

The Marvin Group
NDIA
Future Force
Capabilities
2022



Evolving Armament
Systems to Support
Multi-Domain Operations
Unconventional Emerging Armaments
20 September 2022

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What are Multi-Domain Operations?

- Following definition is extracted from the U.S. Army's Training and Doctrine Command:

*Multi-Domain Operations (MDO) describes how the U.S. Army, as part of the joint force [Army, Navy, Air Force, Marines, and Space Force] can counter and defeat a near-peer adversary capable of contesting the U.S. in all domains [air, land, maritime, space, and cyberspace] in both competition and armed conflict. The concept describes how U.S. ground forces, as part of the joint and multinational team, **deter adversaries and defeat highly capable near-peer enemies in the 2025-2050 timeframe.***

*MDO provides commanders numerous options for executing simultaneous and sequential operations using surprise and the **rapid and continuous integration of capabilities across all domains** to present multiple dilemmas to an adversary in order to gain physical and psychological advantages and influence and control over the operational environment.*

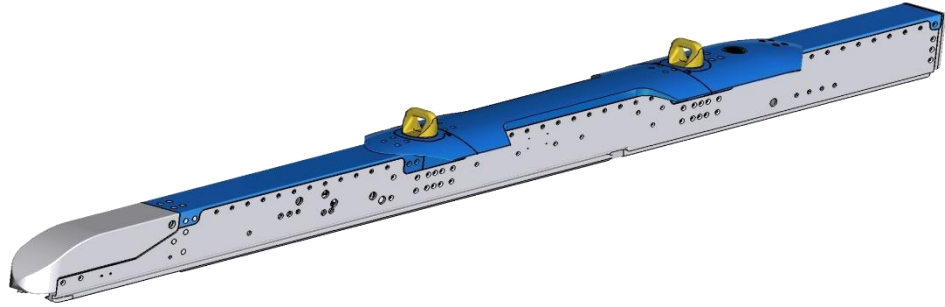
Key Elements of Multi-Domain Operations

- **Penetrate** enemy anti-access and area denial (A2/AD) systems (layered and integrated long-range precision-strike systems, littoral anti-ship capabilities, air defenses, and long-range artillery and rocket systems) to enable strategic and operational maneuver of U.S. forces.
- **Dis-integrate**—disrupt, degrade, or destroy A2/AD systems to enable operational and tactical maneuver of U.S. forces.
- **Exploit** the resulting freedom of maneuver to achieve operational and strategic objectives by defeating enemy forces in all domains.
- **Re-compete**—consolidate gains across domains and force a return to competition on favorable terms to the United States and allies.

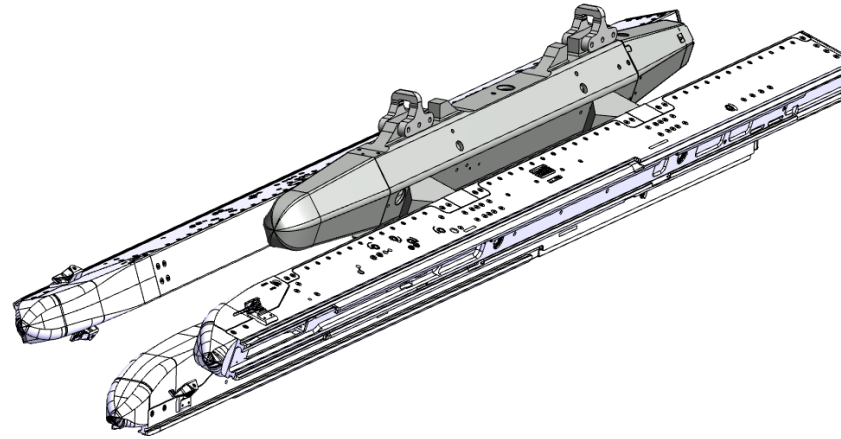
Industry's Role = Facilitate these Objectives!

What Armament Solutions are Needed?

- The **speed of warfare and velocity of decision-making** arguably have never been faster than what exists today, and what is likely to exist tomorrow
- The close coordination of assets operating on Land, Sea, Air, Space, and even Cyber domains to facilitate ISR activities and a kill chain for hostile targets requires precision, as well as a **capacity for “stowed kills” on various platforms**
- **Commonality in systems can reduce burdens in logistics, simplify training and maintenance, and help to ensure consistent, reliable performance across platforms**
- The **ability to rapidly field solutions based on proven technologies**, and to add additional flexibility and options for warfighters, is a **force multiplier**



**LAU-128SE | Universal Missile Launcher
(UML)**



**Multiple Munitions Launcher
(MML)**



Modified LAU-7



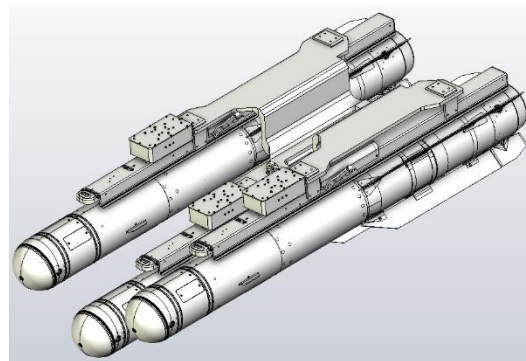
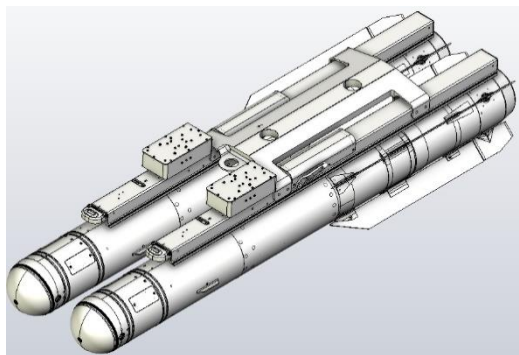
HSRL

Rail Launcher Solutions

Lighter Weight Hellfire Class Launchers

■ Hellfire Scalable Rail Launcher (HSRL)

Adaptation of current M299/M310 (quad/dual rail) Hellfire missile launchers



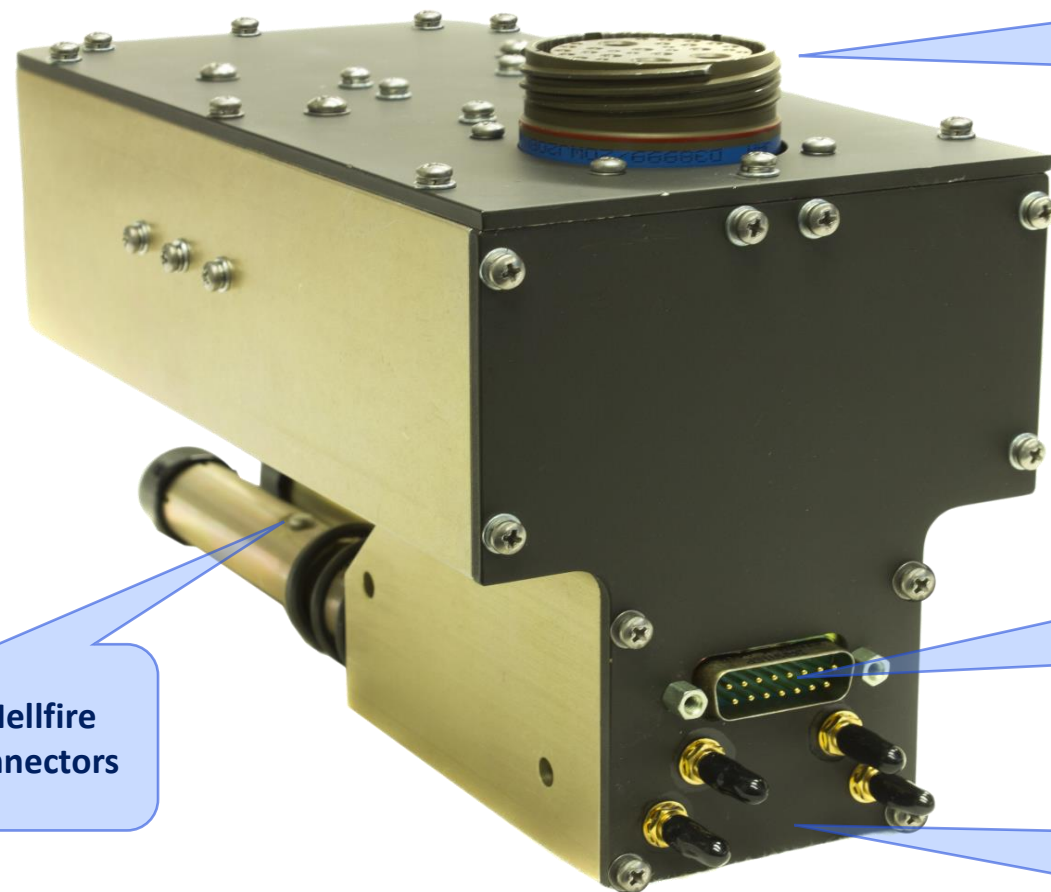
- Offers flexibility for single, tandem, triple, and quad clusters of rails for 100 lb. class (and less) air-to-ground munitions
- Miniaturized electronics significantly reduce weight from the M299/M310 series
- Proven Hellfire (qualified) rail design from the OEM manufacturer
- Ideal for UAV, UGV, Light Attack, Rotary/Tilt Wing, and other weight-sensitive applications
- HSRL is compatible with all Hellfire II, Romeo, Longbow, and JAGM missiles

Hellfire Class Scalable Rail Launcher (HSRL)

- Lightweight scalable Hellfire class launcher that enables integration of Hellfire and similar 100 lb.. or smaller munitions with many platforms including MML and small UAV
- Provides single- and multi-rail launch capability for AGM-114 missiles without the need for external electronics or AC power
- Launcher electronics is a small, self-contained electronics assembly called the **Rail Electronics Unit (REU)**



Rail Electronics Unit (REU) Overview



Standard 1760 connector

Standard Hellfire Shotgun connectors

Test connector (optional)

Rail connections (De-Ice & Holdback)

HSRL features/capabilities:

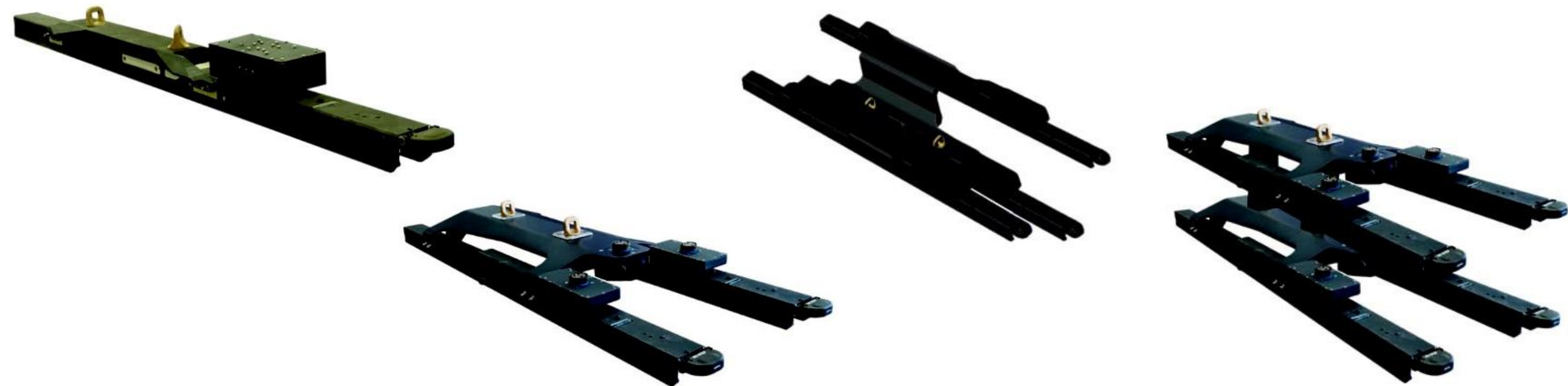
- MIL-STD-1760 interface (same API as M299 launcher)
- Operate from 28VDC sources only (DC1/DC2)
- Multiple adapters available to create single and multi-rail configuration that attach to standard carriage equipment

HSRL/REU Capabilities & Characteristics

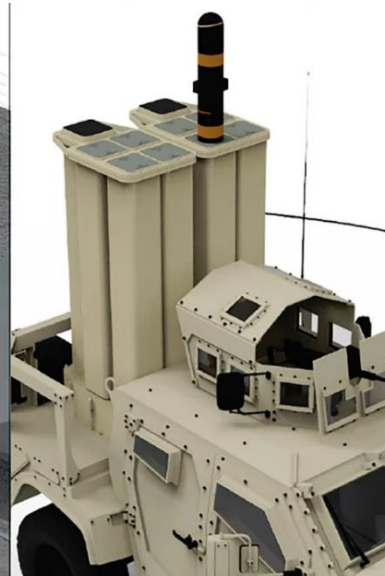
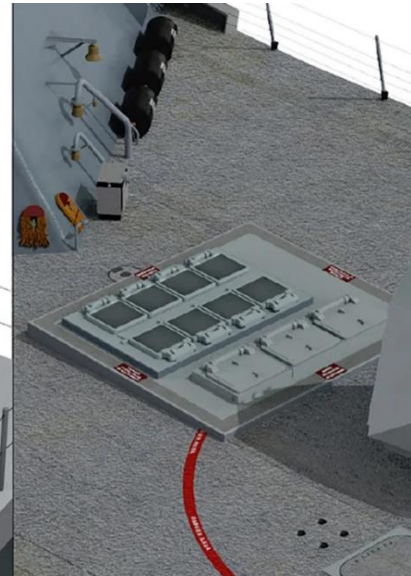
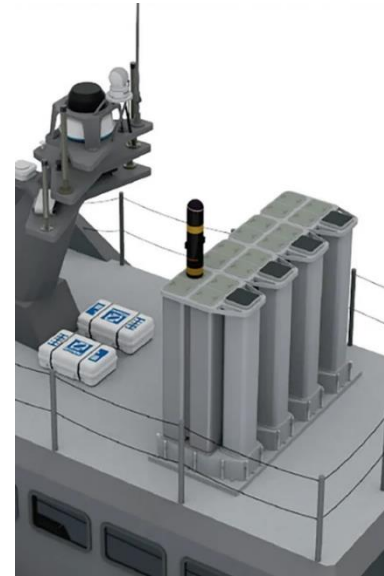
- Platform Interface: MIL-STD-1760
 - Fully compliant with MIL-STD-1760 for Mission Stores (same as M299 launcher – simplifies integration)
 - Uses only 28V DC #1 and 28V DC #2 (115VAC and 270VDC are *not* used)
- Missile Interface and Support:
 - Works with existing M299 Rails
 - All Hellfire II (including Romeo) and Longbow Hellfire variants
 - Brimstone and AGM-179 JAGM possible
 - Does *not* support Hellfire I (AGM-114A/B/C)
- Significant weight reduction compared with any other solution:
 - ~16.8lb per HSRL
 - In tandem and quad configurations, approx. 50% weight reduction over M310 | M299

Scalable Launcher Configurations

- Individual HSRL may be combined to create adaptable configurations based on the platform's requirements: Single-rail, Tandem-rail, Triple-rail, or Quad-rail (with adapters and hardbacks)
- Multiple-rail configurations include a Multiple-Rail Terminal Unit (MRTU):
 - Fully compatible with the M299
 - Handles all the power, discrettes, and communications between the platform and the REUs
 - Electronics based on prior technology used for the Armed Blackhawk program from The Marvin Group



Surface Launch Hellfire | Brimstone



Air Launched Effects (ALE) and APKWS Integration

- HSRL can be integrated with proven 2.75” rocket pod technology to support APKWS or other precision guidance packages in a single or tandem rail configuration
- Various ALE can potentially be compatible with the Hellfire rail for aircraft deployment or an integrated solution with the Common Launch Tube (CLT) is also deemed feasible



HSRL Development Status

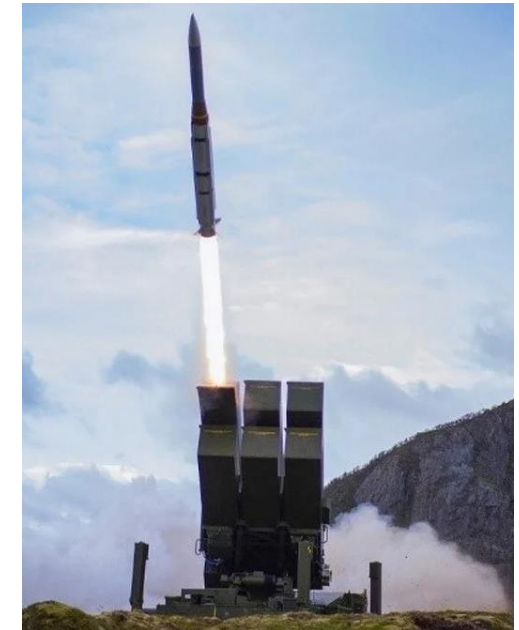
- Three rounds of Weapons Integrations completed at RTC
- **Qualification scheduled for completion during 2023; first customer committed (tandem rail rotary wing platform for international platform) for operational use**
- Currently defining scope for Environmental and Platform qualification testing
- Integration units available for developmental programs
- All tools required for the successful integration of the Hellfire Modular Missile System are also available via the Marvin Group:

- **Hellfire Missile Simulators**
- **Laser Source Simulators**
- **Platform Emulators**



Common Ground Rail (CGR) Launcher

- Adaptation of the proven MRL air-to-air launcher for SRAAM/BVRAAM missiles to accommodate heavier weight missiles for Surface-to-Surface or Surface-to-Air applications
- Can be integrated into canisters to protect the munition during transit and from environmental factors, or as an exposed launcher for “high mobility” applications, such as NASAMS configurations
- CGR can also be integrated with RWS technology for containerized solutions such as expeditionary warfare, border security, etc.
- **Ability to safely carry and launch AMRAAM-ER, which weighs approximately 615 lbs. (279 kg)**



Approach to Aircraft Universal Rail Launcher Design

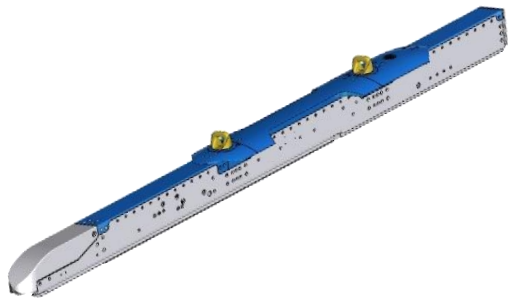
- Leverage over 30 years of consistent and high-volume production experience with air-to-air and air-to-ground launcher systems
- Knowledgeable in multiple weapon systems in fielded environment
- Passionate about delivering high quality, on time, at lowest cost
 - Capabilities for Design, Development, Qualification, and transitioning to Full-Scale Production
 - Robust team of long-tenure subject matter experts
 - Our customer's goals become our own, resulting in long term successful relationships
- Complete solution set including airborne electronics development/production, as well as test equipment for qualification, production, and sustainment.

Active production on all legacy MRL variants as well as newly designed launchers.

Multi-Mission Universal Launchers | In Development

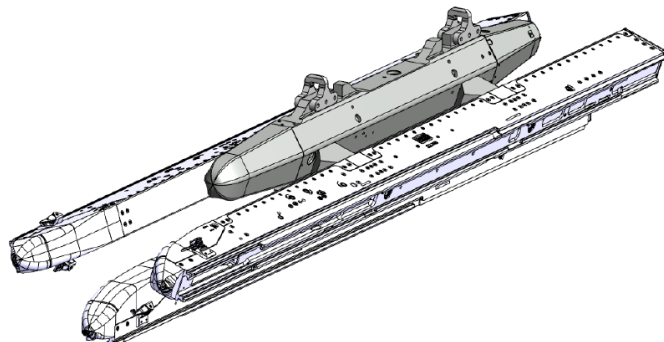
■ Universal Missile Launcher (UML)

Adaptation of MRL (LAU-127/LAU-128/LAU-129) series of rail missile launchers for carriage/release **of multiple missile types**



■ Multiple Munitions Launcher (MML)

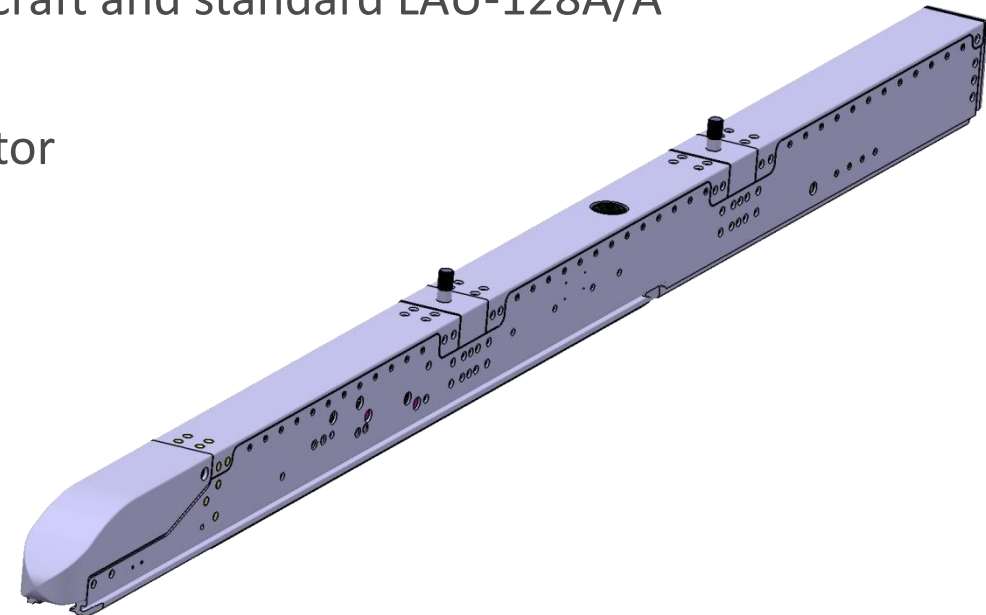
Adaptation of the TER-9/A and MRL series of rail missile launcher for **multiple missile carriage at a single station**



- **Combat capability multiplier with minimal reconfigurations cost**
- **Minimal logistics footprint to support FOB/ACE operations**
- **Suitable for installation on numerous platforms (Fixed Wing/Rotary/UAV) subject to weight limitations**
- **Increased load-out of air-to-air missiles on aircraft with 30" ejector racks**
- **Multi-Service common missile launcher capability**
- **Missile stations capable of domestic and international missile carriage (AIM-9, AIM-120, IRIS-T, Python, Derby, ASRAAM, and Meteor)**

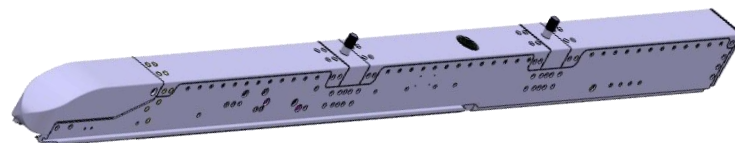
LAU-128SE Universal Missile Launcher Overview

- Based on LAU-128A/A designed proven for carriage of AIM-9 / AIM-120
 - Rail: Uses same geometry as proven MRL family operational on F-15, F-16, and F/A-18
- Supported Missiles: AMRAAM, Sidewinder, ASRAAM, IRIS-T, Python, Derby, A-Darter and Meteor
- Incorporated Modifications
 - Electronics: Power Switching Unit (PSU) to accommodate aircraft and standard LAU-128A/A architecture discrepancies
 - Harness: Modified to accommodate PSU and aircraft connector
 - Mounting: Standard 30” NATO Lugs
- Integration on 30” suspension bomb rack

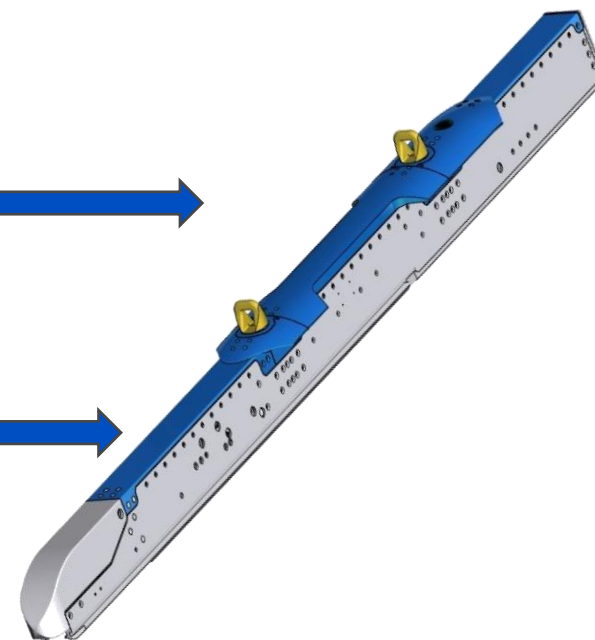


Design Approach

- MEC provides an **affordable low-risk design solution**
 - Our design combines proven concepts and design features to adapt the LAU-128 to 30" lug carriage on 30" Ejector Release Unit
 - Provision MIL-STD-8591H compliant 30" lugs and sway bracing features
 - MEC approach adapts LAU-117, 30" sway bracing concept



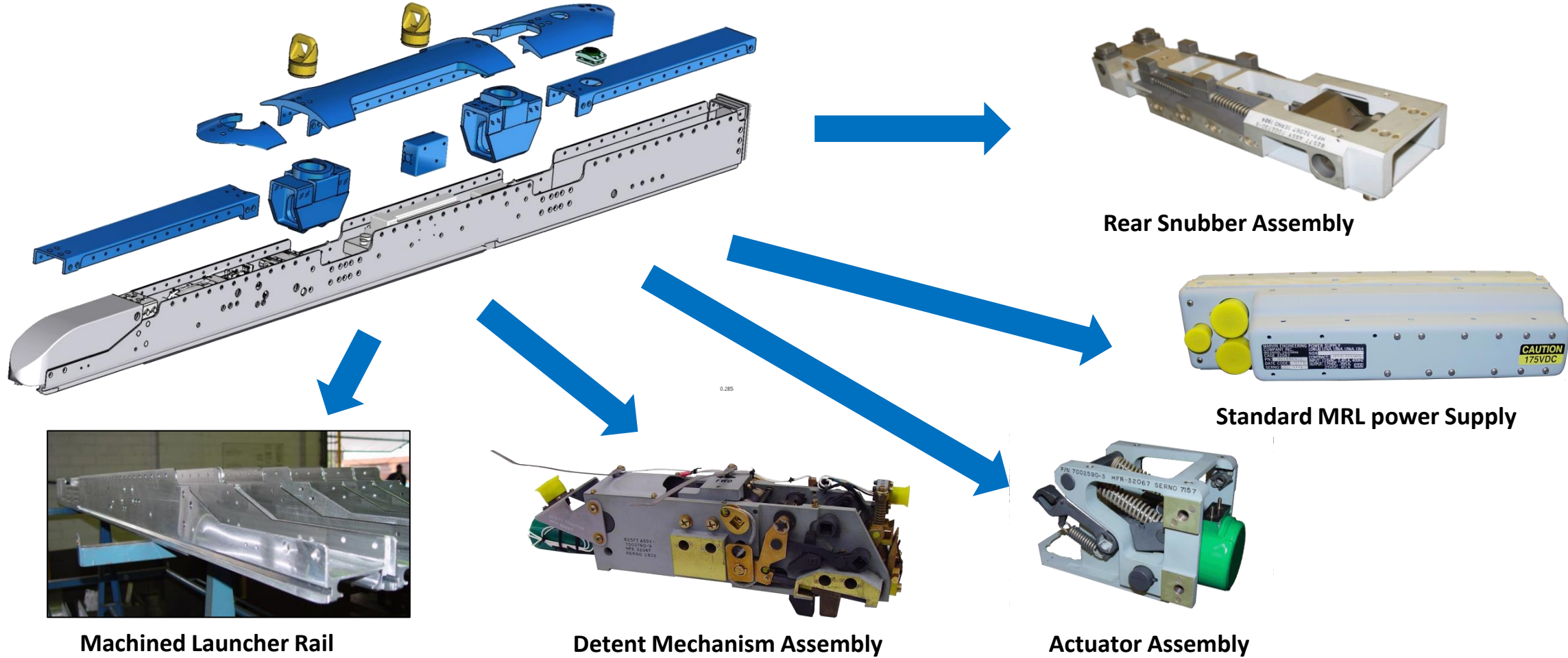
- LAU-127/128/129/139 family (bolt-on to structure)



- LAU-117 Maverick missile launcher (14/30" lug carriage)

- Design solution based on decades of experience in producing a wide range of missile launchers

Design Approach (Cont'd)



Approximately 90% of commonality to LAU-128

Modifications to LAU-128 Baseline Configuration

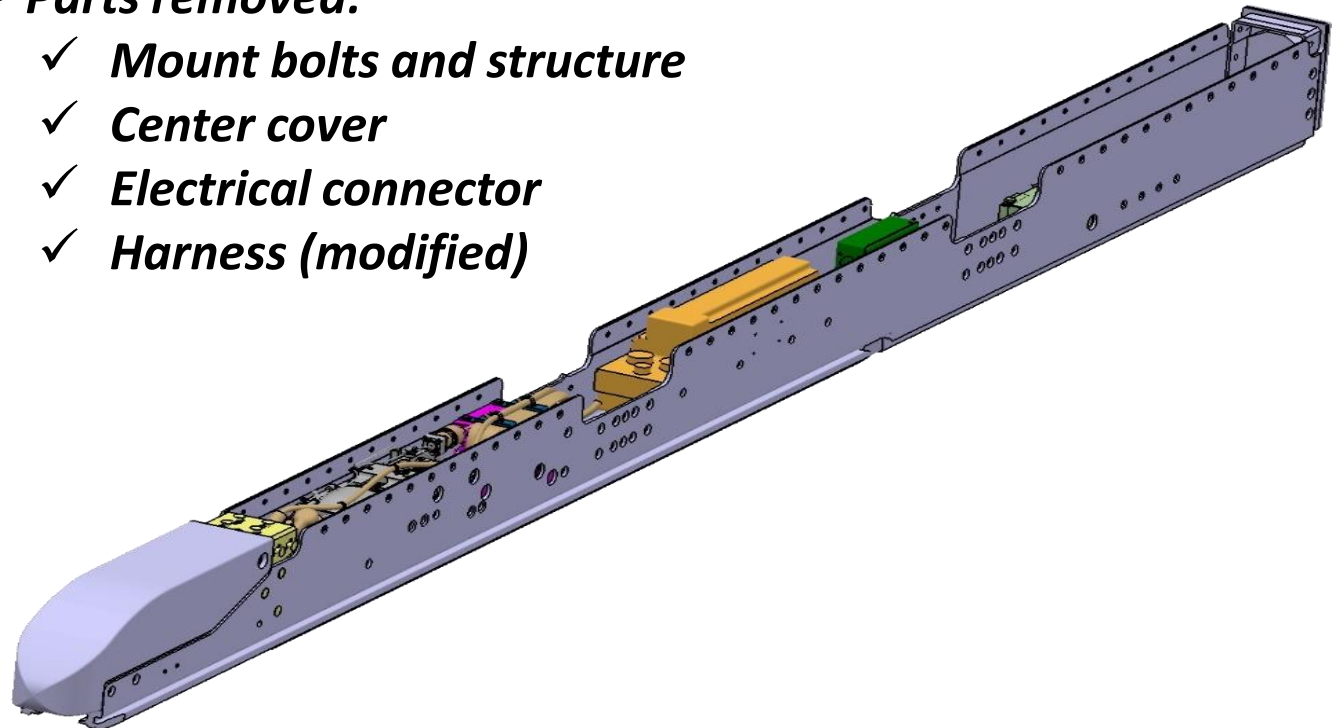
MEC modifications to baseline LAU-128 enable 30" lug carriage

- **Parts retained:**

- ✓ **Rail extrusion/machining**
- ✓ **AIM-9 Umbilical retainer assy**
- ✓ **Fwd/aft fairings**
- ✓ **J9/umbilical retract**
- ✓ **Power supply**
- ✓ **Detent**
- ✓ **Damper**
- ✓ **BIT module**
- ✓ **Fin retainers**

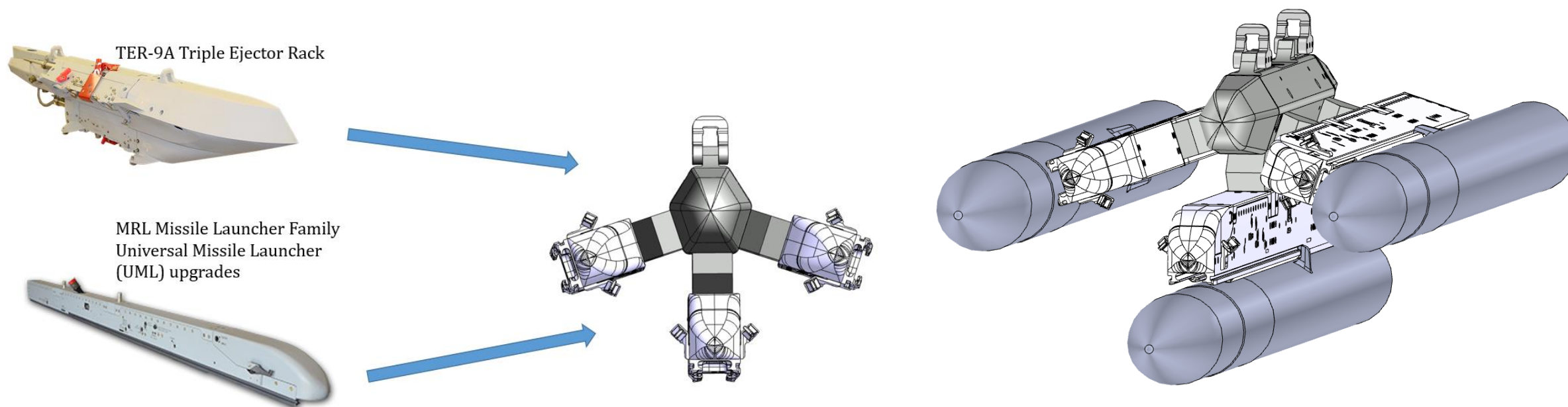
- **Parts removed:**

- ✓ **Mount bolts and structure**
- ✓ **Center cover**
- ✓ **Electrical connector**
- ✓ **Harness (modified)**



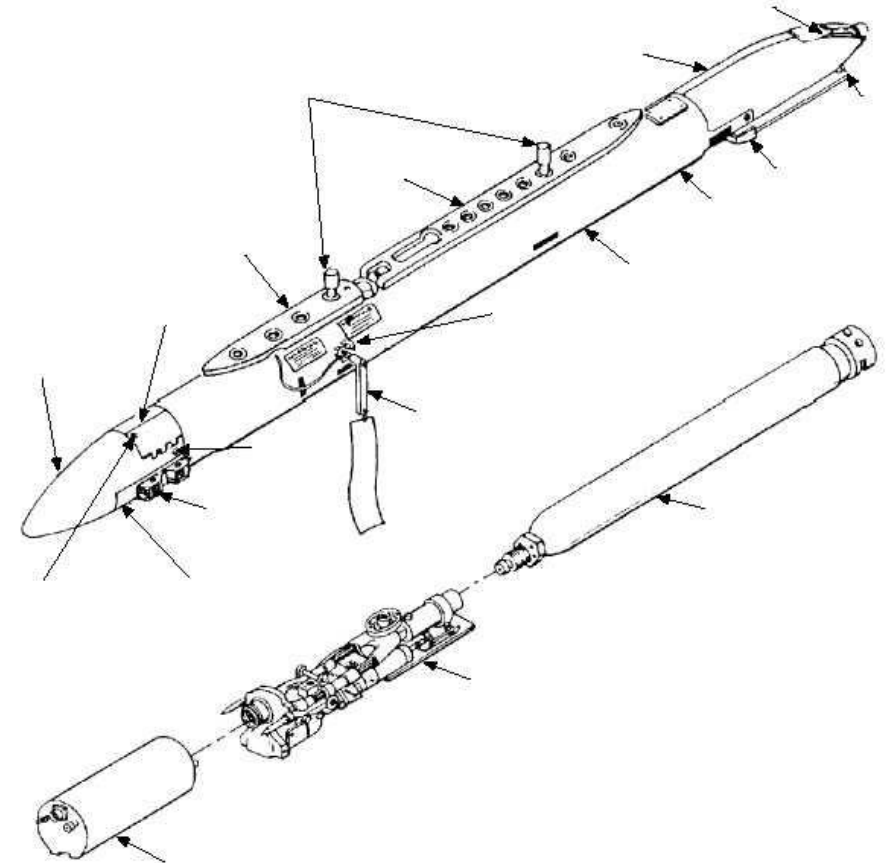
Multiple Munitions Launcher (MML)

- Concept Development for fixed wing aircraft
- Carries 3 UML's at primary and shoulder stations in one configuration
 - **AMRAAM, Sidewinder, IRIS-T, Python, Derby, A-Darter and Meteor**
- Option for Station 1 bomb rack to carry 500 lbs. class store
- Mounting: Standard 30" NATO Lugs



LAU-7 Modifications

- Working with international end user and international missile manufacturer to adapt the lightweight and proven LAU-7 SRAAM launcher for new applications:
 - ✓ Carriage of IR guided SRAAM missiles other than AIM-9
 - ✓ Jettison capability
 - ✓ Integration of sensors to launcher body
 - ✓ Integration of launcher on an Indo-Pacific partner's Russia-designed fighter aircraft (State Dept. Approved)
 - ✓ Note LAU-7 also found on rotary wing platforms such as AH-1W/Z



Lightweight Remote Weapons Stations (RWS)

- In partnership with an innovative Israeli company, we are developing a lightweight, 5.56mm/7.62mm/12.7mm/40mm RWS for airborne application, that leverages superior AI capabilities for ***earlier target detection, identification, tracking, and first-round-on-target performance***
- Based on the technology used to develop currently operational RWS for ground and maritime applications



An Overview Of Our Company (2022)

World Leading
High Tech
Solutions,
Products and
Services for
The Global
Aerospace &
Defense Market

Our Values:

Integrity

Partnership

Can-Do Attitude

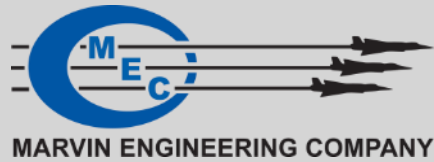
Innovation

- Currently 1,000 + employees across 3 business units, active via FMS/FMF/DCS channels in 40+ nations worldwide
- Total Square footage: Over 500K square feet in Inglewood and Irvine, California
- Classified as “Small Business” in U.S., but over \$350MM annual revenues
- MEC was **Recipient of FY2019 Nunn-Perry Award for Excellence in DoD’s OSBP Mentor-Protégé Program** along with our partner, Lockheed Martin Aeronautics
- Vertically integrated business units covering Air | Land | Maritime Domains



**Relevant NAICS Codes:
336413, 334515, 336992, 336999**

The Marvin Group's Companies



Armament Equipment Air-to-Air, Air-to-Ground, Surface Launch

- Bomb & Ejector Racks
- Missile Rail Launchers
- Multiple Stores Carriage Systems
- Pylons
- MRO/Sustainment
- User/Maintainer Training
- Technology Development



Multi-Level Test Systems, Electronic Components | Assemblies

- Armament Test Sets
- SMS Test Sets
- Flightline Testers
- O-/I-/Depot-Level Maintenance Testers
- Airborne electronics
- User/Maintainer Training
- Engineering services



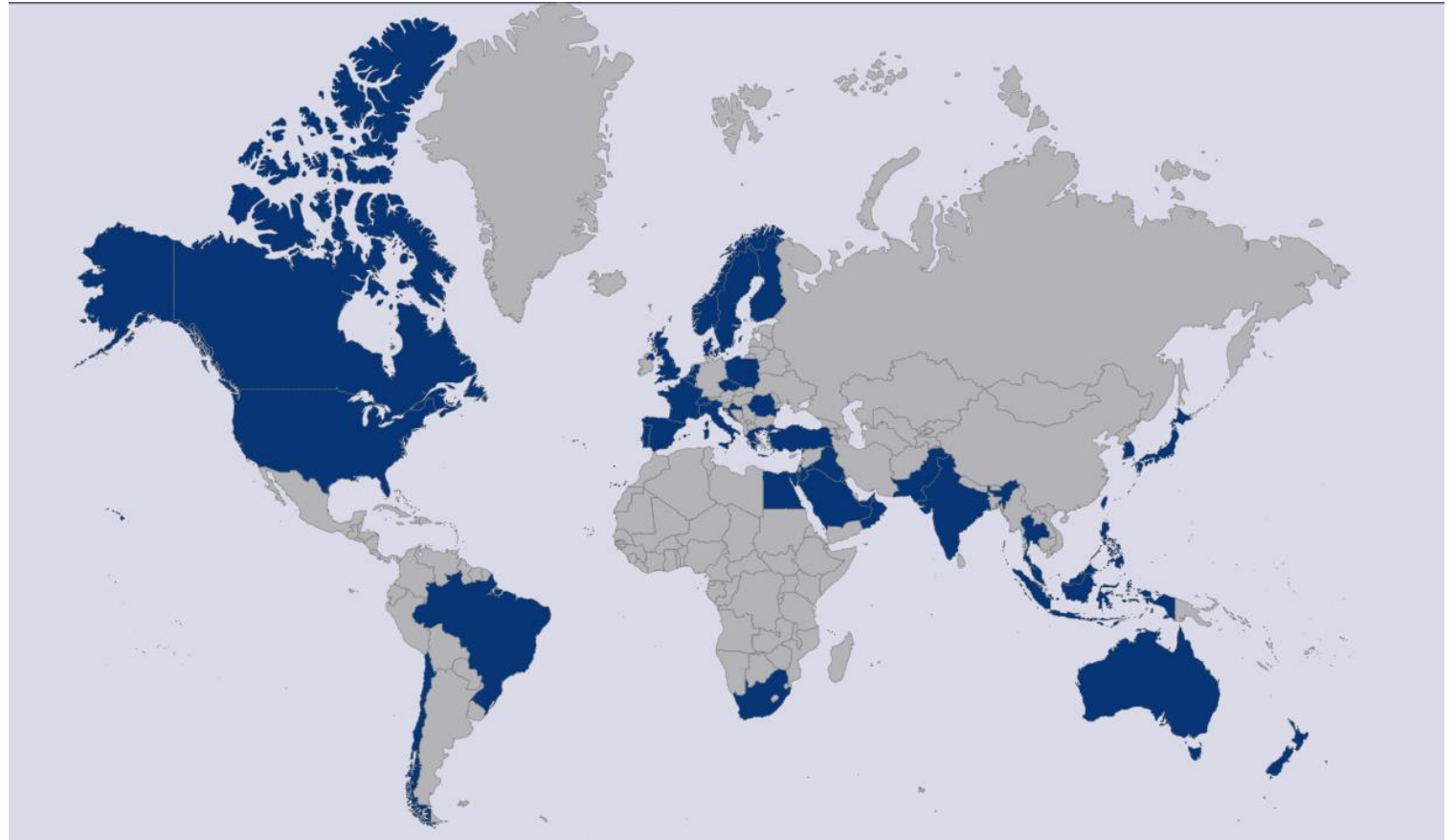
Ground & Maritime Primary | Secondary Support Systems

- Rigid Wall Equipment Shelters
- Environmental Control Units design and production
- Auxiliary Power Units design and production
- Remote Weapons Stations
- Electronics Chillers

The Marvin Group Around the Globe

Australia
Belgium
Brazil
Canada
Chile
Croatia
Czech Republic
Denmark
Egypt
Finland
France
Greece
India
Indonesia
Iraq
Israel
Italy
Japan
Jordan
Korea
Kuwait
Malaysia

Netherlands
New Zealand
Norway
Oman
Pakistan
Philippines
Poland
Portugal
Romania
Saudi Arabia
Singapore
South Africa
Spain
Sweden
Switzerland
Taiwan
Thailand
Turkey
UAE
UK
USA



Currently supporting customers and end users in 40 plus countries via
FMS, FMF, and DCS

5 Global Regions: The Americas | Western Europe & Scandinavia | Central, Eastern and
Southeastern Europe | Africa, Middle East & Central Asia | Indo-Pacific

Select Customers Around the Globe



한국항공우주산업주식회사
KOREA AEROSPACE INDUSTRIES, LTD.



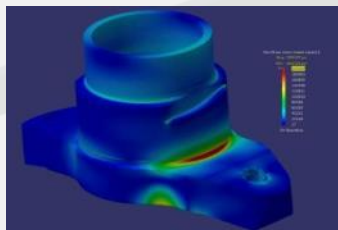
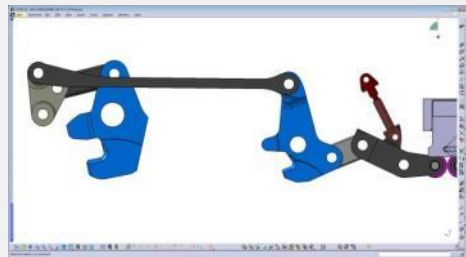
Defense Acquisition
Program Administration



The Total Solution

DESIGN AND QUALIFICATION

- Specification Creation
- Performance Engineering
- Producibility Analysis
- Design-to-Cost
- Qualification Testing



MANUFACTURING AND TEST

- Acceptance Test Equipment
- Design Improvement
- Configuration Management
- Continuous Improvement



MAINTENANCE AND SUSTAINMENT

- Special Test Equipment
- Spares/LRU Supply Chain
- O-/I-/Depot-Level Test Sets
- Technical Documentation
- Comprehensive Training





QUESTIONS?
THANK YOU FOR YOUR TIME!

Marvin Engineering Co.
261 West Beach Avenue
Inglewood, California 90302
USA
310.674.5030
Fax: 310.673.9472
sales@marvineng.com

Marvin Test Solutions
1770 Kettering
Irvine, California 92614
USA
949.263.2222
Fax: 949.263.1203
sales@marvintest.com

Marvin Land Systems
261 West Beach Avenue
Inglewood, California 90302
USA
310.674.5030
Fax: 310.673.9472
sales@marvinland.com