Materials and Manufacturing Processes

Scope/Thrust Areas

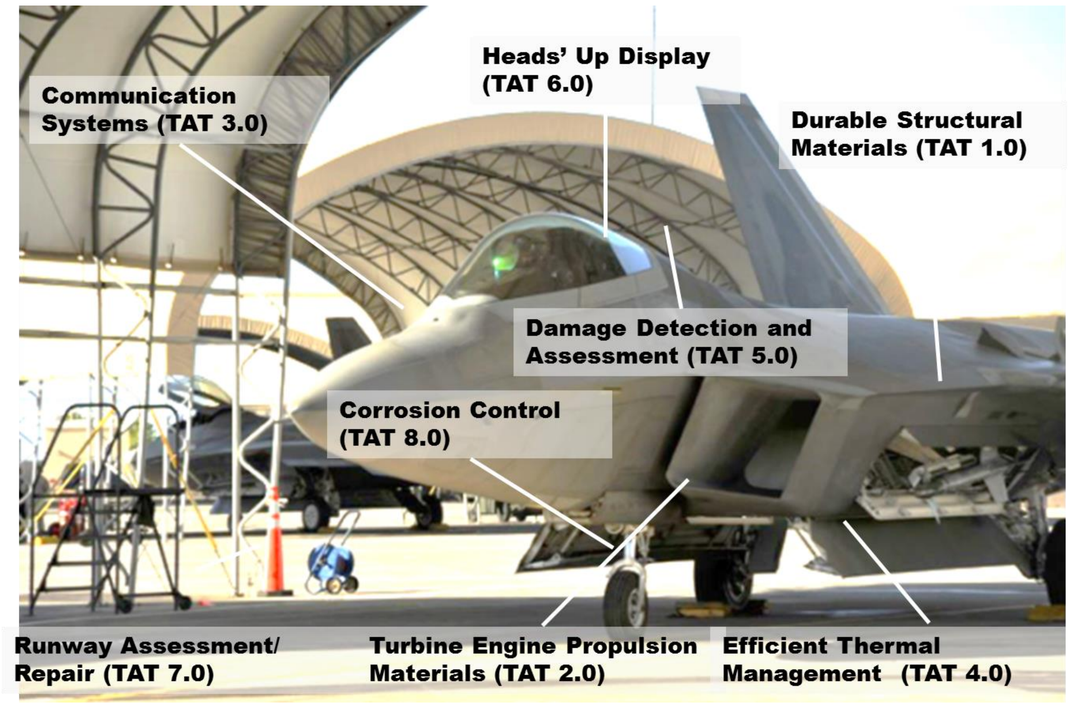
The Materials and Manufacturing Processes COI provides national leadership delivering technology products as well as the scientific and engineering expertise needed to maintain and enhance U.S. Defense capability.

- **Materials & Manufacturing Processes**
  - **Materials/Processes for Survivability & Life Extension**
  - **Civil Engineering**
  - **Manufacturing Technology for Affordability**
  - **Environmental Quality**

Engagement Opportunities for Industry

- **Attend NDIA** – forum for the exchange of information between industry and Government on National Security issues
- **Review Defense Innovation Marketplace** – centralized communications resource to provide industry with improved insight into the Research and Engineering investment priorities of the DoD
- **Partner with DoD laboratories**
- **Partner through National Manufacturing Institutes**

Impact on Capability Needs



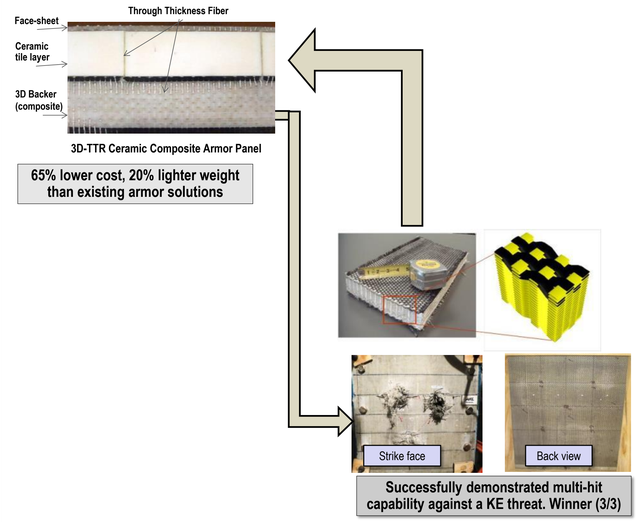
COI - Subarea	Area Where Created Value by COI Collaboration	Description/Impact of Collaboration
M&MP for Structures & Protection	Understanding and mitigating blast effects	Navy's program augmented by Army test and validation facilities provides new, national design code for ceramic armor
M&MP for Propulsion & Extreme Environments	Turbine engine materials development	Long standing VAATE program coordination allows materials engineering efforts to be co-planned among the Components and NASA
M&MP for Electronics & Sensors	Thermoelectric materials for power generation and cooling	Army-AF collaborations exploited unique fabrication and characterization facilities, leading to emerging OSD-India DRDO project
M&MP for Power & Energy	Development and demonstration of fuel cell materials and components	Army, Navy, AF and DARPA programs tightly coordinated for applied research resulting in capabilities for mission-centric fuel cell development for various UAVs
M&MP for Readiness	Integrated hybrid structural health management systems (IHSMS)	Coordination of projects such as Navy's IHSMS effort to provide cost-saving prognostics capability for rotor craft
M&MP for the Individual Warfighter	Understanding and mitigating biological cell response to blast	Army-Navy collaborations to develop test protocols are estimated to save $1M and accelerate pace of project 2X
M&MP for Civil Engineering	Airfield damage repair technologies	Army-Navy/Marine Corps-AF collaborations developed common repair procedures & kits now in use
M&MP for Corrosion	Surface protection/modification; resistant materials; prediction	Newly established (FY15) community is teleconferencing bi-weekly to establish collaborative activities
Manufacturing Technologies	Ceramic matrix composites- "Ceramics Affordability"	AF-Army-Navy prior collaborations enabled AF-Army T700 shroud replacement and set stage for Title III SiC fiber production
Environmental Quality	Solvent-free powder coatings	Navy, Army and Industry team developed powder coatings that are absent of solvent, emit nearly zero VOCs, can be recycled and are compatible with existing (CARC) systems

Success Stories

Development Strategy of 3D-TTR Technology

Technological Breakthrough - successful multi-hit demo in ceramic composite armor

- Enabled by advanced material hybridization, 3D fiber architecture & TTR weaving
- Successful implementation of multi-scale material computational modeling procedure
- Co-developed with academic partner and transitioned to industry through MANTECH



Reliance 21 Impact – Turbine Engine Materials

ONR, AFRL and ARL investments coordinated through VAATE programs

- Environmental barrier coating and application technologies (Navy) in collaboration with hybrid disk developed in AF program
- 2700F SiC/SiC CMC development
- Behavior and life prediction modeling
- CMAS-resistant and functionally graded coatings

Improved processing of metallic-based systems, CMCs, intermetallics and protective coatings for legacy, F35, F18 E/F, ship, and future gas turbine engines.

6.1 basic research to 6.3 development multi-service Investments have resulted in:

- Increased range (≥ 30%), fuel efficiency (≥ 25%), and loiter time (≥ 35%) for military flight vehicles
- Increased standoff distance for warfighter
- Mitigation and control of corrosion and CMAS attack in turbine engine systems to enable increased time between maintenance cycles