



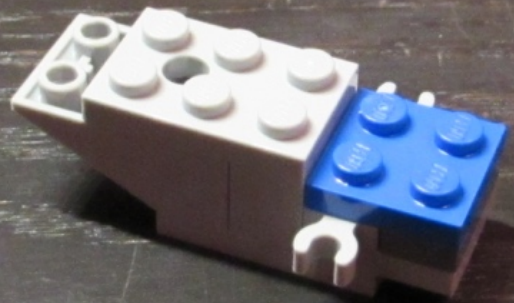
GE Additive & CeC Pittsburgh Short Introduction

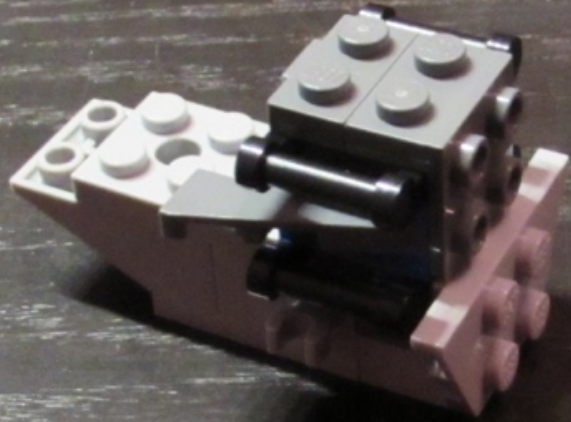
October 2017

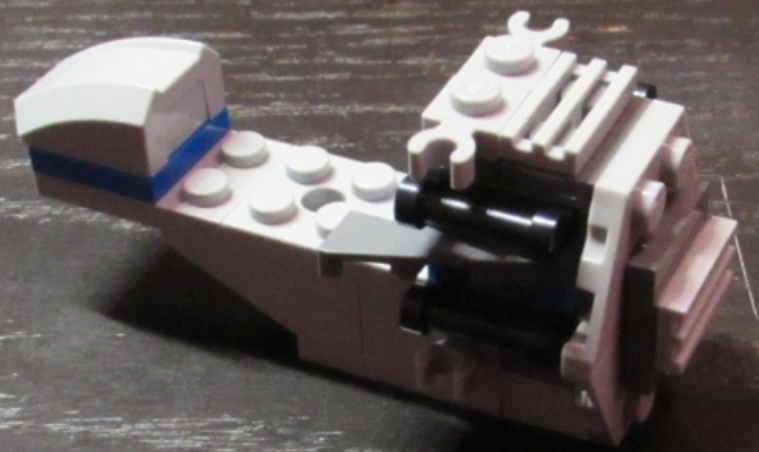
Who has experience in AM?

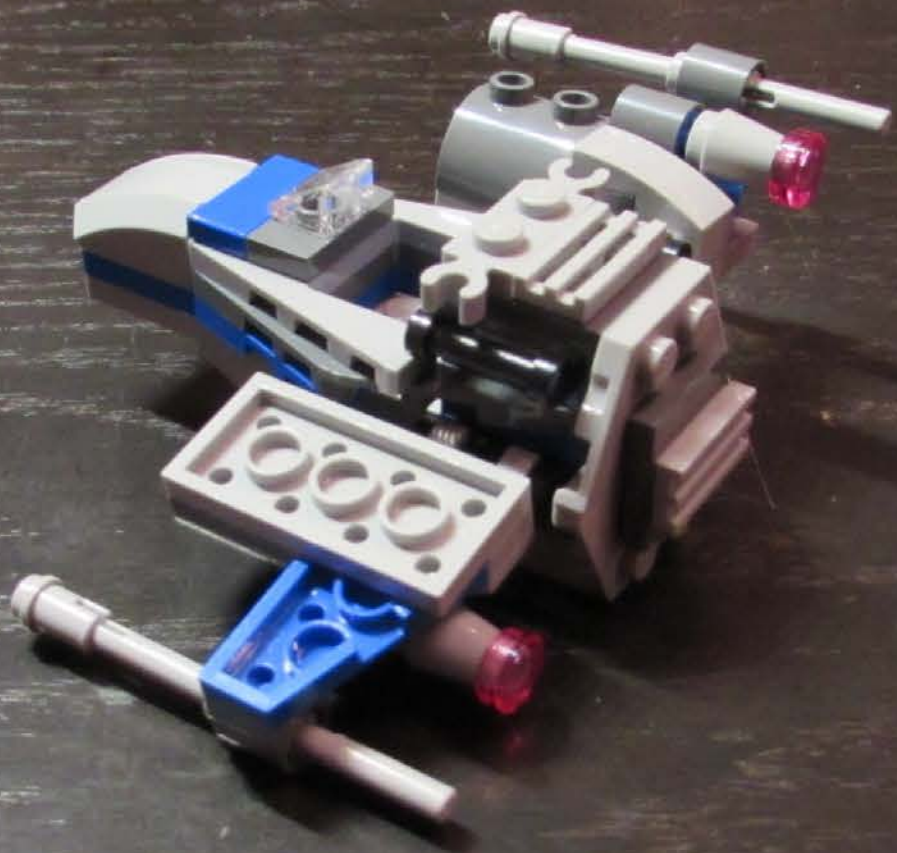


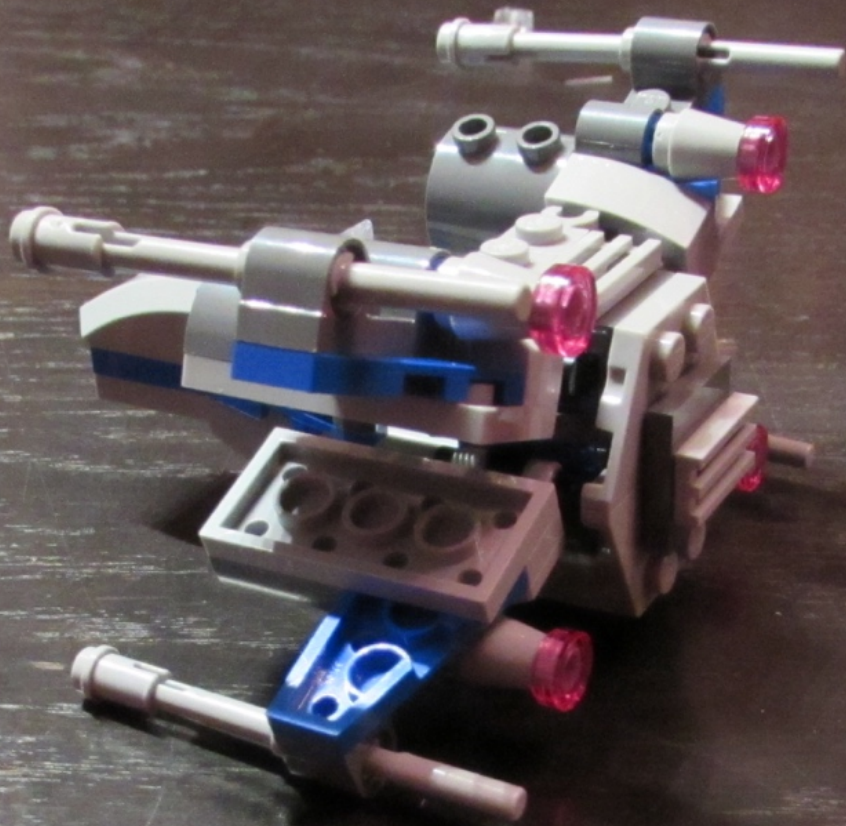










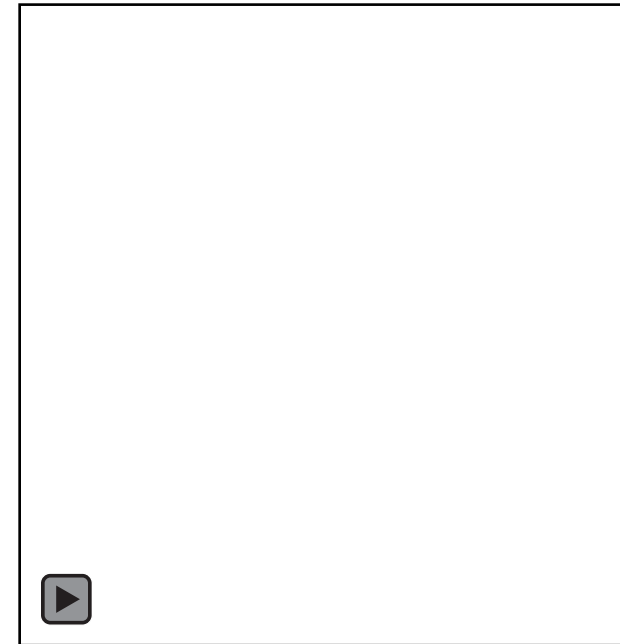
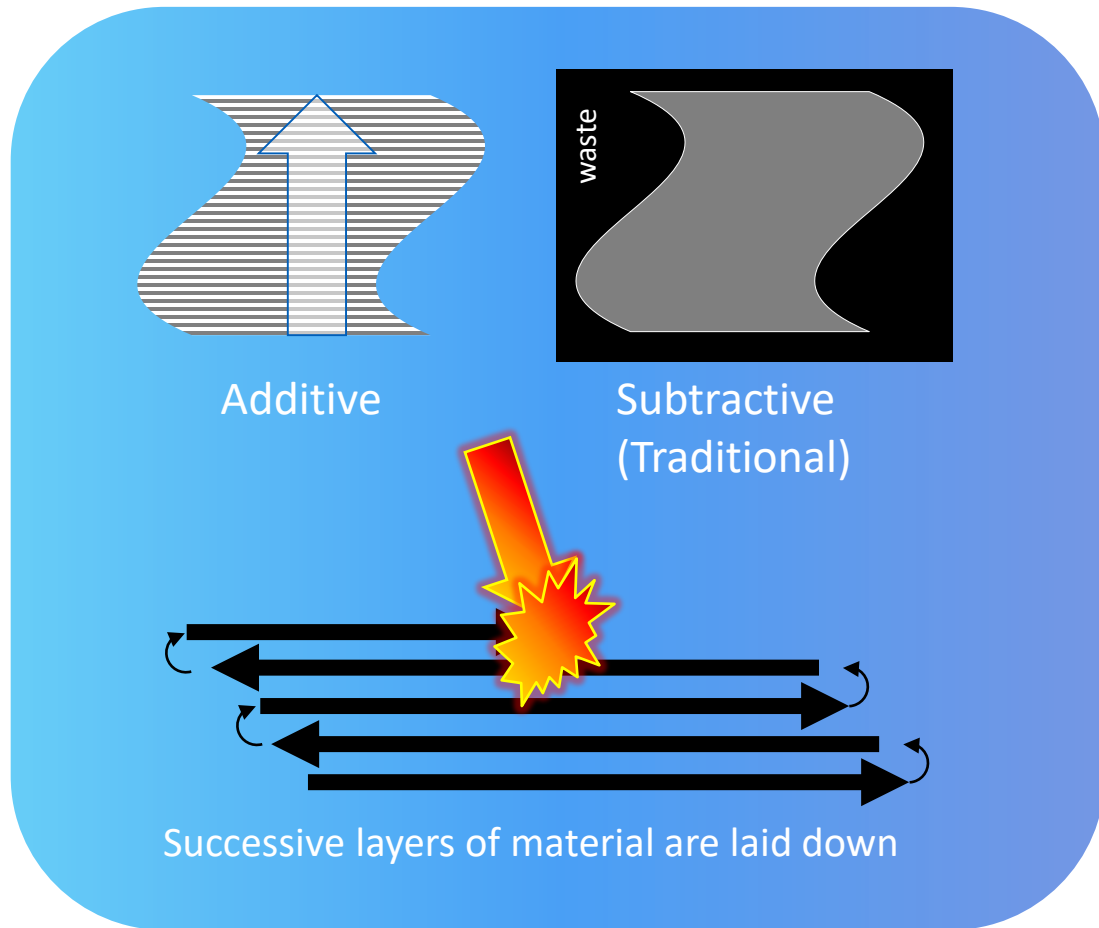




Who has experience in AM?



What is Additive Manufacturing (a.k.a. 3D Printing)



Any of various processes for making a three-dimensional object of almost any shape from a 3D model or other electronic data source primarily through additive processes in which successive layers of material are laid down under computer control.

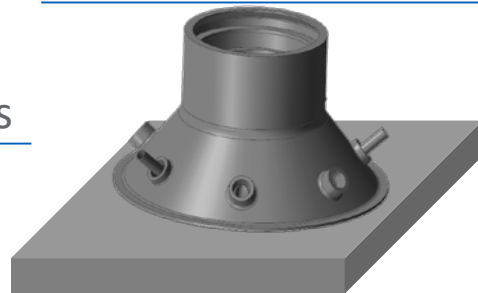
- Wikipedia

AM - Level of Complexity

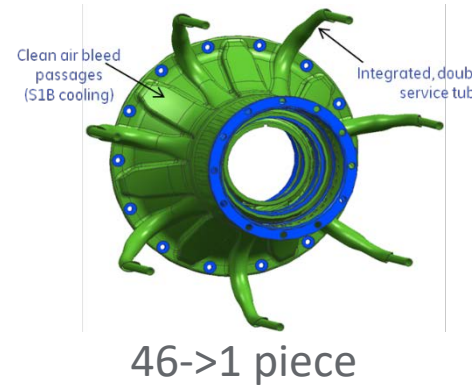
Level 0 Jigs & Fixtures



Level 1 - Component



Level 2 - Sub Systems



Level 3 - Function



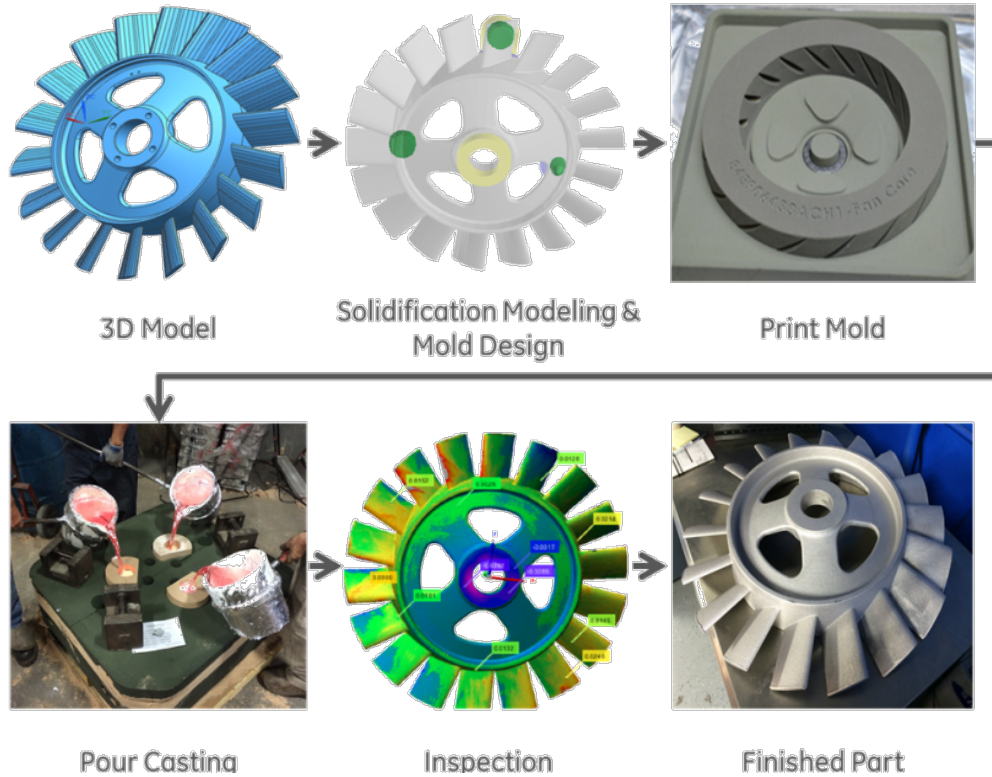
structural
Thermal
fluid

Level 4 - advanced function

Self assembling
structures
Embedded functional
electronics



Level 0: Tools and fixtures



Contravane



Impeller

	Traditional Molds	Printed Molds
Lead Time	6 Months	6 Weeks
Tooling Investment	\$70k	\$0
Cost	\$500/casting	\$6500/casting

Level 3: Functional Integration... ATP

Combustor test schedule reduced from **12 months** to **6 months**

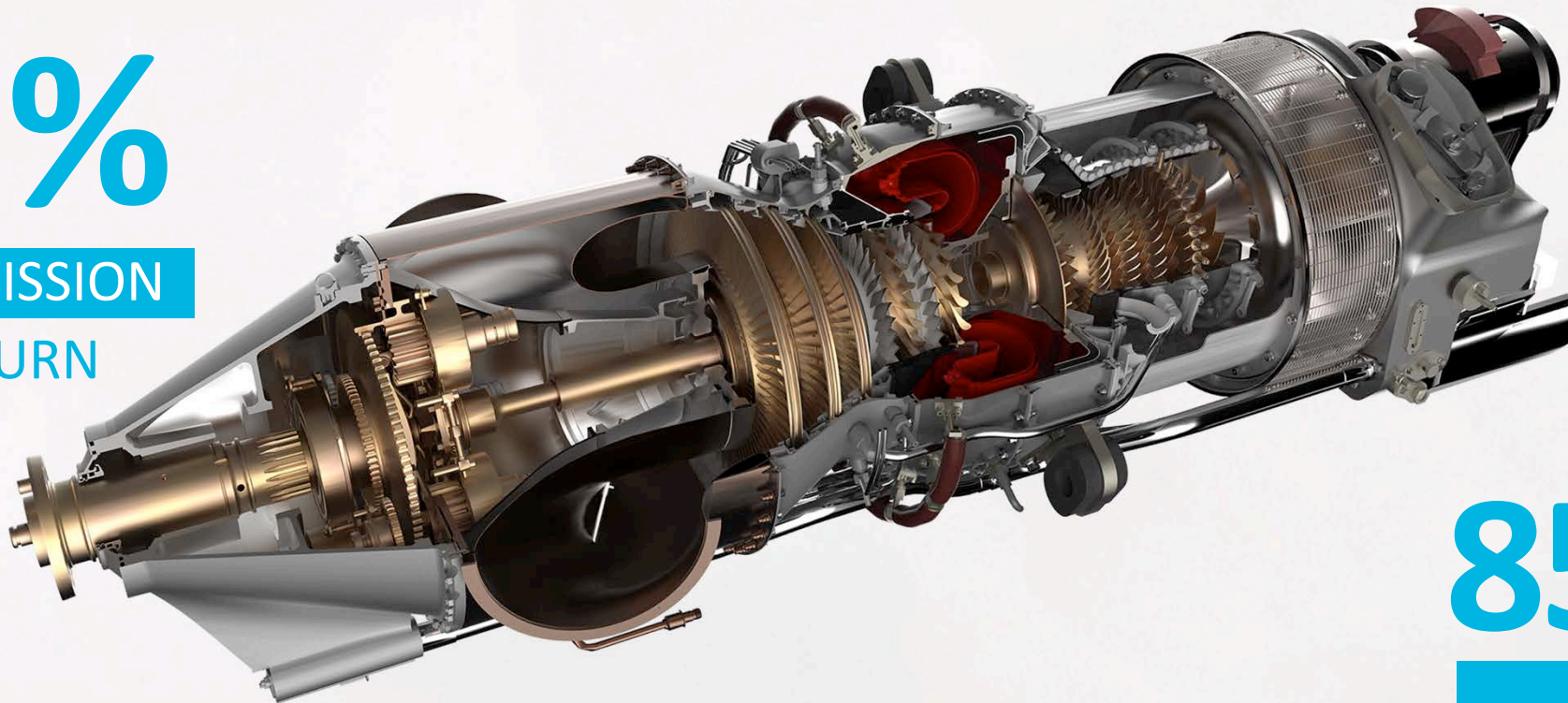
5%

**WEIGHT
REDUCTION**

20%

LOWER MISSION

FUEL BURN



855 → **12**

PARTS



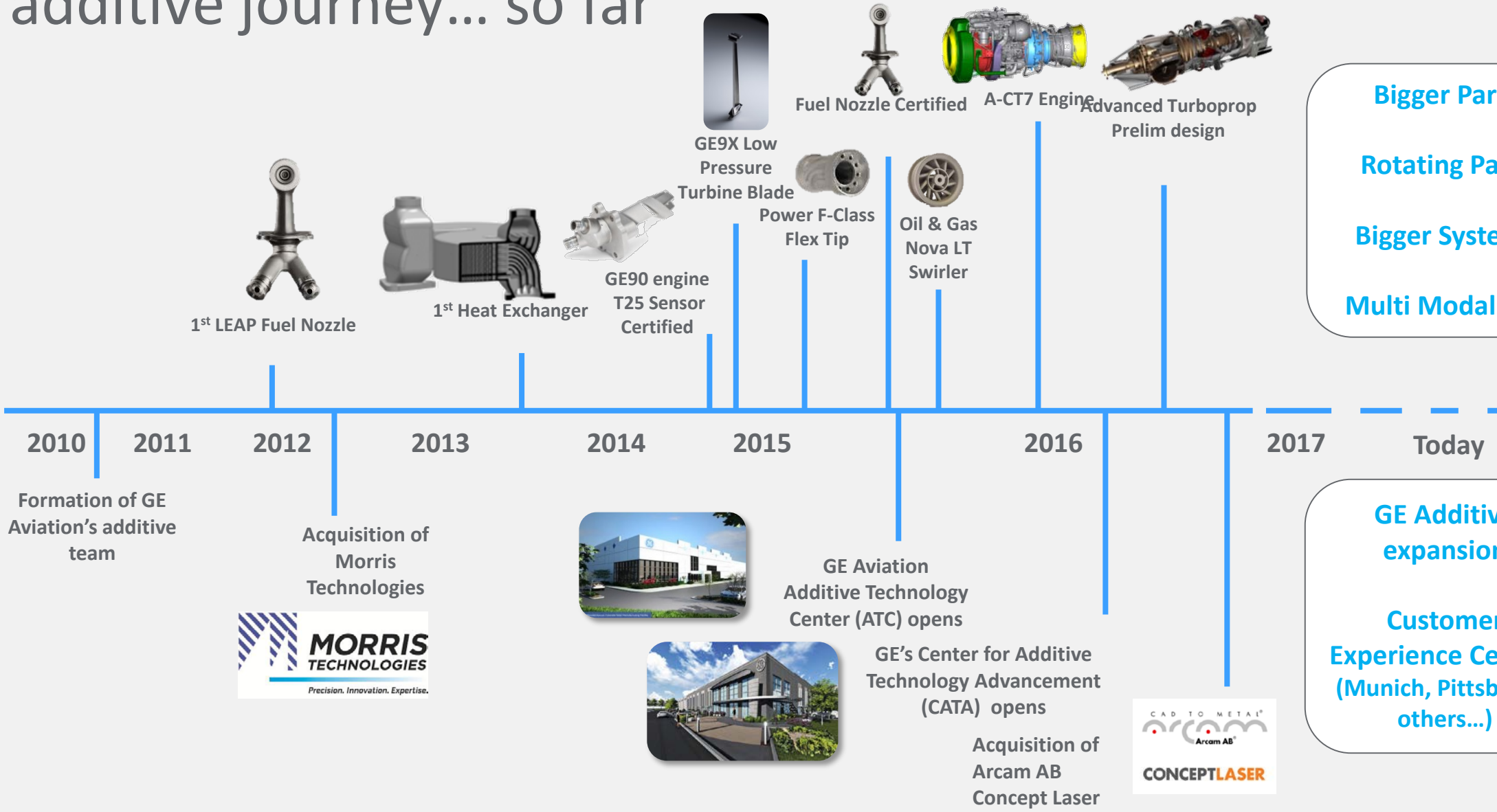
GE's additive journey... so far

Technology

Infrastructure

- Bigger Parts
- Rotating Parts
- Bigger Systems
- Multi Modalities

- GE Additive expansion
- Customer Experience Centers (Munich, Pittsburgh, others...)



From fuel nozzle to bigger parts ... & now systems

GE Additive Customer Experience Centers

Americas

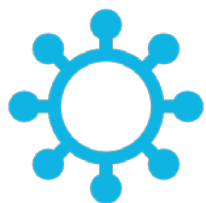
Europe

Middle East

China

Australasia

Our Customer Experience Centers are designed to help customers understand the additive process; from design to prototyping to production and support them along the way



Customer Collaboration

- Application Engineering
- Rapid Prototyping
- Low Rate Manufacturing



Customer Training

- Additive Design
- Additive Machines
- Additive Materials



Customer Support

- Field Support
- Spare Parts
- Materials
- Logistics

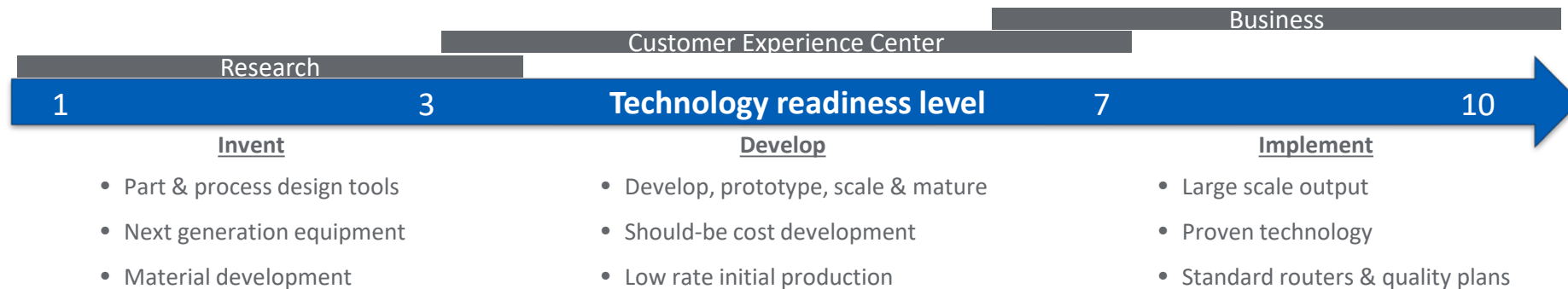
Customer Experience Center - Pittsburgh

GE Additive's Pittsburgh site opened in April, 2016 to serve as an enabler for the GE businesses to accelerate the adoption of additive technology. Transitioning to GE Additive in May 2017, the facility kept its core mission, but expanded that focus to serve a broader customer base as well.

Site Details

- ~50 employees
- 125,000 square ft
- \$39M Corporate investment
- 7 modalities of additive manufacturing

Pittsburgh, PA



We're focused in
three areas...



Materials



Machines + **PREDIX**



Engineering



Machines

CONCEPTLASER
A GE Additive Company

Mlab



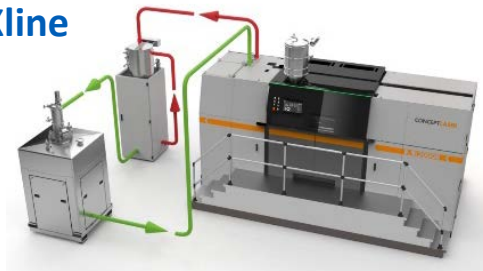
Mline



M2



Xline



 **Arcam EBM**
A GE Additive Company

Q10plus



Q20plus



A2X



GE Additive ... our Mission

\$1B annual revenues by 2020

10,000 units sold by 2026

\$3-5B+ product cost-out by 2026



