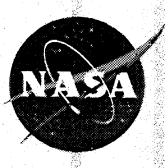


MTAC

MID-ATLANTIC TECHNOLOGY APPLICATIONS CENTER

ANNUAL REPORT 1997

QUARTERS 1-4

Summary Highlights

MTAC pursued a number of initiatives designed to enhance the strategic position of the Langley Research Center (LaRC) and NASA in industry. Among these was a closer association with the ISA, International Society for Measurement and Control. During 1997, MTAC placed articles regarding NASA-developed technologies in each ***In Tech*** magazine. The monthly magazine is sent to 46,000 sensors and instrumentation professionals. In addition, MTAC coordinated NASA's participation in the ISA Tech 97 Conference, securing $112,000 of free exhibit space, 1500 NASA sensors posters at no cost to NASA, and thousands of dollars of free publicity.

MTAC was awarded a contract by ISA to operate its Technical Resource Center (TRC). The goal of this project is to determine what user needs are in order to identify opportunities for collaboration between NASA centers and companies. In addition, the TRC work will lay the groundwork for the Technology Development Consortium (TDC) proposed by MTAC. The purpose of the TDC is to: match current industry needs with NASA technologies available now, and to identify future needs of NASA and industry which may lead to dual use projects.

The goal of these activities is twofold: to infuse NASA technologies into the sensors and instrumentation industry and to secure industry funds to support NASA technology development projects. The instrumentation and sensors industry is valued at $30 billion worldwide, with $12 billion in sales in the United States. The growth rate averages 13.5%, so that by the year 2000, the industry will produce products worth $49 billion. More than 80% of instruments, sensors and control systems are currently manufactured in the United States. NASA and the industry do not have a history of collaborative projects; MTAC's initiatives in this area are designed to foster working relationships between the two parties that will help maintain U.S. leadership in this field.

MTAC continued to work on LARC-SI and Thin Layer Unimorph Driver and Sensor activities. MTAC helped develop the "master license" concept and identified additional applications and potential clients. The goal of these activities was to increase the financial return to Langley Research Center, to ensure the diffusion of the technologies throughout the economy, and to attract partners for future NASA technology development efforts.

In an attempt to market LARC-SI and the Thin Layer Unimorph Driver and Sensor, MTAC developed and pioneered the use of the USRTTC Technology Commercialization Team. As a result, MTAC's sister RTTCs identified both applications and potential users for the two technologies. MTAC also benefitted from its affiliate network to locate companies throughout the region that were interested in the two technologies.

MTAC is working with Allegheny Ludlum to monitor the progress of the installation and testing of ultrasonic equipment purchased as a result of Langley Research Center's assistance. According to Allegheny Ludlum, the new equipment, calibrated with

Langley's instructions, could detect inclusions small enough to be relevant to its most demanding applications. They can now precisely quantify steel cleanliness within a few days after hot rolling, as opposed to 6-8 weeks with the previous method. The new method also provides about 2000 times the amount of data sampling as the previous method, with the ability to generate information that was not practical before: three-dimensional spatial maps of inclusions, which are providing new insights into their casting process.

MTAC coordinated the efforts of the Fire Fighting Task Force, with progress in all three areas identified as priority projects: enhanced communications, improved visibility and tracking and monitoring. Several NASA technologies are under consideration for these projects. Perhaps most immediately promising is a marriage of NASA and Navy technologies to create a fore-head mounted microphone communications system for fire fighters. Originally developed for underwater use by the military, the piezoelectric headset device allows hands-free communication. Because the only sound transmitted is that created by vibrations through the skull, the device is especially effective in noisy environments. An added benefit is that the system may also be useful to law enforcement personnel. Prototype systems are now being built. MTAC's continuing efforts on this project are supported in part by the Federal Laboratory Consortium (FLC).

MTAC and sister RTTC organizations are mounting an assault on the long-standing problem of the failure of SBIR companies to secure Phase III success. As a research program, NASA's SBIR program has been a success; as the product development program that was intended by Congress, it has generally been a failure. It is clear from the history of the SBIR program throughout the federal government, that SBIR companies need help in marketing the products they develop. MTAC has been successful in finding large companies with extensive marketing capabilities to partner with SBIR companies, to license their technologies, or acquire them. MTAC is working with its sister RTTCs to develop a NASA-wide program that would improve the performance of its SBIR program by: (1) determining the commercial potential of subtopics, (2) assessing the commercialization plans of SBIR applicants, and (3) matching successful Phase II companies with commercialization partners.

MTAC has increased the NASA presence in the Mid-Atlantic FLC. MTAC is working closely with the Regional Coordinator to develop an action agenda and programs for the region. Planned activities focus on outreach efforts to increase regional industry awareness of federal laboratory capabilities. Langley Research Center will benefit from leveraging the resources of the FLC to identify partnership opportunities with companies in the region.

1997 MTAC and Affiliate Services

Quarter	Needs	Commercialization
January - March	143	32
April - June	296	44
July - September	327	53
October - December	270	48
TOTAL	**1,036**	**177**

Services that fall into the Needs category include:

- Identification of client needs and problems
- Applications analyses and technical assistance
- Engineering reports and evaluations
- Information retrieval

Services counted in the Commercialization category include:

- Technical and business analyses
- Venture capital sourcing
- Technology brokering
- Marketing assistance
- Patent licensing assistance

MTAC 1997 Web Metrics

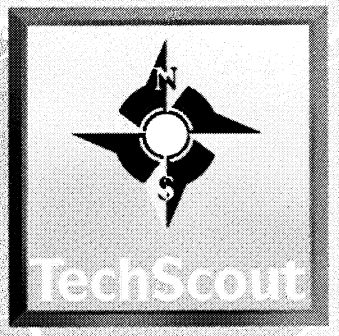
Quarter	"Hits"
January - March	4,097
April - June	3,852
July - September	4,667
October - December	5,480
TOTAL	**18,096**

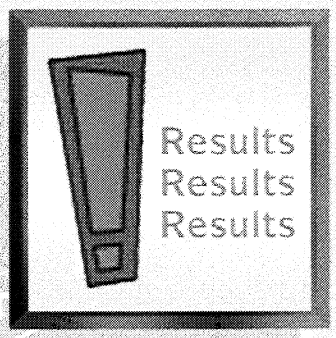
MTAC's web page titled "NASA Technology Sampler" ranks as one of our most accessed pages (only second behind our "main" homepage). Many of the "hits" can be identified as being a direct result of the searches done by people using net searching tools.

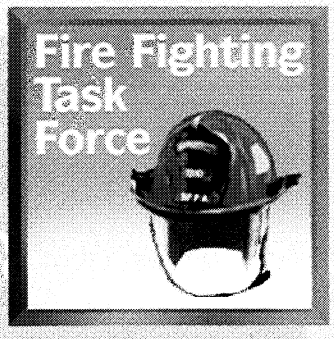
In many ways, this technology replaces a traditional newsletter and other types of collateral material. Many first time callers are already familiar with our organization and services. We also have noticed that at presentations to companies, the people in the audience have educated themselves by "visiting" our homepage. As a result, we are able to spend less time giving them background information and are able to get right to business.

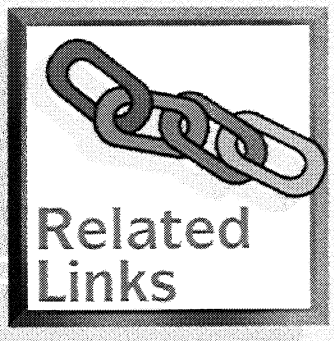
The MTAC homepage

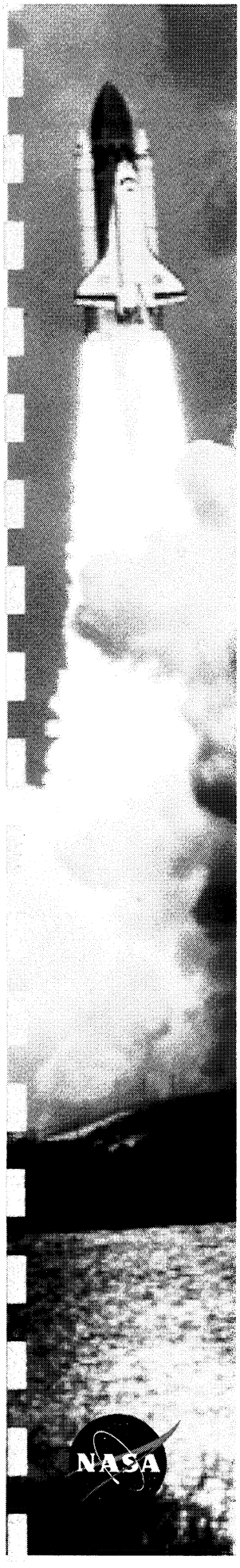
http://oracle.mtac.pitt.edu/WWW/MTAC.html











Faster steel quality assessment for Allegheny Ludlum

Allegheny Ludlum of Brackenridge, PA, an Allegheny Teledyne Company, is a producer of continuously cast stainless steel. The traditional method of determining microcleanliness of the steel involves detailed metallographic inspection techniques. This labor-intensive and expensive process often results in delays of one to two months to obtain a detailed characterization of the microcleanliness. NASA expertise, in conjunction with off-the-shelf technology, has been used to develop a rapid-turnaround ultrasonic test method for the detection of non-metallic inclusions in representative stainless steel samples.

Careful matching of detection requirements and ultrasonic transducer performance characteristics enabled NASA, working with Allegheny Ludlum (AL) R&D, to develop an inspection technique that could be performed in-house.

In the development phase, a NASA Langley researcher tuned the ultrasonic system to the physical properties of the steel. He generated a high-resolution, three-dimensional map of the size and location of the microscopic inclusions in the steel. Microscopic examination verified that the inclusions were precisely where the C-Scan map (two-dimensional image map) showed they would be.

This technique provides a thorough characterization of microcleanliness in days instead of weeks and enables more efficient production scheduling. In addition, it eliminates labor-intensive metallographic analysis and costly surface preparation sometimes associated with conventional ultrasonic testing.

AL purchased the same kind of system used by NASA and installed it in April 1997. Robert F. Miller, PhD, Vice President, Technical, says the project has been "a tremendous success. We can now precisely quantify steel cleanliness within a few days after hot rolling, as opposed to six to eight weeks with our previous method." The ultrasonic method provides AL with about 2000 times the amount of data sampling over the old method, plus the ability to generate information that was not practical before — three-dimensional spatial maps of inclusions that are providing AL with new insights into their casting process.

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LANI S. HUMMEL, EXECUTIVE DIRECTOR

Allegheny Ludlum

An Allegheny Teledyne Company

Robert F. Miller, PhD.
VicePresident,Technical
AlleghenyLudlum
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Brackenridge,PA15014-1597
Voice(412)226-5671
FAX(412)226-5415

6 November 1997

Ms. Lani S. Hummel
Mr. Robert B. Saba
Mid-Atlantic Technology Applications Center
University of Pittsburgh
823 William Pitt Union
Pittsburgh, PA 15260

Dear Lani and Robert,

We would like to thank you very much for the role that MTAC has played in facilitating the transfer of ultrasonic testing technology to Allegheny Ludlum. In 1995 we were in the process of developing a method to measure the cleanliness of our steel using ultrasonic testing. Local experts had advised us to perform a considerable amount of surface grinding, and they were ultrasonically scanning our cast and forged samples at relatively low frequencies with large diameter transducers. By coincidence Robert Saba put us in contact with Robert F. Berry, Jr. (NASA Langley) at just the time when we were about to test a production plate sample (November 1995). Mr. Berry was convinced that he could detect inclusions without any surface grinding and asked for a sample to test. Robert Saba personally transported this sample to Mr. Berry.

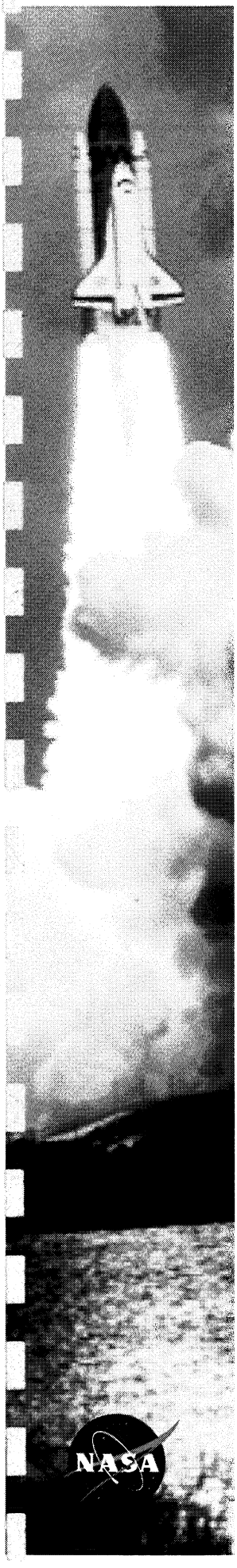
A few days later, Mr. Berry called to confirm that he had been very successful in detecting inclusions in our material by adjusting the transducer to a small diameter and high frequency. We purchased an identical version of the transducer and were able to duplicate his results in-house. Mr. Berry also supplied a C-Scan (2D image map) of the inclusion distribution from an immersion ultrasonic test, and marked the locations of some of the larger inclusions on the sample itself. We were able to section the sample and metallographically verify that the inclusions were exactly where he said they were. The C-Scan and the sample itself later became the standards against which we evaluated systems for purchase. During this time Robert Saba kept in close contact with both David Forrest (our engineer in charge of the project) and Robert Berry to make sure we were communicating effectively—a valuable additional role.

Once we had verified that we could detect inclusions small enough to be relevant to our most demanding applications, we developed a justification to purchase an ultrasonic testing unit (as it turns out, the same make as Robert Berry's unit). The system was installed in April 1997 and has been a tremendous success. We can now precisely quantify steel cleanliness within a few days after hot rolling, as opposed to 6-8 weeks with our previous method. And the ultrasonic method provides about 2000 times the amount of data sampling over the previous method, with the ability to generate information that was not practical before: three-dimensional spatial maps of inclusions, which are providing new insights into our casting process.

Mr. Berry's involvement accelerated the development of the project by 6 to 12 months, immediately showing how to take measurements of very small inclusions without special surface preparation. Robert Saba's initial involvement in establishing the contact, and his continuing involvement in facilitating ongoing communication has been of great value to us. Thank you again, and we look forward to working with MTAC in future projects of this type.

Yours sincerely,

Robert F. Miller



Virginia company gets help for peanuts

Virginia's Center for Innovative Technology has received national recognition for its project, the "World's First Self-Propelled, Eight-Row Peanut Combine." Merging ingenuity with opportunity, a Suffolk, VA, company gained a worldwide market for this unique product. The project, directed by Robert W. Harrell, Jr., was designated "outstanding" in the technology transfer category of the Project of the Year Award. The competition is sponsored by the National Association of Management and Technical Assistance Centers (NAMTAC).

Amadas Industries of Suffolk contacted the Virginia Center for Innovative Technology (CIT) seeking assistance in wining a joint venture contract with John Deere to develop and manufacture the world's first self-propelled eight-row peanut harvester. CIT's support and the expertise of several Virginia universities helped Amadas to win the contract. CIT provided a one-year grant that supported a graduate engineer in the plant to lead finite element and stress analysis studies and train Amadas engineers.

The harvester integrates the drive system from John Deere and the harvester from Amadas. The Technology Application Center at Old Dominion University and the Virginia Technical Information Center, both CIT-funded centers, provided technical support, as did the Mid-Atlantic Technology Application Center through NASA Langley. John Deere will distribute the product worldwide.

The new harvester's front end design results in greater mobility, productivity, and product damage reduction. It increases the harvest rate from 25 acres up to 125 acres a day, and with the substantial savings in damaged product, it dramatically increases cost efficiencies. Fifty jobs are involved in the production of the harvester, with a total return on investment by CIT to the economy of Virginia calculated at 464-1 annually for CIT's research assistance.

The Project-of-the-Year Award Competition is held annually to identify outstanding efforts to help NAMTAC clients become more globally competitive, more viable in their fields of expertise, or more capable of delivering services to the public sector.

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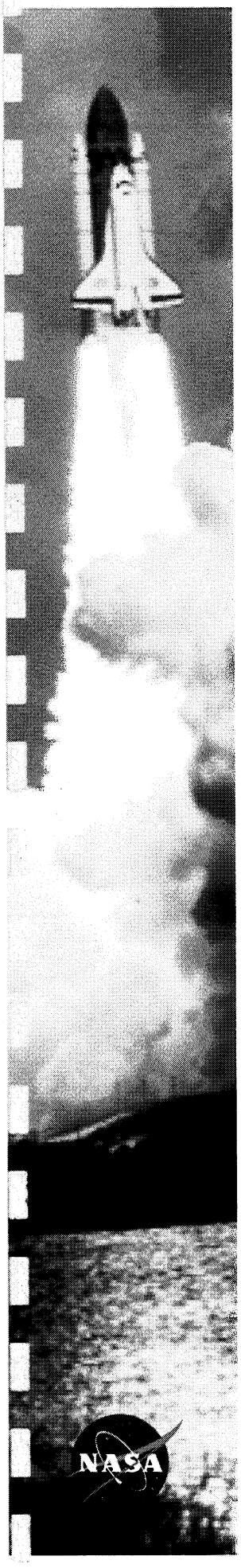

UPDATE: JohnCo has hired a research scientist experienced in biochemistry to perform bridge testing needed to take the card to market in 1998. MTAC assisted JohnCo with the interviewing process.

Microassay on a card

MTAC is providing assistance to JohnCo. Rental Inc. of Gowanda, New York, owned by Ross John, Sr., a member of the Seneca Nation, to manufacture and market a microassay-on-a-card (MAC) sensor. The sensor is capable of identifying small quantities of illegal drugs in solid materials in less than one minute. The disposable MAC devices will be about the size of a credit card and consist of three layers of materials encased in plastic. The layers are treated with specially designed antibodies, enzymes and dyes. After the substance in question is placed in an aqueous solution, a drop applied to the test well on the card will cause a definite color change if an illegal drug is present.

When JohnCo. first approached MTAC, the Seneca Nation Reservation was burdened with a crippling unemployment rate. The company was seeking an economic activity that would be socially valuable and create jobs for the young people of the reservation. MTAC worked with JohnCo. to determine what sort of manufacturing enterprise would best capitalize on the company's resources, and then presented them with a portfolio of technologies that could form the basis of a new product line. JohnCo. chose to pursue the MAC sensor, a technology developed by the Naval Research Laboratory. This method is less expensive, easier to use and provides results faster than rival drug assay methods.

In addition to the technology search, MTAC assisted with market assessments and arranged for process development assistance.

The biochemical processes involved in the manufacture of the card are currently being validated and refined. The card is expected to reach the market in 1998.

Potential customers for the card include police departments, customs operations, schools and the armed services. Initial market assessments estimate annual sales will top $1 million. MTAC expects this to be just the start of a continuing, mutually-beneficial relationship for JohnCo. and the federal lab system.

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FIRST QUARTER

January 1 - March 31

First Quarter 1997
Outreach/Networking

January

Pittsburgh High Technology/CMU/Pitt Conference Planning meeting
CTO Network meeting
Johns Hopkins meetings
Pittsburgh High Technology Council Breakfast meeting
Charlotte Weber/Robert C. Byrd Institute meeting
AEA meeting/CRADA signing
US Flywheel Systems, Inc meeting
Human Engineering Research Lab/UPMC/VA meeting
A-Line Products meeting
Allegheny Ludlum meeting
Provident Insurance meeting
Fraunhofer Day Conference
Foamed Metals Symposium
Baltimore County High Technology Council meeting
Environmental TLC Luncheon
BioEnhance Open House

February

Hiram G. Andrews Center meeting
Pittsburgh High Technology Council meeting
AUTM meeting
AFT2E meeting
MPI meeting
Johns Hopkins meeting
Pittsburgh High Technology Council Breakfast meeting
Respironics meeting
Mneumonics meeting
Roseanne Rosenthal/Ben Franklin of Southeastern Pennsylvania meeting
ISA Consortium meeting
Kennedy Space Center meeting
Pittsburgh Bureau of Fire meeting
Drexelbrook meeting
ISPA/Baltimore meeting
Calgon Carbon meeting
NREL/Bureau of Reclamation
Maryland Business Alliance

March

Virginia Power meeting
Pittsburgh Bureau of Fire meetings
Hiram G. Andrews meetings
AISI meeting
NIOSH meeting
Pittsburgh High Technology Council Breakfast meeting
Representative Coyne meeting
Kennemetal meeting
Lear, Corporation meetings
SPI meeting
Ben Franklin South Eastern Pennsylvania meeting
CONMAT meeting
Goddard Space Flight Center meetings
Johns Hopkins meeting
Vision Interface Corp. meeting
Ted McCurdy Associates meeting
CONMAT/CERF meeting
Bacharach, Inc. meeting
Rusmar, Inc meeting
DVIRC Manufacturing Services meeting
Life Sciences Roundtable meeting
Elizabeth River Project TLC Luncheon
Hampton Roads Technology Alliance Breakfast Seminar
Riverport Task Force TLC Luncheon
Combustion By-Products Take Force meeting

First Quarter 1997 Information Retrieval Projects

Abrasion Resistant Materials	Medical Monitors
Advanced Materials	Metals for Electrical Motors
ALCOA - Company Info.	Method to Treat Graphite Composite Structures to Make Them Heat Resistant
Allegheny Teledyne - Company Info.	Mid-Atlantic Venture Association
Aristech - Company Info.	MSA - Company Info.
Associates International - Company Info.	MSFC Patent No. 5,141,636 Purification System
BioDx, Inc. - Company Info.	Multi-Channel Crosstalk
Breakaway Guy Wire for Utility Poles	NASA & DoD Suppliers in PA
Breathing Apparatus	Non-Imaging X-Ray Sensors
Brush Manufacturers	Novel Air Conditioner
Calgon Carbon - Company Info.	Nuclear Power Plant Info.
Carpal Tunnel Syndrome	Ozone Treatment in Laundry Systems
Catalytic Hydrogenation of Carboxylate Salts	Patent Misuse
Cemented Carbides, Ceramics for Wear Resistance & Cutting Tools	Patents from Digiray Corp.
Cetek - Company Info.	Plastec Inc. - Company Info.
Charge Coupled Devices & Packaging	Polymerase Chain Reaction
Computer Coach - Company Info.	Polymetallurgical Corp - Company Info.
Cryogenic Power Component	Powder Metallurgy
Derivation of Nonlinear Parametric Equations Software	Precision Measurement Devices
Digiray - Company Info.	Radiant Barrier Technologies
Dingman Center- Private Investors Network)	Safety Critical Software
Dominion Resources - Company Info.	Sen. Arlen Specter's Committee Assignments
Electronic Ballast Technology & Fluorescent Lighting	Sensor Technologies
Environmental Monitoring Technologies	Sound Insulation
Fire Safety & Sensors	SSA - Disability Info.
Firecap, Fireguard Trademark Searches	Temps & Co. - Company Info.
Flash Lamps	Textiles, Fabric, Carpets, Mats
Fosbel - Company Info.	Thermal Insulation
Grace Industries - Company Info.	Thunder Licenses
Hydrogenolysis of Carbohydrates	Tooling Systems
Info. on William J. Hughes Technical Center	Trademarks
Lab Royalties - NIH, Argonne, Los Alamos, Sandia	Ultracapacitors for Hybrid Electric Vehicles
Laser Technology for Measuring Well Water	*Zacharin v. United States* Decision
Machining, Cutting, Shaping & Forming of Alloys, Metals & Minerals	

Technology Transfer

NASA offers flameout technology

Another in a continuing series of articles for ISA members by the Mid-Atlantic Technology Applications Center (MTAC), one of NASA's six regional technology transfer centers.

Pittsburgh, Pa.—NASA Langley Research Center's 8-ft. temperature tunnel is a large-scale wind tunnel capable of simulating hypersonic flight conditions through the use of air/methane combustion.

So it can function as a test bed for propulsion system research, liquid oxygen is injected directly into the tunnel's combustor to replenish that which would normally be consumed during conventional air/methane combustion. Because of the volatile nature of methane, liquid oxygen, and air, safety concerns over an unplanned combustor flameout and re-ignition prompted the development of a new flame detection scheme capable of responding quicker than the thermocouple-based system already in use by the facility.

Computer modeling of combustor flameout and re-ignition indicated that the proposed system must respond to such an event in less than 100 milliseconds. If, after 100 milliseconds, the unburned fuel in the combustor were to re-ignite, the resulting pressure pulse might be capable of exceeding the design limits of the combustor.

The extremely fast responding fiber-optic flame detection system was developed to detect an unplanned combustor flameout during tunnel operation and signal the facility control network to prevent additional fuel from entering the combustor.

The optical flameout detection system (OFDS) monitors light energy in discrete spectral bands (200-600 nanometers) with two independent photomultiplier tube (PMT) optical detectors. Light energy from the combustion process is optically coupled to the detectors through a pair of 20-ft.-long, 0.0625-in.-diameter fiber-optic probes.

The output of the PMTs is used to activate circuitry that determines whether a Flame On/Off condition exists in the combustor.

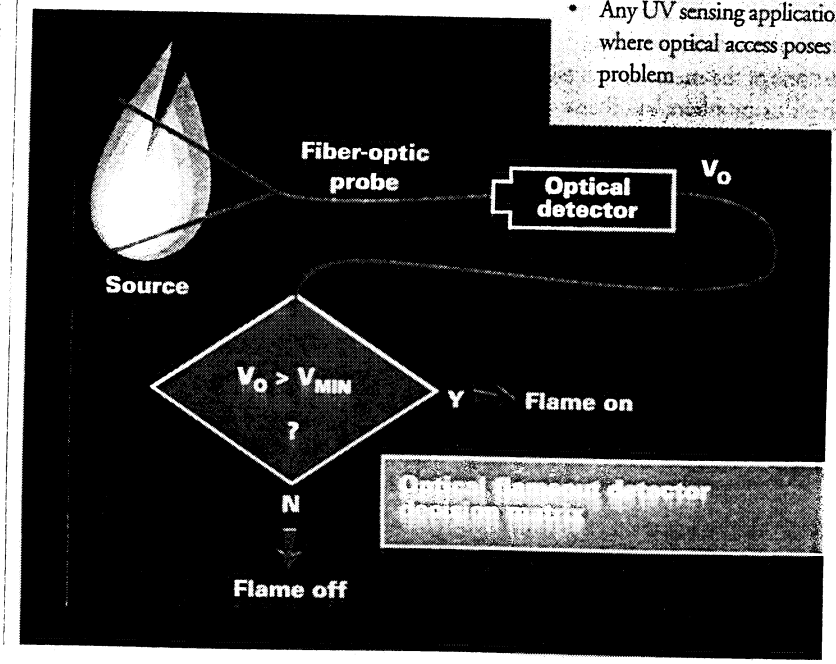
In order to generate a main-Flame On indication from the detection circuitry, the detector outputs must exceed a preset minimum value corresponding to the light intensity associated with a low-intensity boost flame. Conversely, if the detector outputs drop beneath a minimum value, then a Flame Off condition is registered, which initiates a rapid shutdown of the main fuel supply.

The major components of the flame detection circuitry are a noninverting amplifier, a voltage comparator, and two relays—one normally open (NO) and one normally closed (NC). The amplifier conditions the detector output for the fixed voltage comparator. Variation of the amplifier gain changes the minimum detector output voltage required to generate a state change in the fixed voltage level comparator. A 2-1 comparator on/off voltage ratio is designed into the comparator circuitry to guard against false triggers from reflections within the combustor.

When the comparator undergoes a state change, a corresponding state change will also occur in the NO/NC relay. The relay combination is the flameout detection system's trigger, which is monitored directly by the facility's process control system.

Derivations of this electro-optical system could provide more detailed information on various aspects of the combustion process or in an application where the process control has a radiometric property correlation.

OFDS is an unpatented invention. NASA Langley wants to identify companies interested in commercializing this technology. For information, contact John Bacon, NASA/ISA liaison, by phone at 412/383-2530 or by e-mail at jbacon@mtac.pitt.edu.



MTAC

Visit MTAC's home page on the World Wide Web to view the Instrumentation and Sensors section and check out other hot technologies: http://oracle.mtac.pitt.edu/WWW/MTAC.html.

Benefits

- Able to survive pressures up to 4,000 psi
- -100°F to 750°F operating range for the optical probes
- Less than 10-millisecond system response time

Potential commercial uses

- Flame detection system for furnaces, burners, and free-standing flames
- Pilot-light detector
- Welding flame sensor
- Any UV sensing application where optical access poses a problem

Technology Transfer

Nondestructive testing probes locate flaws

Another in a continuing series of articles for ISA members by the Mid-Atlantic Technology Applications Center (MTAC), one of NASA's six regional technology transfer centers.

Pittsburgh, Pa.—Research at NASA in the area of nondestructive evaluation (NDE) has resulted in development of numerous instruments based on a novel electromagnetic probe.

Two inventions, discussed here, resulted from NASA's work to improve the air worthiness of America's aging commercial airline fleet and, ultimately, to maintain the global competitiveness of U.S. airlines. Both devices employ a unique driver-pickup coil configuration that produces a zero output voltage when unflawed material is inspected. In the presence of a flaw or crack, a large output voltage is recorded. The signal offers the instrument operator an easy method for detecting and locating a flaw.

Flux focusing sensor and rotating probe method

NASA's flux focusing sensor and rotating probe method for flaw detection offers a significant advance in detecting fatigue cracks under rivet heads. The probe consists of two concentric coils, outer (drive) and inner (pickup) coils, separated by a ferrous, thin-walled tube called the flux focusing lens. This lens isolates a high-turn pickup coil from the excitation coil. The lens also simplifies inspections and increases detectability of fatigue cracks under circular fasteners in high-conductivity materials.

In the presence of an unflawed sample, the flux focusing lens produces a null voltage output across the pickup coil, called the self-nulling condition. In a flawed sample there is a redistribution of the current flow, which eliminates the self-nulling condition; a high voltage is produced which yields a clear, unambiguous flaw signal.

This NASA device enables parts to be rapidly scanned. It monitors only the amplitude of the pickup coil signal. The device can detect flaws under fastener heads or other inhomogeneities in the material. Flaw sizing and location can be easily determined from the instrument's output. The instrument has been used to detect small cracks hidden under rivet heads.

Test results have proven that the probe is capable of detecting 0.032-in.-long fatigue cracks under fasteners with a 90% probability.

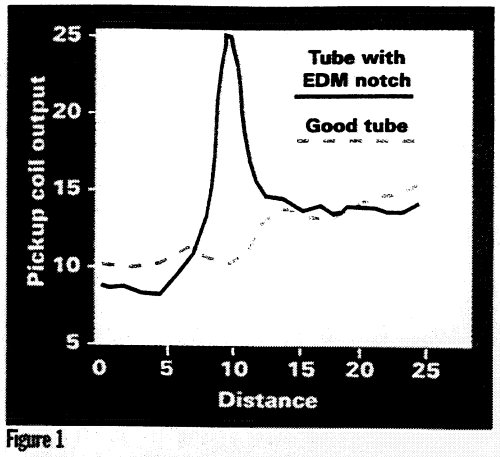


Figure 1

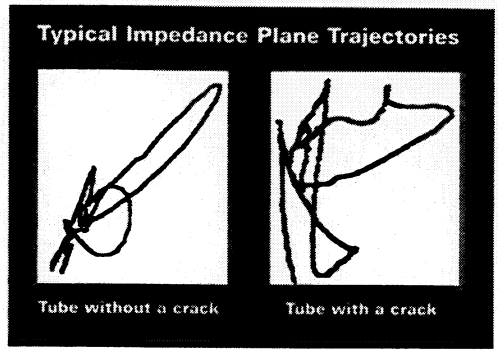


Figure 2

Radially focused eddy current instrument

A second invention, NASA's radially focused eddy current instrument, enables the probe to be placed axisymmetrically into a tube to detect longitudinal fatigue cracks and flaws. The probe induces eddy currents in the tube walls, and the pickup coil is fixed slightly below at 90° with its axis normal to the tube wall. The magnetic flux is focused such that, in the absence of a flaw, there is minimal linkage with the pickup coil and, therefore, a small signal.

In the presence of a flaw, the induced eddy currents in the tube walls are forced around the flaw. The flux linkage is thereby greatly increased, and a larger voltage is induced across the pickup. A significant advantage of this design is that the probe is relatively insensitive to circumferential discontinuities such as butt joints or weld beads. The probe has successfully been used to detect cracks in welded joints between steel tubes and other structures.

The operating characteristics of the device enable longitudinal flaws in metallic tubes to be easily detected. Flaw sizing can be determined from the amplitude of the signal.

Figures 1 and 2 contrast the results obtained from the NASA device and a conventional method. With the NASA device, the large increase in the pickup coil output (see Figure 1) is unambiguous and clearly identifies the location of the flaw. In contrast, the impedance plane trajectories from the conventional differential eddy current probe are heavily affected by the weld joint such that the signal is lost in the background (see Figure 2).

These technologies are not available for licensing, but will be available to end users through the licensing companies. For more information about these technologies, contact John Bacon, MTAC/ISA liaison, phone: 412/383-2530; e-mail: bacon@mtac.pitt.edu; fax: 412/383-2595.

Technology features

- Detects fatigue cracks in conducting materials
- Requires no calibration (self-nulling) or reference standards
- Provides a clear, unambiguous signal
- Requires minimal instrumentation
- Producible at lower cost than existing devices
- Portable

MTAC

Visit MTAC's home page on the World Wide Web to view the Instrumentation and Sensors section and check out other hot technologies: http://oracle.mtac.pitt.edu/WWW/MTAC.html.

Technology Transfer

Light-sensing technologies hurdle barriers

Another in a continuing series of articles for ISA members by the Mid-Atlantic Technology Applications Center (MTAC), one of NASA's six regional technology transfer centers.

Pittsburgh, Pa.—Two light-sensing technologies, from two separate NASA research centers, overcome some technical problems that have previously limited optic systems currently in use.

1. Self-referenced intensity-modulated fiber-optic sensing systems, from NASA Lewis Research Center, are fiber-optic sensing systems with intensity-modulating sensors that respond to applied disturbances by altering the light intensity passing through the sensing elements. The systems are conceptually simple and relatively inexpensive. They do not require coherent sources and single-mode fibers, and a variety of sensing elements make it easy to design a custom sensing system.

However, a serious drawback limits system applications in harsh environments. They are sensitive to variable losses in sources, detectors, connecting fibers, and connectors. Two newly developed techniques introduce various compensating schemes to reduce these negative effects.

Two compensating schemes developed at NASA Lewis involve either a pulsed or continuously modulated source. Both schemes incorporate an intensity-modulating sensing element into one interferometric sensing head arm.

In the pulsed-source scheme, the initial light pulse is split—part is sent through the sensing element and the rest bypasses it. The different optical paths taken by each initial pulse part in the interferometric sensing head cause a double pulse.

The pulse that passes through the sensor is the "signal" pulse, and the other is the "reference." The relative pulse amplitude carries information about sensor losses related to the measured parameter.

A triple pulse can also be generated: the middle pulse is the signal; the other two are the references. The amplitude-to-frequency conversion technique permits tracking a so-called characteristic frequency as a function of the measured parameter.

In the continuously modulated scheme, the source is modulated at two radio frequencies so one signal experiences constructive interference and the other undergoes destructive interference. The signal ratio of the two frequencies is highly sensitive to changes in the measured parameter but not to disturbances outside the sensing head.

The compensating schemes are simple to implement and can accommodate different sensing elements. Various configurations of interferometric sensing heads permit design flexibility.

NASA Lewis seeks industrial partners to license and/or commercialize the technology; some has been patented (patent number 4,995,697).

2. Method and apparatus for modulating light using spatial modulators, developed by NASA Johnson Space Center, directs coherent light beams from a single source to multiple receivers. It enables constructing computer-generated holograms by using spatial light modulators to communicate with an optical recording medium having multiple-level information storage.

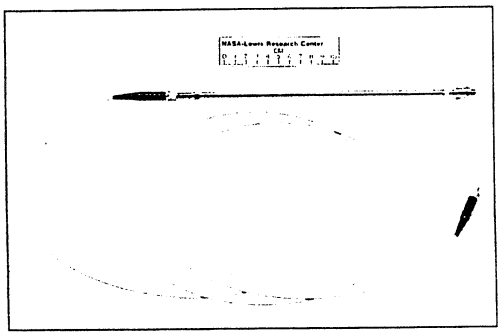
The simplicity of the invention, its appropriateness for many uses, and its uniqueness is a result of the filter correlation metric optimization technique developed by the inventor.

The apparatus can be used in optical computers for holographic video applications and in optical storage media for long-term, high-speed data-archiving applications. New applications for this unique technology will be realized as the market for optical computing devices increases.

Spatial modulators can improve training for complex or spatial-reference familiarization tasks. It could be used for field excursions via a high-resolution (102 lines/mm), lightweight, head-mounted display system.

A patent application has been filed, and a laboratory model is available for inspection.

NASA is seeking commercial partners to further develop these technologies. For more information, contact John Bacon, NASA/ISA liaison, at 412/383-2530 or at jbacon@mtac.pitt.edu.



One of the proposed configurations of NASA Lewis's sensor

Potential commercial uses:

- Fiber-optic sensing systems for harsh and noisy environments
- Process control instrumentation
- Medical instrumentation
- Fly-by-light instrumentation
- Signal processing of short-duration pulses

Benefits:

- Minimizes the effect of noise and variable losses on measurements
- Increases sensitivity and dynamic range
- Employs multimode fibers and connectors and low-coherence sources
- Provides flexibility in design to meet particular requirements
- Uses relatively inexpensive components

Visit MTAC's home page on the World Wide Web to view the Instrumentation and Sensors section and check out other hot technologies: http://oracle.mtac.pitt.edu/WWW/MTAC.html.

ISA•TECH97

Technology Exchange

Networking key to business success

By John M. Bacon

Research Triangle Park, N.C.—Understanding networking is already crucial to process and discrete parts manufacturing company success.

In today's digital information age, just-in-time manufacturing is not a goal, it's a reality. And computer networks are essential tools for meeting consumer demands.

In a global economy, for instance, manufacturing may take place in widespread areas. A customer goes into a car dealership seeking a specific model with specific options in a specific color. If this car is not in stock, the dealer must be prepared to tell the customer when it will be available. The dealer must also be able to search inventory at other dealerships or at the main manufacturing location and deliver the product quickly and cost-efficiently—even if it requires building a new part.

Process manufacturing companies also are recognizing the need for real-time and enterprise-wide communication. Oil companies, for example, often need to redistribute the flow of large amounts of petroleum products to meet varying consumer demands. They must find the most economical way to deliver their product or they lose money.

So, they have established wide area networks (WANs), including intranets and the Internet, linking the home office with remote plant locations. There, an intraplant system, or local area network (LAN), can alert an operator to make a process change via a local fieldbus computer.

Enterprise-wide nets needed

Enterprise integration is where industry is going. From field buses to plant operations LANs to the Internet—they are all tied together.

Today, the most important networking question to address is interoperability. Bus systems must be able to talk to each other and be based on standards developed so vendors will follow them. End users seek networks that any vendor can hop onto with their equipment. Instrument companies must strive for compatibility.

Additionally, the challenge of connecting systems together that have never been tied together is making plant managers and corporation presidents reluctant to move ahead. Companies must spend great amounts of time and money examining all the different network alternatives before they buy, checking out interoperability as well as reliability. They're worried, and justifiably so—well aware that one failure can cancel a thousand successes.

Plant managers need to recognize networking should go beyond the plant floor. Information from a field-bus network operating unit can be fed into laboratory or shipping department networks, or anywhere else the information is needed.

Supplier networks needed

Integrating the supply stream is another networking need. Supply functions are being farmed out to various integrators for several reasons, including downsizing and specialized expertise.

Because buying decisions are being made at increasing speeds, sales representatives must quickly learn from their own manufacturing area whether a product can be made and delivered by a certain date. With integrated networking, the sales rep can answer that question in the customer's office. Such capability is vital to win in business today.

But while the needs are clear, solutions are muddled. Measurement and control users and vendors need better education on networking interoperability and integration. Indeed, these are supercritical issues now and will remain so for the coming years.

ISA TECH/97 is a good vehicle for learning leading-edge networking technologies and issues. TECH/97 will encompass all types of network technologies, from field-bus users doing on-site measurement, to LANs for controlling plant operations, up to the ever-expanding WANs. TECH/97 attendees will see detailed demonstrations of working solutions.

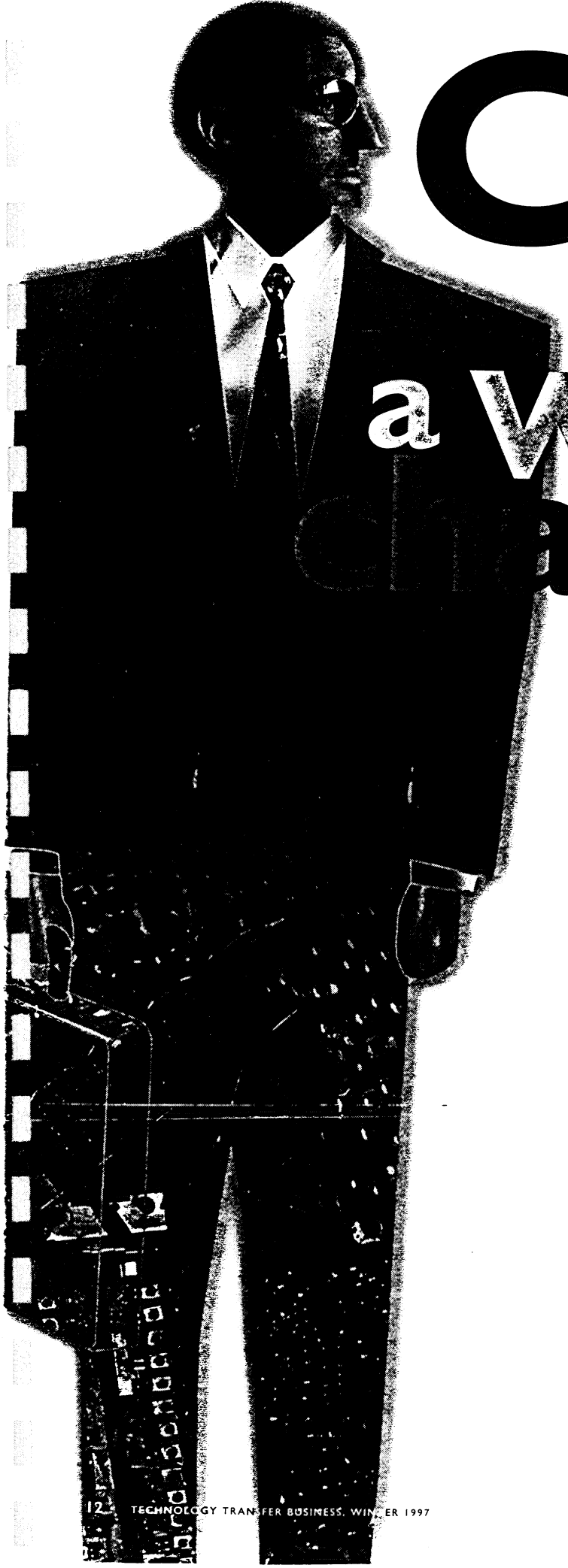
Highlights of the Networking, Industrial Communications, and Buses theme at ISA TECH/97 include developing international standards for fieldbus and sensor buses; optimal distribution of control and data between the field, control room, and office; and interoperability of devices on a plant-floor network and of applications running at different levels within and between enterprises. Additional issues include reliability, integrity, and security of high-speed networks in critical applications, embedded networking, and the Internet.

Editor's note

This monthly column is aimed at covering technology trends and issues in measurement and control technology that will be covered at ISA TECH/97, to be held October 7-9 in Anaheim, Calif. For more information, visit ISA TECH/EXPO OnLine at http://www.isa.org/techexpo/.

Behind the byline

John M. Bacon, committee chairman for the Networking, Industrial Communications, and Buses theme at ISA TECH/97, is a business development specialist for the Mid-Atlantic Technology Applications Center (MTAC), one of NASA's six regional technology transfer centers.



CTOs face a world of challenges

For thousands of companies today, corporate growth is technology-based and market-driven. The chief technology officer sits at the center of this dynamic and makes it happen.

By Paul Harris

"Anywhere we find the best technologies that fit our needs, we will go there and get them," says Gary W. Weber, vice president of science and technology at PPG Industries Inc., Pittsburgh. "We will partner with anybody, anywhere."

It's often that way today as companies broaden their horizons in the quest to remain technologically competitive. In-house R&D labs, if they've survived the downsizing wave, have been augmented by partnerships that can occur anywhere in the world. At the same time, however, they are typically narrowing their focus to technologies that fill precise market needs for established lines of business.

That mission has helped spawn a new class of corporate executive, one who enjoys a direct line of authority to the CEO and whose expertise extends well beyond R&D.

For Weber, the chief technology officer at $6.5 billion PPG, reporting directly to the president means greater ability to implement programs. It's a major change from the recent past, when the position was merely an advisory function to senior

From the
Federal Laboratory Consortium

Federal Laboratory Technologies to Enable the Disabled

"The disability access provisions in the Telecommunications Act of 1996 mark a high point in legislative advocacy for the disabled community....Universal design enhances the marketability of a new product or service..."

--Deborah Kaplan, National Summit on Disability Policy, 1996

And access to many new, more useful technologies or products that provide greater assistance and independence to the disabled community may be via the Federal Laboratory Consortium (FLC).

The FLC's participation in the 1996 International Paralympics Congress and Abilities Expo this summer in Atlanta marked their introduction to the disabled community and reaffirmed their intention to support the Disabilities Act of 1988. Individuals and companies alike at the Expo responded favorably to the technologies that the federal defense and civilian labs were exhibiting for the disabled community.

Vast Lab Resources

Expo participants were even more enthusiastic to learn of the *vast* technological resources within the federal lab network, the existing technologies that could be developed or adapted for specialized use--opportunities for even greater contributions to assist the disabled.

At the initial session on Assistive Technologies (AT) at the FLC Fall National Conference, AT officials explained the needs of the identified 49 million disabled people in the U.S. today. They told representatives from government labs, agencies and private companies that existing and emerging technologies in the federal labs may play a vital role in maximizing the independence of individuals with disabilities.

Greater AT Needs Ahead

More importantly, the statistics for the disabled and severely disabled will increase as the population ages. Therefore, the Federal laboratories could have a great impact in the development of assistive technologies, especially through the incorporation of a universal design that responds to the needs of both the abled and disabled communities.

As the Federal community downsizes and the labs seek new partnerships and collaborations from a broader base, the FLC is establishing important links with manufacturers and consumers of assistive technologies to facilitate the universal design approach for its member labs. Once the labs understand the technical requirements of the AT manufacturing community, there will be *great potential* in developing and transferring technologies, in a more timely and cost-effective manner.

Opportunities Abound

In the products/services industry for the disabled (estimated at $26.5 billion), the Federal lab expertise and technologies offer opportunities for:

- Developing new products to meet specialized requirements.
- Improving the performance of existing products.
- Expanding the functions of existing products.

The FLC locator service is developing a directory of federal labs in selected AT areas: mobility, education, accessibility, and visual and hearing impairment. The FLC has also established ties with the Department of Education's 16 AT research and engineering centers, state and local governments, and the broader FLC community, and is leveraging member lab resources through the Internet.

executives, he says.

The position of CTO, regardless of its specific title, has been a relatively fast evolution for many U.S. technology-based companies, believes William G. Howard, a Scottsdale, Ariz.-based management consultant who retired as senior vice president of R&D at Motorola Inc.

Less than 10 years ago, top managers in companies often didn't know what the technology officer did, or how to use their technology assets, says Howard. "But that picture is changing as companies manage technology more closely." CEOs are now involved in the make-versus-buy decisions in the technology area. They're participating in alliances, acquisitions and licensing arrangements. That activity is more in tune with what CEOs are comfortable doing — being in the marketplace making deals instead of managing an R&D or product development lab."

As companies reach more often to outside sources of technology, a shift has occurred in the way management regards the issue. New priorities are re-engineering, efficiency and return on capital.

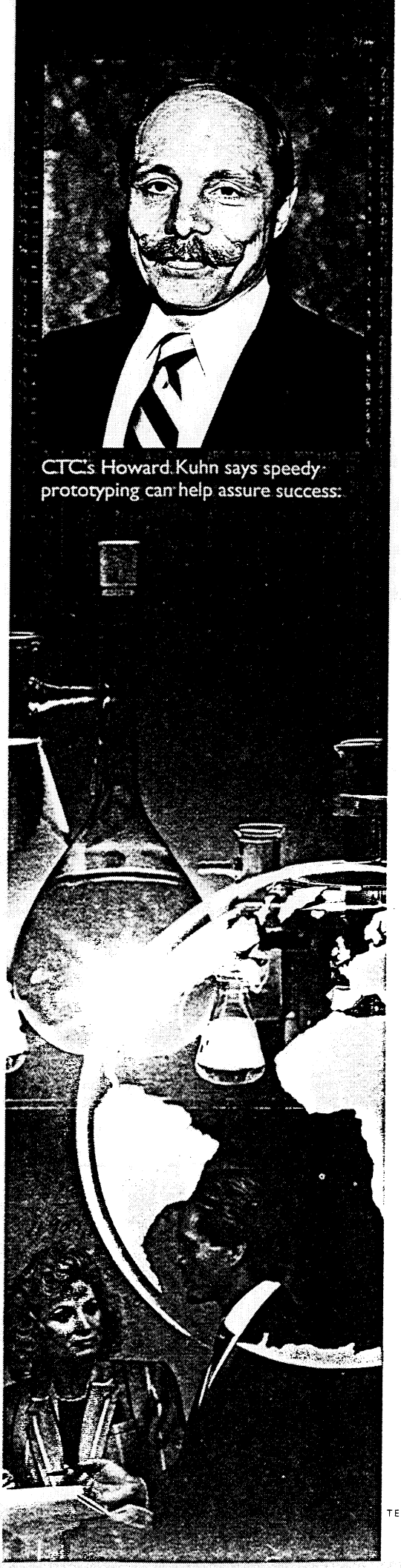
"By contrast, R&D is seen as a risky business — a long-term, hit-or-miss proposition," he says. "Companies can't afford to risk the chance that their product doesn't fit, or may not be pre-eminent in the market they're engaged in." Outsourcing reduces that risk, enabling companies to kick the tires.

And as R&D settles in as one part of a typical company's portfolio, the spotlight has turned to other techno-management questions. Among them: How to get the technology to the market in time, how to measure the effectiveness of innovations, and how to systematically weigh the technological opportunities that come one's way.

CTOs form a network

How are CTOs meeting these challenges?

For PPG's Gary Weber, these and other questions are grist for the CTO Network, a two-year-old organization of Western Pennsylvania and Ohio executives who share common problems and create alliances. Formed by the Pittsburgh High Technology Council with financial help from a local law firm, it enjoys the support of NASA's Mid-Atlantic Technology Applications Center.



CTC's Howard Kuhn says speedy prototyping can help assure success.

A frequent discussion at the peer group's bimonthly meetings is a problem that bedevils every CTO — the chronic incompatibility between business and technological objectives. "We're able to talk about these issues, which is refreshing for members who often have no one in their own companies to turn to," says Howard Kuhn, vice president and CTO of Concurrent Technologies Corp., a Johnstown, Pa.-based nonprofit organization that helps companies solve technical problems.

Another key concern for CTOs is technology validation, notes Kuhn. The solution is often found in how a product, component or process is prototyped, he says. Essentially, says Howard, there are five levels of prototyping. Most common is "legacy" or experience prototyping, which develops a solution based on an already proven concept. Another is the demonstration factory, in which a technology is demonstrated at full scale. Common in product development, the method is "as close to reality as you can get," he says.

Three other types of prototyping are physical modeling, mathematical modeling and virtual reality. The three move progressively away from reality but toward a more rapid response, says Kuhn. He contends that "quick response is the separating factor between success and failure." Common in the space program, for example, such prototyping amounts to "technology validation in a virtual mode," says Kuhn.

A draining experience

Developing a strategy for acquiring technology is a universal problem for companies, but the biggest headache of all is that tech transfer is such an "activity intensive business," says Randolph J. Guschl, director of corporate technology transfer for DuPont.

"The number of activities that lead to accomplishment is quite low. You can be consumed by trying to find a technology or somebody who may buy it, or determining if a technology coming at you is pertinent to your core competencies. An organization can be drained trying to follow up on leads that are not high priorities."

DuPont addresses the problem by establishing a core group within Guschl's office with a collective knowledge of the company's expertise.

It screens out unsuitable technologies and passes good ideas onto other panels within specific business units, he says.

When a suggested technology does strike a responsive chord, Guschl's group establishes a dialogue between the organization and the appropriate business unit and then "lets it happen."

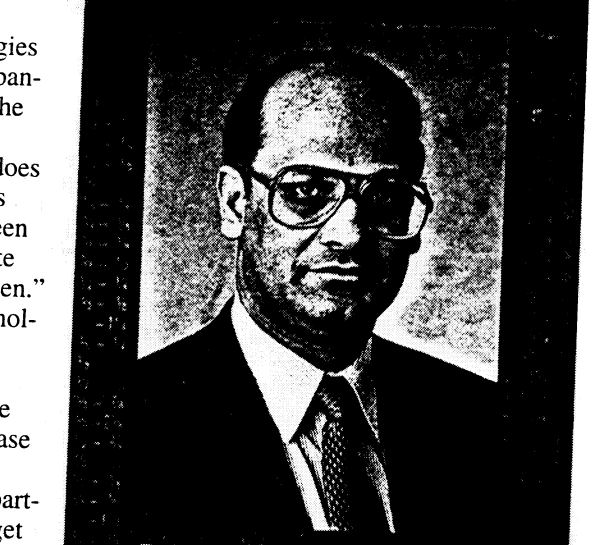
Gabe Tincher, science and technology planning leader at Owens-Corning, Granville, Ohio, says his company has generally followed the corporate acquisition route to increase its arsenal of technologies. But he agrees that its future rests more in partnerships. Its $80 million R&D budget (2% of sales) is focused on supporting established businesses, increasing productivity and "keeping our businesses vital."

Priorities include agile manufacturing and speedy implementation of technologies that fit the company's markets. A classic example is the introduction of Miraflex® Fiber, an internally developed insulation material that went from drawing board to full production in record time.

One reason for that leap is Bob Lonegran, Owens Corning's vice president of science and technology. Lonegran, CTO and head of a 1,000-person global engineering, science and technology organization, has an MBA — not an engineering degree. He is a member of the company's leadership group and reports directly to the CEO. He ensures that S&T is focused on supporting growth of core businesses, not in "pie-in-the-sky" research, says Tincher.

PPG Industries' Weber says his company's biggest dilemma is how to continuously validate its investment in technologies. One useful metric is the "percent of new products" formula — the percent of sales achieved from products five years old or less. "When you communicate this to the board and other audiences, it covers all areas," he says.

PPG relies on partnering with university and government laboratories to remain technologically competitive. Its studies in resins and coatings include research agreements with Oak Ridge, Sandia and Los Alamos while an exchange agreement swaps a PPG researcher with one from Los Alamos for a year. Similarly, interns from MIT are in residence for a semester. Overseas, the company has partnerships with laboratories in the Netherlands, Russia, the Ukraine and other countries. "We operate a virtual technology network," he says.



Deb Chatterji: "Technology is not just created by people who conduct R&D."

Strategy and Teamwork

Deb Chatterji, managing director of technology for the BOC Group, a $6 billion British multinational, believes that successful companies classify technology as the end product and R&D a set of processes, inputs or activities that help produce it. "It all takes marketing, manufacturing and engineering in a teamwork fashion to develop it successfully."

At BOC, a producer of gases, medical devices, pharmaceuticals and other products, cross functional teamwork is paramount. "I no longer think in terms of 1,000 individuals in my organization who must be motivated individually," says Chatterji. "It's how to create 50 teams of 20 or fewer members each, all working with their counterparts in marketing, manufacturing and engineering." The role of the individual inventor is less critical than it was 15 years ago, he says.

'People don't realize that sourcing of technologies is as much a business process as conducting internal R&D.'

Chatterji contends that business in general is not good at scouting the globe for new technologies. Why? "Much of the search-and-find activity is not driven in a strategic sense," he believes. "People don't plan carefully, organize, and get the right stakeholders in the company to take ownership. It's an ad hoc thing; and as a result, it founders."

Typically, he says, companies randomly target a new technology outside their fence. If it fails, they simply stop. "People don't realize that sourcing of technologies is as much a business process as conducting internal R&D," Chatterji believes. Being systematic means going after new companies, universities and others with a game plan geared to specific goals such as new products, new technologies or new capabilities. This, he says, raises a widely misunderstood issue — the dif-

ference between "sourcing" and "outsourcing." Chatterji says

The distinction isn't one of semantics, he insists.

"Outsourcing is a threatening word for many people today. It implies that contributions they make to an organization could be procured someplace else. But in the case of technology development, that's not how it works."

Companies regularly outsource routine types of activities beyond their core expertise. "But if you want to grow

PPG's Gary Weber: Partnerships are paramount.

the business and have new products in your arsenal, to think that you can outsource product development and be successful is an illusion," he says. Instead, companies are "sourcing" new knowledge from the outside that complements their internal activities.

Outsourcing may make a company leaner, but it will not make it stronger and more successful than a competitor, Chatterji argues. By contrast, the business of sourcing new technologies involves finding and evaluating them, negotiating the right deal, bringing them in-house and making it all work. It should be viewed as a complement to corporate R&D in a balanced approach to driving corporate strategy.

Proper strategy is needed

So what is the long-term impact of corporate America's fixation with market-driven research? CTOs worry about that too. Even at everyone's role model, Bell Labs, a change in culture has produced an "ivory basement" mentality in which scientists are free to follow their instincts but are told to monitor AT&T's strategic issues and see their projects through to development.

"Many people assume that basic technologies will always be available and that they can simply acquire and use them," says Jude E. Franklin, CTO of PRC Inc., an information services firm in McLean, Va. "In our case, we invested years ago in technologies that appear to our customers as commonplace, such as secure Internets and intranets."

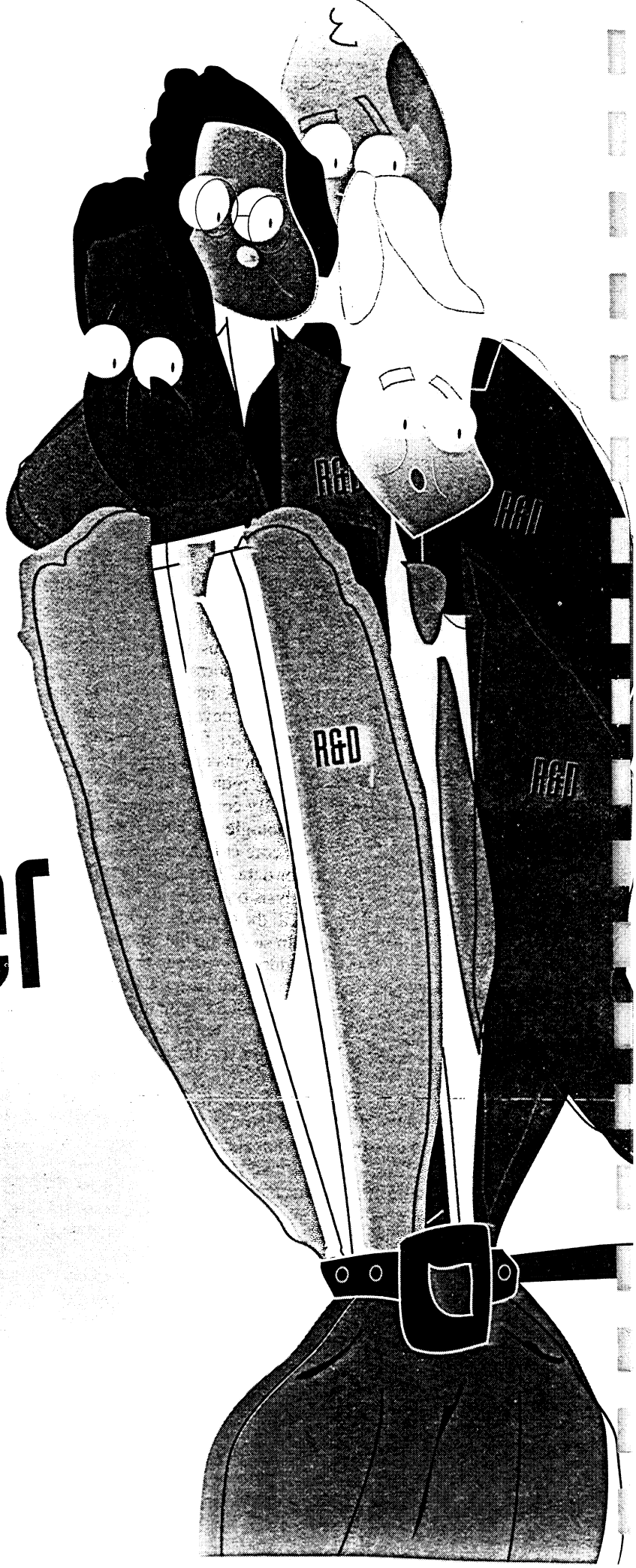
PRC, recently purchased by Litton Industries, is planning for tomorrow according to a strategic technology blueprint. PRC developed the plan by predicting future customer requirements and the technologies required to meet them. By comparing those technologies with the company's core competencies and other data, it produced a self-analysis on how it could best fulfill those needs.

In so doing, the company produced a strategy to prioritize the technology business plan needed to go after these customers, both government and industry. It focuses on a three-to five-year time frame, says Franklin.

Such a strategy is essential for advanced technology companies, he figures. "If you manage a company by stressing processes and core competencies, you get an entirely different view than if you manage according to products and product lines. You get far more innovation, and wind up in areas where you wouldn't naturally have evolved into."

In the rapidly changing world of advanced technologies, says Franklin, that's the only way to stay ahead. ■

Could leaner budgets mean healthier federal labs?



VOLUME 2 • 1ST QTR. 1997

Hot News *from the* Fire Fighting Task Force

The Fire Fighting Task Force thanks the Federal Laboratory Consortium, Mid-Atlantic Region, for $20,000 in financial support for commercialization activities.

Presentations

Robert Saba, MTAC, spoke about the efforts of the FFTF at the Sixth Annual Pennsylvania Fire Services Institute Meeting at Camp Hill, PA, on November 18, 1996.

Lani Hummel and **Robert Saba,** MTAC, discussed technologies applicable to firefighter safety at a NIOSH meeting in Pittsburgh on November 26. A White Paper was presented by NIOSH outlining a prossible approach to monitoring/tracking firefighters by means of electromagnetic wave transmission.

Lani Hummel and **Robert Saba,** MTAC, **Chief Charlie Dickinson** and **Battalion Chief Arthur George,** Pittsburgh Bureau of Fire, attended the Department of Corrections and Firefighters Technology Transfer Workshop at Wright Patterson Air Force Base, OH, on December 19, 1996.

Challenging the limits of technology

On December 19, 1996, 31 people from as far away as Florida and Connecticut gathered at Wright Patterson Air Force Base to discuss new technologies. FFTF representatives were there because some of these technologies could be modified and applied toward improving firefighter safety.

After attending the meeting, Chief Charlie Dickinson of the City of Pittsburgh Bureau of Fire (PBF) said, "We here in Pittsburgh are more encouraged than ever after this meeting that the answers to most of our equipment improvement goals are out there in newly developed technology."

Battalion Chief Arthur George of the PBF added, "Fire suppression activity has been driven by the technology that exists at a particular time in history. Using available technology, product manufacturers could develop or modify products for use in fire suppression activity. While available technology enabled certain activity, it also served as a limit to what was possible. The formal presentation and informal discussion at Wright Patterson challenged this view. Instead of accepting the limits of available technology, the fire service is being challenged to define what it needs to carry out its mission."

By defining its needs clearly, industry and government can begin to apply existing technology in novel ways or even develop completely new technologies.

Lt. Col. Larry Kosiba hosted the meeting. Technologies discussed were the Passive Millimeter Wave Camera, the Diver Alert and Tracking System, the Personnel Locator, the Forehead Mounted Microphone, Installation Security Testing Capabilities, Windshield Transparencies, Smart Firefighter's Coat, Smart Earplug, Acoustic Perimeter Surveillance, and Telephone Monitoring Technologies.

Vision enhancement tools valuable for law enforcement

Chief Charlie Dickinson, Pittsburgh Bureau of Fire, told Pittsburgh Police Chief Robert McNeilly about FFTF's efforts to reduce the size of equipment that uses currently available infra-red technology while also reducing the cost. Chief McNeilly expressed his belief that this technology is applicable to police work as well. While firefighters would use the technology to detect the heat of a fire or body heat of a trapped victim, police could employ the technology to locate suspects attempting to hide in buildings or obscured areas. Chief McNeilly is anxious to see the developments of this project.

Technologies reviewed

COMMUNICATIONS

There may be a significant breakthrough in improved communications intelligibility by piggy-backing the standard hand-held radios used by the majority of firefighters and law enforcement officials with speech enhancement techniques developed for assistive technology (disabled and speech impaired.) Initial demonstration of the "black box" device by the speech enhancement company at the Pittsburgh Bureau of Fire (PBF) produced dramatic results in improved communications intelligibility at very high noise levels (about 105 dB). It could also have application in permanent vehicular installations. Arrangements are being made for a similar demonstration at the St. Louis Fire Department in February.

MONITORING/TRACKING

The need for a monitoring/tracking system that would continually monitor the location and movement of firefighters in a building fire continues to be a priority item for the FFTF. In the 9 months since the team got together, three approaches have been submitted for consideration: UHF Radio Transmission (Jet Propulsion Laboratory, NASA); Infrasound Low Frequency Detection Transmission (Los Alamos National Laboratory, DOE); and Electromagnetic Wave Transmission (National Institute for Occupational Safety and Health). NASA Langley Research Center, MTAC and the PBF are curently evaluating each approach as to its technical feasibility and maturity with the goal of obtaining funding assistance for continued research and development.

ENHANCED VISIBILITY

Cost continues to be the largest inhibitant to providing enhanced visibility technology to the fire service. However, ongoing discussions between JPL and a manufacturer regarding the possibility of collaboration to develop an inexpensive hand-held device are encouraging.

A leading defense contactor has also been working with JPL for some time and is interested in developing an inexpensive (less than $10,000) helmet-mounted, lightweight device. Areas have been identified that warrant investigation for reducing cost and improving performance.

Additionally, Cmdr. John Farley of NRL has been keeping the Task Force apprised of new developments with Argus/EEV.

MTAC's strategy regarding enhanced visibility is to offer assistance to companies involved in the design and manufacture of infrared imaging systems by matching them with federal laboratories. MTAC will continue to offer its services to companies to bring about an improvement in this technology and speed up the process of developing an affordable product.

Robert Saba, MTAC, adds, "There are a lot of very good, exciting ideas out there. One of the major problems we are facing is funding of R&D required to develop prototypes to be tested by the FFTF. Everyone wants to know where the money is coming from. There is no doubt in my mind that one of our primary efforts in 1997 should be working together to identify the best sources of available funding and develop a strategy to pursue those sources. With nine major Fire Bureaus as part of our Task Force, we have a high level of credibility as nationwide experts working to improve firefighter safety."

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Marshall signs agreement with Chicago

Marshall Space Flight Center (MSFC) recently finalized an agreement with the Chicago Fire Department to provide a framework for evaluating enhancement technologies for the emergency services industry, with an emphasis on the fire service. As part of this effort, MSFC established the Fire and other Emergency Service Working Group (FESWG) made up of representatives from each of the NASA field centers. Cheryl Allen is the Langley Research Center represenative, and will provide periodic updates to the FFTF. It is anticipated that this expanded collaboration will benefit the fire service as a whole.

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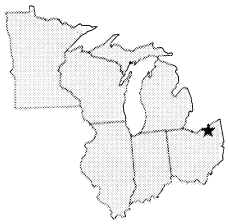
That new industries have been built on NASA-developed technology that made space exploration possible, including personal computers, advanced medical equipment, communications satellites, weather forecasting and natural resource mapping.

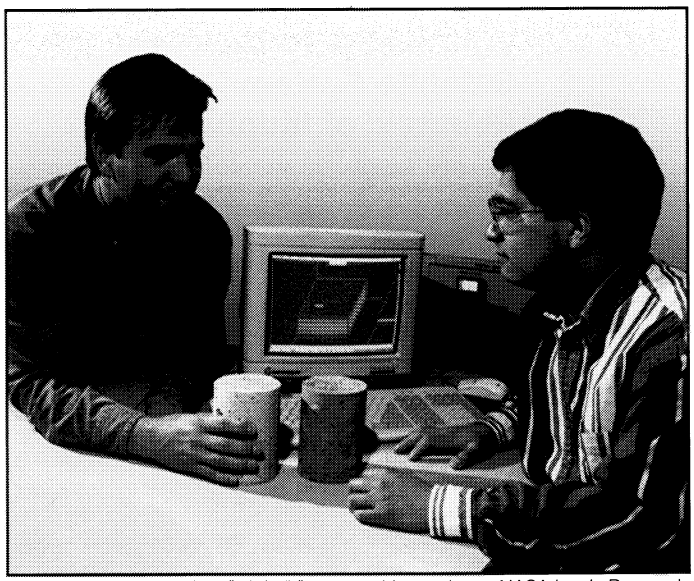
The RTTC's can provide access to new and innovative technologies to develop new industries and markets.



NASA Modeling Code is Helping Ohio Company

The Midwest RTTC helps Ohio company reach a Space Act Agreement with NASA to develop software solution to model concrete microstructures and predict mechanical performance under structural loads.

Through the efforts of the Great Lakes Industrial Technology Center (GLITeC), the Midwest RTTC, the NASA Lewis Research Center is helping Master Builders model concrete microstructures and predict mechanical performance under structural loads using NASA-developed software. Master Builders develops and markets specialty chemicals for the construction industry, and enlisted GLITeC's help to identify software to model the mechanical behavior of experimental concrete/additive mixtures and optimize properties for use in structural applications.



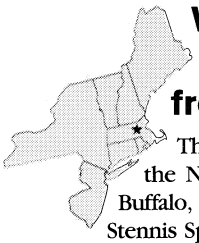
Dale Hopkins, Acting Chief of Structural Mechanics at NASA Lewis Research Center and Steve Tysl, of Master Builders review the ICAN software.

GLITeC located the Integrated Composite Analyzer (ICAN) software, developed at NASA Lewis, that Master Builders and Lewis determined could be adapted to solve the companyís software needs. Once a two-phase work plan was developed, Lewis began modifying the code through an umbrella reimbursable Space Act Agreement GLITeC had in place with Lewis.

"Physical testing of concrete, mortar, and polymer coatings is a labor intensive and messy job," says Steve Tysl, a civil engineer in Master Builders' Engineering Support Laboratory. "Computer modeling allows us to investigate literally hundreds of various mix proportions on a desk-top computer in a single day. The alternative is to actually mix small batches in the lab. This usually takes a crew of five technicians and at best they can do 15 to 20 mixes a day."

The modified software represents a true partnership between the company and NASA Lewis, and both parties benefit from the cooperative program. Master Builders will have exclusive use of the modified software for a limited period and NASA Lewis will be able to use the software for its own jet engine design work. "So far, we are very pleased with the predictive capabilities of the modified ICAN software," Tysl adds. "I think the final version will be a very powerful tool."

Congressional Representatives: Senators John Glenn and Mike DeWine, Representative: Louis Stokes
Federal Laboratory Resource: NASA Lewis Research Center
RTTC Contributor(s): Priscilla Diem & Dan DeMiglio



Western NY Firm Licenses Fire Detection Technology from NASA

The Center for Technology Commercialization (CTC), the Northeast RTTC, has assisted Safety SCAN, L.L.C. of Buffalo, NY to reach a Space Act Agreement with NASA's Stennis Space Center to jointly develop for commercial markets a device to detect invisible flames of hydrogen or alcohol, as well as visually obscured hydrocarbon flames, and hot spots. At the same time, the Company has received an exclusive license for manufacturing and marketing the this device, that will be sold under the name FIRESCAPE™.

The Company already markets a number of products designed to aid fire fighters, for example, the FireSCAN™ monitor designed to keep the fireman informed of the air pressure in his breathing apparatus and the ambient temperature, and will generate a warning sound when dangerous levels are reached. FIRESCAPE will complement the product line.

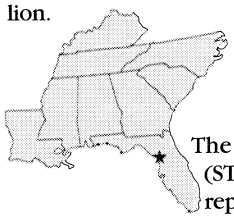
FIRESCAPE is a near infrared Imager that is expected to cost much less than currently available imaging devices. It is especially important because of the danger that invisible flames present to fire fighting personnel. The Imager is portable, and, when designed for commercial use, is expected to be light-weight and rugged.

Communications Firm Works With NASA To Develop Satellite System For the Republic of Indonesia

NASA's Jet Propulsion Laboratory (JPL) provided expertise that assisted CTA Inc., a Maryland Company to develop a communications satellite system for The Republic of Indonesia. CTA contacted the Far West Regional Technology Transfer Center (Far West RTTC) for assistance under its JPL Technology Affiliate's Program. This program allows companies to submit a statement-of-work to the Far West RTTC for assistance in any of the broad capability areas available within JPL.

CTA designs and manufactures satellites, software and hardware for ground and space-based systems. Originally focused on defense work, CTA has broadened its markets into commercial space applications including the newly developed INDOSTAR system. INDOSTAR will be the world's first lightsat (lightweight satellite) for direct broadcast to a single country and will provide television receive-only and digital television receive-only services for Indonesia. The company's previous experience had been with LEO-type satellites employing relatively low power transmitters. INDOSTAR is a geosynchronous communications satellite that represented new challenges for CTA in the areas of potential electromagnetic interference (EMI) and electrostatic discharge (ESD).

JPL was able to respond to CTA's request with only three days lead time and provided the company with recommendations regarding design and implementation for INDOSTAR, and identified potential risk areas and guidance in avoiding those risks. INDOSTAR created approximately 30 new jobs in CTA's Space Systems Division and their export capabilities improved the United States trade deficit by almost $50 million.



Florida Company Develops Dual-Use Technology

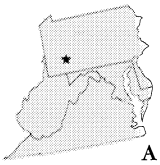
The Southern Technology Applications Center (STAC), the Southeast RTTC, has helped ALST repackage their military laser rangefinder technology into a family of commercial, low cost products. Laser rangefinders are used in military fire control systems to aid in the accurate targeting of direct fire weapons, such as anti-tank guns, recoilless rifles, heavy machine guns, and mortars. They are also used for intelligence gathering missions. Potential commercial applications for this technology include surveying, forestry service, sporting, meteorology among others.

Original ALST laser rangefinders were packaged as "black boxes" to accommodate the various military packaging requirements described above. Thanks to the design assistance which STAC helped them obtain, the new commercial package will be much more user friendly and ergonomically sound for use in commercial applications.The handheld, eyesafe laser rangefinder product now designated the ALST EAGLE has generated strong interest by U.S. and foreign companies alike, and, according to company Vice President Dennis Bellar,"ALST is excited about the potential for this new product and are very grateful for the assistance provided by STAC."

Colorado Firm Licenses Sensor from NASA Langley Research Center

MERCO Inc., a Colorado air quality consulting firm licensed a non-mechanical gas sensor from NASA Langley Research Center (LaRC) with assistance from the Mid-Continent Technology Transfer Center (MCTTC), the Mid-Continent RTTC. The sensor, originally developed for measuring gases in the Earthís atmosphere from aircraft and spacecraft, will monitor gaseous pollutants discharged from petroleum refineries and chemical manufacturing plants. The device, named the Gas Filter Correlation Radiometer (GFCR), has advantages over conventional gas sensors, including capabilities for remote sensing and area source monitoring, higher reliability, faster response, single-gas measurement and a more compact design. The GFCR is more accurate and requires less maintenance than other sensors and requires little calibration and blocks interference such as humidity and temperature.

The MCTTC identified the potential that GFCR offered at Technology 2004 and provided the expertise to facilitate the license agreement between MERCO and LaRC. The MCTTC also worked to help MERCO convince NASA that it could successfully commercialize GFCR technology. The license was signed at a White House Conference on Environmental Technology in Colorado, after which MERCO enlisted the University of Colorado at Denver to build and test a product prototype. MERCO plans to start selling the sensor in about a year.



Pennsylvania Company Accesses Federal Laboratory System To Test New Materials

A Pennsylvania manufacturer of precision-coated abrasives for polishing and lapping of memory disks, heads, fiber optics, and optical lenses needed assistance to test new chemical mechanical planarization (CMP) materials that had the potential to increase the wafer yields of semiconductor manufacturers. Unable to commit to the significant capital investment to properly evaluate the product, the company contacted MTAC, the Mid-Atlantic RTTC for assistance. MTAC connected the company with the Ben Franklin Technology Center of Southeastern Pennsylvania to explore test opportunities and capabilities at federal laboratories.

The company had developed innovative molecular science technology which was incorporated into new precision CMP slurries. The project was submitted for funding through a small business assistance program, which will provide the company with access to test equipment in Class 1 clean room facilities for the CMP product evaluation and analysis. Using federal lab facilities for testing will allow the company to introduce new CMP consumable products with superior operating characteristics, including extreme selectivity and precision polishing, while allowing the company to save the $1.2 million investment that would have been required to test the new materials in-house.

Financial Management Report
January 1997

	Current Month	Quarter to Date	Total to Date
Labor:			
Salaries - Professional	26,392.12	26,392.12	26,392.12
Salaries - Clerical	3,096.64	3,096.64	3,096.64
Salaries - Student	132.00	132.00	132.00
Fringe Benefits	10,527.48	10,527.48	10,527.48
Tuition Remission	0.00	0.00	0.00
Total Labor Costs	40,148.24	40,148.24	40,148.24
Support Costs:			
Supplies	594.77	594.77	594.77
Equipment Rental	693.45	693.45	693.45
Equipment Maintenance	0.00	0.00	0.00
Travel	447.99	447.99	447.99
Subcontracts	0.00	0.00	0.00
Consulting	0.00	0.00	0.00
Telephone	0.00	0.00	0.00
Postage	41.73	41.73	41.73
Printing	0.00	0.00	0.00
Other	135.00	135.00	135.00
Total Support Costs	1,912.94	1,912.94	1,912.94
Total Direct Costs	42,061.18	42,061.18	42,061.18
Indirect Costs	0.00	0.00	0.00
TOTAL COSTS	42,061.18	42,061.18	42,061.18
Client Income	0.00	0.00	0.00

Financial Management Report
February 1997

	Current Month	Quarter to Date	Total to Date
Labor:			
Salaries - Professional	22,280.19	48,672.31	48,672.31
Salaries - Clerical	3,096.64	6,193.28	6,193.28
Salaries - Student	420.00	552.00	552.00
Fringe Benefits	9,073.37	19,600.85	19,600.85
Tuition Remission	0.00	0.00	0.00
Total Labor Costs	34,870.20	75,018.44	75,018.44
Support Costs:			
Supplies	5,689.58	6,284.35	6,284.35
Equipment Rental	746.56	1,440.01	1,440.01
Equipment Maintenance	0.00	0.00	0.00
Travel	3,514.62	3,962.61	3,962.61
Subcontracts	0.00	0.00	0.00
Consulting	0.00	0.00	0.00
Telephone	1,828.68	1,828.68	1,828.68
Postage	172.80	214.53	214.53
Printing	656.93	656.93	656.93
Other	1,850.00	1,985.00	1,985.00
Total Support Costs	14,459.17	16,372.11	16,372.11
Total Direct Costs	49,329.37	91,390.55	91,390.55
Indirect Costs	0.00	0.00	0.00
TOTAL COSTS	49,329.37	91,390.55	91,390.55
Client Income	34,987.50	34,987.50	34,987.50

Financial Management Report
March 1997

	Current Month	Quarter to Date	Total to Date
Labor:			
Salaries - Professional	23,838.12	72,510.43	72,510.43
Salaries - Clerical	3,096.64	9,289.92	9,289.92
Salaries - Student	738.00	1,290.00	1,290.00
Fringe Benefits	9,654.58	29,255.43	29,255.43
Tuition Remission	0.00	0.00	0.00
Total Labor Costs	37,327.34	112,345.78	112,345.78
Support Costs:			
Supplies	(2,258.89)	4,025.46	4,025.46
Equipment Rental	696.32	2,136.33	2,136.33
Equipment Maintenance	840.00	840.00	840.00
Travel	8,770.24	12,732.85	12,732.85
Subcontracts	0.00	0.00	0.00
Consulting	0.00	0.00	0.00
Telephone	2,377.82	4,206.50	4,206.50
Postage	232.52	447.05	447.05
Printing	669.47	1,326.40	1,326.40
Other	1,375.00	3,360.00	3,360.00
Total Support Costs	12,702.48	29,074.59	29,074.59
Total Direct Costs	50,029.82	141,420.37	141,420.37
Indirect Costs	0.00	0.00	0.00
TOTAL COSTS	50,029.82	141,420.37	141,420.37
Client Income	24,000.00	58,987.50	58,987.50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MID-ATLANTIC TECHNOLOGY
APPLICATIONS CENTER
SECOND QUARTER
April 1 - June 30

Second Quarter 1997
Outreach/Networking

April

Allegheny Teledyne meeting
NCTMT meeting
Congressional Fire Services Institute meeting
Virginia Power meeting
Johns Hopkins CNDE meetings
MOD Forum Board meeting
Johnson & Johnson, Inc. meeting
Cairns, Inc. meeting
FLC Spring meeting
Pittsburgh High Technology Council Breakfast meeting
Hiram G. Andrews meeting
Morgan Matrox meeting
McCarthy/FEMA meeting
FFTF Conference
Congressman Murtha meeting
Goddard Space Flight Center meeting
ISPA/Baltimore meeting
Aristech Chemical Company meeting
MTI/NRL meeting
National Volunteer Fire Council meeting
NIOSH meeting
Mneumonics meeting
Air Products, Inc. meeting
Lear, Corporation meeting
Reading Technologies meeting
Information Technology Links meeting
Ergonomics: Program Development & Management Conference
Washington Chamber of Commerce Expo
Williamsburg Bioprocessing Foundation "Monoclonal Conference"
Elizabeth River Project "Business for a Cleaner River" Seminar
PPG Unicoat meeting
Mneumonics meeting
Ranbar meeting

May

NNEOMT meeting
Metro Fire Chief's Conference
Pittsburgh Bureau of Fire meeting
Johns Hopkins/Applied Physics Lab meeting
NIH meeting
AFT2E meeting
FLC Mid-Atlantic meeting
Kennemetal meeting
McAllister/PA Dept of Labor & Industry
Office of Congressman Weldon meeting
Pittsburgh High Technology Council Breakfast meeting
Virginia Power meeting
Fagan's Inc. meeting
OST Startron meeting
SAMPE Expo
JPL meeting
Hampton Roads Technology Alliance Breakfast Seminar
BioVenture Forum

June

ISA Presidents Summer meeting
Informix meeting
AMPemerce meeting
Pittsburgh Research Center tour
Johns Hopkins meeting
Rusmar, Inc. meeting
ARCO Chemical Company meeting
MOD Forum/SPIRC Board meeting
Ben Franklin Southeastern Pennsylvania meeting
Pittsburgh High Technology Council Breakfast meeting
Johnson & Johnson meeting
Ranbar meeting
NIOSH meeting
Allegheny City Fire Academy meeting
Westinghouse meeting
Respironics meeting
Enterprise reception
US Geological Survey

Second Quarter 1997 Information Retrieval Projects

Acetylene and Corrosion Inhibitors	Krautkramer Branson - Comapny Info.
Acutus Gladwin - Company Info.	Kurt J. Lesker Co. - Company Info.
Advanced Refractory Technologies - Company Info.	Laser Photonics Technology - Company Info.
Aladdin Project Info.	Law Enforcement Technologies
Allegheny Teledyne - Company Info.	Litchfield Precision - Company Info.
Applied Sciences Inc. - Company Info.	Lockheed Martin - Company Info.
Aquaculture	Magnesium Hydroxide, Aluminum Hydroxide Calcium Carbonate - New Applications
ATP Inc. - Company Info.	Marvalaud Inc. - Company Info.
Auto Launch Controller	McDonnell Douglas Aerospace - Company Info.
Becton Dickinson - Company Info.	Measauring Motor Shaft Clearance & Wobble
Bob Grimes, MTAC	Metals for Electric Motors
Breakaway Guy Wire for Utility Poles	Method & Apparatus for Non-Contact Monitoring of a Rotating Shaft
Breathing Apparatus	Microwave Imaging Radar
Brimrose Corp. - Company Info.	MRJ Inc. - Company Info.
Catalytic Hydrogenation	NASA Discovery Program
Chevron Research & Technology - Company Info.	NASA Hydrophobic Coating
Coatings for Electrical Insulation	NASA Optoelectronic Technologies
ColdFusion Software - Company Info.	NASA Sensors
Components, Inc.- Company Info.	Noesis Inc. - Company Info.
Concurrent Technologies Corp. - News Articles	Northern Initiatives
Congressional Fire Services Caucus	NSF & ARPA SBIR Contacts
Control System for Prosthetic Devices	Oil Pool Quick Rise Fire Test - Standards
Creatone, Inc. - Company Info.	Omniview - Company Info.
Crystallume, Implant Sciences Corp. - Company Info.	Omron Electronics - Company Info.
Cutting Fluids	Ozone Treatment for Cooling Towers
Cutting Tools	Patent No. 5520331 (Fire Fighting Technology)
Dead Sea Bromine Co., Ltd. - Company Info.	Personnel Tracking
Diamond Coatings	Philips CSS Inc. - Company Info.
DNA Analysis	Photosensitive Fabric
Drexelbrook Engineering - Company Info.	Physical Sciences Inc. - Company Info.
E.I. DuPont de Nemours - Company Info.	QM Technologies - Company Info.
Electroplating	Quartzdyne - Company Info.
Evidence Tracking	Quest Integrated - Company Info.
Exxon Research & Engineering - Company Info.	R&D Trends for Small Companies
Facial Recognition	Remaxco Technologies - Company Info.
Fiber Recognition	Russian Ground Effect Transports
Fire Protection Blanket	Saudi Arabian Oil - Company Info.
Flam & Russell - Company Info.	Savi Technologies - Company Info.
Flexible Circuits Inc. - Company Info.	SBIR Grants Given to Pennsylvania Companies
Food Sciences Technologies	SciTech Services - Company Info.
Frank Mfg. - Company Info.	Security Cameras
Fuel Savings and Emission Reduction Test Facilities	Serious Shareware - Company Info.
General Electric Co. - Company Info.	Sheldahl Inc. - Company Info.

Grace Industries - Company Info.	Shell Development - Company Info.
Gyroscopic Razor	Smoke & Obscurant Characteristics
Hardcore Composites Ltd. - Company Info.	Sonix - Company Info.
Health Care Organizations - Market Info.	Specialty Gases
Hess Inc. - Company Info.	Strataflex - Company Info.
High Performance Circular Polarization Microstrip Array Antenna	Tayco Eng. Inc.- Company Info.
Howmet Corp. - Company Info.	Three-Dimensional Roller Locking Sprag
Human Nutrition Technologies	Tin Sulfate - Annual Usage
Indoor Air Quality Devices	Toll Manufacturers
Industrial Quality Inc. - Company Info.	Trademark Searches
Info. on Curt Weldon, R-PA Congressman	Triangle Research & Development - Company Info.
Info. on DoD MANTECH Programs	Ultramet - Company Info.
Info. on Russian Technology for Pulverizing Concrete & Rock	Valley Manufacturing - Company Info.
International Executive Service Corp. - Company Info.	VHDL Simulators
Ion Selective Membrane Technology	Weapon Detection
Johnson & Johnson - Company Info.	Wear Resistant Coatings
KAPL Inc. - Company Info.	Westinghouse Electric Corp. - Company Info.
Karta Inc. - Company Info.	

Technology Transfer

Safety devices keep piping systems safe

Another in a continuing series of articles by the Mid-Atlantic Technology Applications Center (MTAC), one of NASA's six regional technology transfer centers.

Pittsburgh, Pa.—Three unique safety devices developed by NASA improve the safety of pressurized piping systems.

Actual valve leakage monitored

The NASA-patented valve malfunction detector, developed at Marshall Space Flight Center, uses check valves and a spring-loaded diaphragm to create and maintain a differential pressure across a small bypass when the valve is properly closed. This differential pressure is sensed by a pressure switch and relayed to a microprocessor. If the valve malfunctions or leaks, the spring has insufficient force to overcome the pressure in the main line and an alarm indicating leakage is activated.

The compact design is simple to use. Because it monitors actual leakage, not just valve position, operators and designers can have more confidence in valve performance. Even very small leaks can be detected, increasing safety margins. The technology is reliable and maintenance-free, improving operator efficiency. Best of all, the cost-effective design means an attractively priced end product.

The valve malfunction detector is ideal for piping systems where it is important to monitor valves for leakage. Wide application is expected in safety systems common in the chemical, food, metallurgical, and natural gas processing industries.

Hybrid valve suits large lines

Another Marshall Space Flight Center development is the NASA-patented hybrid butterfly valve. This valve has a combination rotating and translating closure disk that allows the full flow advantages of conventional butterfly valves along with the sealing capabilities of globe and needle valves. It has a stationary seat with a rotating shaft. The closure disk is attached to the shaft by a bracket and cam system, which allows both axial movement and full 90-degree rotation.

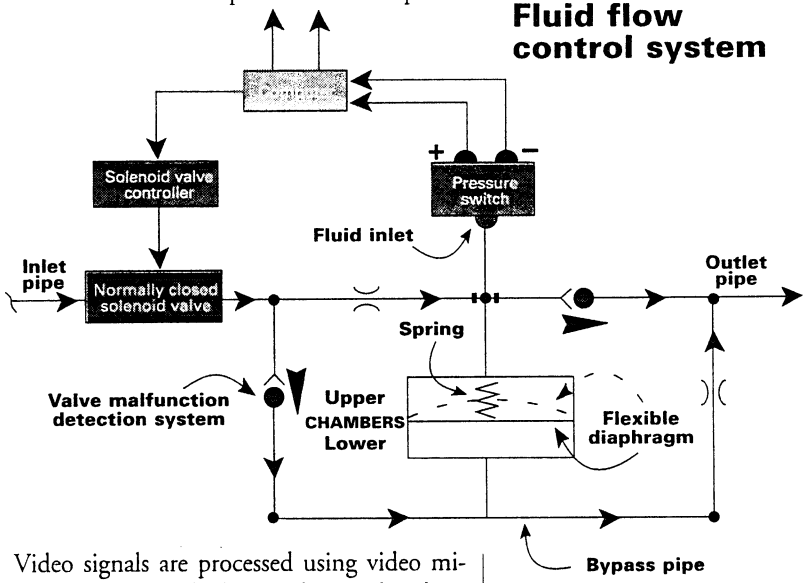
The compact and simple design provides for easy and cost-effective operation. The valve's superior sealing and control characteristics and low pressure drop use less power. It is durable and easy to maintain, improving operator efficiency.

The hybrid butterfly valve is ideal for relatively large lines where sealing and control requirements exceed conventional butterfly valve capabilities.

Surface integrity evaluated

The surface defect analyzer, developed by NASA Kennedy Space Center, provides an accurate, in-the-field method of evaluating flaws, defects, and damages on critical surfaces. Measurements are based on structured light microscopy. A line or shadow edge is projected obliquely onto a flaw and viewed from a point out of the plane.

Fluid flow control system



Video signals are processed using video micrometer software, which provides rapid and accurate measurement of the defect. When coupled with appropriate optics, the system can recognize defects as small as millionths of an inch.

The system offers real-time analysis as well as digitized defect images for future analysis. Its compact design (optical video head, monitor, and laptop) make it easy to transport.

The surface defect analyzer is an alternative to the mold impression/optical comparator or optical micrometry processes currently used. Its widest application is expected in commercial aviation maintenance, new equipment production markets, and the precision tooling industry.

The valve malfunction detector and the hybrid butterfly valve are available for licensing. The surface defect analyzer does not require a license. For more information, contact John Bacon, MTAC/ISA liaison, phone: 412/383-2530; e-mail: jbacon@mtac.pitt.edu; fax: 412/383-2595.

MTAC

Visit MTAC's home page on the World Wide Web to view the Instrumentation and Sensors section and check out other hot technologies: http://oracle.mtac.pitt.edu/WWW/MTAC.html.

Technology Transfer

High-tech fab lab offered for research

This article, from Glenn Unger, Office of Commercial Programs, Goddard Space Flight Center, is another in a continuing series of articles for ISA members by the Mid-Atlantic Technology Applications Center (MTAC), one of NASA's six regional technology transfer centers.

Pittsburgh, Pa.—The Detector Development Laboratory (DDL) at Goddard Space Flight Center in Greenbelt, Md., is a highly advanced semiconductor fabrication facility that meets all the latest federal and state safety codes and regulations. The DDL houses a 4,400-square-foot Class 10 cleanroom that includes a high-performance ion implanter, an advanced electron cyclotron resonance (ECR) system, a wide variety of process tools for semiconductor fabrication, and a highly skilled workforce.

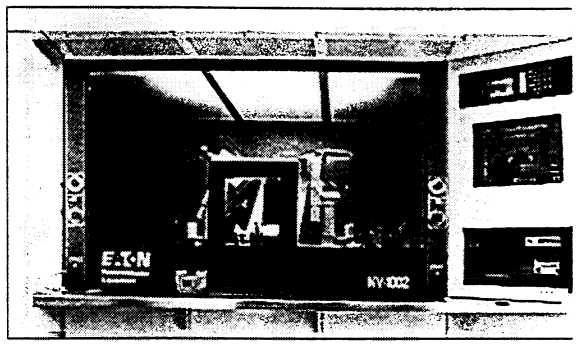
Through NASA's space exploration missions, scientific expertise and facilities have been developed that also benefit commercial industries through technology transfer. Like all NASA's research centers, Goddard Space Flight Center's technology commercialization goal is to meet clearly defined needs in industry or areas of national concern, such as health care, public service, and environmental protection. To meet these goals, NASA scientists and engineers cooperate with experts from companies, universities, industry associations, and national user groups, as well as state and other federal agencies.

While this often means licensing technologies, it also includes sharing expertise and equipment. Goddard is pursuing partnerships with companies that could benefit from the high-tech expertise and equipment found in the DDL. Goddard has made the facility available for contract research and development to outside enterprises.

The 24,000-square-foot, multilevel DDL building provides a high-quality work environment. The 4,400-square-foot Class 10 cleanroom is located on a vibration-isolated floor that is detached from the other levels. It is supported on its own foundation. The cleanroom is arranged into eight bays, each dedicated to a specific semiconductor fabrication or inspection process. A state-of-the-art sensing system, integrated into the alarm system, monitors toxic and pyrophoric gases 24 hours a day.

The DDL has a state-of-the-art Eaton NV-1002 ion implanter, a versatile tool for controlling electrical properties in semiconductor devices. It is a middle current/high voltage implanter with capabilities ranging from 10 KeV to 3 MeV. Ion doses between 10^{11} and 10^{16} ions/cm^2 can be implanted with a uniformity across the wafer and repeatability between wafers of 99.5%. The implanter is built around a linear accelerator and also contains double mass analysis to improve the selection of desired ions.

Main control for the system is provided by a Sun workstation. Inside the implanter, 10 computers control operations. The computers are linked by an Ethernet, which provides fast response for operational control. Robots load the wafers into the implanter in a Class 1 environment so the wafers are kept free of particulate. The ion implanter can handle wafers from 1 mm to 200 mm in diameter in batches of 25.



Ion implanter robotic arms

Dry etching or plasma etching is performed in the ECR system and a reactive ion etcher (RIE). These tools are used for anisotropic etching, which delivers precise etching results. Chemical vapor deposition is performed using the ECR system. The system deposits silicon dioxide and silicon nitride on a substrate with a temperature as low as 100 degrees centigrade. A rapid thermal annealing system and several atmospheric furnaces are available to perform thermal processing for oxidation and diffusion. Alloying furnaces are also available.

The DDL can perform wet etching of metals, dielectrics, and semiconductors, with emphasis on micromachining of silicon. Wet etching is performed in temperature-controlled, filtered, recirculating baths that maintain temperatures at ±5 degrees centigrade. The chemicals are filtered to 0.1 micron to remove etch and product residue. Chemicals used in the wet etching process include potassium hydroxide, sodium hydroxide, buffered hydrofluoric acid, hydrofluoric acid, and aluminum etch.

For more information on NASA Goddard's Detector Development Laboratory, contact John Bacon, MTAC/ISA liaison, phone: 412/383-2530; e-mail: jbacon@mtac.pitt.edu; fax: 412/383-2595.

Visit MTAC's home page on the World Wide Web to view the Instrumentation and Sensors section and check out other hot technologies: http://oracle.mtac.pitt.edu/WWW/MTAC.html.

Technology Transfer

Mini sensor adds new flexibility

Another in a continuing series of articles by the Mid-Atlantic Technology Applications Center (MTAC), one of NASA's six regional technology transfer centers.

Pittsburgh, Pa. —A NASA Ames research scientist has developed a method and apparatus that can sense temperatures on the surface of, or within, fabrics and flexible thermal insulations.

In the past, a bare thermocouple element was positioned within the fabric or insulation. This was ineffective because, in the flexible material, the element would not stay in position, making it impossible to measure the temperature at a known, fixed location. In addition, the unprotected thermocouple element would eventually be destroyed in an oxidizing atmosphere at temperatures greater than 2,700°F.

The new temperature-sensing device can be used in any environment to measure high temperatures at precise locations. It can measure temperatures between 100°F and 3,200°F in an oxidizing and aeroconductive environment without being damaged. It can also be installed in a known, fixed position and remain where it was placed.

A type R thermocouple wire element is housed in a ceramic sheath. The sheath has two sections held at right angles to each other. The thermocouple junction is located at one end of one section and the lead wires extend from the other section. The section that includes the thermocouple junction is secured to a flexible surface, such as fabric or insulation, with ceramic cement. The two thin lead wires relay real-time data to a minivoltmeter and, if desired, a data recorder. Software to instantly convert the detected voltage to an actual temperature reading is available.

The miniature temperature probe is 1 inch long and approximately the thickness of a mechanical pencil lead (0.03 inch). It measures temperatures at 3,000°F with an accuracy of 1%, as demonstrated by comparing actual measurements with computer analytical modeling. Those familiar with high-temperature measurement will find this probe easy to understand and operate; those unfamiliar with current temperature measurement techniques will require minimal training.

The probe can easily be installed in fabrics, insulation, and composites, as well as in thermoplastic, composite, or metal moldings, without changing their configuration or affecting their performance. It can also be mounted on the exterior of a material with a high-temperature-resistant ceramic adhesive or, for lower temperatures, a silicone adhesive. When mounted on the exterior, the probe can be removed and reused. It is also inexpensive enough to leave embedded in a material.

The temperature probe is inexpensive and easy to fabricate. Manufacturing could be automated with appropriate tooling. It can be used to:

- Test thermal insulation materials
- Sense temperatures within catalytic converters to optimize automobile emissions
- Monitor plastic curing temperatures
- Determine temperatures within cast metals
- Monitor inside firewalls and other structures subject to extreme temperatures
- Measure temperatures in any high-temperature environment where measurement at precise fixed locations is desired.

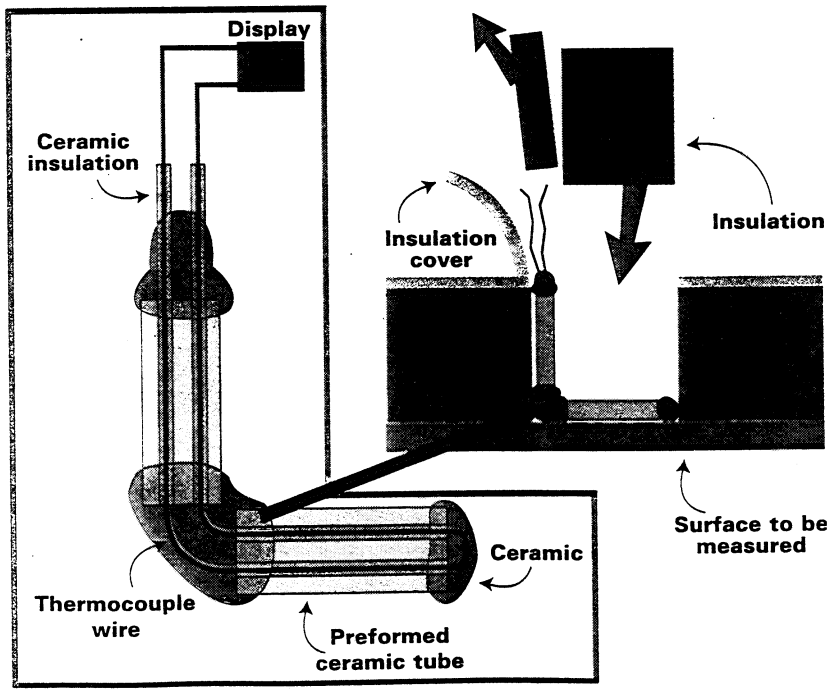
The miniature temperature probe is described in U.S. Patent #5,399,019, issued on March 21, 1995, as assigned to NASA. Licensing opportunities are available.

For more information, contact John Bacon, ISA/MTAC liaison at jbacon@mtac.pitt.edu; 412/383-2530; or fax: 412/383-2595.

This and previous articles can be found at *InTech*'s home page: http://www.isa.org/journals/intech/nfnasa.html.

MTAC

Visit MTAC's home page on the World Wide Web to view the Instrumentation and Sensors section and check out other hot technologies: http://oracle.mtac.pitt.edu/WWW/MTAC.html.



Spring 1997

MTI COMMUNICATIONS

MATERIALS TECHNOLOGY INSTITUTE OF THE CHEMICAL PROCESS INDUSTRIES, INC.

1215 Fern Ridge Parkway • Suite 116 • St. Louis, MO 63141-4405 • Telephone: 314/576-7712 • Fax: 314/576-6078

Spotlight on St. Louis

Our St. Louis office is a constant BUZZZ! of activity year round. With 3 meetings a year (TAC, BOD, Annual Meeting) there is continual preparation, including everything from getting head counts for meals and name tags to preparing agendas, financial reports and minutes.

The office staff helps coordinate two newsletters which are distributed in the spring and fall. The office gathers articles, proofreads stories and distributes to some 800 recipients, worldwide.

Publishing the Annual Report requires updating member company information, proofing content and determining the design and layout, and distribution.

Not only do these major activities keep things hopping, but there is the ongoing project work which includes corresponding with contractors and resource group members, keeping mailing lists up-to-date, scheduling conference calls, and distributing minutes and final draft reports.

Office personnel take care of the ongoing changes that constantly take place within the membership by maintaining and updating records in the Personnel and Projects Handbook and the Home Page web site. The BOD Policy Manual is also revised yearly. In addition, they must fulfill the new member needs and send correspondence to potential members.

The office professionals take care of many tasks and duties backstage but, without their dedication and commitment, MTI would not be the first class operation that it is.

Leveraging Assets

In a new direction, MTI is interested in supporting projects that are leveraged/participated through group or partner sponsorship in contrast to MTI exclusive projects. The reason for doing this is for MTI to be able to support technology programs requiring large cost and long times to develop and complete.

In many of the technologies that are of interest to MTI members, developments are occurring in many of the government and university laboratories supported by federal dollars. In an attempt to discover what technologies are being developed in these places, MTI has entered into an agreement with NASA's Mid-Atlantic Technology Application Center (MTAC). The mission of MTAC is to help U. S. companies improve their competitiveness by assisting them in the location, assessment, acquisition and utilization of

...continued on page 3

MTI On the Internet

TECHNICAL FORUM A POPULAR ADDITION TO WEB SITE

In late 1996, MTI established a web site [www.mti-link.org] on the Internet. The web site has both a public area and a members only area. So far a total of 90 people from 30 member companies have accessed the member area.

Around mid-January, a new feature the MTI Technical Forum, appeared on the MTI web site, in the members area.

As of April 22, 1997 a total of 19 discussion items have been posted, with a number of useful responses. A total of 17 people from 12 member companies have participated.

This on-line discussion group will become a very quick and effective method of exchanging information. All representatives of member companies are encouraged to participate. The more active the forum, the more useful and interesting the results will be.

In This Issue

Materials Technology Institute of the Chemical Process Industries, Inc. (MTI) is a unique, cooperative research and development organization representing private industry Its objective is to conduct generic, non-proprietary studies of a practical nature on the selection, design, fabrication, testing, inspection, and performance of materials and equipment used in the process industries.

Project Highlights

continued from page 2

over other inspection methods. However, AE is a global technique that cannot pin point defect location or determine damage type, orientation or size. For local inspection, ultrasonic and radiographic techniques have been used with limited success on polymeric equipment.

An NDE method identified by TRI offering great potential for local inspection of composites and monothilic polymeric vessels is microwave technology. The MTI Advisory Group is developing plans for MTI to support programs to accelerate the availability of microwave hardware and technique for inspecting polymeric materials. To assist in developing a path forward for MTI, the Advisory Groups will sponsor a Microwave Technology seminar to hear from a commercial provider, a commercial research developer and long range research and development at university/government laboratories.

Leveraging Assets

continued from page 1

technologies that reside in NASA and other federally supported laboratories.

Through the use of Problem Statements created by MTI Resource Groups and staff, MTAC will search its domain to identify laboratories and personnel who may have developments pertinent to solving the problems. One such problem statement dealing with the NDE evaluation of tank bottoms has led MTI to an upcoming meeting at the Naval Research Laboratory to discuss and witness a device that may have the capability to inspect the bottom and side walls of tanks without the need to empty or enter the tank.

Member Company News

WELCOME NEW MEMBER...

...ELLETT Industries Ltd.

Still a family owned fabrication business located in British Columbia, Canada, ELLETT celebrated a 75th Anniversary in 1996. Early emphasis was on fabrication of copper and brass for breweries, distillers, food and beverage and the shipyards of B.C. As other metal alloys developed they moved into stainless steels and the chemical process industry. As the CPI moved into other alloy systems so did ELLETT who now handles nickel base alloys, aluminum alloys and the super stainless metals. Today they have also become expert fabricators of Titanium, Zirconium and Niobium, building equipment for customers worldwide. ELLETT offers services from design to delivery.

MTI extends a warm welcome to the ELLETT Industries Ltd. and the ELLETT group: Western Titanium, Corwest Fabricators, ELLETT Valve, and ELLETT Mechanical.

Bob Gill is the TAC representative.

SPOTLIGHT ON...

...DuPont

DuPont was represented at the famous "bar chat" which led to the conception of MTI; participated in the "design process" for MTI and became a charter member. This chemical giant company, the largest chemical company worldwide, recently celebrated its first billion dollar earnings in the first quarter 1997; in 1996 the earnings were 3.6 billion and sales of 43.8 billion. In recent years the company has substantially reduced the number of employees through re-structuring, currently 97,000 people but has kept its focus on "profits from new technology" a tradition over the centuries as sacred as the company's dedication to safety.

DuPont is a major producer of oil, natural gas and petroleum products and a leader in science and technology in a range of disciplines including high-performance materials, specialty chemicals, pharmaceuticals and biotechnology. The company has a long-established presence in North America and Europe, and strong and growing market positions in South America and Asia Pacific. DuPont has been in continuous operation for 194 years.

DuPont representatives have been among the most active participants and contributors to MTI programs over these twenty years which has been much appreciated by the membership.

Bert Moniz is the TAC representative.

...Dow

Dow is another charter member of MTI recognizing very early the importance of materials of construction to the company and the potential value of MTI.

The Dow Chemical Company is the fifth largest chemical company in the world, with annual sales of more than $20 billion. The company provides chemicals, plastics, energy, agricultural products, consumer goods and environmental services to customers in almost all countries around the world. Dow operates 94 manufacturing sites in 30 countries and employs about 39,500 people who are dedicated to applying chemistry to benefit customers, employees, shareholders and society.

MTI congratulates Dow on their "Centennial" year! One Hundred years of conspicuous success.

Over the past twenty years Dow's representatives to MTI have made major contributions to the MTI success story which is much appreciated by MTI. We trust that MTI has also made contributions to Dow. Good Luck and much success for the "next century".

Gene Liening is the TAC representative and has been a Board member since 1989.

NASA's Regional Technology Transfer Centers offer SBIR and STTR assistance

NASA's Regional Technology Transfer Centers (RTTCs) work with companies and laboratories in all phases of the Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) programs. The RTTCs can help from start to finish—from matching companies with technical topics in solicitations to helping awardees partner with other companies to achieve Phase III success.

Phase I

Through a nationwide network, the RTTCs provide thousands of U.S. companies with information on the SBIR and STTR workshops and proposal solicitations at the local, regional and national levels. At these workshops companies learn about the SBIR program and interact with SBIR program representatives from a variety of federal agencies. As a result of the conferences and other marketing efforts, more companies than ever before are submitting proposals for consideration for Phase I awards.

When RTTCs get involved with companies at this early phase, they typically continue to provide ongoing assistance throughout the commercialization process. For example, a Southeast RTTC Affiliate worked with Medical Thermal Diagnostics to acquire funding to develop a system enabling military medical teams to carry out triage procedures in total darkness. The RTTC Affiliate provided assistance in proposal development, commercial assessments of the product and linking the company to appropriate labs.

Phase II

Several RTTCs offer commercialization training workshops for Phase II SBIR awardees. Participants in the workshop learn what is really needed to move to Phase III, including how to identify strategic partners, develop commercialization plans and how to acquire and utilize market information. They also receive advice from venture capital investors about attracting investment capital.

Phase III

The RTTCs have still more to offer to SBIR awardees as they move into Phase III. Services provided include commercialization assessments of the technology, advice on the business and marketing plans, introductions to partners, and help with acquisitions and licensing.

As a result of this assistance, a number of SBIR Phase II awardees have proceeded to Phase III. For instance, the Northeast RTTC's Long Island affiliate is working with a NASA Goddard SBIR Phase III company to acquire final funds to commercialize an improved, low-cost navigation device that monitors the earth's horizon. Tests have shown the technology to be a reliable and versatile advancement in space and high altitude navigation.

The Mid-Atlantic RTTC is helping to partner two SBIR Phase II awardees with a third firm that has applications for the SBIR-developed technologies. The larger company has the marketing and manufacturing capabilities that the more technically-driven SBIR firms are not equipped to handle. It is anticipated that the mutually beneficial partnership will lead to commercialized SBIR technologies in the near future.

The RTTCs provide valuable help. **Before South Carolina's RTTC Affiliate was tapped to offer SBIR/STTR assistance to the state's businesses, companies who could benefit from the programs didn't know how to access them. Since the Affiliate began promoting and providing SBIR/STTR assistance services, more than 25 companies have been awarded funding.**

To be connected to the RTTC in your region call 800-472-6785.

U.S. COMPETITIVE Advantage
PRODUCTS FOR THE 21ST CENTURY
Vol. 2 No. 1
April, 1997

A Quarterly Publication of the U.S. Regional Technology Transfer Centers (RTTC).

Northeast RTTC
Westborough, Massachusetts
508 870-0042

Mid-Atlantic RTTC
Pittsburgh, Pennsylvania
412 383-2500

Southeast RTTC
Alachua, Florida
904 462-3913

Midwest RTTC
Cleveland, Ohio
216 734-0094

Mid-Continent RTTC
College Station, Texas
409 845-8762

Far-West RTTC
Los Angeles, California
213 743-2353

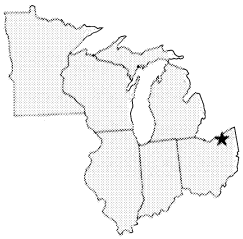
Newsletter inquiries should be directed to the Center for Technology Commercialization, 508 870-0042.

Internet Address:
http://www.ctt.org/usadvnt.htm

Did you Know?

That virtually every aircraft in use today utilizes technology pioneered by NASA. The aeronautics industry is one of the nation's strongest industries, employing nearly one million Americans.

That the RTTC's can help your company identify and develop new products and applications for use in the aeronautics industry.



Ohio Company Hits a Hole in One with GLITeC and NASA

The Midwest RTTC helps an Ohio company develop a partnership with NASA to improve their product design.

Thanks to a partnership between NASA and the Ben Hogan Company that allowed the company to quickly develop and prove a new golf ball design, golfers will now be able to shoot lower scores and enjoy the game more.

Representatives from Ben Hogan and NASA-Lewis conduct tests on experimental golf ball designs.

Ben Hogan engineers wanted to measure spin rates of experimental golf balls and contacted GLITeC, the Mid-West RTTC, for assistance. GLITeC connected the company with the NASA Lewis Research Center's Imaging Technology Center that has state-of-the-art, high-speed video equipment that can gather high-quality digital video imagery to measure, analyze, and obtain accurate data for numerous applications.

NASA measured the spin rates of seven experimental golf balls by marking the golf balls with data analysis control points, hitting each ball three times with four golf clubs, capturing images of the balls in flight with high-speed video equipment, archiving the imaging data, and analyzing the data via computer to determine spin rates and velocities.

The test results allowed Ben Hogan to improve the spin characteristics of the ball. "We could not have done this without GLITeC," commented plant manager Quint Dougan. "We needed the results in time for the PGA Merchandise Show and GLITeC delivered. Ten days after a decision had been made to work with NASA, we had results in our hands that translated into a spin optimization for us." GLITeC and Ben Hogan are now working to introduce NASA Lewis technology and expertise to other new golfing products. The company plans to introduce a new golf ball to the market within the year.

Congressional Reprentatives: Senators John Glenn and Mike DeWine, Representative Sherrod Brown
Federal Laboratory Resource: NASA Lewis Research Center
RTTC Contributor(s): Dave Salay

Sensor Company to Commercialize NASA's Catalyst and Membrane Technologies

The American Gas & Chemical Company, Ltd. (AGCC) of New Jersey and NASA Langley Research Center (LaRC) are working together under a Memorandum of Understanding to commercialize catalyst and membrane technology developed at LaRC. The project was developed with the assistance and cooperation of the New York and Connecticut offices of the Center for Technology Commercialization (CTC), NASA's Northeast Regional Technology Transfer Center.

AGCC has expertise in development, manufacturing, and marketing of sensors and detectors, including sensors that use catalysts. The novel metal/metal oxide catalysts that exhibit high oxidation activity at ambient temperatures, and membranes that are selectively permeable only to certain gases and vapors, will be used by the New Jersey company to develop a family of commercial sensors for detecting and monitoring certain hazardous gases. The project involves the design and fabrication of proof-of-concept models, prototypes, laboratory and field testing and trials; and assignment of company personnel to work on-site at LaRC for short periods.

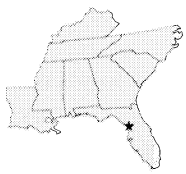
AGCC also obtained a sub-license from Rochester Gas & Electric (RG & E) for use of LaRC's catalysts in the planned sensors. RG & E, in turn, received a license from LaRC for use of catalytic materials over a wide range of applications. The upstate NY office of CTC continues to provide assistance with this project.

Mid-Atlantic Company Works with NASA to Commercialize SBIR Technologies

A manufacturer of fluid separation and purification products is developing strategic partnerships with several small SBIR companies thanks to the efforts of the Mid-Atlantic Technology Application Center (MTAC), NASA's Regional Technology Transfer Center for the Mid-Atlantic region. MTAC contacted the company to discuss their technology needs and to explore areas of opportunity for new product development.

Armed with an in-depth understanding of the client's objectives, MTAC searched the federal labs for technologies and identified some fluid separation and purification technologies under development by two companies with SBIR's under process with NASA Johnson Space Center (JSC). MTAC interviewed the companies to learn more about the technologies and their commercialization potential. A meeting between the client and the SBIR companies was arranged, and as a result, a partnership is underway to develop and license one of the technologies.

Additionally, MTAC has worked with JSC and NASA Marshall Space Flight Center to review NASA-sponsored SBIR projects for other product opportunities that the company can develop and commercialize. This effort has already identified one promising lead and the two are discussing a joint development project.



Louisiana Manufacturer of Hunting Decoys Works With NASA To Improve Their Manufacturing Operations

Sport Flex, Inc., of Bossier City, Louisiana, a manufacturer of thermoformed animals teamed with two affiliate offices of the Southern Technology Applications Center (STAC), the Southeast RTTC to improve their manufacturing process. Sport Flex worked with STAC on a problem the company was having with their line of thermoformed hunting decoys, which are manufactured from two flat sheets of polyethylene foam mounted in a moving frame. Sport Flex runs two shifts, with four people per shift who cut the decoys from the foam sheet. This process is labor intensive, painstaking work that Sport Flex wanted to change.

STAC's Louisiana office worked with NASA's state representative to develop a problem statement and submitted it to the Southeast Technology Transfer Alliance Regional Technology Applications Board (RTAB) for assistance. As a result, STAC's Alabama Affiliate who is on the board who has a background in foam technology agreed to work with the company. A working sketch of a possible solution was developed and sent to a designer at Promethean Products in Decatur, Alabama to help design and develop a test mold. After reviewing the design, a Huntsville, Alabama firm was contracted to test the thermoform.

After a number of iterations which identified further modifications, a successful prototype was developed for the raised die perimeter which fuses the decoy halves together and severs the sealed area out from the remaining foam. This die design uses a simple stepped configuration which Sport Flex believes can be replicated on all of their tooling, which the company estimates could save Sport Flex in excess of $100,000 annually.

Ohio Company Teams with NASA's Jet Propulsion Laboratory to Develop Advanced Materials for Satellite Applications

SEA, Inc., of Dayton Ohio, a satellite electronics company has teamed with NASA's Jet Propulsion Laboratory (JPL) for assistance to improve their products and manufacturing processes. The Far-West RTTC introduced SEA to JPL's Technology Affiliates Program, which enables JPL scientists to work with industry to provide technical assistance and help in developing new products and dual-use applications.

SEA has a unique capability in the development of materials possessing exceptionally high thermal conductivity. Such material systems allow electronics to be miniaturized for increased speed, reliability, and portability. Materials under development include vapor-derived graphite fibers, diamond thin films, and composites therefrom. Just as silicon transistors provided a major breakthrough in the 1960's for electronics, these enabling technologies have the potential to drive the next generation of electronics industries.

This effort with JPL is on-going, and when completed will allow US firms to deploy satellites and aerospace vehicles that have breakthrough levels of performance and functionality. For example, satellites that weigh tons today, could weigh only hundreds of pounds when new material are introduced. These improvement will reduce costs of manufacturing and orbital launching, and thereby making ubiquitous communications of the future attainable earlier and less expensive.

Texas Company Signs Exclusive License for JSC Software

BioMetric Systems, a Houston human factors engineering company, has an exclusive license for ergonomic software developed by NASA Johnson Space Center (JSC), thanks to help from the Mid-Continent Technology Transfer Center (MCTTC), NASA's Regional Technology Transfer Center. BioMetric Systems signed a license agreement with NASA for the Posture Video Analysis Tool (PVAT) software system, which classifies working postures from video footage.

BioMetric learned of the software from MCTTC, which discovered that JSC used it for collecting posture data on astronauts during space missions and assisted BioMetric with the licensing and commercialization process. When used with videotape, the PVAT system allows BioMetric to perform ergonomic analysis of people in the workplace. Examples of how the system can be used include determining the correct height of a keyboard or the proper height of a chair or stool. The system also will help a company determine if employee ailments are caused by inefficient equipment setup or poor worker technique.

BioMetric plans to sell three versions of the software service package: One version provides instructions for clients to set up, use and analyze ergonomic data themselves; another lets clients use the package and return the results to BioMetric for analysis; and a third version is designed to have BioMetric perform the work on-site, from setup to analysis. BioMetric hopes to introduce the PVAT package into the market within six months.

Financial Management Report
April 1997

	Current Month	Quarter to Date	Total to Date
Labor:			
Salaries - Professional	23,838.12	23,838.12	96,348.55
Salaries - Clerical	3,096.64	3,096.64	12,386.56
Salaries - Student	810.00	810.00	2,100.00
Fringe Benefits	9,663.32	9,663.32	38,918.75
Tuition Remission	0.00	0.00	0.00
Total Labor Costs	37,408.08	37,408.08	149,753.86
Support Costs:			
Supplies	1,544.48	1,544.48	5,569.94
Equipment Rental	733.96	733.96	2,870.29
Equipment Maintenance	30.00	30.00	870.00
Travel	7,656.70	7,656.70	20,389.55
Subcontracts	0.00	0.00	0.00
Consulting	0.00	0.00	0.00
Telephone	1,811.51	1,811.51	6,018.01
Postage	171.10	171.10	618.15
Printing	299.70	299.70	1,626.10
Other	1,250.00	1,250.00	4,610.00
Total Support Costs	13,497.45	13,497.45	42,572.04
Total Direct Costs	50,905.53	50,905.53	192,325.90
Indirect Costs	0.00	0.00	0.00
TOTAL COSTS	50,905.53	50,905.53	192,325.90
Client Income	4,987.50	4,987.50	63,975.00

Financial Management Report
May 1997

	Current Month	Quarter to Date	Total to Date
Labor:			
Salaries - Professional	23,838.12	47,676.24	120,186.67
Salaries - Clerical	3,096.63	6,193.27	15,483.19
Salaries - Student	654.00	1,464.00	2,754.00
Fringe Benefits	9,633.18	19,296.50	48,551.93
Tuition Remission	0.00	0.00	0.00
Total Labor Costs	37,221.93	74,630.01	186,975.79
Support Costs:			
Supplies	1,720.16	3,264.64	7,290.10
Equipment Rental	717.20	1,451.16	3,587.49
Equipment Maintenance	130.00	160.00	1,000.00
Travel	12,630.10	20,286.80	33,019.65
Subcontracts	0.00	0.00	0.00
Consulting	92,160.25	92,160.25	92,160.25
Telephone	2,325.53	4,137.04	8,343.54
Postage	222.16	393.26	840.31
Printing	2,244.05	2,543.75	3,870.15
Other	38,339.00	39,589.00	42,949.00
Total Support Costs	150,488.45	163,985.90	193,060.49
Total Direct Costs	187,710.38	238,615.91	380,036.28
Indirect Costs	182,417.41	182,417.41	182,417.41
TOTAL COSTS	370,127.79	421,033.32	562,453.69
Client Income	0.00	4,987.50	63,975.00

Financial Management Report
June 1997

	Current Month	Quarter to Date	Total to Date
Labor:			
Salaries - Professional	23,838.12	71,514.36	144,024.79
Salaries - Clerical	3,096.63	9,289.90	18,579.82
Salaries - Student	72.00	1,536.00	2,826.00
Fringe Benefits	9,621.52	28,918.02	58,173.45
Tuition Remission	0.00	0.00	0.00
Total Labor Costs	36,628.27	111,258.28	223,604.06
Support Costs:			
Supplies	3,548.97	6,813.61	10,839.07
Equipment Rental	721.08	2,172.24	4,308.57
Equipment Maintenance	0.00	160.00	1,000.00
Travel	4,707.65	24,994.45	37,727.30
Subcontracts	0.00	0.00	0.00
Consulting	43,906.75	136,067.00	136,067.00
Telephone	2,076.30	6,213.34	10,419.84
Postage	84.37	477.63	924.68
Printing	39.00	2,582.75	3,909.15
Other	21,035.00	60,624.00	63,984.00
Total Support Costs	76,119.12	240,105.02	269,179.61
Total Direct Costs	112,747.39	351,363.30	492,783.67
Indirect Costs	54,118.75	236,536.16	236,536.16
TOTAL COSTS	166,866.14	587,899.46	729,319.83
Client Income	6,500.00	11,487.50	70,475.00


19 3 97
MID-ATLANTIC TECHNOLOGY
APPLICATIONS CENTER
THIRD QUARTER
JULY 1 - SEPTEMBER 30

Third Quarter 1997
Outreach/Networking

July

Johns Hopkins/Applied Physics Lab meeting
Center for Innovative Technology meeting
Pittsburgh High Technology Council Breakfast meeting
Ranbar meeting
ISA meeting
AMP meeting
Bethlehem Steel meeting
Picatinny Arsenal/Army meeting
Pittsburgh Bureau of Fire meeting
Grace Industries meeting
Saxonburg Ceramics meeting
Technology Transfer Society Annual meeting
NASA Goddard Workshop
Virginia Modeling & Simulation Center Open House
Hampton Roads Technology Council Business Development Breakfast

August

Office of Congressman Mikulski meeting
Department of the Interior meeting
NSWC/NRL meeting
SBIR Phase III meeting
Pittsburgh High Technology Council Breakfast meeting
Allegheny Ludlum meeting
McAllister/PA Dept of Labor & Industry meeting
PA Dept of Environmental Protection
Mid-West FLC Regional meeting
Pittsburgh Bureau of Fire meeting
Lockheed Martin meeting
NFPA meeting
Army Natick Lab meeting
SBIR Task Team meeting
NRL/Johnco meeting

September

AFT2E Board meeting
NIOSH meeting
Pittsburgh High Technology/CMU/Pitt meeting
Pittsburgh Tissue Engineering Initiative meeting
Deputy PA Department of Environmental Protection meeting
Pittsburgh High Technology Council Breakfast meeting
ILC meeting
Technology 2007 Conference
MOD Forum Board meeting
Pittsburgh Bureau of Fire meeting
NIST Fabrication Technology Group
Pharmalliance/Ben Franklin meeting

Third Quarter 1997 Information Retrieval Projects

Acoustic Materials	Motorized Wheelchair Manufacturers
Acqutek Corp. - Company Info.	Municipal Water Treatment Facilities - Construction Projects
Air Filtration & Clean Rooms - Market Info.	Nanoparticles or Magnetic Particles for HDTV
Applied Theoretic Systems Inc. - Company Info.	New Renewable Energy Technologies
Aquatic Plant & Microbial Plant Filters	Open Celled Foams
Assistive Technologies	Paramount Capital, Inc. - Company Info.
Biocode, Inc. - Company Info.	Pharmaceutical Technologies
Biomedicine Technolgies	Photometer for Measuring Local Coefficient of Specular Reflection of Mirrors
Blood Pressure Monitors	Photometer for Measuring Total Illuminance Outside a Spacecraft
Cannondale Corp. - Company Info.	Piezothermics - Company Info.
Carbon & Carbon Fiber Market Info.	Planet Products - Company Info.
Closed Military Base Info.	Pressure Sensors
Compact Air Scrubber Patent	Printed Circuit & Flex Circuit Manufacturers
Compunetics. Inc. - Company Info.	Printed Circuit Equipment Manufacturers
Covert Marking Technologies & Expertise	Radical Tek - Company Info.
Diversa Corp. - Company Info.	Ranbar Technology - Company Info.
DrugTesting LabsInfolux, Inc. - Company Info.	Remington Products Inc. - Company Info.
Electronic Speech Enhancement, Inc. - Company Info.	Solar, Wind, Geothermal & Biomass Technologies
Embedded Data or Digital Watermarking	Space Biology and Aerospace Medicine
Enzyme Immobilization	Space Shuttle Program
EPS, Inc. - Company Info.	Stabilization of Optical Images in Telescopes Placed on Spacecraft
ERG, Inc - Company Info.	Star Blind Co. - Company Info.
Flat Panel Displays - Market Info.	Strataflex Inc. - Company Info.
Gears and Gear Drives	Suicide Monitor
ILC Dover- Company Info.	Super Absorbent Polymers
Inventive Solutions - Company Info.	Tayman Medical Inc. - Company Info.
ISO-2768 - Standard	Technology Center
IV Fluid Container Manufacturers	Third Generation R&D
Large Storage Tank Construction	Trademark Searches
Lubricants Products	Translogic Inc. - Company Info.
MacroSonix Inc. - Company Info.	University of Pittsburgh Research Funding Statistics
MEMS Literature Search	Variable Speed Drives For Use With A.C. Motors
Micro-Laser Doppler Anemometer	Waterproof Lock
Mitigation of Explosive Devices Using Aqueous Foam	Wind Velocity Measurement Device

Technology Transfer

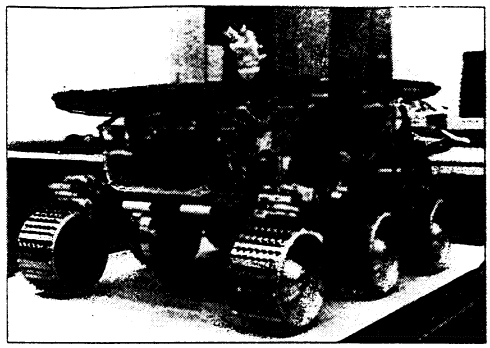
Mars MEMS useful here on earth

Microelectronic machining technology is essential to NASA for reducing the size, weight, and cost of present and future spacecraft. Using microelectromechanical system (MEMS) technologies, the Mars Pathfinder rover—scheduled to land on the Red Planet July 4, 1997—is carrying a variety of sensors, monitoring instruments, and communications processors, each smaller than a fist. By the time you read this, they will already be sending information back to earth. For the next several months we will be featuring MEMS technologies and how they can be applied here on earth.

Miniaturized CMOS demonstration camera

NASA's Jet Propulsion Laboratory (JPL) has developed an advanced imager technology device that integrates a 256 by 256 analog output active pixel sensor (APS) imager chip with a 20.4-micron pixel size into a small-form-factor camera with a full digital interface as well as electronic pan and zoom. The chip input requires a 5-V supply, start commands, and parallel data load commands for defining integration time and windowing parameters. These asynchronous digital command logic and analog readout control parameters were implemented in field-programmable gate-array logic chips in the miniaturized camera enclosure and the image display PC. The camera's small size and power make it suitable for many applications, including robotics, machine vision, guidance and navigation, particle detection, automotive applications, consumer electronics, and home surveillance.

The JPL Advanced Imager and Focal Plane Technology Group received the NASA Group Achievement Award for the complementary metal-oxide semiconductor (CMOS) APS technology used in this camera. CMOS APS enables development of lower-cost, lower-mass, lower-power, and smaller instruments featuring a "camera-on- a-chip."



Mars Pathfinder rover, equipped with miniature sensors, monitoring instruments, and communications processors, that will "roll out" onto the Martian surface.

CMOS APS features ultralow power (one-hundredth the power of charge-coupled devices), a high degree of miniaturization (one-tenth the mass of a charge-coupled-device system), and on-chip signal processing and conditioning. This leads to a high level of integration, resulting in a more reliable sensing system and simple interface, easier operation (single power supply), and excellent imaging performance (high quantum efficiency and low noise—less than 10 electrons). *Continued on p. 30*

Visit MTAC's home page on the World Wide Web to view the Instrumentation and Sensors section and check out other hot technologies: http://oracle.mtac.pitt.edu/WWW/MTAC.html.

CMOS APS features:

- Low noise (6-electron rms, single read)
- Low power (e.g., 3 mW at 100 Kpixels/sec)
- High dynamic range (>75 dB; 100,000 electrons full well)
- Good quantum efficiency (30% peak photogate mode, 60% peak photodiode mode)
- Low dark current (<150 pA/cm^2 at room temperature)
- Large formats (up to 1K by 1K demonstrated)
- Single 5-V (or 3-V) power supply operation
- Low fixed-pattern noise (<0.1%)
- Electronic shutter
- Antiblooming
- On-chip timing and control
- Signal chain electronics
- On-chip programmable multiresolution output
- Radiation resistant compared with charge-coupled devices

Benefits:

- Highly miniaturized, high-performance, low-cost imaging systems are possible.
- System power requirements are 100 to 1,000 times less due to on-chip integration.
- Chips cost three times less when standard CMOS microelectronics technology is used.
- System design time is reduced and reliability is improved because of full digital interface.
- Integration of on-focal-plane signal-processing circuits provides smart imager capability.
- Window-of-interest readout and random access for star trackers and electronic panning are possible.
- Shielding mass is reduced and reliability is improved by radiation-hard technology.

Continued from p. 28

Highly integrated smart digital CMOS APS image sensors featuring on-chip timing and control and on-focal-plane analog-to-digital converters (ADCs) have been demonstrated. In specific APS applications, the JPL Group has demonstrated both 256 by 256 and 1,024 by 1,024 formats with high resolution (less than 11-micron pixel pitch).

A 256 by 256 CMOS APS with on-chip timing and control has been integrated into the Space Technology Research Vehicle-2 experiment, a mission sponsored by the Ballistic Missile Defense Organization and the British Ministry of Defense. A high-resolution 256 by 256 APS is being used as the primary camera in the Miniature Integrated Camera and Spectrometer (MICAS) instrument aboard the spacecraft. In addition, the large-format (1,024 by 1,024) APS with on-chip ADC (no timing and control) has been built for use in the Lander and Microcamera Imaging Spectrometer (LAMCIS). Several NASA and non-NASA missions currently baselining CMOS APS technology include the Mars Surveyor, Outer Planets (Pluto, Europa, and solar probe), Muse C, Champollion, ACLAIM (a combine lasercomm and imager for microspacecrafi and Vigilante.

Recently, JPL demonstrated anoth highly miniaturized sensor called the Digit Integrated Camera Experiment (DICE This true "digital-cameral-on-a-chip" r quires only a single 5-V power supply and clock for operation and features a single s rial input/output interface for camera pr gramming (e.g., exposure, window-o interest, and spatial resolution) and digit camera output. The DICE chip represents new generation in the miniature, ultralo power, high-quality, user-programmab "imaging-system-on-a-chip." The DIC chip will be integrated into a low-pow wireless camera.

For more information about CMOS AP and licensing opportunities, contact Joh Bacon, ISA/MTAC liaison, by phon 412/383-2530; e-mail: jbacon@mtac.pitt.edu or fax: 412/383-2595.

CMOS APS applications:

Commercial
- Automobiles
- Baby monitors
- Computer multimedia input devices
- Home security
- Toys
- Video phones

Industry
- Inspection
- Integrated low-light/thermal infrared sensors
- Low-light level imaging
- Machine vision
- Mail and package routing
- Miniature unmanned airborne vehicles
- Personal imaging systems
- Reconnaissance
- Surveillance

Biomedical
- Endoscopes
- Readout of large-area X-ray imaging tubes
- Telemedicine
- X-ray imaging of teeth

Technology Transfer

Micro weather station fast and accurate

Another in a continuing series of articles by the Mid-Atlantic Technology Applications Center (MTAC), one of NASA's six regional technology transfer centers.

Pittsburgh, Pa.—Understanding climate, global change, and ozone depletion in the Earth's atmosphere depends on accurate characterization of the upper atmosphere. NASA's Jet Propulsion Laboratory (JPL) has developed micro weather station instruments that improve capabilities of various meteorological measurement platforms, including aircraft, balloon-borne radiosondes, and aircraft-deployed dropsondes.

A micro weather station has commercial applications in radiosondes and dropsondes for *in situ* weather measurement for both weather prediction and modeling as well as ground truth weather measurements near airports. Currently, more than 100,000 radiosondes are deployed annually in the U.S., with serious deficiencies in data accuracy, particularly in humidity measurements.

JPL's micro weather station program has focused on developing a low-mass, low-power, highly accurate, and fast-responding microhygrometer, or instrument for measuring humidity. Humidity is difficult to measure in cold, dry environments like Earth's upper atmosphere, but because it affects Earth's weather patterns it is of great interest. Many conventional techniques exist for measuring humidity, but none combines low mass, low power, high accuracy, and fast response.

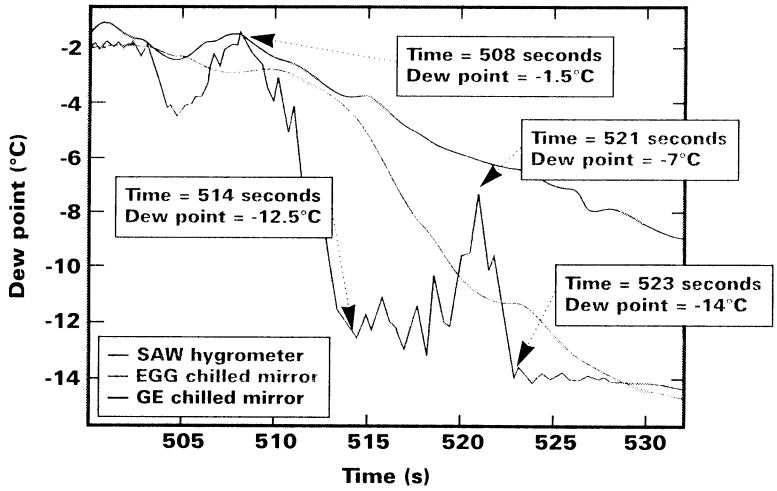
One technique uses a dew-point hygrometer to measure water in the atmosphere by cooling a surface and evaluating condensation on the surface. A primary advantage of the dew-point hygrometer is its accuracy and sensitivity at low humidity; however, at very low humidity it has limitations in cooling the hygrometer mirror down to the dew point. A dew-point hygrometer directly measures a thermodynamic quantity related to water condensation, but also has disadvantages such as high mass, high power, and possible long-term stability problems in the harsh environments encountered by micro weather stations.

To overcome these disadvantages, JPL has developed a surface acoustic wave (SAW) hygrometer, which is cooled through the dew point using a small, two-stage thermoelectric cooler. The device temperature is determined with a co-mounted temperature sensor, and the SAW hygrometer frequency output is measured as a function of this temperature. This sensor was measured using a dew-point generator and a state-of-the-art chilled-mirror hygrometer as a calibration standard. The agreement between the SAW hygrometer and the chilled-mirror hygrometer was excellent for dew points between -40°C and +20°C.

It also performed extremely well during DC8 flight tests when compared with the two onboard chilled-mirror hygrometers. Data taken during ascent, shown in the figure, demonstrates the advantages of the SAW hygrometer. Takeoff and ascent are challenging because the sensors must respond quickly to changes in dew point over a wide dynamic range. The SAW hygrometer responded much faster than the chilled-mirror hygrometers, allowing much finer resolution of dew-point changes. During less dynamic times, chilled-mirror versus SAW hygrometer data correlations indicate that the SAW hygrometer accurately measured and tracked dew-point variations in time.

The figure also shows two distinct periods of rapidly decreasing humidity. During these rapid drops, chilled-mirror hygrometers could not cool rapidly enough to track the dew point, whereas the SAW hygrometer tracked dew point very well. Thus, SAW hygrometer data reveals dew-point structure that is either missed or inaccurately recorded by the chilled-mirror hygrometers.

For more information, contact John Bacon, ISA/MTAC liaison at jbacon@mtac.pitt.edu; 412/383-2530; or fax: 412/383-2595.



Dew-point data taken from the NASA DC8 during ascent by the SAW hygrometer and two chilled-mirror hygrometers.

Potential commercial uses

The individual sensors incorporated in micro weather stations have numerous potential commercial applications as independent instruments. A small, inexpensive hygrometer could be used in airplane-mounted atmospheric sensors or as moisture detectors in corn drying apparatus. A small, integrated laser Doppler anemometer could be used in aerospace and paper manufacturing and possibly find new markets depending on the cost of the final instrument.

Visit MTAC's home page on the World Wide Web to view the Instrumentation and Sensors section and check out other hot technologies: http://oracle.mtac.pitt.edu/WWW/MTAC.html.

Technology Transfer

Small lasers expand possibilities

Another in a continuing series of articles from the Mid-Atlantic Technology Applications Center (MTAC), one of NASA's six regional technology transfer centers.

Pittsburgh, Pa.—NASA's Jet Propulsion Laboratory (JPL) semiconductor laser program develops semiconductor diode lasers for future NASA space missions. Using recently developed semiconductor lasers, very small, high-efficiency lasers and laser instruments can be fabricated. Semiconductor lasers offer large increases in communication bandwidth, enabling tremendous enhancements in spacecraft-to-ground and interinstrument data transmission rates.

Near infrared (NIR) tunable diode lasers (TDLs) are well suited for detecting trace gases by optical absorption. Their high detection sensitivity and ability to quickly identify gases makes them ideal for life-support applications on space missions. TDLs require no vacuum pumps or other moving parts, unlike the mass spectrometers and gas chromatographs usually used. TDLs are also highly specific sensors and therefore much less susceptible to interference by other gases in the environment.

Conventional lead-salt material lasers will not operate at temperatures above -130°C and must be cryogenically cooled using liquid nitrogen or bulky, inefficient closed-cycle helium coolers. Newer NIR lasers operate at as high as 50°C and can be temperature stabilized using small thermoelectric coolers (TECs). TECs are all-solid-state devices that can both heat and cool, making them ideal for precise temperature control of TDLs.

Without special processing, a TDL emits light at several wavelengths simultaneously. Such a "multimode" laser is not useful for spectroscopic gas sensing. Special NIR laser structures using distributed feedback (DFB) or distributed Bragg reflector (DBR) geometries are used to create a single-frequency or single-mode TDL. These specialized laser structures require burial of a submicron, lithographically defined grating within the laser structure using state-of-the-art fabrication and epitaxial growth techniques.

Currently, NIR DFB or DBR TDLs that operate at room temperature are restricted to wavelengths below about 2.1 microns (cryogenic lead-salt material lasers will operate at wavelengths as long as 30 microns). The specific material system determines the approximate output wavelength between 0.5 to 2.1 microns. Once the approximate wavelength is reached, the laser is coarsely tuned by adjusting the laser temperature. Fine-tuning to the exact output wavelength desired is done by altering the current through the TDL junction. Since current through the laser, and therefore the output laser wavelength, can be modulated at frequencies >1 GHz, ultrasensitive detection schemes can be used to detect molecular absorptions as small as 1 ppm.

Researchers have built upon an extensive commercial research base to develop high-quality, reliable TDLs at the specific wavelengths required for gas-sensing applications both on earth and in planetary atmospheres.

The TDLs fabricated at JPL for the Mars '98 mission are made from the same materials used for commercial lasers in CD players, laser printers, and bar-code readers. However, their operating wavelengths have been specifically designed for measuring H_2O (1.37 microns) and CO_2 (2.05 microns). Certain isotopes of these gases can also be monitored due to the carefully chosen wavelength regions targeted with the lasers.

One spectrometer is located on the meteorological mast extending vertically from the lander's deck. Two mirrors in a multipass arrangement are mounted on the mast with the laser assembly behind one of them. This system will monitor H_2O and CO_2 in the free atmosphere and provide information on isotopic composition and humidity throughout the mission. The other sensor is the analyzer for the thermal and evolved gas analyzer. A small, closed cell contains the multipass mirrors and laser assemblies. This sensor will monitor H_2O and CO_2 concentrations in gases evolved from soil samples collected by a robotic arm and heated in special ovens.

For more information, contact John Bacon, ISA/MTAC liaison at jbacon@mtac.pitt.edu; 412/383-2530; or fax: 412/383-2595.

This and previous articles can be found at *In Tech*'s home page: http://www.isa.org/journals/intech/nfnasa.html.

Potential Commercial Uses/ Applications

TDLs use less power, are lighter and more compact than their standard counterparts, and have greater detection sensitivity in many cases. Some are already being used to monitor gases in commercial process plants and waste disposal facilities and for air pollution and medical research. They can also be used to monitor toxic gas; for medical applications (e.g., breath analysis); to detect methane and carbon monoxide in mines; to monitor pollutants in stack gases; and to monitor combustion or chemical processes online.

MTAC

Visit MTAC's home page to view the Instrumentation and Sensors section and check out other hot technologies: http://oracle.mtac.pitt.edu/WWW/MTAC.html.

You had a great idea...you found out it works...now what?

How do you turn your SBIR technology into a successful commercial product? There are many good ideas that fail in the marketplace because of inadequate marketing and lack of expertise in business planning. DON'T LET THIS HAPPEN TO YOU.

Let **NASA's Regional Technology Transfer Centers** (RTTCs) match you with success. We can help you with:

- **Commercialization assessments of your technology.** Do you have a winner? In what markets? Are there applications you haven't thought of? Who are your best potential customers?

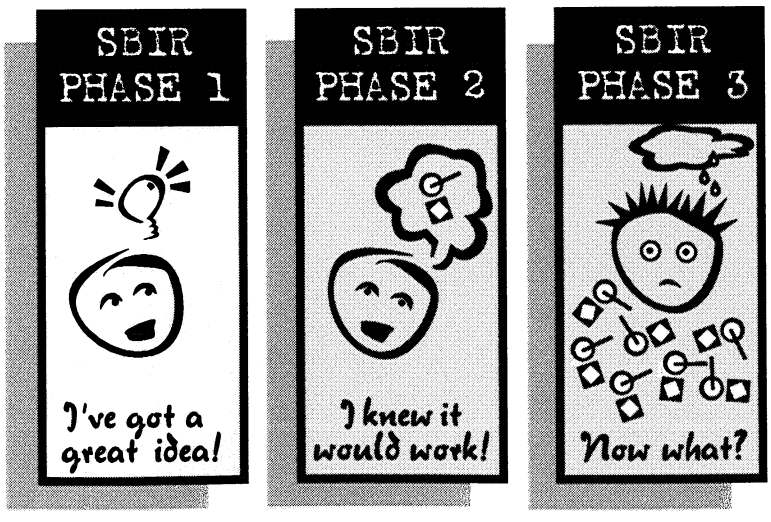
- **Business planning.** Avoid the "ready, fire, aim" syndrome -- get your act together before you go out the door to decrease the time and expense of getting your product to market.

- **Technology marketing.** Let the experts help you target your customers and go after them -- take advantage of the expertise of seasoned professionals who have proven track records marketing products in your industry.

- **Deal brokering.** The RTTCs work with thousands of companies in all industry segments -- companies that are looking for new technologies. Let us put you in touch with people who want to buy what you are selling -- we can help you with introductions, acquisitions and licensing.

The six RTTCs were established in 1992 as part of NASA's commitment to broaden the scope and increase the effectiveness of its technology commercialization program. They help U.S. firms improve their competitiveness by assisting them in the location, assessment, acquisition and utilization of technologies and scientific and engineering expertise within the federal government. In pursuit of this mandate, the RTTCs have developed an in-depth knowledge of industry needs and, as a result, now offer a variety of technology marketing services for small businesses.

For more information, call **800-472-6785.**



U.S. COMPETITIVE Advantage
PRODUCTS FOR THE 21ST CENTURY
Vol. 2 No. 2
July, 1997

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412 383-2500

Southeast RTTC
Alachua, Florida
904 462-3913

Midwest RTTC
Cleveland, Ohio
216 734-0094

Mid-Continent RTTC
College Station, Texas
409 845-8762

Far-West RTTC
Los Angeles, California
213 743-2353

Newsletter inquiries should be directed to the Center for Technology Commercialization, 508 870-0042.

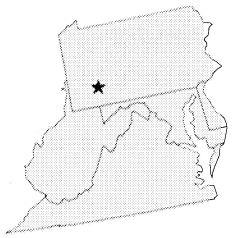
Internet Address:
http://www.ctt.org/usadvnt.htm

Did you Know?

That Tech 2007, the Eighth Annual National Technology Transfer Conference and Exposition will be held in Boston, MA on September 22-24, 1997.

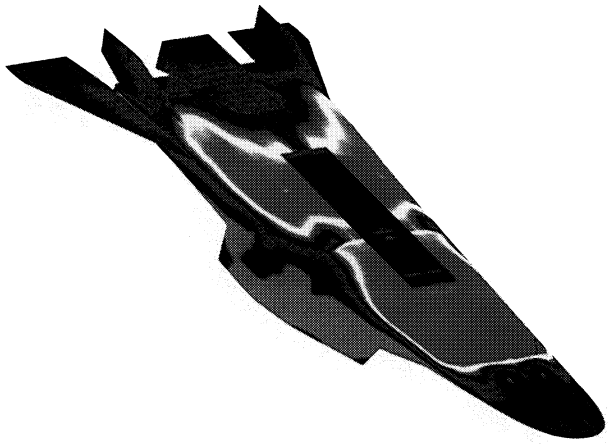
Tech 2007 offers an opportunity to meet with and sell to technology managers and senior engineers throughout industry and government. Tech 2007 can help you launch new products, introduce next-generation technologies, and pursue licensing agreements and partnerships with the nation's high-tech leaders.

If you are interested in attending Tech 2007, you can contact your regional RTTC for conference information.



Virginia Company Licenses NASA Software to Enter New Market

The Mid-Atlantic RTTC provides the expertise for a Virginia company to license software developed at NASA Langley Research Center for the aerospace industry.

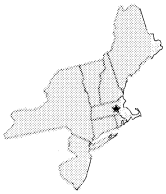


The Mid-Atlantic Technology Application Center, NASA's Regional Technology Transfer Center for the Mid-Atlantic region, helped Collier Research and Development of Hampton, Virginia license NASA-developed software for commercial application. The HyperSizer™ software, originally developed as research code at NASA's Langley Research Center also represents a significant step in the recognition of the intellectual property rights of software as transferable technology, where software is treated similarly to hardware patent rights.

Historically an engineering consulting organization, Collier used this technology to develop software that could be marketed directly to the aerospace industry. HyperSizer™ is a structural analysis and sizing optimization computer program that displays an aircraft's surface in different colors and shows engineers how materials will react under different high-speed, temperature and pressure conditions. Red indicates areas of pulling forces, purple indicates pressing forces and blue shows where load is minimal. The program is particularly adept with advanced composite materials and extreme variations in thermal environments. The data are then used to select proper materials for building an aircraft, vehicle or ship, thus allowing engineers and designers to more accurately and efficiently analyze and optimize structures, reduce design time and improve performance. HyperSizer™ can also be integrated with commercial finite element analysis packages and provides Collier an opportunity to offer structural analysis and sizing services to government and private industry customers.

Collier expects increased sales of at least $100,000 annually from this new product and plans further development of the software to allow analysis of concrete, wood and traditional metals for other fields of use, such as the construction, transportation and marine industries. And, to expand the marketability of HyperSizer™, Collier will provide software support, training and update releases.

Congressional Representatives: Senators John Warner and Charles Robb, Representative: Robert Scott
Federal Laboratory Resource: NASA Langley Research Center
RTTC Contributor(s): Joy Bryant

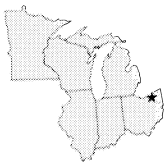


US Navy CRADA Helps Maine Company With Dual-Use Product Development

The U. S. Felt Manufacturing Company (USF), located in Sanford, Maine, manufactures industrial grade wool felt products for applications that include military use, electric motors, medical devices and equestrian equipment. Founded as a defense contractor to fabricate felt components for U.S. Army munitions, USF wanted to develop new cold weather footwear for dual-use applications, but needed assistance with materials testing and product evaluation within a life-like environment.

USF had been working with the Center for Technology Transfer (CTT), the Maine affiliate of The Center for Technology Commercialization, on a market diversification project and also needed assistance with locating a testing facility. CTT teamed up USF with the US Navy's Clothing and Textile Research Facility (NCTRF), who develops and evaluates new materials and innovative clothing products for the military. CTT helped USF develop a Cooperative Research and Development Agreement (CRADA) with NCTRF to test and evaluate their cold weather materials and footwear products. The CRADA, still in progress, has already produced very useful results and USF is gaining valuable product development support.

While USF initially targeted its R & D efforts at civilian footwear markets, it also has its sights on future military applications. Once the CRADA is completed, USF will introduce its products to the outdoor consumer clothing industry and hopes to have its cold weather boots become government issue for America's armed forces.

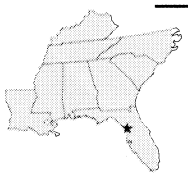


Ohio Company Introduces New Product With Help From NASA

Moen Incorporated, a producer of plumbing products, identified a need for durable polished brass kitchen faucets, but faced a challenge. Polished brass has not been widely used due to the short lifetime of the finish. Polished brass is soft, corrodes easily, and is relatively expensive. Seeing an opportunity for brass fixtures, Moen sought to identify technologies to create a brass finish as durable as chrome at an affordable cost. NASA assistance allowed the Ohio company to develop a new finish and increase its marketshare when foreign competitors were knocking at the door.

The Great Lakes Industrial Technology Center, the Midwest RTTC, connected Moen to the NASA Lewis Research Center Electro-Physics Lab. The Electro-Physics Lab is a leader in the development of technology using ion-beam vacuum deposition to enhance the physical properties of a wide range of materials, and to deposit protective coatings on a variety of substrates. Working with Lewis allowed Moen to avoid significant research costs by testing different coatings and identifying new technologies and techniques to improve the finish of the brass fixtures.

Moen launched a new line of brass fixtures that offers the beauty of polished brass with the durability of chrome at the January National Association of Home Builders Show. These new fixtures are guaranteed not to tarnish, corrode, flake off from UV light exposure, or discolor, and are so scratch resistant that steel wool cannot affect the finish.



Health Care Software Created For Space Flight Has Earthbound Applications

Healthcare on long space flights presents unique and difficult problems. A medical information and diagnostic support system developed for space travel has found new earthbound applications. SYMED, a spin-off company from the University of Florida, who worked with NASA to develop the S2000 system to improve health care on space missions has found commercial applications for the S2000 system that includes hospitals, clinics, group medical practices, rural health care settings, mobile clinics and educational settings.

SYMED contacted the Southeast Regional Technology Transfer Center (STAC) for assistance in commercializing this technology. STAC conducted a technology assessment of the S2000 system and helped SYMED develop their business plan. STAC also introduced SYMED to Florida Technology Management, Inc., who helped them raise over $250,000 in investment capital and negotiated a license agreement between SYMED and Soft Computer Consultants, Inc. (SCC) of Palm Harbor, Florida who will integrate the S2000 system into its product line. Under this agreement, SYMED received approximately $4 million from SCC in exchange for an exclusive, world-wide license to market the S2000 system to health care institutions. SCC and SYMED also formed a joint development program to expand the features and capabilities of SYMED's medical information systems.

Global Positioning Technology Helps Northeast Fishing Industry Improve Fishery Management

A partnership between The Northwest Office of the Far West RTTC and the National Marine Fisheries Service (NMFS) will help the fishing industry develop an electronic logbook using GPS technology. The partnership hopes to make the electronic entry of fishery data less burdensome, develop standardized reporting requirements, and find partners to commercialize the technology.

Fishermen are required by state agencies and the NMFS to collect and report data to assist the management of fish catch. Data includes the number of fish intentionally caught, number unintentionally caught, and the type of equipment or gear used in the catch. However, fishermen complain that recording the data is cumbersome, labor-intensive and further complicated by not being standardized. The electronic logbook will combine entry of catch data with sensor collected environmental data, which will provide fishermen an easier method to track their catch and make more efficient business decisions when searching for fish.

In addition to improving the management of the fishing industry, benefits of this logbook include lower cost to collect fisheries data, easing of state requirements and enforcement, and reducing the likelihood of overfishing due to augmented fishing data.

SBIR Helps Texas Company Develop Enhanced Project Management Software

Knowledge Based Systems Inc. (KBSI), a Texas company, has taken software developed for NASA to manage complex projects with smooth, efficient control and developed ProjectLink, a project management software package. Funded through a NASA Johnson Space Center SBIR, the software was designed to help NASA project managers plan flight activities for the space shuttle. The Mid-Continent RTTC helped KBSI locate federal funding to commercialize ProjectLink, which enabled KBSI to take the software from the demonstration level to production. KBSI also modified ProjectLink as an add-on for its process modeling and simulation software, ProSim. This natural linkage allows KBSI to use its existing customer base to market the new software.

ProjectLink provides two-way communication between ProSim and other project management software packages. ProjectLink acts as an integrated workbench of knowledge engineering and analysis tools, which allows users to: gauge the impact of scheduling; monitor and manage subcontractors and suppliers; predict and detect cost variances; and improve the accuracy and consistency of cost estimates. ProjectLink also allows companies to: manage risk; understand relationships between people, tasks, and costs related to a project; and capture lessons learned for future reference. Since introducing ProjectLink, KBSI has sold the system to several major customers, including Lucent Technologies and Comprehensive Technologies International.

Financial Management Report
July 1997

	Current Month	Quarter to Date	Total to Date
Labor:			
Salaries - Professional	18,678.40	18,678.40	162,703.19
Salaries - Clerical	3,096.64	3,096.64	21,676.46
Salaries - Student	0.00	0.00	2,826.00
Fringe Benefits	6,793.81	6,793.81	64,967.26
Tuition Remission	0.00	0.00	0.00
Total Labor Costs	28,568.85	28,568.85	252,172.91
Support Costs:			
Supplies	114.82	114.82	10,953.89
Equipment Rental	198.00	198.00	4,506.57
Equipment Maintenance	11,560.95	11,560.95	12,560.95
Travel	611.16	611.16	38,338.46
Subcontracts	0.00	0.00	0.00
Consulting	23,515.50	23,515.50	159,582.50
Telephone	1,483.07	1,483.07	11,902.91
Postage	0.00	0.00	924.68
Printing	24.80	24.80	3,933.95
Other	7,480.00	7,480.00	71,464.00
Total Support Costs	44,988.30	44,988.30	314,167.91
Total Direct Costs	73,557.15	73,557.15	566,340.82
Indirect Costs	35,212.39	35,212.39	271,748.55
TOTAL COSTS	108,769.54	108,769.54	838,089.37
Client Income	4,000.00	4,000.00	74,475.00

Financial Management Report
August 1997

	Current Month	Quarter to Date	Total to Date
Labor:			
Salaries - Professional	9,771.04	28,449.44	172,474.23
Salaries - Clerical	3,096.64	6,193.28	24,773.10
Salaries - Student	0.00	0.00	2,826.00
Fringe Benefits	4,014.71	10,808.52	68,981.97
Tuition Remission	0.00	0.00	0.00
Total Labor Costs	16,882.39	45,451.24	269,055.30
Support Costs:			
Supplies	574.73	689.55	11,528.62
Equipment Rental	1,181.48	1,379.48	5,688.05
Equipment Maintenance	0.00	11,560.95	12,560.95
Travel	2,154.21	2,765.37	40,492.67
Subcontracts	0.00	0.00	0.00
Consulting	(9,226.50)	14,289.00	150,356.00
Telephone	2,203.95	3,692.02	14,111.86
Postage	0.00	0.00	924.68
Printing	0.00	24.80	3,933.95
Other	(4,400.00)	3,080.00	67,064.00
Total Support Costs	(7,507.13)	37,481.17	306,660.78
Total Direct Costs	9,375.26	82,932.41	575,716.08
Indirect Costs	3,933.02	39,145.41	275,681.57
TOTAL COSTS	13,308.28	122,077.82	851,397.65
Client Income	15,678.05	19,678.05	90,153.05

Financial Management Report
September 1997

	Current Month	Quarter to Date	Total to Date
Labor:			
Salaries - Professional	15,270.60	43,720.04	187,744.83
Salaries - Clerical	3,374.59	9,567.87	28,147.69
Salaries - Student	0.00	0.00	2,826.00
Fringe Benefits	5,817.31	16,625.83	74,799.28
Tuition Remission	0.00	0.00	0.00
Total Labor Costs	24,462.50	69,913.74	293,517.80
Support Costs:			
Supplies	385.66	1,075.21	11,914.28
Equipment Rental	732.64	2,112.12	6,420.69
Equipment Maintenance	0.00	11,560.95	12,560.95
Travel	1,229.04	3,994.41	41,721.71
Subcontracts	0.00	0.00	0.00
Consulting	(23,515.00)	(9,226.00)	126,841.00
Telephone	1,797.15	5,489.17	15,909.01
Postage	176.01	176.01	1,100.69
Printing	0.00	24.80	3,933.95
Other	(5,022.61)	(1,942.61)	62,041.39
Total Support Costs	(24,217.11)	13,264.06	282,443.67
Total Direct Costs	245.39	83,177.80	575,961.47
Indirect Costs	(233.87)	38,911.54	275,447.70
TOTAL COSTS	11.52	122,089.34	851,409.17
Client Income	44,000.00	63,678.05	134,153.05


19 4 97
MID-ATLANTIC TECHNOLOGY
APPLICATIONS CENTER
FOURTH QUARTER
October 1 - December 31

Fourth Quarter 1997
Outreach/Networking

October

ISA Tech '97 Expo & Conference
AUTM Conference
Pittsburgh High technology Council Breakfast meeting
CTO Network meeting
FLC Regional meeting
Carol Cohen/NIDARR meeting
Ruth Haines/NIST-MEP meeting
Tribune Review Interview
PIWG/Oak Ridge meeting
ISA meeting
Ted McCurdy Associates meeting
NIOSH meeting
Fraunhofer Quarterly Advisory Board meeting
National SBIR Conference
Regional Manufacturing Institute
NIH technology transfer Seminar
Public Health Biomedical Research Park Building Groundbreaking Ceremony
Hampton Roads Technology Tigers Breakfast Seminar
1997 Government Procurement & EDI Conference
Photovoltiac Conference & Semi-Annual meeting

November

Pittsburgh Tissue Engineering Initiative meeting
Pittsburgh High Technology Council Breakfast meeting
ILC-Dover meeting
NCTMT meeting
Ken Lindsey/Robert C. Byrd Institute meeting
Ed Linsenmeyer/Navy-Pittsburgh Fire Bureau meeting
Pittsburgh High Technology Council meeting
NIOSH/WVU meeting
NSWC/ARL meeting
Ergonomics Workshop & Expo
RADVA Corporation Groundbreaking
Virginia Recycling Association Annual meeting
First Annual State of the River Seminar

Environmental Symposium 1997
Hampton Roads Technology Tigers Breakfast
Hampton Roads Chamber of Commerce 1997 Annual meeting
w/Governor-Elect Gilmore
Lansberry, Stone & Wood, Inc. meeting

December

Kirkpatrick & Lockhart meeting
CTO Network meeting
Biomedical Business Network meeting
Pittsburgh High Technology Council Breakfast Meeting
Cellular Products/Johnco meeting

Fourth Quarter 1997 Information Retrieval Projects

Accumetrics Associates - Company Info.	Joseph T. Ryerson & Son, Inc. - Company Info.
Aerosol Dispensing Apparatus	Kaufman Glass Co. - Company Info.
AIN Plastics - Company Infor.	KT Enterprises - Company Info.
Aircraft Load Flooring	Lambson Engineering - Company Info.
AirTech International - Company Info.	Land Mine Neutralization
Allied Plastics Supply Corp. - Company Info.	Lithium Tantalate
Almac Plastics Inc. - Company Info.	Manufacturers of Machines That Roll Polymide & Plastic Films
Analytical Power Corp. - Company Info.	Microcoating Technologies
Arctic Metal Products - Company Info.	Microwave Drying of Vacuum Formed Ceramic Fiber
ASV Inc. - Company Info.	Microwave Heating of Materials
Auburn Plastic Engineering - Company Info.	Norplex/Oak, Inc. - Company Info.
Barium Strontium Niobate	Optical Computing
Barium Strontium Sodium Niobate	Patent No. 5447730
Biofiltration Technologies	Patent No. 5536751
Bronx Plastics & Supply Corp. - Company Info.	Pipeline Technologies
Cadillac Plastic & Chemical Co. - Company Info.	Plastic Consultants, Inc. - Company Info.
Commerical Plastics & Supply Corp. - Company Info.	Pressure Distributions on Spheres
Companies That Manufacture Roll Coating Machinery	Pressure Sensors
Council of Consortia CEOS - Association Info.	Pro Plastics, Inc. - Company Info.
Crystal-X Corp. - Company Info.	R&D Spending Statistics
Dayton Plastics Inc. - Company Info.	Richmond Technology, Inc. - Company Info.
Defense Industry Trends	Ronco Consulting Corp. - Company Info.
Dielectrophoresis	SBIR Grants in the Mid-Atlantic Region
Difference Between 440 Steel & 4958 Rockwell Steel	Screw, Nut, & Bolt Manufacturers in the Philadelphia, PA Region
DoD Sensor Needs	Separation of Salts From Seawater
DOE & EPA SBIR Solicitation Dates	SPD Technologies - Company Info.
DuPont Co. - Company Info.	Technologies for Sports Equipment
Electrical Components	Technology Transfer & Law Firms
Electrical Current Measurement	Titanium Metal Composites
Electro-Optic Deflectors/Scanners	Top Federal Labs Based on Budget
Energy Management and Building Systems	TREX - Company Info.
Federal Technology Development Programs	Ultrafiltration
Flaw Detection in Railroad Ties	Universal Plastics Co. - Company Info.
Franklin Fibre-Lamitex Corp. - Company Info.	UXB International Inc. - Company Info.
Gray Capital Investment - Company Info.	Visonic Inc. - Company Info.
Instruments & Sensors from Kennedy Space Center	Watertech International - Company Info.
Inter-America Marketing Systems Inc. Company Info.	Wireless Data Corp. - Company Info.
Investment Banks in Pennsylvania	

DECEMBER 1997

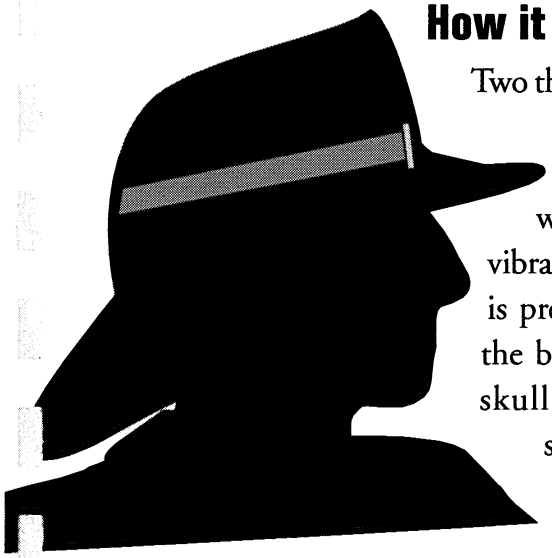
Hot News flash!

Exciting NSWC technology showcased in Pittsburgh

Prototype under development

A forehead-mounted microphone, originally developed for underwater use by the military, is being adapted for firefighters and possibly law enforcement personnel.

On November 12, 1997, Pittsburgh firefighters and police witnessed a demonstration and personally tested a piezoelectric headset device that allows hands-free communication. Dr. Frank Downs, the developer of the device at the Navy's Coastal Systems Station, came to demonstrate the device and answer questions about its use.



How it works

Two thin, piezoelectric polymer films, such as NASA's LARC-HDA, are sandwiched to a firm, flat, non-vibrating substrate. When this is pressed to the forehead in the brim of a helmet or hat, skull vibrations caused by speaking move the piezoelectric element of the "sandwich," generating an electric current. This current is transmitted to speakers which convert it into sound.

A switch is necessary to activate the microphone but it can be integrated into the the firefighter's turn-out gear, along with the power source for the speaker.

Because the only sound picked up is created by vibrations through the skull, the device is especially effective in noisy environments.

What's next?

Suggestions made by the firefighters at the meeting are being incorporated into a prototype for the next demonstration. It is hoped this prototype will be ready for demonstration in the spring of 1998.

The Fire Fighting Task Force will keep its members informed as developments continue. For more infomation contact Robert Saba, MTAC (412-383-2560), Robert Hirosky, Pittsburgh Bureau of Fire (412-255-2865), or Cheryl Allen, NASA Langley (757-864-4438).

Firefighters join Space Age for safer equipment

Grace Industries employee Loretta Blom inserts screws into the casings of an alarm device that would warn firefighters if another was in trouble inside a burning building. (Keith Hodan/Tribune-Review photo)

By Paul Muschick
TRIBUNE-REVIEW

Scientists can drive a remote-controlled robot on Mars. Geneticists can clone sheep. Doctors can repair critical organs with lasers. Firefighters still are crawling around blind in dark burning buildings. They hunch down on hands and knees. Eighty pounds of gear weigh them down. They're cut off from the outside except for a radio that makes them sound like Darth Vader.

More than 70 firefighters have died fighting fires nationwide under those circumstances since 1995, including three in Pittsburgh. More than 115 others have died performing other duties. Tired of the funerals, nine fire departments - led by Pittsburgh's - have teamed with NASA scientists and others to see if Space Age technology can help firefighters do their jobs better and safer. "We let some of these scientists and researchers put this equipment on and I think part of the conclusion was that we were still in the Stone Age," Pittsburgh Fire Chief Charlie Dickinson said.

The hope is that, with the turn of the century, firefighters will have goggles that pierce smoke and allow them to see flames inside walls so they can maneuver better through burning buildings. Orders from chiefs outside a burning building will scroll across a firefighter's face mask like on a computer screen. Radio calls to the outside will be loud and clear. Clothing will be as thin as a jogging suit, but more protective.

And if something were to go wrong - and a firefighter was trapped or hurt - a sensor on the gear would send a locator signal to rescuers. The blip would tell the exact location of the downed person, along with their heart rate, oxygen supply and other vital signs - essentially telling rescuers how much time they have.

"Think about what that would be like," Dickinson said. "We haven't changed what we've asked them to do. But what we've done is provide a much more effective way to do that. That would change drastically how we do business. I know that sounds like space cadets, but that's what it is. It's using space technology to make our work easier," he said.

Dickinson is certain such equipment would have saved Thomas Brooks, Patricia Ann Conroy and Marc Kolenda, the three city firefighters killed Valentine's Day 1995 in a Brushton arson. Those deaths spurred the agreement two years ago with National Aeronautics and Space Administration.

GETTING STARTED

'We were babes in the woods. Fire departments historically, except in a very few cases, have never conceptually thought of a piece of equipment and then asked the private sector to build it for us.'

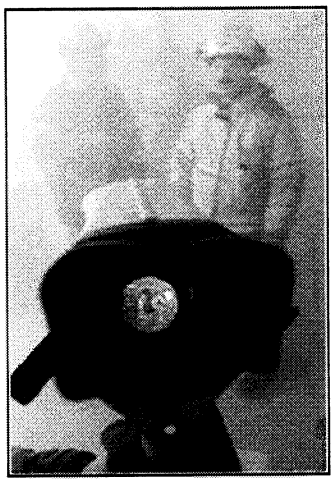
- Charlie Dickinson
PITTSBURGH FIRE CHIEF

When NASA was founded in 1958, the deal was that its new technology would be shared with all mankind. Six centers were set up around the country to investigate ways to apply NASA's knowledge in everyday life. NASA's Mid-Atlantic Technology Applications Center is located in Oakland, where researcher Robert B. Saba and Executive Director Lani S. Hummel watched the televised funeral of Brooks, Conroy and Kolenda. "It was just very depressing," Hummel said.

"We all felt that surely there must be some technology that might help firefighter safety," Saba said.

He called Dickinson. "This quickly became not just for Pittsburgh," Dickinson said. "The question is: Is there technology developed out of the space program that the fire service as a whole could use to their advantage?"

Eight other fire departments joined the Pittsburgh-based Fire Fighting Task Force: Miami, New York City, Boston, St. Louis, Minneapolis, San Antonio, Portland, Ore. and Freemont, Calif. "There wasn't any discussion of whether we needed it. Everyone recognized that we need technological help," Dickinson said.



A clear image of three Whitehall firefighters is seen through the viewfinder of the Argus Thermal Imaging Camera, demonstrated here in a smoke-filled room. The camera picks up thermal heat of firefighters or victims and is used to locate or keep track of individuals when visibility is obstructed by smoke.

The cities were chosen to provide a variety of climates and working conditions to test equipment. "A lot of times, what might work in Miami might not work in New York," Hummel said.

In the past, some fire companies - Chicago, for example - had worked individually with manufacturers to develop equipment. The U.S. Fire Administration and the National Fire Protection Association regularly study needs of their members.

But the Fire Fighting Task Force is believed to be one of the most wide-reaching and thorough partnerships to develop firefighter technology in laboratories and take it directly to private manufacturers. "We were babes in the woods," Dickinson said. "Fire departments historically, except in a very few cases, have never conceptually thought of a piece of equipment and then asked the private sector to build it for us."

In April 1996, Pittsburgh fire administrators visited NASA's Langley Research Center in Virginia. "It was acutely clear that they had no idea what fire departments experience," Dickinson said. "But they were all interested. There's one thing we learned and we knew this before. Everybody loves fire engines. Everybody would love to ride on a fire truck. So there was this commonality. They understood why we were there and what had happened to us. And they were all very supportive," the chief said.

Thirteen national laboratories - funded by taxpayers - are working on the project. They include Kennedy

Space Center and Los Alamos National Labs, where the nuclear bomb was born.

GETTING THE GEAR

Alarm device

The technology isn't Star Trek. Its time is coming. "I think we're going to see these kinds of technology. But I think it's going to be over time and it's going to be incremental," said Robert McCarthy, a retired Jersey City, N.J., fire captain who is chief of fire technical programs at the U.S. Fire Administration. "It's a matter of ... the manufacturers pulling it together, ensuring that it does meet the needs of the fire service and getting it out there," McCarthy said.

Research first is being steered toward three objectives: allowing firefighters to see better, communicate better and monitor each others' movements. Though they generally cut search time in half, fewer than 500 of the country's 33,000 fire departments use sight-enhancement devices, according to Mine Safety Appliances Co. in Cranberry Township.

Part of the reason is because the gear is costly. Researchers are attempting to make it cheaper. "You've got to be able to afford it ... that's the angle that we push," said Pittsburgh Deputy Fire Chief Robert Hirosky. "Technology that's affordable."

The Fire Fighting Task Force is following military research expected to give every United States infantryman night vision gear by 2005.

Mine Safety Appliances Co. markets the Argus Thermal Imaging Camera, a 6-pound, hand-held, battery-operated device similar to a camcorder. It costs $18,000. A thermal imaging camera allows firefighters to see the body heat of victims and flames inside walls, floors and ceilings.

Firefighters from Whitehall in Allegheny County, Peters Township in Washington County and Washington Township in Westmoreland County, use the Argus. "To me, it has the potential to save one of the residents of the borough if they got caught in a fire," Whitehall Fire Chief Hobe Moore said. "It's expensive, but I think it's worth it. If it will save a life, it's worth every penny."

Whitehall purchased the gear this summer with state grant money. Other departments across the country used fund-raisers. "Eighteen thousand dollars is hard to justify spending on one piece of equipment," Moore said.

Hobe said the borough's two volunteer fire companies have fortunately not had to use the equipment to search for victims yet. But they have used it to find flames inside chimneys and walls.

Cairns & Brother Inc., of Clifton, N.J., makes the CairnsIRIS, a similar device worn by a firefighter like goggles mounted on a helmet. It costs $25,000. The two companies are in a heated competition.

Some firefighters prefer the Argus because it can be handed from firefighter to firefighter. Other fire companies bought the CairnsIRIS, preferring to have helmet-mounted gear so firefighters can carry hoses or victims.

Communicating also is a problem for firefighters. Fires are noisy, with glass breaking, fire trucks running and people shouting over radios through face masks. A Missouri inventor has shown researchers a gadget that cuts background noise 90 percent. "We'll probably see something in the next year on that," Hirosky said.

The U.S. Navy research laboratory has a flat, waterproof, piezoelectric device the size of a quarter that can be slipped inside a headband that amplifies sound by conducting it through the skull.

TRACKING FIREFIGHTERS

Randy Ference makes adjustments on alarm devices at Grace Industries, a Mercer County company spearheading developments on new equipment for firefighters. (Keith Hodan/Tribune-Review photo)

Likely the biggest reason three Pittsburgh firefighters died in 1995 was because no one knew they were trapped or where. Equipment to monitor firefighters is on the drawing board. "The only way we have to do that now is by voice transmissions over portable radios," Dickinson said. "They have to tell us where they are. When they get in trouble, which happens from time to time, command (staff) ... isn't aware of it unless we're told."

Firefighters wear a personal alarm - a Personal Alert Safety System. The 7-ounce box, about double the thickness of a pager, sounds a siren if firefighters don't move for about 25 seconds. If there is no movement, the firefighter may be trapped and unconscious. Firefighters also can manually push the alarm.

But someone must be close enough to hear. And in the Pittsburgh fire, the victims had not activated their alarms. Some firefighters did not use them because they can sound when firefighters are standing still and are not in danger.

Technology has developed since 1995 so that most PASS alarms are automatically armed when firefighters turns on their air supplies. Grace Industries, a family-run company in Transfer, Mercer County, is the first to market a device that sounds an alarm to people outside a building when a firefighter's PASS goes off inside, said President James P. Campman. "Hopefully, we're going to save somebody's life with it. That's our job. That's our mission," said Campman, a former NASA engineer.

The Grace Employee Monitoring System is a computer that monitors all PASS alarms within a mile, scanning through up to 50 of them every 10 seconds using radio signals. If a PASS sounds, the computer shrieks, "Firefighter down! Firefighter down! Check status of all personnel!" The computer also identifies the firefighter, narrowing the search. "We know with certainty that something ha occurred," Campman said. "Not like in the past, with what happened in Pittsburgh."

The Las Vegas Fire Department ordered the system Nov. 4. It's also in use in Fairbanks, Alaska. Costs start at $2,800.

The next step is building an alarm to tell rescuers exactly where in a building the firefighter is down. Technology exists to place them in two dimensions. But to be of use, height also must be determined. That remains a barrier. "We can be able to pinpoint someone, but you can't tell if they're two levels above ground, two levels below ground or on the fifth floor, 10th floor or 20th floor," Hirosky said.

He hopes some technology could be on the market within a decade. "If we just develop one technology

that saves the life of one firefighter, that in my opinion is a great accomplishment," Saba said.

Tribune-Review tributaries **Return to News ...**

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Technology Transfer

Gas sensors enhance safety

The Chemical Species Gas Sensors Team at NASA Lewis is developing gas-sensing technology for aeronautics and aerospace applications that could be useful in commercial applications. Hydrogen sensors, developed for the space shuttle launchpad, have been applied to an automotive production system containing a Pd13%Ag Schottky diode hydrogen sensor developed by NASA Lewis and Case Western Reserve University, which won a 1995 R&D 100 award.

In rocket propulsion, hydrogen propellant leaks pose significant operational problems. In 1990, leaks from the space shuttle temporarily grounded the fleet until the leak source was identified. In response to this problem, NASA Lewis attempted to develop microfabricated point-contact hydrogen sensors.

NASA is researching other gas-sensing technology. The sensors are microfabricated and micromachined to minimize size, weight, and power consumption. A temperature detector and heater are also included in the structure to allow stable sensor operation at a variety of temperatures.

Mass sensor fabrication using silicon-processing technology should minimize the cost per sensor. Codevelopment opportunities exist for hydrocarbon, oxygen, nitrogen oxide (NO_x), and multigas sensors in various conditions and temperatures.

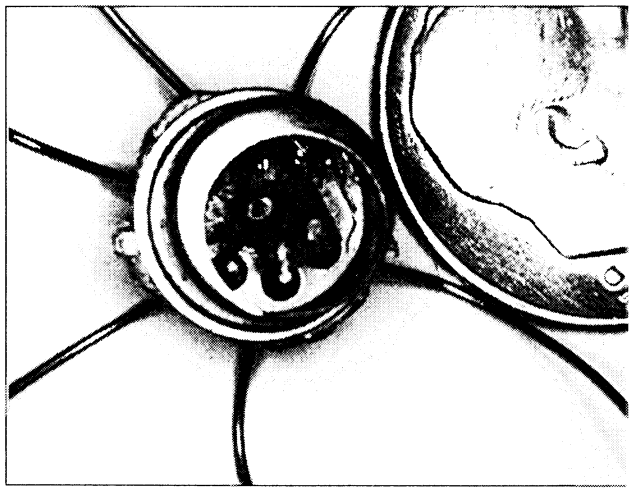
Monitoring chemical species in exhaust is important for reducing engine emissions. Emission monitoring requires both a sensor that can detect emissions and supporting signal-conditioning electronics. Possible development of such equipment has been greatly enhanced by recent developments in silicon carbide (SiC) semiconductor technology.

SiC is suitable for use in hostile conditions that would exceed the inherent limitations of Si-based electronics. Because SiC can operate as a semiconductor at high temperatures, it is useful for emission-measuring applications. SiC device operation at temperatures higher than 600°C is made possible by its wide bandgap and low intrinsic carrier concentration. Silicon devices are limited to temperatures below 300°C, but gas emissions are often at temperatures considerably higher. At these higher temperatures, catalytic effects occur that make hydrocarbon detection possible for many hydrocarbons and sensor designs. Thus, in a Schottky diode structure, SiC is used instead of Si for high temperature emission monitoring and control.

A SiC-based Schottky diode hydrocarbon and hydrogen sensor composed of Pd directly on SiC is being developed. The diode sensitively measures hydrogen concentration by measuring the diode's forward current or capacitance. Propylene detection has been demonstrated in both inert and oxygen-bearing environments, and the propylene signal magnitude appears to be temperature dependent. A sensor package including a temperature detector and heater is being developed.

Present work centers on stabilizing the sensor for long-term, high-temperature operation. PdCr is used instead of Pd as the gas-sensitive metal and a reactive insulator is used between the metal and the semiconductor. Both approaches show improved stability over the Pd on SiC Schottky diode design.

A second emissions class is nitrogen oxides. One objective of the work at Lewis is to monitor the NO_x in the engine emission stream and use this signal to control engine parameters to reduce NO_x. Two approaches are being investigated: 1) a SiC-based Schottky diode sensor as described previously but with a NO_x-sensitive gate and 2) a tin-oxide-based sensor processed to ensure stable operation. Prototypes of both sensors are being fabricated and will be tested soon.



Research into oxygen sensors is intended to develop a zirconium dioxide solid electrolyte O_2 sensor using microfabrication and micromachining techniques. This technology can also be used in emission measurements.

O_2 often affects hydrogen, hydrocarbon, and NO_x sensor response. Accurate O_2 concentration measurements help quantify sensor response in environments where O_2 concentration varies. Thus, combining an O_2 sensor with other gas sensors could optimize emissions monitoring.

Another application is for safety monitoring. Simultaneous measurement of both the oxygen concentration and flammable gas (e.g., hydrogen) concentration will give an accurate indication of whether an explosive condition exists.

For more informatio about this research and c development opportunities contact John Bacon, ISA MTAC liaison by phone: 412 383-2530; e-mail: jbacon(mtac.pitt.edu; or fax: 412 383-2595.

MTAC

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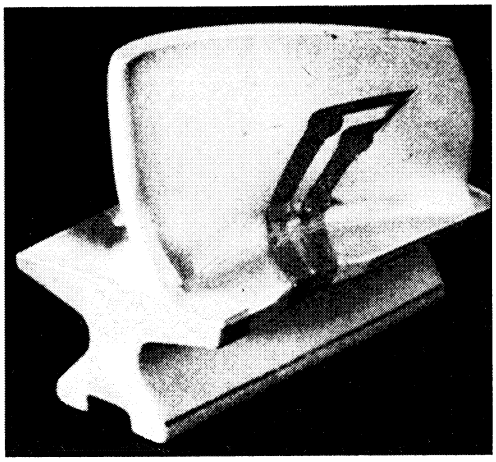
Technology Transfer

Miniature strain gauges beat the heat



The NASA Lewis Research Center is actively developing miniature high-temperature thin-film resistance strain gauges that are deposited directly on the test articles. These sputter-deposited thin-film resistance strain gauges can provide minimally intrusive surface strain measurements in temperatures from ambient to at least 1,100°C. The search for suitable materials for high-temperature static strain gauges has been underway since the resistance strain gauge was introduced some 50 years ago. Until now, no strain gauge system has met all of the desired characteristics at high temperatures.

A thin-film strain gauge that meets urgent needs in aeronautic and aerospace research has been developed. It is suitable for use where stress and temperature gradients are high, aerodynamic effects need to be minimized, and higher operational temperatures are required. The gauge, a vacuum-deposited thin film formed directly on the surface of a test structure, operates at much higher temperatures than commercially available gauges. This technology not only extends the maximum use temperature from the current capability of 600°C to at least 1,100°C but also allows minimally intrusive surface strain measurements. This significant breakthrough makes it possible to test and predict the behavior of many advanced materials for use in harsh environments at extremely high temperatures.

An electrical resistance strain gauge is a strain sensing element whose electrical resistance changes in response to an applied strain. By knowing the strain sensitivity of the gauge, the applied strain from the change in gauge resistance can be determined. This type of strain gauge (normally foil or wire gauge bonded onto a test article surface with glue, ceramic cement, or flame-sprayed ceramic) is widely used at low temperatures because of its simplicity, high sensitivity, reliability, and low cost. As the operating temperature increases, however, the gauge materials currently used either oxidize or change structurally. As a result, the gauge characteristics do not remain within acceptable limits over long periods of time, nor do they vary predictably. In addition, the bonding agents limit both the degree of strain transmitted from the test structure to the gauge and the maximum working temperature of the gauge. The bulky bonded gauge is also intrusive and disrupts aerodynamic gas flow on the test structure surface.

The NASA Lewis gauge uses an alloy (i.e., palladium-13 wt% chromium [PdCr]) developed by United Technologies Research Center under a NASA contract. This alloy is structurally stable and oxidation resistant up to at least 1,100°C. Its temperature-induced resistance change is linear, repeatable, and not sensitive to heating and cooling rates. A strain gauge made of 25-micron-diameter PdCr wire was demonstrated to be usable to 800°C and won an R&D 100 Award in 1991. By further improving material purity and developing gauge fabrication techniques using sputter deposition, photolithography patterning, and chemical etching, an 8- to 10-micron PdCr thin-film strain gauge has been developed that can now measure dynamic and static strain to at least 1,100°C. For static strain measurements, a 5-micron-thick Pt element serves as a temperature compensator, further minimizing temperature effects on the gauge.

These thin-film gauges provide the advantage of minimally intrusive surface strain measurements and give highly repeatable readings with low drift at temperatures from ambient to 1,100°C. This is a 300°C advance in operating temperature over the PdCr wire gauge and a 500°C advance over the commercially available gauges made of other materials. This technology won an R&D 100 Award in 1995.

For more information about this research and codevelopment opportunities, contact John Bacon, ISA/MTAC liaison by phone: 412/383-2530; e-mail: jbacon@mtac.pitt.edu; or fax: 412/383-2595.

Potential commercial uses

These sensors will be extremely useful in designing and developing high-speed civil transport vehicles and advanced gas-turbine engines. They can be used to study crack development/propagation, residual stress, stress/strain distribution, and thermal expansion coefficients of materials at very high temperatures. These sensors can also be used and integrated as pressure transducers and high-temperature extensometers. Any mechanical/structural design using new and advanced materials for applications in extremely high temperature environments would benefit from these sensors.

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Technology Transfer

Damaging dust revealed

A particle fallout monitoring system for commercial use in contamination monitoring or activity monitoring has been developed at NASA's John F. Kennedy Space Center. It is a real-time contamination monitoring system used to detect accumulation of potentially damaging dust and fibers on sensitive payload components. It can also be used to monitor activity levels based on increased fallout levels.

Before this technology was developed, NASA engineers used witness plates and manual microscope examination to monitor and measure accumulation of dust and other damaging particles on delicate payload components. The particle fallout system was developed by NASA engineers to provide a real-time record of the fallout. The current system is battery operated, has memory capability, and was designed using commercially available components.

The particle fallout monitor is a single unit that incorporates a sensor and a data acquisition device. The unit is constructed of black Delrin, a highly versatile engineering plastic, or an equivalent plastic, chosen for its optical properties. It has an opening in the top through which particles can fall and settle onto a silicon wafer. An infrared light-emitting diode with a limiting aperture illuminates a portion of the wafer. This light is reflected by the wafer when no particles are present. However, a portion of the light is scattered when it encounters particles. The scattered light is monitored by an optical assembly consisting of lenses, a long-pass filter (which removes the effect of ambient light), and a large-area silicon detector. The signal from the detector is digitized by a 20-bit analog-to-digital converter, processed, and displayed on a liquid crystal display on top of the unit.

The unit polls the sensor for data at selected time intervals and saves the data. A microcontroller and a timekeeper with 32 kilobytes of memory enable the data to be time-tagged. The unit can be connected to any computer with an RS-232 serial port.

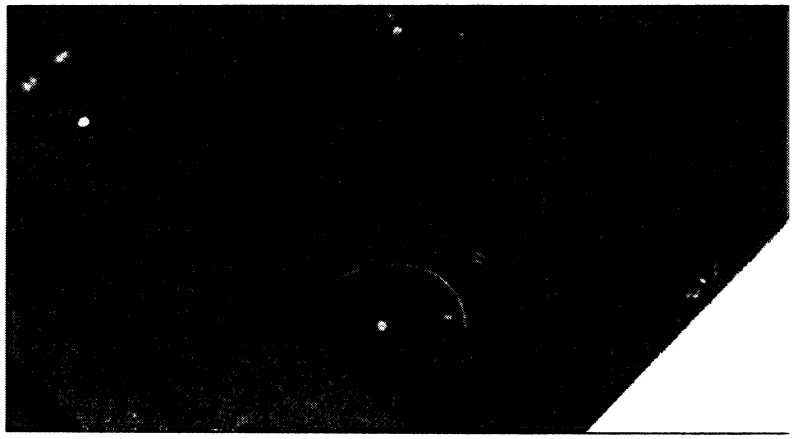
The infrared source wavelength is 900 nanometers (nm). Therefore, particles 200 nm and larger will scatter the light and be detected by the system. Thus, particles smaller than 1 micron can be detected by the system. Condensables this small can also be detected as long as they stay in droplet form and do not form a sheet on the wafer.

Potential commercial uses for this technology include:

- Contamination monitoring (e.g., clean rooms and pharmaceutical or semiconductor manufacturing)
- Activity monitoring (e.g., medical patient monitoring, accumulated animal motion, and security systems)
- Air-handling assessment (e.g., performance assessment and verification)

The basic monitoring system has been designed, built, tested, and implemented at Kennedy Space Center. This invention has also been patented under U.S. Patent No. 5,412,221 issued May 2, 1995. The technology is available for commercial applications as designed or with modifications as required by a specific application.

For more information about this particle fallout monitoring technology, contact John Bacon, ISA/MTAC liaison by phone: 412/383-2530; e-mail: jbacon@mtac.pitt.edu; or fax: 412/383-2595.



Benefits of this technology

In its current configuration, the NASA system:

- Records particle accumulation in real time, enabling correlation to outside events
- Operates independent of facility power supply
  - 9-volt battery source when operated without data acquisition module
  - 7.2-volt nickel-cadmium rechargeable power pack when operated with data acquisition module
- Stores data (32 kilobytes of memory in existing design)
- Uses commercially available components
- Enables user to set sampling intervals
- Is inexpensive when compared with equipment of comparable levels of sensitivity

MTAC

Visit MTAC's home page to view the Instrumentation and Sensors secti and check out other hot technolog http://oracle.mtac.pitt.edu/WWW/ html.

Technology Update

ISA considering consortium to push M&C technology

Anaheim, Calif.—Eyeing as a model the semiconductor industry's successful Semiconductor Research Corp. consortium, an ISA task force is studying the feasibility of having ISA oversee a proposed consortium that would focus on solving major measurement and control technology problems.

As discussed at ISA TECH/97, the concept calls for creating a Technology Development Consortium (TDC), which would assess generic problems of industrial users, then seek to solve them using technical experts at government and educational research laboratories.

Chaired by William Calder of Factory Mutual Research Corp., the TDC task force plans to present its recommendations at the ISA President's Winter Meeting to be held January 31–February 5 in Orlando. Other task force members include John Bacon, ISA liaison for NASA's Mid-Atlantic Technology Applications Center (MTAC), one of NASA's six regional technology transfer centers; Henry Dammeyer of Ohio State University; Ron Dieck of Pratt & Whitney; Perry Grady of North Carolina State University; Hank Hegner of ManTech Advanced Systems; and Richard Anderson of Oak Ridge National Laboratories.

ISA's most recent past-president, Ronald B. Jones, of Dow Chemical, said TDC's goal would be to develop technologies—never products—to help solve specific problems, then make the new technologies available to all consortium participants.

For example, Jones said, chemical and petroleum producers are looking for a nonintrusive method to measure level in vessels and storage tanks under certain conditions. Those industries also need more precise chemical analysis in gas streams, and a device is needed to measure multiple chemicals in real time, Jones noted.

MTAC's Bacon said the proposed technology consortium would evaluate "where in the laboratory system work is being conducted that could solve those problems." The next step, Bacon said, would be to develop a request for price quotation (RFQ) to determine what laboratories were interested in joining a partnership to develop specific problem-solving technologies. Funding could come from users facing a problem, including government agencies such as NASA, and instrument suppliers seeking to develop specific products incorporating the new technologies.

Other technical problems that the consortium might tackle, discussion participants suggested, could include stress and strain issues caused in thinly rolled steel processes, and, for the pulp and paper industry, a need for sensors capable of simultaneously measuring multiple variables—moisture, temperature, pressure, for example—to control the quality of paper produced.

"We're in the formative stages, investigating whether to go ahead with the consortium," Calder explained. If the decision is to proceed, the consortium's goal would be to bring industry users; federal, state, and university laboratories; and instrument manufacturers together, he said.

As proposed, the technology consortium would be modeled after Semiconductor Research Corp. (SRC), the research arm of the Semiconductor Industry Association. SRC was formed in 1982 at a time when major semiconductor manufacturers—led by IBM Corp.—saw market share and quality slipping in the face of overseas competition, primarily from Japan.

Realizing the technical challenges were too big

"We're in the formative stages, investigating whether to go ahead with the consortium."

ISA TECH/97 roundtable luncheon, called to discuss proposed Technology Development Consortium, was moderated by Caspar Weinberger, second from right. Special speaker was NASA space shuttle astronaut Dr. Mary Ellen Weber, second from left. Looking on are Robert Norwood, left, NASA director of commercial programs, and Keith Nosbush, senior vice president, Rockwell Automation. **For story on astronaut Weber's address, see page 43.**

"ISA is a neutral group and can make sure there is a balance so users are adequately represented."

for any one company to overcome alone, semiconductor manufacturers—albeit competitors—agreed to jointly fund new technologies that would enable them to leapfrog their foreign rivals. Largely as a result of that effort, U.S.-based semiconductor manufacturers today rank second to none in shipments and product quality.

Speaking at ISA TECH/97, SRC's president, Larry Sumney, outlined how other subunits were created by SRC along the way, such as Sematech, formed in 1987 to focus on semiconductor manufacturing, and a Microelectronics Advanced Research Cooperative (MARCO), being formed this year, that will focus on very leading-edge research for applications such as space travel.

At a roundtable luncheon, user and supplier representatives alike agreed the consortium should not be supplier driven and said ISA could lead the consortium process in a way that would ensure users were involved and adequately represented.

One user expressing encouragement was Ashok Nangia, associate corporate engineer in 3M Corp.'s process instrumentation and controls department.

"It should stay with ISA, and ISA should show the leadership," Nangia told approximately 20 corporate executives and technology leaders from industry and government at the roundtable moderated by former U.S. Secretary of Defense Caspar Weinberger, ISA TECH/97 keynote speaker and now chairman of *Forbes* magazine.

Elaborating later, Nangia, who provides technology strategic planning for 3M in the area of process control, said he foresees the proposed technology development consortium being "a glue between users—[TDC's] customers; federal, state, and university laboratories; and vendors."

"ISA is a neutral group and can make sure there is a balance so users are adequately represented," Nangia explained. "ISA has to make sure it gets the suppliers behind [the TDC], too." However, a consortium driven primarily by vendors should be avoided because, "suppliers want to drive proprietary technologies. They have a self-interest to drive their own products," he noted.

In addition, "ISA already has a lot of tools in place, including an organization in which information can be disseminated very quickly," Nangia continued. "ISA already has a large membership; ISA is an international organization and has international contacts. Also, we have already in our schedules plans to participate in ISA shows," where interested users and other participants can meet, the 3M technologist added.

Walter Steward, Yokogawa senior vice president, expressed a similar view. "I think the consortium is what's needed, and it's important that ISA do it and take its place at the center of the technology development consortium."

"We've heard words of wisdom," summarized task force chair Calder. "I'm personally encouraged by what I've heard. If we do it, we better do it right."

—Jim Strothman

Future measurements need 6X more accuracy

Anaheim, Calif.—The measurement instrument of the next few years will have to be up to six times more accurate than present-day instruments and increasingly will be required to reside outside the personal computer.

Those are two conclusions in a new *Measurement Needs Tracking Study* of 301 process and test engineers, commissioned by Keithley Instruments, Cleveland, Ohio, and released at the ISA TECH/97 conference in Anaheim.

Building on similar market data gathered in 1996, study researchers asked respondents to describe their measurement practices today and to envision what they will need during the next few years.

Respondents said resolution is critical. Sixteen-bit performance and better will be a necessity for 56% of those surveyed compared to the 35% who require it today. For 18-bit performance and above, the 6% of engineers who require it today will increase to 25%—a fourfold jump.

Respondents made similar predictions for their accuracy needs. Measurement applications requiring 0.1% of full-scale-range accuracy or better make up 3% of measurement tasks, they said, but in the near future will represent 18%, a sixfold increase.

According to the study, engineers also need faster measurements, with 30.5% saying they'll require greater than 1,000 readings/second performance compared with 23% today. Some 12% of the respondents reported they'll need speeds of no less than 10,000 readings/second.

Nearly a third of engineers, or 30%, reported that their typical tasks today require more than 40 data points.

When asked what barriers in instrument and sensor performance will have to be overcome to realize these future needs, respondents pointed to budget and time constraints along with data communications problems as the most limiting factors. Software and sensor performance also were listed among the five most critical measurement barriers.

continued on p.20

ISA•TECH97

'Benefits worth risks,' astronaut assures high-level audience

Anaheim, Calif.—Why do NASA astronauts like herself enthusiastically climb into a spaceship knowing they have a 1 in 183 chance of not coming back from a mission? Because "the benefits are worth taking the risks," space shuttle veteran Dr. Mary Ellen Weber ardently told a high-level ISA TECH/97 roundtable luncheon.

The roundtable, moderated by keynote speaker Caspar Weinberger, was organized to gather opinions on whether ISA should oversee a proposed consortium that would focus on helping solve measurement and control technology problems. (For details on consortium proposal, see page 17.)

Weber's personal enthusiasm captivated Weinberger and about two dozen industry and government executives in attendance. They listened intently as she logically told why "space exploration is the seed kernel for driving technology" and is, therefore, essential for improving life on earth.

For NASA, necessity is the mother of invention, she explained. For example, "it now costs $10,000 per pound to get into orbit. We need lightweight materials. Those materials need to be strong. They need to survive extreme cold and heat."

Weber, who prior to joining NASA helped develop state-of-the-art semiconductor manufacturing equipment for Texas Instruments and the Sematech consortium, said new ground must be broken in electronics. Even ¼-micron measurements are not acceptable because "we need 1/700 micron." Much improved sensors are needed to evaluate human and environmental conditions, she added.

Aboard a Discovery space shuttle flight in 1995, Weber checked out and helped deploy a communications satellite now in operation 22,300 miles above the equator. She also plays a key role in biotechnology experiments. Her technical assignments on earth have included chairing the evaluation board for procuring a biotechnology contract.

Weber expressed special enthusiasm about benefits resulting from experiments studying protein growth conducted on nearly all the space shuttle flights. The studies, which test various drugs and chemicals to advance and/or stop a protein process, will soon result in a drug to stop every flu virus there is and could also possibly assist with the treatment of AIDS, she predicted.

In addition, "this year, for the first time, we have learned there are planets around other stars. We're looking for earth-like planets," Weber said. Looking for life on them will drive technology even further, she assured.

—Jim Strothman

system in the Americas and hopes to further penetrate Asian and European markets through the agreement.

Also allying with Yokogawa is a Chino, Calif., company, Measurementation, Inc. (MI), which fabricates, assembles, and delivers process sampling and analyzer systems directly to the job site. As a result of the alliance, MI has exclusive rights to distribute Yokogawa's new GC 1000 process gas chromatograph and NR 500 near-infrared analyzer in the Americas and southeastern Asia.

Yokogawa now has more than 100 group companies and revenues expected soon to surpass $3 billion (U.S.) per year.

Testing, software firms partner

Factory Mutual Research Corp. (FMRC), in the testing business since 1884, has agreed to work jointly with equally venerable (1871) TuV PS. They plan to harmonize safety instrumentation standards requirements, test procedures, and certification services for plant operators and vendors.

"Applications such as spreadsheets and word processors—which were previously restricted to the desktop—can now be seamlessly integrated into QNX-based embedded systems for process control, point-of-sale, telephony, and so on," said Linda Campbell of QNX Software Systems Ltd. (QSSL). That's one of the results of a licensing agreement with Sun Microsystems, the Java company. Many manufacturing software vendors are moving to the Java platform.

Two Massachusetts software developers announced their intention to cooperate by jointly creating industrial software development tools. FactorySoft, Inc., a designer of development tool kits, and PC Soft International, Inc., PC-based operator interface and SCADA supplier, are teaming to provide an industrial software environment that enables users to easily integrate products from multiple vendors. An object-oriented set of foundation classes plays a major role in this undertaking.

VenturCom, Cambridge, Mass., and Synergetic Micro Systems, Downer's Grove, Ill., declared their intention to bring real-time NT to the field-bus market. Under a licensing agreement, Synergetic will develop hard real-time drivers for use with its own line of field-bus interface cards and VenturCom's RTX product designed to provide deterministic response for Windows NT.

The Foxboro Co., meanwhile, said Dow Chemical signed an agreement making Foxboro the supplier of Dow advanced process automation systems. "The two companies will combine their expertise and intellectual assets, including licensing of patented Dow technology to Foxboro, to meet Dow's demanding automation requirements and enable Foxboro to accelerate its technological leadership," a Foxboro spokesman said. IT

ISA TECH/97 Conference

As a result of MTAC efforts, NASA Administrator Dan Goldin was the keynote speaker at the ISA TECH/96 Conference which was held at McCormick Place in Chicago, Illinois. The positive feedback from the ISA membership regarding Goldin's speech prompted ISA to invite NASA to participate in the ISA TECH/97 Conference in Anaheim in October 1997.

NASA's participation in the ISA TECH/97 show effort was spearheaded by MTAC with John Bacon and Bobbi Hons acting as liaisons between ISA, NASA headquarters and the NASA centers.

Because of MTAC's work with ISA, NASA was provided, at no cost, a 2800 square foot exhibit space (a $112,000 value), 1,500 NASA Sensors Posters designed by MTAC and printed by ISA, and free publicity. The NASA Centers that participated were NASA Lewis Research Center, NASA Goddard Space Flight Center, NASA Kennedy Space Center, NASA Jet Propulsion Laboratory, NASA Ames Research Center.

In addition, space shuttle veteran Dr. Mary Ellen Weber and Dr. Robert Norwood represented NASA at the ISA TECH/97 roundtable luncheon discussion on the MTAC proposed Technology Development Consortium (TDC). Dr. Weber later signed NASA Sensors posters in the NASA booth. Dr. Dan Williams of NASA Lewis Research Center served as a panelist on the Technology Development Panel and Joseph Rothenberg of NASA Goddard Space Flight Center was moderator of the plenary panel on Networking. Additional researchers from various NASA centers also served as panelists for the ISA session on the TDC.

A number of NASA technologies were showcased including ACTS, MEMS, the Mars Rover and the Shuttle Simulator.

The attendees at the ISA TECH/97 Conference totaled 12,500; NASA was again invited, free of charge, to participate in ISA EXPO/98 which will be held at the Astrodome in Houston, Texas in October 1998 with an expected attendance of 40,000.

ISA Technology Development Consortium

Mission Statement

To foster collaboration in the public and private sectors for the development and implementation of new or improved instrumentation, measurement and control technologies and equipment by acting as an independent catalyst for fund raising and facilitating directed developments.

The Approach

To identify measurement and control technology/implementation needs
To obtain technical and financial commitment form participants and administer the disbursement of funds as well as the publication of results.

The Goal

To share the risks and rewards among the participants equally to develop new technologies and implementation strategies that are available to all consortium participants.

Suggested TDC Process

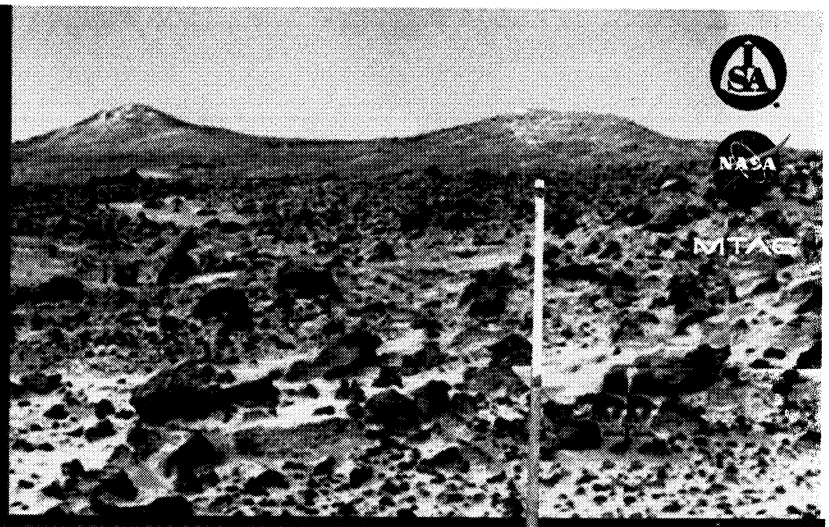
TDC meets with industry representatives to obtain needs statement.
TDC searches labs (federal, university, private) for potential technical solutions/expertise.
TDC facilitates meeting between industry and selected labs.
TDC prepares RFQ for labs.
TDC and industry review proposal.
TDC contacts member manufacturers for joint product development with labs.
TDC monitors project progress to ensure initial problem is solved.

TDC Operational Areas

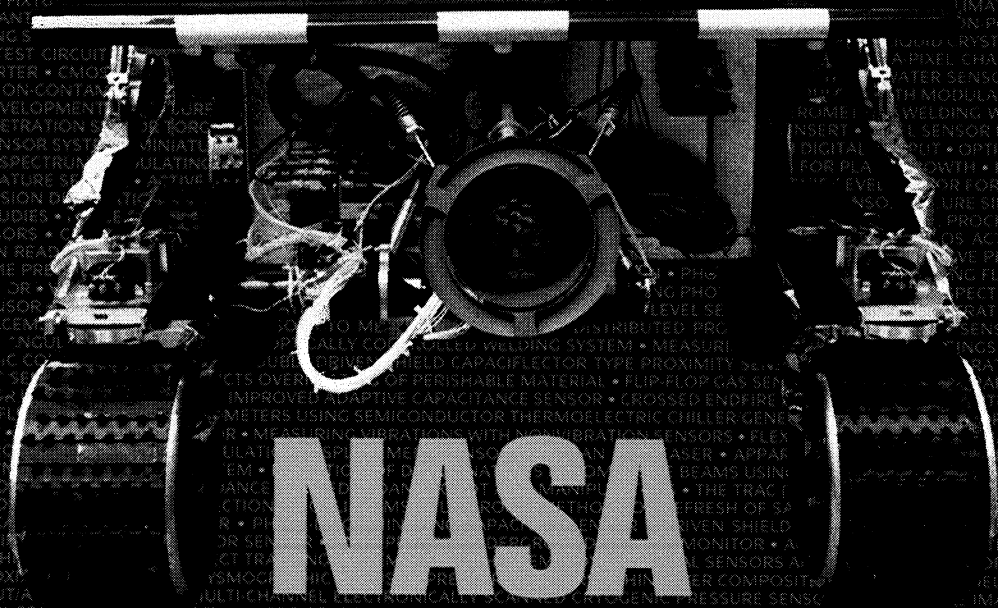
Match industry needs with existing prototype
Match industry needs with current R&D programs
Match industry needs with R&D capabilities
- Precompetitive joint research projects

ISA•TECH97

ISA, THE INTERNATIONAL SOCIETY OF MEASUREMENT AND CONTROL



To Mars or to market... NASA technology can get you there.



NASA SENSORS

NEWS RELEASE

For Release: IMMEDIATELY **Date:** December 10, 1998
Contact: Beth Roden (919) 990-9255

ISA EXPO/98 SELECTED FOR U.S. DEPARTMENT OF COMMERCE INTERNATIONAL BUYER PROGRAM

RESEARCH TRIANGLE PARK, NC--For the second consecutive year, ISA's annual tradeshow and exhibition has been selected as one of only 20-30 tradeshows chosen to participate in the U.S. Department of Commerce 1999 International Buyer Program. The International Buyer Program brings international buyers together with U.S. firms by promoting exports of U.S.-made products. ISA's 1998 tradeshow - ISA EXPO/98 - will take place October 19 - 22, 1998, in Houston, TX.

According to the U.S. Department of Commerce, the selection of ISA EXPO/98 from more than 5,000 U.S. tradeshows indicates the quality of the event and its potential for attracting international attendees. The events selected each year for the International Buyer Program must be recognized as leading domestic and international marketplaces for the promotion of products and services. "As the United States is the leading marketplace for measurement and control technology, ISA EXPO/98 provides an outstanding opportunity to reach international buyers from more than 60 countries," says ISA President, Hugh N. Roser.

ISA EXPO/98 is the second-part of ISA's redesigned two-year event format that alternates an exhibit-driven event with a technology-driven event, such as this year's ISA TECH/97. "The Department of Commerce endorsement for the second year is a significant achievement, because it recognizes both ISA EXPO/98 and ISA TECH/97 as events with great potential for favorably impacting the U.S. economy and especially our exhibitors' bottom line," says Roser.

Working closely with U.S. consulates and embassies around the globe, the Department of Commerce promotes international attendance and exhibitor exposure. "The International Buyer Program will clearly benefit all who participate in ISA EXPO/98," says Roser, "from international attendees to U.S. firms."

more...

Department of Commerce Project Managers at ISA EXPO/98 will provide expertise and assistance to U.S. companies interested in exporting, including export counseling and market analysis.

ISA is a 46,000-member international, nonprofit, educational organization. The Society fosters advancement in the theory, design, manufacture, and use of instruments, computers, and systems for measurement and control.

In addition to hosting the largest conferences and exhibitions for instrumentation and control in the Western Hemisphere, ISA is a leading training organization and a respected publisher of books, magazines, and consensus standards. And, ISA serves the professional development and credentialing needs of Control Systems Engineers (CSE), instrument technicians, and others within the field of measurement and control.

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Editor's Note: You can find this news release, all current ISA news releases and much more on ISA's own website! Just access http://www.isa.org and click into a 24-hour-a-day connection to measurement and control information, useful reference material, industry news and events, technology updates and industry standards.

Financial Management Report
October 1997

	Current Month	Quarter to Date	Total to Date
Labor:			
Salaries - Professional	13,471.90	13,471.90	201,216.73
Salaries - Clerical	3,206.59	3,206.59	31,354.28
Salaries - Student	0.00	0.00	2,826.00
Fringe Benefits	5,203.69	5,203.69	80,002.97
Tuition Remission	0.00	0.00	0.00
Total Labor Costs	21,882.18	21,882.18	315,399.98
Support Costs:			
Supplies	902.32	902.32	12,816.60
Equipment Rental	737.24	737.24	7,157.93
Equipment Maintenance	737.55	737.55	13,298.50
Travel	440.37	440.37	42,162.08
Subcontracts	2,500.00	2,500.00	2,500.00
Consulting	0.00	0.00	126,841.00
Telephone	1,380.51	1,380.51	17,289.52
Postage	176.97	176.97	1,277.66
Printing	0.00	0.00	3,933.95
Other	9,155.92	9,155.92	71,197.31
Total Support Costs	16,030.88	16,030.88	298,474.55
Total Direct Costs	37,913.06	37,913.06	613,874.53
Indirect Costs	17,844.38	17,844.38	293,292.08
TOTAL COSTS	55,757.44	55,757.44	907,166.61
Client Income	21,500.00	21,500.00	155,653.05

Financial Management Report
November 1997

	Current Month	Quarter to Date	Total to Date
Labor:			
Salaries - Professional	13,954.60	27,426.50	215,171.33
Salaries - Clerical	3,229.32	6,435.91	34,583.60
Salaries - Student	0.00	0.00	2,826.00
Fringe Benefits	5,361.39	10,565.08	85,364.36
Tuition Remission	0.00	0.00	0.00
Total Labor Costs	22,545.31	44,427.49	337,945.29
Support Costs:			
Supplies	516.36	1,418.68	13,332.96
Equipment Rental	198.00	935.24	7,355.93
Equipment Maintenance	258.39	995.94	13,556.89
Travel	10,796.91	11,237.28	52,958.99
Subcontracts	20,000.00	22,500.00	22,500.00
Consulting	2,548.00	2,548.00	129,389.00
Telephone	1,531.81	2,912.32	18,821.33
Postage	202.87	379.84	1,480.53
Printing	2,505.00	2,505.00	6,438.95
Other	5,724.35	14,880.27	76,921.66
Total Support Costs	44,281.69	60,312.57	342,756.24
Total Direct Costs	66,827.00	104,740.06	680,701.53
Indirect Costs	31,981.91	49,826.29	325,273.99
TOTAL COSTS	98,808.91	154,566.35	1,005,975.52

Financial Management Report
December 1997

	(Estimate) Current Month	Quarter to Date	Total to Date
Labor:			
Salaries - Professional	13,954.60	41,381.10	229,125.93
Salaries - Clerical	3,197.50	9,633.41	37,781.10
Salaries - Student	0.00	0.00	2,826.00
Fringe Benefits	5,351.46	15,916.54	90,715.82
Tuition Remission	0.00	0.00	0.00
Total Labor Costs	22,503.56	66,931.05	360,448.85
Support Costs:			
Supplies	1,540.39	2,959.07	14,873.35
Equipment Rental	900.00	1,835.24	8,255.93
Equipment Maintenance	733.88	1,729.82	14,290.77
Travel	3,905.48	15,142.76	56,864.47
Subcontracts	112,500.00	135,000.00	135,000.00
Consulting	5,047.00	7,595.00	134,436.00
Telephone	1,000.00	3,912.32	19,821.33
Postage	200.00	579.84	1,680.53
Printing	1,145.25	3,650.25	7,584.20
Other	400.00	15,280.27	77,321.66
Total Support Costs	127,372.00	187,684.57	470,128.24
Total Direct Costs	149,875.56	254,615.62	830,577.09
Indirect Costs	62,340.27	112,166.56	387,614.26
TOTAL COSTS	212,215.83	366,782.18	1,218,191.35

US RTTC

U.S. COMPETITIVE Advantage

PRODUCTS FOR THE 21ST CENTURY

Vol. 2 No. 3
October, 1997

A Quarterly Publication of the U.S. Regional Technology Transfer Centers (RTTC).

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Newsletter inquiries should be directed to the Center for Technology Commercialization, 508 870-0042.

Internet Address:

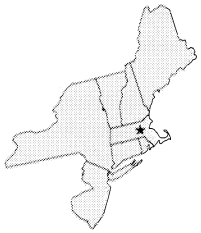
http://www.ctt.org/usadvnt.htm

Did you Know?

That the results of a year long assessment of more than 400 defense-related R & D projects sponsored by the RTTCs and the Federal Laboratory Consortium was released in a 313-page book, 'The RIB-IT Views'.

The RIB-IT Views lists the 12 technologies considered to have exceptional commercialization potential along with 26 other projects also viewed as commercially promising. The book also provides private sector companies with a good insight into the kinds of technologies available in the federal labs.

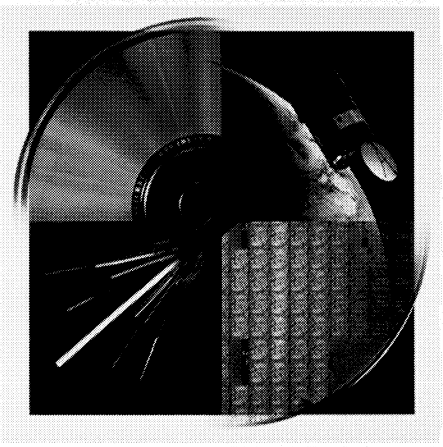
The RIB-IT Views is available from your local RTTC, who can provide assistance to learn more about any technologies of interest.



Radiation Tolerant Technology Poised to Revolutionize Space Electronics

The Center for Technology Commercialization, the Northeast RTTC, is helping to commercialize Radiation Tolerant technology developed with NASA-Goddard Space Flight Center funding at the University of New Mexico.

Radiation Tolerant (RT) technology developed at NASA's Institute for Advanced Microelectronics located at the University of New Mexico (UNM) allows radiation tolerance to be designed into, rather than manufactured into, electronic chips that can now be produced in commercial, rather than government foundries dedicated to radiation hard electronics. RT technologies will greatly impact the communications industry, which will demand light, fast, cheap, and space-qualified electronics. NASA and other government agencies will benefit from the availability of this process through commercial semiconductor houses. Currently, radiation hard electronics must be built in government-supported dedicated foundries. The enormous cost - estimated at $1.5 billion per foundry every five years - will now be borne across the commercial quantities of chips (100's of millions) instead of a relatively small number of chips used in space.



Ed Honowitz/Tony Stone Images ©

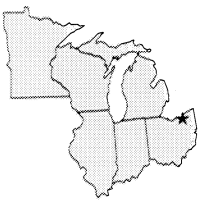
RT will help the communications industry become truly space-ready and state-of-the-art

RT technology protects electronic components against two of the three existing forms of radiation damage, Single Event Upset and Latch Up, by designing in features which eliminate the occurrence of these events. In addition, tests performed at Goddard Space Flight Center (GSFC) have shown that selected existing commercial CMOS processes produce chips that are very resistant to the third form of damage, Total Dose. GSFC found that standard CMOS test cells, manufactured using an unaltered commercial process, withstood a total dose up to 150 krad with no degradation in performance. The target resistance was 100 krad.

CTC is helping to commercialize RT technology as a member of a consortium of participating companies, universities and federal facilities including; UNM, Virtual Silicon Technology, Inc., TRW, Aerospace Inc., GSFC, NASA's Jet Propulsion Laboratory and a commercial foundry. As a result, some significant licensing efforts between UNM and commercial companies have occured and a new commercial venture is expected to be created. CTC also aided Dr. Maki's team, of UNM to stratergize the RT commercialization road-map and negotiate licenses and agreements. Finally, this commercialization effort has produced a commercial library of RT cells and a back end process for qualifying commercially manufactured chips for space flight. This technology is currently under development at GSFC.

Provision of RT electronics to the Space community, which is scheduled to launch $12 to $14 billion dollars worth of radiation susceptible communication electronics into space over the next five years, will have a profound effect on the cost and reliability of space electronics. The impact on NASA and defense oriented programs may even be larger, since they will gain the benefits enjoyed by the commercial space industry as well as the ability to migrate their space electronics down in size and up in speed, through cost paths blazed and paid for by the commercial giants.

Federal Laboratory Resource: Goddard Space Flight Center
RTTC Contributor(s): Richard Callahan



NASA Technology Helps Ohio Software Company Develop New Product

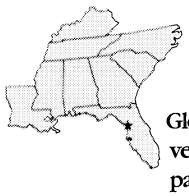
Digital Interface Systems (DIS), a small Ohio company, worked with experts from NASA Lewis Research Center to redesign its digital interface system. GLITeC, the Mid west RTTC, identified four potential projects which could benefit from NASA-Lewis input. The most promising project concerned a product DIS had formerly sold to high school science departments that enabled schools to have "turnkey" science labs. However, DIS's technology was obsolete and needed to be updated to be compatible with today's computers and other interfacing equipment. Lewis worked with DIS to redesign the hardware that allows its system to connect with most PCs and added software modifications and NASA codes to improve the performance of the digital interface system.

As a result of the assistance received from Lewis, DIS has developed a prototype data interface system that acts as a converter between PCs and lab equipment and data acquisition systems. According to the company president, this improved product can accommodate a number of different markets, including corporate R&D, 10th grade physics, 12th grade chemistry, graduate level scientific research, and many others. Users are only limited by the types of data they are accessing. The different products should make it easier for students to learn science, easier for teachers to teach, and easier for companies to conduct more effective research and development. A prototype model of the system was successfully demonstrated in April, 1997 and DIS expects to introduce it to the market in 1998. DIS projects total sales of $500,000 in the first year.

Illinois Company Works with Navy Lab to Improve Profitability and Efficiency

Plymouth Tube, of Warrenville, Illinois, a manufacturer of dimensionally and metallurgically critical stainless steel and nickel alloy tubing for computer chips, aerospace and nuclear applications was experiencing a frosting condition on the inner surfaces of the 1/4" metal tubing after electropolishing, which was resulting in an unacceptable rejection rate. Plymouth needed to determine the cause of imperfections and wanted to improve their protocol for preparing and handling samples. Finally, Plymouth wanted recommendations to develop a better analysis procedure to evaluate tubing products.

Plymouth turned to the Maryland office of Mid-Atlantic Technology Applications Center, the Mid-Atlantic RTTC for assistance, who determined that the US Navy's Indian Head Division had technology that could help the company. Tests were performed at Indian Head using dispersive x-ray scanning, electron microscopy and ion chromatography to determine the elemental sources causing the frosting conditions. In addition to testing for the frosting condition, sources of other potential problems were identified and a protocol for testing future samples was developed. As a result of the RTTC assistance, Plymouth has found solutions that increased its profitability and efficiency.

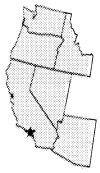


Mississippi Company Ready to Launch New Aircraft

Global Aircraft Corporation of Mississippi is poised on the verge of a new business opportunity with the long-anticipated production of the company-designed GT-3 trainer plane and a propeller called the Quasi Constant Speed (QCS). The Global GT-3 Trainer is an all-composite material airplane designed to meet the needs of the professional flight training market that features a number of advances including fuel economy and improved low-speed handling.

Global Aircraft worked with the Southern Technology Application Center, NASA's SE RTTC to find the technology and expertise they needed to bring this new aircraft to market. Working with the RTTC's Mississippi affiliate and other partners, Global Aircraft acquired a Phase I SBIR for $70,000 from NASA Lewis Research Center that facilitated development of the QCS propeller. Global Aircraft subsequently received a Phase II for $600,000 and more recently several STTRs in conjunction with faculty at the University of Southern Mississippi to further refine this technology.

Global Aircraft employs 13 people and plans to break ground soon on a 55,000 square foot building where the company expects to increase total employment to more than 300 people to support the manufacture of the propeller and training plane.



Defense Contractor Works With NASA To Open New Markets

Ling Electronics, Incorporated, a small defense contractor of high performance electrodynamic vibration testing systems and high intensity sound systems who had been affected by cuts in sales and employment through reduction in defense orders, turned to NASA for help to develop new commercial products. Ling embarked on a product development program and experienced technical problems so critical that Ling had to stop work or find outside expertise for assistance.

Ling contacted NASA's Far West RTTC for assistance who identified some NASA technologies available at NASA Marshall Space Flight Center and NASA Lewis Space Flight Center that would allow Ling to solve its technical problems. And the Far West encouraged Ling to become a commercial partner with the NASA Jet Propulsion Laboratory, which has worked on vibration technology. The solutions available from NASA enabled Ling to turn the corner and continue with its new product development efforts.

The Far West also provided strategic marketing assistance and helped Ling develop a relationship with a major automobile manufacturer and freight car manufacturer. Finally, the Far West helped Ling develop a strategy for accessing Asian markets through its Affiliate Export Small Business Development Center. Ling expects to realize increased employment and sales as a result of these efforts.

Texas Company Commercializes SBIR-Developed Water Purification Technology

Funded by an Air Force SBIR, Lynntech Incorporated, of College Station, Texas has developed a method for advanced ozonation that has already attracted some interested customers. The Air Force wanted to develop a method to clean organically-contaminated groundwater. In response to this need, Lynntech developed a cost-effective and efficient electrochemical-based ozone generator to generate high concentrations of ozone for water purification. Ozone is an attractive means to purify water because it disinfects much better than other chemicals, including chlorine. The portable technology is less expensive than existing methods and can produce either small or large amounts of ozone making it adaptable to industrial or home applications. Lynntech has built a prototype that fits in the bed of pickup truck for easy transportation to contaminated sites.

Lynntech worked with the Mid-Continent Technology Transfer Center (MCTTC), the RTTC for the Mid-Continent region to explore the commercial potential of its ozonation technology. MCTTC provided marketing and market assessment assistance and submitted Lynntech's ozonation technology to the rigors of the Reinvention Initiative Between Industry and Technology (RIB-IT). RIB-IT, a joint program between the RTTCs and the Federal Laboratory Consortium, is a multi-step market assessment process to evaluate the commercial potential of federally-developed technologies. Lynntech's ozone generation was one of 12 technologies out of 118 deemed most promising for commericalization. Because of its inclusion in the book 'The RIB-IT Views' Lynntech has received inquiries from more than 30 sources interested in commercializing its device.