Manufacturing Technology Acceleration Centers (M-TAC)

The Long Island Forum for Technology (LIFT), one of ten MEP Sub-recipient Centers within New York State submits this response to the National Institute of Technology (NIST) Request for Information on the new Manufacturing Technology Acceleration Centers (M-TAC). LIFT's response focuses on the technical and business challenges small and mid-sized manufacturers have in transitioning their development and production capabilities to the application of transformative composite materials and processes. With the adoption of composite materials exponentially increasing in many market segments across the US economy, domestic capacity to meet tomorrow's production demand is woefully short emphasizing the need for the manufacturing supply base to be expanded. LIFT believes such expansion is urgent, necessitating acceleration and assistance from the government in areas of coordination, information exchange, education, workforce development, and most importantly access to skilled mentors and facilities that will hasten a company's entry into composite technology.

In 2012, New York State granted LIFT $15,000,000 to establish the Advanced Materials and Manufacturing Technology Innovation Center (AMMTIC). The AMMTIC Center will permit companies looking to advance beyond metal manufacturing or to develop new business areas to contract for the technical expertise, tools and resources needed to design and fabricate prototypes made from composite materials without the significant up-front capital investment. These prototypes will be applied across diverse industry sectors critical to the nation's economy including aerospace, infrastructure, transportation, energy and others. Companies will be exposed to educational institutions who are working closely with AMMTIC to develop curriculum and provide courses for tomorrow's technicians and engineers skilled in the design and manufacture of composites.

AMMTIC will also compliment university research by providing an "at-scale" prototype capability for applied research. It will promote and foster research and development of new cutting edge manufacturing technologies in Advanced Composites, Intelligent Materials, Micro Machining and Manufacturing Process Modeling and Simulation. It will encourage the gathering and interaction of scientists, technologists, and inventors in the pursuit of the advancement of scientific and technological knowledge to accelerate the transfer of technology and ideas, to test and validate products and to educate manufacturers, their workforce and the public on technology and manufacturing processes for Composite Materials.

The AMMTIC facility will be outfitted with a comprehensive inventory of conventional and automated composite process equipment. The facility is currently being built out with a full operational capability planned by mid-2014. With this as a backdrop, LIFT respectfully provides our AMMTIC views and experiences to the challenging questions being posed by NIST's M-TAC concept.

Question-1: What are the specific types of technology transition and commercialization tools and services that should be provided by M-TACs? Emphasis is on the alignment of these tools and services with the most pressing needs of small and mid-sized U.S. manufacturers.

For decades, Long Island manufacturers have demonstrated great success in producing critical aerospace components for world-wide OEMs. Surprisingly today, over 76% of the region's manufacturers employ less than 25 staff. Most are contract producers possessing little ability to develop new products and processes. As well, they have limited access to growth market knowledge and rising technology needs. This situation is not unique to Long Island. For these reasons, LIFT recommends M-TACs provide a comprehensive suite of manufacturing support services aligned specifically on a vital technology subject area and its associated growth market OEMs and supply chains. This focus will allow the M-TAC to:

- Facilitate an innovative and progressive growth culture that can assist small businesses understand how to implement organic innovation processes and tools. Access to best practices and hands-on training required by OEM defined needs.

- Build and exchange market knowledge through conferences, technical associations, hands-on training and distribution of published materials. Methods must maximize the use of social media tools and web-based information exchange.

- Identify and facilitate technology partnerships with research institutions, business and industry associations, market research, workforce skills development, production manufacturing and testing resources.

- Provide access to manufacturing process experts for support in design, analysis, tooling, manufacturing methods, test and product compliance assistance. Assist companies in understanding Manufacturing Readiness Levels. The available staff should be subject matter experts with recognized credentials in the technology marketplace. In the case of AMMTIC, we have access to an experienced cadre of composite technologists from the aerospace and defense industry that will assist in design, development and quality assurance of prototype components and assemblies.

- Provide access to specialized manufacturing equipment that would otherwise be unaffordable and/or unavailable to a small business or university. The equipment would include the upfront design support (CAD stations, analysis software, 3-D printers) assisting companies to create electronic models and rapidly prototype their concepts. Access can be provided directly through M-TAC owned facilities or indirectly through established partner relationships. For AMMTIC, composite prototyping equipment is owned by the Center and provided to the individual company for use on a fee-for-service basis. Use of equipment would include expert technical support for safe and efficient operations. Refer to the attached List of Major AMMTIC Equipment and Capabilities (page 7).

- Provide access and personal introductions to funding and investment resources that understand small business technology needs and can assist in capitalization efforts. This includes referrals to state's economic development assistance programs and partners.

a) How would M-TAC services complement the services currently offered by MEP Centers?

LIFT considers the NIST M-TAC goals to be highly consistent and complimentary with MEP program services. This very alignment encouraged the 2007 establishment of AMMTIC focusing on the specific growth need for composites manufacturing. AMMTIC will be an excellent example of how an MEP Center can cooperate and function as a full-service Manufacturing Innovation Center. LIFT as the MEP, provides company alignment for establishing an innovative culture, process improvement and capacity growth while AMMTIC provides development and prototype services for rapid product development. MEPs also provide well established partnerships with research, education, and economic development entities allowing alignment and leverage with industry and regional needs.

M-TAC efforts will afford MEP an efficient method to deepen market penetration into small businesses not normally reached. While engaged with the small business, the MEP would gain better insight into specific company needs for innovation, direct assistance for growth services, factory expansion, and process improvements in quality, and lean operations – all potentially leading to increased MEP service business.

Question-2: What role should future M-TACs play with respect to supply chain needs? How should OEMs participate? How can industry associations, professional societies, and other appropriate national organizations participate?

M-TACs should play a significant role in fulfilling supply chain needs. LIFT believes the primary M-TAC role would be to provide practical hands-on support and training for a small business to enter and sustain itself within the supply chain. It should act as a concierge for knowledge and practical understanding of the marketplace and its requirements, husbanding the small business to success.

In order to achieve OEM participation, an M-TAC would need to be appropriately integrated within the fulfillment strategy of the OEM needs. This would include areas such as technology development, contractual compliance, partnerships, and future product innovation needs. Intimate knowledge between the M-TAC staff and the OEM will be critical and will take time to establish. Once accomplished, the M-TAC will be able to affect both the supply and demand sides of the supply chain equation creating success for all stakeholders.

- OEM's should provide endorsement for M-TAC efforts relating to it as an extension of their supplier outreach and development efforts. An M-TAC should be offered active participation in OEM strategic discussions both for supply chain insights and a resource for OEM success.

- Provide access to specific OEM technology roadmaps, identifying areas where small business discretionary R&D efforts may be best placed to ensure OEM technology needs are met and to help position small businesses on the right course for success.

- OEM's should provide sponsorship for events and conferences as a demonstrable indication to small businesses that the M-TAC is viewed as an active and respected member of the supply chain development structure.

Similarly, industry associations, societies and organizations could play a significant role. First, they should endorse an M-TAC's role to their constituents, promoting small business growth through engagement with the M-TAC. Secondly they can provide M-TAC with outreach through opportunities for prominent positions at national and local conferences and technical presentations.

For example, AMMTIC was faced with the challenge to engage a wider national audience while owning and operating a physical facility and equipment on Long Island. AMMTIC recognized the need to collaborate across geographically diverse organizations - being virtual in terms of its operational availability and use outside of New York, yet physical in terms of providing tangible assets to develop and manufacture prototypes. AMMTIC's key to success was the familiarity of LIFT's engaged and experienced Board of Directors. Through their efforts, the AMMTIC Center began establishing cooperative relationships with partners who are nationally recognized composite leaders. Initial partnerships were established with the South Carolina Research Authority (SCRA) in Charleston South Carolina, and the National Composites Center (NCC) in Dayton Ohio. Together, we are pursuing ways to align efforts toward advancing common mission objectives to help promote and expand the use of composites across all industry sectors of our national economy. AMMTIC's participation with SCRA and NCC has greatly expanded its outreach and better positioned it for national success.

Question-3: Is there a particular long-term scalable and financially sustainable business model that should be implemented by future M-TACs that will enable small and mid-sized U.S. manufacturers to effectively access and benefit from the technology transition and commercialization assistance and other resources they need?

A sustainable business model that can generate retained asset growth for future investment is undoubtedly one of the most challenging hurdles an M-TAC will need to overcome. Government investment in capital is necessary but is insufficient to ensure long-term viability of operations. At the same time, M-TACs will desire to support as many small businesses as possible on a national scale without overburdening the client's projects with large administrative costs. LIFT suggests that a balanced cost model would endeavor to maximize financial support from sponsors / OEMs, minimize the service cost burden to the small businesses, while leveraging state and federal monies to the greatest extent.

The AMMTIC business model reflects the upfront state investment in capital equipment by minimizing the resulting cost burden to the small business client. Further, it attempts to separate fixed from variable costs for accounting and pricing purposes. AMMTIC will provide staff and equipment resources to companies on a fee-for-service basis. Client costs will be project dependent and will be determined on a case by case basis. Small business client projects for prototype development tasks would typically involve short engagements and may only be burdened by the variable costs of the project's operation. Larger scale development efforts

typically requiring a longer period of time and multiple design and fabrication cycles may be burdened with both the variable costs and a portion of the fixed operating expenses.

Additionally, AMMTIC envisions a "Contract Support" relationship to be established with OEMs. In this relationship, primes would commit an agreed upon amount of yearly support funds to AMMTIC in return for usage time of the facility. Such funds would be the primary source of fixed expense coverage. Prime facility usage may either consist of their individual use for development purposes (off-loading of R&D work), or their co-sponsoring of supply chain training and development within the AMMTIC facility (supply chain development / mentor-protégé program).

The AMMTIC business model will also actively seek research funding through grants, contracts, and other cooperative agreements.

a) Because of the programmatic connection to the NIST MEP Program, M-TACs may require cost share. Are there cost share models for future M-TACs that promote scale up to reach nationally dispersed clusters of small and mid-sized manufacturers? If so, what are those models, and why might they be successful?

LIFT recommends that no cost-share requirement be levied. If required, a record of actual capital equipment usage may be reported as cost share.

b) The generation of intellectual property is possible, and even likely as a result of M-TAC operations. What types of intellectual property arrangements and management constructs would promote active engagement of industry in these pilots, especially among small and mid-sized U.S. manufacturers that would be supportive of the business model? As appropriate, please include a set of potential options, and please explain your responses.

AMMTIC's initial business model recognizes multiple sources of IP development and will clearly document expectations prior to small business engagement. Generally, AMMTIC does not envision taking an IP ownership stake in products or processes developed by a company and its staff within the facility. In the case where AMMTIC provides the client project with specific IP owned by AMMTIC or an engineering discovery performed by AMMTIC personnel, an IP arrangement would be generated. AMMTIC does envision establishing a fair royalty relationship with small businesses on their future product success resulting from AMMTIC's contribution to the companies' commercialization efforts.

Question-4: How should an M-TAC's performance and impact be evaluated? What are appropriate measures of success for future M-TACs? Please explain your response including the value of the performance measure to business growth.

An approach similar to the current MEP Client Survey Process could be adapted to address M-TAC performance and impact. The current survey tool addresses the quantitative client impact measures of service type, increased sales, jobs created, clients helped, service satisfaction, etc. The survey mechanism could be further adapted to address development process measures such as product development service provided, duration, contract value, technology advancement

(manufacturing readiness level), products transitioned into production, anticipated sales growth, etc.

Supply chain measures would also need to be established. These could include information about OEM's served, relationships and their objectives, activities accomplished towards specific goals, specific clients served within the supply chain and at what level of service, future outreach plans, etc.

A specific OEM survey may be appropriate to record their assessment of M-TAC support. Measures may include activities accomplished towards specific goals, supply chain improvements achieved including responsiveness, strategic participation, training, diversity development, M/WBE growth, cost effectiveness, implementation of developed technologies into production equipment, increased automation, etc.

Question-5: Are there any other critical issues that NIST MEP should consider in its strategic planning for future M-TAC investments that are not covered by the first four questions? If so, please address those issues here and explain your response.

LIFT applauds NIST's RFI process and search for smart ideas and best practices before establishing M-TACs. In LIFT's opinion, a large issue is whether an M-TAC should be an all-purpose resource for small business innovation and manufacturing support across a broad array of technology areas, or rather a resource more focused on a singular manufacturing technology area such as the case for AMMTIC and composites. The latter requires significant connection with national partners and OEM supply chains across the nation to ensure success.

Major AMMTIC Equipment List and Capabilities		
Type of Equipment	**MFG**	**Size**
Automated Fiber Placement Robotic System	Automated Dynamics	Capable of producing a 5ft dia. X 10ft long complex contoured part using thermo-set or thermoplastic material
Filament Winding	TBD	Capable of producing a 5 dia. X 8 meter long tube or cylinder
Compression heated presses (Two Systems)	Wabash	250 ton with a 48"x 48" platen and a 100 ton with a 18"x18" platen, both 800 def F.
Hand Layup in a Class 100,000 clean room	Gerber Technologies	1200 sq ft of Class 100,000 equipt with 6ft wide Single Ply Automated Cutting system with laser guided temples
Vacuum Assisted Resin Transfer Molding System (VARTMS)	TBD	
3D Printers	Statrasys	Work volume of 16" x 16' x 12", various composite processing material
Autoclaves , Small	Bondtech	8ft dia.x 20 L, 450 def F at 165 psig
Autoclaves , Large	Bondtech	5ft dia. x 8ft L, 800 deg F at 300 psig
Walk-In Oven	Wisconsin	6ft w x 14ft L, 800 def F
Batch Oven	Wisconsin	4ft Cube, 1000 def F
Walk-In Freezer, storage of composite materials	Tafco & Tyson	10 ft w x 14 ft long, Temp of -10 def F
Test & Inspection equipment	Various	Such as CMM and Ultrasonic testers