

Station News

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EDL Economists Design Energy Forecasting Model

Summer utility bills often provide rude surprises, driving us out of expensive air-conditioned comfort into financial sweat. Energy planning agencies and utilities can't afford such surprises, in the summer or at any other time. Consequently, these organizations increasingly have come to rely on energy economists like Jerry Jackson, Robert Lann, and Bill Riall of the Economic Development Lab (EDL), who recently designed a load forecasting model for the New York State Energy Office (NYSEO).

Robert Lann describes the end-use model EDL derived for the project as a "highly disaggregated amalgam of economic and engineering principles." End-use models have proven to be especially useful forecasting

tools because they can project the amount of energy consumers will require for very specific purposes — space heating, water heating, or lighting, for example — as well as provide comprehensive estimates of future energy needs in particular sectors of the energy market. Lann points out: "Since the severe disruptions of the energy market in the 1970s, the need for more disaggregated models has become apparent. Energy planning agencies and utilities are continually struggling with ways to increase the efficiency of energy use by individual consumers and industry."

For example, NYSEO required a model that could predict future commercial sector energy use, given eight different building types, eight types of energy use, and five types of fuel. The model was designed to enable NYSEO to foresee peak commercial sector de-

mand, plan new energy conservation programs, and measure the effects of programs already in place.

NYSEO has been using the EDL model, and the data base supporting it, since April 1981. The Electric Power Research Institute has contracted with EDL to refine the model further and to implement it in pilot projects with the Georgia Power Company and the Long Island Lighting Company.

End-use models like the one designed by EDL can have important impacts for the public at large, as Lann makes clear: "There are a lot of load management programs around. It's very important to have a model that can measure their effects accurately, so that capacity needs can be efficiently planned for and met in the most economical way possible."

Anthony DeCurtis



EDL economists Bill Riall (left) and Robert Lann (center) are greeted by Robert Nelson, a demand forecasting analyst at Georgia Power Company, one of the electric utilities involved in a pilot project to refine and test-market the EDL end-use forecasting model.

Infrared Technology May Power Satellites

The Electromagnetics Lab (EML) has just embarked on a three-year study for the National Aeronautics and Space Administration (NASA) that holds promise of breaking new ground in infrared to electrical power conversion.

"Basically, we'll be looking at a scheme for powering devices in space," said Project Director Jim Gallagher. "NASA has long been concerned with power transfer. They have investigated transferring solar energy from space satellites to the ground by microwaves, but this technique would require building a miles-long structure of solar collectors in space plus a large 'rectenna farm' on the ground composed of antennas with devices that rectify or convert microwave radiation to direct

electric current. Budget restrictions may result in abandoning this gigantic project."

"A group in NASA has always been interested in transferring power in the opposite direction — from ground to space — using infrared (IR) radiation. For instance, you could put up thousands of very small satellites — so small that they had no power on them — and beam IR radiation by lasers to supply the power to operate the devices in these satellites. But you would need small rectifiers to transform the IR power to electric power. Such rectifiers don't exist yet —

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Professional Activities

ECONOMIC DEVELOPMENT LAB

Harris Johnson and **Phil Loveless** recently presented seminars on "Computers in Small Business" to approximately 50 people in Commerce and Winder, Georgia.

ELECTRONICS & COMPUTER SYSTEMS LAB

The August issue of *80 MICRO* features an article by **Larry Becker** on a new war game he developed; the title is "4 and 1 plus another." An article by **Bennett Teates** on "The Role of Decision Support Systems in Command and Control" will appear in the September issue of *Signal* magazine. **Edward Shanahan, Jr.** will deliver a paper entitled "An Approach Towards Evolutionary Development of Command and Control Systems" on August 23 at the 5th Annual MIT/ONR Workshop on C³ Systems Naval Post-Graduate School in Monterey, California.

ENERGY & MATERIALS SCIENCES LAB

James Johnson attended the Electron Microscopy Society of America annual meeting in Washington, D.C., August 8-13. **Bob Cassanova** gave a presentation to the Solar R&D Panel of the Energy Research Advisory Board in Denver, Colorado, on July 1-2.

SYSTEMS & TECHNIQUES LAB

Gary Simpson was coauthor with two MITRE Corporation researchers of a paper that was presented at the 15th An-

nual Simulation Symposium, held March 17-19 in Tampa, Florida.

TECHNOLOGY APPLICATIONS LAB

Tom McGowan presented a paper on "Industrial Wood Energy Feasibility Studies" on August 2 at the 17th Congress of the Pan-American Federation of Engineering Societies in San Juan, Puerto Rico. On August 4, he conducted a workshop on "How to Build and Sell Energy Efficient Homes" in Atlanta under the auspices of the Georgia Office of Energy Resources and the Homebuilders Association of Metropolitan Atlanta.

Alan Pashkevich planned and conducted a seminar in the Philippines May 17-20 for participants in the Barangay (Village) Water Program. This joint program of the U.S. Agency for International Development (AID) and the Philippine government provides money and technical assistance to 70 provincial governments for building water facilities and training workers. Ninety waterworks engineers and technicians participated in the seminar. Pashkevich, who ran Georgia Tech's AID hand pump technology transfer program in the Philippines for eight months, gave the participants two days of hands-on training in hand-pump technology. He also wrote the course manual. A U.S. consulting hydrogeologist gave an introduction to water well technology the other two days.

SEL Upgrades Radar Warning Receivers

A Systems Engineering Lab (SEL) research team has dramatically improved the computing speed, energy efficiency, and design simplicity of the AN/ALR-46/46A,-69 family of radar warning receivers (RWRs) for the Air Force's Air Logistics Center at Warner Robins, Georgia (WRALC).

Jim Lansford, Terry Tibbitts, and Tim Strike of SEL's Electronic Support Measures Division have demonstrated that, by using a new Fairchild microprocessor (9445) and electrically erasable programmable read only memories (EEPROMs), the redesigned RWRs operate four times faster than the old ones and use less power; the redesign also replaces five circuit boards with one. In addition, the team developed an all-new memory loader/verifier (ML/V) which enables reprogramming of the RWR memory without removing the receiver from an aircraft.

These significant improvements have led to related contracts. Lansford directs the ML/V diagnostic software design and development program; Tibbitts directs a program to upgrade the Warner Robins ALR-46 Integration Support Station, and Strike heads the EEPROM upgraded ALR-46 preproduction RWR engineering design oversight program.

Recently, SEL received additional contract awards totaling \$930,000 for 28 months to redesign the video preprocessor and input/output (I/O) circuits of the ALR-46 RWR and to design the associated software. The most recent WRALC program award is to design an I/O board which is compatible with standard formats (High Speed Data Bus, RS232 and 1553B), to serve as a generic I/O interface bus for several RWRs in the Air Force inventory; Strike is project director.

The project team has written the following technical papers: "Technology Upgrade to ALR-46 and ALR-69 Radar Warning Receivers," presented by Lansford at the 1982 IEEE National Aerospace and Electronics Conference, and "Using Technology Insertion to Upgrade Radar Warning Receivers," presented by Strike at the 1982 Dixie Crow Electronic Warfare Symposium.

Infrared (Continued from page 1)

and this is what NASA's Lewis Research Center has contracted with us to investigate," Gallagher explained.

"We'll look at what kinds of suitable materials exist for building these rectifiers, what we can do with them, how the IR power will transfer through the atmosphere, and whether there is enough thermal radiation from the earth to use."

Chris Summers is investigating the state of the art in materials and devices now to determine whether the group will have to build the rectifiers themselves or if there are commercial devices that they can use as power converters. Don Blue has designed a model for testing them to see how they respond in the 10 micron (IR) wavelength region.

"We'll simulate the earth's radiation by using CO₂ lasers and by setting up a

blackbody of a broadband thermal nature. The first-year goal is to build or buy at least one workable device. Eventually, we hope to come up with an array of small dipole antennas to act as efficient radiation collectors," Gallagher said.

In addition to thermal radiation from earth to satellite, the EML team will look at laser radiation, which would be particularly useful for satellite-to-satellite transfer. For instance, NASA might power a whole colony of satellites by using one as a power station to collect solar energy and transform it to laser energy for beaming to other satellites.

If EML researchers can come up with a rectifying scheme that will produce a reasonable current and voltage, one day scientific devices on NASA satellites may be powered by infrared radiation beamed from earth and converted to electrical energy by rectifiers developed at EES.

All Aboard!

When Jerome Callahan of RAIL stopped by the state government warehouse in Americus on his way to Florida last winter, he was "just looking" to see what surplus equipment might be available. As a result, Georgia Tech has acquired several "Golden Age Expresses," vans used by the Department of Human Resources to transport senior citizens.

The first of these vehicles has been repaired by the Tech motor pool, and Callahan has remodeled it into a mobile electronics laboratory for use by the Systems Engineering Lab in conducting ECM field measurements or evaluations. Nine kilowatts of 60 Hz power are available from two on-board generators. The heated/air-conditioned work area has equipment racks, work benches, and storage areas. A rigid roof platform supports a pivoted 16-foot antenna mast and facilitates use of a large variety of antennas.

From senior citizens to electronics engineers — that's quite a switch!



RAIL Reorganizes

The Radar and Instrumentation Lab, which has had basically the same organizational structure since its formation in 1977, announces the following changes, effective July 1:

- Analysis Division (formerly Radar Applications), Bob Trebits, chief (new appointment).
- Instrumentation and Measurements Division (formerly Radar Experimental), Nick Currie, chief.
- Modeling and Simulation Division (formerly Modeling and Analysis), Harold Bassett, chief.
- Development Division (unchanged), Charlie Brown, chief; has assumed major hardware development responsibility for RAIL.
- Creation of a Special Projects Office and a chief scientist position.



Above: Bob Willoughby (left) and John Bordelon check out the Transportable Electronic Defense Support System (TEDSS) equipment that will go in the SEL van. **Below left:** Remodeled van, equipped with antenna mast and bumper-mounted generators. (Photos by Charles Haynes)

Testing the Test Set

When military flight crews get ready to fly a mission, they need to be sure the electronic countermeasures (ECM) equipment on their aircraft is working properly. The equipment must be tested out of the aircraft and without making any modifications.

Systems Engineering Lab (SEL) personnel recently designed an automated Flight Line Test Set (FLTS) for the Warner Robins Air Logistics Center (WRALC). It simulates signals of threat (enemy) radar and measures the response of the aircraft equipment under test — an early warning receiver or jammer. A commercial contractor currently is building the hardware and software for the testing system, and WRALC has contracted with SEL to conduct independent verification and validation (V&V) of the FLTS software.

The 22-month project, involving Defense Systems Division personnel under the direction of Andrew Lipscomb, has two principal objectives:

- to monitor the contractor and verify that the delivered software meets design requirements;
- to develop support software for use in both the initial V&V effort by Tech and in later V&V work by the sponsor for system maintenance and modification.

SEL is building an all-software test environment (simulator) to test the FLTS software independently of the hardware. This will allow a substantial part of the software debugging to be completed prior to integrating it with the FLTS hardware. "When they are tested together, it's hard to determine what's wrong when attempting to make the integrated system work," said Lipscomb. "Testing software independently of hardware will simplify and speed up the final qualification operational test and evaluation of the integrated FLTS."

SEL also is trying to establish a basic integrated system that will allow test "tools" or techniques to work interactively off the same central data base. "An integrated system isn't available now — test tools must be bought as separate items from different vendors," Lipscomb explained. "So you have to learn a new set of tools every time you want to do something new."

Lipscomb sees great contract potential in the independent V&V of software. "Over the last five years, the Air Force and Department of Defense have come to realize that independent testing and quality assurance saves money in the long run. From now on, I believe that whenever we are asked to write another specification, we will get the V&V project, too."

In Memoriam

Mary Lupton, a senior secretary in the Electromagnetics Lab, died June 22 after a six-year battle with cancer.

"Mary's courage in the face of crisis after crisis was an inspiration to everyone," says her boss, Walter Cox, chief of EML's Physical Sciences Division. "Through it all, she maintained her cheerful attitude and interest in people."

Mary's love of people made her a favorite among many coworkers during her ten years or so at EES. She also will be long remembered for her miraculous "green thumb" — a trip to her office was like a jungle safari.

An accomplished violinist, Mary played for a period with the Atlanta Symphony and later was concertmistress of the Marietta Symphony.



She shared her love of music with her husband, Joe, a singer and former choir director. They also worked together during most of their years at EES, and Joe currently is a research technologist in EML's Physical Sciences Division.

Firstman Heads TAL

Sidney I. Firstman is the new director of the Technology Applications Lab (TAL), subject to approval by the Board of Regents. He replaces Jerry Birchfield, who now heads the Advanced Technology Development Center.

Dr. Firstman joined TAL as a principal research engineer a year ago. He has a strong background in solar systems technology and applications and alternate fuels development. Other areas of expertise include energy conservation, urban transportation, waste collection and processing, computer-aided communication and command systems, and operations research and man-machine systems for military and space operations.

For five years prior to coming to Tech, Firstman was manager of the Energy Applications Division and the New York City office of Science Applications, Inc. He also directed urban programs for the Aerospace Corporation and the Planning Research Corporation, and led the Space Operations Group at RAND Corporation.

Firstman holds B.S. and M.S. degrees in engineering from UCLA and the Ph.D. in engineering/operations research from Stanford.

Strictly Personal

ECONOMIC DEVELOPMENT LAB

Dennis Primrose of the Savannah Area Office resigned July 31.

Marilyn Black, Safety & Health, gave birth to a boy in July.

ELECTRONICS & COMPUTER SYSTEMS LAB

The Command & Control Branch welcomes three new research scientists I: **Roger W. Anderson**, **Clark H. Weeks**, and **Larry D. Becker**.

ENERGY & MATERIALS SCIENCES LAB

Photography by **John Owen** is on exhibit at the Callanwolde Gallery in DeKalb County August 6-28.

Welcome to **James Lefferdo**, a new senior research engineer in the Solar Energy Division.

SERVICE GROUPS

Mechanical Services: New employees are machinists **Terrell C. Brown** and **Terry A. Long** and **William C. Donaldson**, mechanical technician I. **Robert A. Knox** was promoted from research machinist to instrument maker, while **Anthony J. Angerami**, **James D. Brown**, and **William A. Hale** were promoted from machinists to research machinists. Congratulations!

Personnel Services: **Brenda Wilkerson** has resigned to take up a new career as mother.

Research Property Management: Congratulations to **Harry Ross**, who has been named department manager.

Research Security: **Sandy Casper** is working 50% time as a clerk IV.

SYSTEMS & TECHNIQUES LAB

The "S" Program Office has three new employees: Senior Research Scientist **Richard H. Prater** and Lab Technicians I **Alda L. Beese** and **Lisa D. McDonald**. The Microwave Systems Division welcomes **Alton G. Dunn, III**, research engineer II. STL also welcomes two secretaries who transferred from SEL: **Diane Aenchbacher**, administrative secretary, and **Vicki Tibbitts**, senior secretary.

Congratulations to Barbara and **Bill Leverett**, whose daughter, Amanda Faye, was born June 15, and to Judith and **Don Bodnar**, whose daughter, Jennifer Ann, was born July 1.

SYSTEMS ENGINEERING LAB

New hires in the Electronic Support Measures Division are **Michael T. Kopp**, research engineer I, and senior secretaries **Janet L. Jewell** and **Debbie Schreiber**. The Defense Systems Division has gained **Ronnie W. Camp**, senior research scientist. **Gretchen Lochridge** has joined the Concepts Analysis Division as a clerk I.

TECHNOLOGY APPLICATIONS LAB

Administrative secretary **Wanda Dennis** transferred to the Advanced Technology Development Center on August 2. New senior secretaries are **Sherry Edlin** and **Lynn Holt**.

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