MISSION CRITICAL
DEFENSE SOLUTIONS
EQUIPPING THOSE WHO DEFEND FREEDOM
MOOG DEFENSE
EQUIPPING THOSE WHO DEFEND FREEDOM AROUND THE WORLD

AIR
LAND
SEA

**ROTOR WING**
- Weapon Stores Management Systems (SMS)
- Flight Control Systems
- Missile Launchers
- Vibration Control
- Slip Rings

**FRELON WING**
- Weapon SMS
- Flight Control Systems
- Stabilized Motion Control for Turrets
- Engine Control Systems
- Media Converters/Ethernet Switches

**UAS**
- Flight Control Systems
- Weapon SMS
- Missile Launchers
- Actuators
- Vehicle Management Systems

**MISSILES & KILL VEHICLES**
- Thrust Vector Control
- Fin Control
- Wing Deploy
- Divert and Attitude Control
- Thrust Vector Control

**Sensors and Surveillance**
- C-UAS Systems
- Integrated Sensor & Tracking Systems
- Weapons Scoring
- Trajectory Analysis
- Pan/Tilt Positioners & Tripods
- EO/IR Systems
- Automatic Runway Fire Detection

**RADAR**
- Radar Deployment Systems
- Cooling Equipment Units
- Slip Rings

**COMBAT & TACTICAL VEHICLES**
- Turret Weapon Systems & Integration
- Stabilized Motion Control
- Driver’s Vision Enhancer
- Fire Control
- Ammunition Handling

**LAUNCHERS**
- EH to EM Conversions & Upgrades
- High Power Elevation & Azimuth Control
- Weapon SMS
- Slip Rings

**SENSORS AND SURVEILLANCE**
- Border/Perimeter Security
- Mobile/Stationary Surveillance
- Critical Infrastructure Protection
- TACAN

**SURFACE VESSELS**
- EM Actuation
- Weapon SMS
- Stabilized Motion Control for Turrets
- Gun Control Units
- Ammunition Handling

**AUV**
- Propulsion Systems
- Steering & Dive Control Systems
- Subsea Utility Motors

**SUBMARINES**
- Valve Actuation
- Hull Mechanical Actuation
- Servocontrols
- Periscope Actuation
- Optronics
- Rotary Joints

**EXPERIENCES**
- North America
- South America
- Europe
- Asia
- Australia
- Africa

**DID YOU KNOW THAT MOOG HAS LOCATIONS ON SIX CONTINENTS?**

**ROTOR WING**
- Black Hawk V-22
- Seahawk S-92 | S-76
- AW109 | AW159
- V-280

**FRELON WING**
- F-35
- AC-130U Ghost Rider
- Caravan Eurofighter
- AT-802L

**MISSILES & KILL VEHICLES**
- X-47B
- Mantis
- Predator
- Gray Eagle

**SENSORS AND SURVEILLANCE**
- Hypersonic Missiles
- Strategic Missiles
- Tactical Missiles

**RADAR**
- G/ATOR
- AN/TPY-2
- Sentinel
- OS3
- MEADS
- Aegis

**COMBAT & TACTICAL VEHICLES**
- LAV-A1/25
- Stryker
- CV90
- PZH-2000
- Bradley
- Abrams
- M113AS4

**LAUNCHERS**
- MML
- HIMARS
- MLRS

**SUBMARINES**
- Virginia-class
- Columbia-class
- Scorpene-class
- Barracuda-class
- Dreadnought-class
- Types 45 | 23 | 122-124

**SURFACE VESSELS**
- Ford-class Aircraft Carrier
- Littoral Combat Ship
- Types 45 | 23 | 122-124

**AUV**
- XLUUV (Orca)
- UUV-FoS (Snakehead)
- Echo Voyager
- RMVY
Today's sophisticated Ballistic Missile Defense (BMD) Systems rely on Divert and Attitude Control Systems (DACS) to steer the Kill Vehicle (KV) through the final intercept trajectory. At the heart of the DACS are Moog thruster valves which precisely meter the flow of propellant to the rocket engines used for KV steering.

**DIVERT AND ATTITUDE CONTROL SYSTEMS (DACS) EXPERIENCE**
- Thruster Valves
- Regulators
- Service Valves
- Tanks

**MAJOR INTERCEPTOR PLATFORMS**
- Thaad
- EKV/RKV
- Patriot
- Aster 15 / 30
- VT-1

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**MISSILE CONTROL EXPERIENCE**
- Fin and Canard Control Actuation Systems (CAS)
- Missile Thrust Vector Control Systems
- Seeker Motors
- Wing Deployment Actuation Systems

**MAJOR MISSILE PLATFORMS**
- HELIFIRE®
- JAGM
- AMRAAM
- TOW
- HAAWC
- SM-6
- Tomahawk
- SGM
- Trident
- MALD

**MISSILE CONTROLS**
From tactical to strategic missiles, from close air support to long range hypersonic, Moog leads the industry in providing precision flight control actuation systems.

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**INTERCEPTOR AND KILL VEHICLE STEERING**

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**AIR**

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**TACTICAL – C-RAM – LONG RANGE CRUISE – SUPERSONIC – HYPERSONIC**
WEAPON STORES MANAGEMENT SYSTEMS (SMS)

The Third Generation Weapon Stores Management System (SMS) is a modular COTS weapons control system that seamlessly integrates with aircraft sensors and mission management systems to provide the crew with a superior fire-control solution.

This proven, lightweight rugged system is an affordable solution to stores management on air, land, and sea platforms. The SMS leverages Moog's extensive experience in systems integration, internal software development, weapons technology, and fire control solutions. The flexible modular design of the SMS enables fast delivery, rapid integration and future upgrades to the sensors, avionics and weapons ensuring the SMS's value for future mission requirements and weapons expansion.

BLACK HAWK PLATFORM SMS INTEGRATION

CARAVAN PLATFORM SMS INTEGRATION

DIGITAL SMS COMPONENTS

STORES CONTROL PANEL (SCP)
ENHANCED STORES MANAGEMENT COMPUTER (E-SMC)
ENHANCED STORES INTERFACE UNIT (E-SIU)
GUN ROCKET UNIT (GRU)

SMS THIRD PARTY INTERFACE WITH L3 FORCEX WIDOW® MISSION MANAGEMENT SYSTEM

DUAL RAIL LAUNCHER WITH HELLFIRE INTERFACE UNIT (DRL)

REMOTE POWER UNIT (RPU-6)
Moog designs, manufactures and integrates weapon systems, sub-systems and products for a variety of global military vehicle platforms. You can gain access to the expertise in fire control, gun control, weapon stabilization, and weapons integration found on over 30 of the world’s leading military vehicle platforms including manned and unmanned turrets and remote weapon stations. Small, medium and large caliber weapons are equally supported by Moog technology.

**RECONFIGURABLE INTEGRATED-WEAPONS PLATFORM**

RIwP is an innovative remote weapons platform offering multiple weapon options to guarantee tailored overmatch in every combat situation. Engineered with many advanced features, RIwP includes high-performance target acquisition technology and unmatched pointing/stabilization accuracy ensuring U.S. and allied forces see first, engage first and achieve mission success. Additionally, the RIwP offers an unprecedented range of platform weapon system interoperability and allows the warfighter both reload under armor and in-field weapon reconfigurability.
LAND (CONTINUED)

FLEXIBLE MISSILE PLATFORM (FMP)
Meeting an increased demand for ground launched anti-tank/anti-air weaponization, Moog has applied key technologies of launch control, aiming and platform stabilization to the mechanical integration required to achieve reliable and consistent launch parameters.

Global militaries already trust and rely on Moog’s expertise in stabilization, fire control, power distribution and management, and weapon stations. The FMP exploits multiple Moog technologies and these are a foundation for anti-tank/anti-air missions required by today’s dynamic military forces. Flexible in both mission and missile, the FMP is an affordable way to weaponize a variety of vehicles.

WEAPON SMS
Moog’s Weapon SMS are customizable for air, land and sea. Successful test fires have been conducted from trailers, and military vehicles. SUVs and Vans can also be weaponized.
(see more on Moog’s Weapon SMS solution on pages 6 and 7)
LAND (CONTINUED)

LAUNCHERS, OEM, AND CONVERSIONS AND UPGRADES

Moog is an OEM for existing and future launcher programs providing elevation and azimuth precision control as well as power and data transmission. Moog also works closely with vehicle manufacturers and the armed forces to upgrade, convert, and reset existing assets. Our modeling, hardware, software, mechanical and production engineering teams are experts in both electromechanical (EM) and electrohydraulic (EH) motion control systems and technologies, providing system upgrades to meet strict space, weight, and power constraints.

We have developed patented high-redundancy, fail-safe, EM actuation systems offering users reassurance in power failure conditions.

EXPEDITIONARY RADAR DEPLOYMENT SYSTEMS

Moog provides motion control products, integrated subsystems, complete single and multi-axis actuation systems for land radar platforms, including:

- Antenna Elevation and Fold Actuation
- Point and Stare Actuation
- Azimuth Drive Motor, Controller, Actuation
- Automatic Leveling Actuation
- Integrated Rotary Joint Assemblies
- Hydraulic to Electric Conversions
- Communication Networking Products

RADAR COOLING EQUIPMENT

Our line of brushless DC fan motors provide extremely reliable cooling for critical defense radar equipment. As a crucial element of U.S. national missile defense, such systems operate in some of the harshest environments on earth, and when called upon absolutely must function as designed every single time. Moog provides greatly enhanced manufacturability, reliability and performance to this mission essential equipment. We also supply associated electronic controls for cooling systems, providing a complete turnkey solution to the customer.
LAND (CONTINUED)

SENSOR AND SURVEILLANCE SYSTEMS
Moog designs, produces, and integrates high-quality, scalable physical security solutions for extreme environments. Our unique offerings enable 24/7/365 asset protection, threat intervention, border protection, and communication around the world. From surveillance accessories to fully integrated customized solutions, Moog provides reliable surveillance products to the defense market.

POSITIONERS, TRIPODS AND CAMERA SYSTEMS
Moog supports RF Satellite communications and surveillance for military applications.
- Pan and tilt positioners designed to handle payloads requiring up to 500 foot pounds of elevation torque with precision and accuracy
- Tripods able to support and position systems with unsurpassed reliability and performance
- Camera Systems available in short, mid, or long range options for 24/7 surveillance in any environment
- Driver’s Vision Enhancer (DVE) for rugged mobile military applications

VIDEO TRACKING AND INTEGRATED SYSTEMS
From stand-alone video tracking cards to fully integrated tracking systems, Moog can meet your mobile, fixed and portable tracking needs with comprehensive, sophisticated solutions.
Solutions:
- Electronic Warfare
- Missile Tracking
- Trajectory Analysis
- Weapon Scoring Systems
- Airborne and Land Based Tracking
- Integrated Work Stations

c-UAS INTEGRATED SOLUTIONS
The pairing of Moog’s specialized video-tracking capabilities with a variety of field-proven sensor technologies to detect, track, identify, and interdict (as jurisdictions permit) potential UAS threats offers our customers a customized c-UAS solution. Sensor technologies include 3D Radars, RF Sensors, Laser Range Finders, and RF/GPS Disruptors.

BORDER/CRITICAL INFRASTRUCTURE SECURITY SOLUTIONS
Moog solutions are engineered to meet the challenges of terrain, climate, and target characteristic/type. A layered surveillance approach yields the highest success rate, combining unattended ground sensors, ground-based radar and remote thermal imaging. To minimize unwanted oversight or detection by threat; rapid, easy deployment is important and reduces the potential of destruction.

1 CAMERAS (LONG RANGE VISIBLE AND THERMAL)
2 POSITIONERS/RUGGED PAN AND TILTS
3 ASSET PROTECTION SURVEILLANCE CAMERAS
4 POWER SUPPLIES
5 WIRELESS CAPABILITIES
6 RADAR
SEA

SURFACE SHIP WEAPONS

Moog is a leading supplier delivering high-precision motion control and electronic solutions to many of the world’s naval forces. Comprehensive systems are engineered to perform reliably in the harshest of marine environments, providing the long-life and dependability our customers require. Extending our customers’ investments even further is the scalability and upgradeability designed into every component and system along with through life support. Many of Moog’s precision technologies are integrated into littoral and blue water ships. On-board these ships, Moog’s premier electromechanical turret drive actuation, stabilization and slip ring technologies are incorporated into various weapon platforms.

Moog also provides tactical air navigation and surveillance systems, as well as components for network communications, and servocontrols that stabilize the entire ship.

MULTI-AXIS AMMUNITION HANDLING

Moog heritage is responsible for the design, manufacture and integration of precision ammunition handling systems for a variety of applications including naval gun ammunition. Our ammunition handling systems involve complex mechanical integration, linear and rotary actuation and sophisticated, ruggedized motor control technologies.

BAE Systems’ Mark 8 Mod 1 Naval gun: Moog provides the high performance motors for aiming stabilization and ammunition loading. The slip ring transfers power and data.

Rheinmetall’s MLG27 naval gun mount: Moog provides the electric gun/turret drives, motion sensors along with the power and stabilization electronics. The slip ring transfers power and data.

See Moog technology in action. Follow the link below to see multi-axis Ammunition Handling Technology used on the Type 23 Frigate by the Royal and Chilean Navies. This ship features the Mk8, Mod 1, 4.5” gun with Moog ammunition handling drives.

www.moog.com/shipweapons
Moog is a major supplier of hydraulic, electromechanical and pneumatic motion control systems for submarines, aircraft carriers, and other naval vessels. The company has designed and manufactured hundreds of critical control systems that operate valves, open and lock hatches and provide propulsion for these platforms.

**SUBMARINE ACTUATION**

Moog's legacy supplying actuation in U.S. Navy submarines extends more than 50 years, from the USS George Washington-class all the way to today's USS Virginia-class and the future Columbia-class.

Moog actuation is also found in mission critical surface ship applications such as the propulsion plants of both USS Nimitz and USS Gerald R Ford-class aircraft carriers.

**MOOG'S CURRENT CONTENT INCLUDES:**

- 47 Different Models
- 132 Units per Ship-set
  - 8 Servoactuators
  - 99 Rotary Rack and Pinion Actuators
  - 25 Linear Actuators

**AUTONOMOUS UNDERSEA VEHICLE PROPULSION AND CONTROLS**

For ROV and AUV platforms Moog provides motors, controllers, actuators, servovalves, and sonar equipment and is making investments in future technologies to support these platforms. Moog has facilities in the United States, Canada, United Kingdom, Germany, and Australia dedicated to the naval and marine industries. If your application is in a challenging environment where performance really matters, Moog has the reliable, low-risk solution to ensure mission success and provide propulsion for these platforms.
Some of the Products and Solutions shown in this brochure may be subject to the export control requirements of the country in which they are manufactured. Contact Moog for additional information.

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