

The **Aerospace Center** is an applied **research center** focused on the design, development and testing of aerospace, defense and energy systems. Core research strengths are in:

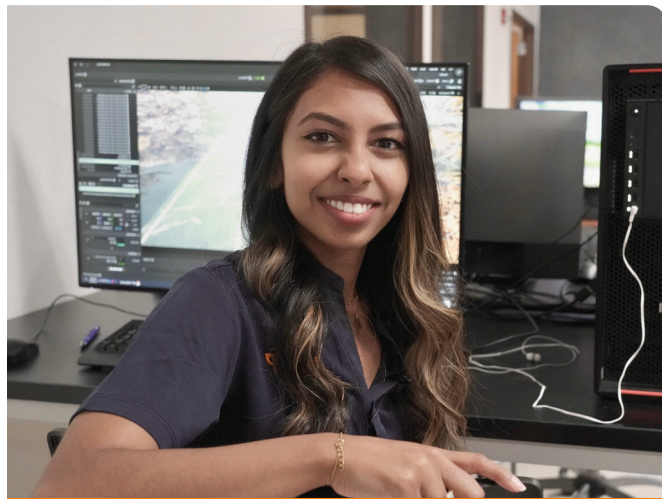
- Propulsion
- Small Satellite Design
- Lunar In-Situ Resource Utilization
- In Space Manufacturing
- Hypersonic Systems
- Uncrewed Aerial Systems
- Missile Systems
- Combustion/Clean Energy
- Digital Engineering and Design

## ON-CAMPUS FACILITIES

- **Goddard's Combustion & Propulsion Research Facility**  
4,280 sq. ft. - Includes 600 sq. ft. ultra-high velocity projectile resistance bunker
- **Challenger-Columbia Structures & Materials Research Facility** 3,340 sq. ft.
- **Digital Engineering Design Center** 3,960 sq. ft.



**Advanced Manufacturing and Aerospace Center**  
Opens 2024



**DIGITAL ENGINEERING DESIGN CENTER (DEDC)**  
Digital Engineering Design Center (DEDC)  
DEDC @Youngstown | Youngstown, OH | 4,250 sq. ft.  
DEDC @Huntsville | Huntsville, AL | 1,700 sq. ft.  
DEDC @Houston | NASA Johnson Space Center | Houston, TX | 400 sq. ft.

## OFF-CAMPUS FACILITIES

### Tech 1 Campus | Fabens, TX | Tornillo, TX Alpha Site | Research Airport | Fabens, TX

- Propulsion and Energy Systems Integration Facility | 10,200 sq. ft.
- Unmanned Aerial Systems Integration Facility (Opens in 2024) | 15,661 sq. ft.
- Uncrewed Aerial Systems Integration Facility (Opens in 2024) | 15,661 sq. ft.
- Subsonic and Supersonic Wind Tunnel Facility (Opens in 2025) | 15,661 sq. ft.
- Aeronautics Research and Learning Facility (Opens in 2025) | 15,661 sq. ft.
- Advanced Machining and Fabrication Facility (Opens in 2025) | 15,661 sq. ft.
- Propulsion and Large-Scale Testing Site | 18 Acres | 4,200-foot and 2,300-foot runways, six test cells and one test stand



**Tech1 Campus-Alpha Site**  
Fabens, TX

### Bravo Site | Uncrewed Aerial System Flight Test Range | Tornillo, TX

- 400-foot runways | Test Support Facility LSTAR Radar
- 100 KW Power Trailer Propulsion and Energy Systems



**Tech1 Campus-Bravo Site**  
Tornillo, TX

## PROPULSION & ENERGY: SYSTEMS & EQUIPMENT

- ultra-high velocity projectile resistance combustion bunker
- strand burner system
- cryogenic methane & oxygen delivery system
- multifuel manifolds & feed systems for liquid & gaseous fuels
- multistage compressors
- intermediate pressure turbine combustor (IPT)
- multipurpose optically accessible rocket combustor (MOAC)
- high-speed combustion test facility (SCT)
- low pressure combustor
- flat-flame burner, twin-flame counter flow burner, & oxy-fuel burner
- instrumented rocket thrust stand
- high-speed particle image velocimetry (PIV)
- laser doppler velocimetry & stereo-particle image velocimetry
- phase doppler particle analyzer
- planar laser induced fluorescence (PLIF) & TR PIV-PLIF systems
- color Schlieren deflectometry
- ultra-high-speed intensified imaging
- laser ignition facility equipped with a CO<sub>2</sub> laser (Synrad Firestati-60) & mass spectrometer (Pfeiffer Omnistar GSD320)
- hot-wire ignition facility
- high-speed video camera (Vision Research Phantom v1210)
- high-resolution video camera (Sony XCD-SX90CR)
- infrared video camera (FLIR SC7650E)

## POWDER MIXTURE PREPARATION EQUIPMENT

- stainless steel glovebox isolator (Terra Universal S-300)
- planetary ball mill (Fritsch Pulverisette 7 Premium Line)
- shaker ball mill (SPEX SamplePrep 8000D)
- roller ball mill (Labmill-8000)
- three-dimensional inversion kinematics tumbler mixer (Bioengineering Inversina 2L)
- acoustic mixer (Resodyn LabRAM)
- sieve-shaker (Octagon 2000)
- hydraulic press (Carver)
- ultrasonic cleaner (Branson 1510)
- digital hot plate stirrer (Scilogex MS7-H550-Pro)
- precision balance (Mettler Toledo ML 303E)

## KINETICS & MATERIAL CHARACTERIZATION EQUIPMENT

- laser diffraction particle size analyzer (microtrac bluewave)
- differential scanning calorimeter (Netzsch DSC 404 F1 Pegasus)
- high-pressure differential scanning calorimeter (Netzsch DSC 204 HP Phoenix)
- oxygen bomb calorimeter (Parr 6220)
- semimicro calorimeter (Parr 6725)
- thermogravimetric analyzer (Netzsch TGA 209 F1 Iris)
- electrical property analyzer (Netzsch SBA 458 Nemesis)
- mass spectrometer (Netzsch QMS 403 D Aeolos, Netzsch TGA/DSC-MS coupling)
- Fourier transform infrared spectrometer (Bruker Tensor II, Netzsch TGA/DSC-FTIR coupling)
- laser flash apparatus (Netzsch LFA 457 MicroFlash)

## MECHANICAL TESTING & COMPOSITE EQUIPMENT

- Instron Corporation, Model 5866, with 10kN & 0.5kN load cells, for tension, compression & flexural testing
- Instron Corporation, Model 880, Servohydraulic Fatigue Testing System, with  $\pm 100$ kN load cell for tension, flexural, compression, compression after impact, and three high- and low-cycle fatigue and thermomechanical fatigue testing
- Instron Corporation, CEAST 9340 Droptower Impact System suitable for a range of impact applications including tensile impact, penetration tests on plates and films, Izod, and Charpy tests. System capable of producing an energy range: 0.30 - 405 J, impact speed: 0.77 - 4.65 m/s, drop height: 0.03 - 1.10 m, and drop weight: 1.00 - 37.5 kg
- Genesis Compression Press used for compression molding of rubber, plastics, composites and laminating with adjustable clamp force: up to 30 tons, platen size: 12" x 12", closing speed: 70-90 IPM, pressing speed: 5 IPM, heated platens temperature: 350 °C, water cooled platens, digital PID temperature controllers & programmable controller with access module
- MTS Systems Corporation, Model 370 servohydraulic system, with 100kN load cell, for static & dynamic testing including durability, fatigue crack growth, high & low cycle fatigue, fracture toughness, tension, and compression
- MTS Corporation, Model 370.02 axial-torsional servohydraulic system, with 25kN load cell, 200N-m torque rating for static & dynamic testing including durability, fatigue crack growth, high & low cycle fatigue, fracture toughness, tension, compression
- Cascade TEK, Forced Air Oven for composite manufacturing with a 10 ft<sup>3</sup> capacity, temperature range: 15 °C to 306 °C, & programmable watlow ramp and soak controller
- Aerospace-grade 3X5 Econoclave ® Autoclave System

## MACHINING & TOOLING EQUIPMENT

- 6-axis hybrid hexapod femtosecond laser machining system (6-D Lasers, ALIO Industries, SCANLAB, Edgewave)
- CNCs: TORMACH CNC PCNC 440 3 axis milling machine & TORMACH CNC 8L 2 axis lathe
- conventional manual machines: KENT USA TRL-1340 2 axis manual lathe & KENT USA KTM-3VKF 3 axis manual knee mill
- INTEGRIX i250HSN 40"/1000U MAZATROL SMOOTHA CONTROL Machining Center
- Wazer Water Jet Cutter capable of cutting carbon fiber, stainless steel, marble, boro glass, HDPE and silicone.
- Welding Stations: MILLER SYNCROWAVE 210 TIG/MIG/STICK welder & MILLER MAXSTAR 161 STL TIG welder

## ENVIRONMENTAL TESTING EQUIPMENT

- vibration testing up to (max. 11G, 40 lb load) test article (Shaker: LW127.123-500D12) with testing random: 350 lbs rms, Sine force: 500lbs force pk, & shock: 1000lbs pk
- vacuum chambers: 1.4 10<sup>-6</sup> torr & 5 thermocouples (K-type)
- TVAC-LACO vacuum system to simulate down to 10<sup>-6</sup>-torr & temperatures cryogenic to 150degC

## ELECTRONICS

- Cadence OrCAD Allegro Schematic/PCB Layout Software Suite
- HPC & MICIT DAQ System - NI LabVIEW Based, modular, ethernet enabled, real-time data acquisition & control system for high pressure combustor & propulsion systems
- function generators, power supplies, source meters, logic analyzers, oscilloscopes
- Texas Instruments DSP development platform & Code Composer Studio Platinum
- Microprocessor development kits
- SMTMax QM1500 Pick & Place Machine
- SMTMax AE-F600C ReFlow Oven
- NI USRP Software Defined Radio Device packages: ethernet enabled, real-time software controlled, 70Mhz - 6 Ghz frequency ranges, up to 56 Mhz instantaneous bandwidth.
- Library of passive & active components
- Software: Code Composer Studio
- Arduino development boards
- Laser microwelder (Miyachi LW5AG)

## UNCREWED AERIAL SYSTEMS

- unmanned traffic management (UTM) systems
- 28 autonomous long range/long endurance aircraft; fixed/rotary wing
- Q48 Radar Systems
- autonomous SLAM aircraft navigating in confined GPSdenied environments
- advanced sensors & applications, to include: EO, Multispectral, IR, UV
- advanced post-processing capability to produce a range of research-grade data products
- UAV ground & flight academics

## CAD & DESIGN SOFTWARE

- CAD: Pro-E (Creo), NX CAD (Siemens), & SolidWorks
- Manufacturing: NX CAM, SurfCAM & FeatureCAM Analysis Software
- CHEMKIN | ANSYS-STK | Aspen Plus | Siemens Xcelerator | Nastran | STAR-CCM+
- Simcenter3D | Capital | Amesim | Teamcenter
- Schematic Capture, SPICE, & PCB Design Software
- Proteus Design Suite 7.9 Release (ISIS Profession Release Schematic Capture | Spice Advance Simulation | ARES Professional Release PCB Capture)
- Cadence Design Systems 16.6 Full Suite (Allegro Design Entry CIS | PSpice AD | PCB Editor)