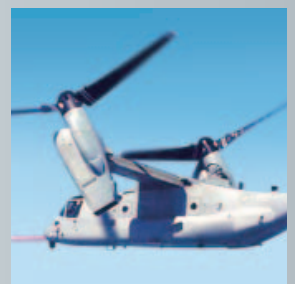
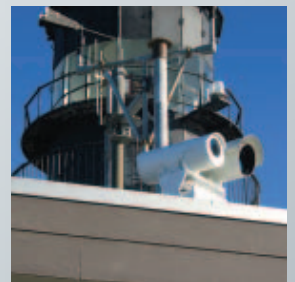
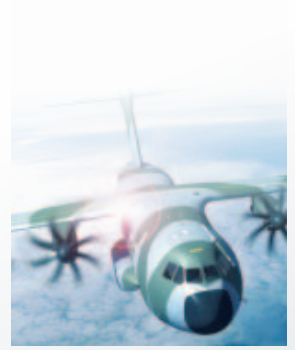


MOOG



MISSION CRITICAL SOLUTIONS FOR DEFENSE



Moog has established a reputation throughout the world as a company whose people and products are at the forefront of the defense industry.



Over the past 50 years, we have become known for our successful solutions to motion control challenges that are viewed by others as impossible.

This directly reflects the creativity, work ethic, and remarkable attention to purpose of our people.



Moog is a leading supplier of integrated control actuation systems. We are continuously investing to extend the depth of our systems capability while simultaneously expanding our core component expertise to take on the challenges and responsibilities of a changing industry. As a result, we are positioned today on virtually every platform in the marketplace, supplying reliable system solutions that are highly supportable and add significant value for our customers.



FROM PRODUCTS TO COMPLETE SYSTEMS

Advanced Technologies

- Integrated Electronics
- Electrohydrostatic Actuation (EHA)
- High Temperature Actuation
- Ballistic Tolerant Design
- Power and Data Management

Integrated Systems Capability

- Modeling and Simulation
- DO-178B Level A Software
- DO-254 Hardware
- HW/SW Integration
- Validation and Verification
- System Qualification

MOOG SYSTEM SOLUTIONS

Integrated Flight Controls
Turret Stabilization and Fire Control
Guidance and Navigation
Vibration Control
Weapon Auto Loading
Payload Positioning

Logistics Support

- Worldwide Aftermarket Support
- Personalized Service
- Integrated Logistics
- Public-Private Partnerships

Manufacturing

- In-House Rapid Prototyping
- Supply Chain Management
- Global Offset Partners

Program Management

- Earned Value Management
- Task Based Management
- Risk Management
- Program Change Management
- Lessons Learned

Proven Building Blocks

- Motion Control Electronics
- High Power Control
- Servoactuators
- Software
- Components



COMPREHENSIVE SYSTEMS CAPABILITY



Requirements Definition

- Joint Concept Definition
- Architectural Trade Studies
- Hazard Assessment
- Redundancy Management
- Requirements Development

System Design

- Requirements Flow Down
- Manage Industry Teams
- Modeling and Simulation
- Software
- Reliability Analysis
- Prototyping

System Integration

- Hardware/Software Integration
- Sub-System Qualification
- Full Scale System Testing
- Verification and Validation

System Qualification

- Safety Analysis
- Environmental Testing
- Platform Integration
- Ground and Flight Testing

Production

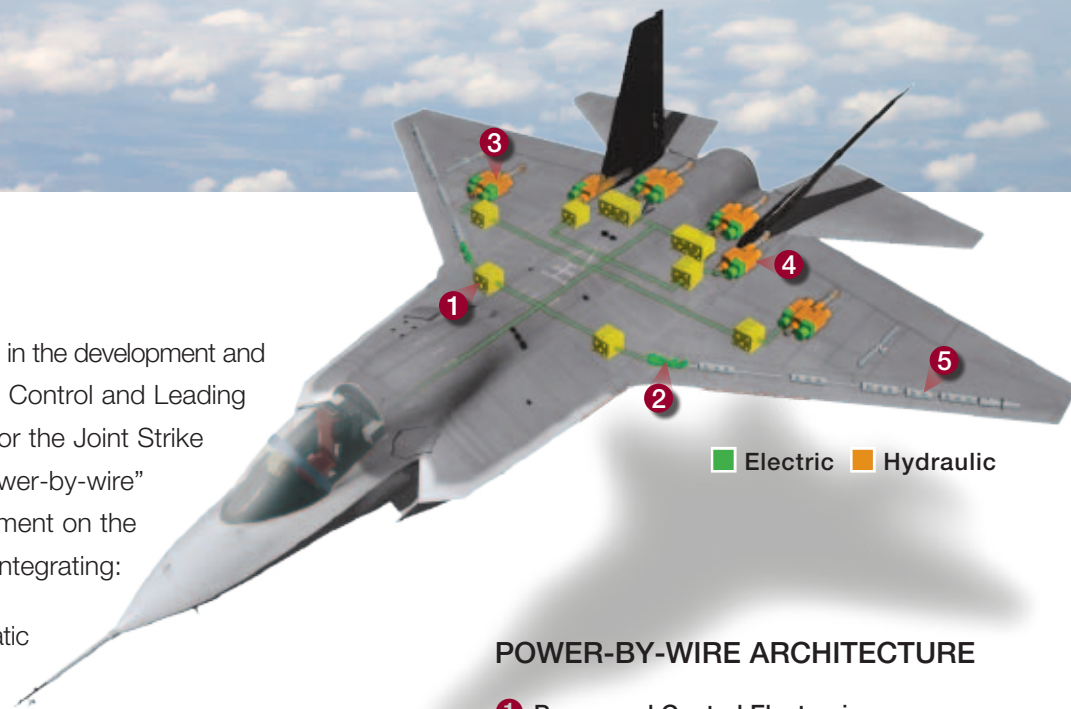
- On-Site Technical Support
- Kanban Inventory Management
- Kitting for Point-of-Use Delivery
- Third Party Supplier Management

Support Solutions

- Modifications and Upgrades
- Training and Documentation
- Integrated Logistic Services
- 24/7 Support
- Field Support

COMPLETE TURNKEY SOLUTIONS

SYSTEM INTEGRATOR FOR THE LOCKHEED MARTIN F-35



Moog is leading an industry team in the development and integration of the Primary Flight Control and Leading Edge Flap Actuation Systems for the Joint Strike Fighter Program. The F-35 “power-by-wire” system represents an advancement on the more electric aircraft topology integrating:

- Self-contained electrohydrostatic (EHA) actuators to position primary flight surfaces
- Electronic Control Units to remotely drive and control the EHAs
- Electrically driven PDUs to position the maneuvering leading edge flaps

As the Prime Contract Holder, Moog’s role includes managing the industry team, integrating the entire actuation system and supplying critical technologies and major sub-systems.

POWER-BY-WIRE ARCHITECTURE

- 1 Power and Control Electronics
- 2 Electric Drive Unit
- 3 Dual Tandem EHA Actuator
- 4 Simplex EHA Actuator
- 5 Flap Actuation System

AIMING AND STABILIZATION SYSTEM FOR CV9035



With heritage on over 30 vehicles, Moog provides innovative motion control solutions for armored vehicles that utilize state-of-the-art electromechanical and rugged hydraulic systems. Moog was selected to supply the Aiming and Stabilization Systems for the 35 mm Gun and Commander’s Sight on the new Dutch CV9035 Combat Vehicle, featuring:

- Digital controller for motor and actuation control
- Elevation and traverse control for hit-on-the-move capability
- Built-in diagnostics for obstacle avoidance

With our low-cost global manufacturing and worldwide aftermarket support infrastructure, Moog has become a trusted partner with the world’s leading armies and weapons platform manufacturers.

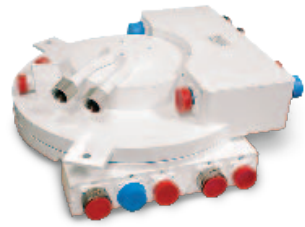
ALL ELECTRIC SYSTEM DESIGN

- 1 Traverse Actuator
- 2 Elevation Actuator
- 3 Observation Actuator
- 4 Observation Controller
- 5 Turret Controller

PROVEN PRODUCTS AND TECHNOLOGIES FOR HIGHER LEVEL SYSTEMS

Products

- Motion Control Electronics
- Power Drive Electronics
- Operator Controls
- Electromechanical (EM) Actuators
- Electrohydrostatic (EHA) Actuators
- Hydraulic Actuators
- Mechanical Actuators
- Electropneumatic Actuation
- Slip Rings
- Navigation Sensors
- Control Manifolds
- Components
- Tuned Mass Dampers



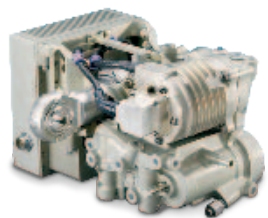
Stryker Turret Slip Ring



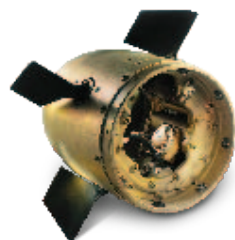
Kill Vehicle Divert Control Valve



Light Armored Vehicle Gun Elevation Actuator



A400M Electrohydraulic Primary Flight Control Actuator



Hellfire Control Actuation System



X-47B Actuation System Controller



M113 Operator Controls



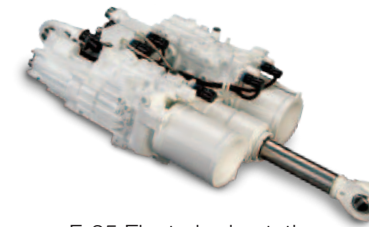
F-35 Wingfold Actuation



Flight Control Computer



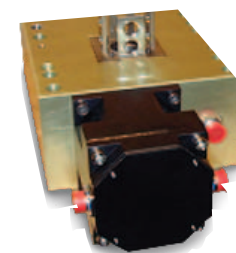
SpaceShipOne Guidance and Navigation



F-35 Electrohydrostatic Flight Control Actuator



Remote Acoustic Hailing Device



Virginia Class Submarine EM Quiet Valve Actuator

Technologies

- High Integrity Electronics and Software
- High Pressure/Temperature Actuation
- Advanced Materials and Processes
- Ballistic Tolerant Designs
- Advanced Motor and Pump Designs
- FPGA Based Controllers
- Advanced Digital Controls
- Radiation Tolerant Electronics
- Sensor Node Integration
- Active Vibration Control
- Quiet Actuation
- Prognostics and Health Management
- Power and Data Management



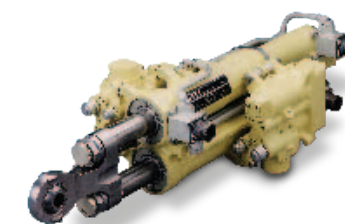
CVN 78 FPGA Controller



High Velocity Servo Motor Controller



V-22 Active Vibration Suppression System



Helicopter Ballistic Tolerant Main Rotor Servoactuator



F-35 EHA Digital Flight Controller

RUGGEDIZED CONTROLS FOR MILITARY GROUND VEHICLES

Whether it is mission critical electromechanical systems, rugged hydraulic systems or advanced electrical systems, Moog has the expertise to design and manufacture solutions our military vehicle customers need. We offer original equipment engineering and upgrade solutions. We provide solutions for platforms such as: Expeditionary Fighting Vehicle (EFV), PzH 2000, High Mobility Artillery Rocket System (HIMARS), and Advanced Mortar System (AMOS).

Missions performed by military and special purpose vehicles demand enhanced visibility in adverse environmental conditions. To support these dangerous missions, Moog supplies pan and tilt mechanisms for the Driver Vision Enhancer system utilized on the MRAP (Mine Resistant Ambush Protected) vehicles. While Moog provides essential security, soldiers can conduct maneuvers and effectively detect targets and ambushes.

Robust Solutions Advanced Technologies

- Turret and Stabilization Systems
- Autoloaders
- Ammunition Handling Systems
- Liquid Cooled Controllers
- High Density, High Power Motors
- Slip Rings and Resolvers
- Digital Controls
- Electromechanical Pan and Tilts

Turret Stabilization Solution for Stryker Mobile Gun System

Moog has played a key role in providing unique solutions for the U.S. Army's Mobile Gun System (MGS). General Dynamics Land Systems, the prime contractor for the Stryker vehicle, approached Moog to help solve a problem they were having on the existing turret drive system. By developing a custom motor design and working within the existing weight and power constraints, Moog was able to provide a custom electromechanical drive solution which solved the problem and allowed the MGS to be fielded in Iraq.



UNMATCHED HERITAGE IN MISSILES AND MUNITIONS

For almost 60 years, Moog has provided innovative fluid and steering controls for missiles and munitions. We are a leader in flight control systems, with years of proven experience and delivery of hundreds of thousands of fin actuation systems. Moog's integrated solutions include cold and warm gas divert and attitude control thrusters, low-cost fin control actuation, fin deployment systems and thrust vector control systems.

We support our unique capabilities through our state-of-the-art test facilities, utilizing highly accelerated life testing and stress screening. Moog's program heritage includes: Joint Air-to-Ground Missile (JAGM), Hellfire, Exoatmospheric Kill Vehicle (EKV), Non-Line of Sight Launch System (NLOS-LS), Maverick, Minuteman III, Trident D5, and Ground-based Midcourse Defense (GMD).

Complete Systems Proven Expertise

- Guidance and Navigation Systems
- Digital Controllers
- Fin Control Actuation Systems
- Wing Deploy Actuation
- Flight Control Computers
- Divert and Attitude Control Systems



MALD™ Wing Deployment and Fin System

Moog has designed, developed and is producing the MALD fin Control Actuation System (CAS), Wing Actuation Unit (WAU) and the associated Electronic Controller for Raytheon Missile Systems. Moog's actuation solution leverages multiple programs with commonality to keep the system affordable. Our COTS based digital controller operates three independent fin actuators and the wing deployment mechanism. Moog's system supports the decoy's aggressive affordability requirements while maintaining the highest standard of reliability and quality.



HIGH PERFORMANCE MOTION CONTROL FOR NAVAL VESSELS

Moog supplies various mission critical hydraulic and electromechanical rotary and linear actuators for naval ships. Our motion control solutions comply with stringent naval qualification requirements such as shock, vibration, low acoustic signature, and corrosion resistance.

We are the sole source supplier of rotary motion control systems for all United States Navy submarines. We are also at the forefront of shipboard security, offering non-lethal devices to deter potential security threats at stand-off distances. Moog's naval heritage includes the Los Angeles Class, Ohio Class, Virginia Class, Barracuda and Seawolf submarines, LPD-17, UUVs, and the CVN-78 Aircraft Carrier.

Affordable Solutions Robust Products

- Electro-Optical Sensors
- Deck Gun Drive Systems
- Non-Lethal Acoustic Devices
- Steering, Diving and Stabilization Controls
- Propulsion and Power Systems Controls
- Utility and Automation Controls
- Signal Processing
- Distributed Intelligence



Precision Actuation for CVN-78 Aircraft Carrier

Moog is at the forefront of the Navy's conversion to electric machine systems, designing and developing extremely high power, high force electromechanical systems for use onboard CVN-78. The ship's power generating steam turbines are throttled by Moog servoactuators. Moog also provides trip throttle control to keep the turbines safe in an emergency.



ADVANCED TECHNOLOGY FOR UNMANNED AIRCRAFT

Moog supplies a broad range of high performance solutions to meet the unique application challenges in the Unmanned Aircraft industry. From triplex redundant flight control systems to high power density electromechanical actuators, Moog offers a variety of options for satisfying vehicle or payload applications.

To deliver product solutions in support of compressed schedules, we are able to draw upon our portfolio of flight qualified assemblies and building blocks. With the broadest range of control and actuation technology available in the market we are able to address the most challenging applications with proven, time tested, products.

With extensive application and product expertise, our systems engineering staff is uniquely qualified to perform system and technology trade studies while supplementing your internal engineering resources.

Tailored Products Complete Systems

- Flight Control
- Weapons Bay Door Drive
- Utility Systems
- Payload Gimbals
- Stabilization Systems
- Sensors
- Data and Power Transmission
- Controllers
- Actuation
- Motors



Systems Integrator for X-47B Primary Flight Control Systems

Moog is the Primary Flight Control Actuation Systems Integrator for Northrop Grumman's X-47B unmanned combat air system. The system includes a fully redundant architecture featuring multifunction system controllers and modular electrohydraulic (EH) actuators. The system controller features a high speed 1394 bus interface, redundancy management, and full digital closed-loop control for all flight surfaces and advanced vehicle functionality. The high dynamic dual tandem EH actuators position the Aileron, Elevator and Spoiler flight control surfaces.



INNOVATIVE SOLUTIONS FOR MILITARY AIRCRAFT AND HELICOPTERS

From flight control computers and software to complete actuation systems, Moog is a technology and market leader in supporting mission critical systems. With the broadest range of actuation and control technology available in the market, Moog is uniquely qualified to approach each application from a technology neutral perspective, offering customers unbiased trade studies from which to design the best overall solution.

Our system solutions provide precision control of flight surfaces on supersonic aircraft supporting the air superiority enjoyed by the U.S. and its allies. Our product based solutions draw upon our extensive actuation and control heritage.

Our attention and adherence to proven processes ensures development projects are predictable, cost effective and produce highly reliable products that simplify overall life cycle support.

Superior Engineering Advanced Technologies

- Fly-by-Wire Control Systems and Software
- Primary and Secondary Flight Control Actuation Systems
- Maneuvering Leading Edge Flap Actuation Systems
- Weapons Bay Door Drive Systems
- Vibration Suppression Systems
- Flight Control Computers
- Wingfold/Bladefold Actuation Systems
- Engine Controls
- Utility Actuation

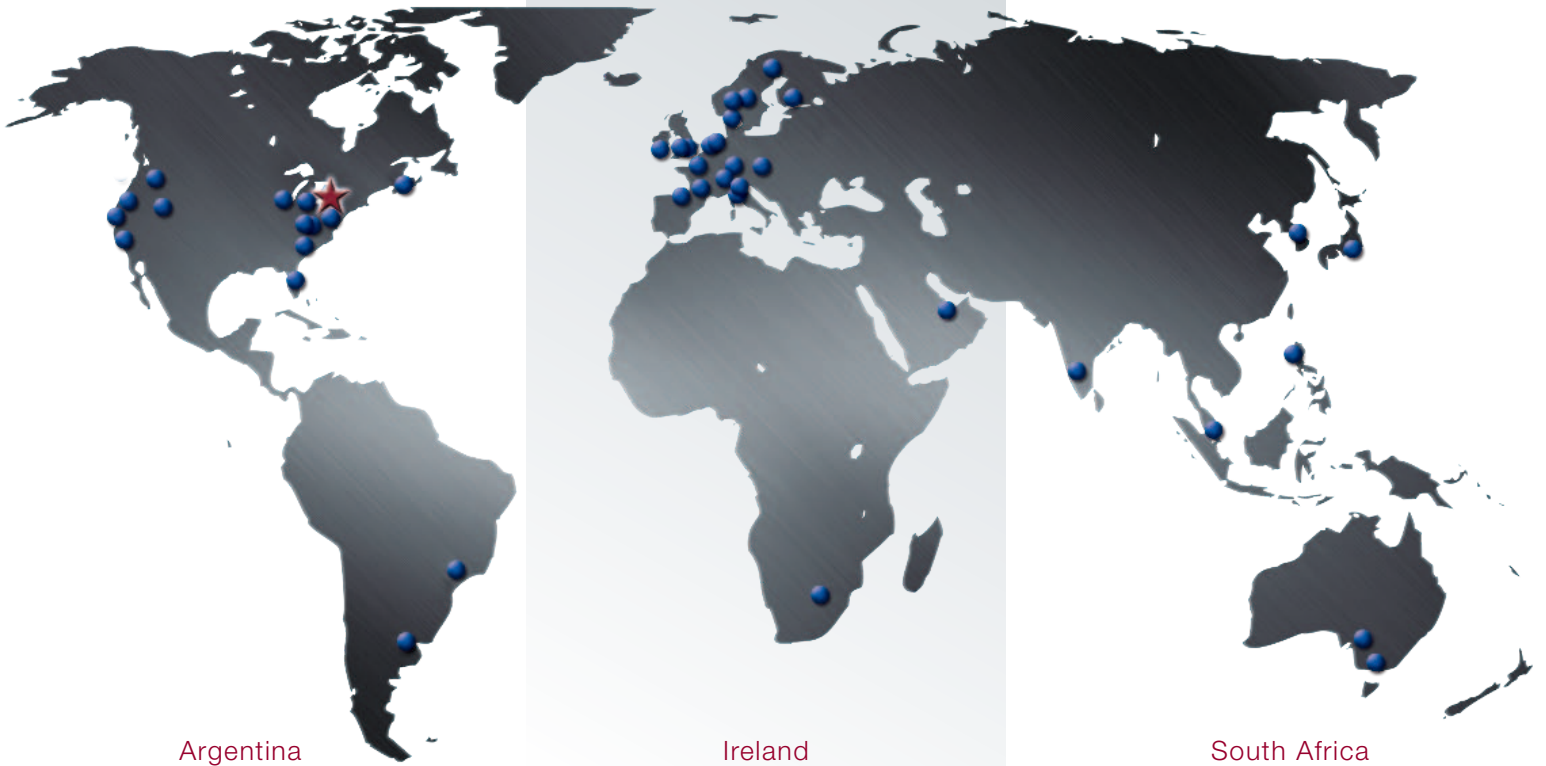


Supplier of A400M Primary Flight Control Actuation

On the **Airbus A400M** Moog is providing the design, manufacture and integration of 8 fly-by-wire servoactuators for the aircraft's primary flight control surfaces. Moog is supplying electrohydraulic (EH) actuators for the Aileron, Elevator and certain Spoiler surfaces and electric backup hydraulic actuators (EBHA) for positioning other Spoiler panels. The EBHA includes a self-contained electrohydrostatic actuator (EHA) with integral pump and electronic controls.



M O O G W O R L D W I D E



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