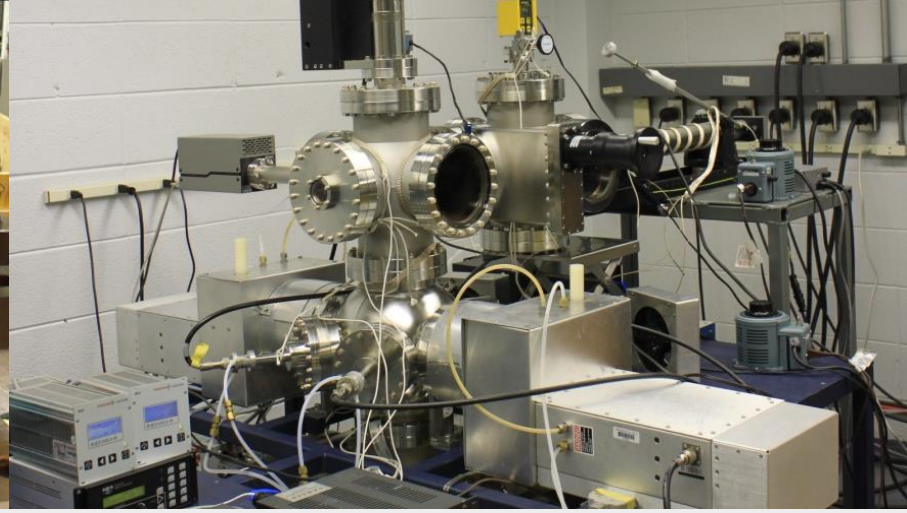
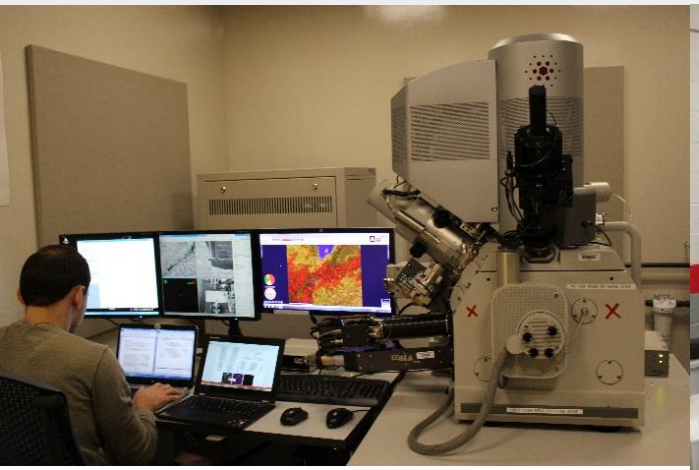
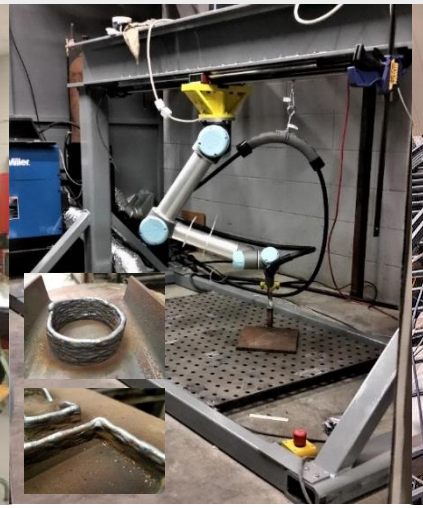
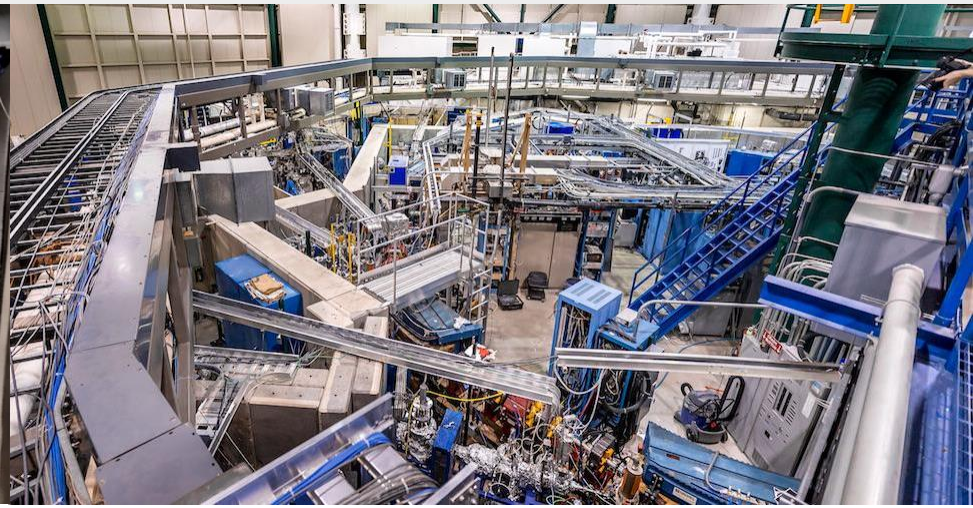



Resources Supporting Advanced Manufacturing Research



National Center for Advanced Manufacturing (NCAM)

NCAM is a partnership between NASA, the State of Louisiana, Louisiana State University (LSU), who leads and manages NCAM activities, and the University of New Orleans (UNO). The core NCAM facilities are located within the Main Production Building at the NASA Michoud Assembly Facility in New Orleans, Lousiana.

NCAM EQUIPMENT INCLUDES:

- Two MTS Universal Weld Systems (UWS1 & 2) [Friction Stir Welding]
- MTS Robotic Weld Tool (RWT3) [Friction Stir Welding]
- MTS PDS Panel Welder
- Two Ingersoll Advanced Fiber Placement Machines (FPM 1 & 2)
- Ingersoll High Speed Machining Center (HSMC II)
- Forest – Line High Speed Machining Center (HSMC I)
- Matec Non-Destructive Evaluation System (NDE)
- Mentronor Portable Dimensional Inspection System

Composites Fiber Placement

Large Scale Manufacturing

High Speed Machining Center

Friction Stir Welding

NCAM is a state-of-the-art advanced manufacturing technology ecosystem in support of the NASA space program, defense applications and related industries. Associated technologies and research include:

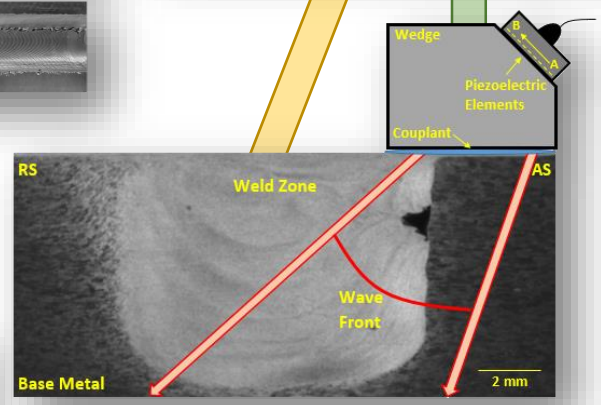
- Large-scale structure manufacturing in light-weight metals and composites
- Friction Stir Welding (FSW)
- In-situ qualification for FSW
- Non-destructive testing and evaluation
- Replication-based multi-scale manufacturing
- Sustainable manufacturing
- Robotics manufacturing
- Multi-scale, simulation-aided materials design
- State-of-the-art materials characterization

Friction Stir Welding

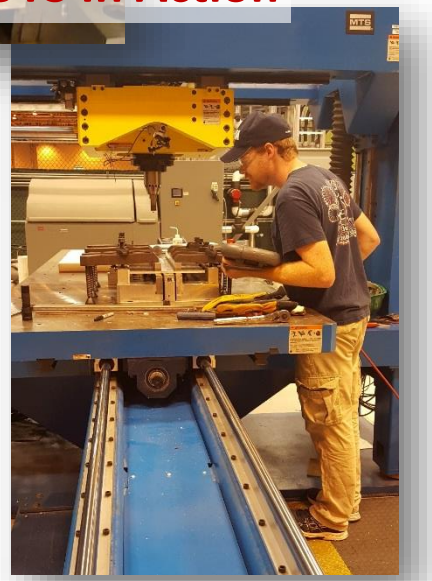
- Phased Array Ultrasonic Testing System (PAUTS) Development
  - In-Situ, Real-Time, Non-Distructive Evaluation of Friction Stir Weld Quality
- Friction Stir Welds
  - Classification and Qualification
  - Post-Treatment Analysis

NCAM

PAUTS In Action

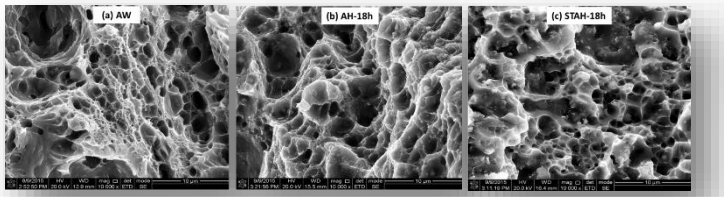


The Concept



NASA Funded

SIF



LSU College of Engineering
Department of Mechanical & Industrial Engineering

M. A. Wahab, T. Warren Liao, Ayman Okeil

LSU Center for Advanced Microstructures and Devices (CAMD)

CAMD is the only state-funded synchrotron facility in the U.S. Provides X-rays and equipment for materials science research, characterization via tomography, and other targeted areas of scientific and technological exploration.

High Performance Computing Resources

System	Nodes	Cores	TFlops
SuperMIC	360	7200	1000
SuperMike-II	440	7040	146
Philip	37	296	3.5

LSU High Performance Computing

LSU Center for Computation & Technology

System	Nodes	Cores	TFlops
QB2	504	10080	1052
Eric	128	1024	9.5

LONI

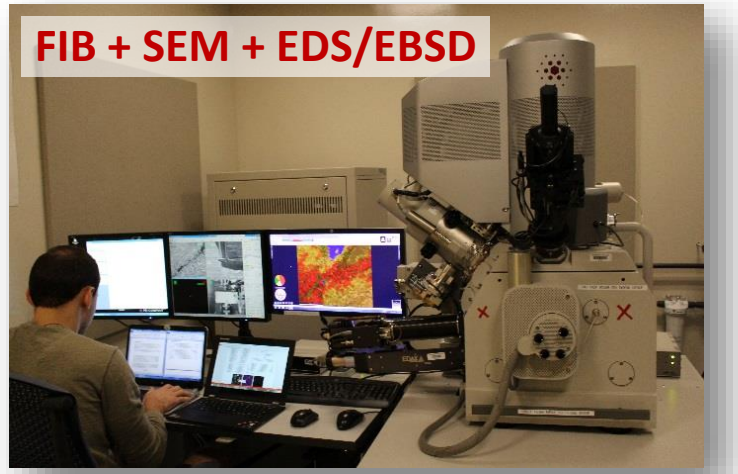
LSU

Shared Instrumentation Facility (SIF)

State-of-the-art Materials Characterization and Microscopy

- **Comprehensive Materials Characterization**
  - SEM + EDS
  - TEM + EDAX/EDS
  - XRD, XPS, Electron Microprobe
  - FIB + SEM + EDS/EBSD
  - Raman Spectroscopy
- **Nano-Machining**
  - Focused Ion Beam (FIB)
  - Ar Ion Milling
- **Sample Preparation**
- **Optical Microscopy**

Raman Spectroscope

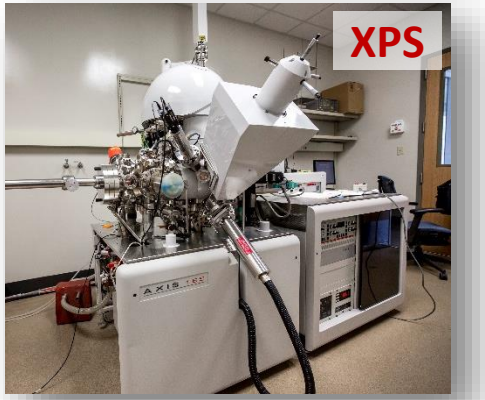


FIB + SEM + EDS/EBSD

TEM + EDAX/EDS

3,000 ft^2 of space

Electron Microprobe



XPS

College of Engineering
Department of Mechanical & Industrial Engineering

Technical Staff: C. Loehn, D. Cao, D. Burk, N. Muttik, Y. Xiao

Advanced Manufacturing & Machining Facility (AM^{2}F)

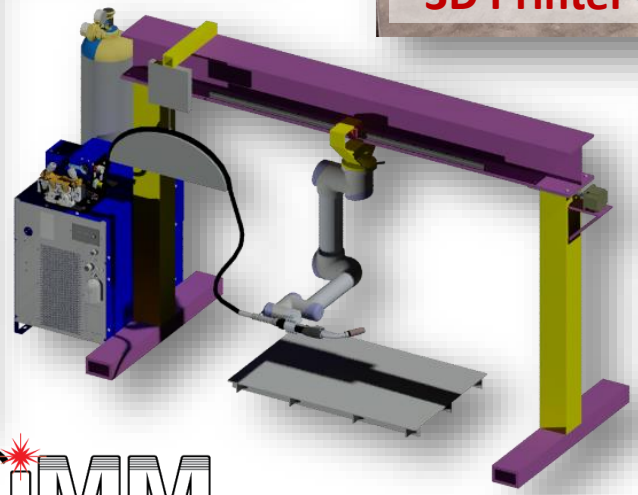
- **Traditional CNC (Including Multi-Axes) Machining**
  - **5 CNC Mills, 5 CNC Lathes - *Haas***
- **Water-Jet Cutting.**

8,000 ft^2 of space

Technical Staff: Nic Dinecola, Jason Guy, Ethan Dolan, Charlie Smith

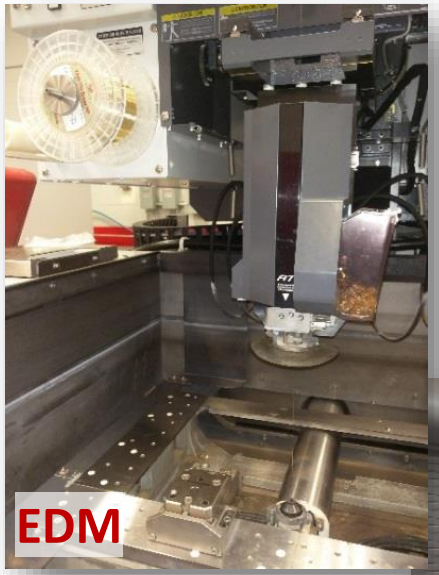
Advanced Manufacturing & Machining Facility (AM^{2}F)

- **Additive Manufacturing**
  - **Plastics** – Polyjet, Extrusion, and Stereolithography
  - **Metals** – Selective Laser Melting
  - **Metals** – Arc-Welding
- **Injection Molding (F 2017)**
- **Robotic Welding**



CiMM

Advanced Manufacturing & Machining Facility (AM^{2}F)



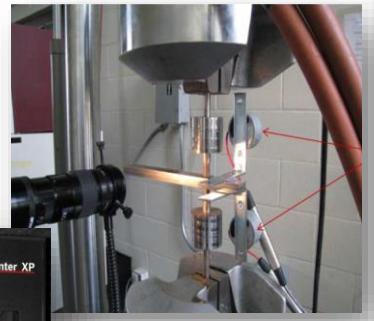
- **Micro-Milling (40K RPM)**
- **Multi-Axis (5-axes) Micro-Milling (80K – 160K RPM),**
- **Electrical Discharge Machining.**

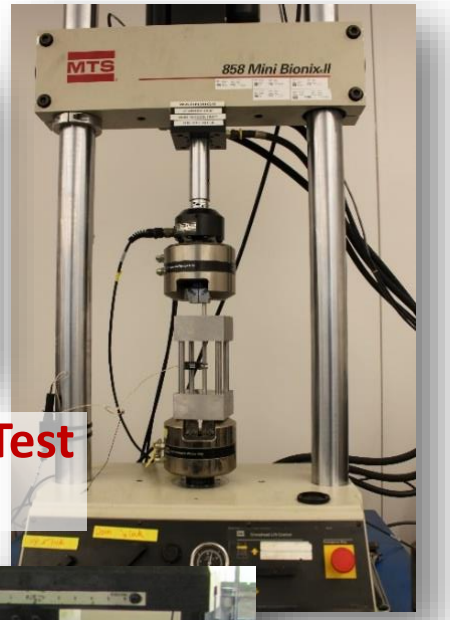
CIMM

Materials Manufacturing, Testing & Evaluation Facility (M^2TEF)

- **Mechanical Testing of Materials and Structures**
  - **Tensile, Torsional, Bending with Env. Chamber**
  - **Fracture**
  - **Impact**
  - **Hardness**
- **Non Destructive Evaluation (NDE)**
- **Heat Treatment Furnaces**

Fracture Testing

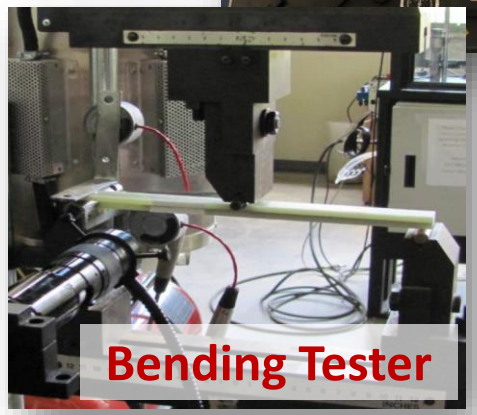




Nano-indenters

Mechanical Test Frames

NDE Tester



Bending Tester

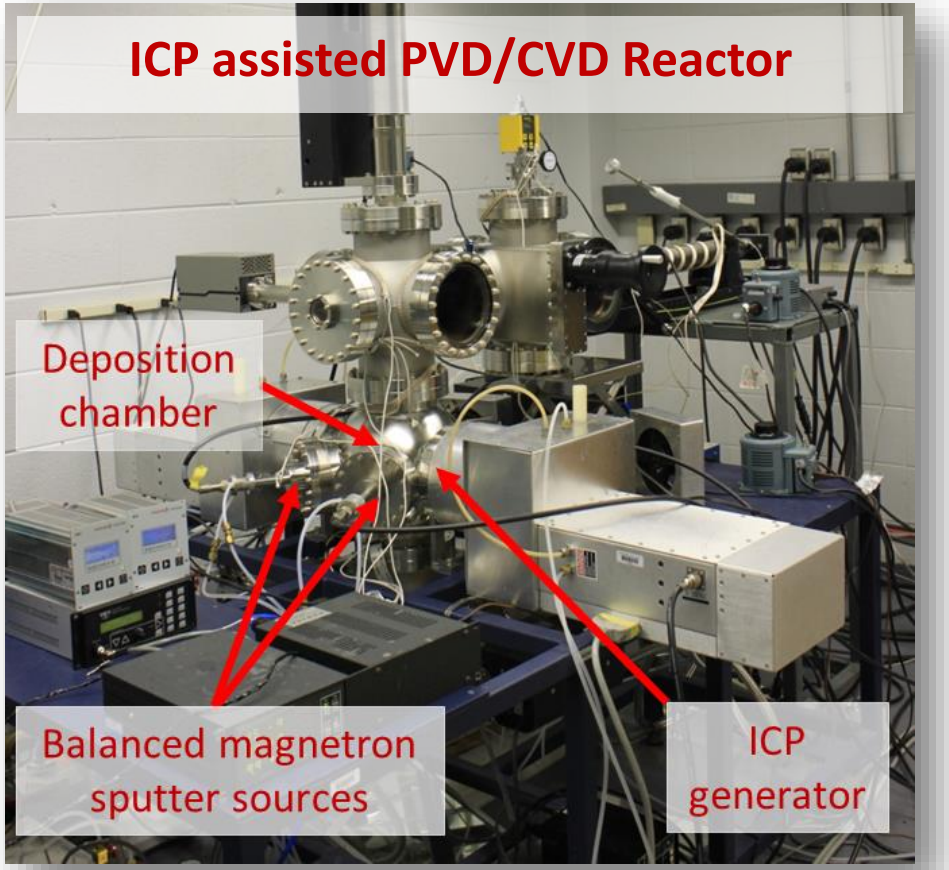
Furnaces

3,000 ft^2 of space

Materials Manufacturing, Testing & Evaluation Facility (M^2TEF)

- **Thermal Spray Coating**

- **Thin-Film Coating Synthesis**



CiMM

CVD, PVD, Inductively Coupled Plasma (ICP) Assisted PVD/CVD

Materials Manufacturing, Testing & Evaluation Facility (M^2TEF)

- **Alloy Stock Production (Caster)**
  – to be installed Fall 2017
- **Metal Powder Synthesis**
  – small batch system for R&D

- **Metal Micro-Forming**