

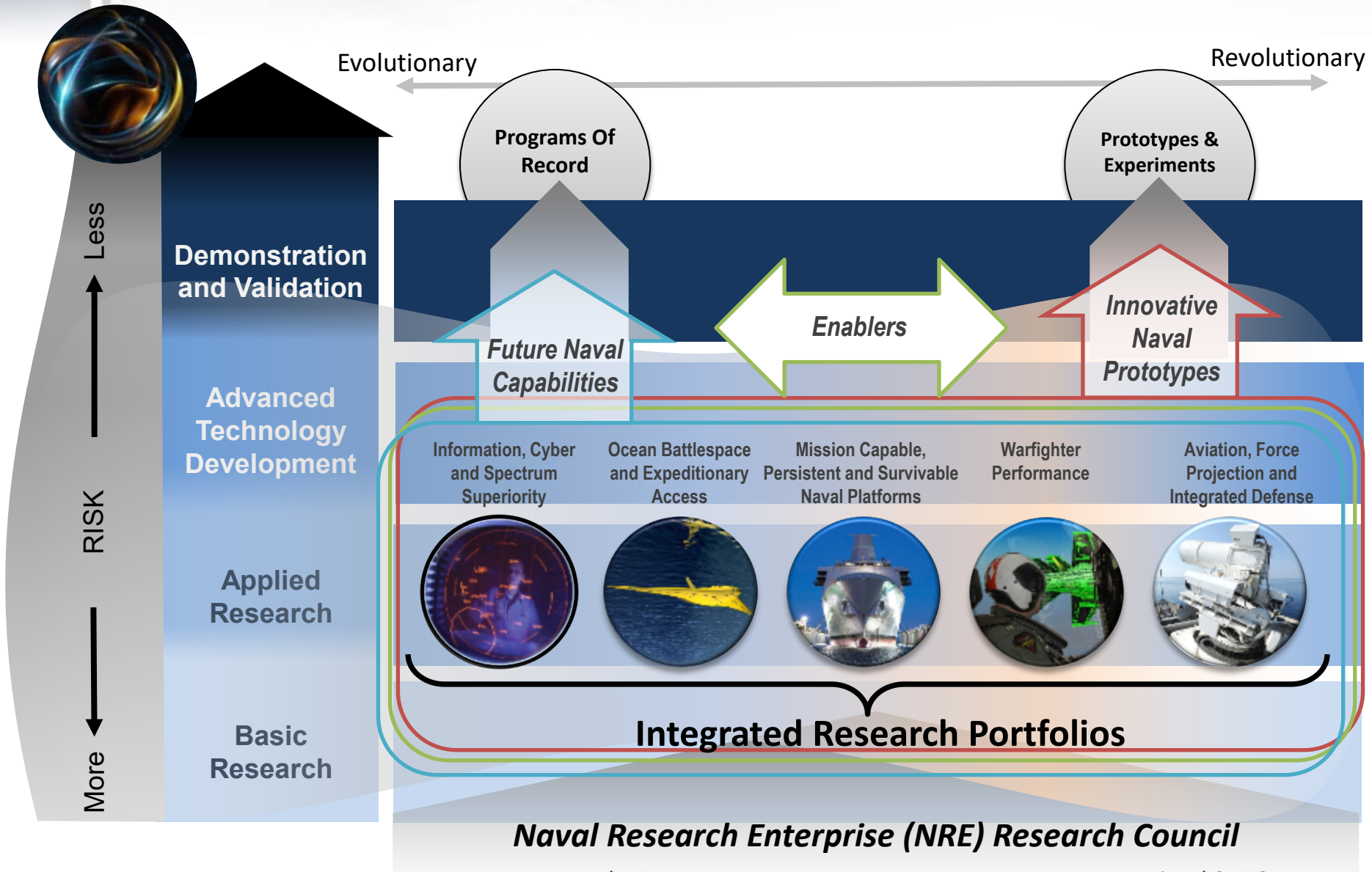


Changing the Manufacturing Paradigm

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ACCELERATING TO THE NAVY & MARINE CORPS AFTER NEXT

The Naval Research Portfolio



WWI and WWII



First Liberty ship, named for the Revolutionary War patriot Patrick Henry, was launched in Chesapeake Bay.
Courtesy of the Library of Congress



Victory ships are under construction at California Shipbuilding Corp., Los Angeles, 1944.
Courtesy of the National Archives and Records Administration



Today....



<https://www.maritimebusinessworld.com/>



How do we change the paradigm?

The Future





Changing the way we make things



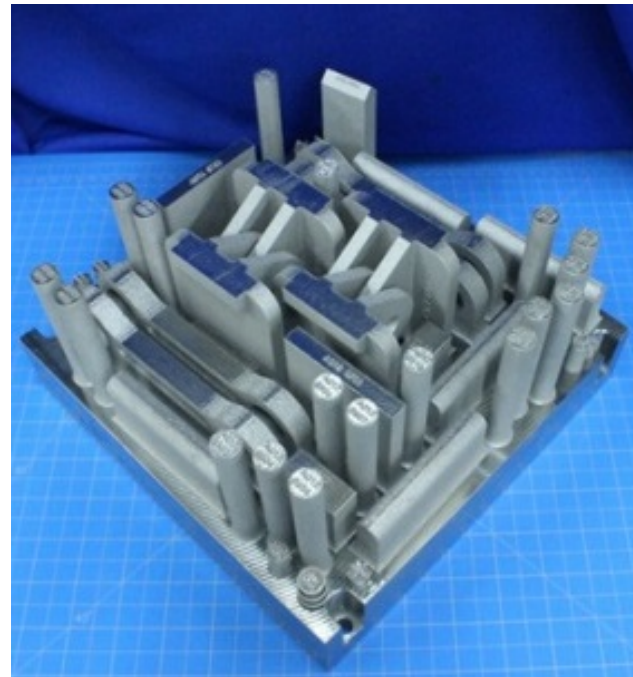
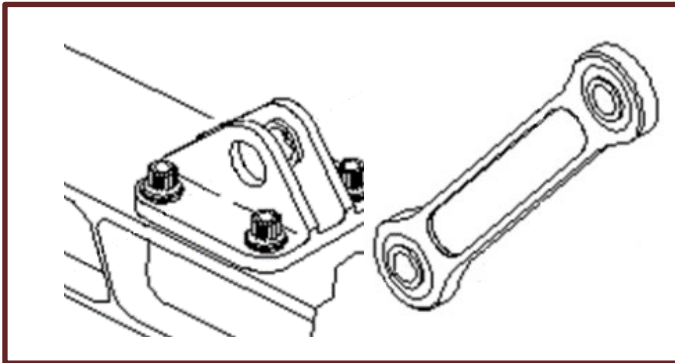
<https://www.energy.gov>



Additive Manufacturing . . . Right Now

- Fabrication of components/ assemblies for obsolete or long lead time items
- Enables supply chain agility
- May provide intermediate solution

V-22 Nacelle Link and Fitting



NAVAIR News Release
NAVAIR Headquarters
Patuxent River, MD

July 29, 2016

NAVAIR marks first flight with 3-D printed, safety-critical parts



An MV-22B Osprey equipped with a 3-D printed titanium link and fitting inside an engine nacelle maintains a hover as part of a July 29 demonstration at Patuxent River Naval Air Station, Maryland. The flight marked Naval Air System Command's first successful flight demonstration of a flight critical aircraft component built using additive manufacturing techniques. (U.S. Navy photo)

NAVAL AIR STATION PATUXENT RIVER, Maryland – Naval Air Systems Command (NAVAIR) marked its first successful flight demonstration of a flight critical aircraft component built using additive manufacturing (AM) techniques here July 29.

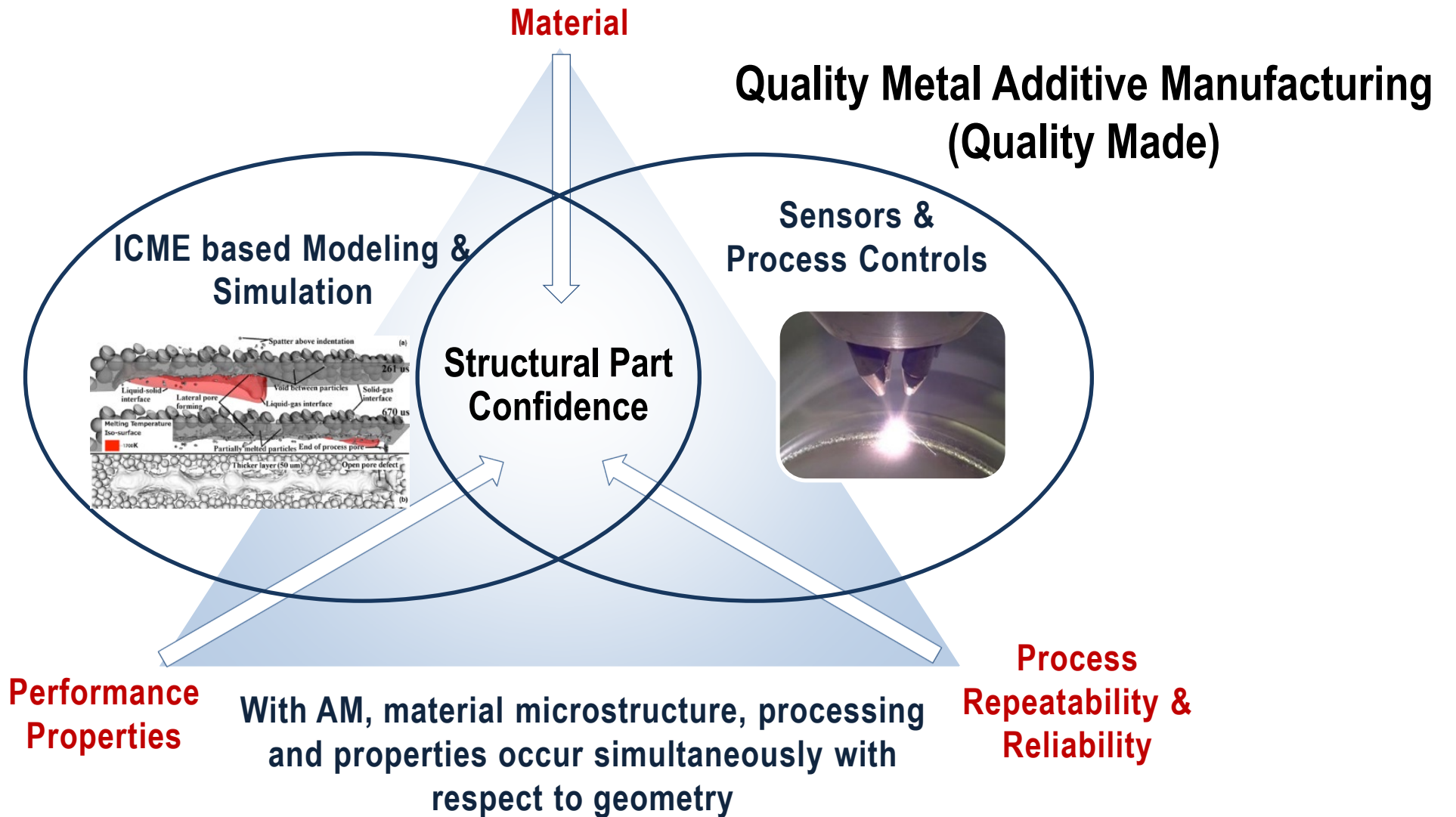
An MV-22B Osprey completed a test flight outfitted with a titanium, 3-D printed link and fitting assembly for the engine nacelle. This link and fitting assembly is one of four that secure a V-22's engine nacelle to the primary wing structure and will remain on the aircraft for continued evaluation. The flight was performed using the standard V-22 flight performance envelope.

"The flight went great. I never would have known that we had anything different onboard," said MV-22 Project Officer Maj. Travis Stephenson, who piloted the flight.

AM uses digital 3-D design data to build components in layers of metal, plastic and other materials. The metal link and fitting assembly for this test event were printed at Naval Air Warfare Center Aircraft Division in Lakehurst, New Jersey. Prior to this flight, multiple V-22



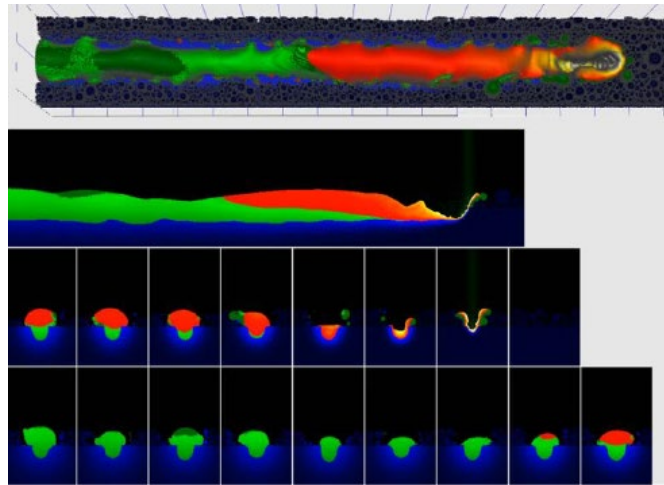
Changing the Qualification Paradigm



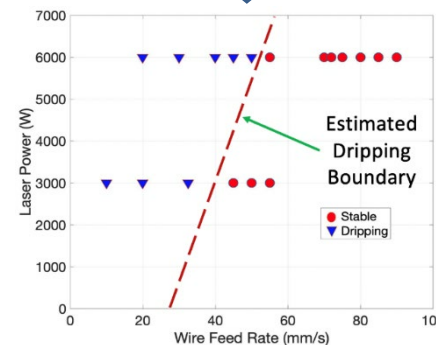
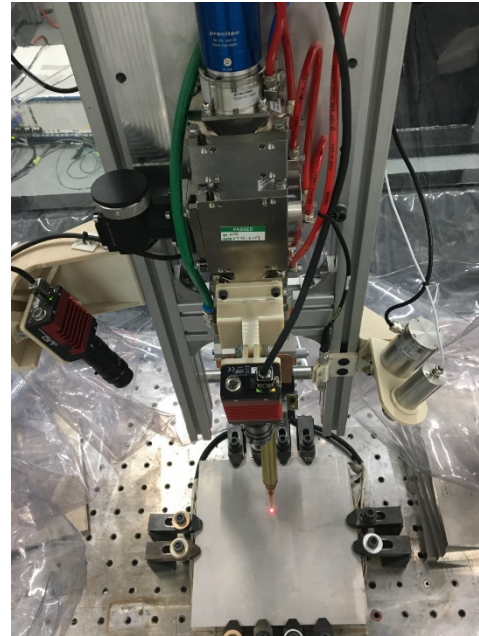
Informing Qualification

Process

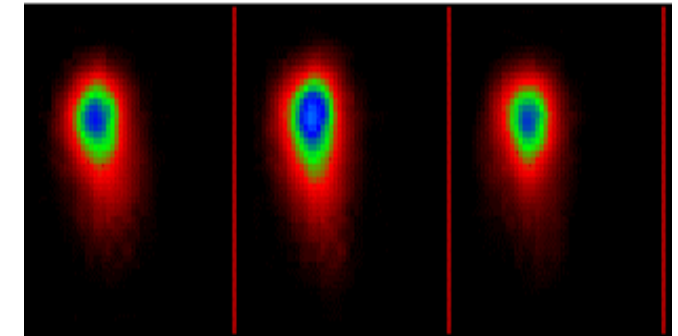
Models



- Local, detailed insights
- Subsurface
- Length & solidification behavior



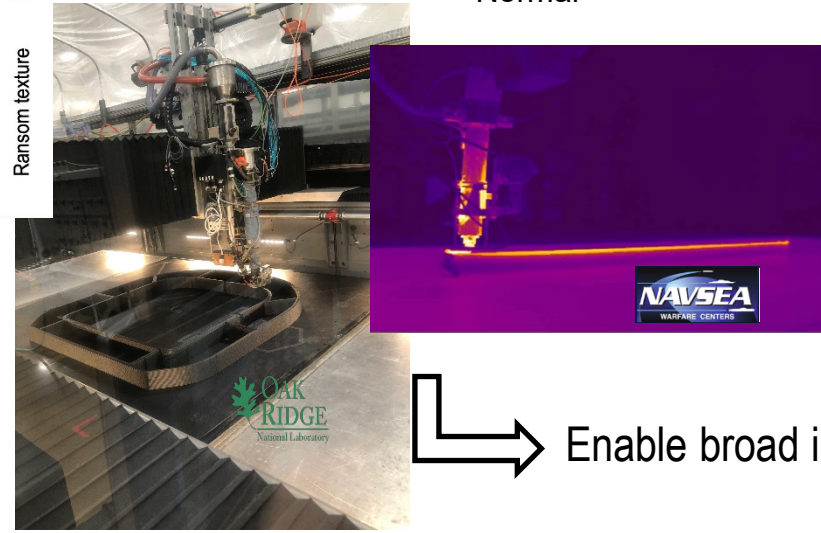
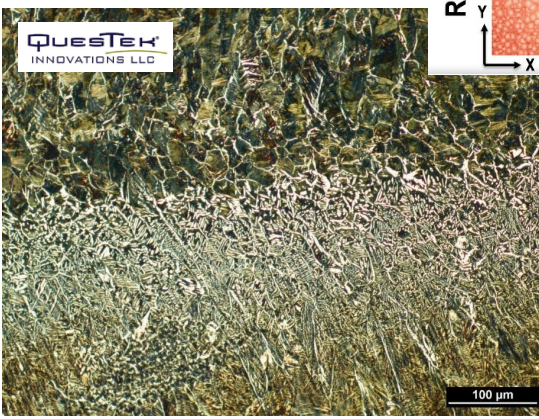
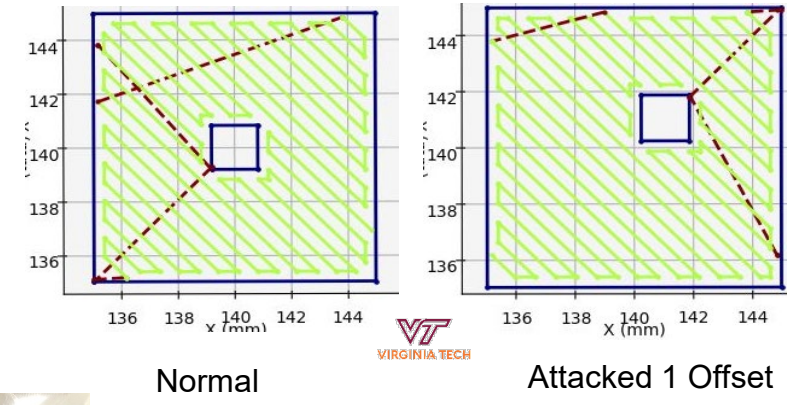
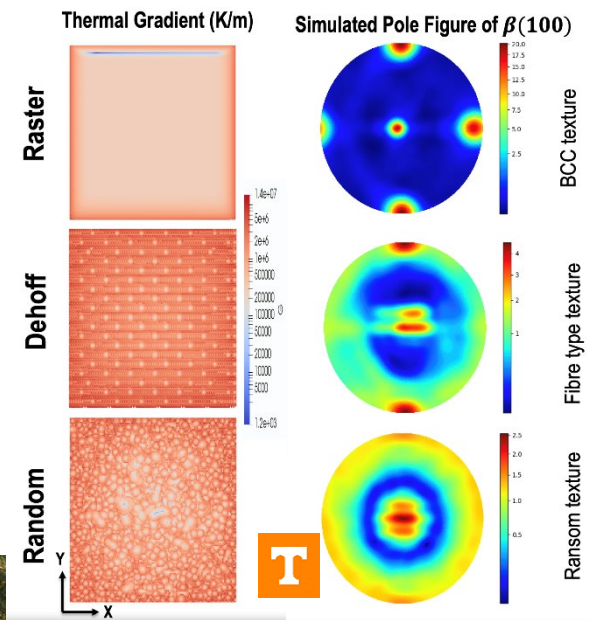
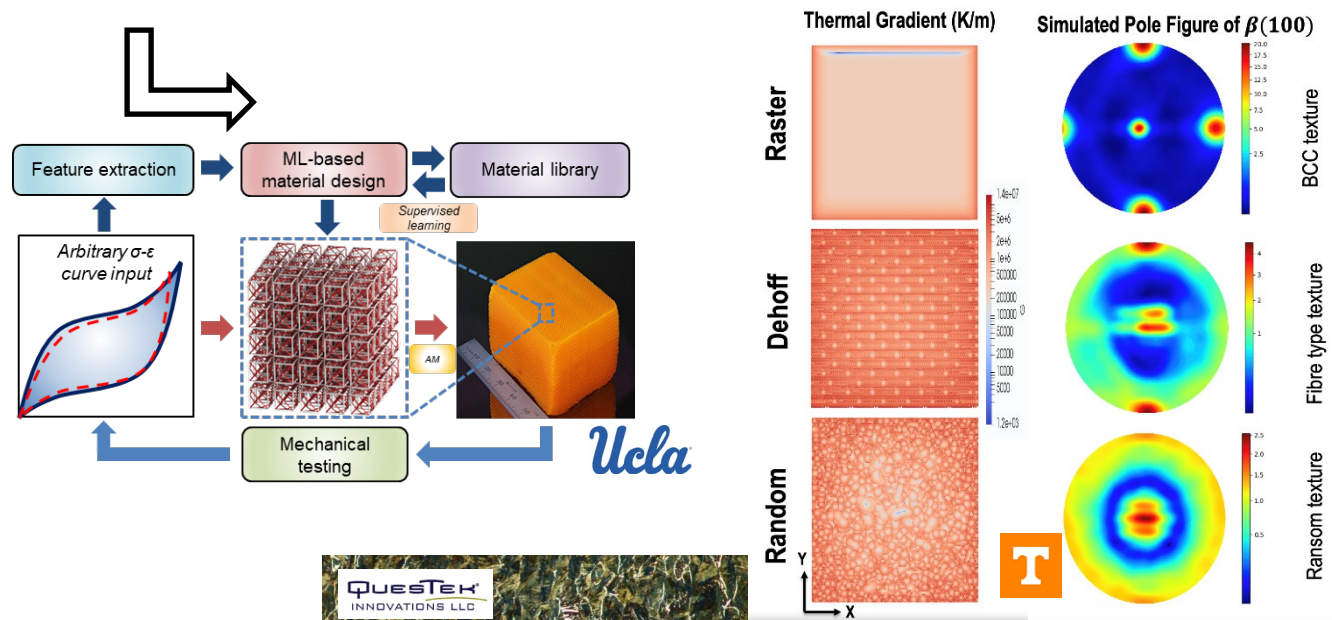
Sensors



- Rapid, simple insights
- Isolate shifts in process
- Stability

Advancing our Materials and Processes

Create and develop additive manufacturing materials and processes for Naval applications

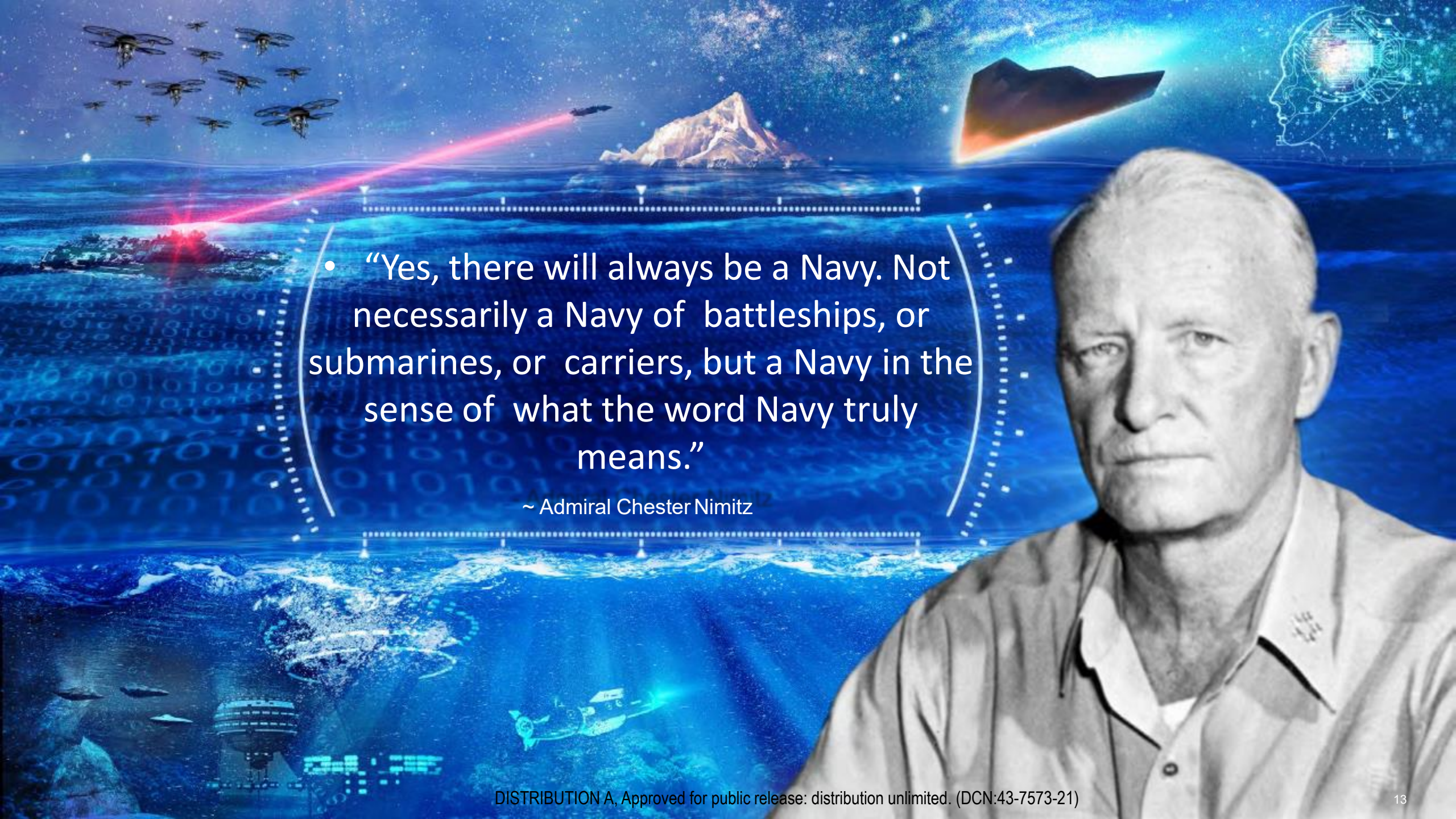


Enable broad implementation of AM

Enhanced capabilities through broader design space in AM fabrication, including tailored design and materials performance



Where do we go next?

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- “Yes, there will always be a Navy. Not necessarily a Navy of battleships, or submarines, or carriers, but a Navy in the sense of what the word Navy truly means.”

~ Admiral Chester Nimitz