

# Aerospace

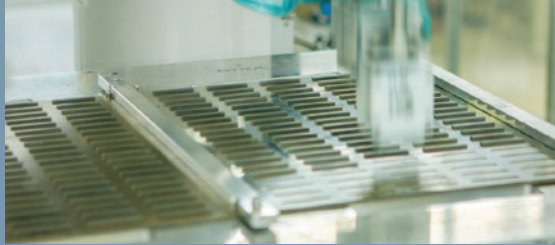
**EEC** ELECTRON  
ENERGY  
CORPORATION

A detailed illustration of a satellite in space. The satellite has a central body with various instruments, including a large circular dish and several antennas. Two large, rectangular solar panel arrays are extended from the sides. The background shows the Earth's horizon with a layer of white clouds, set against the deep blue and black of space filled with stars.

From inertial devices for aircraft to engine components used in NASA spacecraft, EEC provides high-performance magnet solutions to demanding mission-critical industries.

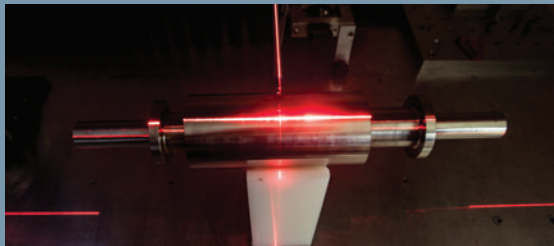
## Quality Service, Premium Materials & Innovative Solutions

Electron Energy Corporation (EEC) is an expert developer and leading producer of permanent magnet products and assemblies for a variety of markets, including aerospace, medical, defense, oil, gas, and power generation. Since 1970, EEC has produced high-strength magnets to provide maximum performance for these industries. Through a variety of services and capabilities, EEC works as an extension of the customer's engineering team to provide first-class magnetic solutions.



### In-House Production & Manufacturing

EEC has a broad range of permanent magnet types, including neodymium iron boron, samarium cobalt, alnico, and ceramic, to fulfill virtually any application requirement. Because EEC produces magnets in-house at our Material Technical Center, customers are provided with a wider selection of products that can be customized quickly and economically.



### Engineering & Assembly Support

As a vertically-integrated rare earth magnet producer, EEC engineers have a deep understanding of the magnets and the assembly processes. This not only helps in developing superior products but also shortens the time-to-market by reducing costly time and errors. EEC provides comprehensive before and after engineering support. Your magnet experts are just a phone call away.

### Research & Development

R&D is a key element in EEC's history of distinction in magnetic solutions for aerospace and defense applications. Our in-house R&D lab, world-class team of scientists and engineers, and university partnerships allow us to provide innovative solutions to serve both government and commercial sectors.



### Prototyping

In an industry where protocols and standards are ever-changing, the timely development of new products is critical. EEC helps customers meet their objectives by providing fast, reliable, and more cost-effective proof-of-concept prototypes and product evaluations in as little as two weeks.

### Design

EEC engineers can assist customers with magnetic circuit design by using finite element analysis (FEA). ANSYS Maxwell® 2D/3D and Cobham Opera® 2D/3D electromagnetic simulation software are currently used at EEC for magnetic design services. We use SolidWorks® for mechanical design and stress analysis. Our engineering experts can provide innovative magnetic design solutions for the most challenging applications to reduce costs and enhance system performance.

#### Engineering Services

- Finite element analysis
- Prototyping
- Testing and validation

#### Application Engineering

- Design expertise
- Material selection
- Assembly development
- Total systems analysis

#### R&D Specialty Materials

- Research grade particles
- Customized compositions
- R&D projects

#### Product Platforms

- Samarium cobalt
- Neodymium-iron-boron
- Alnico
- Ceramic
- Assemblies

**Premium Quality - Product Innovation - Full-Service Provider**





EEC has extensive experience working with aerospace applications. Since becoming AS9100 certified, our knowledgeable engineering team has provided permanent magnet solutions to the world's leading aerospace companies and organizations. Such applications include:

- **Traveling Wave Tubes, Klystrons & Magnetrons**

These products amplify signals at microwave frequencies for high-performing radar, communications, and electronic countermeasure systems.

- **Circulators & Isolators**

These products provide non-reciprocal transmission paths for microwave signals.

- **Accelerometers & Gyroscopes**

These inertial devices are used primarily in aircraft, marine vessels, and spacecraft navigation and control systems.

- **Motors, Generators & Actuators**

The military, commercial aviation, and aerospace applications require magnetic materials that provide greater thermal stability, lower weight, and higher magnetic performance.

- **Reaction & Momentum Wheels**

Our products help power special motors used for spacecraft orientation and energy storage.

- **Ion Propulsion Engines**

High-performance magnets are critical to ion thruster operation, which enables modern spacecraft to travel farther, faster, and more economically.

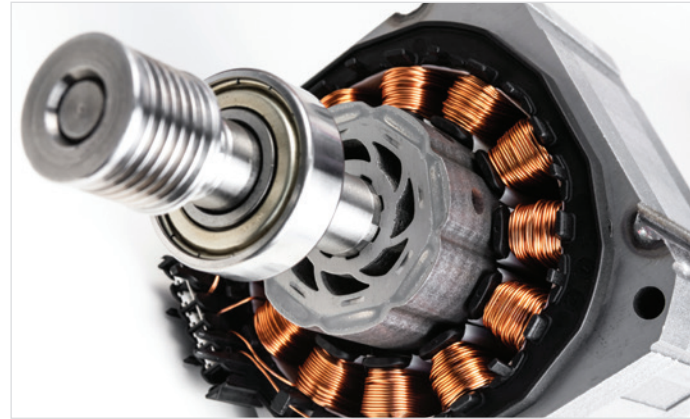
- **Rotating Machinery**

Magnetic bearings reduce friction and vibration while increasing performance and reliability in rotating machinery for aircraft.

- **Accelerators**

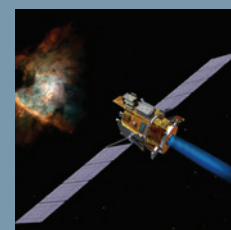
Halbach arrays and Halbach cylinders reduce the size, maintenance, and cost of performance-critical accelerator components.

*Our team of engineers has extensive experience providing magnetic solutions across a broad range of applications. Since 1970, the engineering team at EEC has been partnering with the world's largest aerospace, defense, and government laboratories to develop magnetic solutions and advance industry innovation.*



## Real Aerospace Solutions

EEC developed and manufactured ultra-high-temperature magnets, which have been successfully applied in space travel. NASA's Deep Space 1 mission, the first in a series of deep-space and Earth-orbiting missions conducted under the New Millennium Program, tested 12 advanced, high-risk technologies in space. The test included an ion-propulsion engine manufactured by Hughes Electron Dynamics using EEC's high temperature magnets. In an



extremely successful extended mission, Deep Space 1 encountered Comet Borrelly and returned the best images and scientific data of a comet ever captured.

# EEC: Past and Present



Marlin innovates Temperature Compensated SmCo that has near-zero change in magnetic field over a wide temperature range.



EEC patented Ultra-High Temperature SmCo 2:17 magnets, that operate at temperatures up to 550°C.



EEC's "Milk House" was recognized as an ASM Historical Landmark.



EEC reaches 5-Years Zero Lost Time Accidents milestone.

1970

Mid 1970s

1985

2000

2002

2012

2014

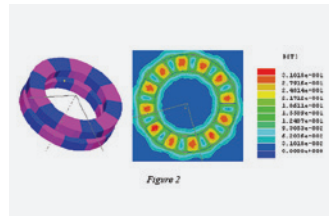
2016



EEC was founded in a milk house with two employees, as Marlin Walmer pioneered the processing and subsequent commercialization of an entirely new class of permanent magnets (SmCo).



40,000 sq. ft. facility was built to support the steady growth of business from 1970 to 1985.



EEC began to offer finite element analysis and magnetic design services.



A new 45,000 sq. ft. facility was added to house the magnet finishing operations.

EEC received 25 SBIRs & STTRs awards since 1996 from NASA, DOE, NSF, EPA, and DOD.