



### **cSETR Facilities**

#### *On Campus Capability*

- Goddard's Combustion and Propulsion Research Facility | 4,280sqft
  - Including 600 sq.ft Ultra-high velocity projectile resistance combustion bunker
- Challenger-Columbia Structures and Materials Research Facility | 3,340 sq.ft
- Spacecraft Design and Engineering Facility | 3,960 sq.ft
- Computational Laboratory | 735 sq.ft

#### *Off Campus Facilities*

- Technology Research and Innovation Acceleration Park | Fabens, TX
  - General Aviation Airport| 4200 ft. and 2300 ft. Runways| 400 acres
  - HQ Site | Integration Facility | 10,200 sq.ft
  - Alpha Site | Pilot Scale Testing Facility | 18 Acres
  - Aeronautics Research and Learning Facility (*Planned*) | 10,000 sq.ft
- Tornillo Unmanned Aerial System Flight Test Range | Tornillo, TX | 600 acres
  - 400 ft. Runways | Test Support Facility (*Planned*)
- Satellite Ground Station (*underdevelopment*) | Horizon City, TX |
  - 2.4 m S-band antenna | 436 MHz UHF antenna

#### *Partner Facilities | Horizon City, TX*

- Horizon City Aerospace and Defense Accelerator | 2,400 sq.ft
  - Small Business Incubator
- TMD Space and Defense | 350 acre
  - Administrative Area, 21,000 sq.ft warehouse, Hazardous Material Assembly Area with (10) Missile Assembly Cells, (7) Storage Magazines, Firefighting Support Building with 2,000 gal/min pump capacity & 250,000 gal water storage

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### **Combustion/Propulsion Systems and Equipment**

- Ultra-high velocity projectile resistance combustion bunker
- Cryogenic Methane Delivery System
- Cryogenic Oxygen Delivery System
- Multi-Fuel Manifolds and Feed Systems for Liquid and Gaseous Fuels
- Multistage Compressors
- Intermediate Pressure Turbine Combustor (IPTC)
- 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
- High speed particle Image Velocimetry (PIV)
- Stereo-Particle Image Velocimetry
- Laser Doppler Velocimetry
- Phase Doppler Particle Analyzer
- Planar Laser Induced Fluorescence (PLIF)
- TR PIV-PLIF Systems
- Color Schlieren Deflectometry
- Ultra-High Speed Intensified Imaging
- Emission Analyzers
- Gas Chromatograph
- Laser ignition facility equipped with a CO2 laser (Synrad Firestar ti-60) and a mass spectrometer (Pfeiffer Omnistar GSD 320)
- Hot-wire ignition facility
- High-speed video camera (Vision Research Phantom v1210)
- High-resolution video camera (Sony XCD-SX90CR)
- Infrared video camera (FLIR SC7650E)

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### **Mechanical Testing**

- Materials testing system (Instron Corporation, Model 5866, with 10kN and 0.5kN load cells, for tension, compression and flexural testing)
- Materials testing system (MTS Systems Corporation, Model 370 servohydraulic system, with 100kN load cell, for static and dynamic testing including durability, fatigue crack growth, high and low cycle fatigue, fracture toughness, tension, compression)
- Materials testing system (MTS Corporation, Model 370.02 Axial-torsional Servohydraulic system, with 25kN load cell, 200N-m torque rating for static and dynamic testing including durability, fatigue crack growth, high and low cycle fatigue, fracture toughness, tension, compression)

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### **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: 500 lbs force pk, Shock: 1000 lbs pk
- Vacuum chamber
  - 1.4 10<sup>-6</sup> torr & 5 thermocouples (K-type)



### Equipment for preparation of powder mixtures

- Stainless steel glovebox isolator (Terra Universal Series 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 (Sciogex MS7-H550-Pro)
- Precision balance (Mettler Toledo ML 303E)

### CNC Machining and Tooling

- CNCs
  - Mill: MAZAK Nexus 410A-II, HAAS, & BRIDGEPOINT Interact 412
  - Lathe: KENTOCN KLR-12
- Welders: Tig Welder & Mig Welder
- Grinding Stations
- Saw: Vertical saw [GROB INC] & Horizontal saw [ DM 10- HYD MECH]
- Conventional Machines
  - Mill: 2 SHARP-precision machine tools
  - Lathe: 2 Leblond Regal & 1 Delta Rockwell

### Electronics:

- Cadence OrCAD Allegro Schematic/PCB Layout Software Suite
- SMTMax QM1500 Pick and Place Machine
- SMTMax AE-F600C ReFlow Oven
- cSETR HPC and MICIT DAQ System - NI LabVIEW Based, modular, ethernet enabled, real-time Data acquisition and control system for High Pressure Combustor and Propulsion systems
- Function generators, Power supplies, Sourcemeters, Logic analyzers, Oscilloscopes
- Microprocessor development kits
- NI USRP Software Defined Radio Device packages: ethernet enabled, real-time software controlled, 70Mhz – 6Ghz frequency ranges, up to 56Mhz instantaneous bandwidth.
- Texas Instruments DSP development platform and Code Composer Studio Platinum
- Library of passive and active components
- Software: Code Composer Studio
- Arduino development boards
- Laser microwelder (Miyachi LW5AG)

### Unmanned Aerial Systems

- Unmanned Traffic Management (UTM) systems
- 14 Autonomous Long Range/Long Endurance aircrafts, both fixed and rotary wing
- Autonomous SLAM aircraft able to navigate in confined GPS-denied environments
- Advanced Sensors and applications, to include: EO, Multispectral, IR, UV
- Advanced post-processing capability to produce a range of research-grade data products
- UAV Ground and flight academics

### Software

#### *CAD and Design*

- CAD: Pro-E (Creo), NX 7.5 UGS (Siemens), and SolidWorks
- Manufacturing: SurfCAM and FeatureCAM

#### *Analysis Software*

- CHEMKIN
- ANSYS
- ASPEN-HYSYS
- Nastran MD (MSC)