the GTRI connector

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Volume 2 Number 6 April 1986

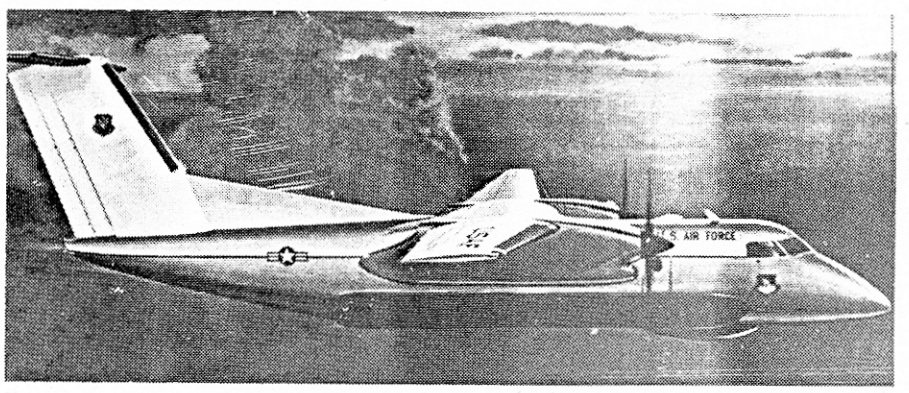
ECSL Will Build Unique Airborne Tracking Antenna

by Mark Hodges

Georgia Tech has won a $7.266-million research contract to build one of the largest phased-array antennas ever to fly on an aircraft.

The Electronics and Computer Systems Laboratory (ECSL) is developing a telemetry antenna, 30 feet long and 2½ feet wide. When deployed, the phased array will be mounted along one side of the fuselage of a DeHavilland-8 (known commonly as the Dash-8) aircraft.

The antenna will allow the Air Force to collect telemetry data on airborne missiles and drones at the same time. It will be used in missile testing programs near Air Force bases on the Gulf of Mexico. The antenna will track targets over a frequency range of 2.2.-2.4 GHz.



The long, dark pod mounted on the side of this DeHavilland-8 airplane is an artist's conception of the unique phased-array telemetry antenna being developed by ECSL, with support from STL, EMSL, and Mechanical Services, for LTV Aerospace. (LTV Photo)

"As far as we know, this will be the only operational phased-array antenna of its size and capability which is fly-able and operates at S-band frequencies," says Laboratory Director Fred Cain.

The antenna is one part of a $34-million airborne electronics platform being developed for the Air Force Systems Command. The platform will accommodate a variety of military testing programs. The Sierra Research Division of LTV Aerospace and Defense Company is the project's prime contractor.

Project Director Bill Cooke says low weight and high performance were crucial features in the success of ECSL's design. The antenna will weigh only 2,700 pounds, low enough for mounting on an economical aircraft like the DeHavilland. Engineers used sophisticated computer simulations to reduce structural weight.

Another notable feature of the antenna is its reliability. Researchers are using state-of-the-art component design and modular components which are interchangeable.

The program's schedule may prove to be its most challenging element. Within 15 months, GTRI engineers must build and successfully test-fly two models of the telemetry antenna. To ensure on-time delivery, they will use off-the-shelf equipment where possible.

RAIL Directs Large Measurements/Analysis Program

The Radar and Instrumentation Laboratory (RAIL) and the Electromagnetics Laboratory (EML) are collaborating on a $4-million project to help the U.S. Army Missile Command (MICOM) determine the basic millimeter-wave radar and infrared signatures of a large set of tactical military vehicles. They also are helping MICOM evaluate the effectiveness of several developmental seekers designed to operate against tank-type targets. GTRI is the prime contractor supporting MICOM's efforts in a joint Army/Air Force program.

Approximately 15 people from the two labs conducted tests at Eglin Air Force Base from mid-August through November, according to Project Director Trent Farill (RAIL). Ted Lane (RAIL) was in charge of the basic signature measurements. Simultaneous radar and infrared data were collected on several targets under various operating conditions. The team utilized a 300-foot tower and a turntable mounted on a track to provide a constant range at three depression angles up to 40 degrees and over 360 degrees in azimuth. IR data were collected on cold, idling and exercised targets. After the signature data were calibrated and verified in the field, they were given to the Air Force for entry into a government data base.

Marshall Weathersby (EML) monitored the captive flight tests. These tests were performed at Eglin by subcontractors who were responsible for integrating their seekers into instrumented government helicopters. Both IR and dual mode (IR/MMW) seekers were tested. GTRI personnel maintained detailed logs of the targets' locations and operating conditions. The performance of the helicopter-mounted seekers was recorded on videotapes for later analysis.

The analysis is being conducted at GTRI under the direction of Gene Knott (RAIL). It includes the modeling and analysis necessary to predict the performance of MMW radar, IR and dual-mode seekers operating under various conditions in diverse environments ranging from deserts to forests and plains. GTRI staff also will analyze and document the basic target signature measurements as an aid to government and contractor engineers in designing seekers and predicting weapon system performance.

Environment, Health and Safety Conference Calls for Cooperative Effort

by Dean Lail, EDL

Georgia Tech's Environmental, Health, and Safety Division (EHSD) presented its Third Annual Conference and Exhibition on the Environment, Health and Safety at the Atlanta Marriott Marquis Hotel March 31-April 3. This year's conference, entitled "Basics and Beyond . . .," was designed to familiarize professionals from various fields with the hazards and issues, regulations and techniques that affect their workplaces and the general environment.

In setting the tone for the conference, EHSD Chief John C. Nemeth urged that the artificial separation of safety, health and environmental endeavors be eliminated, with the result being a greater sharing of technology to advance toward a healthier society overall.

The keynote speaker was Dr. Donald Millar, Director of the National Institute for Occupational Safety and Health (NIOSH) and Assistant Surgeon General of the U.S. Borrowing a line from Robert Frost's poem, "Mending Wall," Millar urged the audience to refute the idea that "good fences make good neighbors," especially when that fence exists between the workplace and the environmental community. Millar cautioned that with the growth of new technologies such as factory automation, lasers, robotics and genetic manipulation come new dangers that will doubtless create additional problems for both the occupational sector and the community.

In closing, Dr. Millar reminded attendees that high tech does not necessarily equal low risk. He called upon all professionals to work together, dismantling the walls that separate their various disciplines. "Only through sharing knowledge and expertise can we find answers to the myriad problems facing industrialized nations in today's world," he said.

Conference attendees were

See "Conference," page 4

Intelligent Systems Research Helps U.S. Industry Compete

by Martha Ann Stegar

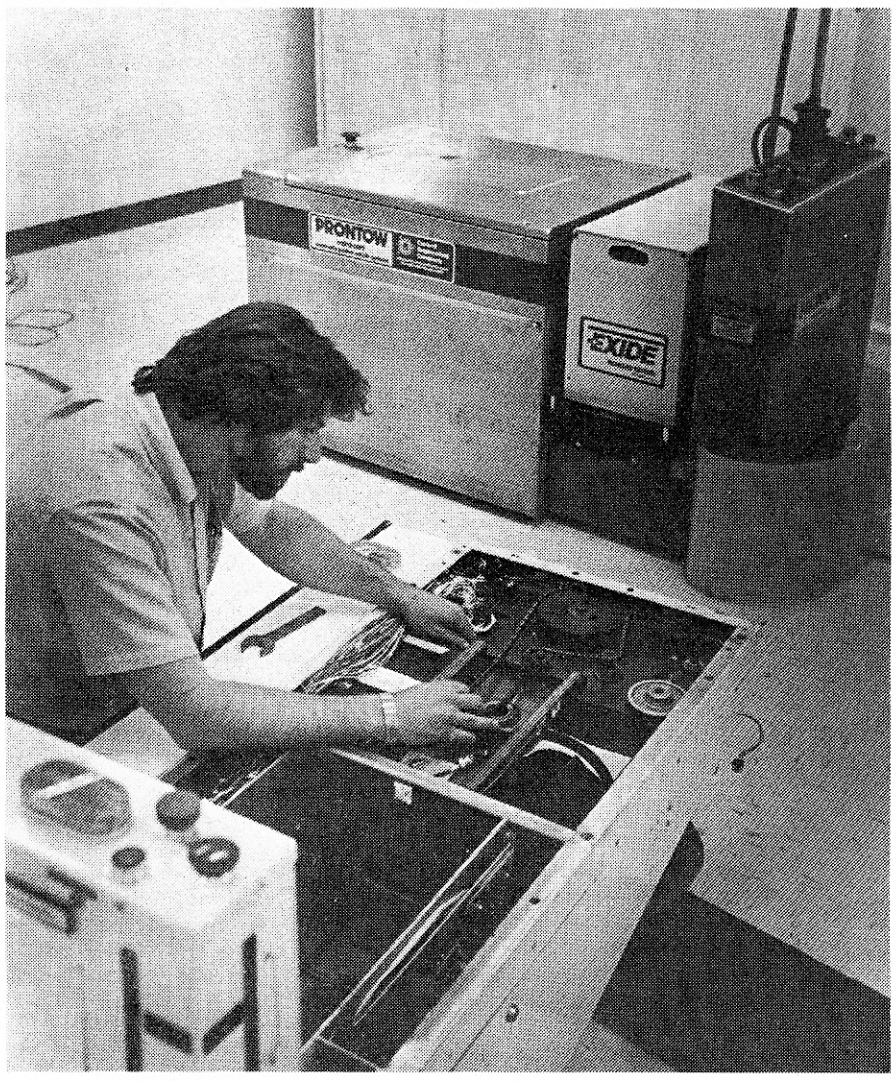
Manufacturing excellence and efficiency have become a national imperative if American industry is to compete in the world marketplace. The key is developing and utilizing the latest manufacturing technology.

Intelligent systems research in the Electromagnetics Laboratory (EML) is helping to meet that challenge. The research, under the direction of Ron Bohlander, is performed in cooperation with the Material Handling Research Center (MHRC). After successful development last year of a lateral effect photodiode camera to enable robots to "home in" on their work, emphasis has shifted this year to "off-wire" guidance of automated guided vehicles (AGV).

Automated Guided Vehicles

The AGV's currently in use follow a wire or a fluorescent painted stripe in the floor. They must follow a fixed path, with only brief side excursions by dead reckoning. "We're developing a technique to guide the vehicle off the path," Bohlander said. Larry Banta directs the project, which is conducted in cooperation with Steve Dickerson of the School of Mechanical Engineering. Other principals are Jim Larsen and Wiley Holcombe of EML and Tom Single and Brett Lapin of the Office of Interdisciplinary Programs.

The researchers are using more encoders on the vehicle to give some information redundancy, so that established dead reckoning techniques can be used more accurately. The vehicle also carries a camera to look for landmarks (low-cost reflective tape patterns), enabling it to get course corrections and go further off-wire.



These automated guided vehicles are being modified by EML engineers in research on "off-wire" guidance. Wiley Holcombe is adjusting a Litton Series 900, and a Prontow vehicle is in the background. (Photo by Charles Haynes)

An on-board computer takes the data from the encoders and visual system and fuses them into a "best guess" as to the vehicle's position. This is called "sensor fusion." The computer will have a map of the area and, using adaptive algorithms that are being developed, it will be able to learn and adapt the vehicle's behavior accordingly.

Another aspect of this research involves developing an optical system for improved measurement of the progress of an AGV system. "Actually, we're trying to watch the floor go by, using something similar to an optical mouse," Bohlander explains. The most prevalent method—measurement of wheel revolutions—can suffer from wheel bouncing or slipping, giving a false result. The optical method can't slip, so it provides a more accurate measure of distance and direction traveled. We'll use both methods together," he notes. "Here, again, redundancy helps identify error situations."

Jim Larsen is project director, assisted by Ron Bohlander, Al McSweeney, and Bob Lilly.

Automated Loading/Unloading

EML also is developing automated truck loading/unloading technology using AGV fork trucks. Wiley Holcombe is in charge of the vehicle technology portion of the project, and John Gilmore directs the vision systems work.

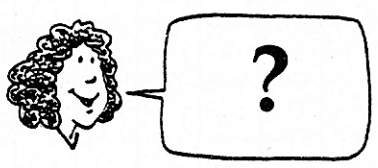
"The problem we're working on is how to give the AGV additional sensors to do the job," Bohlander says. "We're experimenting with ultrasonic ranging for coarse guidance and using vision systems (TV camera with computer image analysis) to recognize key environmental features such as pallets." They also will develop a configuration of fork sensors to sense balance as well as weight.

Bolander stresses that they are doing research with real commercial AGV systems. They use a Litton Series 400 vehicle in the MHRC lab as a test bed, and four more vehicles are being installed in the Centennial Research Building. This equipment, a gift from IBM, includes two Litton Series 900 and two Prontow vehicles.

"We're also studying the possibilities for automated palletizing of unequal size containers," Bohlander says. "Several companies are interested in such a project through the MHRC."

QUESTIONS, ANYONE?

by Charles McCullough



All of us look forward to paychecks, but they surely can cause a lot of confusion. Here are the definitive answers on two common questions:

"I submitted my first monthly timesheet on schedule but still didn't get my first paycheck on the regular payday. What's the deal?"

Until you understand the documents required in generating pay for monthly-paid employees and the time frames involved, you'll never pass "Paychecks 101." The GTRI timesheet for monthly-paid employees does nothing to get you paid. The timesheet's sole purpose is to distribute your monthly expense to GTRI to the projects and/or accounts (including paid absence accounts) to which you charged time. The critical document for monthly paychecks is the Personal Service Form (PSF).

Upon receipt of a PSF enrolling a new monthly-paid employee, Georgia Tech's Payroll and Records Services (PARS) enters that person's existence into THE COMPUTER. Until some other action via another PSF is received, THE COMPUTER will continue grinding out the same check every month for eternity.

Because of the complexity of the various systems involved, the cutoff date for transactions affecting pay for monthly-paid employees (employment, start of or return from a leave of absence, termination, etc.) is around the middle of the month. For a monthly-paid employee hired in March to be recognized by THE COMPUTER as deserving a paycheck on March 31, for example, the employment PSF must have been received in PARS by March 14.

The key is "date received in PARS," not the date your lab or department generates a PSF. Add a week to ten days to the date the PSF leaves your lab or department to arrive at the date you can realistically expect it to arrive in PARS. The schedule of cutoff dates for each month is sent to each lab and department from the Business Office.

"I'm terminating the middle of next month. My final paycheck, including pay for unused vacation, will be ready on my last working day, won't it?"

Indeed not. More effort has been expended in trying to correct this myth than was required to construct the great pyramids. Despite what you're told by your secretary, your boss, or your friend, the answer is NO. A terminating employee's final paycheck will be cut on his or her next regularly scheduled pay date. Neither threats, pleas, not trembling chins will alter this fact. The final check will include unused vacation pay if the terminating PSF was generated in time. If not, unused vacation pay will be picked up on the following regularly scheduled pay date. This applies to monthly paid as well as biweekly-paid employees.

Terminated employees do not have to return to campus to pick up their checks. The Personnel Division, on request, will mail the checks to whatever address is specified. Remember, too, that the Personnel Division is the only office on campus authorized to release final paychecks to terminating employees and will do so only if all their obligations to Georgia Tech (parking fines, overdue book fees, deliverables on sponsored projects, etc.) have been satisfied.

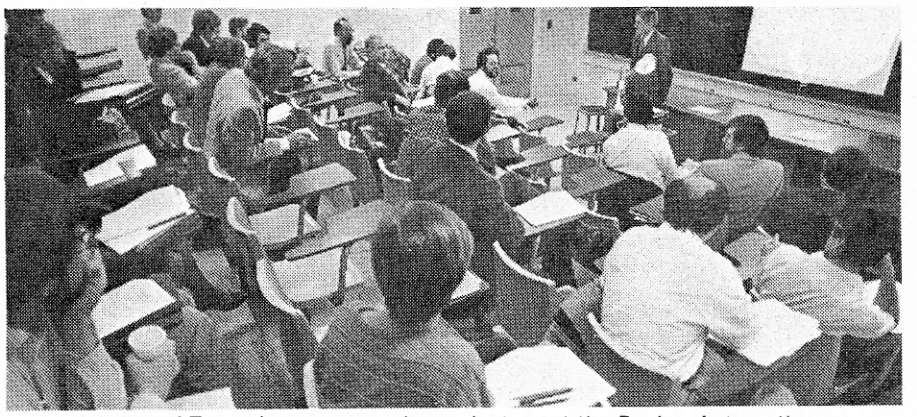
***(Note:** Send your questions to Charles McCullough, GTRI/HRD, for possible answer in this column.)*

SEL Hosts AI Workshops

The Software Engineering Branch of the Systems Engineering Laboratory hosted two research workshops in artificial intelligence at Georgia Tech March 24-28. The objective was to determine research needed in artificial intelligence (AI) to support its application to the areas of design automation (DA) and generic avionics.

The Avionics Laboratory of the Air Force Wright Aeronautical Laboratories sponsored the workshops. The meetings brought together leading researchers in AI, DA and avionics to provide guidance to the Air Force in planning AI research efforts.

Fred Cox organized and coordinated the workshops. Other SEL personnel who assisted were Kathy Schlag, Gene Lowe, Shirley Woods, and Angie Combs.



Dr. Bill Haney of Texas Instruments gives a lecture at the Design Automation Workshop hosted by the Systems Engineering Laboratory March 24-26. It was one of two workshops held on the Tech campus to guide the Air Force in planning its AI research efforts. (Photo by Charles Haynes)

Security Controls Tightened

On February 4, 1986, Secretary of Defense Caspar Weinberger approved for prompt implementation within 120 days 48 of the 63 recommendations of the Stilwell Commission's report, "Keeping the Nation's Secrets." These recommendations affect both governmental and contractor employees who hold security clearances. Some of them are as follows:

- Establishing a billet control system for TOP SECRET clearances.
- Justifying all clearance requests.
- Severely limiting clearances to immigrant aliens.
- Expanding investigative requirements for clearances.
- Requiring cleared contractors to designate individuals to act as agents of the Government, to ensure all information on clearances is made available.
- Establishing means to report serious security data, such as a **"hotline,"** and providing rewards to persons who provide information on apprehension of persons engaged in espionage.
- Requiring challenges to improper classification.
- Requiring DoD to institute a uniform degree of accountability for SECRET.
- Prohibiting retention of classified documents not permanently valuable records of the Government more than five years old, unless specifically authorized.
- Designating an annual classified **"clean out"** day.
- Prohibiting employees from working alone on Top Secret or Special Access programs.
- Increasing security awareness in industry.
- Reporting **all** contacts with **foreign nationals** and **foreign travel.**
- Subjecting persons to some type of inspection program entering and leaving cleared facilities.
- **Requiring unannounced inspections.**
- Requiring reports on repeat security violators.
- Requiring establishment of **administrative actions** against employees who violate security regulations.
- Revoking clearances of contractors for repeated security violations.
- Establishing minimum levels of training for security personnel to include certification.

Some of these recommendations, such as the control of clearances and justification of new clearances, have already been implemented at Georgia Tech. Security Coordinator Al Becker says Tech is now going through the "clean out" procedure, but the other regulations will take more time to implement. Becker was one of two security representatives from industry selected nationwide to testify before the Stilwell Commission.

Software Review

by Ed Anderson, RSTF

The Research Software Training Facility (RSTF) is offering a half-day course in Power Tools designed for Artificial Intelligence applications development. New programming environments have emerged from the AI laboratories and are commercially available on AI workstations such as the Xerox 1186. Exploratory programming, unlike conventional programming techniques, assumes that a programming project is essentially a problem of design mixed with implementation, a process in which program specifications are discovered during coding of early rapid prototypes.

Only by exploring tentative solutions can the client and programmer jointly discover what is needed to solve the problem in program form. Programming Power Tools are needed in a dazzling array to balance the lack of structure in the exploratory environment and to keep the programmer's bookkeeping responsibilities to a minimum, so that programmer productivity is not diverted.

Using an 1186 Xerox Artificial Intelligence workstation, the course provides demonstrations of the Power Tools available in the parallel Interlisp-D and Common Lisp environments. Tools begin with Masterscope, an intelligent software agent assigned to build a dynamic database around the user's application in progress. Masterscope is then able to analyze relationships within the application and answer direct questions about program structure and current state.

Power Tools also include the Programmer's Assistant, which maintains various histories and archival records about past user actions that may become relevant in the present, enabling the easy "undoing" of recent acts. The Programmer's Assistant shares knowledge about the user's application with both Masterscope and DWIM.

DWIM, a third Power Tool, stands for "Do-What-I-Mean." It permits the programmer to operate in either Trusting or Cautious mode. In Trusting mode, mistakes in Lisp syntax, program function and variable name misspelling, and general typographic mistakes such as run-on words are automatically corrected. As DWIM learns more about the context of the program being built, it also becomes more efficient in error correction. The same features are available through DWIM's Cautious mode, but now the user and DWIM confer about proposed changes before they are made (or unmade, as DWIM can call the Programmer's Assistant to do).

If you are interested in signing up for this short course, please contact the RSTF staff at 894-6206. A prerequisite of three months Lisp coding experience is generally suggested.

Training Schedule

The Software Training Schedule for May was not ready in time for publication this month. Call RSTF at ext. 6206 for course offerings, dates and times.

Watt Wins Top Defense Award

Systems and Techniques Laboratory Director Charles K. Watt received the Defense Meritorious Distinguished Service Award in February. The award was given by Secretary of Defense Caspar Weinberger.

The award citation states: "As the Director of Defense T&E, he was instrumental in formulating major milestone decisions directly affecting attainment of operational effectiveness and suitability of all major weapon systems acquired by the Department of Defense over the past five years."

Secretary Weinberger cited Watt's drive to improve the management of test and evaluation, significant improvements in DoD test methodologies and procedures, renovation of the DoD posture in the area of advanced threat simulator systems, and major positive contributions to the operational procedures and combat effectiveness of our military forces.

Hail to the Chief

Effective March 1, Trent Farill became the new chief of RAIL's Modeling and Simulation Division. He replaced Harold Bassett, who died last November after a long illness.

A senior research engineer, Farill joined GTRI in 1980. His fields of interest are radar systems; battlefield identification, friend-or-foe; surveillance and target acquisition; and physical security. He has moved to MSD from RAIL'S Technology Development Division.

Farill previously was a program manager at Systems Planning Corporation in Arlington, Virginia. Prior to that, he served 20 years in the U.S. Army, where he was both a helicopter and airplane pilot. In addition to spending two years flying in Vietnam, he was involved in various aspects of electronics research and development.

Farill received his BS and MS degrees in electrical engineering from Georgia Tech in 1958 and 1968, respectively.

PROFESSIONAL ACTIVITIES

ECONOMIC DEVELOPMENT LAB

Georgia Tech cohosted a national conference on higher education and economic development in late April. It was sponsored jointly by the American Association of State Colleges and Universities and the National Association of Management and Technical Assistance Centers (of which Tech's EDA University Center is a part). EDL Director **David Clifton,** University Center Director **Art Brown,** and Business Development Division Acting Chief **Bob Springfield** were among GIT representatives to the conference.

Bill Ewing and **Eva Clay** have been named co-chairpersons of the National Asbestos Council's Publications Committee. One of their functions will be generation of the quarterly *NAC Journal.*

William Spain has been promoted from editorial advisor to assistant editor (industrial hygiene and safety) for *Occupational Health and Safety* magazine.

ELECTROMAGNETICS LAB

A paper by **Chris Summers,** "Variably Spaced Superlattice Energy Filter—A New Device Design Concept for High-Energy Electron Injection," has been published in *Applied Physics Letters.*

Paul Wine is coauthor (with J. R. Wells and A. R. Ravishankara) of an article, "Channel Specific Rate Constants for Reactions of O(ID) with HCl and HBr," in the February 1 issue of the *Journal of Chemical Physics.*

Fred Eisele has had two papers accepted for publication in the *Journal of Geophysical Research:* "Mass Spectrometric Study of Tropospheric Ions in the Southwestern and Northeastern U.S." (coauthored with Physics Professor Earl McDaniel) and "Identification of Tropospheric Ions."

The March issue of *Optical Engineering* featured a paper by **John Gilmore** and **Antonio Semeco** entitled "Knowledge-based Approach Toward Developing an Autonomous Helicopter System."

ELECTRONICS & COMPUTER SYSTEMS LAB

Fred Cain, Joe Seals, and E. C. Burdette are coauthors of "In-situ Tissue Permittivity at Microwave Frequencies: Perspective, Techniques, Results," a chapter in the monograph, *Medical Applications of Microwave Imaging,* just published by the IEEE Press. The book is devoted to new and important applications of microwave energy, and the issues covered are on the "cutting edge" of technology.

Roy Miller participated in the 19th Annual Simulation Symposium in Tampa (FL) March 10-14, serving as chairman of a session on "Evaluation of Interconnection Networks in Multiprocessor Systems."

ENERGY & MATERIALS SCIENCES LAB

A paper by **Lois Speaker,** "AFT (Anti-Fouling Technology) for Membranes and Non-Permeable Surfaces," appears in *Fouling and Cleaning in Food Processing,* published by University of Wisconsin-Madison Extension Duplicating.

Wally Shakun presented a paper coauthored with **Dave Henderson** and **John Bearden** at the 6th International Thermoelectric Conference, held at the University of Texas at Arlington, on March 14.

The March issue of the *Journal of Protective Coatings and Linings* includes a paper by **Tom Starr** on "Improving the Performance of Zinc-Rich Paint Systems."

Jim Hubbard was interviewed by Paul Reynolds of WAGA TV 5 on asbestos in floor tile and the problems arising from improper removal. The interview was aired March 26 on the 6:00 News.

RADAR & INSTRUMENTATION LAB

At the IEEE 86 National Radar Conference in Los Angeles March 12-13, two RAIL papers were presented: "Three Dimensional Imaging of Radar Targets at 95 GHz," by **Ed Reedy, Steve Brookshire, Yalcin Peker,** and **Jerry Eaves,** and "A High Power Coherent 95 GHz Transmitter (HIPCOR-95)," by **Tracy Wallace** and **Phil Moore.**

Three papers were presented at the 10th DARPA Tri-Service Millimeter Wave Symposium, April 8-10: "Millimeter Wave Characteristics of Ground Targets," by **Margaret Horst** and **Gene Knott;** "Dual-Frequency Coherent MMW Target Measurements," by **Teddy Lane** and **Joe Bruder;** and "Performance of 95 GHz Air-to-Ground Seekers," by **Jim Echard** and **Jill Bach.**

SYSTEMS ENGINEERING LAB

Mike Furman has been appointed to the ad hoc committee of the General Faculty Assembly which is reviewing and modifying the Georgia Tech Software Policy.

At the Association of Old Crows annual Southeastern Regional Symposium, held at Warner Robins March 18-20, **Bob Mobley** chaired a technical symposium and **Bill Youngblood** and **Fred Cox** presented a paper on artificial intelligence.

PERSONNEL NEWS

ECONOMIC DEVELOPMENT LAB

In the Business Development Division, **Tom Parsons** and **Carrie Bellware** have resigned, while **Rita Warwick, David Marsh,** and **Ken Kucera** have transferred to ATDC. **Gerry Doubleday** and **Charles France** have shifted to the Industrial Extension Division, and **Lois Nelson** has joined the Environmental, Health, and Safety Division.

ELECTROMAGNETICS LAB

Richard Campbell, chemist, began work April 1 at the Huntsville Operations at Redstone Arsenal (AL) and will be supporting rocket propellant research and development.

J. Michael Cathcart is a new research scientist II in the Electro-Optics Division, where he will be doing modeling research in air-to-air IR seeker simulation, target signature prediction, and threat assessments. Dr. Cathcart has expertise in IR detectors and infrared systems.

Ron Forsythe, Joe Newton, Avery Davis, and **Marshall Weathersby** have resigned.

ELECTRONICS & COMPUTER SYSTEMS LAB

The Biomedical Research Division welcomes **Dr. Philip Kennedy,** RS II, who has just finished a postdoctoral research program with Emory University on neurophysiology/neuroanatomy and neurobiology. His principal area of research interest is electrostimulation of paralyzed muscle groups in quadraplegics and spinal-cord-injured persons. Dr. Kennedy has a PhD in physiology from Northwestern University. He holds an MD from the National University of Ireland and has done additional degree work at the Royal College of Surgeons in Dublin, Ireland.

David Millard has returned to the Electromagnetic Compatibility Division after a one-year leave of absence while working on his PhD under a fellowship provided by the Vice President for Research.

The Computer Technology and Applications Division welcomes **Beverly Cookes,** senior secretary.

RADAR & INSTRUMENTATION LAB

Welcome to co-op **Joe Arrowood,** who will be working in the Modeling and Simulation Division, and to electronic data processing clerk **Karen Moss,** who will be working during the summer in the Analysis Division.

SYSTEMS ENGINEERING LAB

Congratulations to March employee of the month **Suzy Calvert,** cited for her exemplary aid in getting a competitive, classified proposal out the door "just under the wire."

Janie Kite has been promoted to division secretary for the Concepts Analysis Division.

Virginia Burr is a new senior secretary in the Countermeasures Development Division (CDD), replacing **Evelyn Lochan,** who transferred to the Human Resources Department. Virginia previously worked on campus for TAL. **Larry Stroud** has transferred from CDD to the Defense Systems Division.

SYSTEMS & TECHNIQUES LAB

STL welcomes **Scott McBride,** research engineer I; **Cynthia Rogers,** accountant II (transfer from SEL); and **Tedd Toler,** mechanical designer (transfer from EML).

Doug O'Neil has terminated.

Personal Notes

Their coworkers in GTRI extend their sympathy to the following on the recent deaths of their fathers: **Grant Curtis** (EDL), **Douglas Guillory** (EML), **Bill Cooke** (ECSL), and **Kathy Schlag** (SEL). Sympathy also to **John Estrada** (ECSL) on the death of his brother.

Congratulations to Kathy Curran and **Jon Hoffmeister (STL)** on the birth of their new son, Daniel Curran Hoffmeister.

Want Military Retirement Credit?

Veterans who are interested in purchasing Teachers Retirement System credit for their military service during World War II, the Korean War, and the Vietnam War are asked to contact Ernie Ruda, GTRI/STL, at 424-9642. We would like to determine how many people are eligible and interested in purchasing this time in the TRS, but who have not done so because of the interest computation that TRS uses. Please reply by May 15.

Conference

(from page 1)

invited to choose from more than 70 individual sessions with such diverse themes as working safely in a confined space, hazard communication, stress management, asbestos abatement, prevention of robot-related accidents, environmental assessment, hazardous and industrial waste management, and the epidemiology of Acquired Immune Deficiency Syndrome (AIDS). In addition, 33 exhibitors from service organizations and commercial suppliers had display booths.

Three-hundred fifty-eight people attended the conference, an increase of nearly 35% over last year. Calling the conference an unqualified success, Conference Chairman Marty Melton said planning for next year's meeting has already begun.

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