



# Lightweight Innovations For Tomorrow

Supporting Weight Reduction for the Transportation Industries

Sherkoh Abbas  
Director of Technology Operation  
August 24, 2016

# The NNMI Institutes



**Advanced Functional Fabrics of America (AFFOA)**

# Light weighting



Alan Taub – LIFT CTO

# Lift Technology Project Categories

**I. MEMBER IDENTIFIED  
TRANSITION OPPORTUNITIES**

**III. INDUSTRY SPONSORED  
PROJECTS**

**II. LIFT BROADCAST  
REQUEST FOR PROPOSALS**

**IV. GOVERNMENT SPONSORED  
PROJECTS**

# Lightweight Innovations For Tomorrow

Member of the National Network of Manufacturing Innovation (NNMI)

Location:

- Detroit's Historic Corktown
- Launched: February 25, 2014
- Facility Ribbon Cutting: January 15, 2015
- Headquarters: ~100,000 sq. ft.

Agency Sponsor: Department of Defense

- Startup funding:
  - \$70M: Public
  - \$78M: Industry co-investment

Founding Research Partners:

- University of Michigan
- The Ohio State University
- Edison Welding Institute

LIFT Industrial Commons:

- 770,000+ sq. ft. in five core regions across the U.S
- Equipment Value: \$187.7M



# Our Mission

Establishing the U.S. as a world leader in lightweighting innovation



- **Accelerate** development and application of innovative lightweight metal production and manufacturing technologies
- **Benefit** the U.S. transportation, aerospace and defense markets
- **Ensure** the U.S. is the world leader in innovation and manufacturing technologies
- **Build** a robust talent pipeline for metals manufacturing

Video

# Our Opportunity

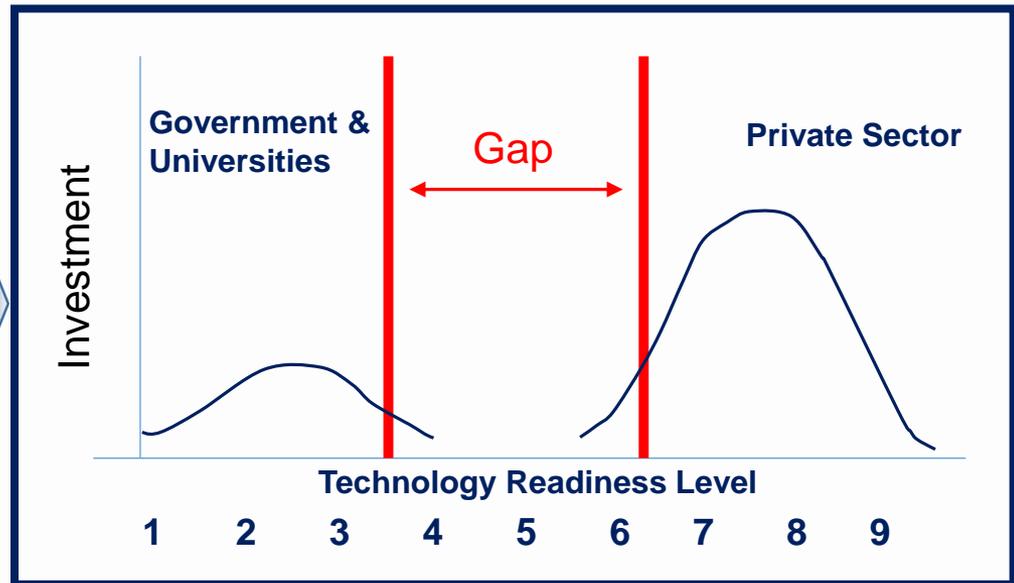
To close the gap between idea and commercial ready technology

## What is the problem?

- Designing and producing high-performance lightweight products is **costly and complex**
- Engaging all players early in the development of new materials and processes is **challenging**

## The Result?

A “**Valley of Death**” syndrome in which new materials are **developed but never implemented** due to a disconnect between development, design and manufacturing.

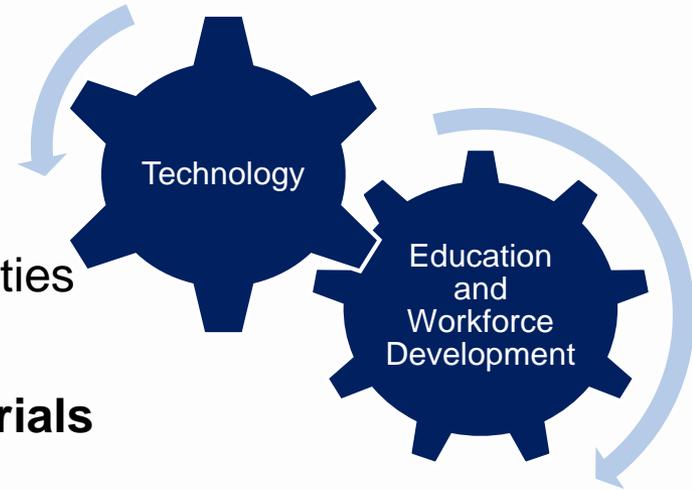


# Our Approach

Rapid development, qualification, optimization and deployment of new technologies for defense and commercial needs

## LIFT's bold approach includes:

- **Engaging** the full manufacturing supply chain
- **Employing** systems engineering principles
- **Developing** innovative processes in dedicated facilities with unparalleled capabilities
- Using high-fidelity **Integrated Computational Materials Engineering (ICME)**
- Developing a **model-based certification toolkits**
- Supporting scale-up to commercial use
- Preparing an eager workforce equipped with 21st century advanced manufacturing skills.



# 93 Membership Agreements Signed

### Industries & Professional Societies

### Academic & Research Partners

### Small/Medium Manufacturers

### Start-ups

### Workforce/Education

# Our Technology Portfolio

Working across transportation, aerospace and defense industries

- All projects must have applications crossing **at least two industry sectors**
- All projects are:
  - **Identified and prioritized by industry partners**
  - With input from government agencies to **ensure deployment plans are in place**
- Projects authorized to-date: **~\$22M**



# Our Technology Scope

Industry-led projects from concept to production

## Priority metal classes and are:

- Advanced High-Strength Steel, Titanium, Aluminum and Magnesium

## Our six pillars of technology development:

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

## Including eight crosscutting themes:

- Integrated Computational Materials Engineering (ICME)
- Design
- Life-cycle analysis
- Validation / Certification
- Cost modeling
- Supply chain
- Corrosion
- Ballistic / Blast



# Current Technology Projects

Each project runs between one and two years and carries a total investment of between \$1 million and \$4 million

Project Pillar	Project Description
Melt Processing	Two Projects - Thin wall casting: Ferrous and Non-Ferrous Components
Thermo-Mechanical Processing	Two Projects - TMP Processing for Assured Properties in Titanium and Al-Li Forgings
Coatings	Manufacturing Process Optimization Methods for High Performance Al Alloys
Joining and Assembly	Distortion-free construction of lightweight stiffened panels

## Project Process

- Project ideas are solicited from **all LIFT members**
  - Universities account for ~70% of submitted ideas and ~50% of selected projects
- Companies from more than one transportation sector are **engaged in every project**
  - All projects are led by an industry PI
- Each project has **a number of university researchers** engaged
  - A lead university researcher is assigned to assist the PI

# Melt Processing

## Developing and Deploying Thin Wall Ductile Iron Castings for High Volume Production



### Project Objective

To obtain a 30% to 50% weight reduction in components by decreasing wall thickness through improvements in the methods of producing thin wall ductile iron castings and the alloys involved.

**Industry Partners:** Grede, Comau, Eaton, PDA

**Trade Association:** American Foundry Society

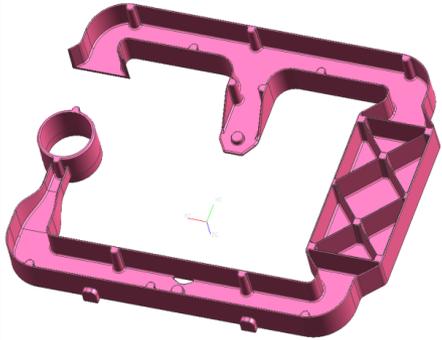
**Research Partners:** Michigan Technological University, Massachusetts Institute of Technology

### **PRELIMINARY RESULT:**

**Achieved 40% weight reduction in first castings tested**

# Melt Processing

## Vacuum aided aluminum die casting production



### Project Objective

To enhance the ability of ICME models to predict the performance of aluminum die cast parts by combining information about the microstructure of the metal with a host of design and production parameters.

These enhancements will be used primarily for aerospace, defense, and automotive applications.

**Industry Partners:** Boeing, Eaton, Alcoa, Comau, Nemark

**Trade Association:** American Foundry Society, North American Die Casting Association

**Research Partners:** The Ohio State University, Worcester Polytechnic Institute, University of Michigan, Southwest Research Institute, Massachusetts Institute of Technology

# Thermo-mechanical Processing

Predicting the performance of aluminum-lithium alloys



**Industry Partners:** United Technologies Research Center, Lockheed Martin  
**Research Partners:** University of Michigan, Case Western Reserve University, The Ohio State University, Southwest Research Institute

## Project Objective

To better predict the performance of aluminum-lithium alloys in formed parts by developing advanced computer simulations.

The project partnership will also include material process modeling and simulation of the properties evolution during industrial operations.

# Thermo-mechanical Processing

Advancing analytics to better predict performance of titanium alloys



**Industry Partners:** GE Aviation, Scientific Forming Technologies Corporation, Boeing  
**Research Partners:** The Ohio State University, University of Michigan, University of North Texas, Purdue University, Southwest Research Institute

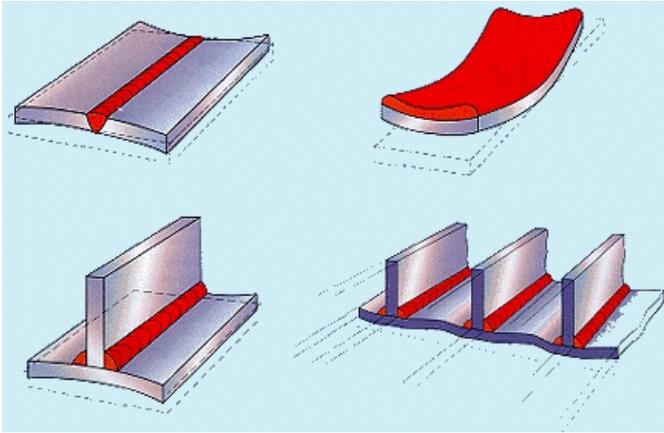
## Project Objective

To develop computer models that will reduce by 50% both the time and cost for materials development, component design, and manufacture.

These new computational tools will help improve performance in manufactured components.

# Joining and Assembly

Reduce warping in joining lightweight metal sheets in shipbuilding



## Project Objective

To expand the ability of computer simulations to predict the results of large sheets of metal being welded together in a production environment.

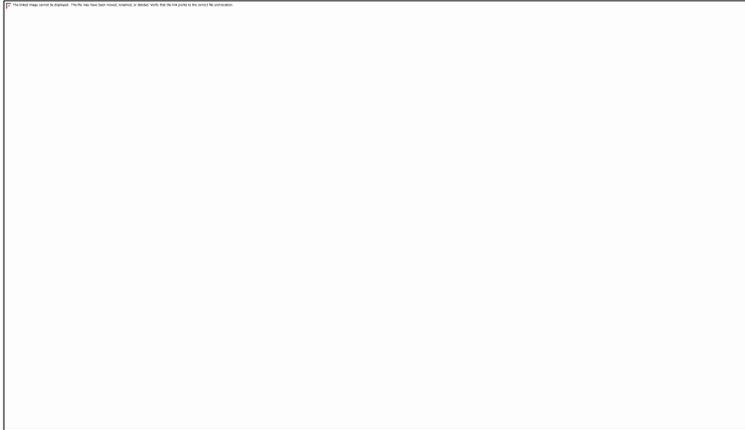
The project will result in reduced rework, improved first time quality and increased productivity.

**Industry Partners:** Ingalls Shipbuilding, Comau and ESI NA

**Research Partners:** University of Michigan, EWI, Massachusetts Institute of Technology and The Ohio State University

# Coatings

Better predict corrosion to improve airplane parts



## Project Objective

To develop a database and computer models to better predict the way aluminum alloys corrode, based on the microstructure of every area of a finished component, after being put in use as parts for airplanes or other forms of transportation.

**Large Industry Partners:** UTRC, Lockheed Martin, DNV GL

**Research Partners:** University of Michigan, The Ohio State University

# LIFT PRIORITIZED EQUIPMENT

The HQ facility will house unique pilot scale equipment. An extensive survey and iterative communication was conducted with our Gold & Silver industry partners and appropriate Gov't Agency representatives to identify and then prioritize the equipment we will procure and install at HQ. The overarching priority/goal was to identify unique equipment that the industry members could use for both shared and proprietary projects as well as capabilities that would position LIFT for future government R&D needs.

## ***Priorities Based on:***

- Industry Member Potential to Use for both Shared and Proprietary Projects
- Potential Relevance to Future Government Programs

Prioritized Pilot Scale Equipment	
<b>Melt Processing</b>	Melt and Tilt pour casting machine
	Die casting machine
<b>Thermo-mechanical Processing</b>	Extrusion Press
	Hydroforming Press (sheets and tubes)
	Forging Press
	Sheet Metal Forming Press with Local Temp Control
<b>Powder Processing</b>	Rapid Quench/Cooling Hot Isostatic Pressing)
	Metal Injection Molding
<b>Agile/Low Cost Tooling</b>	Incremental Tube Forming
<b>Coatings</b>	
<b>Joining</b>	Flexible robot cell for joining technology development
	Linear Friction Welding System

# LIFT Industrial Commons

## Core Sites

1400 Rosa Parks Blvd. Detroit, MI 48216



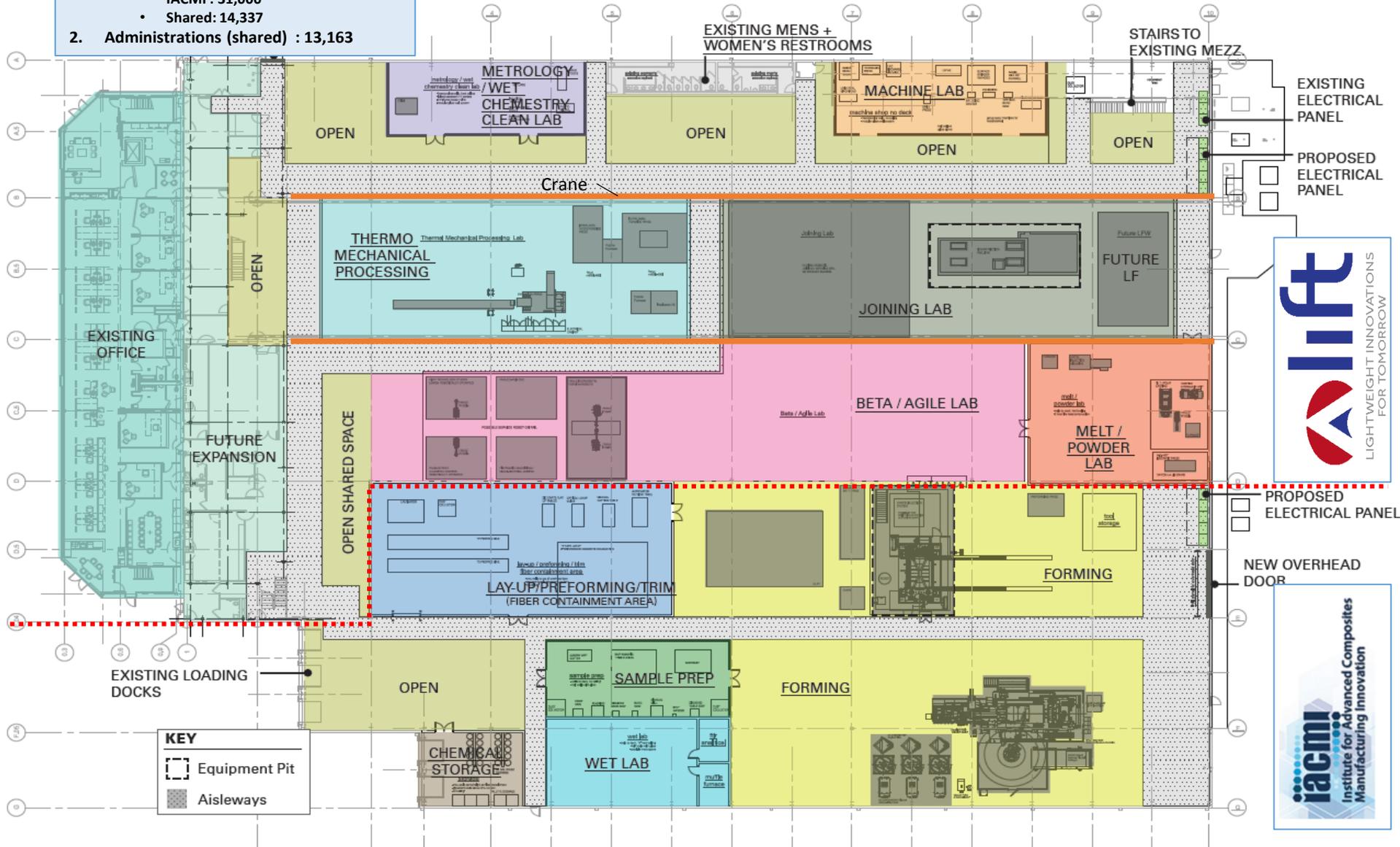
### LIFT Industrial Commons (core sites):

- 770,000+ sq. ft. in core regions across the U.S
- Equipment Value: \$187.7M

**Total Facility Area: 100,000 SQFT**

- Mfg./Lab (Hi-bay) : 86,837**
  - LIFT : 41,500
  - IACMI : 31,000
  - Shared: 14,337
- Administrations (shared) : 13,163**

# Lift's Layout



# Thermal Mechanical Processing Extrusion

## Function (Extrusion Press):

- Extrusion Alloy AlMgSi 0,5

## Capabilities:

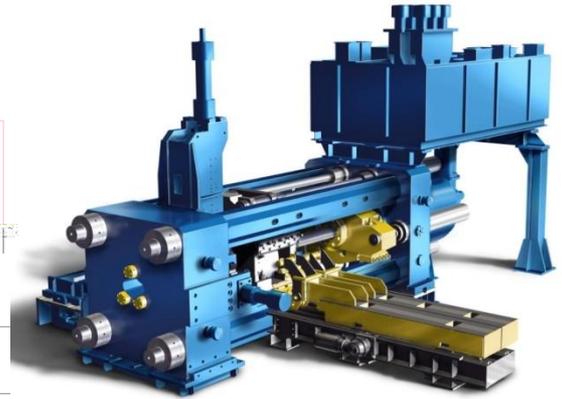
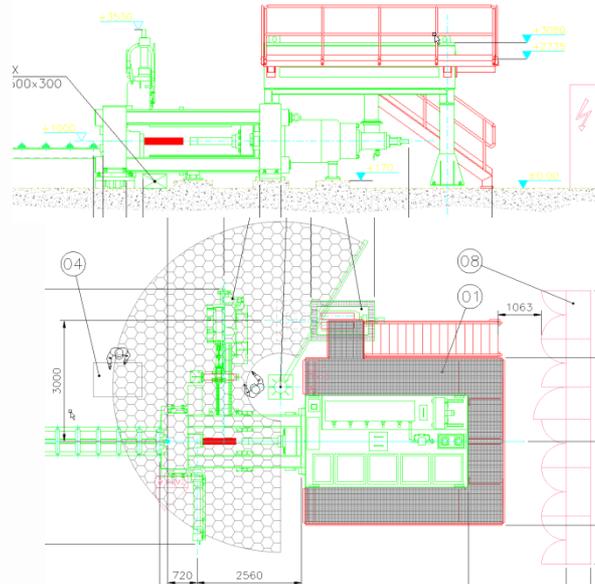
- Up to 400" plus long ext. sections
- 12 MN / 1344 US Tons
- Exit hole  $\varnothing 7.9$ " / Ext. slot 11.9"
- Billet  $\varnothing 6$ " x from 15.75 to 31.5" long
- Furnace for Billets / dies preheating (200lbs @900F)

## Operational:

- Est. Delivery Aug/Oct 17
- Installed 4Q 2017

## Vendor: DANIELI BRED A

Billet Heating Furnace		
Installed Power	50	HP
Capacity	200	lbs
Heating Temperature	896	*F
Extrusion Press		
Type	Short Strok Front Loading	
Capacity	12	MN
	1344	USI
Nominal Pressure	3336	PSI
Installed Power	560	HP
Extrusion Speed	0,63	inch/sec
Working Stroke	39	Inch
Dead Cycle Time (up to the upsetting initiation)	16	sec
Die Stack Size	Diameter: 13,98	Inch
	Length: 13,98	Inch
Exit Hole on the Extrusion Platen	Diameter: 7,9	Inch
	Slotted width: 11,9	Inch
Vertical Daylight	102	Inch
Horizontal Daylight	96	Inch



## Samples



Profile Handling		
Exit Rollway Length	49	inch
Exit Rollway Width	15,75	inch
Billet Loading System		
Type	Hydraulic Billet Loader	
Min. Billet Handling Size	15,75	inch
Max. Billet Handling Size	31,49	inch
Billet Characteristics		
Billet Length	31,5	inch
Billet Diameter	152,4	mm

# Thermal Mechanical Processing Hydroforming

## **Function** (Hydroforming press):

- Hydroforming

## **Capabilities:**

- 1000 ton clamping actuator, 16" stroke
- 64" FBx76.5" SS x 36" daylight

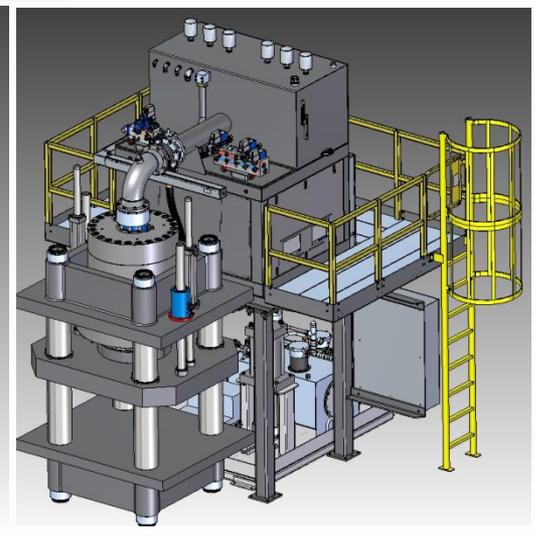
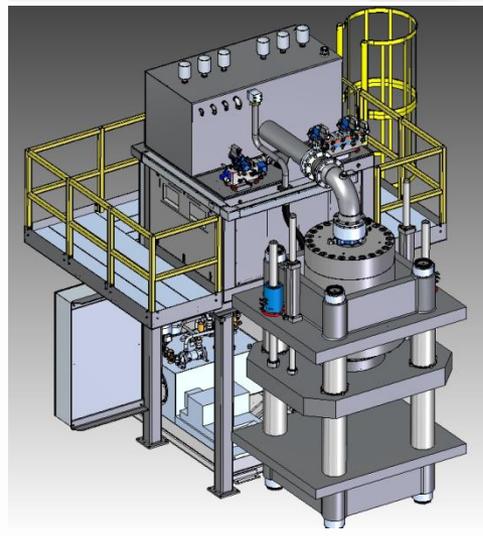
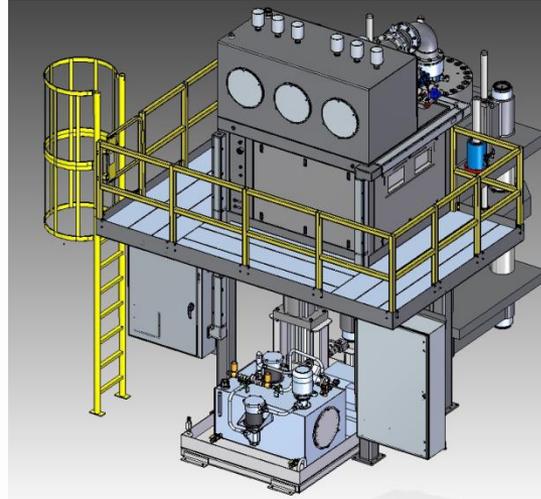
## **Operational:**

- Est. Delivery April/Oct 17
- Installed 4Q 2017

## **Vendor:** Interlaken Technology (ITC)

- Near-zero deflection reaction frame
- 3 inches/second open and close rate
- 32" column spacing side to side
- 32" column spacing front to back
- Shut Height 20"
- Two feed actuators, 115tons each, 8" stroke
- Reaction plate/die shoe for tooling
- Hydraulic power supply
- 20,000 psi pressure intensifier, servocontrolled
- Closed-loop forming-fluid handling system
- Complete control system with multiple open channels for user inputs and outputs. Comes preloaded with software for tube hydroforming
- high rate data acquisition
- all interconnecting hoses, tubes, piping, wiring and cables
- position control to within 0.001", force control to within 5% of full scale

## Samples



# Thermal Mechanical Processing Forming

## Function (Stamping/forming)

- Multi-purpose double action forming press

## Capabilities:

- Local temperature control
- Double action forming 300x230Ton
- FB35"xSS35"x 24" Daylight

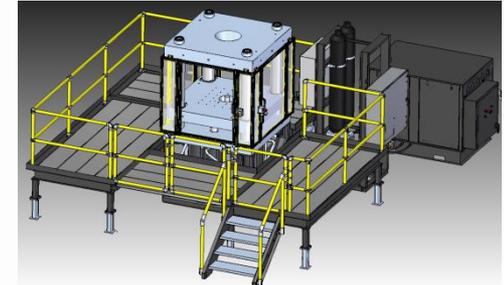
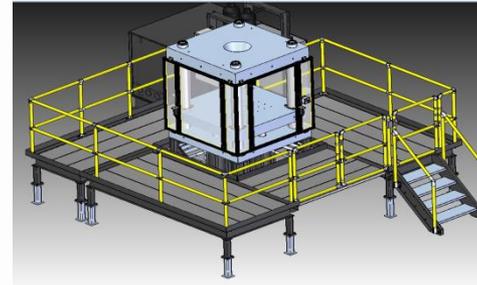
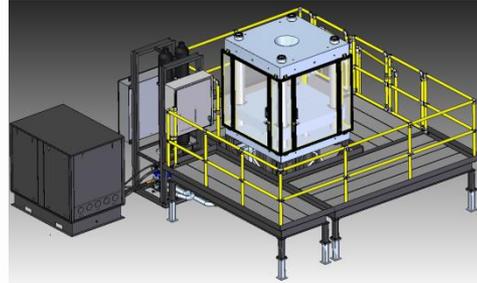
## Operational:

- Est. Delivery Jan/Aug 17
- Installed 4Q 2017

## Vendor: Interlaken Technology (ITC)

Super ServoPress 300 Ton (2670kN) clamp, 230 Ton (2046kN) punch

- 609mm stroke on clamp and punch
- 36" (800mm) between the columns, front to back and side to side, 24" (600mm) daylight
- Up acting configuration
- Work platform in front of press
- Unitest control system
- Hydraulic power supply
- Complete system



## Samples



## TOOLING...

- LDH
- Marciniak
- FLC/FLD
- Nakajima
- Bulge Testing, 100mm, 200mm
- Hole Expansion, flangibility
- Deep Drawing Test
- Cup Test
- Engelhardt Test
- Earing Test
- Fukui Test
- Olson/Erichsen punches/rings
- OSU Forming/ Friction



## OPTIONS...

- Sheet & Tube Hydroforming
- Hot Gas Forming to 1000°C
- Hot Oil Forming to 300°C
- Warm Forming to 500°C
- Hot Forming to 1000°C
- Hot Forming with in Die Quenching (Hot Stamping) to 1000°C
- Isothermal Forging-1400°C
- Digital Image Correlation (DIC) camera system
- Custom voltages/Hz
- Metric or English display





# Joining Flexible Joining System

## Function (Multi-robot joining cell):

- Arc Welding
- Spot Welding
- Adhesive (bonding) Joining
- Mechanical Joining
- Surface Treatment –cleaning / coating

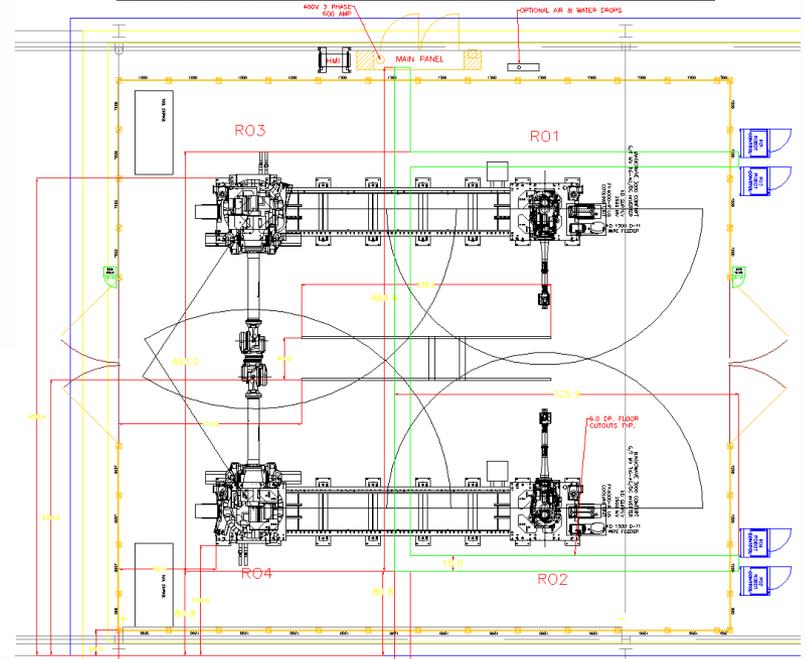
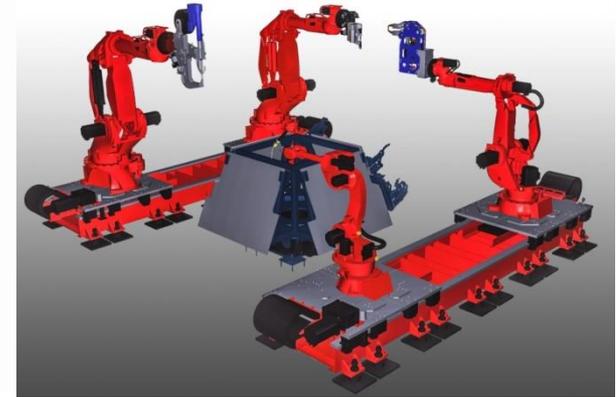
## Capabilities:

- Small assemblies
- Large assemblies such heavy truck frames
- Large plates for ships (both sides being welded simultaneously)
- 7 Axes cell – (6 Axes robot + 1x slide)
- Payload 16 and 300 Kg
- Reach 3.0-3.1 m

## Operational:

- Est. Delivery Dec/ 16
- Installed 1Q 2017

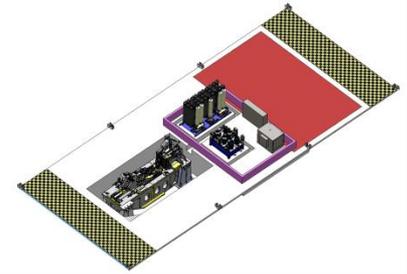
## Vendor: COMAU



Robot & Slide Content Summary	Qty
SMART5 NJ 16-3.1 - Payload 16kg - Reach 3.1m	2
CMT Package - Single Torch	1
SMART5 NJ 370-3.0 - Payload 370kg - Reach 3.0m	2
HANDLING PACKAGE NJ & C5G - FIELDBUS on AXIS 6 with BAZOOKA SLS	2
TMF4D: DOUBLE Carriage SLIDE with DRESSING HANDLING	2
Flexible Tooling Rail System	1



# Joining Linear Friction Welding



**Function:** Solid State Joining

**Capabilities:**

- 35 Ton Oscillating force
- 75 Ton forge force
- Universal machine capable of solid state welding of materials, sizes and geometries.
- Superior joint quality
- Energy efficient
- Quick welding
- Multi-material joining

**Operational:**

- Est. Delivery March 18
- Install 2Q-2018

**Vendor:** Manufacturing Technology Inc.



**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 (18.3m X 12.2m) with an approximately 9 ft (2.7m) deep foundation.

**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.

[MTIwelding.com](http://MTIwelding.com)

**Samples**

**JOINT GEOMETRIES**

Linear Friction Welding can join a wide range of part geometries



PLATE TO PLATE



TUBE TO PLATE



SQUARE TO SQUARE



ROUND TO SQUARE



TUBE TO SQUARE



CONCAVE TO ROUND



# Powder Metal Hot Isostatic Processing

**Function:** Powder Pressing

- Rapid Cooling HIP - Hot Isostatic Pressing

**Capabilities:**

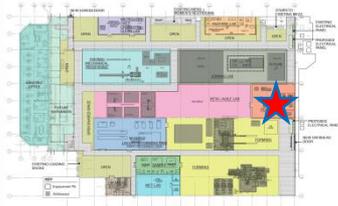
- Rapid Cooling
- Hot zone 6" dia x12"L
- FURNACE 1400 C molybdenum two zone furnace with a 150mm diameter x 30mm long hot zone.
- VESSEL INTERIOR DIAMETER 10 inches (250 mm)
- VESSEL INTERIOR LENGTH 30 inches (760 mm)
- WORKING PRESSURE 30,000 PSI (207 MPa)
- VESSEL TYPE ASME Section VIII, Div 2 code stamped pressure vessel, National Board registered. Hydro-Tested and stamped. SA-723 steel.
- Cooling: Treated closed loop cooling system with reservoir, pump and heat exchanger. Connects to customer coolant (city, re-circ, or chiller) at 15 gpm.

**Operational:**

- Deliver to Lift Sep 16
- Installed 4Q 2016

**Vendor:** AMERICAN PRESSES, INC





# Powder Metal Metal Injection Molding

**Function:** Metal Injection Molding

**Capabilities:**

- Total Clamping force max. US-tons 110
- Clamping force max. kN 1000
- Distance between tie bars inch 18.50 x 18.50
- Distance between tie bars mm 470 x 470
- injection unit (170) horizontal, for injection through the fixed mold platen: 25 mm screw @ 59cm<sup>3</sup> volume.

**Operational:**

- Arrived @ Lift 6/16
- Install 4Q-2016

**Vendor:** ARBURG



Samples





# Melt Tilt Pour Casting Machine

**Function:** Tilt Pour Casting Machine / casting

**Capabilities:**

- Melt and Tilt pour casting machine
- HALL 3HS Permanent Mold Casting Machine (tilt pour gravity die casting machine)

**Operational:**

- Arrived @ Lift
- Install 4Q-2016

**Vendor:** Hall CMH Mfg.

## Gravity Die Casting Machine

**Features**

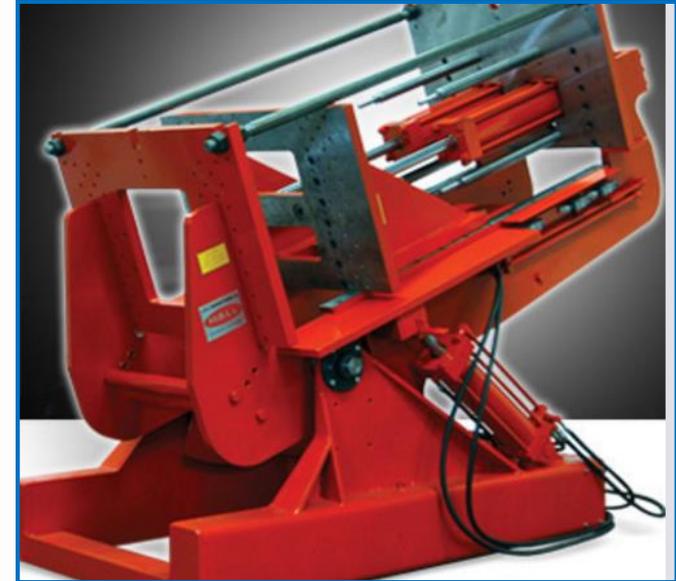
- Low maintenance due to few moving parts, heavy duty, rugged, and dependable.
- Frame open on 3 sides, plus front and bottom, to facilitate use of core pulls in 5 directions.
- Twin cushioned tilt cylinders provide a smooth tilting motion from start to stop.
- Twin ram cylinders provide a safety factor, as well as extra holding pressure and better clamping balance.
- Hydraulic power units available in manual, automatic, or with programmable controllers, sized to facilitate all available accessories at low operating pressure.

**Specifications**

Clamping pressure	58,900 lbs.	(26,717 kg.)
Max. mold size	36 x 38 in.	(91 x 97 cm)
Max. mold weight	4,000 lbs	(1,815 kg.)
Ram stroke	30 in.	(76.2cm)
Daylight opening	17.50 in	(44.5 cm)
Pressure height center	12.50 in.	(31.8 cm)
Machine weight	8,150 lbs	(3,697 kg.)
Tie bar size	2 in. dia	(5.08 cm)
Tilt speed	7 sec.	

**Options**

1. Tie Bar Extensions
2. Manual Swing In Casting Catcher
3. Powered Swing In Casting Catcher
4. Front Ejector
5. Proportional Tilt
6. Custom Platen Drilling or Sizes



Sample





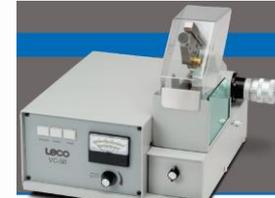
# Quality & Met Lab

**Function:** Quality Control

**Capabilities:**

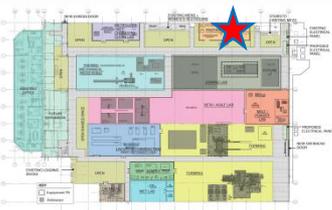
- Quality Lab
- Wet chemistry lab
- **Operational:**
- Arrived @ Lift
- Install 4Q-2016

**Vendors:** LECO & Hexagon



QTY	ITEM #	DESCRIPTION
1.00	801-900	VC-50 VARI /CUT, 0-500 RPM, low deformation
1.00	826-400-3	MSX-255M Radial Feed Metallographic Laboratory
1.00	863-208	LECO LR300TD DIGITAL TWIN Tester .
1.00	863-783-1	(P2-LM) PAXcam2 LM camera. PAX-it Lite software
1.00	863-790-2	LECO LM-310AT Vickers Microindentation Tester
1.00	863-889	LECO/Olympus SZ61 Stereo Microscope
1.00	GX41RBT	LECO-Olympus GX41 Inverted Reflected Light Bench
1.00	PR36150D	Automatic Mounting Press. Heat, cures and then cools
1.00	SS-1000BD	SS-1000 Bench Model, Dual 8" .5 Hp/373W variable
1.00	807-915	Left Vise Assembly Kit
1.00	811-651-4	Water Flow Control Valve for Transparent Lucite
1.00	812-423	Kit Basket Catch Msx-250
1.00	861-250-2	Ringlight Adapter For Olympus Sz
1.00	861-722-3	Digital stage micrometer (English & Metric)
1.00	862-596	Test Block HR 15N 90-91
1.00	863-460-1	AMH43 STYLE sample holder Upgrade kit
1.00	863-703	(U-V105C) 0.5x CCD Camera Adapter with C-mount.
1.00	863-783-8	Description: EasyLED Ring Light Plus
1.00	812-534-5	Mold Assy 50mm Complete Sncm220
1.00	861-520	2.0x Aux Lens WD:38mm (1-S822)
1.00	1	7.10.7 GLOBAL PERFORMANCE CMM





# Machining Lab CNC Fabricating Lab

**Function:** Support Technology Operation/Machining

**Capabilities:**

- Building tooling
- Modify tooling
- **Operational:**
- Arrived @ Lift
- Install 4Q-2016

**Vendors:** Knuth

- Assembly
- Deburring
- Punching
- Notching
- Bending
- Drilling
- Routing
- Tumbling
- Countersinking
- Milling
- Slotting
- Cutting
- Mitering
- Tapping

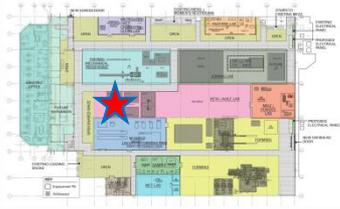
**Multipurpose Machines**

- 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



QTY	ITEM #	DESCRIPTION
	Lot / page	Multipurpose Machines for machine shop
1.00	301231	MF 1 KVP: Multipurpose Milling Machine
1.00	162337	SSB 40 F Super: Column Drill Press
1.00	102500	VB 300 Vertical Bandsaw
1.00	152797	HB 280 B Band Saw Machine
1.00	124288	HFS 2550 VC - Hydraulic Surface Grinder
1.00	112700	BTM 250 Belt /Disk Sander
1.00	109540	5T Arbor Press
1.00	110047	3 in 1 / 1000 Sheet Working Machine
1.00	129112	Hydraulic Tube Bender 1/2" - 2" diameter pipe.
1.00	100105	ZNC-EDM 250 - Electrical Discharge Machine
1.00	300821	V-Turn 410/1500 - Precision Lathe
1.00	131745	Hydraulic Workshop Press with double-acting cylinder

QTY	ITEM #	DESCRIPTION
	Lot / page	Multipurpose Machines for machine shop
1.00	130172	HPS 55/110 D Ironworker : punching, cutting & notching
1.00	130240	KMT 1353 - Motorized Swing Beam Shear
1.00	102785	DS Turning Tool Grinder
1.00	129061	Inside Micrometer Set 3-POINT 11-20
1.00	108880	magnetic v-block I
1.00	108796	Magnetic Micrometer Holder 5 in 1
1.00	US400065	KEYED Accessory Set for Drill Presses MT 4
1.00	US522235	ABS 280 B Band Saw Blade
1.00	US400074	B 150 Belt Package
1.00	US400075	BTM 250 Belt and Disc Package
1.00	146372	3-Jaw Lathe Chuck 200mm D1-6 (steel)



# Beta Plasmatreat Cleaning and Coating

**Function:** Support Technology Operation/treating

**Capabilities:**

- Cleaning
- Coating
- **Operational:**
- Arrived @ Lift
- Install 3Q-2016

**Vendors:** Plasmatreat



Coating/Cleaning:

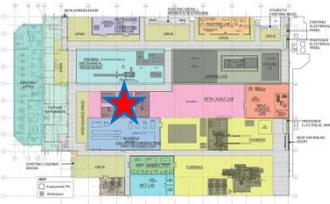
Plasmatreat: Coating/ Surface treating

Bonding/Joining pertains to; PLASMATREAT Openair® and Aurora® plasma and plasma polymerized films facilitate usage of lightweight metals and composites

Adhesives / Sealants / Ink/Prints/ Coatings/  
Paints







# Beta CT Scanning

**Function:** Support Technology Operation/CT scan

**Capabilities:**

- NDT / Quality / reverse engineering
- CT scanning
- X-ray inspection

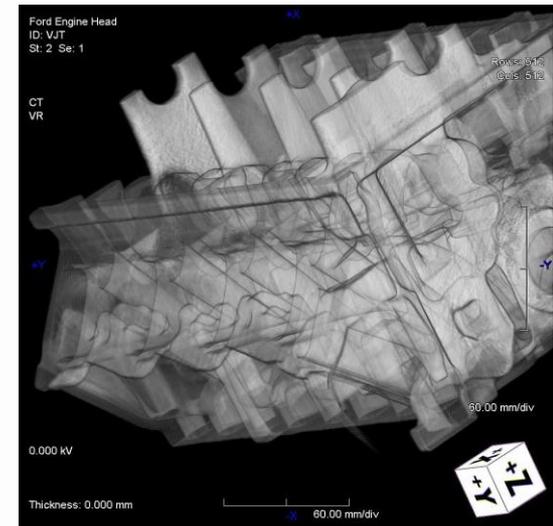
**Operational:**

- Install 3/4Q-2016

**Vendors:** Vijay Technology



	MiniCT	ValuCT Systems	
	50KV	160kV	180kV
<b>X-ray source</b>	50kV, 50W, focal spot size < 50µm as per IEC60336	160kV, 0.2-3.12mA, focal spot size 0.8 mm as per IEC60336	180kV, 0.2-6.0mA, focal spot size 0.8 mm as per IEC60336
<b>Detector</b>	1024 x 1024 pixels, 48 µm pixel size	9" Image Intensifier, 1000 x 1000 pixels, optional 5.8" x 5.8" flat panel detector at 127µm pitch	
<b>Spatial resolution</b>	36 µm voxel size at M=1.3; 18 µm voxel size at M=2.7	190-330 µm voxel size	
<b>Helical function</b>	50mm length of stroke function	360° Turntable with motorized lift axis	
<b>Magnification</b>	Up to 2.7x	User adjustable, fixed magnification for CT (around 1.3)	
<b>Sample Size / Weight</b>	diameter < 45 mm, height < 65 mm, < 250 g	width up to 150 mm, height < 600 mm, < 25 kg	
<b>Equipment Dimension</b>	350 mm x 300 mm x 230 mm + 17" laptop	2000 mm (+900 mm operator console) x 1300 mm x 1850 mm	
<b>Equipment weight</b>	< 25 kg + 17" laptop	2000 kg	
<b>Site power requirements</b>	230V, 50/60 Hz	230V, 50/60 Hz	
<b>Other required utilities</b>	None	None	
<b>Site location requirements</b>	Benchtop device	Forklift capable for easy movement; any floor surface capable of supporting 160 lbs/sq. ft loading	
<b>Radiation protection</b>	50kv shielded cabinet with manual parts door; meets all international radiation safety standards, including 21CFR1020.40 and EN 61010-2-091 2012	225kv shielded cabinet with motorized parts door; meets all international radiation safety standards, including 21CFR1020.40 and EN 61010-2-091 2012	
<b>Software</b>	Voletx 6/Voletx 10	Voletx 10	
<b>PLC/HMI</b>	Windows based software application via laptop computer, or similar	Windows-based software application controlled via 23" touch screen monitor, or similar	
<b>Operator skills level</b>	Student/Technician Level	Student / Technician Level	
<b>Advanced analysis options</b>	Available as additional software module licenses	Available as additional software module licenses	



# Education & Workforce Development

Building a **confident and competent** manufacturing workforce

## We Believe:

We must **develop the educated and skilled workforce** necessary to use new technologies and innovative processes.

## Education Tied to Technology:

Education and Workforce Development will be tied to each of our technology projects and include measurements:

- Will it impact design, production or both?
- What new educational content is needed?
- What will the results be for the workforce?

## State Teams:

Teams in five states made up of leaders in **education, workforce development, economic development and labor** help guide our initiatives



# 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 lightweighting 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

Proud Member of the  
**National Network for Manufacturing  
Innovation**

Learn More At:  
<http://lift.technology>

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LIGHTWEIGHT INNOVATIONS  
FOR TOMORROW



*Partnership for Manufacturing Innovation*