Team Experience

MAGNETICS:
Custom innovative actuators and sensors
MEMS actuators
Navy aircraft launcher and arrestor
Maglev high-speed trains & rocket sleds
Minesweeper and submarine cloaking
Permanent magnet machine signature analysis
Electromagnetic spacecraft launcher
Magnetic motor resolvers

MECHANICAL and ROBOTIC SYSTEMS:
Man/machine force feedback interfaces
Zero backlash 2 DOF joints
Active and passive noise cancellation systems
Active center of mass controls
Proprietary automotive system development
Robotic drive and transmission systems for multi-
  DOF control

ELECTRONIC SYSTEMS:
Voltage– and Current-mode controllers
350 HP motor controllers
Distributed control and power systems
Commercial switching devices
Electric vehicle components
Microprocessor programming for intelligent
  peripherals
Electronic control systems for haptics

We are innovation experts

Engineering Matters has helped our clients develop:

- Force feedback devices
- Microcontroller systems
- Sensors & robotics systems
- Electromagnetic devices from MEMS to Maglev
- Motor/generators and electromagnetic drives
- Electronics for motor control
- Electromagnetic signature reduction systems

Birth of a Joystick

The Engineering Matters Force Feedback Joystick was developed under contract to the US Air Force. During pilot training and studies, subjects are required to make high-force maneuvers in a simulator. Existing low-force joysticks which use pulleys and cables, were constantly breaking down and interrupting the training and studies. The Air Force defined a need for a high-force, high-reliability joystick. Engineering Matters' solution was selected as the best from a field of contenders. We have continued to develop the joystick system, making it suitable for many applications.

Call: 617-965-8974
Toll Free: 877-202-2246
Email: info@engineeringmatters.com
Visit our website:
www.engineeringmatters.com

ENGINEERING MATTERS®

High Torque Wide Bandwidth Highly Reliable Joysticks

Experience the Joy!™

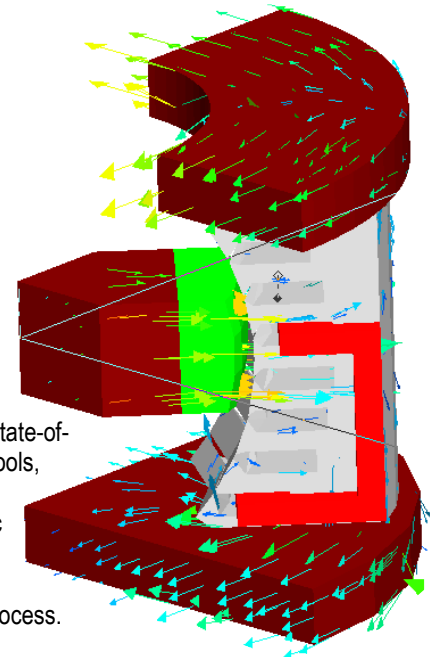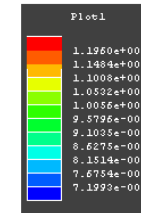# ENGINEERING MATTERS®

Direct Drive Force Feedback Joystick:

- ◆ 2-DOF
- ◆ Rugged
- ◆ Powerful
- ◆ 10 ft-lbs torque
- ◆ 1000 Hz response
- ◆ Center stick and side stick configurations

Experience the Joy!™

TECHNICAL SPECIFICATIONS

- ■ 2 Degrees of Freedom: ±30° each DOF
- ■ Long Life
  - □ Extremely rugged - One moving part
  - □ Hardened chrome steel ball bearings
- ■ Force Feedback
  - □ Very powerful (1.5 HP)
  - □ High torque (10 ft-lbs.)
  - □ Rare Earth magnets
- ■ Responsive & Sensitive
  - □ Wide frequency response (1 kHz)
  - □ High resolution (0.06°)
- ■ Direct Drive
  - □ No mechanical transmission
  - □ Brushless permanent magnet motor
- ■ Microprocessor Control
  - □ Host control via RS-232
  - □ Java GUI and DirectX® available
- ■ Operating Environment
  - □ Mechanics temp. range –50 to +125°C
  - □ Electronics temp. range 0 to +85°C
  - □ Humidity (100% saturated)
- ■ Power Supply
  - □ 120 V AC
  - □ 1.5 HP motor
  - □ Off-line MOSFET SMPS
  - □ Low voltage handle (5 V)
- ■ Physical
  - □ 55 lbs
  - □ 9.5 inches diameter x 6.5 inches high
  - □ Handles to 24" in length
- ■ Other Information
  - □ US Patent #6,320,284; other patents pending.
  - □ Ergonomic hand grips with up to 14 buttons available
  - □ Center- or side-stick configurations
  - □ Joystick strain gauge available

Engineering Matters routinely uses state-of-the-art design tools, such as the electromagnetic analysis shown here, in the development process.

Applications:

- ■ Aviation
- ■ Automotive
- ■ Entertainment
- ■ Industrial/Construction/Agriculture machine control
- ■ Healthcare
- ■ Telemedicine
- ■ Teleoperation (UxV or ROV control)
- ■ Hazardous Environmental Cleanup
- ■ Nuclear Facility Maintenance & Operation
- ■ Robotics

There are many other applications, limited only by your imagination. The configuration and behavior of our joystick can be changed to fit nearly any application - Virtual environments, Human-Machine interface, Exoskeletons... etc. **If you can think it, Engineering Matters can create it!**