Expanding and Innovating Utah’s Advanced Materials Manufacturing Community: Strategies for Accelerating the Resurgence of Manufacturing Jobs

A programmatic strategy to further strengthen the virtuous cycle of development underlying Utah’s advanced materials economic ecosystem

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Introduction

This proposal puts forth a series of programmatic efforts aimed at assuring growth and sustainability of one of Utah’s most remarkable manufacturing clusters. The Advanced Materials Manufacturing (AMM) industry in Utah represents a virtually complete supplier network of over fifty companies. Examples include Hexcel, Inc., producing carbon fibers; ENVE and HyperComp supplying finished products to the sports and energy markets; and Fortune 500 companies Boeing, Excelis and ATK, producing parts for the world’s aerospace industry. The supplier network also includes various companies such as Janicki Industries and Barnes Aerospace that support the cluster with specific machining and tool manufacturing. Additionally, Utah is home to Hill Air Force Base, which houses the Air Force Center of Industrial Excellence for Low-observable, Stealth Aircraft Structural Composite Materials. With over 40,000 jobs, Utah’s AMM cluster is one of the highest concentrations of this industry in the nation. Utah’s AMM cluster contains a notable sub-expertise in carbon composites, an industry responsible for over 15,000 jobs in Utah.

This proposal builds on Utah’s highly successful cluster-based economic development strategy and encompasses the foundational elements of a strong economic ecosystem, including Workforce and Training, Supplier Network, Infrastructure/Site Development, Trade and International Investment, Operational Improvement and Capital Access, and important in this age of ever-increasing competition, Research and Innovation.

Beginning with the strategic missile programs of the 1950s, Utah has grown one of the highest concentrations of AMM companies in the nation. Currently, Utah’s market footprint in this industry is truly global with our companies supplying national and international companies and markets. Regionally, the AMM industry covers nearly 30% of the counties in Utah and is served by educational programs in eight universities and regional vocational/technical colleges.

The Global Market for Advanced Material Manufacturing - Carbon Composites

Like all advanced materials the global market for carbon composites is robust, projected up to 17% growth annually to over $7B annually. This market has significant foreign competition especially from Asia-Pacific nations. In fact, Japan holds roughly 70% of the market in fiber production. With the recent acquisition of US-based fiber manufacturer Zoltek Cos. by Japan-based Toray Industries, the manufacturing of both high-tow and low-tow fiber is largely based in Japan with US companies Hexcel and Cytec holding only 13% of the market. The innovation story is even less encouraging. In the years 2005-2010, Japanese companies accounted for 71% of the patents awarded in the field of carbon fiber production and application; US companies accounted for less than 20%. This important industry is in need of a US resurgence.

Investing in Manufacturing Community Partnerships (IMCP) - The Utah Advanced Materials Manufacturing Cluster
Assessment of Local Industrial Ecosystem

**Location Quotients for the Advanced Materials Cluster:** Utah has a strong base in advanced materials as demonstrated by an establishment LQ of 1.19 and employment LQ of 1.14, which are the 12th and 14th highest in the nation, respectively. The AMM cluster is Utah’s 7th largest cluster for employment. 

Utah also has strengths in industries that are closely aligned with advanced materials, including aerospace and transportation, outdoor recreation and athletic equipment, and metal manufacturing.

**Aerospace and Transportation:** In Utah, technologies in traditional aviation and aerospace are increasingly relying on advanced materials. This has led to companies such as Boeing, Excelis and ATK establishing manufacturing operations in Utah to produce composite aircraft parts. Utah’s aerospace establishment LQ is 1.44 (7th highest in the nation) in Aerospace Products and Parts Manufacturing (NAICS 3364).

Additionally, Utah has an establishment LQ of 1.45 (16th highest in the nation) in Other Transportation Equipment Manufacturing (NAICS 3369). This industry includes the manufacture of military vehicles and tanks, as well as bicycles and bicycle parts.

**Outdoor Recreation and Athletic Equipment:** Utah also has a strong industry cluster in outdoor recreation. Companies in this industry are increasingly looking to advanced materials to refine and differentiate their products. A growing number of these companies are re-shoring their manufacturing operations. For example, DPS Skis in Ogden, Utah re-shored manufacturing in 2013. In this cluster Utah has an establishment LQ of 1.38 (6th highest in the nation) in Other Miscellaneous Manufacturing (NAICS 3399), which includes the manufacture of sporting and athletic goods.

Specifically, Utah has an employment LQ of 12.36 in Sporting and Athletic Goods Manufacturing (NAICS 339920).

**Metal Manufacturing:** Finally, Utah has maintained strengths in metal manufacturing industries, which overlap with and support advanced materials in research, workforce, and supply chain. Utah has establishment LQs of 1.29 in primary metal manufacturing and 1.2 in fabricated metal manufacturing clusters.

**Advanced Materials Manufacturing - A Utah Strategic Cluster**

In 2005 Utah Governor Jon Huntsman initiated Utah’s Economic Cluster Initiative including the Defense and Aerospace cluster, which, in turn, included the Utah AMM cluster. Utah’s AMM cluster strategy focused on three key objectives:

**Economic Ecosystem:** Building an effective private/public partnership to create a supplier network to support gaining market share nationally and internationally
- Building an awareness at the municipality level of the local needs of its AMM companies,
- Identifying and filling immediate gaps in the AMM supplier network,
- Building a networked community around AMM

**Market Development:** Creating a global awareness of Utah’s significant capabilities in AMM through strong representation at major international shows.

**Workforce Development:** Aligning the technical colleges and community colleges with industry in building a workforce to staff the rapidly growing needs of the AMM cluster.

The strategy was very successful helping the AMM/carbon composites cluster to grow from 6,000 jobs to over 15,000; over 25% of Utah’s overall AMM employment.

Expanding the Strategies - **Making Utah’s AMM Cluster Uniquely Competitive**

While Utah’s current success is significant we have an enormous amount of unrealized potential. It is critical that Utah establish programs to maintain and extend the advantages we have achieved in developing a strong economic ecosystem, workforce, and market position. In
this proposal we offer strategies addressing lacking components in our current cluster and supporting achievement and sustainment of both our current and future objectives. In brief:

**Workforce and Training:** We propose strategies 1) Aimed at better alignment across Utah's noncredit and credit education program, through new Innovation Centers and a consortium of training institutions, 2) Increasing hands-on training for undergraduate students, 3) A rural program to incentivize movement of workforce to rural markets, and 4) Accessing non-traditional populations to supplement the AMM workforce.

**Infrastructure/Site Development:** We offer a strategy to enhance our infrastructure via the siting of regional Innovation Centers focused on a holistic view of innovation, operational improvement, and workforce training. Our plan uses existing transportation infrastructure and strategic construction to optimize construction and operational costs.

**Supplier Network:** To create an even higher level of supplier network integration we propose an in-depth assessment of our current supplier network. We also propose developing instruments for building a significantly more integrated supply chain, including:
- Formally creating the nonprofit industry organization – the Utah Advanced Materials Manufacturing Initiative (UAMMI)
- Developing a strategy to extend the Utah Manufacturing Association’s (UMA) database for better access Utah's supplier network
- Proposing a strategy for capability and gap assessment, plan formulation, and program expansion that will leverage groups such as GOED, Utah Commercial Research Group, and Grow Utah in growing the depth and utilization of Utah's supplier network

**Operational Improvement and Capital Access:** We have developed a strategy, and gathered partners, to build an “access to capital” model that includes early stage innovation funding through venture and venture debt capital vehicles. This program will leverage federal, state, private, CRA programs, and strategic industry investment.

We will also engage assorted programs in Operational Improvement including a program aimed at drawing Utah’s AMM SMEs into Manufacturing Extension Partnership (MEP) programs with a regional Innovation Center at Utah Valley University (UVU).

**Research and Innovation:** We propose a strategic plan to recruit teams of university-level, best-in-class researchers to work together with industry to feed the innovation needs of the AMM cluster. These teams will align with federal research opportunities in advanced materials. We also propose the creation of a pooling and direct cross-licensing strategy for handling IP encouraging market specific usage of innovations.

**Trade and International Investment:** Our work in this area aligns very closely with our proposed work in building our Supplier Network. Corporate recruitment, market alignment, and Gap/Capabilities Assessment strategies will align with our proposed market research component to inform the cluster on strength and weaknesses with regard to growing our Supplier Network to fit national and global markets.

**About This Proposal**

In building this proposal, Utah’s advanced materials, aerospace, and sports equipment manufacturing communities have collaborated with the state’s university research system, technical training system, and government to design a programmatically-defined strategy or ‘roadmap’ to position Utah’s AMM cluster as an international leader. This roadmap will help not only Utah, but the US to face a nationally declining leadership position in an industry important to the future of transportation, infrastructure, and our military.

This proposal is designed to provide Utah with a roadmap built from strategies for accelerating the resurgence of manufacturing jobs in the AMM cluster. This roadmap is also built to look toward aligning Utah’s strategies with federal opportunities in collaboratively building manufacturing communities.
Implementation Strategy Description
The strategic and tactical plans presented within the Implement Strategy Description were vetted during several meetings with industry including four industry advisory board meetings under the efforts funded as part of the University of Utah’s Investing in Manufacturing Communities Partnership Implementation Strategy Grant. As such, these plans are well-supported by the AMM community as shown by the accompanying letters of support.

Workforce Development
Data from the Department of Workforce Services (DWS) show the AMM cluster workforce enjoys compensation rates averaging 57% higher than other non-farm employers. While this state data reflects excitement and optimism surrounding trends in advanced manufacturing, industry employers continually point to general observations such as:

- Inaccurate perception of the nature of work in today’s AMM cluster
- A serious shortage of skilled talent at technician level employment as well as a shortage of related industry jobs including, engineering and STEM related occupations

In response, UAMMI will establish a comprehensive framework for workforce development and education, which builds on an existing foundation of strong programming in the sector, responds to specific skill gaps identified by industry, and includes strategic public/private sector partnerships which support talent recruitment into AMM employment.

Current Capability: Institutions within the Utah System of Higher Education (USHE) as well as the Utah College of Applied Technology (UCAT) system and workforce development entities are positioned to support AMM industry training and education. Recent large grants from the Depts. of Labor (DOL), Education (USDE), Energy (DOE), and the National Science Foundation (NSF) have allowed USHE and UCAP institutions, workforce entities, and their industry partners to develop strategic manufacturing infrastructure, and devote resources to the identification and creation of workforce oriented training. The Utah Cluster Accelerator Partnership Project (UCAP) initiative has provided $1,132,060 to these partners in funding to support these institutions as they:

- Develop responsive, industry-driven education and training systems to provide a skilled talent pipeline (short- and long-term capacity)
- Create and implement best practice partnerships, strategies, and models that best support talent and economic growth needs of Utah’s key industry clusters

Institutions within the UCAT system such as Ogden-Weber Applied Technology Center (OWATC), and Davis Applied Technology Center (DATC) provide entry level noncredit technician training and certification while USHE institutions such as Salt Lake Community College (SLCC), Weber State University (WSU) and Utah Valley University (UVU) provide both noncredit and credit bearing certifications and programs through accelerated level studies. Additionally, USHE-based institutions have articulated agreements which provide a smooth transition from SLCC’s preparatory programs to upper division coursework at receiving institutions. Finally, through state legislative support, Utah enjoys the ability to create a noncredit to credit “stackable credential” model which allows integration of UCAT and USHE noncredit short term training to a credit-bearing academic pathway within USHE institutions, see figure on next page (and detailed figure in appendix 4).

Current Institutions for Improving Capacity: Because of defined workforce mission, best practice examples of public/private partnerships, etc., the following institutions will act as a consortium to improve capacity for workforce development in advanced materials manufacturing:
Core institutions for noncredit technician level training

**Salt Lake Community College**: Utah’s only comprehensive community college providing transfer, work-ready, and noncredit applied technology training and provides targeted industry training to service area employers and is recognized by Hexcel, Boeing, and smaller employers within the service region for its premier composites certification program.

**Ogden-Weber Applied Technology College**: OWATC is one of eight campuses in the UCAT system focused on entry-level noncredit manufacturing technician training with specialties in machining, welding, and Non Destructive Testing and Inspection (NDT/I).

**Davis Applied Technology College**: DATC provides entry-level noncredit manufacturing technician training and targeted industry training to service area employers. Focused on composites, automation, and robotics.

Core institutions for credit-bearing undergraduate engineering and manufacturing related programming (see Comprehensive Institutional Workforce Profile in appendix 5).

- SLCC: Manufacturing and engineering academic certificates and two-year degree programs
- Weber State University (WSU): Manufacturing and Engineering technologies
- University of Utah (UofU): Engineering, Composites, Aerospace Engineering, Computer Science/Engineering
- Utah State University (USU): Engineering, Composites, Aerospace Engineering, Computer Science/Engineering
- Utah Valley University (UVU): Manufacturing and Engineering technologies

Identified Gaps

Industry has identified the following as critical gaps in achieving both short and long term workforce development goals for their organizations:

- Need for composite materials training for entry- and intermediate-level fabricators and assemblers
- On-going shortage of skilled and certified CNC machinists and welders
- Advanced or “super technician” certification programs for composites, automation, industrial technician employment tracks
- Lack of hands-on project design and/or industry internships for undergraduate students studying related engineering or manufacturing technologies

Investing in Manufacturing Community Partnerships (IMCP) - The Utah Advanced Materials Manufacturing Cluster
Limited student and faculty access to research, innovation, and new technology application for undergraduate and certificate seeking students

Plan

To increase capacity and reduce identified gaps, the above institutions will be identified as **Excellence in Manufacturing Education/Innovation Centers** (see Regional Centers of Excellence, appendix 6). These Centers will be integrated into regional innovation centers to:

- Lead a statewide effort to coordinate comprehensive linkages for their respective regions, ranging from noncredit/credit technical training, apprenticeship, two-year, and baccalaureate degree programs. This programming will adopt nationally recognized MSSC certification standards
- Provide correlated skill assessment of career readiness through Work Keys, a NAM-endorsed career readiness tool adopted by Utah as part of the state’s inclusion in the Work-Ready communities initiative
- Use skill assessment to direct long-term unemployed workers as well as recently dislocated workers to immediate training opportunities and job placement within the industry
- Provide assessment and a model for prior learning experience to support Veteran training and placement as civilians in related job categories
- Provide educational infrastructure for new employee and incumbent worker training to companies in the advanced materials sector
- Support a long-term k-12 pipeline in STEM-related education, and
- Offer entrepreneurial support to SME companies needing prototyping and business development assistance and training

Each Center will have a clear focus for both leadership and support in well-defined technical area(s); e.g., advanced composites materials, testing and inspection, robotics and automation, and rapid prototyping.

**Increasing rural workforce in the AMM cluster:** The more rural counties have a problem in growing manufacturing industries, especially those underpinned by technology such as the AMM cluster. Efforts to develop a new sector in rural counties suffer from the chicken-and-egg problem. A prerequisite to starting a business in a new location is the presence of an appropriately trained workforce, yet how can rural governments direct specialized training if there are no businesses locating in their area?

There is an opportunity before us to crack this particular egg.

Garfield County is one of the most rural counties in the State of Utah, and among the poorest. Garfield’s primary economic sectors are travel/tourism and agriculture. While these sectors are the economic foundation of the region and important to Utah’s economy, they generally create jobs that are low paying, not benefited, and seasonal (see figure). We will, in collaboration with Garfield County, work to establish a student loan program for students from Garfield County who study advanced materials at an institution within the state. The student loans will be forgiven if those students return to Garfield County and start a business focused on advanced materials or take employment with a similar business. To finance these start-ups we propose creating a loan

![Figure: The unemployment rate in Garfield County, Utah.](image)

This graph shows the extreme seasonality of Garfield’s economy. Breaking the chicken-and-egg problem could help to stabilize economies in rural areas like Garfield County.
fund for establishing businesses in AMM in this rural area. With the National Parks and Monuments in the vicinity of Garfield county we suspect it is possible to attract, with available workforce and capital, manufacturers in the AMM/sports equipment manufacturing industry.

Such a program would kickstart economic development in Garfield County and further the IMCP’s goal of developing advanced materials businesses within the state. We propose working with the USDA in aligning this strategy with their Rural Business Enterprise Grant (RBEG) Program.

**Increasing human capital availability:** We propose to enhance the availability of human capital for the AMM cluster by increasing participation of non-traditional and traditional workforce. Working with industry we will design programs aligning with several federal initiatives including: Department of Labor’s Women in Apprenticeship and Nontraditional Occupations (WANTO) Technical Assistance (TA) Grant, Face Forward 2 - Intermediary and Community Grants, H1-B Ready to work program, YouthBuild, and, of course, NSF’s REU program with the universities and proposed innovation centers.

**Conclusion**

Through a design, implementation, and evaluation strategy, the Centers will meet the following objectives of the proposal (see Workforce Training Phases, appendix 7).
- Create an industry/education partnerships which can respond with agility and flexibility to provide industry-driven workforce education and training
- Establish career and education pathways aligned with national and portable certification standards
- Accelerate training in prioritized areas to create certifications for marketability and career mobility; e.g., extending undergraduate engineering programs to include industry-endorsed and credit-bearing internships providing “hands on” exposure and project design elements.

Achieving the above objectives through investment in UAMMI provides increased opportunity for Utah to build on a foundation as a nationally recognized leader in AMM training and education and supports a national manufacturing “renaissance” agenda.

**Workforce Development Cost Benefit Analysis**

**Executive Summary:** With industry input, the workforce development component of the UAMMI addresses four general observations surrounding the skill gaps in the advanced materials manufacturing industry including lack of certified CNC machinists, advanced certifications for composites, automation, and industrial technician employment tracks, hands-on projects for undergraduate engineering students, and faculty access to innovation. The UAMMI proposes to remedy these deficiencies by relying on frameworks already established within the USHE, UCAT system, and workforce development entities. A summary of this project component can be found in the table below.

<table>
<thead>
<tr>
<th>Current Status/Baseline &amp; Problem to be Addressed</th>
<th>Change to Baseline/Alternatives</th>
<th>Type of Impacts</th>
<th>Population Affected by Impacts</th>
<th>Economic Benefit</th>
<th>Summary of Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identified gaps: certified CNC machinists and welders, advanced manufacturing certificates, hands-on projects for undergrad engineering students, and faculty training</td>
<td>Develop and implement super technician certificate, develop a practical application project as part of undergrad engineering programs, and create train/train for faculty</td>
<td>Improved assessment of high demand technician position, work-ready graduates for engineering-related occupations, and teaching faculty trained in latest innovation</td>
<td>Adult learners, veterans, dislocated workers, underserved populations, K-12 STEM Pipeline, and regional university, community college, and applied technology colleges</td>
<td>Job growth in high demand areas of the sector and cost savings of training dollars spent by manufacturers</td>
<td>Industry-endorsed certification standards for technicians, industry driven faculty training, and advanced manufacturing job creation and fulfillment</td>
</tr>
</tbody>
</table>
Summary of Costs and Benefits Involved: The associated costs of the project will be as follows:

1. Assessing and developing potential sites for locating certification programs.
2. Developing curricula using the efforts of two industry related subject matter experts and two academic experts from identified institutions.
3. Reassigning chosen faculty towards the project efforts.
4. Determining and applying training and tuition costs at each innovation center.
5. Providing institutional support through the Department of Workforce Services (DWS).

Despite the cost, if the job placement is achieved over the three years of project and maintained, the potential economic benefit could be significant. In the end the NPV of the project would be approximately $101 million, the detailed analysis can be found in appendix I.

Infrastructure/Site Development
Utah has a 50-year history in the AMM industry with an infrastructure and transportation system that has grown with the cluster. From transporting people and raw materials to reaching international markets, Utah’s infrastructure is built to manufacture and export.

Current Capabilities:
Transporting Workers
The 2002 Winter Olympic Games motivated a dramatic upgrade of Utah’s transportation systems. Utah has continued to expand I-15, added lines to the light rail system (TRAX), and built the FrontRunner commuter rail connecting the entire Wasatch Front.

I-15: In the State of Utah, Interstate 15 runs north–south through the state, passing through the majority of the state’s population centers, including St. George, Provo, Salt Lake City, and Ogden, the latter three being part of the urban area known as the Wasatch Front, the majority of the state’s population resides along its corridor. Since the 2002 I-15 Corridor Reconstruction Project UDOT and USDOT have continued to update and expand the I-15 corridor with major projects both north and south of Salt Lake City including the replacement of 63 bridges and 10 freeway interchanges.

The Utah Transit Authority (UTA)
UTA operates a fleet of buses and paratransit vehicles, vanpools, light rail vehicles, and commuter rail cars and locomotives in a 1,600 square mile service area that stretches over six counties from Payson to Brigham City. The UTA serves the largest segment of population in the State of Utah and operates in one of the largest geographical service areas of any transit agency in the US.

Ridership on the rise: Although 70% of UTA riders have access to a car, people continue to choose transit as a viable transportation option. Ridership increased by 3% in 2012, reaching an all-time high of 42.8M boardings. TRAX ridership increased 14%.

Transporting Goods
Utah is a central location to the major western cities and states with one- to two-day access to half the nation’s population. Salt Lake City is a hub for air, ground and rail distribution located almost equidistant from all major western US markets and offers a full-service customs port of entry.

Highways and Ground Freight: Utah’s road system includes distribution arteries of I-15, I-80, I-70, and I-84, over 700 trucking companies and 2,500 registered carriers that provide one- and two-day direct service to any point in the continental western US.

Rail: Utah’s 1,700 miles of railroad track converge in the Salt Lake-Ogden metropolitan area. The main lines link Utah to major sea ports such as Los Angeles, Oakland, Portland, and Seattle. The state’s location makes for an excellent interline switching route for shipments destined for...
West Coast or Eastern and Midwestern main terminals without the need to back haul shipments.

**Air Freight:** Sixteen cargo carriers handle more than 550M pounds of air cargo and airmail annually. Air cargo volumes within the state have grown at an average annual rate of 9%.

**Air Travel:** Salt Lake City International Airport (SLCIA) served 20M passengers in 2012 ranking it as the 26th busiest airport in North America and the 64th busiest in the world. In 2012, there were 328,130 takeoffs and landings. SLCIA is a hub for Delta Air Lines. Seven airlines and their affiliates operate over 700 daily flights to ~89 cities with non-stop flights. There is international direct service to Canada, Mexico, Paris, France, and Tokyo, Japan. A Terminal Redevelopment Program (TRP) will result in a new terminal building and accompanying facilities; completion date for the entire project is 2022.

**Utilities**

**Electric Power**

**Industry Overview:** Utah is ranked 4th in the US for the least expensive electricity across all sectors at an average of 6.99¢/kWh. Utah has the second lowest commercial electricity cost in the US at 6.95¢ per kWh, compared to the nation at 9.85¢ per kWh and the fourth lowest industrial electricity cost in the US at 5.02¢ per kWh, compared to the nation at 6.6¢ per kWh.

**Cities with Municipal Power Companies:** Utah has several municipal power companies offering competitive electricity rates. Utah Associated Municipal Power Systems (UAMPS) is a subdivision of the State of Utah with 53 members consisting of municipal electric utilities and other local government units in Utah and seven other states. UAMPS operates to provide a variety of power supply, transmission and related services to its members.

**Natural Gas**

**Industry Overview:** Utah has among the lowest costs in natural gas in the country with four of the US’s largest oil fields and two of the largest natural gas fields. Utah offers the 10th lowest industrial rate in the nation at $5.49 per thousand cu ft., 30% lower than the national average.

**Energy and the Small Business (SBA Program):**

The Small Business Assistance Program helps small businesses with permitting assistance, emission calculations, technical issues, regulatory interpretation and pollution prevention techniques.

**Site Development**

**Manufacturing Parks/Centers:** With its excellent infrastructure Utah offers many locations to site AMM establishments. Below are three examples of such sites. Two of these are proposed sites for the UAMMI Innovation Centers*.
*Business Depot Ogden (BDO)*: Depot Ogden (BDO) is a 1,118-acre master-planned business park with 500 build-to-suit available acres. BDO has 860,000 sqft. of new construction, 6.5M existing sqft. and 1.8M sqft. of available space. BDO is a vibrant business and industrial park that has undergone significant changes since the transfer to Ogden City in 1997. Currently, the infrastructure investment exceeds $55M dollars. The Boyer Company is one of the largest commercial developers in the Intermountain Region. With over $200M in projects underway, Boyer has the financial strength to obtain financing to facilitate the Depot. The Depot is just 40 min. north of Salt Lake City and the Salt Lake International Airport. I-15 is less than a mile away, and rail service is onsite.

*Freeport Center* is a manufacturing, warehousing, and distribution center located in Clearfield, Utah. The 680-acre (280 ha) Freeport Center consists of 78 buildings, totaling more than 7M sqft. Buildings range in size from 4,000 sqft. to 400,000 sqft.. Most buildings have railroad loading docks and truck loading docks. Approximately 70 companies have manufacturing and distribution facilities in the Freeport Center, including AMM companies ATK and Futura Industries. The Freeport Center’s name is a reference to Utah’s Freeport Law exempting inventory held for sale from property taxes.

**Falcon Hill:** The US, acting through the Secretary of the Air Force, entered into Master Agreements with Sunset Ridge Development Partners (SRDP) as part of the Falcon Hill National Aerospace Research Park Enhanced Use Lease (EUL) Project. This project is designed to allow the DoD to take underutilized property and lease it to a developer for 50 years in exchange for value back. The developer finances, constructs, leases, and operates the commercial buildings. 499 acres are designated at Hill AFB and 51 acres will be added. During the 50-year Master Lease, SRDP will have the option to ground lease the land in stages. The Falcon Hill EUL is projected to be the largest and most financially successful EUL project in DoD history. The development will hold office and research space, supporting retail establishments, restaurants and two hotels and is projected to create over 15,000 jobs.

**Site Selection**

**Select Utah Real Estate (SURE):** SURE Sites, operated by EDCUtah, is Utah’s qualified sites program featuring industrial and office building and land sites designed to meet the needs of relocating and expanding businesses. The database includes some of the best site location opportunities in Utah along with critical information necessary to make sound real estate decisions.

**Foreign Trade Zone**

The Salt Lake City FTZ number 30 is strategically located on 55 acres adjacent to the Union Pacific Intermodal Terminal and in close proximity to the city’s international airport and major interstate highways. These are a few of the reasons the Salt Lake City FTZ can be a strategic location for any company, especially manufacturers.

Key Benefits include:

- Deferral of customs duties helps cash flow and reduces interest costs.
- Direct Delivery which allows quick delivery of goods to the zone.
- Merchandise Processing Fees are capped.
- Elimination of US duty for goods exported to other countries.
- Improved security which reduces theft and lowers insurance costs.
- Inverted tariff savings opportunities

**Identified Gaps**

**Foreign Trade Zone Development:** The Salt Lake Foreign Trade Zone (FTZ) we re-established in 2008, but has had limited development since.
Innovation Centers Aimed at the AMM Cluster
The lack of innovation centers supporting one of Utah’s most strategically important industries is a serious impediment to the growth of this essential industry.

Plans
Transporting Workers
While not specifically planned to alleviate gaps in Utah’s AMM cluster there are ongoing plans that will shore up the underlying infrastructure:

Greening of the UTA fleet: In 2012, UTA ordered 24 compressed natural gas (CNG) buses. These new additions to the bus fleet have lower emissions due to their use of cleaner burning fuel and are more cost-effective to operate. UTA is reducing pollution through replacements of its diesel-powered bus fleet. UTA has already reduced nitrogen oxide emissions and particulate matter by more than 60%. In 2012, UTA improved its mpg performance in its bus fleet, averaging 4.54 mpg over 4.47 mpg in 2011 saving more than 300,000 gallons of fuel.

Energy
Utah Energy Policy: The Utah Department of Energy has created three renewable energy portfolio goals: 1) increase energy efficiency by 20% by year 2015; 2) reduce greenhouse gas emissions to 2005 levels by year 2020; 3) utilities must account for 20% of electric sales from renewable/non-carbon emitting energy source by year 2025. Renewable energy is identified as a key component for Utah’s economic growth.

Example of new polices for Alternative Energy:
2012 Alternative Energy Development Tax Credit Act (S.B.65): This bill updated the Renewable Energy Development Incentive (REDI) so that it would apply to all qualified “alternative” energy resources, which are more broadly defined than renewable energy resources.
2012 Utah Energy Infrastructure Authority (H.B. 137): This bill broadens the applicability of the tax-free bonding mechanism to apply to delivery infrastructure for all forms of responsible energy development.
2013 Cleaner Burning Fuels Tax Credits Amendments (H.B.96): This bill amended corporate and individual income tax credits for cleaner burning fuels.
2013 Sales and Use Tax Exemptions for Sales of a Fuel Cell (S.B.250): This bill created a sales tax exemption for combustion-free natural gas and/or biogas generation facilities, namely fuel cells.

Foreign Trade Zone Development (FTZ)
In collaboration with Salt Lake City, Salt Lake County, GOED, and EDCUtah the UAMMI is proposing to create a plan to leverage Salt Lake City’s FTZ. This plan will focus on concepts of shared warehousing and creating a fourth innovation center designed with information from the Manufacturing Specialties & Capabilities Assessment described in the Suppliers Network section.

Innovation Centers Aimed at the AMM cluster
Three regional Innovation Centers to form a chain of innovation and training involving the Northern Wasatch Front.

Rather than build on university campuses, we have sited multiple Innovation Centers near industry centers of activity aimed at bringing industry, training, applied research, and basic research together. Additionally, we include the state’s applied technology colleges and community colleges as integral management partners in the innovation centers to assure workforce training and development are integrated into the mission of the innovation centers. Additionally, we plan an Operational Improvement Center on the campus of UVU partnered with MEP (see Operational Improvement section).

After careful analysis of industry needs (see AMMI Survey, appendix 8), current educational capabilities/locations, available sites, available public/private transportation, costs of construction/
renovation and matching funding opportunities, we have created a scenario optimized to the goals of this proposal. Addendum 9 is a map of this area indicating the companies and employee densities the site would serve. The table below shows the number of employees within reach of these sites. Our industry survey also showed that a center within 20 miles of a company was well within an acceptable range to be of great use.

The following are the primary needs of industry that we will provide at the IC sites:

<table>
<thead>
<tr>
<th>Site</th>
<th>Buffer</th>
<th>Employees</th>
</tr>
</thead>
<tbody>
<tr>
<td>Business Depot Ogden (BDO)</td>
<td>10 miles</td>
<td>4,968</td>
</tr>
<tr>
<td></td>
<td>20 miles</td>
<td>14,615</td>
</tr>
<tr>
<td>Freeport Center (FPC)</td>
<td>10 miles</td>
<td>12,623</td>
</tr>
<tr>
<td></td>
<td>20 miles</td>
<td>13,808</td>
</tr>
<tr>
<td>SLCC Meadowbrook (SLB)</td>
<td>10 miles</td>
<td>7,871</td>
</tr>
<tr>
<td></td>
<td>20 miles</td>
<td>8,131</td>
</tr>
</tbody>
</table>

Table: Employee densities associated with the three proposed Innovations Centers

1. Research into improved methods:
   a. **Site I**: Advanced composites simulation, modeling and nondestructive testing,
   b. **Site II**: Advanced manufacturing processes, such as; Robotics, melt extrusion of fibers, microwave processing, laser curing, plasma processing, out of autoclave processing, faster cycle times, better repeatability or other innovative manufacturing processes,
   c. **Site III**: Increase in regional workforce development.

2. Training of technicians and “super” technicians and “Training the Trainer”

3. Facilities to provide a nexus for the research universities to interact with industry to apply research discoveries to real world problems.

4. Availability for leasing time on high-end equipment for prototyping and small scale manufacturing (open lab concept)

5. Incubation space for startup companies

**Site I - BDO:** We have chosen to construct a 51,000 SF site (see appendix 10 Letter of Intent and Map). The developer has provided significant incentives (e.g. ground lease reduction totaling ~$1.75MM over 30 years). The preliminary layout of the building (shown in appendix 11) provides training, open lab, incubator, and research space. This facility will focus on NDT/NDI activities. OWATC has agreed to move existing NDI/NDT training programs to this facility and WSU has agreed to move its UCAID to this facility (see appendix 12). The main features of the Site I BDO location are:

1. Central location for many employees and companies; several composites and/or composite related companies already located in BDO
2. Equidistant from USU and UofU
3. Excellent public and private transportation (1 mile from I-15, UTA bus service, 2.5 miles from Frontrunner Rail)
4. Significant locations for expansion in existing low cost space and new buildings

**Site II- Freeport Center, Clearfield Utah:** This site would be an expansion of an existing facility owned and operated by DATC. DATC currently occupies 32,000 SF of space in a Freeport Center building (total building 120,000 SF) where they teach automated manufacturing technologies. We propose this as the ideal location for a robotics development and training center. DATC has agreed to lease UAMMI 28,000 SF contiguous to the existing space for a minimal cost (see appendix 13). This facility will have incubator, research and open lab space. The main features of this location are:
1. Central location for many employees and companies; ATK has a major aerospace manufacturing facility in Freeport Center; under 5 miles to Hill Air Force Base (HAFB).
2. Excellent public and private transportation (2 miles from I-15 exit, UTA bus service, 1.6 miles from Frontrunner service).
3. Potential for startup companies to have low cost lease space in the remaining 60,000 SF of space in the building.

**Site III- Salt Lake Community College-Meadowbrook (SLCC-M):** SLCC-M is an existing site centrally located in Salt Lake County. It currently has advanced composites training programs, but is severely undersized for its activities. SLCC-M provides open lab leasing at night. We propose expansion of the SLCC-M site to meet the industry needs (See appendix 14 for MOU with SLCC). The main features of this location are:
   1. Central location for many employees and companies;
   2. Excellent public and private transportation (<1 mile from I-15 exit, bus service, 1.1 miles from TRAX service)
   3. Relatively low cost to significantly increase capacity both for training and open lab leasing
   4. Existing programs and industry demand as industry density continues to move southward from Weber and Davis Counties

<table>
<thead>
<tr>
<th></th>
<th>BDO</th>
<th>Freeport</th>
<th>Meadowbrook</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cost</td>
<td>$4.5MM</td>
<td>$2MM retrofit of Bay 2</td>
<td>$0.5MM renovation</td>
<td>$7MM</td>
</tr>
<tr>
<td>FF&amp;E</td>
<td>$4MM</td>
<td>$2MM</td>
<td>$1MM</td>
<td>$7MM</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Construction contingencies and inflation</td>
<td></td>
<td>$1MM</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td></td>
<td>$15MM</td>
</tr>
</tbody>
</table>

**Table:** Summary of costs for the three Innovation Centers - Cost include construction/remodeling, furniture and fixtures and equipment (FF&E) budgets. Equipment in Site I will focus on NDT/I, Site II Robotics and continuous manufacturing processes, and Site III training and incubation for regional needs.

**Economic Distress**

As shown in the table below the three Innovation Center sites are all located adjacent to economically distressed communities.xvi

<table>
<thead>
<tr>
<th>Innovation Center Site</th>
<th>2012 Unemployment Rate</th>
<th>Threshold Calculation: Unemployment</th>
<th>2012 Per Capita Money Income</th>
<th>Threshold Calculation: Income</th>
</tr>
</thead>
<tbody>
<tr>
<td>BDO</td>
<td>13.3%</td>
<td>4.0%</td>
<td>$14,421</td>
<td>51.41%</td>
</tr>
<tr>
<td>Freeport Center</td>
<td>6.1%</td>
<td>-3.2%</td>
<td>$17,308</td>
<td>61.70%</td>
</tr>
<tr>
<td>Meadowbrook</td>
<td>10.4%</td>
<td>1.1%</td>
<td>$16,631</td>
<td>59.29%</td>
</tr>
</tbody>
</table>

Note: 2012 5 Year ACS Data; threshold calculation is based on a national unemployment rate of 9.3 and income of $28,051.

The proximity of the Innovation Center sites to economically distressed communities is an opportunity to improve access to training and employment. All three sites will offer training programs through nearby Applied Technology or Community Colleges. The training is intended to develop Techs and ‘Super Techs’ in advanced materials and composites manufacturing. Programs will benefit residents who require retraining or additional training to access certain job opportunities, as well as students seeking a career path.
Programs will be developed at the Innovation Centers to ensure that those who live in adjacent communities benefit from the centers. Programmatic elements may include outreach at local high schools, career fairs, and open houses, as well as scholarship programs. Coordination with industry and the Utah DWS will ensure students receive the training required by local employers, improving their access to job opportunities. Additionally, we will reach to the Dept. of Housing and Urban Development for assistance in planning the development of sustainable and inclusive communities around the increased economic activity of the Innovation Centers in partnership with our partners in development and CRA loan mechanisms.

With these parameters, we would work with the EDA to examine both using our capital access partners to help match EDA construction, non-construction, and revolving loan fund investments under the Public Works and Economic Adjustment Assistance Programs to design funding strategies to implement these Innovation Centers. Once in place we will work with multiple agencies such as NSF and NIST to build “Train the Teachers” programs and work also with the SBA to examine mechanisms such as the FAST program to work with individuals in accessing early business and technology development aid.

Supplier Network

The program aimed at the strengthening and further integrating Utah’s AMM Supplier Network focuses on three areas: 1) Moving the Advanced Composites Working Group (ACWG) into a formal structure as the Utah Advanced Materials and Manufacturing Initiative (UAMMI); 2) Building a higher intrastate utilization of supplier network capabilities and products; 3) Creating a comprehensive understanding of Utah’s current supplier network capabilities and how those capabilities map to current and future markets, and 4) Creating a plan to fill gaps within the network.

Capabilities: The Utah Supplier Network runs from the most fundamental building blocks in the supply chain to the manufacture of sports equipment, structural products, and large aerospace assemblies. In Utah, Hexcel produces fiber and prepreg fiber sheets for the aerospace industry; tooling manufacturers such as Janicki Industries support large Utah manufacturers such as Boeing, ATK and Excelis in manufacturing composite components for the Boeing 787 Dreamliner and Lockheed Martins’ F35 Lightning.

In 2007 the GOED in collaboration with EDCUtah and the Society for the Advancement of Material and Process Engineering (SAMPE) founded the Utah Advanced Composites Industry Working Group (ACWG). The ACWG counts among its membership two dozen companies, including direct competitors, educational institutions, and state and local government.

Partner Vignette on Supplier Network

Economic Development Corporation of Utah (EDCUtah)

edcUTAH Started in 1987, EDCUtah is a nonprofit, public/private partnership, working with state and local government and private industry to attract and grow competitive, high-value companies and spur the development and expansion of local Utah businesses.

From first call to ribbon cutting, EDCUtah provides the services needed for companies to successfully expand, relocate or consolidate in Utah. Business Development Consultants streamline site selection by providing accurate data, local contacts, and logistical support.

EDCUtah partners with regional municipalities and the GOED to coordinate an effective corporate recruitment process from site selection to tax credit consideration and work with other supplier network partners including those needed for workforce development.

Examples of the EDCUtah/GOED partnership include the recruitment of Janicki Industries, to Utah, helping embed a missing piece in Utah’s carbon composites supplier network. Other examples include expansions of ATK, Exelis, Hexcel, and ENVE in Utah.

Groundbreaking for Janicki Industries

Investing in Manufacturing Community Partnerships (IMCP) - The Utah Advanced Materials Manufacturing Cluster
Gaps in Utah’s AMM Supplier Network:

The limited Mission of the Advanced Composites Working Group (ACWG)

The ACWG has seen significant success in supporting the collaboration of industry, government, and technical workforce development, which is essential to expanding regional supplier networks. While largely effective, the ACWG is under organized and under supported to maintain its mission considering the growth of the AMM industry in Utah. Add to this mix the rapidly increasing international competition this industry is witnessing, and it is apparent the loose affiliations underpinning the ACWG need to be strengthened and formalized. In addition, the ACWG’s mission must be broaden to include innovation and an “outward view” to help Utah maintain its leadership role in this rapidly developing international market.

Supplier Network Utilization

Large Utah manufacturers have expressed interest and willingness to source contracts locally with the potential benefits of reducing costs, shortening lead times, and increasing quality. Purchasing and supply chain managers from significant manufacturers have stated that there are tens of millions of dollars of contracts sourced out of state that could be turned to local manufacturers. Many of Utah’s AMM SMEs have limited channels with larger Utah companies. Both small and large manufacturers need each other’s capabilities and processes, yet they are unable to effectively connect to solve supply chain issues dealing with logistics, cost, and quality.

In Depth Knowledge of the Regional Supplier Network and Matching Capabilities to Future Markets

In 2010, the team of EDCUtah, ACWG, GrowUtah, and GOED characterized the AMM industries as a part of Utah’s >$5B aerospace industry with the result being a Utah Cluster Acceleration Program (UCAP) report focused on aerospace. With AMM being a subsection of aerospace, there exists a significant gap in Utah’s knowledge of its AMM supplier network capabilities and how these capabilities align with future AMM markets outside of aerospace.

Plans to Strengthen and Enhance Utah’s AMM Supplier Network:

The limited Mission of the Advanced Composites Working Group (ACWG)

To extend the mission and strength of the ACWG we propose to formalize the new Utah Advanced Materials and Manufacturing Initiative (UAMMI). As evidenced by the attached letters of support and memoranda of understanding the UAMMI and its mission are well-supported by industry, government (federal to regional), technical training institutions, and academic institutions across the state. Specifically we propose the University of Utah lead the effort initially, during this time all parties will cooperate to form the UAMMI as a nonprofit industry association built to work with local and federal resources to accomplish the programmatic goals contained in this proposal. In the second year of this effort we will transition management to UAMMI leadership.

UAMMI will be structured with a Board of Directors recruited from industry. Leadership of the UAMMI will leverage relationships among UAMMI partners with the purpose of being lightweight and efficient while significant enough to propel the UAMMI mission forward; for instance leveraging the WSU Technology Transfer Office to manage the patent pool (see WSU letter in the appendix). The leadership will evolve to eventually include an Executive Director, Director of Finance, Director of Operations, and Administrative Manager. In collaboration with the OWATC and DATC the Director of Operations will manage the Innovation Centers and relationships centered around the Innovation Centers (such as MEP, HAFB, TQS, etc...) and all marketing functions. The Director of Finance will work with the many banks, venture/angel funds, investors, SBA, and industry partners to structure the various granting, private, strategic investing, and debt vehicles that will support innovation and corporate development in the AMM cluster. And will also work with the developers, HUD, and CRA banks to work toward developing sustainable and inclusive communities around the Innovation Centers. The Executive Director of UAMMI will hold the responsibilities associated with management of the UAMMI.
and execution of its mission including proposal creation, federal program alignment, and building and maintaining the various partnerships involved in creating a strong virtuous economic cycle around Utah's AMM cluster.

Supplier Network Utilization

Citing Karen Gordon Mills, former SBA Administrator, “The reality is that large manufacturers need a diverse and nimble network of small suppliers. These suppliers make large companies more efficient, more productive and more globally competitive. A strong supply chain of small businesses can be a determining factor for locating production in a particular area. And it really is a win-win. Tapping into a large commercial supply chain can also be a game-changer for a small supplier...”

Building a nimble network of suppliers is a primary goal of the UAMMI. To increase awareness of intra-state suppliers and supplier opportunities we propose to team with the UMA (see Vignette) in closely integrating the Utah AMM supplier network into the UMA's Utah Manufacturing Capabilities Assessment Network (UMCAN or CAN). The mission of the CAN is to enhance, promote, and increase networking, collaboration, and opportunities for growth among Utah manufacturing companies. By creating a system that makes it easy to find manufacturers by capabilities and products, the network will showcase Utah manufacturing and identify opportunities for manufacturers to grow their businesses.

The CAN comprises a database of Utah manufacturers and cloud-based software enabling effective searching for manufacturers by multiple search criteria. Set to launch in 2014, this web application will match qualified Utah manufacturers with companies in need of their services.

UAMMI and UMA will also allot a significant effort in training Utah's AMMI cluster companies in the use of the system both for entering and maintaining listings of and for finding products and capabilities.

The ability to collect and manage the correct manufacturing company data is essential to the project's success. Performing data analysis, determining key performance metrics, and studying industry trends within the software platform are equally important. These analytical tools will be built into the system to help the Utah Manufacturers Association (UMA), the Manufacturing Extension Partnership (MEP), EDCUtah and GOED better understand the current state of manufacturing in Utah. This information will enable the UMA and MEP to amplify the positive effect they currently have on the manufacturing industry. These data and output also can assist state and local economic development agencies identify the areas needed for improvement within the supplier network, thus, assisting EDCUtah and GOED in recruiting companies to Utah that fill the AMM supplier network needs.

Supplier Network/UCAN Cost Benefit Analysis

A summary of the elements involved in this project component can be found in the table below. By adding Utah manufacturer's data to the UMCAN database and increasing usage of Utah's AMM supplier network tens of millions of dollars in out of state contracts could be brought to...
Utah increasing business for composite manufacturers and the demand for jobs and technical education in the state.

Funding required for the project is estimated at $275,000 (see appendix 2 for details). There would be four areas of investment including baseline marketing, maintenance strategy, improvements and adoption and usage over a three year period. The first year will involve the efforts of a temporary full-time marketing consultant. The next two years will involve the efforts of a full time developer and a three quarter time technical support staff.

Alternatives: Alternatives involve expanding other smaller resources that are available. Business will not be aware of AMM supplier’s capabilities and resources in Utah without some sort of promotion of those assets. This could be done on a smaller level as an individual company could expand their marketing efforts or some sort of coalition of suppliers could evolve to promote their resources in a single location.

Nevertheless, a solution involving multiple suppliers will need to rely on a single coordinating source. A benefit of the proposed approach is the collaboration with the UMA. UMA has nearly 1,000 member companies providing AMM suppliers the contacts needed to create a far reaching database and the experience in working with manufacturing companies that other organizers might not have.

Result: The NPV to the economy depending on the amount of contracts could be from $3-10M (detailed in appendix 2). The long-term goals would benefit the entire UAMMI goal of increasing technical jobs in the state and the demand for education in these fields.

In Depth Knowledge of the Supplier Network
The UAMMI proposes partnering with UtahCRG, Emperitas, GrowUtah (GU), and Wasatch Front Regional Council (WFRC), potentially under the PWEDA program or similar SBA programs, in extending the regional CEDSxix with an intensive survey style market analysis to completely map the global network of the AMM supplier network. The methodologies we would use in creating the assessment would include automated search methods, in-depth interviews, and capabilities assessments intended to determine the current state of the entire industry. Industry specialists and key stakeholders will form action plans based on the results of the assessments and determine the areas with highest potential for improvement. Complemented by existing tools and programs, the recommendations from the action plans will be implemented to fill gaps and to maximize the growth potential of the entire industry.

Current Capability & Gap Assessment Approach
Industry Needs Assessment: The diversity of companies involved in AMM creates a complex and dynamic landscape including touch points with many other industries. Thus, the collaboration of UAMMI, UtahCRG/Emperitas and Grow Utah propose the following assessment method and tools to detail the strengths and weaknesses of Utah’s AMM supplier network. The results of this assessment will, of course, be matched to the results of the customer assessment described in the Trade and Foreign Investment section to steer supplier networks toward current and emerging markets, in essence driving supplier network-based corporate development and recruiting.

Manufacturing Specialties & Capabilities Assessment - Having a clear and accurate understanding of Utah’s current AMM capabilities is fundamental to designing a roadmap to

<table>
<thead>
<tr>
<th>Current Status/ Baseline &amp; Problem to be Addressed</th>
<th>Change to Baseline/ Alternatives</th>
<th>Type of Impacts</th>
<th>Population Affected by Impacts</th>
<th>Economic Benefit</th>
<th>Summary of Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lack of awareness of intra-state suppliers and supplier opportunities</td>
<td>Expand manufacturers data in UMCAN software, market this product to manufacturers, and provide technical support of system</td>
<td>Highlight Utah manufacturers capabilities/ resources could help Utah manufacturing businesses grow</td>
<td>Utah advanced materials manufacturers</td>
<td>Out of state contracts amounting to tens of million dollars could be brought to Utah</td>
<td>Adoption of the system, increased business for Utah advanced materials manufacturers, and increases in jobs</td>
</tr>
</tbody>
</table>
increase Utah’s capacity to capture market opportunities. The main purpose of the effort envisioned is to create an assessment of capabilities helping drive supplier network-based corporate development and recruiting. The assessment will utilize snowball sampling to map unknown industry relationships and extend the network of industry experts, and current suppliers from within Utah to the national and international markets. This information will be supplemented through social media/web mining and an automated machine-learning tool built to search known industry databases and map professional connections within the global advance materials industry. Using the global network discovered through the search, qualitative in-depth interviews (IDIs) with the identified industry experts and current suppliers will be conducted late in year 1 and will continue as needed through year 2 of the project timeline. The interviews will utilize a laddering process to uncover current organizational capabilities, organizational needs, organizational structure and future opportunities in: workforce characteristics, vendors and supply chains, innovation, investment needs, and market conditions.

Utilizing UAMMI’s industry board of directors, a series of strategic work sessions will be conducted to review the assessment data collected in the Customer Needs assessment (see Trade and Foreign Investment section) with the Capability and Gap assessment and reach a conclusive and realistic assessment of Utah’s overall AMM supplier network capabilities.

**Customer/Supplier Network Response Readiness**

For continued guidance of the UAMMI’s mission the industry leaders composing the UAMMI’s industry board of directors will undertake to develop a Customer Response Readiness Action Plan. The first version of this plan will be authored in year 2 of the project and reauthored periodically. Participating in a series of facilitated decision making strategic work sessions, the members of the Board will consider the assessments completed, and the market opportunities identified. We will identify gaps by mapping Utah’s current capabilities against the market and customer needs.

With the WFRC, the Board will design specific Action Plans to enhance the current CEDS that are focused on filling the gaps specifically in six areas that compose Utah’s AMM cluster core capability; Workforce, Infrastructure/Site Development, Supplier Network, Operations and Capital Access, and Research and Innovation. This Action Plan will clearly define the specific

**Partner Vignette: Supplier Network**

Supplier Network Analysis Team: **UtahCRG and Grow Utah**

**UtahCRG/Emperitas - the analysis experts:** Students take a two course/two semester track comprising Economics 5960 and 5950. The basic focus of both classes is to teach students how to conduct research, how to analyze the data that has been collected, and how to prepare deliverables which summarize the findings of the research.

As part of the process we have created a student research group called Utah Community Research Group (UtahCRG) which partners with local businesses to research questions. For example, just completed was project for Overstock.com, and this summer semester we will work with the Salt Lake Chamber of Commerce, the Utah Girl Scouts and the Deer Valley Music Festival. Each research topic is different, but they all follow the same basic process of creating a research question, conducting research, analyzing the results and presenting the findings. As project surpasses student capabilities and timelines we subcontract with a partner company Emperitas.

**GrowUtah - Market expertise:** GUV’s mission is to accelerate the creation of innovative, entrepreneur-led, high-growth businesses that will strengthen and expand the future growth of Utah’s economy.

In the Spring of 2010 GUV authored the most recent Utah Cluster Acceleration Project (UCAP) report on Utah’s aerospace cluster. To maintain continuity and position UtahCRG efficient UAMMI has asked GUV to lead the market analysis efforts with UtahCRG to produce a ‘UCAP on steroids’ report on Utah’s supplier network and the alignment of the supplier network with current and emerging markets.

Investing in Manufacturing Community Partnerships (IMCP) - The Utah Advanced Materials Manufacturing Cluster
programs to be implemented, designate the public/private/academic organization responsible for implementation and the success metrics that will be used to monitor achievements.

Operational/Improvement and Capital Access
Larger companies with long track records generally have significant financing relationships and well-established operations practices such as “Lean Manufacturing” and “Six Sigma”, but this is not the case for even established SMEs. SMEs often lack both ready financing for operations and access to best practices in accomplishing operations. Utah has an active capital market and many companies following highly efficient operations models along with consulting groups such as MEP. The lack is connecting the various groups and accessing both capital markets and operations best practices.

Capabilities:
Operational Improvement
Manufacturing Extension Partnership (MEP): MEP is a business dedicated solely to the success of Utah businesses. Part of a national nonprofit network of over 350 business centers, MEP was originally developed by the Department of Commerce through the National Institute of Standards and Technology (NIST). As such, MEP uses a unique, researched model to offer resources, networking, and developmental co-funding opportunities. MEP works with SMEs throughout Utah to help keep them on track with the resources and training.

MEP’s team has developed an approach, the “5-P Success Strategy.” This architecture is filled with customizable services and resources for varied businesses. After testing and evaluation, a tailored suite of services is created to help the company increase its revenues and profit margins.

Housed within Utah Valley University (UVU), MEP offers training in their 5-P model including: Lean Tools, Lean Certification, Six Sigma, Quality Certifications, and Transformation Systems.

Utah Center for Applied Innovation and Design (UCAID): UCAID has shown a significant capability in helping Utah companies, both large and small, develop product testing. For instance, in work with ENVE, Inc., UCAID designed an interactive control system for use by ENVE engineers on a brake test dynamometer. With ATK, UCAID designed a test fixture for quality assurance purposes in the aerospace products department. Increasing QA/QC capabilities is fundamental to improving operations and reducing waste in manufacturing.

Business Resource Centers (BRC)/Small Business Develop. Center (SBDC) The Utah Small Business Development Center (USBDC) facilitates a network of centers throughout the state in a variety of rural and urban communities. Eleven service centers and four satellite locations provide high quality business consulting and training for existing businesses and entrepreneurs who want to start a business. Business Resource Centers (BRC) act as a one stop shop for starting small businesses. The USBDC Network is hosted by Salt Lake Community College and funded by

Figure: MEP’s 5-P Principle Strategy. The 5P Tactical Target Points are the centerpieces of the 5P Strategy: People, Product, Process, Planet, and Profit each with Key Objective efficiencies. Three Key Objective Efficiencies lie beneath each 5P Tactical Target Point.
the U.S. SBA, the GOED, and eight colleges and universities throughout Utah.

**Capital Access**

Several Utah groups have well-tested, effective models for funding early-stage innovation, early-stage companies, and mid-market companies. Additionally, Utah has implemented a successful strategy to attract outside funds to Utah through the Utah Fund of Funds.

**Ideation Funding Programs**

Over the past six years, the UofU's Technology and Venture Commercialization (TVC) office has consistently ranked as one of the nation's most prolific University based commercialization centers and 2012 data show the trend is continuing.

**TVC Fund**: The TVC Fund I is a seed stage venture capital fund with a strategic relationship as a preferred funder to invest alongside the UofU's TVC. The Fund is expected to invest, at a minimum, on a 50/50 basis alongside the TVC.

**USTAR SBIR-STTR Assistance Center** – In total the SBIR-STTR programs offer more than $2.6B annually to support the development of technology by small businesses across the US. Vying for these funds is a complex process, daunting for bootstrapping, young companies. To address this need, USTAR opened the SBIR-STTR Assistance Center (SSAC) in cooperation with and located at SLCC. The SSAC is Utah's source for information and assistance in preparing and submitting SBIR-STTR applications. Since 2008, the center has helped more than 100 Utah businesses bringing more than $4.7M to the state in federal grants. The SSAC's application success rate is 25%, considerably higher than the 16.6% national average.

**Seed and Angel Investing**

**KickStart Ventures**: KickStart is a fund raised using private and university funds that is sector-agnostic. It is interested in strong technology-backed intellectual property with a clear, capital-efficient path to market. KickStart focuses on seed-stage start-ups and will invest in companies with $1-5M in pre-money valuation that are looking to raise up to $3M.

**Park City Angel Network (PCAN)**: The PCAN is a group of 70+ accredited investors dedicated to improving the investing experience of both the investor and the entrepreneur. PCAN provides seed- and early-stage capital in the range of $150k to $1.5MM. PCAN's members are successful businesspeople, entrepreneurs, executives, professionals, and other business leaders who have built and funded strong companies.

**VentureMD** is an angel capital firm and medical device incubator focused on musculoskeletal products. VentureMD provides the human, financial, and intellectual capital to develop and manage start-up medical device companies around promising ideas. VentureMD serves the areas of orthopedics, spine, dental, arthroscopy and laparoscopy.

**Venture Investors**

**Pelion Venture Partners**: Working side by side with some of the most innovative companies in the industry, while achieving industry-leading returns for its limited partners. Pelion's technology and market experience has given the fund the ability to understand complex technologies and recognize the potential of emerging companies and new markets. Pelion
Venture Partners is well placed in the national venture community and brings syndications with several larger outside venture firms from around the country.

**Renewable Tech Ventures**: RenewableTech Ventures is committed to creating exceptional returns for both the entrepreneurs we invest in and our fund investors. These exceptional returns are achieved by investing in early stage and growth stage energy innovations in renewable energy, clean technology, energy conservation, green materials, and other clean technologies. Our investment activity is focused in the Rocky Mountain region of Canada and the United States. This region is an area rich in energy and technology resources and is an underserved region for venture capital.

**Private Equity Investors**

**Sorenson Capital**: Sorenson Capital is a private equity firm headquartered in Salt Lake City. Sorenson provides small to middle-market buyout and growth equity investments, with a particular focus on opportunities in selected states in the mountain and western regions of the US. Sorenson Capital’s specialty is partnering with management teams to invest for the long term in companies with established strategic positions, strong growth characteristics, attractive margins, and healthy industry dynamics.

**State Based Investment Programs**

**GOED Technology Commercialization and Innovation Program (TCIP)**: The purpose of the TCIP is to accelerate commercialization of promising technologies that have strategic value for Utah. The end goal of the TCIP is to drive economic development and job creation. The TCIP is a state-funded grant program developed to help accelerate the process of taking university-developed, cutting-edge technologies to market.

**Utah Fund of Funds**: Utah Fund of Funds focuses on bringing alternative capital to Utah to finance and grow Utah-based businesses.

**Identified Gaps**

**Operational Improvement**: Even though Utah has multiple groups such as SBA, SCORE, MEP, and UCAID offering mentoring services in operational best practices these services are not as well recognized by SMEs as could be and as a result are not used.

**Early and Seed Capital Access**: The Utah capital market is a relatively strong market. With that said, the early capital market is attuned to innovations in the information technology and biodevices markets leaving manufacturing innovations in areas such as AMM underserved in this region and in the Rocky Mountain region, in general.

**Plans**

**Operational Improvement**

In an effort to help the SMEs move beyond the ‘don’t know what they don’t know’ barrier to getting help in achieving operational improvement we propose a program for education through action by introducing the MEP and UCAID to Utah companies and innovators. It is our proposition that by bringing innovators into meaningful working relationships with these groups the introduction process will eventually migrate to groups such as SBA, SCORE, and USTAR-SSAC but, the first contact must be established.

**The Advanced Materials Prototyping Center (AMPC)**

Simultaneously UAMMI will look to extend our regional impact beyond the northern Wasatch into areas surrounding UVU and BYU. To achieve this expansion we are proposing a three-year program to develop a southern Wasatch Front “Applications Center” to provide production space using state-of-the-art prototyping equipment such as 3D printers and scanners, mills, lathes and injection molders. This Prototyping Center will be located on the UVU Campus and managed by staff provided by the MEP with support from the Small Business Development Center (SBDC), university students and faculty, and industry advisors. With a student population of over 30,000 UVU is ideally situated to develop and support an Applications Center that will
directly promote two of Utah’s AMM cluster strategies; Operational Improvement and Workforce Development.

**Center Structure**

**Management**: A full-time MEP staff member will manage the AMPC overseeing center operations, project management, staffing, and budget.

**Outreach**: Outreach for the AMPC will be performed by MEP staff that already have broad reaching interaction with Utah manufacturing companies. Leveraging this established resource will allow rapid penetration into companies currently using advanced materials as well as companies that could benefit from using advanced materials.

**Projects**: The AMPC will work toward meeting innovation and workforce development needs using a project system. External applications for operations, prototyping or research and development projects will be vetted and funded within the center.

**Student Engagement**: The Innovation Center offers a substantial and valuable educational and research experience for registered students and faculty serving an academic purpose where students assist in the research and development of advanced composites research and prototyping.

**Capital Access**

To introduce regional capital markets, including industrial strategic capital, to the regionally available innovations in AMM we propose to essentially ‘prime the pump’. We seek to obtain $3.5M in capital support, of which $500K will be allocated for an unrestricted seed fund and $3M for a seed-equity capital pool. We also propose a $500K matching program for SBIR/STTR awardees in the AMM cluster.

**Unrestricted Seed Fund for Cluster Startups**: An unrestricted $500K seed fund will accelerate industry growth by building on the emerging ecosystem with funds that do not require a match. Providing seed funding to companies at an early stage, without requiring a match, will help keep technologies and companies moving forward while pursuing other funds, including SBIR and early stage private investors.

The unrestricted seed fund will make $5K-30K milestone-based investments. These small milestone-based investments will be key to obtaining financing from larger financing sources including university commercialization funds; federal programs such as SBIR/STTR; State of Utah start-up funding programs such as the TCIP, as well as other private investors.

**Seed-Equity Capital Pool**: The capital pool will function similarly to a venture capital fund by evaluating investment opportunities, making select investments in composite companies, both early stage and growth stage, and managing a portfolio of investments seeking strong returns that will aggregate into an evergreen pool of capital. The capital pool will be managed by the UAMMI finance manager.

**Evergreen Pool of Capital**: As the fund’s portfolio companies have successful exits or return investment capital with interest, the returns generated on the initial capital invested will pool into an evergreen capital program meant to assist and encourage the growth and development of the composites technology ecosystem for many years in the future.

**Automatic Matching Funds to SBIR Awardee Startups**: The SBIR/STTR grant programs are specifically designed for small, entrepreneurial, technology enterprises. We propose creating a $500K fund for an automatic matching program for companies receiving these awards to accelerate their progress and, in many cases, make them eligible for further federal funds.

**Innovation Center Economic Development Loan Fund**: A consortium of private banks in Utah is interested in providing support for the programs within this proposal by providing a matching innovation loan fund. This fund will support small business development, workforce education and training, entrepreneurship, and technology innovation with a focus on serving low-moderate...
income populations, re-training displaced workers and revitalizing economically distressed locations.

The bank consortium includes American Express, American Express Centurion Bank, CIT Bank, GE Capital, GE Retail, Morgan Stanley, and Zions Bank. (see letters in appendix)

Products, terms and operating procedures will be developed by a committee of the UAMMI financial director, bank partners, and contributing public agencies when funds are provided.

### Loan Fund Principles

1. Total matching resources are anticipated to be up to $29M
2. Fund products and uses qualify under CRA guidelines, serving low-income/underserved populations, distressed geographic regions and small business development
3. Funds support operations related to Innovation Center activities and companies
4. Funds are deployable in transit oriented or transit adjacent locations
5. Grant resources will provide a loan loss reserve for the loan fund

### Proposed Financial Tools

**Built Environment:** Financial resources for the built environment will be provided through New Markets Tax Credits. A local Utah company will include the IMCP project as a priority for their 2014 allocation and provide the expertise necessary to execute the process. A letter of interest is attached.

**Equipment and Furniture Matching Fund:** The equipment matching fund provides up to a 1:1 match to expand the use of grant dollars.

**Revolving Innovation Loan Fund:** The revolving innovation loan fund is a suite of loan products that supports education, training and development for labor force, small business development and entrepreneurship. Products, terms, rates and operating procedures will be defined by a loan fund board.

### Organizational Structure of the Loan Fund

**Fund Manager:** The UAMMI financial director will oversee the appropriation, dispersal, use and reporting of the funds. In this capacity the financial director will work directly with the UAMMI director and is a member of the governing board and the liaison to financial entity partners.

**Financial Entity Partners:** The innovation loan fund will partner with established financial entities in the community to leverage expertise and existing administrative resources. The UAMMI financial director will serve as liaison between the UAMMI and the financial entity partners. Financial entities considered for partnership may be Community Development Financial Institutions (CDFIs), Community Development Entities (CDEs), Small Business Investment Companies (SBICs), nonprofit economic development companies or for-profit companies with expertise in banking relationships and related financial products. Letters of interest are provided.

### Research and Innovation

**Capabilities** The State of Utah has three universities classified as ‘research universities’ according to the 2010 Carnegie Classifications. On a national level the University of Utah (UofU) is classified as one of 108 universities with very high research activity (RU/VH) and both Utah State University (USU) and Brigham Young University (BYU) are considered universities with high research activity (RU/H), of which there are 99 nationally. All three universities have programs in advanced materials and carbon composites. Industrial groups and leading enterprises in Utah’s AMM cluster do work directly with university researchers. For example ATK and Hexcel work with the UofU mechanical engineering department. BYU has spun-out isotruss-based companies, Novatek, Inc. and Razik Bicycles. High quality training and targeted research programs have been developed at all three of Utah’s research universities. In addition...
the Utah chapter of SAMPE is very strong and provides a robust platform for university researchers to meet with industry engineers.

**Current Institutions for Improving Capability**

The research universities have a variety of intrinsic capabilities applicable to the AMM industry, including nano- and macro-imaging equipment and robotics laboratories, all able to support basic research functions. Laboratories supporting new fiber material precursors are well established at USU. In addition, the evaluation of material properties of carbon composite structures is supported at both the UofU and BYU. The UofU is home to the Scientific Computing and Imaging (SCI) Institute, a world class group specializing in imaging, image analysis and computer simulation of material properties. The SCI Institute leads the US Army Research Laboratory’s (ARL) efforts in multi-scale modeling for understanding material properties from “Atom-to-Application”.

**Identified Gaps**

While Utah has a significant platform from which it can build upon in addressing the global AMM industry, these programs and capabilities are not aligned with a comprehensive industry development and growth program that will assure future success in a globally competitive industry. Utah's innovation engine has a gap between highly applied research and very basic research. An example of highly applied research would be product testing work done between ENVE Composites and WSU (see Vignette in Operations Improvement section), whereas the very basic research is typified by USU’s work in organic precursors (see Vignette). This results in projects within our state with 1-2 year horizons (highly applied) and projects with 7-10 year horizons (basic research). And, while the 1-2 year horizon projects are highly aligned with industry the 7-10 year horizon projects are more aligned with a basic research agenda. **Utah has a gap in the 2-7 year horizon research and development effort.**

**Plans**

Consider that Tokyo University has launched the Today-JAXA Center for Composites to create a “focal point of Industry-Academia collaboration”\textsuperscript{xii}. To fill the gap identified above Utah needs to create a robust platform for university and industry collaboration in that will address an increasingly globally competitive AMM market. The depth and size of Utah’s current programs must be expanded and strengthened to sustain a constant
and responsive innovation engine for Utah’s AMM industries and supplier network. We plan to start filling the void of 2-7 year research and development projects by recruiting on two fronts. The first front is essentially recruiting industry to work with the state’s universities. Three primary parameters are required to recruit this interest and effort from Utah’s industry members: 1) University researchers aligned with mission critical research; 2) Easy access to Intellectual Property; and 3) A series of early wins showing the potential of industry/university collaborations.

Recruiting faculty interest in industry aligned research requires the research to meet distinct but relatively simple parameters: 1) The research cannot dominate the faculty member’s research agenda; 2) The research has academic relevance; 3) The industry partner is fully engaged with the research; and 4) The research is fully supported. To sum these parameters, to foster highly effective industry/academic research agendas we must find research with a sufficient cross section of interest between industry and academia and we must create a seamless ability to move resulting intellectual property between the universities and industry.

**Identifying Innovation Needs:** To establish which research directions have a large cross section, and relevance between industry and academia, we held roundtables and discussions with industry members. Those discussions resulted in a survey to Utah’s AMM industry to determine their most pressing needs. As shown in the table below, the survey found eight distinct research areas ranking highly for establishing unique and sustainable market advantages. In comparing these needed research areas to current expertise in academic research we found correlation between industry and academics in six specific areas.

<table>
<thead>
<tr>
<th>Industry Importance</th>
<th>Existing University Capability</th>
<th>Topic</th>
</tr>
</thead>
<tbody>
<tr>
<td>87.5%</td>
<td>Yes</td>
<td>Advanced manufacturing processes, such as; Robotics, melt extrusion of fibers, microwave processing, plasma processing, out of autoclave processing, faster cycle times, better repeatability or other innovative manufacturing processes</td>
</tr>
<tr>
<td>87.5%</td>
<td>Yes</td>
<td>Advanced composite matrices, polymers, resins, or other advanced performance materials</td>
</tr>
<tr>
<td>87.5%</td>
<td>Yes</td>
<td>Advanced composites simulation, modeling and nondestructive testing</td>
</tr>
<tr>
<td>75%</td>
<td>Yes</td>
<td>Composites recycling, recovery, and sustainability</td>
</tr>
<tr>
<td>75%</td>
<td>No</td>
<td>Nanocomposites (tensile strength, E&amp;T conductivity)</td>
</tr>
<tr>
<td>62.5%</td>
<td>No</td>
<td>Composites technology transition for successful commercial application (scale up, etc)</td>
</tr>
</tbody>
</table>

**Partner Vignette on Research and Innovation**

**The University of Utah (UofU)**

The UofU houses efforts ranging from the study of composite material integrity, image analysis, and robotics.

**Dr. Daniel Adams** and his laboratory focus on the material properties and construction of composite materials. Recent work in Dr. Adams’ laboratory includes the development and evaluation of fracture mechanics test methods for sandwich composites. His laboratory has close working relationships with industry members such as ATK, Hexcel, and, progressive start-up Conductive Composites.

**Drs. Tom Henderson, Dan Adams, and Mark Minor:** Within the College of Engineering is a collaboration of scientists examining the use of robotics and dynamic data driven application systems (DDDAS). This group of researchers is interested in furthering their work toward robotics in composites manufacturing and the use of DDDAS systems to monitor damage in composites during performance. Recent work of the group focused on methods that would apply broadly to any physical system that is modeled and monitored with sensors; for example, aircraft, bridges, refineries, etc.

Over the past decade, the **Scientific Computing and Imaging (SCI) Institute** has established itself as an internationally recognized leader in visualization, scientific computing, and image analysis applied to a broad range of application domains. The overarching research objective is to conduct application-driven research in the creation of new scientific computing techniques, tools, and systems. SCI Institute researchers address challenging computational problems in a variety of application domains such as manufacturing, defense, and energy.

Investing in Manufacturing Community Partnerships (IMCP) - The Utah Advanced Materials Manufacturing Cluster
streamlined recruitment strategies and has refined the year existence, the USTAR program has discovered recruiting over 50 high-end faculty members in its short 7-model and the building and programming model. In USTAR Model:
analytical, medical imaging and neuroscience. biopharma, energy, digital media, imaging technology, research institutions to work in the areas of biodevice/
Western, Oak Ridge National Laboratory, and other top researchers from MIT, Harvard University, UCLA, Case teams.
to secure some of the best talent to lead their research Leading Innovators:
opportunities; 3) Address large and strategic global markets; 2) Have vast commercialization strategic innovation development areas. The characteristics UofU and USU to create world-class research teams in To accomplish its objectives, USTAR collaborates with the UAMMI director, specifically, would work on bringing university and corporate groups to help shape proposals in areas of interest. About USTAR: One of the primary foundations of this proposal is leveraging many existing programs and partnerships in Utah. An example is the Utah Science, Technology, and Research (USTAR) Initiative. USTAR Recruiting Innovation and Research Teams in Defined Focus Areas To accomplish its objectives, USTAR collaborates with the UofU and USU to create world-class research teams in strategic innovation development areas. The characteristics of these innovation focus areas: 1) Are based on existing university strengths; 2) Have vast commercialization opportunities; 3) Address large and strategic global markets; and 4) Leverage Utah industry strengths.
Leading Innovators: USTAR has gone to great lengths to secure some of the best talent to lead their research teams. Since its inception, USTAR has attracted 50 leading researchers from MIT, Harvard University, UCLA, Case Western, Oak Ridge National Laboratory, and other top research institutions to work in the areas of biodevice/biopharma, energy, digital media, imaging technology, nanotechnology, medical imaging and neuroscience.
The Advanced Composites Cluster Use of the USTAR Model: We will leverage the USTAR recruitment model and the building and programming model. In recruiting over 50 high-end faculty members in its short 7-year existence, the USTAR program has discovered streamlined recruitment strategies and has refined the

<table>
<thead>
<tr>
<th>Industry Importance</th>
<th>Existing University Capability</th>
<th>Topic</th>
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</thead>
<tbody>
<tr>
<td>56%</td>
<td>Yes</td>
<td>New and alternative carbon fiber precursor materials and processes, and/or carbon fiber orientation</td>
</tr>
<tr>
<td>56%</td>
<td>No</td>
<td>Carbon fiber specialty coatings and adsorption</td>
</tr>
</tbody>
</table>

Table: A recent survey found eight distinct research areas rank highly in the view of Utah’s industry members for establishing unique and sustainable market advantages in carbon composites. In comparing these needed research areas to our current expertise in academic research we found high cross section between industry needs and academic abilities in five specific areas.

Alignment with Federal Research Agendas: Many of the research topics finding resonance with both Utah’s industry and academic groups also align well with established federal research agendas. We will pursue alignment with NSF, NIST, and DoD programs such as: NIST: Measurement Science and Engineering (MSE) Research, Precision Measurement, Center for Nanoscale Science and Technology Researcher and Visiting Fellow; and the Summer Institute for Middle School Science Teachers and NSF: Mechanics of Materials, Manufacturing Enterprise Systems, and Catalyzing New Intern Collaborations. The UAMMI director, specifically, would work on bringing university and corporate groups to help shape proposals in areas of interest.

Recruiting Research and Researchers: Adding sustainable research power to a university system is not as simple as it would seem. For sustainability the research agenda must be carried by teams of faculty members. Adding a faculty member to a college or department is a commitment to support the new faculty member through curriculum development, research, and eventually through the arduous process of gaining tenure. We have worked with Utah’s research universities to find cross sections of industry and academia that will be well supported by both industry interest and university support. Additionally, we will work toward gaining funding to recruit new researchers.

About USTAR: One of the primary foundations of this proposal is leveraging many existing programs and partnerships in Utah. An example is the Utah Science, Technology, and Research (USTAR) Initiative.

<table>
<thead>
<tr>
<th>Metric</th>
<th>Ratio compared to Non USTAR faculty</th>
</tr>
</thead>
<tbody>
<tr>
<td>Extramural Funding</td>
<td>1.5</td>
</tr>
<tr>
<td>Invention Disclosures</td>
<td>8.4</td>
</tr>
<tr>
<td>Provisional US Patents Filed</td>
<td>5.8</td>
</tr>
<tr>
<td>Full US Patents Filed</td>
<td>4.0</td>
</tr>
<tr>
<td>Licenses Issued</td>
<td>5.7</td>
</tr>
<tr>
<td>Technology Start-up Companies</td>
<td>2.3</td>
</tr>
</tbody>
</table>

Table: USTAR faculty at the University of Utah have outperformed non-USTAR faculty on important metrics tied to economic activity. The table shows metrics from 2007-12 of 11 USTAR teams at the University of Utah.
introduction of new faculty members to Utah’s capital, industry, and academic communities. As a result, USTAR faculty have shown a very high level of performance (see table).

**Intellectual Property Management**

As part of the UAMMI, the intellectual property (IP) management will include a pooling strategy. Aoki and Schiff (2008)xxiii posit that IP pooling aggregates complementary technology efficiently to reduce licensing fees and enable producers to have all the components necessary to practice a technology. As part of the IP pooling strategy, UAMMI will implement the following: 1) Create a patent pooling agreement, 2) Contract an independent evaluator, and 3) Manage the IP pooling portfolio.

The patent pooling agreement will initially seek to include all the UAMMI participating institutions of higher education and applied technology centers agreeing to pool all technology developed through UAMMI funds and/or using significant UAMMI resources. Participating institutions and industry collaborators may additionally elect to include complementary technologies into this pool. Each participant’s share of the licensing royalties will be determined by a formula derived from independent valuations of their technology. UAMMI has identified Michael Best & Friedrich, LLP as being the independent evaluator because Michael Best has extensive experience working with universities and the requisite expertise in antitrust and IP law. The IP portfolio management will include a licensing team and IP management software. WSU’s Technology Commercialization Office (TCO) will negotiate licensing terms and draft corresponding contracts with licensees.

In addition to its patent pooling strategy, UAMMI will also establish programs, introductions and incentives to encourage direct cross-licensing of industry patents and trade secrets where appropriate and as agreed to by industry participants.

**Research and Innovation Cost Benefit Analysis-Research Recruitment**

One objective of the Research and Innovation component of the UAMMI is researcher recruitment. We are creating a strategic plan to recruit a team or teams of University-level, best-in-class researchers to work together with industry in more effectively producing composites. Our solution involves using research facilities already in place at the University environment. The full analysis can be found in appendix 3 - Cost/Benefit Analysis.

**Summary of Costs and Benefits Involved:** The University setup for the component research would involve a team of up to three researchers located at the UofU, WSU, and USU. To aid with their research, each researcher would also need startup funding for graduate research assistants. A summary of expected cost savings and expenses can be found in Table A-2 of appendix 3 - Cost/Benefit Analysis.

Longterm benefits of basic research will come from new product introduction and gained advantages in competition for market share. In the near term the benefit will more likely be gained as a “pseudo deferred cash savings” where industry gets more basic research without spending funds to gain the output creating a savings of funds not spent on R&D. Also, there will be several upfront costs before the actual benefit of research is realized. After a three year period, we anticipate the cost to manufacturers to decrease significantly as their R&D costs go down. In the end, the Net Present Value of the cash flows would be a positive $30M and the internal rate of return will be a positive 15% (see Table A-2 of appendix 3 - Cost/Benefit Analysis).

**Baselines:** Without aid from UAMMI there would not be a specific investment in Utah Universities towards researching manufacturing composites. Of course, University departments like Mechanical Engineering (ME), Aerospace Engineering (MAE), and Manufacturing Engineering have an interest in composites, but they are not focused on increasing manufacturing productivity especially with the use of robotics or non-destructive testing and inspection. This partnership would allow for collaborations among the two areas by hiring or refocusing of research efforts.
Market Expansion, Trade, and International Investment

As a state, Utah's Advanced Materials/Carbon Composite (AMM) manufacturers engage in varied industries from recreational products to aerospace and defense, exporting goods through both national and international market channels. To extend Utah's national and international channels we will piggyback on the intensive survey style market analysis described in the Suppliers Network section. As in other sections, we will leverage multiple partner programs such as state programs aimed at expanding international trade.

**Capabilities:** Utah's AMM cluster is closely aligned and even integrated into Utah's Aerospace and Recreational clusters. Financially civilian aerospace is Utah's 4th largest export with nonelectrical graphite or carbon being the 13th largest financial export and the AMM cluster is associated with most of the exports listed in betweenxxiv. Utah has a solid set of international channels in which it ships its products. Foreign investment is also very robust in Utah; in 2011 foreign controlled companies employed 32,500 Utah workers, responsible for 3.2% of private industry employmentxxv

**Procurement Technical Assistance Center (PTAC):** The mission of Procurement Technical Assistance Centers (PTAC) is to help Utah small and medium enterprises (SMEs) find, bid on and receive awards from federal, state and local government. PTAC is a federal and state funded agency that helped Utah SMEs obtain more than $346M in contracts and subcontracts, creating or retaining approximately 7,000 jobs. With eight offices throughout Utah PTAC focuses on:

- Registration Assistance (DUNS, SAM, BIDSYNC)
- Procurement Histories / Pricing Data
- 8(a) / Hub Zone Opportunities
- Bid Proposals (response to an RFP)
- Contracting: Prime/Sub, Mentor/Protégé, Team Agreements
- GSA Assistance

**Helping Companies Leverage Existing Efforts in Market Outreach**

**Access to National and International Trade Shows**

GOED, with management by EDCUtah, created a program to build shared Utah representation at major shows. An example is JEC, the largest composites conference in the world JEC is important to Utah companies as evidenced in the 2013 show report, “JEC Europe remains the best place for Composites professionals to get the fastest ROI on an event since cumulative returns from the trade show for all exhibitors are estimated at around €769M, or US$997M. Around 65 useful contacts with follow-up orders are acquired on average per exhibitor, with a declared payback period of 20 months.”xxvi This program continues to include the State of Utah sponsored reception and a large booth housing Utah companies at major shows such as JEC, SAMPE, CAMX and SAE

**Reaching International Markets**

The State of Utah organizes and leads several trade missions each year. State trade missions focus heavily on SMEs as SMEs generally need to leverage established networks and relationships more than larger corporations. Utah companies are offered one-on-one meetings with vetted companies that are potential partners, distributors, and/or buyers. These are arranged using various resources including: US Commercial Services. In addition to these activities, there are meetings with specific government agencies that control or regulate the industries of the companies participating. Since 2012, the State of Utah has led 13 trade missions to Vietnam, Indonesia, Japan, Korea, Mexico, Chile, Thailand, Israel, UK, Philippines, Peru, Brazil and China with 45 manufacturing companies participating. The state led trade missions have resulted in approximately $24M in sales and contracts over the following three years among participating companies.
Beginning in calendar year 2014, the State of Utah has instituted a strategic approach to international trade for the next 18 months focusing on Brazil, Canada, China, and Mexico. These destinations have been identified as leading global markets for Utah’s leading industries.

**Manufacturing Travel Incentives (STEP Grant)** Utah has funds available to assist small businesses export their products under the State Trade & Export Promotion (STEP Program). STEP is a grant program partially funded by the US SBA and The State of Utah’s International Trade & Diplomacy Office (ITDO). The STEP grant provides a small reimbursable fund to cover costs related to international trade events, such as; airfare, business-to-business matchmaking, trade show fees, and translation/interpretation expenses.

**Manufacturing Inbound Trade Mission** The ITDO at the Governor’s Office of Economic Development also works to host interested parties who visit Utah to explore potential business opportunities. Utah leverages Trade Missions to attract Foreign Direct Investment. Trade Missions are a great opportunity to make the business case that Utah is the premier business destination in the United States, as attested to by Forbes Magazine who has ranked Utah the “Best Place for Business” three years in a row.

**World Bank Services** World Bank Private Sector Liaison Officers (PSLO) Network, launched in 1999, is a group of 114 officers in 81 countries around the world working to foster trade and investment between their regions and developing countries. PSLOs facilitate companies’ access to international financial institution (IFI) business opportunities. World Trade Center Utah is a host to one of the nine US Private Sector Liaison Officers.

**Gaps**

**Market Positions in Markets Outside of Aerospace and Outdoor Recreation and Athletic Equipment:** Utah has relatively weak efforts in understanding and aligning the AMM cluster with emerging markets such as energy, alternative energy, marine, construction and infrastructure, automotive, pipes and tanks, and others.

**Plans**

**Market Positions in Markets Outside of Aerospace and Outdoor Recreation and Athletic Equipment:** The UAMMI in collaboration with UtahCRG/Emperitas and Grow Utah, proposes a project to discover and align Utah’s industry sector more closely with its current markets of aerospace and outdoor recreation and athletic equipment and the emerging markets associated with the AMM cluster. The methods and work proposed in this section dovetails with the capabilities assessment proposed in the Suppliers Network section. In fact, while the assessment proposed in the Suppliers Network section is inward looking and the work proposed in this section is outward looking having a clear and accurate understanding of Utah’s current AMM capabilities is fundamental to designing an overall roadmap to increase Utah’s capacity to capture new market opportunities.

**Expanding Utah’s Market Knowledge** We have devised assessment methods and tools to more fully illustrate the customer needs within this industry. This assessment will utilize snowball sampling to map unknown industry relationships and extend the network of industry experts and end-user customers in national and international markets. As in the capabilities assessment work, this information will be supplemented through social media/web mining and an automated machine-learning tool built to search known industry databases and map professional connections and opportunities within the global AMM industry. Using the global
network discovered through the search, qualitative in-depth interviews (IDIs) with the identified industry experts and end-user customers will be conducted. The interviews will utilize a laddering process to uncover current and future opportunities and market conditions. Finally, a quantitative survey will be given to each industry expert with the goal of segmenting the markets and market channels discovered through the qualitative and quantitative work.

**Customer Needs Assessment**

We will assess customer needs using three steps: 1) Identify industry experts, end-user customers, and current suppliers. 2) Understand the customer's organizational capabilities, organizational needs, and organizational structure. 3) Understand the market conditions each customer faces. For the AMM industry, experts, end-user customers, and current suppliers include private and public entities ranging from SMEs to national governments. While each customer and their needs are necessarily unique, there will be shared characteristics that can be leveraged for predictive purposes.

**Customer Response Readiness**

The combination of the results from the Customer Needs Assessment and the Manufacturing and Capabilities Assessment (see Supplier Network section) will enable a detailed and careful consideration of the readiness of Utah businesses to serve current AMM customers and successfully respond to emerging market trends. In this phase of the effort, industry representatives will design specific Customer Response Readiness Action Plans to fill any determined gaps and capture market opportunities. These plans will specifically identify responsible implementation organizations with corresponding implementation schedules and success metrics.

**Customer Response Readiness Example**

**UAMMI Project for Establishing an ASME Certified Composite Manufacturer**

**Problem Statement:** There is a gap or barrier in the Utah AMM cluster KTS associated with the manufacturing of ASME Composite Overwrapped Pressure Vessels (COPVs). There are no ASME Certified Composite Manufacturers in Utah. This lack is restricting Utah's entry into the emerging market for the manufacture of these high pressure COPVs.

**Background:** The acceptance of advance composite materials in commercial pressure vessel industries has changed in the last decade. Historically, this market relies on steel for high pressure vessels. Carbon fiber high pressure vessel are significantly lighter weight and lower in cost to manufacture. The wall thickness for a steel vessel at 10,000psi can be over 5 in. thick and weigh as much as 15,000lbs. A comparable COPV is projected to weigh 75% less and reduce production costs by 2/3.

Because the pressure vessels are located on land and off-shore drilling rigs, the vessels must be ASME Boiler and Pressure Vessel (BPV) Code certified. The certification process of design, development, qualification and certification of a vessel can be cost prohibitive for composite fabricators. As a result there are limited numbers of ASME Certified Composite Pressure Vessel manufacturers in the US and none in Utah. This gap is easily remedied by implementing a strategically funded program as part of the larger UAMMI effort.

**Pool for Projects Requiring ASME Certification (Matching Grant):** UAMMI is proposing the creation of a funding source to provide matching grants for projects and marketable products that require ASME certification. As a Company or End User forecasts a product requiring ASME certification, an application will be made to the granting agency (UAMMI). The granting agency would provide 50% matching funds. 25% matching funds would be provided by both the Manufacturer and the End User.

After completion of the ASME Certification project, the Utah Composite Industrial Ecosystem would have one (possibly more) certified composite manufacturers expanding the ASME COPV market in Utah.

Metrics to be measured would include:
- Jobs created and subsequent tax return
- Number of COPVs produced by the program
- Number of ASME Certified Manufacturers in Utah

**Strategy:** For projects such as this example, where base funding could rapidly heighten Utah’s market expansion. We will work with federal representatives and GOED to seek subsidies from local, state and federal agencies in support companies in this type of activity.

Investing in Manufacturing Community Partnerships (IMCP) - The Utah Advanced Materials Manufacturing Cluster
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