



GILAT BLOG

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Transforming In-Flight Connectivity: The Potential of Electronically Steered Antennas (ESA)

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During the past 10 years, we have witnessed the emergence of Electronically Steered Antenna (ESA) technology for satellite communication terminals, particularly in the context of mobile satellite services and in-flight connectivity (IFC). The demand for high-speed internet on moving platforms prompted the development of ESA, capable of tracking satellites with high precision, fast beam switching, and operating in highly dynamic environments.

In recent years, ESA technology has continued to advance, with improved performance, efficiency, and affordability. ESA systems are now being deployed in various industries beyond aerospace and defense such as maritime, remote sensing, 5G networks, autonomous vehicles, and more.

Additionally, the rise of Non-Geostationary Orbit (NGSO) constellations has created new large opportunities for ESA technology. The ability of these antennas to perform fast switching between satellites within a LEO or MEO constellation as well as between orbits is crucial for maintaining a continuous communication service over a wide coverage area.

In an increasingly interconnected world, in-flight connectivity is evolving from a luxury service used by few to an essential service expected by most passengers and airline crews. The latest innovation of ESA has emerged as a technological breakthrough that is bound to reshape the landscape of in-flight communication.

The Challenge of In-Flight Connectivity

Whether for business communications, entertainment, or staying in touch with loved ones, passengers expect reliable and seamless in-flight connectivity.

Conventional mechanically steered antennas, although effective, are limited in their ability to support NGSO services due to their inherently slow satellite tracking and when switching from one satellite to another. NGSO-based services require a large amount of beam switching (every few seconds) and satellite handovers (every few minutes) during a flight route which means frequent service disruption if beam and satellite switching is not seamless. In addition, mechanically steered antennas include motors and other moving parts that reduce the reliability of the satellite terminal resulting in internet service outages, frequent maintenance calls, and disruptions to airline operations.

ESA: Revolutionizing In-Flight Connectivity

ESA antenna systems employ a network of electronically controlled modules, each responsible for directing the antenna beam toward the satellite of choice. Unlike traditional mechanically steered antennas, ESA requires no physical movement of any element to adjust the antenna's orientation, and satellite tracking and switching is performed nearly instantaneously. This agility enables the ESA to maintain a constant connection by dynamically adapting to changes in satellite position and other environmental factors.



Gilat's Innovative ESA Technology Enhances the Global Flying Experience

Gilat has been investing in ESA technology development over the past 5 years to address commercial, business, government, and defense aviation market segments, with breakthrough ESA demonstrations for in-flight connectivity during 2019 and in the following years. These technology demonstrations confirmed the feasibility of ESA technology for the aviation market including multi-orbit operations supporting satellites in GEO and LEO orbit.



Gilat was recently selected by Satcom Direct as the driving force behind the technology that will deliver the highest possible bandwidth to business aviation customers utilizing OneWeb's Low Earth Orbit (LEO) constellation. The ESA antenna will be mounted on the aircraft fuselage and connected to Satcom Direct management and WiFi systems inside the cabin. The ESA terminal will enable Satcom Direct to deliver an unparalleled internet connectivity user experience and the highest data transfer capabilities.

Gilat is uniquely qualified to provide the next generation of ESA aero terminals based on its technology leadership in the IFC market delivering thousands of aviation-grade modems and solid-state power amplifiers for its worldwide customers over the past 7 years. The ruggedized ESA terminal adheres to strict aviation quality standards, including safety of flight standards.

Gilat's proven active phased array technology supports GEO and NGSO constellations, exhibiting continuous multi-orbit connectivity in Ka and Ku frequency bands, guaranteeing seamless communication service globally.

Our ESA terminal's compact, low-profile flat design and light weight minimize drag and fuel consumption and the efficient SWaP (Size, Weight, and Power) enables passive cooling and minimal drag on aircraft. The open standard interface demonstrates our commitment to interoperability and facilitates the integration with any modem, allowing for a seamless connection between Gilat's ESA terminal with any existing satcom infrastructure.

So far, the effectiveness of our technology has been validated in real-world scenarios:

• December 2019: **First ESA in-flight test over GEO satellite utilizing Honeywell B757 technology demonstration aircraft:** [Watch here](https://www.youtube.com/watch?v=6a5gRxuyXUg) & [Read more](https://www.gilat.com/pressreleases/gilats-esa-terminal-demonstrates-first-ever-in-flight-operation-on-commercial-aircraft/)

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<https://www.gilat.com/pressreleases/gilats-esa-terminal-demonstrates-first-ever-in-flight-operation-on-commercial-aircraft/>

• February 2020: **Second ESA in-flight test demonstrating multi-orbit LEO-GEO operation with Honeywell B757 technology demonstration aircraft:** [Watch here](https://www.youtube.com/watch?v=0BSWCd_wv6s)
https://www.youtube.com/watch?v=0BSWCd_wv6s

• March 2020: **ESA Collaboration between Gilat and Carlisle Interconnect Technologies Now Presented at Satellite 2020** [Read more](https://www.gilat.com/pressreleases/esa-collaboration-between-gilat-and-carlisle-interconnect-technologies-now-presented-at-satellite-2020/)
<https://www.gilat.com/pressreleases/esa-collaboration-between-gilat-and-carlisle-interconnect-technologies-now-presented-at-satellite-2020/>

• January 2021: **Gilat's Proven ESA Technology Successfully Demonstrated over Inmarsat's Global Xpress** [Read more](https://www.gilat.com/pressreleases/gilats-proven-esa-technology-successfully-demonstrated-over-inmarsats-global-xpress/)
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• March 2022: **Proven by Airbus Defense and Space as part of the prestigious European Commission Horizon 2020 initiative, flying the Gilat ESA terminal on Airbus C295 aircraft** [Watch here](https://www.youtube.com/watch?v=mydPNXEYBbA) & [Read more](https://www.gilat.com/pressreleases/gilats-electronically-steerable-antenna-esa-for-ifc-achieves-breakthrough-during-airbus-flight-tests-operating-on-spacecoms-advanced-satellite/)
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• August 2023: **Satcom Direct and Gilat Sign Strategic Agreement for Joint ESA Project to Expand Plane Simple® Portfolio** [Read more](https://www.gilat.com/pressreleases/satcom-direct-and-gilat-sign-strategic-agreement-for-joint-esa-project-to-expand-plane-simple-portfolio/)
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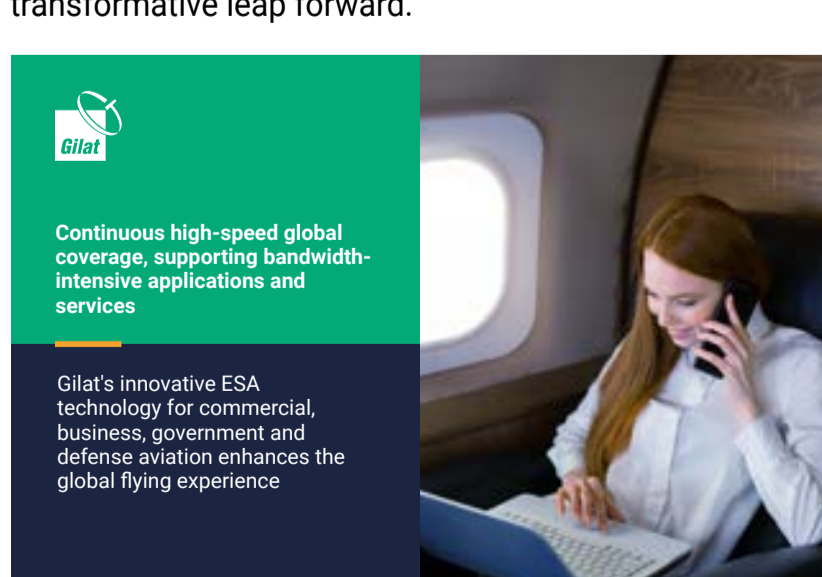
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As ESA technology continues to evolve, the sky is no longer a barrier to communication and productivity - it is a realm where passengers can enjoy uninterrupted connectivity and airlines can elevate their offerings to meet the ever-increasing expectations of a digital world. The fusion of ESA with aviation marks a ground-breaking convergence of technology and travel that has the potential to redefine the passenger experience and reshape the future of air travel.

Gilat is at the forefront of ESA technology, working with key service providers and aircraft manufacturers to customize the technology to fit the antenna to various aircraft types and missions.

For more information please visit [ESA](https://www.gilat.com) or contact us at: info@gilat.com