Revolutionizing Manufacturing Through Innovation + Collaboration and Education and Workforce Development
Since Launching in 2012:
• $1B+ Federal; $2B+ non-Federal
• 1,600+ companies, universities, and non-profits involved
• 44 states represented

Manufacturing USA Network

DISTRIBUTION A: Cleared for Public Release
If it moves by Land, Air, Sea, or in Space, it can be Lightweighted
WHAT WE DO

✓ Technology Development

✓ Technology Transition and Transfer

✓ Education & Workforce Development
A PUBLIC-PRIVATE PARTNERSHIP

Delivering:

✓ Collaboration
✓ Innovation
✓ Access
COLLABORATION

✓ Facilitating an ecosystem to accelerate innovation

✓ Identifying opportunities and sharing cost through a public-private partnership

✓ Developing technical and workforce programs
INNOVATION

✓ Accelerating technology from academia to industry

✓ World-class expertise in manufacturing technology

✓ Full-scale labs for application pilot testing, transition and commercialization

✓ Developing a talent pipeline for innovation

✓ Helping to develop innovative SMM supply chains
ACCESS

✓ To our “industrial commons” capabilities of LIFT and partners

✓ Connecting to government and industry thought-leaders

✓ Leveraging range of workforce and technology programs
by the NUMBERS

200,000
students and teachers through more than 40 education and workforce development initiatives

100,000
square foot research and development facility in Detroit

$20 MILLION
worth of cutting-edge metal working equipment available for R&D collaborative and proprietary work

275
manufacturing industry meetings convened each year since the institute's launch

200+
industry, research, academic and workforce development partners

600+
engineers, researchers, professors and economic development experts working on LIFT-supported initiatives

$60 MILLION
committed to LIFT-sponsored technology projects
Government Partners

Industry, Academic, Research and Government Members
We can help you develop and deploy your competitive edge!

**Memberships:**
- Gold
- Silver
- Bronze
- Research Partner
- Trade Association
- Professional Society

**Government R&D Programs:**
- Direct Contract
- SBIR / STTR
- OTA
- OTA
- MIPR
- Other

**Services:**
- Design
- Engineering
  - CAD
  - CAM
  - CAE
- Manufacturing Engineering
  - VAVE
  - DFM
  - DFA
- Reverse Engineering
- Benchmarking
- Contract Research
- Technical Consulting
- Technical Business Case Review
- Program / Project Management
- Rapid and Preliminary Prototyping
- Physical and Virtual Try Out
- Small Batch Manufacturing
- Technology Roadmapping
- Entrepreneurial Business Planning and Coaching

**E&WD Products and Services:**
- Workforce Development Solutions
- Workforce Roadmaps
- Workforce Strategies/Consulting
- Virtual Workshops/Seminars
- Virtual Learning Modules
- Educational Curricula
- Credentialed Talent
- Flexible, Immersive Learning Lab
- Maker Space
- Materials Science Lab
THANK YOU!

LIFT:
(313) 309-9003
www.lift.technology
@NewsFromLIFT
Backup Slides
LIFT TECHNOLOGY SCOPE

PRIORITY METAL CLASSES

- Advanced High-Strength Steels
- Titanium
- Aluminum
- Magnesium

TECHNOLOGY DEVELOPMENT PILLARS:

- Thermo-mechanical processing
- Powder Processing
- Low Cost, Agile Forming
- Melt processing
- Coatings
- Joining and Assembly

ADDITIONAL CROSSCUTTING THEMES:

- Integrated Computational Materials Engineering (ICME)
- Design
- Life-cycle analysis
- Validation / Certification
- Cost modeling
- Supply chain
- Corrosion
- Ballistic / Blast
LIFT’S IN-HOUSE CAPABILITIES

- Powder consolidation
  - Metal injection molding
  - Hot isostatic pressing
- Thermal mechanical processing
  - Advanced stamping
  - Formability testing
  - Hydroforming
  - Metal extrusion
  - Linear friction welding
- Flexible manufacturing
  - Robotic arc & resistance welding
  - Robotic surface treatment
  - Robotic blacksmithing
- Characterization
  - Metallography / microscopy
  - CT X-ray / Metrology
- Advanced Machine Shop
LINEAR FRICTION WELDER

Linear Friction Welding Advantages & Benefits

- Superior joint quality
  - Does not melt the parent material.
- Energy efficient
  - As much as 20 percent lower than conventional welding processes.
- Ecologically friendly
  - Does not emit smoke, fumes, or gases.
- Eliminate block machining with “near net shape” joining
- Use expensive material only where needed.
- Forged-quality welds for complex geometries of nearly any metal type
  - Can join dissimilar metals not compatible using conventional welding methods.
- Quick welding process meets the demands of any supply chain
  - At least twice and up to 100 times as fast as other welding techniques.
- Minimal joint preparation reduces prep time and speeds up production
  - Machined, saw-cut, and even sheared surfaces are weldable.
- Defect-free welding decreases waste and saves money
  - Machine-controlled process; no melting, solidification defects do not occur. Eliminating gas porosity, segregation, or slag inclusions.
- Scalable welding sizes for any magnitude of applications
  - Welding process is completely scalable to produce any size weld.

LINEAR FRICTION WELDING is a solid state process in which one part moves in a linear motion at high speed and is pressed against another part held stationary. The resulting friction heats the parts, causing them to forge together.

The LF35-75* is a 35 ton oscillating, 75 ton forge capacity (150,000 lbs down to 10,000 lbs) universal machine capable of solid state welding a variety of materials, sizes, and geometries.

*Preliminary machine concept shown is approximately 60 ft by 40 ft (18.3 m X 12.2 m) with an approximately 9 ft (2.7 m) deep foundation.
EDUCATION & WORKFORCE STRATEGIC FOCUS

- Understanding workforce demand-supply gaps
- Reconnecting disconnected youth to high-quality, middle skills jobs
- Teaching the teachers
- Expanding work and learn opportunities for students
- Creating enhancements to engineering curriculum using light-weighting technologies
- Offering on-the-job training solutions for our industry partners
- Attracting students and workers to educational pathways to careers in manufacturing
- Connecting separating military personnel and veterans to fast-track skills development and manufacturing careers

- Deploying pathways from K-12 through community colleges to university four-year degree programs, with more on and off ramps to employment
- Ensuring students gain STEM foundational skills for success in manufacturing careers
- Linking and leveraging resources and related initiatives on the ground today

GET INVOLVED AT OPMNEXTJOBS.COM >
CONSTRUCTION FALL 2018

A national leader in lightweight metals, technologies, and processes training, building capabilities to leverage new developments in lightweighting with additive, digital, composites, and robotics systems.

The LIFT Learning Lab is a unique national asset and the only immersive learning lab to focus on building a talent pipeline of advanced manufacturing technicians.

Learning resources for the entire confluence of talent development:
- students, teachers, and faculty from K-12
- community and technical colleges
- university and graduate degree programs
- incumbent workers in small, medium and global enterprises
LIGHTWEIGHTING IN AUTOMOTIVE

DUCTILE IRON CASTINGS

- Weight Reduced by 40%
- Wall thickness reduced by 50%

OUTCOMES INCLUDED:
- New ductile iron alloy
- Cast prototype parts
- As-cast and machined wall thickness reductions
- Weight reduction

PRODUCT, PROCESS AND MATERIAL DEVELOPMENT:
- Part redesign based on performance needs
- Alloy optimized for strength
- Process developed for material flow
- Trials poured and evaluated
IMPACTING SHIPBUILDING

Welding Distortion Control
- Welding lightweight plates leads to more distortion and buckling

Product, process and material development:
- Team taking approach of “inside out” construction approach similar to automotive

Outcomes:
- Reduced distortion by 30%
- Reduced cost by 13%
- Huntington Ingalls implementing process in shipbuilding going forward
INVESTING IN OUR MILITARY

Optimizing ABS and Electronic Stability Control Systems:
- Reduce fatal rollovers for our U.S. military members

Product, process, and material development:
- Conduct studies for light weighting components
- Component Redesign
- Lightweight prototype development

Outcomes:
- Systems available for purchase by military units worldwide
- Expected to reduce fatal rollovers by up to 74%
- Can reduce stopping distance by 8 truck lengths
SUPPORTING OUR FIRST RESPONDERS

Machined and prototyped couplers for Lifeline Firehose product:
  - Hose delivers air to firefighters in the same hose system as it delivers water to a fire

Product, process, and material development:
  - Machined pieces at LIFT’s Detroit facility
  - Optimized coupler design
  - Two sets made available to Lifeline

Outcomes:
  - System installed on Grand Ledge, Michigan fire truck
  - Working towards higher levels of production through die casting
LIGHTWEIGHT SOLUTIONS THROUGH INCREMENTAL FORMING

State-of-art sheet metal forming technology
   Enables more flexibility in part geometry and cost efficiency compared to conventional processes

Product, process, and material development:
   Baseline established by forming a cone and a pyramid
   Benchmark used to study the effect of different process parameters and tool paths on the structural properties, fatigue and dimensional accuracy of the component

Outcomes:
   • Formed “heart-shape” test component using die assisted two-point incremental forming (TPIF).
   • Demonstrated ability to form same shape with no die single-point forming (SPIF).
   • Delivered prototype to customer.
Industrial Commons and Facility Equipment
LIFT INDUSTRIAL COMMONS:

- 770,000+ sq. ft. in core regions across the U.S
- Equipment Value > $187.7M
Function:
• Extrusion of Aluminum and Magnesium alloys

Applications:
• Aerospace
• Automotive
• Electronics
• Renewable Energy

Capabilities:
• Up to 50’ long sections
• Uses 1,344 U.S. tons of force
• Furnace preheats 200 lb. billets at 900F

Vendor:
• Danieli Breda
Function:
- Uses high-pressure fluid to press material into a die

Applications:
- Vehicle body structures, exhaust systems and frames

Capabilities:
- 1,000 U.S. Ton
- Press bed: 64”x76.5”x36”

Vendor:
- Interlaken Technology
Function:
• Multi-purpose double action forming press

Capabilities:
• Local temperature control
• Double action forming 300x230Ton
• Press bed: 35”x35”

Vendor:
• Interlaken Technology
HOT ISOSTATIC PROCESSING

Function:
• Powder Pressing
• Rapid Cooling HIP - Hot Isostatic Pressing

Capabilities:
• Rapid Cooling
• Working pressure 30,000 PSI
• 10” Diameter x 30” Long Cylinder
• Hot zone 6” diameter x 12” long

Vendor:
• American Presses, Inc.
Metal Injection Molding

Function:
• Metal Injection Molding

Materials:
• Powdered Metals and Ceramics
• Composites
• Plastics

Applications:
• Industrial
• Medical
• Aerospace
• Automotive

Capabilities:
• Clamping force 110 U.S. tons
• Distance between tie bars inch 18.5” x 18.5”
• Injection unit: 25 mm screw @ 59cm³ volume.

Vendor:
• Arburg
FLEXIBLE JOINING SYSTEM

Function:
• Arc Welding
• Spot Welding
• Adhesive (bonding) Joining
• Mechanical Joining
• Surface Treatment

Materials:
• Steel
• Aluminum and Titanium Alloys

Capabilities:
• Small assemblies
• Large assemblies such heavy truck frames
• Large plates for ships (both sides being welded simultaneously)

Vendor:
• Comau
Function:
- Surface coating and treating

Materials:
- Metals
- Carbon Fiber
- Plastics
- Glass
- Composites

Capabilities:
- Adhesives / Sealants / Ink/Prints/Coatings/Paints
- Robotically applied (small-Large)

Vendor:
- Plasmatreat
CT SCANNING

Function:
• Quality/NDT/Reverse Engineering

Materials:
• Metals
• Composites
• Ceramics

Applications:
• To scan components for flaws
• To investigate internal structures and geometry

Capabilities:
• Lift CT scanner medium res 500 micron
• Large scanner, res 1mm
• Reverse engineering
• Quality / NDT

Vendor:
• VJ Technologies
ROBOTIC BLACKSMITHING

**Function:**
- Quality/NDT/Reverse Engineering

**Materials:**
- Sheet Metals

**Applications:**
- Forming prototype or low-volume production parts

**Capabilities:**
- Two robots
- 6 axes

**Vendor:**
- FANUC
MACHINE SHOP

Function:
• Machining Lab support operation

Materials:
• Metals
• Composites
• Ceramics

Capabilities:
• Tool and Die making
• Modifications of tools
• Training

Vendors: Knuth and FANUC
• Drill Press
• Vertical Band saw
• Horizontal Band Saw
• Surface Grinder
• Belt/Disk Sander
• Arbor Press
• Sheet Working
• Machine
• Wire EDM
• Tube bender
• CNC Lathe
• Workshop press
• Milling Machine
• and others
QUALITY & METROLOGY LAB

Function:
• Quality Control

Capabilities:
• Quality Lab
• Wet Chemistry Lab

Vendors:
• LECO
• Hexagon