The Marvin Group

The Marvin Group
NDIA
Future Force Capabilities
2021

MARVIN ENGINEERING COMPANY

MARVIN TEST SOLUTIONS

MARVIN LAND SYSTEMS

Armament Sustainment and Lethality Multipliers in Expeditionary Settings

20 October 2021

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INTEGRITY - PARTNERSHIP - CAN-DO ATTITUDE - INNOVATION

What is an Expeditionary Setting?

- Marine Corps Doctrinal Publication 3 (MCDP 3*), "Expeditionary Operations,"* establishes doctrine for the conduct of military operations by the US Marine Corps.

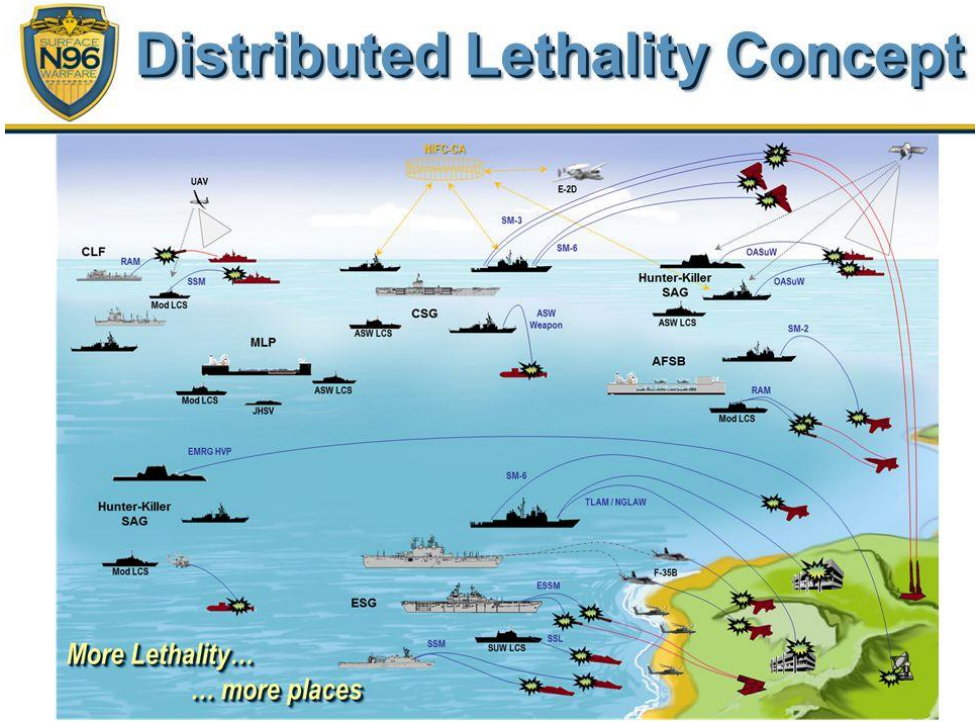
- USMC is ***"…An expeditionary force-in-readiness that is manned, trained, and equipped specifically to respond quickly to a broad variety of crises and conflicts across the full range of military operations anywhere in the world."***

- ***"This naval expeditionary character provides capabilities both to forward-deploy forces near the scene of potential crises as well as to deploy sustainable, combined arms teams rapidly by sea and air."***

What is an Expeditionary Setting (Cont'd)?

- For Naval Forces, Expeditionary Advanced Base Operations (EABO) and Distributed Maritime Operations (DMO) are currently professed doctrine and synergistic

- At their core, it's about being nimble, adaptable, and lethal, units "punching above their weight"



"DMO is a combination of distributed forces, integration of effects, and maneuver. DMO will enhance battle space awareness and influence; it will generate opportunities for naval forces to achieve surprise, to neutralize threats and to overwhelm the adversary; and it will impose operational dilemmas on the adversary."

- Vice Adm. Phil Sawyer, USN, 2 Feb 2021

And More…

- Army and Air Force are capable of expeditionary deployments with certain units and in specific contexts

- Moving heavy armor and large formations is not truly expeditionary, but the more nimble responses of Special Operations and Quick Reaction Forces such as Airborne units better fits this model

- The Army's *"Win in a Complex World"* concept defines expeditionary as the ***"ability to deploy task-organized forces on short notice to austere locations"*** and being ***"capable of conducting operations immediately upon arrival."***

Air Force Not to be Left Behind…

- Agile Combat Employment (ACE) definition: ***"ACE combines adaptive basing, the operational maneuver of air forces, assured command and control, mission-type orders, and other elements to ensure [the force] can generate and sustain combat sorties."*** *(Mark Gunzinger, Director of Future Aerospace Concepts And Capabilities Assessments, AFA's Mitchell Institute for Aerospace Studies)*

- Training multi-capable Airmen to deploy quickly and minimize the logistics footprint and enable agility

- De-centralization and dispersion of squadrons to operate in smaller ship formations from austere locations

What Expeditionary is Not

Inherent Challenges

- We as industry do not set the doctrine, nor the operating requirements, ***but we need to be responsive and be able to demonstrate the "art of the possible" where appropriate***

- ***We cannot "referee" doctrinal conflicts or lack of clarity between and among the armed services,*** but we can present capabilities that address their stated desires to serve our warfighters and our partners and allies

- Despite different concepts of "expeditionary," ultimately, it comes down to available manpower, maintaining a small footprint, and not relying on equipment that realistically will not be available in austere, forward-deployed locations

What can we bring to "The Tactical Edge?"

The Tactical Edge

- **Operating at the "Tactical Edge"**
  - Warfighters at Risk
  - Risk of Disruption / Adversarial Realities
  - Distributed Lethality | Decentralized Forces
  - Infiltration/Exfiltration
  - Anti-Access/Area Denial – "Flipping the Script on Adversaries"

Help Warfighters "Punch above their Weight"

- Keep Battalions/Companies/Platoons/Squads/Fire Teams in the field
- Provide logistical support to 2-Ship / 4-Ship / 6-ship Aircraft Formations
- Reduce over-reliance on extended resupply chains
- Create more organic capabilities at a lower echelon level

Get warfighters what they need, when they need it, with minimal baggage and set-up

Solutions – Containerized and Partially Containerized Kits

- Logistical considerations for Air/Land/Sea transport
- 40-foot ISO Containers are ***too large and unwieldy*** for true expeditionary deployment
- 20-foot ISO Containers, where necessary for the additional protection they offer, are a reasonable compromise
- Combined with soft shelters, these can be moved more readily without specialized equipment, quickly set up, and provide some environmental protection

Experimentation with Mobile Sustainment Concepts

- **CARD as a proof-of-concept / lessons learned**
  - Marvin Engineering Co. IRAD Program
  - Partnership with Lockheed Martin Aeronautics
  - Socialized with F-35 JPO and Partner Nations

- **SPEAR conceptualization / emerging definition**
  - Proposed Capabilities Tailored to End User Requirements:
    - *C4/ISR*
    - *Power Generation/Regeneration*
    - *Repair & Maintenance*
    - *Possibly 3D Printing of certain spare parts/simple small unmanned systems*
    - *Munitions, including Small Arms Ammunition*
    - *"Weapons in a Box"*

Configurable Armament Repair Depot (CARD)

Testbed Prototype Unit in use at MEC facilities in Inglewood, CA to service U.S. F-35 Armament

Configurable Armament Repair Depot (CARD)

Sustainment & Readiness Solution

The Solution

- Supply “one-stop” repair capability for all AME/AAE used across multiple platforms and aircraft including equipment fault isolation, repair, and repair validation.
- Support multiple airbases with fewer dedicated facilities where applicable.
- Provide mobile repair capability for all AME/AAE without the need for a permanent dedicated building.
- Shorter repair turn-around times for all AME/AAE due to reduced transportation and consolidation of repair resources.
- CARD philosophy can be utilized in support of all levels of logistics. (Depot, I and O Levels)

- *Forward Deployable*
- *Optimizes Mission Readiness*
- *Streamlines Repair Process*
- *Sustains Product Quality*
- *Reduces Footprint of Logistics Support*

Lessons Learned from CARD Development

- Something that is transportable and capable of being set up in austere locations ***is still not necessarily optimized for true expeditionary operations***
- 40-Foot ISO Containers are best suited for setup and operation where there is some logistical infrastructure or facilities available
- For expeditionary purposes, 20-Foot ISO Containers are the largest practical size rigid wall shelter
- The Container structure itself is ***NOT*** the discriminating value; it's the capabilities delivered within this footprint in terms of providing the ability to maintain and repair up to the I-Level armament systems for various aircraft that is meaningful
- CARD capability formed the basis for F-35 Depot facility currently being stood up at Hill AFB

SPEAR Concept

Based on the concept of CARD, the provisionally named Special Purpose Expeditionary Advanced Resource (SPEAR) is envisioned as a highly mobile solution to support expeditionary operations, providing small, dispersed units with the ability to "stay in the fight" even if resupply is limited

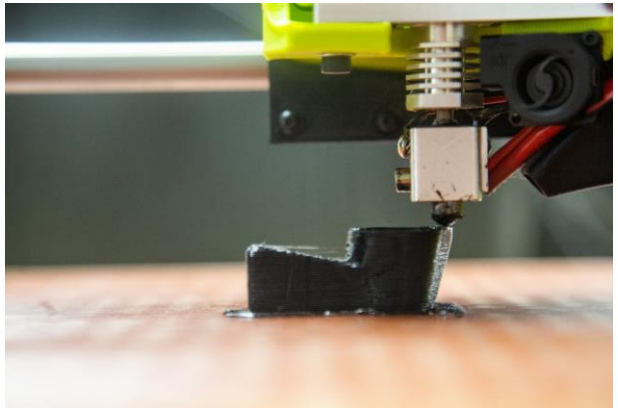
SPEAR will marry together standardized 20-foot CONEX containers (modified in similar fashion to the 40-foot units used for CARD), military soft wall shelters, and high mobility lightweight vehicles (such as our affiliated company Flyer Defense's Tactical Utility Vehicle), which can all be readily transported via Air, Land and Maritime platforms, to enable expeditionary ground forces to prosecute and sustain critical warfighting missions.

SPEAR Concept (Cont'd)

It is known that U.S. Army and Marines have both conducted experiments with additive manufacturing in the field, but integration with unmanned systems is not currently known.

Proposed SPEAR capabilities:

- Support and sustain small tactical unmanned systems, weaponized or not (including loitering munitions), ideally with ability to 3D print replacements in the field
- Ability to 3D print select small arms ammunition, including 40mm grenades and shoulder-fired missiles such as Carl Gustaf M4 84mmm recoilless rifle munition
- Ability to 3D print replacement parts and conduct repairs on designated individual small arms and platoon and company crew-served weapons
- Power generation/regeneration for supported troops via integrated APUs and/or solar panels to recharge batteries
- Secure communications including voice and data to provide additional C4ISR capabilities at the small unit level



SPEAR Concept (Cont'd)

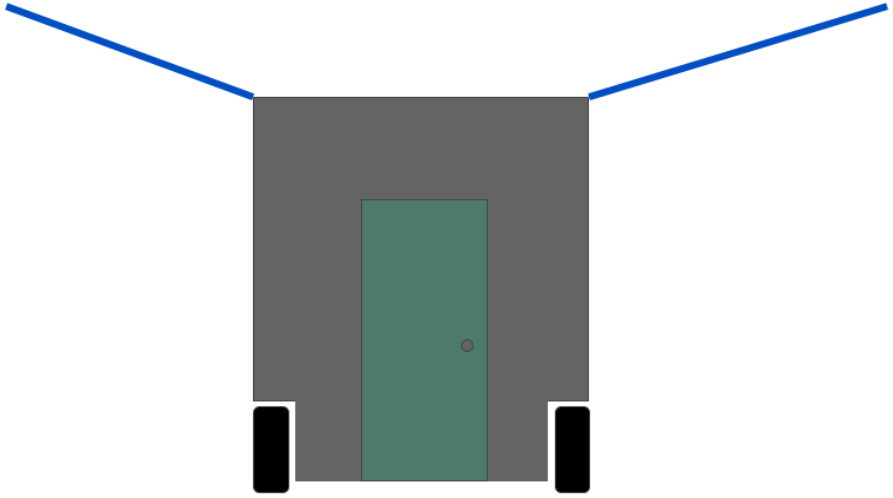
Currently quiet inquiries are being made to identify potential champions for the SPEAR concept in the warfighting community and to understand what capabilities are most needed.

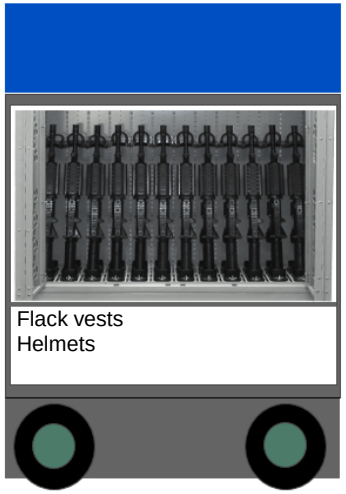
MEC is also in discussions with other industry partners to support this capability.

The idea of containerizing warfighting capabilities is not new, and seems to generate interest in some quarters.

ACCESS Multi Role Container Solutions

- Develop container concepts that meet the ACE concept requirements
  - Mobile (manually pushed)
  - Same foot print as an ISU-90 equal to 1 pallet position (standard cargo container for DoD)
    - Dimension 108"W X 88"L X 91.35"H
  - Multiple roles in one solution (examples)
    - Pilot Debrief
    - Firearm and ammunition storage
    - Personnel Protective Gear
    - Limited O-Level Armament Test
  - Expandable platforms
  - Power
    - Jack boxes
      - Solar charged
    - 110v hook up
  - Additional Options Available to meet requirements:
    - Security Cameras
    - Lighting (Indoor and External)
    - Attached Solar panels
    - Electronic drive motors for wheels





The UxS Opportunity & Challenge

- Support/Sustainment for small UAV/UGV/USV
- Loitering Munitions
- Air Launched Effects (ALE)
- Unmanned Systems are “force multipliers” for ISR/EW/Kinetic Strike/Logistics, etc.
- The ability to regenerate such systems in the field adds additional tools






Solution for UxS – Industry/Warfighter Partnership

- The continued introduction of small, even “micro” tactical systems, particularly those meant to be “attritable,” presents opportunities for repair and even possibly fabrication in forward-deployed settings

- Industry partnerships among OEMs of such systems and engineering firms can provide capabilities to warfighters and serve as “force multipliers”

Indo-Pacific

- The tyranny of distance
- Distributed small units with risk of being cut-off or encircled by hostile forces
- Potential for heavily contested air and sea space that threaten logistics/supply chains (upper-end fight)
- How to enable the ability to strike hard, strike fast, and get out?
- Region lends itself to interdiction, unpredictability, presenting a moving target to adversaries

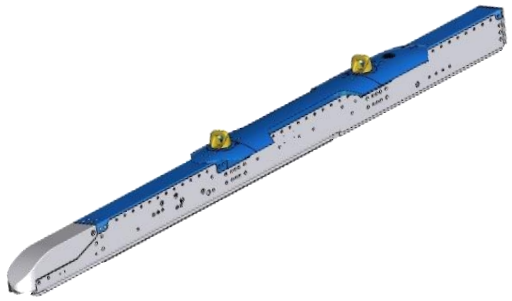
Eastern & Central Europe

- Potential aggression could lead to capture of NATO member territory in initial thrust before reinforcements available
- Fixed installations would likely be early targets; ability to provide mobile repair and maintenance capabilities is a familiar concept from Soviet/Warsaw Pact Doctrine
- Ability to provide local resistance efforts with enhanced capabilities to fight “guerrilla warfare”
- Place adversary’s logistics chains and reinforcements “at risk” from hard to detect smaller formations

Solutions Today | Multi-Mission Universal Launchers

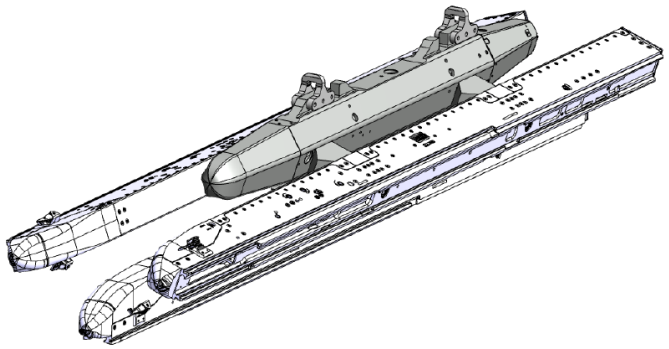
- **Universal Missile Launcher (UML)**

  Adaptation of MRL (LAU-127/LAU-128/LAU-129) series of rail missile launchers



- **Multiple Munitions Launcher (MML)**

  Adaptation of the TER-9/A and MRL series of rail missile launcher

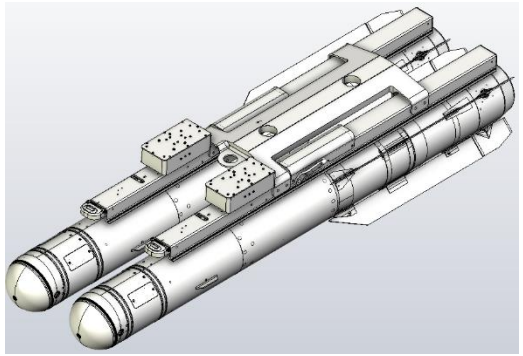


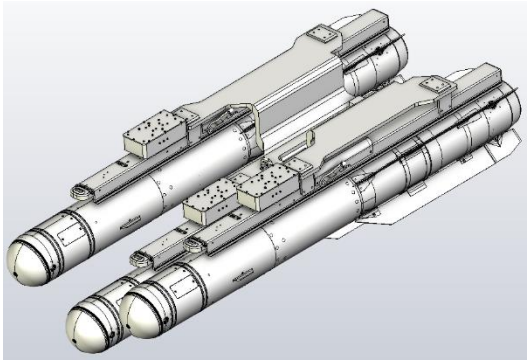
- Combat capability multiplier with minimal reconfigurations cost
- Minimal logistics footprint to support FOB/ACE operations
- Suitable for installation on numerous platforms (Fixed Wing/Rotary/UAV) subject to weight limitations
- Increased load-out of air-to-air missiles on aircraft with 30” ejector 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)

Solutions Today | 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

Future Solutions

- Configuration packages for SPEAR
- Dual Rail Missile Launcher with Integrated MIL-STD-1760 Ejector Rack for 500 or 1000 lb. JDAM carriage
- Multi-role Adaptive Ejector Rack
- Disposable Missile Launcher for Attritable UAVs
- ***Modular Containerized*** Surface-to-Surface / Surface-to-Air Launcher

Who is The Marvin Group? (2021)

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, local presence via authorized distributors/reps in multiple countries/global regions and FMS/FMF/DCS customers in 40+ nations worldwide
- Total Square footage: Over 500K square feet in Inglewood and Irvine, California
- Classified as “Small Business”
- MEC is **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

MARVIN ENGINEERING COMPANY

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

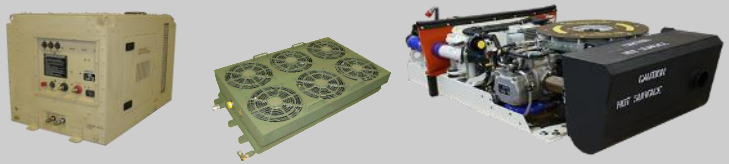
– Bomb & Ejector Racks
– Missile Rail Launchers
– Multiple Stores Carriage Systems
– Pylons
– MRO/Sustainment
– User/Maintainer Training
– Technology Development

MARVIN TEST SOLUTIONS

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

MLS
MARVIN LAND SYSTEMS

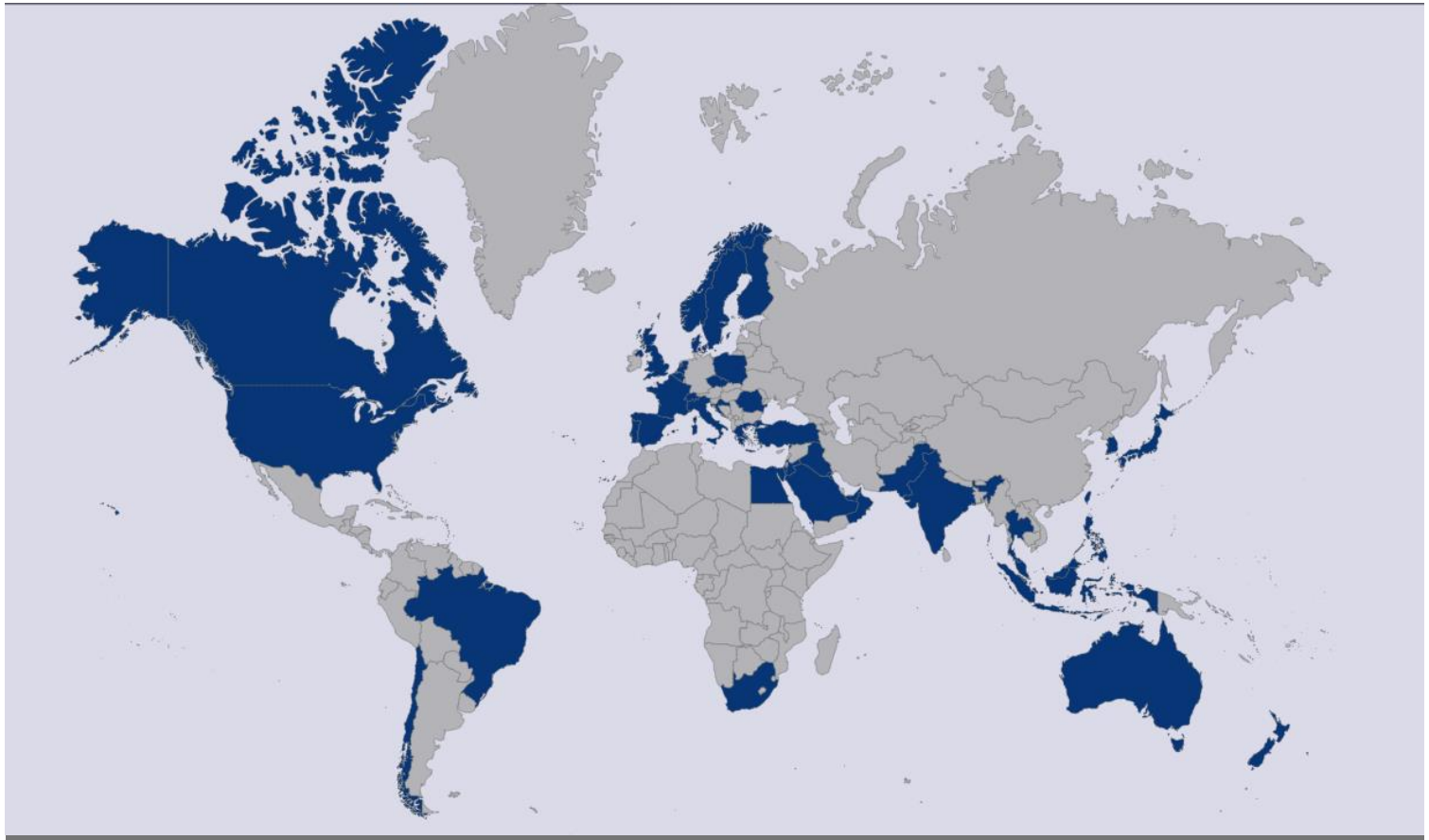


Ground & Maritime Primary | Secondary Support Systems

– 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 | Eastern, Central and Southeastern Europe | Africa, Middle East & Central Asia | Indo-Pacific

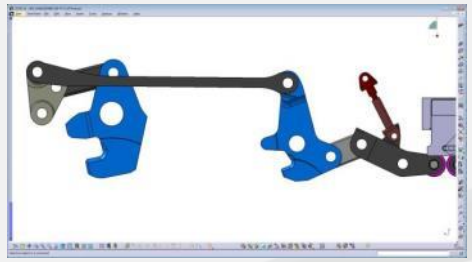
Select Customers Around the Globe

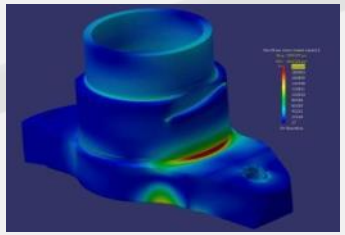
LOCKHEED MARTIN
BOEING
EMBRAER
GENERAL ATOMICS
GENERAL DYNAMICS
KAI
한국항공우주산업주식회사
KOREA AEROSPACE INDUSTRIES, LTD.
Defense Acquisition Program Administration
LEONARDO
BAE SYSTEMS
MBDA
MISSILE SYSTEMS
NORTHROP GRUMMAN
RAFAEL
ADVANCED DEFENSE SYSTEMS LTD.
Raytheon
SAAB TECHNOLOGIES
SIKORSKY
A LOCKHEED MARTIN COMPANY

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

MEC Proprietary and Confidential

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QUESTIONS?

THANK YOU FOR YOUR TIME!