



AEROSPACE & DEFENSE

# APPLICATION GUIDE

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# INTRODUCTION

In an era where electronic warfare capabilities are rapidly advancing, Taoglas stands at the forefront of delivering mission-proven connectivity solutions for aerospace and defense applications. Our systems are designed to meet the most demanding operational requirements where performance cannot be compromised.

As a U.S.-owned company with strategically located facilities, we bring unique capabilities to address today’s complex electromagnetic challenges. Our solutions are trusted by leading defense organizations worldwide for their reliability in critical operations.

## WHAT MAKES TAOGLAS YOUR IDEAL PARTNER

- Deep understanding of contested operational environments
- Proven track record across diverse defense platforms
- Commitment to continuous innovation and quality

## THIS COMPREHENSIVE GUIDE SHARES OUR EXPERTISE IN:

- Addressing evolving battlefield connectivity needs
- Implementing robust electronic protection measures
- Optimizing system integration for various platforms

## TRUSTED BY DEFENSE LEADERS GLOBALLY

Our solutions meet the highest industry standards, backed by internationally recognized certifications that validate our capabilities for sensitive defense applications.



### ITAR REGISTERED WITH DDTC

*Directorate of Defense Trade Controls (DDTC)*



### IPC-A-610 AND IPC-A-620S

*Certified technicians for IPC-A-610 and IPC-A-620S for Military and Space cable assembly applications in our San Diego facility*



### CUSTOMS TRADE PARTNERSHIP AGAINST TERRORISM (CTPAT)

*Started in 2022, in progress for application in 2023*



### CYBERSECURITY MATURITY MODEL CERTIFICATION (CMMC) LEVEL 2 READY

*ISO 27001 certified*



# MARKET OVERVIEW

The smart battlefield is being revolutionized by key solutions and disruptors in the defense digital market. Combined Joint All-Domain Command and Control (CJADC2) is enabling seamless integration and coordination across multiple domains, enhancing situational awareness and decision-making. The shift towards a dispersed force structure is enhancing the agility and resilience of smart battlefield units. Battle management and rapid Sensor-to-Shooter operations are streamlining the targeting process, ensuring swift and accurate responses. Hypersonics and advanced weapons are delivering unprecedented range, speed, and precision, reshaping the dynamics of the smart battlefield.

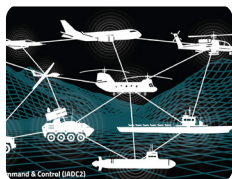
Anti-jamming technology is critical for maintaining reliable GNSS signals in contested environments. The use of drones and Unmanned Ground Vehicles (UGVs) is expanding operational capabilities, providing versatile and effective solutions for reconnaissance, surveillance, and combat operations. Finally, joint and networked logistics, maintenance, and training are ensuring that smart battlefield operations are well-supported and coordinated.





# KEY SOLUTIONS AND DISRUPTORS

## IN DEFENSE DIGITAL MARKET



Combined Joint All-Domain  
Command and Control  
(CJADC2)



Electronic Warfare –  
Electromagnetic  
Spectrum Strategy



Cyber and Information  
Operations



Autonomy, Manned-Unmanned  
Teaming, Weapons and Sensors



Space Dominance and  
Responsive Space



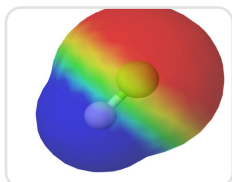
5G, Cloud, Artificial Intelligence  
and As-a-Service Advanced  
Computing



Data Analysis and Artificial  
Intelligence



Networked and Fused Sensors



Dispersed Force Structure



Battle Management and Rapid  
Sensor-to-Shooter Operations



Hypersonics and Weapons  
with Greater Range, Speed  
and Accuracy



Joint and Networked Logistics,  
Maintenance and Training

## CURRENT STATES OF DEFENSE DIGITAL



Multi-domain operations is defined as a warfare development concept wherein advanced adversaries can be fought across all domains, including air, land, sea, space, and cyberspace. Experimentation funding is mainly drawn from existing research, operations, and procurement programs of record.



The aim is to develop a joint network wherein any sensor, any shooter, and any command and control node, aided by artificial intelligence, can outsee, outthink, and outshoot any adversary. Multi-domain operations can be considered an Internet of Battlefield Things.



New ideas such as aircraft carriers, strategic bombing, and missile defense carry with them doubts and disagreements until they are proven and accepted. Multi-domain operations is no different; progress has been made, but it remains to be seen how staffing and resources will be applied.



Various existing and emerging research efforts and programs are contributing to the advancement of the multi-domain operations concept. As the idea matures, more specific funding and contracting opportunities are expected to become available.

## FUTURE TRENDS OF DEFENSE DIGITAL



Often, firms participating in the development of multi-domain operations succeed when they engage with lead systems integrators and contribute updated technology to existing programs. Most of the funding available now is drawn from sustainment and product improvement accounts for networks and weapons systems.



Small firms with innovative technologies are succeeding by partnering directly with new DoD organizations such as the Defense Innovation Unit and Army Futures Command. DoD organizations are seeking commercially based technology insertions; often, they utilize other transaction authority acquisition vehicles.



Multi-domain operation technology trends are focused on advancing artificial intelligence-aided data analysis, networks, and targeting. Defense against and deployment of hypersonic and directed-energy weapons are key to the ultimate success of the concept.



DoD cross-functional teams will continue to request industry support through defense industry consortiums, traditional capability releases, other transaction authorities, and exercise participation formats.





# CRITICAL CAPABILITIES FOR THE SMART BATTLEFIELD

The smart battlefield relies on advanced situational awareness and command & control capabilities to maintain a strategic edge. Situational Awareness (SA) is enhanced through various Intelligence, Surveillance, and Reconnaissance (ISR) systems. These systems include sensors that collect information through radars, cameras, and other devices, providing real-time data from the battlefield. Data processing solutions analyze and interpret this data to support informed decision-making. Track & trace capabilities, utilizing GPS and other technologies, enable the monitoring and management of assets. Visualization tools are essential for presenting situational awareness data in an understandable format, while mobile tools ensure that SA is accessible to field operators, enhancing their operational effectiveness.

Command & Control (C4I) systems are equally critical for the smart battlefield. Command systems provide tools to support decision-making and planning, ensuring that commanders have the information they need to make strategic choices. Control systems manage resources in the field, optimizing the deployment and utilization of assets. Battle management systems assist in planning, executing, and assessing operations, ensuring that missions are carried out efficiently and effectively.

Together, these capabilities form the backbone of the smart battlefield, enabling forces to operate with greater precision, agility, and situational awareness.





# SITUATIONAL AWARENESS

(INCL. ISR SYSTEMS)



## SENSORS

Collect information through radars, cameras, etc



## DATA PROCESSING

Solutions that analyse and interpret data to support decision making



## TRACK & TRACE

Use of GPS, etc to track and trace assets



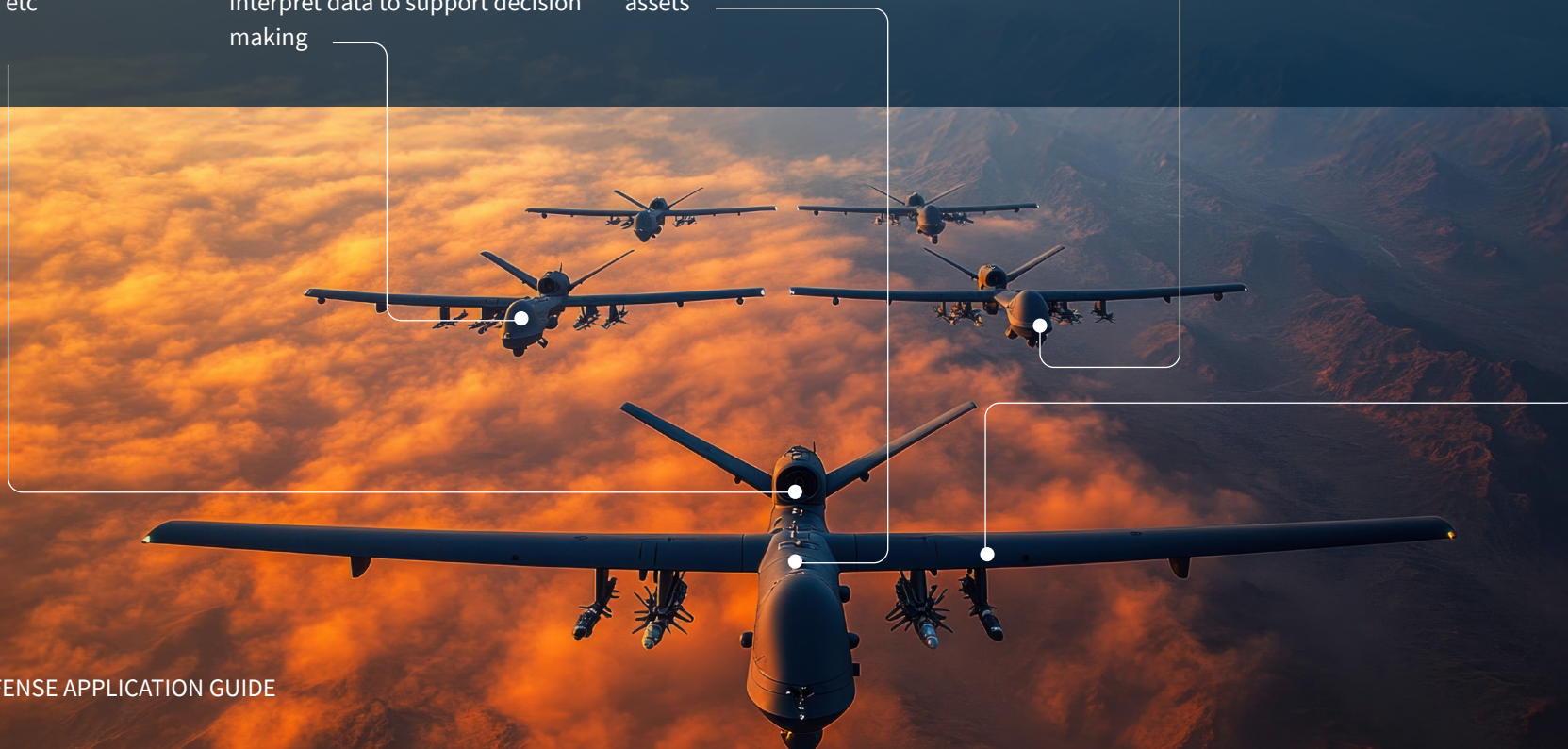
## VISUALIZATION

Tools to support visualizing SA



## MOBILE TOOLS

Tools to support SA in the field





# COMMAND & CONTROL

(INCL. C4I)



## COMMAND SYSTEMS

Tools to support decision making and planning



## CONTROL SYSTEMS

Tools to support managing of resources in the field



## BATTLE MANAGEMENT SYSTEMS

Tools that assist in planning, executing, and assessing operations



## COMMUNICATIONS PLATFORMS (RADIO AND SATELLITE)

Voice and data comms which enables real-time coordination



# ANTI-JAMMING CAPABILITIES

GNSS jamming is heavily used in warfare to disable the enemy's access to reliable positioning, navigation, and timing services. In conflict zones, disrupting GNSS signals through jamming can prevent enemy units from using satellite-based systems to coordinate movements and target strikes. Numerous examples demonstrate how jamming can severely impact both civilian and military operations involving military platforms.

In modern warfare, multiple jammers can be deployed on the battlefield. As the number of jammers increases, the number of CRPA (Con-

trolled Reception Pattern Antenna) elements and anti-jam channels required to counter these threats must also increase to maintain effective countermeasures. Consequently, developing anti-jamming GNSS systems to maintain military platform performance in jamming environments is essential.







# ANTI-JAMMING GNSS SOLUTIONS

To suppress jamming signals, spatial filtering methods are employed. Phased array antennas are used for spatial filtering with respect to incoming signal direction, and jamming signals are separated from GNSS signals. Depending on the number of antennas used for spatial filtering, multiple jamming signals can be nullified simultaneously.

Custom and reliable antenna solutions and signal processing units can be integrated to work with different GNSS receivers, especially for different platforms and tough missions. These solutions are designed with advanced design infrastructure for modeling and simulation and near/far antenna test & measurement environments.

Conformal/Blade antennas are designed specifically for the geometry of the platform, featuring an aerodynamic structure

tailored to air/naval/land platforms. These antennas optimize the radiative beam based on placement and operational requirements.

Anti-jamming GNSS solutions are the most effective and reliable jam-resistant global positioning systems in the market. They have features such as 4, 8, or 16 Antenna Array Configuration, Multi-Frequency Band and Multiple Satellite System support simultaneously, beam nulling, pulse blanking, frequency notch anti-jamming techniques, external GNSS Receiver support, or embedded Multiband GNSS receiver.

These units support concurrent operation across all frequency bands. The system provides independent beam-nulling for GPS and GLONASS bands when properly configured, optimizing each band's anti-jam performance. This multi-band

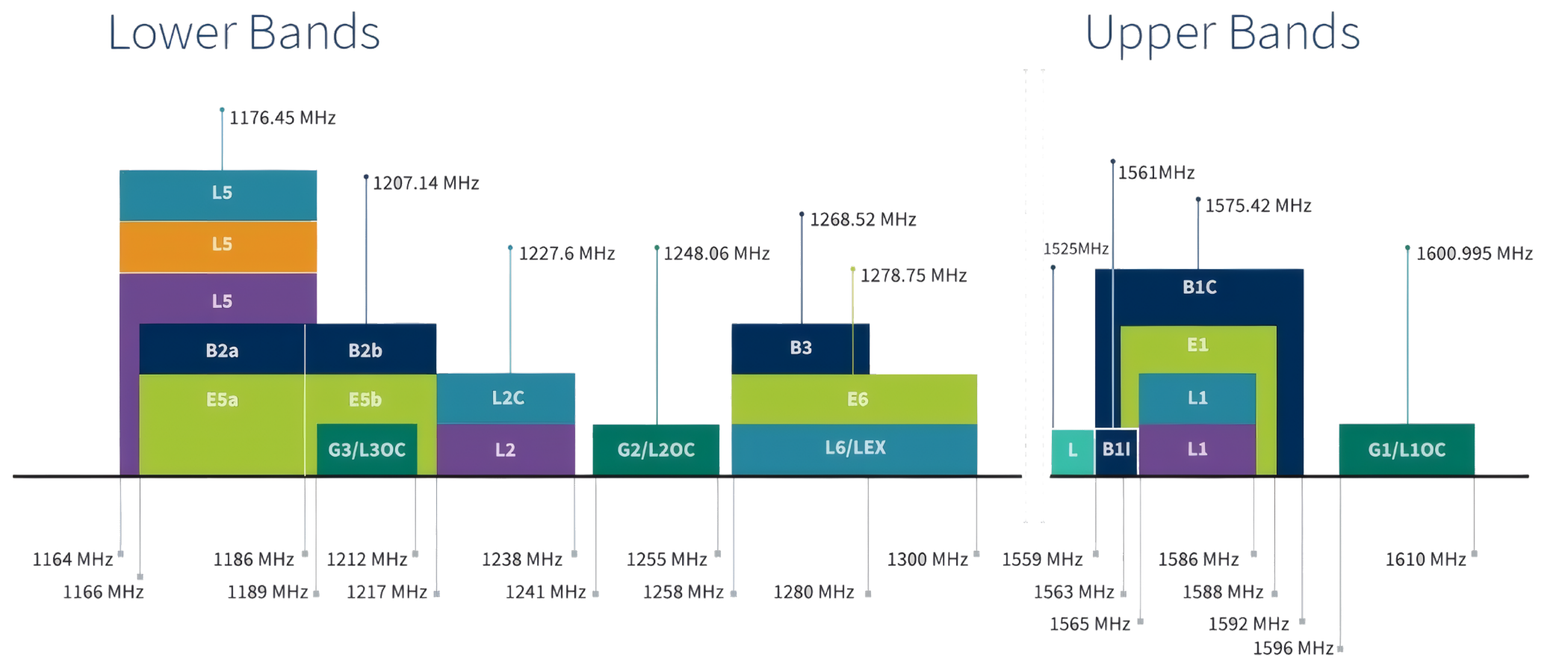
capability enhances resistance against multiple jammers in operational environments.

The system provides continuous protection across five frequency bands without requiring band switching. Its integrated architecture combines three complementary anti-jamming methods (beam nulling, pulse blanking, and frequency notch filtering), which are dynamically coordinated to address diverse jamming threats in GNSS applications.

The three anti-jamming techniques (beam nulling, pulse blanking, and frequency notch filtering) operate as complementary layers – each addressing distinct jamming types. The system automatically selects and combines these methods in real-time based on the detected threat, optimizing anti-jam performance for the operational environment.

# TYPES OF GNSS BANDS

In addition to the general frequency bands such as L1, L2, and L5, the sub-bands of these bands also have different GNSS signals at nearby frequencies, for example: GPS L1CA (1575.42MHz), GLONASS G1(1598-1605 MHz), and BeiDou B1I (1561 MHz).





# ELECTRONICS PRODUCTS

## FOR THE SMART BATTLEFIELD



### DRONES AND UNMANNED GROUND VEHICLES (UGVs)

are pivotal for reconnaissance, surveillance, and combat operations. These autonomous systems provide versatile and effective solutions, enhancing the battlefield's operational flexibility.



### ADVANCED SENSORS

including radars and cameras, collect real-time data from the battlefield. These sensors are integral to Intelligence, Surveillance, and Reconnaissance (ISR) systems, providing critical information for decision-making.



### DATA PROCESSING SOLUTIONS

analyze and interpret the collected data, supporting informed decision-making. These solutions are crucial for transforming raw data into actionable intelligence.



### TRACK & TRACE CAPABILITIES

utilize GPS and other technologies to monitor and manage assets. These capabilities ensure that resources are efficiently tracked and deployed.



### COMMAND SYSTEMS

provide tools to support decision-making and planning, ensuring that commanders have the information they need to make strategic choices. Control Systems manage resources in the field, optimizing the deployment and utilization of assets.



### BATTLE MANAGEMENT SYSTEMS

assist in planning, executing, and assessing operations, ensuring that missions are carried out efficiently and effectively. These systems are integral to maintaining operational coherence and effectiveness.



### AI-DRIVEN TARGETING SYSTEMS AND SMART WEAPONS

equipped with AI and machine learning technologies enhance targeting accuracy and operational efficiency. These systems are guided by advanced algorithms, ensuring precise engagement of targets.



### PHYSIOLOGICAL MONITORING

technologies track soldiers' physical conditions in real-time, ensuring their well-being and readiness. Advanced Helmet Systems have evolved into sophisticated technological interfaces, providing enhanced protection and communication capabilities.



### SIGNAL PROCESSING AND DIGITAL INNOVATION

enhance communication and data processing capabilities, ensuring seamless connectivity on the battlefield. Networked Battlefield Capabilities ensure that all units are connected and coordinated, enhancing operational coherence.



# PRODUCT OVERVIEW

## Synergy - MA1509 9-in-1

Combination Antenna – GNSS,  
5\*5G/4G Cellular & 3\*Wi-Fi



## Meteor FW.90

4G/3G/2G Cellular  
Flexible Whip, SMA(M)



## MagmaX2 – AA.200

Active Multiband GNSS Magnetic  
Mount Antenna



## SPKR.10.4.A

10 Inch Round Subwoofer  
Speaker 80W



## APEX TG.46

Wideband 5G/4G Dipole  
Terminal Antenna



## Pantheon – MA750 5-in-1

Permanent Mount GNSS 5G/4G  
2xMIMO Wi-Fi 2xMIMO Antenna



## Monsoon MA170

2\*5G/4G MIMO Permanent  
Mount Antenna



**DELIVERING LONG-TERM  
QUALITY & TRUST TO  
RUGGED TRANSPORTATION**



# PRODUCT OVERVIEW

## ADFGP.60A

Lightweight Active Multi-band GNSS  
High Precision Patch Antenna



## CBD Series for UAV

Lightweight, Thin 5.8GHz Cable  
Dipole Antenna



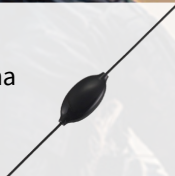
## ASGGB.184

Active GNSS Surface  
Mount Patch



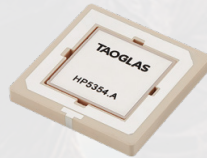
## AJA Series for UAV

2.4GHz Flexible Cable Dipole Antenna  
with Integrated Anti-Jamming  
Out-of-Band Filter



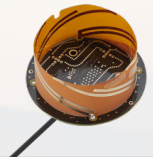
## Inception HP5354.A

Low Profile L1/L5 GNSS  
Patch-in-a-patch Antenna



## EAHP.125 for UAV

L1/L2/L5 Embedded Quad Helix  
Antenna



**LIGHTWEIGHT,  
LOW-PROFILE ANTENNAS  
MOBILIZE THE  
SMART BATTLEFIELD**




# EXTERNAL ANTENNA DESIGNS

## LONGSTANDING HISTORY OF TAOGLAS



**SYNERGY** Combo up to 11-in-1



**OLYMPIAN II** Combo up to 3-in-1



**GUARDIAN** Combo up to 9-in-1



**GUARDIAN X** Combo up to 17-in-1




**HERCULES GNSS 2-IN-1**




**ULTIMA**



**SENTINEL** Combo up to 3-in-1



**STREAM** Combo up to 3-in-1



**PANTHEON** Combo up to 5-in-1



**STORM** Combo up to 5-in-1



**COLOSSEUM** Combo up to 5-in-1



**RAPTOR III** Combo up to 7-in-1



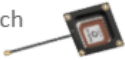
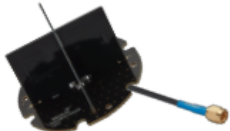







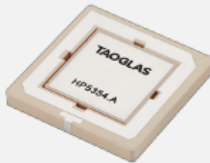








**TAOGLAS®**

20+ Years Trusted Quality and Innovation

# FEATURED PRODUCTS

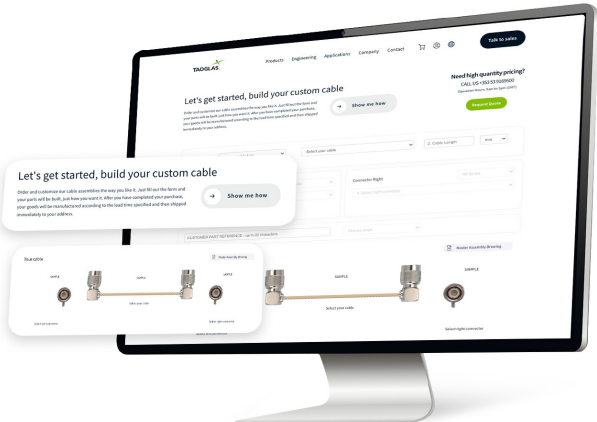
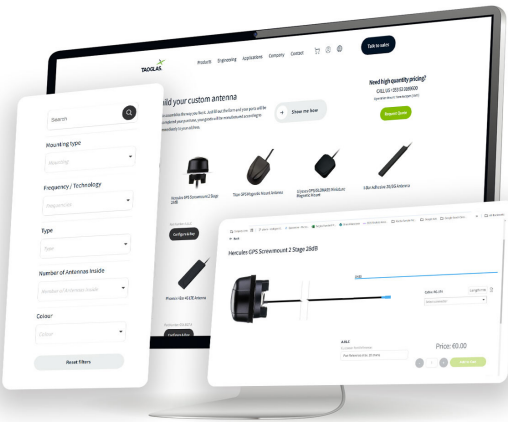
## HIGH PRECISION EMBEDDED GNSS ANTENNA PORTFOLIO

GPS Bands	L1	L1 + L2	L1 + L5	L1 + L2 + L5	L1 + L2 + L5 + L-band
Embedded Antennas - Active	<b>ASGPDF254</b> Dual Feed SMD Active Patch 	<b>AGPSF.36C</b> GPS L1/L2 Low Profile Stacked Patch 	<b>AGVLB.25B</b> Stacked Patch 	<b>EAHP.50</b> – L1/L2/L5/L6 Cross Dipole 	<b>AHP24510</b> L1/L2/L-Band 
			<b>AFXP125</b> Flex PCB Active 		<b>ALPDF254</b> L-Band Patch 
			<b>AGGBLA.125</b> Active SMD 	<b>ADFGP.50A</b> – L1/L2/L5 Dual-feed Stacked Patch 	<b>ADFGP.60A</b> – L1/L2/L5/L-band Patch 
Embedded Antennas – Passive	<b>SGPDF254</b> Dual Feed SMD Patch 	<b>HP2258.A</b> Stacked Patch 	<b>HP5354.A</b> Patch-in-a-patch 		<b>HP24510A</b> Dual-feed L1/L2/L-band Stacked Patch 
					<b>HP54510A</b> Dual-feed L1/L5/L-band Stacked Patch 
Active Circuitry		<b>TFM.100A</b> FEM 	<b>TFM.100B</b> FEM 	<b>TFM.110A</b> FEM 	<b>TFM.120A</b> FEM 
Hybrid Couplers	<b>HC125A</b> – Low Profile 				

# TAOGLAS ANTENNAXPERT SUITE

If you are working on an application that requires wireless communications, Taoglas provides a suite of user-friendly, digital tools to streamline, simplify, and customize antenna design and integration. Available on the Taoglas website, the toolset includes Taoglas Antenna Integrator, Antenna Builder, and Cable Builder.

## THE ULTIMATE ONLINE SOURCE HUB FOR DESIGN ENGINEERS



### Antenna Integrator

Jumpstart your prototype, bypass traditional design barriers, and streamline antenna integration. Receive a personalised report within 24 hours.

### Antenna Builder

Design and personalise external and embedded antennas. Get your custom products shipped within 24-48 hours.

### Cable Builder

Order and customise cable assemblies, your way. Get your custom products shipped within 24-48 hours.



# ABOUT US

Taoglas is a U.S. owned company with operations across three facilities in the USA and is a trusted supplier to the most recognized names in the aerospace and defense (A&D) industry. We understand the engineering challenges of designing for extreme environments, coupled with the industry's heightened security and regulatory requirements.

Our experienced A&D team is dedicated to working with you to design and manufacture reliable and secure solutions that meet your stringent operating requirements—delivering optimal performance and giving you long-term peace of mind.

We offer an extensive portfolio of commercial off-the-shelf (COTS) antennas and advanced RF components for you to select from. Or you can leverage our engineering expertise to create a custom antenna, precisely designed for your next mission-critical project.



# WHERE TO BUY



**KEVIN BLAKELEY**

Head of Aerospace and Defense  
Marine Corp Veteran

C. 858 829 5731

E. [kblakeley@taoglas.com](mailto:kblakeley@taoglas.com)



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