USMSM SMART (**S**outhern **M**aryland **A**utonomous **R**esearch and **T**echnology) Building Facilities:

* Education side of the building
  + **Non-metal machine shop:** Workshop for fabricating non-metal artifacts, utilizing equipment such as Industrial Strength Ultrasonic Table Top Plastic Welding Machine, CNC Milling Machines, Laser Cutters and Vacuum Thermoforming.
  + **Machine Shop:** Workshop for fabricating metal artifacts, utilizing equipment such as MIG/TIG Welders, CNC Milling Machines and a Jet Machining Center.
  + **Electronic Shop:** Workshop for fabricating electronic components, utilizing equipment such as PCB Prototyping machines.
  + **Microwave Lab:** Workshop for testing microwave components, featuring a walk-in anechoic test chamber 8’ x 12’ x 10’ high and a Agilent Fieldfox RF Analyzer.
  + **Electrical Engineering Lab:** Lab space featuring Tektrontix Dual Channel Arbitrary Function Generators; Oscilloscopes, digital multimeters and precision AC/DC power supplies.
  + **Mechanical Engineering Lab:** Lab space featuring a Subsonic Wind Tunnel (Velocity Range m/s (fps) 1.5-15.2/ (5.0-5.0) 3.0 - 45.7), Airflow Bench, Heat Convection and Conduction, a fume hood, Impact of Jet Apparatus, Static Fluid Bench and a Hydraulics Bench.
  + **Discrete Microelectronics / Circuits / Digital Systems / Embedded Systems Lab:** Lab space featuring precision power amplifiers; Keysight Oscilloscopes; function generators; Agilent Fieldfox Microwave Analyzer; Quanser Rotary Inverted Pendulum Module and Rotary Servo Bases; Intronix Logic Analyzers; and soldering stations.
  + **3D Print Shop:** Workshop featuring Markforged Metal X, Sinter and Mark Two printers; a Stratasys Objet30 printer; a Stratasys Object Waterjet; and an Epilog Fusion Laser Engraving and Cutting System for precision printing and project prototyping.
* MATRIX (**M**aryland **A**utonomous **T**echnology **R**esearch and **I**nnovation **X**ploration) Lab
  + **Open Air-Land Lab:** 80’ by 60’ lab with a minimum 30’ ceiling for testing air and ground systems, and including an in-floor water tank for amphibious water interface testing. Two external doors allow drive/fly-in/out capability. Features a two level, 40 camera Vicon Vantage V16 camera system with a resolution of 16 megapixels, a portable operations center, a protected operations center, and a collocated vehicle storage area. Entire room is RF sealed between 30 MHz-18 GHz to allow GPS and other Rf testing, protecting both internal systems and the external airport environment.
  + **Hydrology Lab:** In this lab, researchers will be able to fabricate and test materials, devices, and assemblies in a water environment to aid underwater vehicle and autonomous marine robotics basic research, testing, and evaluation. The water environment will be a self‐contained tank, circulating channel that will have flowing water used to emulate an ocean or riverine environment. Underwater motion capture cameras will enable robotics experimentation. Features a 80 cm by 130 cm Flow Visualization Test Section and Oqus Underwater Camera System.
  + **AR/VR Capable spaces:** The 3D Visualization Laboratory will provide a simulation and modelling environment with capabilities to immerse people into worlds where actual immersion may not be possible due to time, safety, or complexity limitations. This research space will be equipped with a CAVE (Cave Automatic Virtual Environment), which are Virtual Reality (VR) rooms that display images on screens typically using stereoscopic 3D back projected screens (original CAVE) or a higher definition multiscreen LCD layout (CAVE2) a simulation and modeling environment that is unmatched in the US and could be used to train, and conduct research related to autonomous air, sea and ground systems that support both commercial and non‐commercial research goals and objectives.
  + **Project Assembly Area:** Large project work area featuring snorkeled and in-table utilities and collaborative workspaces. Has one ADA fume hood and one non-ADA fume hood.
  + **Collaboration/Post-Doc Spaces:** Several spaces surrounding the technical work areas have collaborative spaces for planning and design between students, faculty and other researchers.
  + **Project Transport Rail:** An overhead motorized transport rail with a one-ton capacity runs the full length of the MATRIX lab to support moving large research artifacts from one end of design and fabrication to the other for testing and external offload.
  + **Roof-top Antenna Farm:** Foundation points are available on the roof of the Open Air-Land Lab to support antennas, including communication and tracking, to support external environment testing. External pass-throughs facilitate ease of wiring.
  + **Outdoor UGV playgrounds:** Landscaped and incorporating material challenges, these external spaces will support exercising unmanned ground vehicles in demanding circumstances in the open-air environment.
  + **Open-air UAS flight:** Supported by the UAS Test Site, operating processes are already in place to fly UAS at this airport environment. Relationships with both the FAA and FCC support research work into all applicable areas. The UAS Test Site is available to facilitate transition from lab basic research to external applied research.
* **Conference facility:** With a capacity for 330 seats/250 seated at banquet tables, and divisible into three sections, with full audio-visual capabilities, this will be the largest, most capable conference facility in southern Maryland. Besides academic conferences, its utility for community and government events is well documented. Adjacent spaces for table and seating storage, as well as a full catering kitchen, support the most demanding events.



