



THE BARNES GLOBAL  
ADVISORS

# Building a Resilient Manufacturing Ecosystem

**prepared for:** RAMP MD Digital Manufacturing Symposium

**prepared by:** Andy Davis, TBGA

Our mission is to accelerate the adoption and industrialization of additive manufacturing.

## Our Vision:

To be sought out as the trusted global leader in AM knowledge, expertise and workforce development/training.

## How:

Through our intimate knowledge, meaningful partnerships and workforce education, robust technical delivery, market leading insights and network, and a culture that embraces innovation.

## Why TBGA? We are:

- Independent
- Agnostic
- Engineers
- Experienced – Over 150 Years in AM Execution & Strategy



## 200+ YEARS OF COMBINED ADVANCED MANUFACTURING EXPERTISE

- Founded in 2017
- Mission: Accelerate the **adoption and industrialization** of additive manufacturing.
- **Extensive experience** across **all AM** processes
- **17** Independent Technical AM Consultants
- Staff experience **leading AM qualification since 2003**
  - Appropriate scope for part complexity & criticality
  - **In-service hardware** on USAF, FAR-25 (Commercial), NASA, Army, Medical Device, Rail
- **15+ AM Standards & Specifications**
- Technical SME for SAE AMDC
- **2,500+ AM Trainings** delivered: including NASA, USAF, Navy, Army, USCG, NNSA, and others
- Primary AM advisor to Army's AMNOW and Navy PEO SSBN efforts

UH-60 Fuel Elbow



\* C-17 Pylon Panel



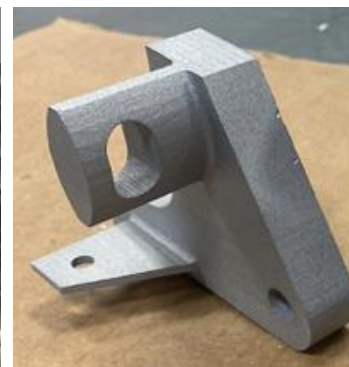
\* F-15 Pylon Rib



\* Rail Manifold



\* Airbus Brackets



\* Qualified in-service hardware

\* JUNO Probe Bracket



\* CH-47 Link



# Why Resilient Manufacturing?



THE BARNES GLOBAL  
ADVISORS



Flooding in China leads to global Aluminum shortages and price increases



A ship stuck in a canal slows the delivery of goods



A global pandemic impacted micro-chip production

A war restricts access to critical minerals



# What does the USG say about it?



## NATIONAL STRATEGY FOR ADVANCED MANUFACTURING

A Report by the  
SUBCOMMITTEE ON ADVANCED MANUFACTURING  
COMMITTEE ON TECHNOLOGY

of the  
NATIONAL SCIENCE AND TECHNOLOGY COUNCIL

October 2022

### Goal 1. Develop and implement advanced manufacturing technologies

Enable clean and sustainable manufacturing to support decarbonization

Develop innovative materials and processing technologies

Lead the future of smart manufacturing

Accelerate manufacturing for microelectronics, semiconductors and the bioeconomy

### Goal 2. Grow the advanced manufacturing workforce

Expand and diversify the advanced manufacturing talent pool

Develop, scale, and promote advanced manufacturing education and training

Strengthen connections between employers and educational organizations

### Goal 3. Build resilience into manufacturing supply chains

Enhance supply chain interconnections

Reduce Manufacturing Supply Chain Vulnerabilities

Strengthen and Revitalize Advanced Manufacturing Ecosystems

# Introducing Neighborhood 91

**Objective:** To condense and connect all components of the Additive Manufacturing (AM) supply chain into one powerful production ecosystem.

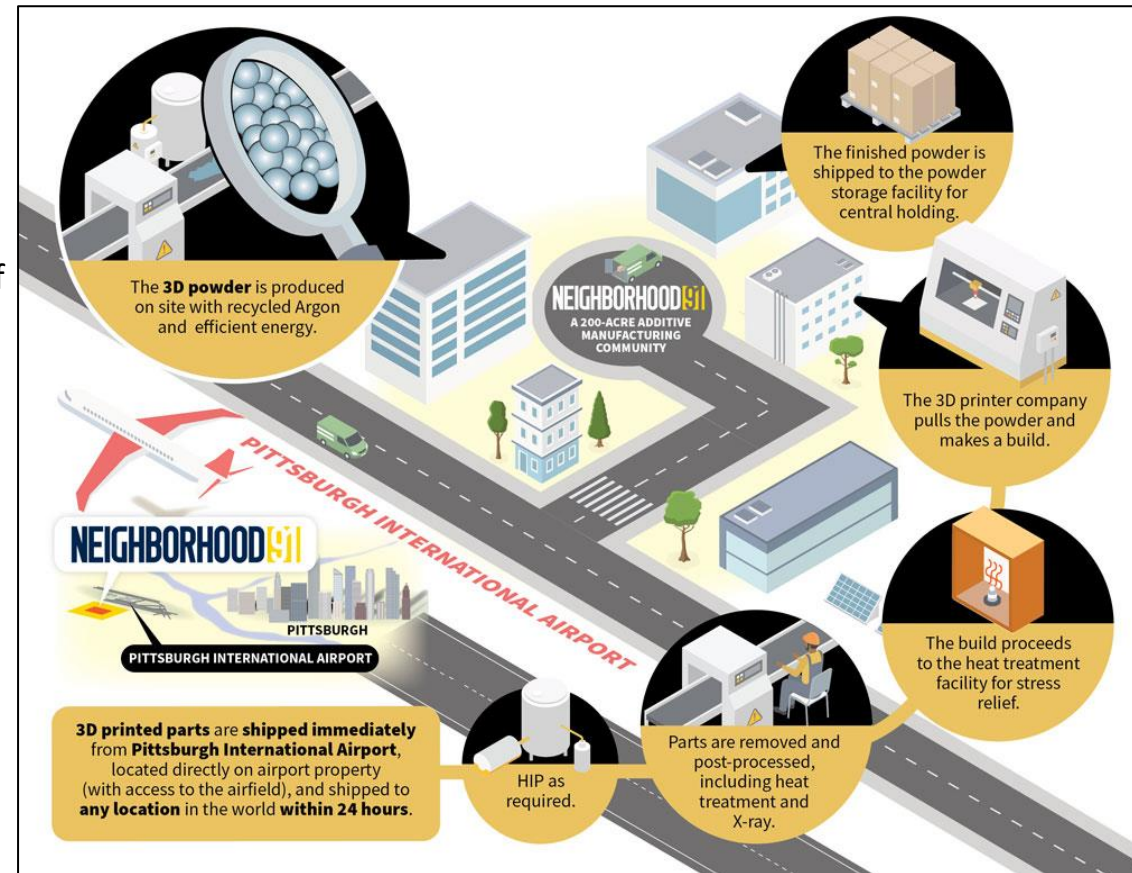
**What?** The world's first end-to-end Metal AM production campus.

**Why?** The AM supply chain is fragmented & expensive.

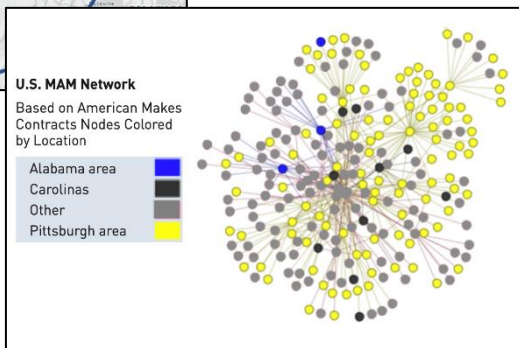
**Where?** Pittsburgh Airport Innovation Campus in Pittsburgh, PA.

**How?** Via joint investments from Allegheny County Airport Authority, the State of PA, State Universities, Private Companies, and the Department of Defense.

**When? NOW!** 2 buildings are completed with 9 on-campus "residents"; construction of additional phases this year.



3 Manufacturing USA Institutes  
World Class Universities  
Excellent Workforce



Powder, Parts, Processing, Testing, Workforce Development

91  
NEIGHBORHOOD

# The Resilient Manufacturing Ecosystem

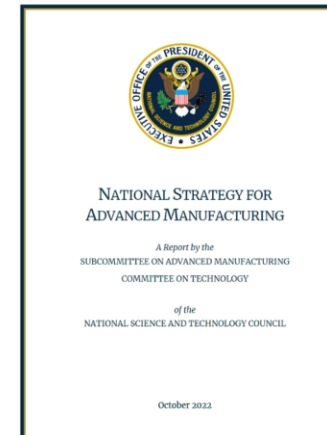
## Resilient Manufacturing Ecosystem



Leverage and expand the N91 platform to support DoD production needs

Demonstrate an RME domestically before attempting to export it overseas

Emphasize workforce, capability/capacity growth, and making real parts



- Goal 1. Develop and implement advanced manufacturing technologies**
  - Enable clean and sustainable manufacturing to support decarbonization ✓
  - Develop innovative materials and processing technologies ✓
  - Lead the future of smart manufacturing ✓
  - Accelerate manufacturing for microelectronics, semiconductors and the bioeconomy
- Goal 2. Grow the advanced manufacturing workforce**
  - Expand and diversify the advanced manufacturing talent pool ✓
  - Develop, scale, and promote advanced manufacturing education and training ✓
  - Strengthen connections between employers and educational organizations ✓
- Goal 3. Build resilience into manufacturing supply chains**
  - Enhance supply chain interconnections ✓
  - Reduce Manufacturing Supply Chain Vulnerabilities ✓
  - Strengthen and Revitalize Advanced Manufacturing Ecosystems ✓

# What have we learned...so far?

## Key Partners



Identify stakeholders that span the full ecosystem i.e. federal, state & local government bodies, academia, regional industries, current and future workforce & local community

### Success factors:

- Leverage existing organizations or alliances
- Engage outside entity to lead scaling of WFD once established

3

## Regional Mission



Re-define the WFD problem as a mission statement from the perspective and needs of the region

### Success factor:

Build mission statement around regional competencies

2

## Regional Champion



Identify person(s) or entity with knowledge and passion for the needs of that region

**Success factor:** The champion must be able to rally the key partners and pull in the required funding sources

4

## Minimum Viable Region



Define the geographic boundaries of the target region for WFD implementation

**Success factor:** The region must be small enough to allow for a regional mission and a champion to be defined, but large enough to have a critical mass of key partners

1

## Target Workforce & Skills



Identify the target workforce (current / future), & the target skills based on regional mission

**Success factor:** Focus on 1-2 key skills before expanding

5

## Communication Strategy



Identify the channels by which outreach and communication about key initiatives is going to reach target workforce

**Success factor:** Consider a multi-media strategy with a regional flavor

7

## Key Initiatives



List key initiatives to be deployed that are aligned with the regional mission

### Success factors:

- Leverage in-place programs & infrastructure
- Dispel misperception of manufacturing
- Develop vocational education & apprenticeships with regional partners
- Include up/re-skilling of current workforce
- Expose students early to manufacturing career paths
- Enable transfer of credits across programs
- Incorporate DEI & attract veterans

6

## Funding Sources & Cost structure



List key funding sources and cost of implementing key initiatives in a sustainable model

**Success factor:** Ensure regional funds are committed to WFD

8

## Success Measures



Define SMART (Specific, Measurable, Achievable, Relevant, and Time-Bound) measures of success for every key initiative

### Success factors:

- Ensure transparency in sharing progress & level of success with regional partners
- Use data analytics to derive actionable insights

9



THE BARNES GLOBAL  
ADVISORS

**Thank you!**

[andy.davis@barnesglobaladvisors.com](mailto:andy.davis@barnesglobaladvisors.com)