

In order to limit magnetic field exposure to individuals, a recent addition to the low voltage directive for household and similar appliances will go into affect February 2006. This requirement EN 50366:2003 establishes testing methodology and limits for magnetic field emissions from restaurant equipment, fryers, ovens, commercial scrubbers, cleaning equipment, water heaters, amusement devices, and others. D.L.S. has added the capability for this new test to their extensive testing services. For more information about the new requirement and about free testing offered by D.L.S. for this standard, go to www.dlsemc.com/EN50366 or call 847-537-6400.

EN 50366 Background Information

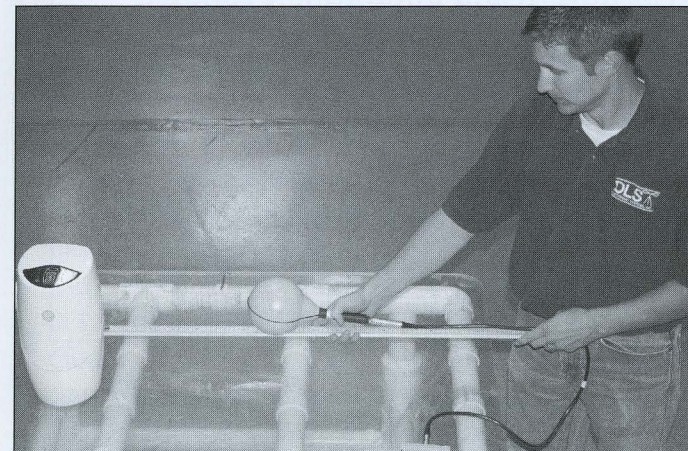
Over the past few years there has been a growing concern on the potential effects on the human body posed by Low Frequency

Magnetic (LFM) fields. The European Union has chosen to limit these fields as a precautionary requirement for appliances. The limits and testing procedures are called out in EN 50366:2003. These requirements become mandatory February 1, 2006.

Measurements are made over the frequency range of 10 Hz to 400kHz. The measurements are relatively simple requiring various faces of the product to be tested. The limit and test distance varies depending on the potential exposure a human operator might experience. For example, appliances where a person might be in direct contact such as a electric blanket, dental hygiene appliances, body worn vacuum cleaners are required to be tested at 0 cm test distance. Products where an operator is some distance away and not in direct contact such as battery chargers, deep fat fryers, floor polishers, food processors, ice-cream makers, vacuum cleaners, and toasters are all tested at 50 cm. An intermediate distance of 30 cm is used for handheld tools, induction hobs, hotplates, microwave, standard ovens, refrigeration appliances, etc.

Other devices not described are covered by the default clause "Appliances not mentioned require a distance determined by the Operator distance."

D.L.S. has the capability to assist all appliance manufactures with a special offer for free testing for one product from each company, plus a reduced price for additional products until February 2006 as availability allows. There will be a nominal charge for test reports. For manufacturers having many different physically large products, arrangements are being made to perform on site-testing. ■



SCANFAX

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IEEE

THE MARKET SERVED

SCANFAX magazine is the official publication of the Institute of Electrical and Electronics Engineers (IEEE) Chicago Section. Those in the Chicago area who are influential in the electrical, electronics, and computer industry receive SCANFAX each month (except June, July and August). It provides a forum for manufacturers, consultants, sales representatives, universities, and colleges to exchange ideas and information.

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From the size and attractive masthead to the full color cover and additional information provided, we intend to make SCANFAX even more of an essential handbook for IEEE Chicago Section members.

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NOTE: Any ads not supplied properly could incur additional charges.

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EMPLOYMENT OPPORTUNITY ADS

\$275 for two consecutive issues. Send type written copy including mailing address, phone number and check payable to SCANFAX Magazine, P.O. Box 6096, Madison, WI 53716.

PROFESSIONAL CARDS

Include your business in the "Professional Card" section of each issue of SCANFAX throughout the year, for the low cost of \$330.00 (includes production). Dimensions of a Professional Card are 3-5/8" wide x 7/8" high. Your advertisement can include your logo, slogan and key information about your business. Ads will be listed alphabetically. Sign up today!

EDITORIAL SCHEDULE*

2006 January Issue
Editorial Focus: Circuits and Devices
Space Reservations and Camera Ready
Materials Due: Nov. 25, 2005

February Issue
Editorial Focus: Industrial Applications
Space Reservations and Camera Ready
Materials Due: Dec. 25, 2005

March Issue
Editorial Focus: Communications
Technology
Space Reservations and Camera Ready
Materials Due: Jan. 25, 2006

April Issue
Editorial Focus: Electromagnetics
and Radiation
Space Reservations and Camera Ready
Materials Due: Feb. 25, 2006

May Issue
Editorial Focus: Education/
Universities
Space Reservations and Camera Ready
Materials Due: March 25, 2006

September Issue
Editorial Focus: Energy and
Power Engineering
Space Reservations and Camera Ready
Materials Due: July 25, 2006

October Issue
Editorial Focus: Computers
Space Reservations and Camera Ready
Materials Due: Aug. 25, 2006

November Issue
Editorial Focus: Signals and Applications
Space Reservations and Camera Ready
Materials Due: Sept. 25, 2006

December Issue
Editorial Focus: Systems and Control
Space Reservations and Camera Ready
Materials Due: Oct. 25, 2006

*Features subject to change without notice

Sections Congress: IEEE's Three-Year Mission

IEEE may not be boldly going where no man has gone before, but it has a very real three-year mission: To carry out or attempt to carry out the goals of the membership as developed during the recent Sections Congress. After local discussions and polling of the membership in the sections and subsections, Connie Kelly, Chicago Section chair; John Zulaski, Northwest Subsection; and Bernard Sanders, Fox Valley Subsection recently traveled to Tampa to join almost one thousand IEEE section, Region, IEEE-USA, and IEEE members at the triennial Sections Congress. Renewing old friendships and viewing exhibits of IEEE programs and meeting the faces behind the voices in the various departments were only a small part of Sections Congress. A comprehensive game plan for all of IEEE was foremost on the agenda.

Each Region had developed a list of concerns, actions, and programs, which it planned to lobby for during the recent meeting. Region 4, as did every other region, had used email and meetings to develop a raw list, which covered topics from training to membership benefits. Prior to the official start of the meeting, representatives from Region 4 sections met with Region 4 staff and refined the list, creating a group of recommendations to be submitted for further discussion.

These items were then sorted by category: Education & Career Development, Industry Relations and Jobs, Membership Benefits, Operations, Public Relations/Awareness, Recruitment/Retention (Membership), and Volunteer Training/Knowledge Management. Each category formed the basis of discussion for a caucus group. These caucus groups further distilled the recommendations into three or four per group. The resulting twenty recommendations, which emerged from the caucus groups, were then voted upon by the primary delegate from each section. The top ten vote getters become the punch list for the three years until the next sections congress.

Of the half that made the cut, the first and last were from Membership benefits: Increasing membership value by expanding the items covered by membership dues was the top vote getter. A growing concern is that members who do not feel they are getting their monies worth will not renew or convert from student membership upon graduation. The last to make the grade, although arguably a direct tie in to making membership more valuable, was creation of an IEEE digital library for continuing education and meeting enhancement.

Education and Career Development saw one of its two entries

come in second in the voting: Development of web-based seminars, and downloadable electronic presentations with an aggressive CEU/PDH program is definitely a close cousin to the tasks which made the grade in Membership Benefits.

Two entries from Industry Relations and Jobs took third and fifth places proposing reaching out to companies regarding the value of IEEE membership for their employees and providing incentives to companies encouraging involvement in IEEE. Expansion and enhancement of the IEEE Job Site was seen as a benefit to both members and IEEE-supportive companies. The sixth place entry from Public Relations/Awareness echoed the idea of finding ways to increase awareness of members' expertise and value to companies.

The Recruiting and Retention entries which placed fourth and ninth, again saw the idea of demonstrating the value of IEEE membership with new tools again reinforcing the value to members and employers, and automatic seniority incentives to members for their efforts.

Items seven and eight addressed Volunteer Training and Knowledge Management by proposing better guidelines and mechanisms for archiving and retrieval of the collective knowledge of past and current leaders to insure that institutional memory is actively used to further our goals. Better training tools based on these best practices to help sections function and transition leadership more efficiently build nicely on the availability of appropriate archives.

The ten items selected for our three year mission really tined into three topics: Effective training and member recognition, promotion of the benefits of IEEE training to industry, and recognition of the efforts of those who are striving to make IEEE a valuable commodity.

The next three years will test the accuracy of the sections' input. It is not sufficient to be the largest professional, technical society in the world. We must also be the best. Accomplishment of these Sections' Congress goals should put IEEE well ahead of its closest competition.

Watch for additional information in future issues of Scanfax and the IEEE Chicago Section Website. As you can see from the lengthy process this is not the whim of a few people. It is the consensus of the membership slowly nurtured and developed over a period of time to insure the best possible use of the three years until the next Sections Congress. ■

Professional AND Business Directory

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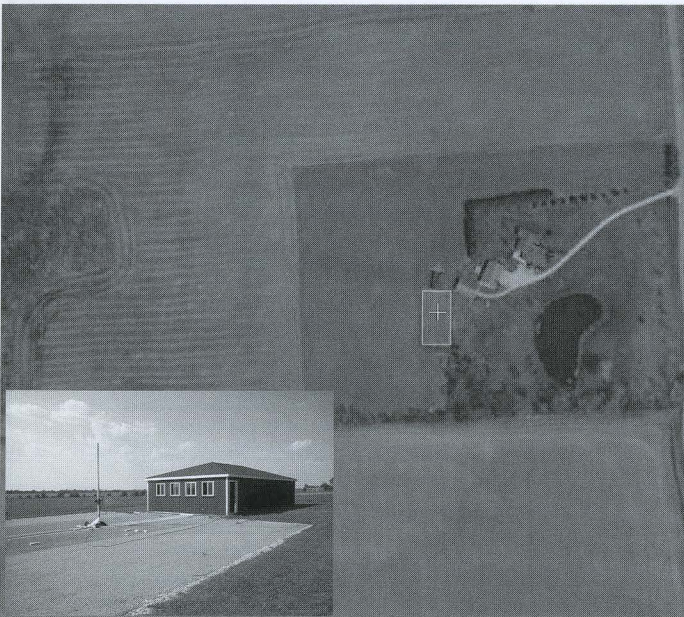
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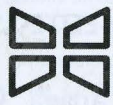


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