The USAF Manufacturing Technology

Program Status Report

Air Force Research Laboratory / Materials & Manufacturing Directorate /
Manufacturing Technology Division / Wright-Patterson AFB, Ohio
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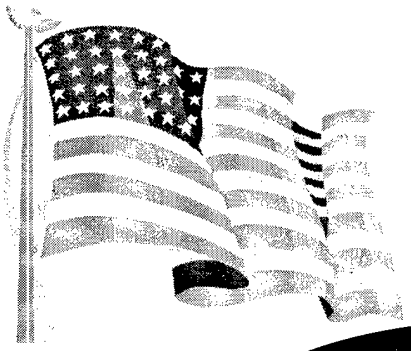

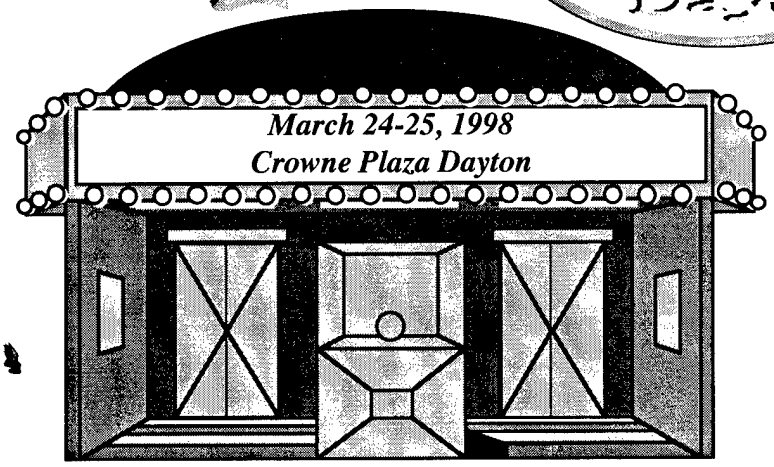

Spring 1998

Manufacturing Technology USAF

The Materials and Manufacturing Directorate's Manufacturing Technology Division is preparing to host its annual Industry Days event, March 24-25, at the Dayton Crowne Plaza Hotel. The theme of this year's event is, "The Rewards of Change."

In this issue:

Manufacturing Assembly Pilot project compresses lead time in supply chain

Project Engineer:
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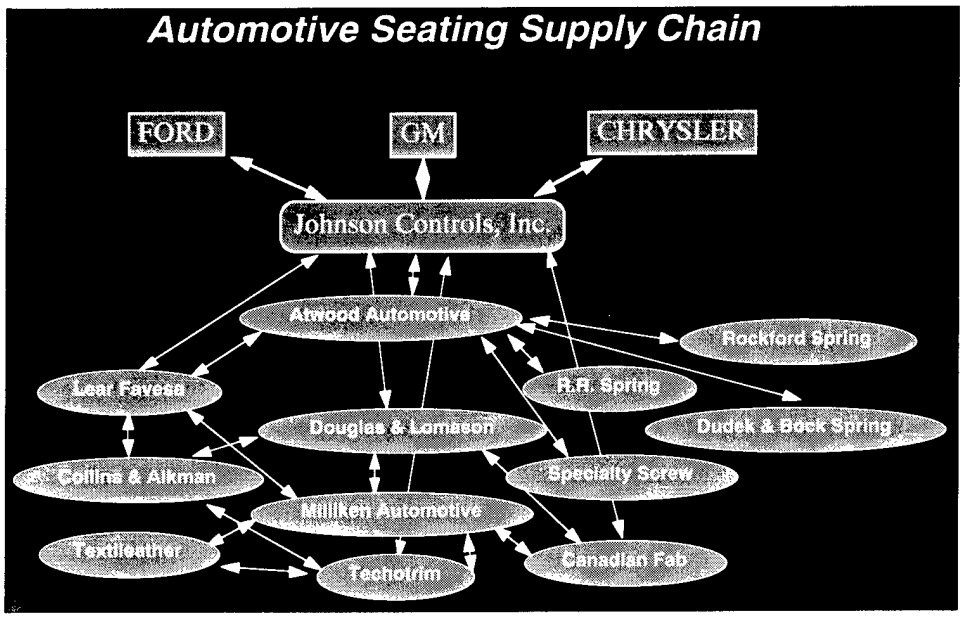
Cooperative Agreement Number:
F33615-95-2-5518

For more information, circle Reader Response Number 1

Under the Manufacturing Assembly Pilot (MAP) project sponsored by the Defense Advanced Research Projects Agency (DARPA) and managed by the Materials & Manufacturing Directorate, the Automotive Industry Action Group (AIAG) improved the flow of material and information up and down the automotive seating supply chain. The MAP project reduced the time it took an order to go from one of the Big-Three automobile companies down to the lowest tier of the seating supply chain, from 28 days to 11 days, a 58 percent reduction.

With 50 percent of a typical supplier's costs contained in its supply base, the ability of the lower tier suppliers to meet requirements such as just-in-time delivery and reconfigurable electronic data interchange, is a critical factor for a cost-effective and agile manufacturing capability. For lower tier suppliers, scheduling information is often late or inaccurate and large inventories are carried just in case there is a problem. Little or no communication exists between suppliers, and this, coupled with the problems mentioned above, leads to high costs in premium transportation, obsolete material and unplanned changeovers in manufacturing. Material flows because suppliers have a "whatever it takes" attitude and the cost of doing business in this way is buried in the supply chain. This is considerably different than at the first tier. In the case of Johnson Controls Inc., world-class practices now exist between the original equipment manufacturer and the first tier supplier. Single-piece flow manufacturing is in place for the seats, which are delivered in sequence so they can be unloaded and installed directly as cars or trucks move along the assembly line. Inventories are almost nonexistent in this environment, quality is high, and material is moved to the next manufacturing operation "just-in-time." Distorted or truncated information can increase cost in the form of "just-in-case" inventories, premium freight and unplanned production changeovers. The use of an electronic system of commerce has also increased the accuracy of that information. The MAP improvements are a result of a cooperative agreement jointly funded by the Defense Advanced Research Projects Agency and the AIAG, which focuses on developing improvements in material flow to build a strong manufacturing support infrastructure for automotive and aerospace industries.

The Manufacturing Assembly Pilot project has created specific, quantifiable improvements in the flow of material and information within the automotive industry seating supply chain, while increasing the speed and quality of this flow and reducing costs. Lead time was reduced by 58 percent and error rates were reduced by 72 percent. Implementing the results of this project throughout the entire United States automotive supplier network is expected to save $1.07 billion. It also provides technologies and business practices that will lead to improvements in material flow within the aerospace industrial supply chain.



Lean Implementation Modular Factory Pilot project becomes joint effort

The Manufacturing Technology Division's (ManTech) Lean Implementation Modular Factory Pilot project received a funding boost recently, when the Naval Research Laboratory (NRL) got involved and turned the project into a joint effort.

The NRL sent $222,000 to ManTech to offset the demonstration production run of C-Band microwave power modules for use in the Navy Cooperative Engagement Capability program. A memorandum of understanding between Air Force Research Laboratory and the Navy has been signed to facilitate this arrangement. The F-15 System Program Office also expressed interest in these demonstrations, and will begin discussions with ManTech soon.

The Lean Implementation Modular Factory Pilot project stimulates the adaptation and implementation of lean production principles for the design and manufacture of military products. Winning production practices benchmarked by the Lean Aircraft Initiative are articulated for defense use by the members of that consortium. Within this pilot initiative, ManTech manages an effort with Northrop Grumman Electronics and Systems Integration Division (NG-ESID) to demonstrate vastly reduced cost and cycle time for the design and production of militarily critical electronic warfare components.

ManTech's Modular Factory for Electronic Warfare Component Manufacturing program provides a business and technical foundation for the design and manufacture of highly engineered military electronics in very small lot sizes. Electronic warfare products are constantly in need of upgrade, however, each customer demands slightly different requirements, necessitating a business paradigm and technical infrastructure that support lot sizes of one or two at a time while maintaining profitability. This program baselines the existing processes employed in the design and manufacture of microwave power modules (MPMs), a key building block of electronic warfare systems. NG-ESID offers several different varieties of MPMs and is building specific lots during this effort to prove out the benefits of infrastructure enhancements and other lean production improvements made during the program.

The goal of the program is to demonstrate that the lean principles embodied in establishing a factory cell or module, as seen in commercial industry, enable affordable production of MPMs in small lot sizes. This production demonstration will allow NG-ESID to show this affordability for a run of MPMs of a type and quantity particular to the Navy Cooperative Engagement Capability program. The affordability objective is to design, produce, test, and deliver the specified lot of MPMs at 50 percent of the baseline cost. This data, coupled with the specific test data generated from the MPMs, will be used to determine the further applicability of an MPM-based solution for the Navy. The program will provide the Space and Naval Warfare Systems Center (SPAWARSYSCEN) San Diego with sufficient test data pilot information to determine if immediate implementation of baseline hardware changes is appropriate, or if additional qualification testing is required.

Under the Memorandum of Understanding, ManTech will team with the SPAWARSYSCEN San Diego, with participation by the NRL, to identify specific requirements for a hardware demonstration, recommend additional improvements, and collect data on the benefits of changes made.

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Cooperative Agreement Number:
F33615-95-2-5564

For more information, circle Reader Response Number 2

Design and solidification modeling project saves money, time for spare parts delivery

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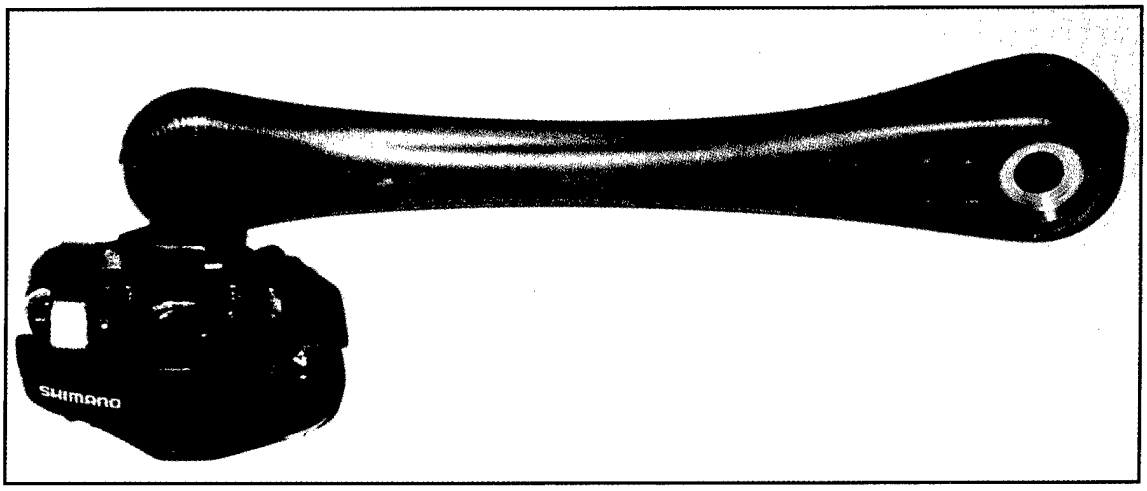
Contract Number:
F33615-95-C-5547

Through a project managed by the Materials & Manufacturing Directorate, Metal Matrix Cast Composites Inc., developed a process to integrate design and solidification modeling into a near absolute net-shape casting production machine. Components begin as computer assisted design solid models and are sent via a communications link to Oak Ridge National Laboratory for finite element analysis and solidification analysis. The data is then sent back to a computer numerical control at MMCC for mold creation and finally cast to near absolute net shape.

With help from Northeastern University and Oak Ridge National Laboratory, MMCC incorporated computer aided design, manufacturing, and engineering tools and customized solidification capabilities into Advanced Pressure Infiltration Casting (APIC™). The rapidly prototyped castings produced by this technology hold extremely tight tolerance with zero shrinkage and will meet the designer's intent, while needing little of the compensation normally associated with traditional casting processes. MMCC analyzed and modeled solidification from data taken in real time, integrating their design and analysis system to ISO-STEP standards, providing universal acceptance of industry-wide data to their system. A demonstration component (a bicycle crank designed and developed for a mountain racing team) which includes net-shape tapers, threads, and holes was manufactured. The cycle from the time the customer established the requirement to the time the prototype product was delivered was reduced from 120 days to 5 days, while the weight of the part was reduced by 10 ounces and its strength was increased 150 percent. This technology will benefit the Air Force by decreasing the delivery time for parts needed in the field and reducing the cost of producing both simple and complex formed products. MMCC is involved in APIC technology applications to the electronics industry, automotive industry and heavy equipment manufacturers. This technology is being applied in the electronics, automotive (auto and trucking), aerospace (airframe and propulsion), marine (engines), and sporting goods industries, where high performance materials are required at low cost. Greater integration will make the process more flexible and prototyping will be more rapid and more representative of true large scale manufacturing. The Defense Advanced Re-

For more information, circle Reader Response Number 3



A bicycle crank created as the demonstration component under this contract.

search Projects Agency and the Navy have awarded a contract to develop this technology as an on-board part production facility. ManTech will participate in this and is studying APIC technology impact in differrent component production environments and in applications for small parts production.

This project demonstrated that near-absolute net-shape parts can be made at low cost using APIC technology. Aluminum alloys, steel, copper, and superalloys have all been cast with reinforcements yielding outstanding strength and stiffness values. This technology will decrease delivery time for parts to the field and reduce costs of producing both simple and complex formed parts.

Materials & Manufacturing Directorate Roadmap Review coming this summer

The Air Force Research Laboratory Materials and Manufacturing Directorate (ML) will host its annual Roadmap Review July 14-16, in the Dayton Convention Center. The purpose of the review is to provide direction and guidance to the defense materials and manufacturing community. Leaders from academia, industry, and government agencies will be in attendance to hear the directorate engineers discuss program accomplishments, present planning activities and future new starts.

The event will be hosted by the ML Director, Dr. Vincent J. Russo, who will provide a complete overview of the Directorate. Dr. Russo will give a progress report on the recent organizational changes, and will discuss the Directorate's mission to help industry maintain an affordable defense materials and manufacturing capability in an era of downsized budgets.

The Review will be devoted to future plans and projects. Each of the directorate's major thrusts will be examined with an eye to plans and strategy. For more information contact the Universal Technology Corporation, (937) 426-2808.

1997 Defense Manufacturing Conference draws leaders from government, industry

By Persis Elwood
Manufacturing Technology Division
Materials & Manufacturing Directorate

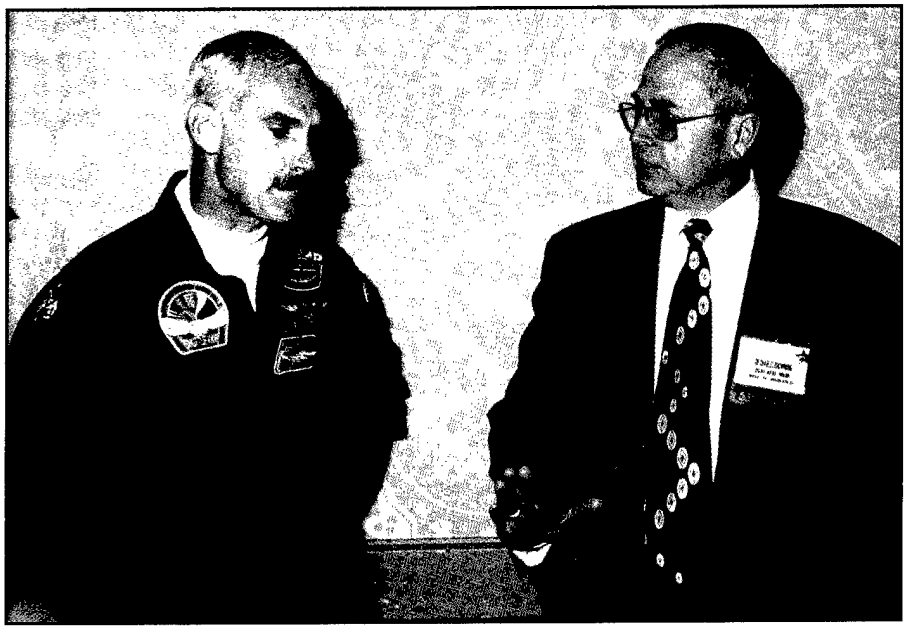
More than 830 representatives from the government, academia, and industry gathered in Palm Springs, Calif., recently, for the 1997 Defense Manufacturing Conference.

The Manufacturing Technology Division (ManTech) of the Air Force Research Laboratory was host for the Joint Defense Manufacturing Technology Panel-sponsored event, which took place Dec. 1-4, at the Palm Springs Convention Center and the Wyndham Palm Springs Hotel. The theme of this year's conference was "Building Partnerships for the 21st Century."

The Assistant Secretary of the Air Force (Acquisition), Arthur L. Money, was the Air Force keynote speaker for the event. Other general session speakers included Acting Deputy Under Secretary of Defense (Logistics), Roy R. Willis; the Navy Acquisition Reform Executive, Daniel Porter; Dale Adams, Office of the Secretary of the Army (Research, Development and Acquisition); and Donna Richbourg, Acting Deputy Under Secretary of Defense for Acquisition Reform.

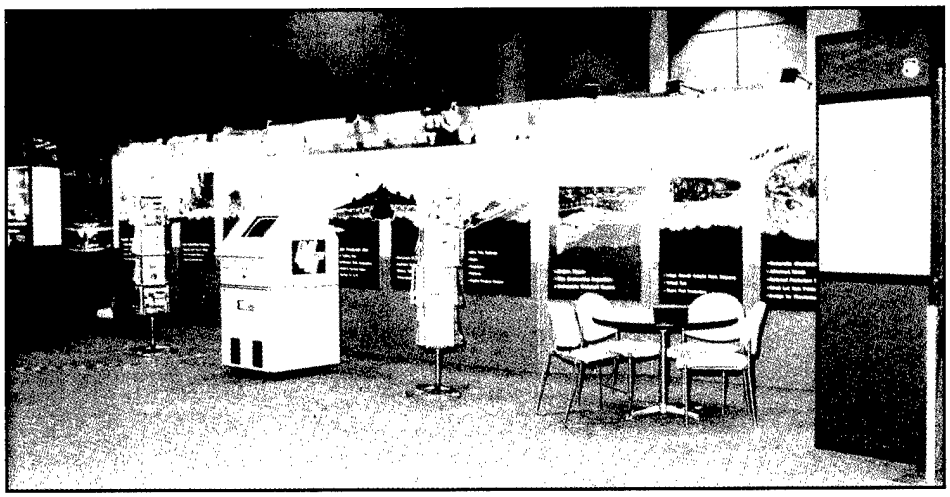
DMC '97 provided an overview of defense manufacturing, which included detailed discussions related to various manufacturing initiatives, sustainment programs, and current technology thrusts. Perspectives and information about critical DoD manufacturing technology initiatives were exchanged and the status of industry and government programs was presented with a vision for the future of defense manufacturing and industrial modernization.

Seventy-five government and industry exhibits were on display for the duration of the conference. The ManTech display played a prominent role, highlighting current programs which reduce weapon systems cost and enable advanced performance. Much of the conference centered around technical sessions and mini-symposiums, which addressed metals processing, composites processing, electronics processing, manufacturing and engineering systems, advanced industrial practices, and several special topics.



Dr. Charles E. Browning, Chief of ManTech, speaks with NASA astronaut Capt. William F. Readdy, (U.S. Naval Reserve) during a luncheon at DMC '97. Captain Readdy was one of the guest speakers.

As conference host, Dr. Charles E. Browning, Chief of ManTech, gave welcoming remarks and set the stage for the multiple panel sessions which took place during the general sessions. Thomas Batterman, Deputy Director of Logistics for Air Force Material Command, participated in the



The ManTech display at DMC '97 was quite prominent.

"Reengineering the Workplace" panel, presenting success stories in the logistics environment.

Anthony Bumbalough co-chaired the mini-symposium for Electronics Processing and Manufacturing, and moderated a session on Commercial Integration and Obsolescence.

John Barnes moderated an Electronic Commerce session and co-chaired a mini-symposium on Manufacturing and Engineering Systems. Ron Bing led a session on The Internet and Its Future Direction and Impact on the Defense Manufacturing Enterprise, while Brian Stucke moderated a session on Virtual Enterprise Engineering Applied to Spare Part Acquisition.

Dan Brewer led a session on Flexible Sustainment Options, and also gave a presentation on Lean Sustainment, while Art Temmesfeld spoke on future initiatives in Lean Space. John Cantrell was part of a panel looking at The Lean Enterprise - Roadblocks and Detours, and also led a session on The Lean Enterprise - Do or Die, which included a presentation by Dr. James Womack, one of the authors of *The Machine That Changed The World.*

A session on Supply Chain Management and Integration - Progress and Continuing Challenges, was moderated by Michael Hitchcock. Pat Price also spoke on the supply chain, looking at Forging Links to Affordable Multi-Missile Manufacturing Success.

Diana Carlin chaired a mini-symposium on Composites Processsing and Fabrication, and led a session on Affordable Composite Applications. Mary Kinsella guided a speakers panel on Expanding the Use of Commercial Items - Barriers and Benefits, and Marvin Gale chaired a mini-symposium on other topics of interest. A session on Technology Transfer was guided by Robert Rice, while Walt Spaulding co-moderated a session on Gee Whiz Technologies.

Brench Boden chaired a mini-symposium on Advanced Industrial Practices and participated in a poster session on Modular Factory for Electronic Warfare Component Manufacturing. David See also addressed Large Aircraft Robotic Paint Stripping in a poster session.

A former director of the C-17 Systems Program Office, Lt. Gen. Ronald T. Kadish (now commander of Air Force Electronic Systems Center), moderated a panel on Life Cycle Cost Reduction. Former commander of Air Force Materiel Command, General (Ret) Ronald W. Yates, and former commander of Air Force Logistics Command, General (Ret) Earl T. O'Loughlin, participated on a Senior Statesman Panel. Other presenters included: Assistant Deputy Under Secretary of Defense for Dual Use and Commercial Programs, Michael F. McGrath; Joint Air to Surface Standoff Missile Program Director, Terry Little; Joint Strike Fighter Program Technical Director, Frederic Schwartz; and Director of Technology Transfer for the Office of the Secretary of Defense, John Todaro.

Production laser peening workstation demonstrates robustness, reliability

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Contract Number:
F33615-96-C-5624

Under a contract with the Air Force Research Laboratory's Materials and Manufacturing Directorate, LSP Technologies Inc., has developed a state-of-the-art laser peening workstation. The objective was to design and fabricate a robust, reliable, laser shock peening cell capable of meeting the near term production goals of the Air Force, while providing for the introduction of laser shock peening to other commercial markets.

The lifetime of turbine engine airfoils is of major importance to the Air Force, commercial engine manufacturers, and commercial airlines. Foreign object damage (FOD) and high cycle fatigue are serious concerns since they can result in the destruction of the engine, loss of aircraft, and possibly loss of life. Several fatigue life enhancement techniques are currently in use on airfoils and other structures, most notably shot peening or glass bead peening. These techniques impart compressive residual stresses to a thin layer of the surface of the airfoil. If the compressive residual stresses can be driven deeper into the surface, the fatigue life enhancement would be even greater. One way this can be accomplished is by using a high-energy laser pulse to generate shock waves which propagate from the surface into the material, which is a process called laser peening. It provides an alternate fatigue life enhancement method that could possibly be used in cases where the use of other methods do not impart the desired fatigue resistance.

This project was divided into three sequential phases. Phase I (17 tasks) was a six-month effort to resolve outstanding technical issues associated with the laser components, solidify the final design, and develop final system specifications. Phase II (six tasks) was a ten-month effort which focused on acquisition, assembly and subsystem check-out. Phase III (four tasks) was a two-month effort for system check-out and performance characterization.

The technology used in this project has a broad range of possible applications. If accepted by the aerospace community, laser shock peening has the potential to increase the detectable blade damage threshold from 5 mils (thumbnail) to 75 mils (visible range), thereby decreasing repair costs by not having to change out blades as frequently. It also resulted in a four-fold improvement in fatigue strength over untreated, damaged blades.

This project demonstrated the robustness, reliability, and operational readiness of an industrial grade laser system for laser shock processing, and integrated it to an enclosed robotic work station. The technology used in this complete laser shock processing facility will be transferable to commercial applications.

For more information, circle Reader Response Number 4

PRISSM assessments enable small/medium-sized manufacturers to reduce costs, push towards world class manufacturing status

The Program for Regional Improvement Services for Small Manufacturers (PRISSM) Manufacturing Assessment Service closes the "competitiveness gap" for small and medium sized companies by systematically evaluating their current practices against many of today's world class business and manufacturing techniques. Over 50 businesses have had PRISSM assessments accomplished so far in the Ohio region, and each have had unique, individual success stories. For example, a Fairfield, Ohio company of 425 people expects a gross savings of more than $200,000 on just one of their six nozzle assembly lines the first year, due to improvements made following a PRISSM assessment.

Under a contract with the Manufacturing Technology Division, PRISSM has been fully developed and tested in the Ohio region. The PRISSM vision is to catalyze subtier suppliers towards achieving world class manufacturing capability in regions rich in companies critical to Air Force manufacturing. The process links manufacturers with regional resource providers to help assure implementations and enable continuous process improvement. PRISSM providers work closely with Air Force prime contractors to help ensure a robust subtier industrial base.

Weapon system affordability relies on reducing the total cost of the system. Between 40 and 60 percent of the cost of a manufactured system comes from subtier suppliers. The PRISSM process links manufacturers with suppliers in an effort to reduce these costs. Once a company has decided to accomplish a PRISSM assessment, field experts spend from three to five days on-site. They conduct interviews, review data, and use other techniques to assess the company's goals, strengths, and constraints within each key department. A management team brief is held following on-site activity to discuss and present the team's findings along with potential opportunities for cost effective improvements. Implementation assistance is also available to provide support for any projects identified. PRISSM was originally conceived in the early 90's by the former Air Force Manufacturing Technology Directorate in response to a study of subcontractor needs. The process was developed over a period of five years and is being migrated into other areas. Los Angeles was chosen as another potentially high payoff region in which to implement this program for DoD suppliers. A regional team has been formed and assessments began in late 1997.

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(937) 255-7278

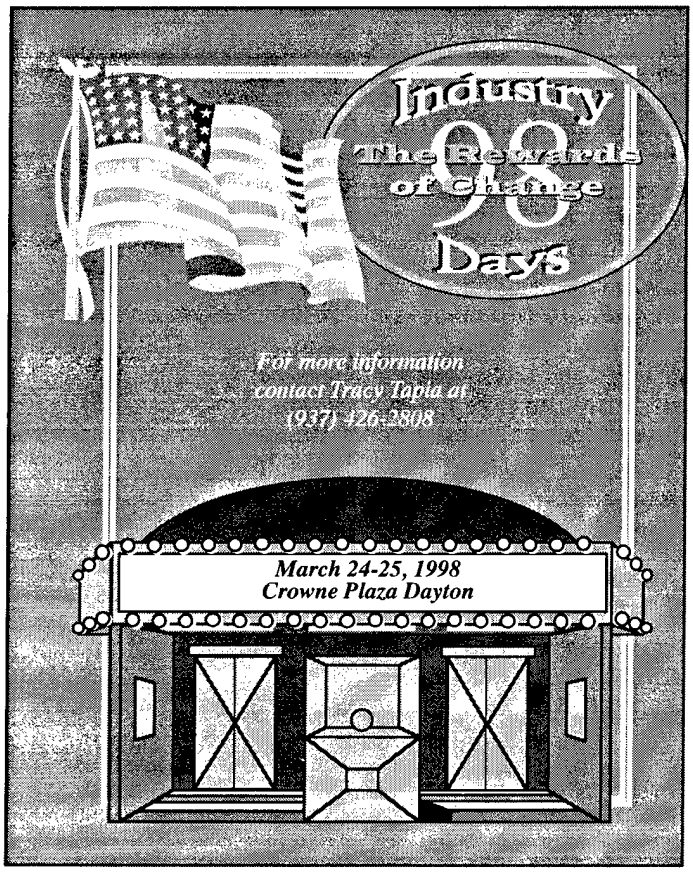
For more information, circle Reader Response Number 5

Directorate holds fourth annual Industrial Base Pilots Industry Days

The Air Force Research Laboratory Materials and Manufacturing Directorate will hold its fourth annual Industrial Base Pilots Industry Days event March 24-25, at the Crowne Plaza Hotel in Dayton, Ohio.

The Industrial Base Pilot (IBP) programs have been demonstrating changes in the acquisition and manufacture of military hardware by focusing on business practices, commercial-military integration, and the lean enterprise. Beyond what many studies and analyses have indicated, the IBP programs have shouldered significant risk to demonstrate the cost benefits of changing how the DoD does business. Industry Days provides a forum for the Air Force Manufacturing Technology (ManTech) Program to share these piloted concepts and associated results with our government, industrial, and academic partners.

The theme for Industry Days '98, *The Rewards of Change*, highlights results and implementation success stories from the IBP Team in its final year of hosting this event. The pilot programs, most of which will be completed this year, will showcase business practice, manufacturing infrastructure, and process technology concepts which can potentially be used throughout the defense acquisition community. Many of these best practices have been transitioned from the laboratory environment to major production programs and are helping to define the roadmap for future programs. Industry Days '98 provides an opportunity to learn about these concepts, to hear other success stories from defense and commercial companies, and to preview other ManTech efforts. Engineers, program managers, contract managers and financial managers will all benefit from this two-day conference.



Industry Days '98 has an informative and entertaining two-day agenda that includes a success stories panel discussion, findings and recommendations from the pilot programs, and two outstanding speakers. Syndicated columnist Mr. D.L. Stewart from the Dayton Daily News, will be the luncheon speaker on the first day. Mr. Fred Stahl, the Director of Technology for the Boeing Company, who was so well received at last year's Industry Days, will be back again as the luncheon speaker on the second day.

For more information or to register, contact Tracy Tapia at Universal Technology Corporation, (937) 426-2808.

Engine Supplier Base Initiative seeks reduced costs, improved processes

The Engine Supplier Base Initiative (ESBI) is a joint Air Force/industry cooperative agreement designed to reduce the cost of investment cast airfoil and large structural components for man-rated gas turbine engines. This is accomplished through a reduction in cycle time and non value-added activities with an accompanying increase in quality brought about through the application of lean practices.

Air Force ManTech representatives will brief this initiative at two upcoming events. The first is the Aerospace Manufacturing Technology Conference & Exposition, being held June 2-4, in Long Beach, Calif., and sponsored by the Society of Automotive Engineers, Inc. They will also make a presentation at the AeroMat '98 Conference & Exposition, in Fairfax County, Va., June 15-18. This event is sponsored by the Aerospace & Defense Industry Sector of the American Society for Metals International.

Affordability has become of paramount importance in the DoD. To date, the majority of the acquisition reform activities have focused on government/prime issues. However, the majority of the cost (and potential for savings) is found at the supplier level. ESBI directly addresses this supplier issue. By 1999, military aircraft engines will account for 15% of the total aircraft engine sales. Of that 15%, investment castings make up 30% of the cost of an engine. The ESBI program focuses on cost reduction activities at the casting supply base by addressing both process technology and business practice issues.

The ESBI pursues technology and business process improvements which are common across the government/OEM/supplier sector. The program is a cooperative agreement between Howmet Corporation and the Air Force Research Laboratory's Materials and Manufacturing Directorate. Five other companies are linked to the program through a collaborative arrangement with Howmet. ESBI successfully pulls together the resources of three major engine manufacturers, one air frame manufacturer, and the two primary suppliers of precision investment cast airfoils and large structural castings. Under ESBI, competitors cooperatively work together to resolve common, non-proprietary issues which can positively impact the cost, quality, and delivery of military engines/airframes for the U.S. government.

The initiative seeks to identify and implement opportunities for eliminating waste in manufacturing operations by the implementation of lean practices affecting the cycle time of production components. The goal is to establish new manufacturing methods through operational innovation, organizational adaptation, and process variability reduction.

The ESBI will establish the methodology and mechanisms by which the diverse components of an industry sector can cooperatively work together to solve technical and business problems common to the industry and to develop an ongoing mechanism for continuous improvement.

ESBI Participants

Air Force Research Laboratory
Allison Engine Company
General Electric Aircraft Engines
Howmet Corporation
Lockheed - Martin Aeronautical Systems
Pratt & Whitney
Precision Castparts Corporation (PCC)

Project Engineer:
Siamack Mazdiyasni
AFRL/MLMP
(937) 255-2413

Cooperative Agreement Number:
F33615-95-2-5555

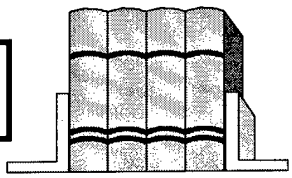
For more information, circle Reader Response Number 6

END OF CONTRACT FORECAST

DATE	PROJECT TITLE CONTRACT NO.	PRIME CONTRACTOR	POINT OF CONTACT
March 1998	Developing a Flexible Mandrel and Semi-Flexible Tooling for the Fabrication of Integrated Composite Structures F33615-97-C-5152	Wright Materials Research Company Beavercreek, OH	Kenneth Ronald (937) 255-7278
March 1998	Porous Sol-Gel Derived Ceramic Release Agent F33615-97-C-5155 TPL Incorporated	TPL Incorporated Albuquerque, NM	Marvin Gale (937) 255-7278
March 1998	Low Cost Flip Chip MDA972-95-3-0031	National Semiconductor Corporation Santa Clara, CA	Charles Wagner (937) 255-2461
March 1998	Labor Infrastructure for Agile High Performance (AHP) Transformations F33615-95-C-5512	Work & Technology Institute Washington, DC	Paul Bentley (937) 255-7371
March 1998	Activity-Based Costing for Agile Manufacturing Control F33615-95-C-5516	Industrial Technology Institute Ann Arbor, MI	Cliff Stogdill (937) 255-7371
March 1998	Development of an Adaptive Laser Imaging Tool for Large Area Flat Panel Display Mask Generation & Maskless Patterning F33615-94-C-4441	Polyscan Incorporated Tucson, AZ	Charles Wagner (937) 255-2461
March 1998	Minnesota Consortium for Defense Conversion F33615-94-2-4417	Minnesota Technology Incorporated Minneapolis, MN	Cliff Stogdill (937) 255-7371
March 1998	Improving Manufacturing Processes in Small Manufacturing Enterprises (SMEs) F33615-94-2-4418	Higher Education Mfg Process Applications Consortium, St Cloud, MN	Cliff Stogdill (937) 255-7371
April 1998	Small Flat Panel Displays	Multiple Contractors	John Blevins (937) 255-3701
April 1998	Design Information Retrieval Using Geometric Content F33615-96-C-5615	Virage Incorporated San Mateo, CA	Theodore Finnessy (937) 255-4623
April 1998	Process Web: Process-Enable Planning & Composition of an Agile Virtual Corporation F33615-96-C-5604	Intelligent Systems Technology Incorporated Los Angeles, CA	Cliff Stogdill (937) 255-7371
April 1998	Enhanced Pultruded Composite Materials F33615-96-C-5629	Rust College Holly Springs, MS	Vincent Johnson (937) 255-7277
April 1998	Responsible Agents for Product/Process Integrated Development (RAPPID) F33615-96-C-5511	Industrial Technology Institute Ann Arbor, MI	James Poindexter (937) 255-7371
April 1998	Flat Panel Displays Multiple	Boeing Company St Louis, MO	John Blevins (937) 255-3701
April 1998	Flat Panel Displays Multiple	US Army, PM NV/RSTA Fort Belvoir, VA	John Blevins (937) 255-3701
April 1998	Flat Panel Displays Multiple	Chrysler Technologies Waco, TX	John Blevins (937) 255-3701
April 1998	Flat Panel Displays Multiple	James Grunder & Associates Incorporated Kansas City, KS	John Blevins (937) 255-3701

DATE	PROJECT TITLE CONTRACT NO.	PRIME CONTRACTOR	POINT OF CONTACT
April 1998	Flat Panel Displays Multiple	Allied Signal Aerospace Company Fort Lauderdale, FL	John Blevins (937) 255-3701
April 1998	Flat Panel Displays Multiple	Boeing Company St Louis, MO	John Blevins (937) 255-3701
April 1998	Flat Panel Displays Multiple	United Technologies Corporation, Sikorsky Aircraft, Stratford, CT	John Blevins (937) 255-3701
May 1998	Large Area Pulsed Laser Deposition (PLD) & Intelligent Process Control for Production Applications F33615-96-C-5834	PVD Products Bedford, MA	David Conrad (937) 255-8786
May 1998	Affordable Tooling for Composite Structures F33615-97-C-5144	Production Products Manufacturing St. Louis, MO	Vincent Johnson (937) 255-7277
May 1998	Titanium Metal Matrix Composites (TiMMCs) Title III	Titanium Matrix Composites Turbine Engine Components Consortium	Phil Tydings (937) 255-3701
May 1998	Composite Manufacturing Process Control System (CMPCS) F33615-96-C-5627	Assembly Guidance Systems Woburn, MA	Diana Carlin (937) 255-7277
May 1998	Infrared Focal Plane Array/Flexible Manufacturing F33615-93-C-4320	Texas Instruments Incorporated Dallas, TX	P Michael Price (937) 255-2461
May 1998	Laser Forming for Flexible Fabrication F33615-95-C-5542	Rockwell International Corporation Canoga Park, CA	Rafael Reed (937) 255-2413
May 1998	Fast and Flexible Design and Manufacturing Systems for Automotive Components and Sheet Metal Parts F33615-94-C-4428	Massachusetts Institute of Technology Cambridge, MA	George Orzel (937) 255-4623
May 1998	Military Products Using Best Commercial/Military Practices F33615-93-C-4334	Boeing Company, Aircraft Division St Louis, MO	Kenneth Ronald (937) 255-7278
May 1998	Fast and Flexible Communication of Engineering Information in the Aerospace Industry F33615-94-C-4429	Massachusetts Institute of Technology Cambridge, MA	George Orzel (937) 255-4623
May 1998	Virtual Test (VTest) F33615-93-C-4308	Lockheed Martin Corporation, Federal Systems Owego, NY	Daniel Lewallen (937) 255-7371
June 1998	Advanced Fasteners for Low Cost Airframe Assembly & Repair F33615-98-C-5108	Materials Analysis Incorporated Dallas, TX	Marvin Gale (937) 255-7278
June 1998	Advanced Casting Technology for Low Cost Composites F33615-97-C-5143	Waukesha Foundry Incorporated Waukesha, WI	Marvin Gale (937) 255-7278
June 1998	Manufacturing Simulation Driver (MSD) F33615-96-C-5609	Raytheon Company, Missiles Systems Division Tewksbury, MA	John Barnes (937) 255-7371
June 1998	Metal Forming Tool Design F33615-96-C-5107	FEM Engineering Los Angeles, CA	Marvin Gale (937) 255-7278

Reports



Active Matrix Pixel and Line Defect Detection Technology (AMLCD In-Process Test Manufacturing Equipment)
Alog Number: 3913
Contract Number: F33615-92-C-5809
Technical Report Number: WL-TR-95-8036
Accession Number: B208367
Distribution: LIMITED

Dynamic Polymer Composite Connectors for Affordable Composite Structures
Alog Number: 3906
Contract Number: F33615-96-C-5622
Technical Report Number: WL-TR-97-8001
Accession Number: B221773
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An Adaptable Enterprise Integration Platform for Flexible Manufacturing
Alog Number: 3900
Contract Number: F33615-94-C-4415
Technical Report Number: WL-TR-96-8008
Accession Number: B216845
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Development of a Commercial Multiple Degree of Freedom Measurement System
Alog Numbers: 3899
Contract Number: F33615-95-C-5551
Technical Report Number: WL-TR-96-8040
Accession Number: B220330
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Integrated Design & Solidification Modeling
Alog Number: 3898
Contract Number: F33615-95-C-5547
Technical Report Number: WL-TR-96-8036
Accession Number: B219988
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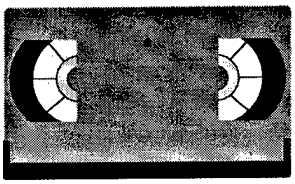

Videos

Design and Manufacture of Advanced Thermoplastic Structures (DMATS)
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Abrasive Waterjet
Alog Number: 99
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The USAF Manufacturing Technology

PROGRAM STATUS REPORT

Spring 1998

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