



TACNAV 3D Capabilities



LAND



SEA



AIR



SPACE

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Assured-PNT is Fast Growing and Aligned with DoD Roadmaps

Defense missions across all domains depend on reliable PNT

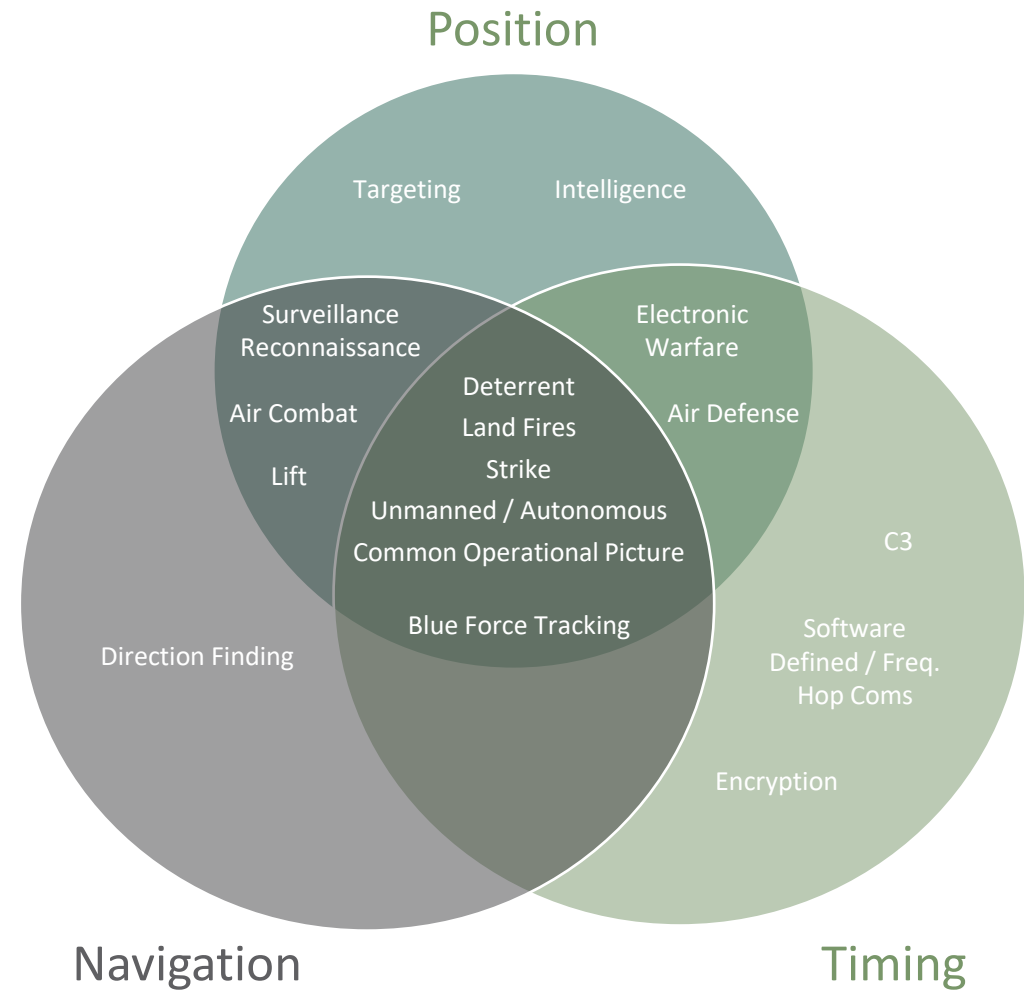
- Providing the warfighter with trusted Position, Navigation, and Timing information while operating in limited, impeded or denied GPS environments, is of critical importance to Defense markets
- Contested navigation, as experienced in near peer action, compromises military operations across all levels and types

Vulnerability to PNT Loss by Domain

Land	Air	Sea	Joint
Maneuver	Lift	Sea Maneuver/Control	C3
Land Fires	Air Combat	Amphibious Assault	Communication
Air Defense	Strike	Ensure Access	EW
			ISTAR
			Unmanned

Key:

- High Vulnerability to PNT Loss
- Medium Vulnerability to PNT Loss



EMCORE is addressing the need for advanced PNT solutions

The Challenge for Tactical Military Navigation

- **Militaries are dependent on GPS and need multiple position, navigation, and timing (PNT) alternatives**
- **GPS signals and satellites are vulnerable to electronic jamming and spoofing, and degradation from environmental conditions**
- **Precision of GPS is needed but must have reliable, seamless alternatives when it is lost**
- **GPS degrading strategies have been employed on the battlefield**



TACNAV Fielding History

1989-1993 AAV7 USMC

1990-1991 LAV USMC

1995-1998 Bradley M2 ODS US Army

Canadian Recce & APC

2001-2007 Swedish CV90

UK Scimitar

FNSS/Malaysia Adnan

2003-2006 HMMWV US Army (SOCOM)

2000-2012 Prophet US Army

SANG Saudi Arabia

RSLF Saudi Arabia

2018+ AMPV US Army

2019+ FOV Saudi Arabia

2023+ GDLS-C LAV Eastern Europe



Over 22,000 TACNAV systems fielded in U.S. DoD and 22 allied nations including the Kingdom of Saudi Arabia

■ A-PNT-capable, Highly Accurate Fiber Optic Gyro-based 3D Navigation for all Terrains

- The fiber optic gyro (FOG)-based TACNAV 3D tactical Inertial Navigation System provides an Assured Position, Navigation and Timing (A-PNT) solution with an embedded GNSS and optional Chip-scale Atomic Clock (CSAC). Its modular tactical design and flexible architecture allow it to function as either a standalone tactical navigation solution, or as the core of an expandable, multi-functional Battlefield Management System (BMS).
- TACNAV 3D joins the line-up of EMCORE's inertial navigation systems and builds upon the success of the battle-proven EMCORE TACNAV family of products and incorporates EMCORE's highest performing Inertial Measurement Unit (IMU).



Ideal Navigation and Pointing Solution for the Digital Battlefield

- Providing extremely accurate heading and dead reckoning navigation and orientation, TACNAV 3D delivers 100% situational awareness in GNSS-denied environments with greater accuracy and at a lower cost than competing navigation systems.
- Designed to easily integrate with BMS, TACNAV 3D provides reliable vehicle position, making it a vital component for effective battlefield management. Compact and lightweight, TACNAV 3D was designed for the close confines of turreted and non-turreted vehicles.

EMCORE's TACNAV 3D is the perfect solution for main battle tanks and many more military platforms



■ Key Features and Attributes

- Compact full three-dimensional navigation
- 100% situational awareness with or without GNSS
- Dead reckoning accuracy within $\pm 0.2\%$ of distance travelled
- Heading accuracy within 0.05° RMS with GNSS
- Modular design for expandability
- Embedded GNSS
- Multiple interfaces for ease of integration: Ethernet, CANbus, RS-422
- Ethernet connectivity
- Integrates with a variety of military GNSS systems
- 1 PPS (pulse per second) Timing Assurance during GNSS signal loss

■ Built-in Options

- CSAC timing option maintains timing signal integrity during GNSS loss, a critical feature in preventing timing delays of PPS output to military radios, etc.
- Iridium transceiver option transmits/receives vehicle position, waypoint, and target location to/from command center or other vehicles. TACNAV 3D also receives messages from the BMS to pass on to the command center via the Iridium short burst message capability.
- TACNAV 3D can receive/transmit data over Ethernet, CANbus, or RS-422 serial data bus.

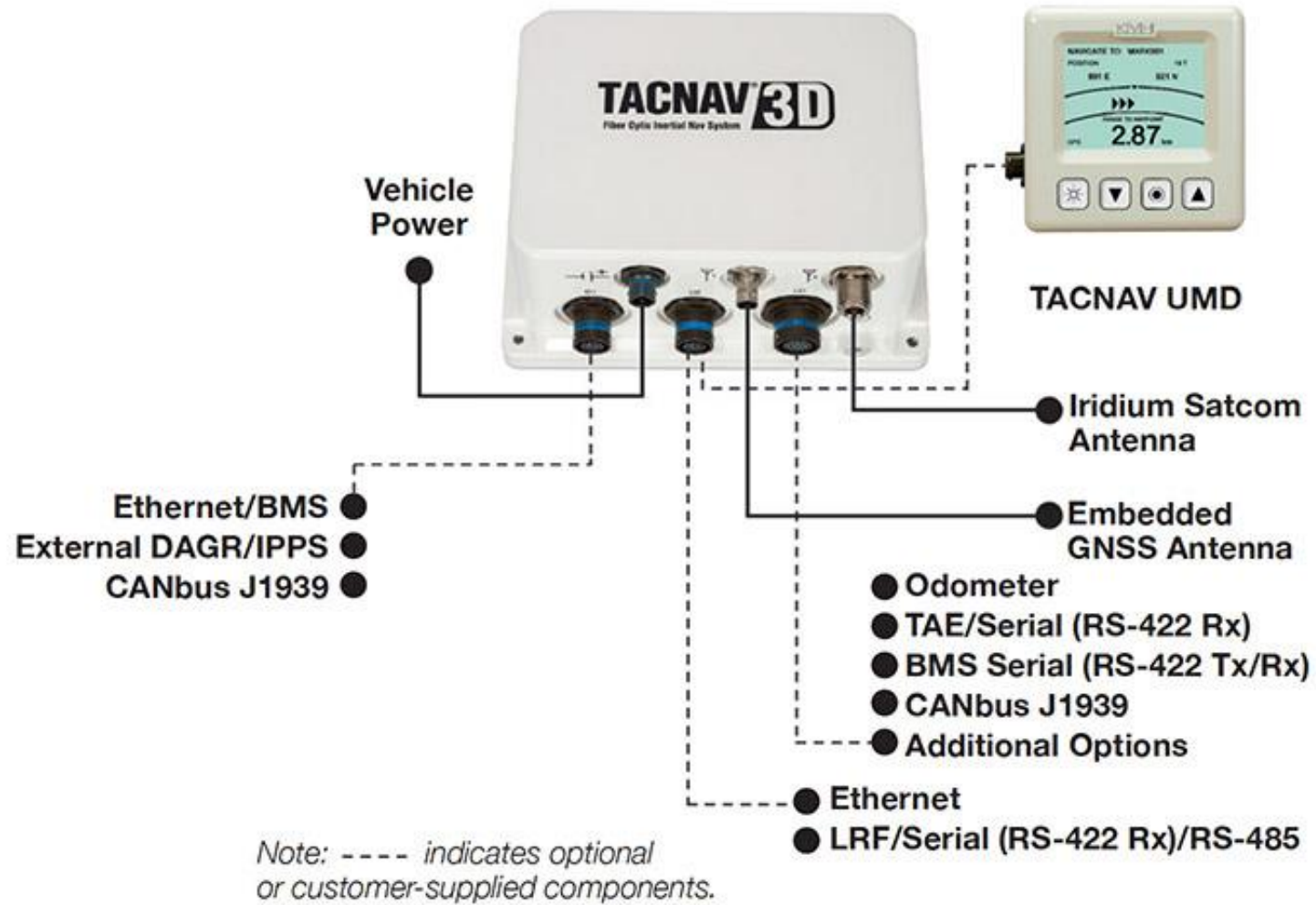
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For situational awareness in GNSS-denied environments, three-dimensional navigation, and battlefield management, EMCORE's TACNAV 3D is the state-of-the-art navigation engine for today's military technology.

System Diagram



■ Technical Specifications

General Performance

Positional Accuracy

- *With GNSS:* 2-3 meters RMS
- *Without GNSS:* $\pm 0.2\%$ distance travelled, typical

Heading Accuracy (dynamic)

- *GNSS Align Heading:* 0.05° RMS
- *Without GNSS:* $\pm 0.30^\circ 1\sigma$
- Location Format: User Selectable: over 200 grids and datums available
- Pitch & Roll Accuracy: 0.05°
- Latitude Capability: Latitude independent with GNSS
- GNSS: Supports GPS, GLONASS, GALILEO, and Beidou
- Timing: 1 PPS output (1 μ s, 5 hrs.)

Interfaces

- CANbus: J1939, CANOpen (optional)
- Serial: RS-422
- Ethernet: UDP (optional), TCP-IP (optional)

Physical

- Input Voltage: +28 VDC (18-36 VDC)
MIL-STD-1275
- Power Consumption: 15 watts
- Dimensions: 148.6 mm (d) x 203.2 mm (w)
x 101.6 mm (h) (5.85" x 8" x 4")
measurements include flanges
- Weight: 3.2 kg (7 lbs)

Environmental

- Temperature: MIL-STD-810G
Operating: -40°C to +65°C
- Altitude: 15,000 meters (50,000 feet)
- Environment: MIL-STD-810G - Humidity, Salt Fog, Sand, Dust & Fungus
- Shock: MIL-STD-810G
- EMI/RFI: MIL-STD-461F
Class A3, digital equipment
- Vibration: MIL-STD-810G
- MTBF: 45,264 hours

EMCORE TACNAV:

- **Has provided accurate, affordable tactical navigation solutions for U.S. and allied militaries since 1989**
- **Is ready & able to provide reliable, seamless alternatives to GPS for accurate, dependable A PNT in GPS-compromised environments**
- **Offers a quick turnaround solution that is deployable anywhere in the world, agnostic of vehicle type or platform**