

# MICHAEL S. WORTHINGTON

512-264-7138 Austin, TX

Design Portfolio: [m-worthington.com](http://m-worthington.com)

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## SENIOR MECHANICAL ENGINEER

Mechanical Engineer with 16 years of advanced electromechanical research providing outstanding project leadership for high value government and commercial customers. Excelling in devising creative innovations that meet project requirements and deadlines within aggressive timelines. Effectively converted mechanical designs into final hardware within analysis, cost and design objectives for projects with values of \$25 million.

### Areas of expertise include:

- Electromechanical systems
  - Product hardware & testing
  - Failure modes and effects
  - Solid modeling
  - Vendor interfacing
  - Analysis tools (FEA)
    - Structural
    - Thermal
    - Frequency
    - Computational fluid dynamics (CFD)
  - Fabrication processes
    - Machining
    - Welding
    - Sheet metal
  - Geometric dimensioning & tolerancing (GD&T)
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## PROFESSIONAL EXPERIENCE

### Mechanical Design Engineer

May 2002 – Jan. 2019

Progressed quickly as a Research Engineer and selected to serve as Lead Mechanical Engineer on multiple high profile projects with complex constraints, leading teams and consulting directly with project partners.

#### **Center for Electromechanics (CEM), University of Texas at Austin**

**Austin, TX**

*A prestigious university research center devoted to fundamental and applied research in the areas of electromechanical devices, energy storage, and advanced materials for industry and government.*

### Project Management

- Coordinated and directed multi-disciplined teams of engineers, technicians and students
- Evaluated fabrication problems on machine-shop floor; prepared engineering change requests (ECRs) and processed document revision control via Enterprise PDM software
- Built relationships with vendors to procure off-the-shelf components, as well as specify custom components; performed site visits inspecting progress
- Participated in technical writing for proposals, reports, published papers (11 journal/conference) and documentation for system assembly and maintenance procedures
- Prepared project status reports, cost comparisons, man-power estimates; created and delivered technical presentations to management and customers

### Technical Responsibilities

- Delivered mechanical 3D CAD designs from individual parts through complex assemblies; conducted design trade studies and identified improvements for next-generation hardware
- Performed detailed FEA for stress, thermal, frequency and buckling load cases
- Conducted computational fluid dynamics (CFD) for both internal and external flows
- Experienced with vacuum systems design, thermal management and motion controls
- Created engineering drawings for fabrication including tolerance stack-up analysis and GD&T
- Substantial hands-on experience assembling hardware, component and system level testing

**Key Project Highlights** (see online design portfolio for additional details: [m-worthington.com](http://m-worthington.com))

- **Hobby-Eberly Telescope Dark Energy Experiment (McDonald Observatory)**

*Project: CEM was an integral partner in performing a \$25 million upgrade to McDonald Observatory's flagship telescope in order to perform largest survey of the universe ever collected to study dark energy.*

- Delivered design, analysis (stress and frequency) and fabrication of \$250k tracker bridge
- Designed sophisticated multi-axis bridge drive system including dual operating planetary roller screws to locate 20-ton tracker with precision of 5 microns
- Created extensive drawing package and assembly/maintenance documentation; participated in FMEA

- **Active Suspensions for Military Vehicles (BAE Systems and U.S. Army)**

*Project: Implemented an active suspension system capable of exerting forces at each wheel to counteract impacts during off-road driving, increasing the maneuverability and survivability of military vehicles.*

- Designed 4500 lbf, 120 in/sec active suspension actuator and associated hardware that increased off-road speeds by 30% on a Light Medium Tactical Vehicle (LMTV)
- Performed CFD analysis to improve fluid flow through hydraulic actuator to increase linear speed resulting in 70% fewer frictional losses in 2<sup>nd</sup> generation actuator

- **Giant Magellan Telescope High-Resolution Near-Infrared Spectrograph (GMTNIRS) (NSF)**

*Project: Provide mechanical and thermal analysis for the conceptual design of the GMTNIRS which was then selected as a first-generation science instrument on the new Giant Magellan Telescope in Chile.*

- Lead engineer for CEM's team, interfacing regularly with outside project team scientists and engineers
- Integrated the precise optical layout onto an optical bench operating in vacuum at 37-70 K

- **Flywheel Motor/Generator for Military Aerospace UAV (Missile Defense Agency)**

*Project: Design, build and test a 7.5 MJ/250kW, 30,000 rpm flywheel generator*

- Lead mechanical engineer for motor/generator design: Performed detailed transient thermal analyses on helium cooled stator coils and rotor composite bandings, significantly guiding machine design
- Specified and ordered titanium forging, permanent magnets and created all engineering drawings for the machine build; supervised fabrication from in-house technicians and fabrication vendors

- **Linear Motor Natural Gas Compressor (DOE via ARPA-E)**

*Project: Designed and built an innovative 2 SCFM compressor (patent pending) for use as an at-home refueling appliance for natural gas powered vehicles.*

- Key contributor to conceptual design and writing technical proposal to win \$4.3 million award
- Lead mechanical engineer in mechanical design of 1.5 kW reluctance linear motor

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## TECHNICAL SKILLS

- SolidWorks (SW) • SW Simulation • SW Flow Simulation • SW Workgroup PDM • Microsoft Office
- Visio • MathCAD • Matlab / Simulink • Visual Basic for Applications • NIST Refprop

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## EDUCATION

### Masters of Science, Mechanical Engineering

May 2010

The University of Texas at Austin, Austin, TX

Thesis: *Design and Analysis of the Hobby-Eberly Telescope Dark Energy Experiment Bridge*

### Bachelors of Science with Honors, Mechanical Engineering

May 2002

Texas A&amp;M University, College Station, TX