Gilat Defense

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White Paper

Multi-Orbit SATCOM for Mission-Ready Defense Networks

Release Date: 12 October 2026

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Introduction

Modern defense operations depend on resilient, high-throughput, and secure communications across land, sea, air, and fixed command locations. In this new environment, SATCOM is no longer simply a backup connection or a means of linking remote locations. It is a core part of the operational network, connecting headquarters, deployed units, mobile platforms, sensors, command posts, and coalition networks to support command continuity, situational awareness, and coordinated action across domains and geographies.

At the same time, the communications environment has become more complex. Single-orbit networks remain important, but they are increasingly challenged by capacity demand, contested spectrum, latency-sensitive applications, and the need to operate across diverse mission profiles. Multi-orbit SATCOM addresses this shift by combining the strengths of GEO, MEO, and LEO into a more adaptable communications architecture. The value is not the use of multiple orbits for its own sake; it is the ability to give defense users the best available path for the mission, the environment, and the threat condition.

Orbit	Primary Role	Benefit for Defense Operations
GEO	Wide-area, mature coverage	Stable backbone connectivity, broadcast services, and established military and commercial networks
MEO	Lower latency and high-throughput regional coverage	Responsive command networks, mobility support, and high-capacity reachback
LEO	Low latency, distributed capacity, and path diversity	Resilient tactical connectivity, mobility, and redundancy when GEO or terrestrial services are constrained

These developments are reshaping the challenges facing defense SATCOM. As SATCOM becomes an integral part of the primary mission network, it is more exposed than ever to jamming, cyberattacks, and kinetic threats. In this new environment, SATCOM resilience depends in part on the ability to monitor network conditions, apply mission policies, switch paths, protect traffic, and maintain service continuity under stress.

Why Multi-Orbit Matters for Defense Operations

A multi-orbit architecture changes the operational model from dependency on a single satellite resource to managed access across multiple orbital layers. This gives network operators and warfighters more options to maintain service, optimize performance, and respond to changing conditions in the field. Key benefits of multi-orbit capabilities include:

- **Resilience and Redundancy:** Multiple orbital layers mitigate single points of failure and ensure continuity of communications under jamming, interference, or satellite unavailability.
- **Low Latency and High Throughput:** LEO and MEO satellites reduce round-trip delay while providing higher data rates for ISR, mission planning, video, and command applications.
- **Global Coverage:** The combination of orbits supports continuous coverage across fixed, remote, and mobile operations.
- **Flexible Capacity:** Bandwidth and service can be allocated across multiple satellite networks according to mission requirements.
- **Mobility at the Tactical Edge:** Advanced tracking and terminal technologies support connectivity for airborne, maritime, ground, and expeditionary platforms operating in dynamic environments.

Gilat's Multi-Orbit SATCOM Solution

Delivering the promise of multi-orbit SATCOM requires more than access to different constellations. It requires an integrated ground system that can manage services across networks, support seamless transitions, and translate satellite diversity into operational availability. Gilat brings together the platform, modems, antennas, and terminals required to support this end-to-end approach.

Baseband Layer – Network Intelligence and Orchestration

SkyEdge IV is Gilat's next-generation multi-service platform for GEO and NGSO operation, providing the baseband layer of the SATCOM architecture. It provides intelligence to the network, turning separate satellite resources into a coordinated service environment. It also supports orchestration, service management, handover, quality of service, and integration with external management and orchestration systems, enabling operators to align network behavior with mission priorities.

Key capabilities include:

- **Multi-Orbit Handover:** Supports beam, satellite, and orbit switching to maintain service continuity when operating across GEO and NGSO networks
- **Dynamic Network Orchestration:** Manages orbit selection, beam assignment, bandwidth use, service profiles, and network visibility through a centralized management layer
- **Security and Traffic Control:** Supports encryption, terminal authentication, access control and traffic separation as part of a broader defense security architecture
- **Cloud-Native Architecture:** Scalable and virtualised, enabling both centralised operation and distributed deployment for field-level networks
- **Open Interfaces:** Enables integration with antenna controllers, BUCs, external orchestrators and network management systems through open interface concepts
- **Proven Heritage:** Selected as the ground segment for SES mPOWER, delivering high-throughput, low-latency connectivity worldwide

Modem Layer – Multi-Orbit Connectivity





The modem layer is where multi-orbit capability becomes operationally usable. Gilat's Aquarius family of modems, with dual transmit and receive interfaces, and Gilat's GLT 1500 SDR Modem support service continuity during satellite transitions, including NGSO tracking, GEO-to-NGSO switching, and GEO-to-GEO operation. The objective is to reduce interruptions during make-before-break handover and enable rapid reconfiguration when satellite conditions change.

Antenna and Terminal Layer – Delivering Multi-Orbit Capability in the Field

The antenna and terminal layer determines how multi-orbit capability is delivered in the field. Gilat Defense's terminals support missions that require ruggedised, lightweight, and flexible terminals for SOTM and SOTP applications on land, in the air, and at sea. This part of the architecture should be viewed in three layers: deployable terminals for rapid field connectivity; tracking terminals that support GEO, MEO, and LEO operations; and ESA technology for high-mobility or low-profile platforms. Together, these capabilities enable defense users to deploy quickly, maintain connectivity across changing satellite environments, and support evolving mission requirements at the tactical edge.

Key features include:

- **Compact and Ruggedized Designs:** Field-deployable terminals built to endure harsh environmental and operational conditions
- **Auto-Tracking and Beam Switching:** Continuous satellite tracking and automated orbital handovers maintain persistent connectivity
- **Multi-Frequency Support:** Compatibility with Ku-, Ka-, and X-band ensures interoperability with multiple defense satellite networks
- **Electronically Steered Antenna (ESA) Integration:** Enables agile, low-latency switching for high-mobility platforms
- **Ease of Installation and Operation:** Simplified setup and operation support rapid deployment and effective use in the field

Conclusion: Multi-Orbit as an Operational Advantage

Multi-orbit SATCOM is becoming a critical enabler of modern defense connectivity because it gives forces more ways to sustain communications, adapt to changing mission requirements, and operate beyond the reach of terrestrial infrastructure. Its strategic importance is not only technical; it directly affects command continuity, operational tempo, and the ability to maintain connectivity across dispersed and contested environments.

With SkyEdge IV as the orchestration and service management layer, Aquarius and GLT 1500 modems supporting continuity through satellite transitions, and terminals delivering deployable connectivity at the tactical edge, Gilat Defense provides an integrated foundation for mission-ready multi-orbit SATCOM. This end-to-end approach helps defense organizations move from satellite access to assured operational connectivity.

About Gilat Defense

Gilat Defense delivers secure, rapid-deployment solutions and battlefield connectivity, with support for multi-orbit and multi-constellation networks. These capabilities ensure reliable communications beyond line of sight, in remote locations, on the move, and in the most demanding operational environments. For more information, visit www.gilat.com.