



# LAISR

L-band Airborne Intelligence,  
Surveillance & Reconnaissance

Global mobility L-band subscription service for  
mission-critical BLOS communications and performance



# The LAISR solution

## Introduction

L-band Airborne Intelligence, Surveillance and Reconnaissance (LAISR) is Viasat's award winning, ultra-small, highly adaptable, satellite mobility solution complementing existing military capacity. Initially envisioned to provide Beyond-Line-of-Site (BLOS) Full Motion Video (FMV) reach back capability for size, weight and power (SWaP) constrained aero ISR platforms, LAISR variants today provide the smallest, most capable and power efficient BLOS capability available globally for ground vehicular, maritime crewed and uncrewed surface vehicles, high altitude balloons and fixed wing crewed and uncrewed aero platforms. Potential applications include electro-optical and infrared real-time high-definition video streaming, laser range finder and designator transmission, signals intelligence, synthetic aperture radar, and backup command and control (C2).

## LAISR service

LAISR service is a global mobility, subscription service that provides users with access to speeds up to 3+ Mbps (forward and return) delivered through low SWaP user terminals.

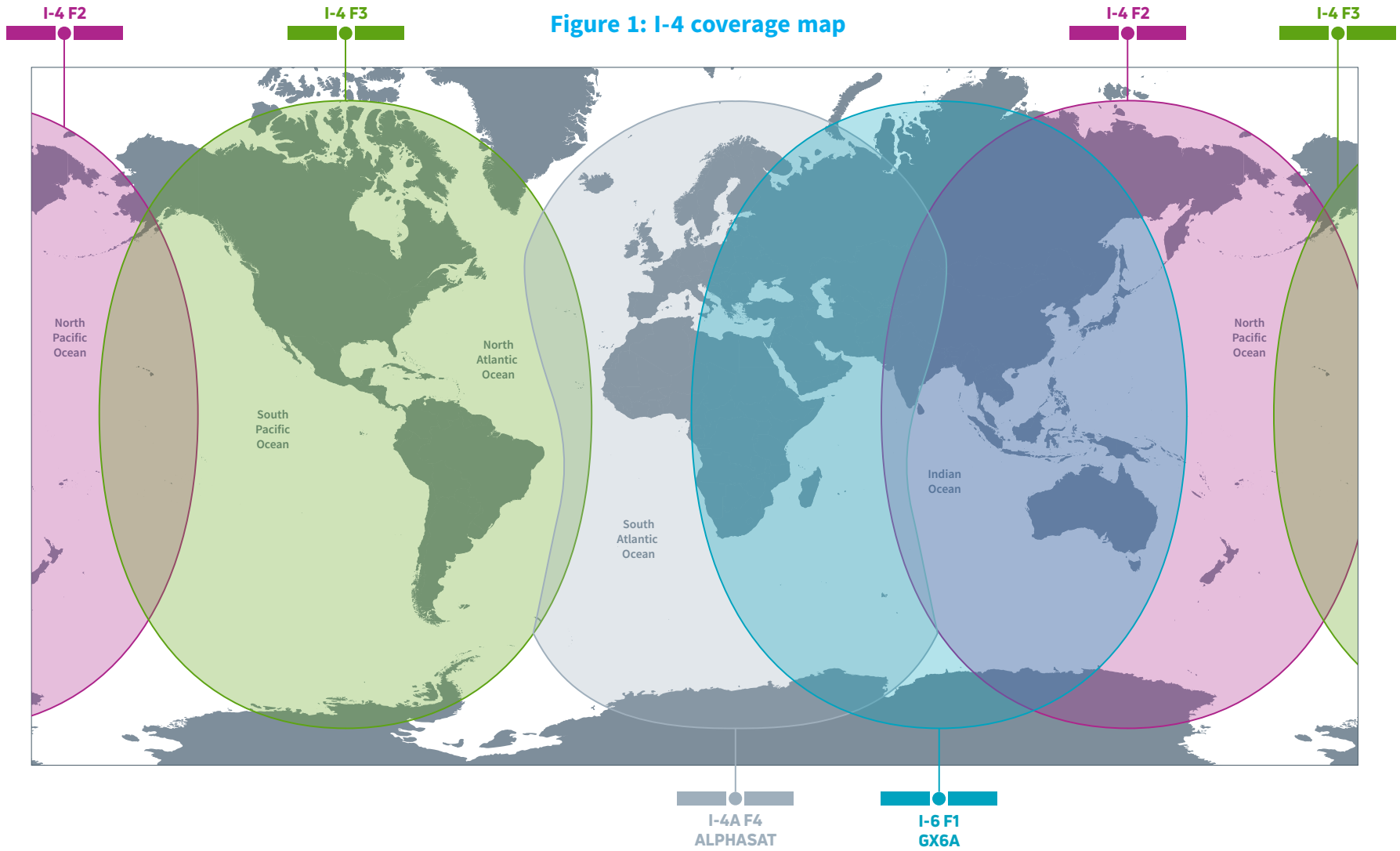
LAISR can be flexibly provisioned for each customer by our ecosystem of in-house and partner teams of

experienced SATCOM engineers who work to fully understand the customer requirements, mission and budget. These experts then integrate the right combination of the appropriate LAISR antenna with either the Light Weight (LW) or Ultra-Light Weight (ULW) core module. The final LAISR configuration is then provisioned for operation on the ELERA seamless, worldwide L-band satellite network with 99% all-weather resilience and network reliability.

**ELERA Network:** LAISR service is delivered as an end-to-end network – SATCOM as a Service – which consists of four GEO satellites that are on orbit today. These include three I-4 satellites (I-4 F1-3) and Alphasat (F4). F1 and F2 were launched in 2005, and F3 was launched in 2008 resulting in the world's first global 3G satellite network. Alphasat, the last satellite in this series was launched in 2013. The I-4 F1-3 satellites operate in standard L-band (1525-1559 MHz RX and 1626.5 - 1660.5 MHz TX) and Alphasat F4 operates in standard and extended L-band (1518-1559 MHz RX and 1626.5 – 1660.5 & 1668.0 – 1675.0 MHz TX). The I-4 satellites provide consistent coverage across four ocean regions: F1 APAC (Asia-Pacific), at 143.5° East; F2 MEAS (Middle East and Africa), at 63.9° East; F3 AMER (Americas), at 97.6° West, and F4-Alphasat EMEA (Europe, Middle East, Africa) EMEA, at 24.9° East. Figure 1 shows the coverage map.



Figure 1: I-4 coverage map





Viasat's global, fully redundant ground infrastructure includes 9 Satellite Access Stations (SAS), supported by 24/7 U.S.-based Network Operations Center (NOC) and Global Customer Service. All traffic passes through SAS located in NATO/Five Eye nations and is backhauled via a secure and resilient Multiprotocol Label Switching (MPLS) network to the customer's specific destination—ground control stations, operation centers, cloud-based services, or remote terminals anywhere worldwide – via private terrestrial line connections, the public Internet or SATCOM. Managed 24/7 by U.S.-based, security-cleared operations and engineering teams, LAISR solutions can be configured to meet the unique requirements of government customers.

**High Performance:** LAISR service delivers high performance which is based on several factors. Among them are environmental and SWaP considerations based on the customer platform, the intended area of operation, the desired transmit and receive data rate required, and service cost. The standard LAISR service offering provides the lowest SWaP terminal possible while enabling data rates up to 3+ Mbps full duplex anywhere within the customer required service area. LAISR service can attain full duplex data rates in excess of 10 Mbps full duplex in specific locations, if required.

Operating in L-band ensures the highest availability of service allowing aircraft to fly over urban, mountain and jungle environments, at low altitudes, in cloud cover and in dense rain. The SATCOM link eliminates the need for a communications relay payload or retransmission vehicles reducing the operational footprint to support ISR missions.

LAISR service is being provided today on Group 2 Uncrewed Aircraft System (UAS) platforms and small maritime surface vehicles utilizing LAISR terminals weighing between just less than 5 lbs. to no more than 9 lbs. for the total installation, as well as high altitude balloons operating at altitudes in excess of 70,000 feet in a hermetically sealed configuration.

**Latest Service Innovation:** Enhanced L-band enabled LAISR on demand is the latest service innovation that delivers global mobility, on-demand managed L-band service offering enabled by ELERA seamless, global L-band space and ground network. It enables go anywhere, anytime communications flexibility via low SWaP user terminals for airborne, maritime and land users. A completely autonomous service, it allows users to just turn on their user terminal and get the service with soon to be provided dynamic capacity allocation.

# LAISR user terminals

LAISR is accessible via type approved LAISR lightweight (LW) and ultra-lightweight (ULW) user terminals optimized for SWaP constrained platforms. LAISR terminals are comprised of a common Core Module (CM) and antenna. Multiple antenna options, which range from compact hemispheric patch antennas to fuselage mounted, high-gain, steered variants are offered, allowing customers the flexibility to customize the solution to meet their individual needs.

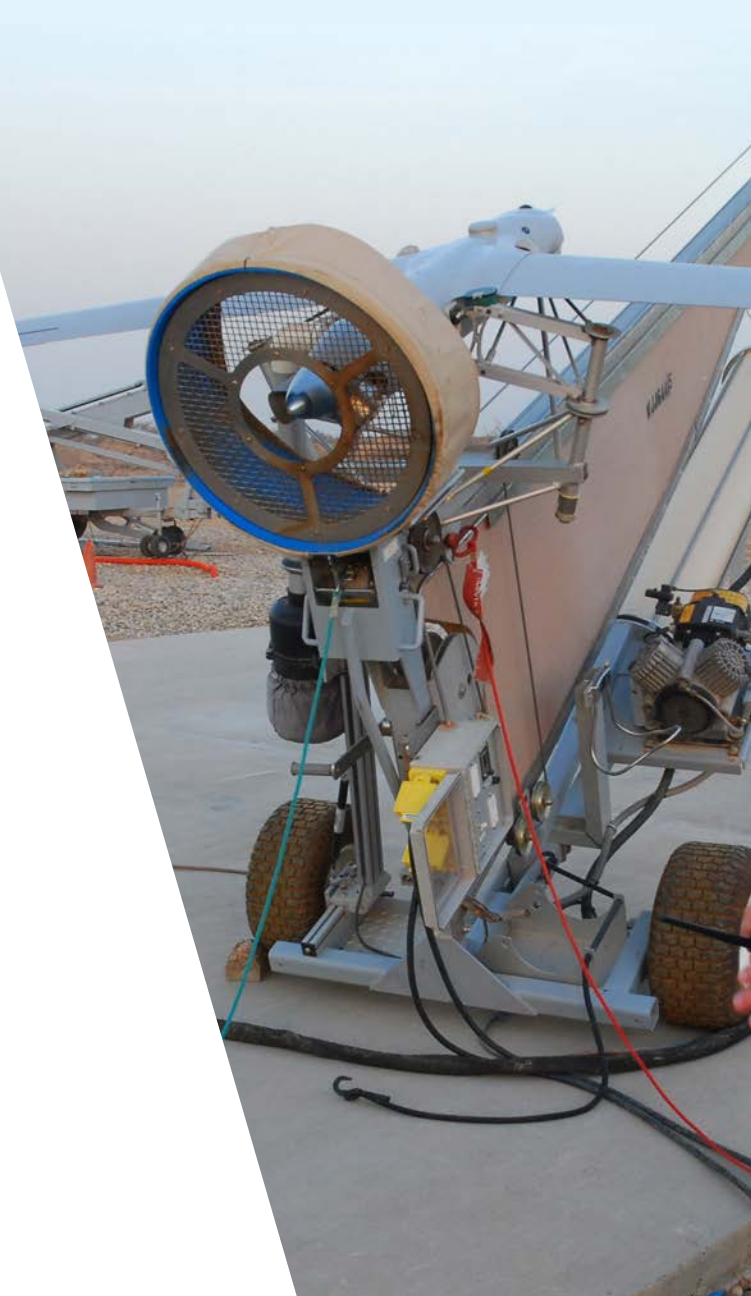
**Core Modules:** Viasat-funded and engineered, our core module capability is best in class in terms of SWaP and performance. There are two LAISR Core Modules; Light Weight (LW) and Ultra-Light Weight (ULW) that when combined with the appropriate L band antenna create a LAISR terminal. Each core module includes a modem, CPU, and RF Front End (RFFE) electronics including a transmit power amplifier, receive low noise amplifier, duplexer and filter circuitry. Differences between the LW and ULW core modules include unique modems, RFFE, and processing capability. Operationally, the LW core module might be a best fit for larger platforms that can provide the space and power needed (25 watts) to gain the benefits LW provides such as the ability to control multiple platforms via a single forward L band carrier while enabling each of the platforms a distinct return carrier on a per platform basis. For highly SWaP constrained platforms the ULW Core module provides essentially

the same data throughput as LW but in a much smaller and power efficient package.

**LAISR Antennas:** A variety of antennas associated with LW and ULW core modules, per Figures 2–3, are available and are an important part of optimizing LAISR service operation for the customer. Size and performance of each of the available antennas provide an ala carte approach to ensuring the best possible solution based on factors such as platform environmental considerations, flight profiles for aero platforms, available space and power on the platform, and desired data rate performance among other considerations.

**Latest Terminal Innovation:** LAISR ULW is the latest innovation, offering customers an ultra-lightweight option to complement the LAISR family of L-band user terminals. This terminal delivers access to high availability, high-performance, full-duplex, secure BLOS communications via a reliable, global ELERA L-band network for airborne crewed and uncrewed platforms, while reducing the total terminal weight to as low as 4.7 lbs.

LAISR ULW delivers high data rate throughput up to 3 Mbps and optimal spectrum utilization. Its highly compact core module features the ULW Radio Frequency Front End (RFFE). LAISR ULW is enabled by the Black ICE Software Defined Radio (SDR), a family of modems which offer access to the powerful and highly





efficient DVBS2X waveform in a low-SWaP form factor. The ULW RFFE delivers advanced filtering capabilities, automatic LTE/ ATC interference protection, low Error Vector Magnitude (EVM) characteristics and constant output power gain control. Similar to the LW LAISR terminals, the LAISR ULW leverages our secure MPLS terrestrial backbone.

LAISR-ULW can be implemented in a stand-alone configuration or can be retrofitted into an existing Viasat enabled aircraft with either an un-steered low-profile patch antenna, or one of three steered options: the IGA-4000, HGA-6000, or AMT-1800. The IGA-4000 (available now) and the HGA-6000/AMT-1800 (available soon) are steered directly by the ULW core module, thus eliminating the need for a separate external control device or steering inputs from the host platform. For customers that already have Viasat services-enabled aircraft, installations can be simplified through use of modification kits that enable LAISR ULW to be integrated with the existing type-approved aero antenna.

### **The future of LAISR**

LAISR LW and ULW are highly modular and adaptable. This flexibility has resulted in versions of LAISR being successfully integrated on multiple Class Two UAS platforms, multiple maritime USV platforms, and on

High Altitude Balloons over the past two years. Over the next few years, Viasat envisions incorporating LAISR capability into Global Xpress Ka-band terminals creating a highly resilient, multi-frequency, multi-service offering for our customers. Additionally, Viasat is currently evaluating the possibility of adding L-TAC functionality to LAISR, enabling existing DOD radios to share the L-band antenna associated with LAISR capability already integrated onto the platform.

Next generation LAISR services will be delivered by the I-6 series of satellites, which consist of two satellites (F1 and F2). The sixth-generation fleet will feature a dual payload with each new I-6 satellite also supporting L-band and Mil and Commercial Ka-band. I-6 F1 launched in December 2021 with the second, I-6 F2 launched in February 2023. F1 will begin offering services during 2023; F2 in mid-2024. The satellites will include a new-generation modular digital processor for offering full routing flexibility of more than 8,000 channels with a dynamic power allocation of more than 200 spot beams in L-band. I-6 F1 will deliver double the capacity per beam and double the power of previous I-4 generation of L-band satellites, which means that much more data can be carried over the same amount of bandwidth.

# LAISR LW

**Figure 2: LAISR-LW Terminals**

Type approved terminals that maximize aero platform range and reduce signatures

\* Data rates may vary and depend upon terminal type, bandwidth leased, operating location, etc.



Terminal	LAISR-LW 3010	LAISR-LW CM
Size	5.3" x 5.3" x 1.3"	12.8" x 8.0" x 2.9"
Weight	0.8 lbs.	7.8 lbs.
Total Weight	8.6 lbs.	
Data rate *	~2 Mbps	---
Max Power	---	28 VDC, 115 W
UAS Group	2	---
LRUs	2	---



Terminal	LAISR-LW 3035	LAISR-LW CM	LAISR-LW SASU
Size	12.9" x 9.3" x 1.9"	12.8" x 8.0" x 2.9"	2.9" x 2.7" x 1.8"
Weight	1.5 lbs.	7.8 lbs.	0.5 lbs.
Total Weight	9.8 lbs.		
Data rate *	2.5 Mbps	---	---
Max Power	28 VDC, 5 W	28 VDC, 115 W	28 VDC, 2 W
UAS Group	3	---	---
LRUs	3	---	---



Terminal	LAISR-LW 3040	LAISR-LW CM	LAISR-LW SASU
Size	10.1" x 10.1" x 9.7"	12.8" x 8.0" x 2.9"	2.9" x 2.7" x 1.8"
Weight	4.0 lbs.	7.8 lbs.	0.5 lbs.
Total Weight	12.3 lbs.		
Data rate *	3 Mbps	---	---
Max Power	28 VDC, 22.4 W	28 VDC, 115 W	28 VDC, 2 W
UAS Group	3	---	---
LRUs	3	---	---



Terminal	LAISR-LW 3050	LAISR-LW CM	LAISR-LW SASU
Size	18.3" x 7.6" x 2.0"	12.8" x 8.0" x 2.9"	2.9" x 2.7" x 1.8"
Weight	4.6 lbs.	7.8 lbs.	0.5 lbs.
Total Weight	12.9 lbs.		
Data rate *	3 Mbps	---	---
Max Power	28 VDC, 21 W	28 VDC, 115 W	28 VDC, 2 W
UAS Group	3	---	---
LRUs	3	---	---

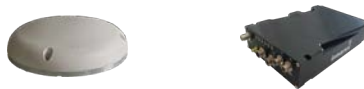
# LAISR ULW

**Figure 3: LAISR-ULW Terminals**

Type approved terminals that maximize aero platom range and reduce signatures

\* Weight does not include required heat sink/cold plate. Customer may provide their own or purchase our ULW thermal kit. Our ULW thermal kit attaches directly to the chassis bottom and weighs ~1.5 lbs.

\*\* Data rates may vary and depend upon terminal type, bandwidth leased, operating location, etc.



Terminal	LAISR-ULW 4010	LAISR-ULW CM
Size	5.0" x 5.0" x 1.0"	8.6" x 5.3" x 1.8"
Weight	0.8 lbs.	3.9 lbs.
Total Weight*	4.7 lbs.	
Data rate**	~2 Mbps	---
Max Power	---	28 VDC, 140 W
UAS Group	2	---
LRUs	2	---



Terminal	LAISR-ULW 4035	LAISR-ULW CM
Size	12.3" x 9.4" x 1.9"	8.6" x 5.3" x 1.8"
Weight	1.5 lbs.	3.9 lbs.
Total Weight*	5.4 lbs.	
Data rate**	3 Mbps	---
Max Power	28 VDC, 5 W	28 VDC, 140 W
UAS Group	3	---
LRUs	2	---



Terminal	LAISR-ULW 4040	LAISR-ULW CM
Size	10.0" x 9.7" x 10.0"	8.6" x 5.3" x 1.8"
Weight	4.0 lbs.	3.9 lbs.
Total Weight*	7.9 lbs.	
Data rate**	3 Mbps	---
Max Power	28 VDC, 22.4 W	28 VDC, 140 W
UAS Group	3	---
LRUs	2	---



Terminal	LAISR-ULW 4050	LAISR-ULW CM
Size	18.3" x 7.6" x 2.0"	8.6" x 5.3" x 1.8"
Weight	4.6 lbs.	3.9 lbs.
Total Weight*	8.5 lbs.	
Data rate**	3 Mbps	---
Max Power	28 VDC, 21.0 W	28 VDC, 140 W
UAS Group	3	---
LRUs	2	---

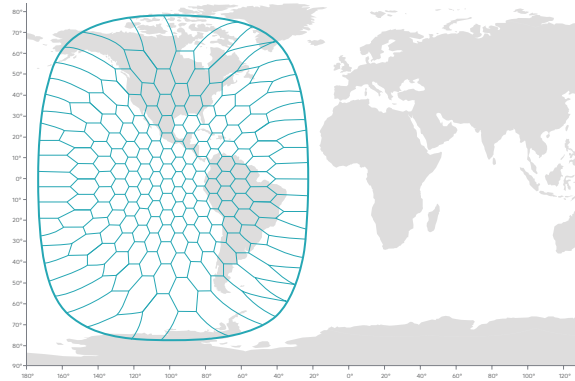
# LACE III

LACE III is a two-way BLOS communication terminal that delivers all-weather broadband connectivity to land expedition users, anywhere and anytime. Based on the LAISR capability and built for land expeditionary users, LACE III integrates the latest advancements in compact high-throughput L-band terminals, delivering efficient terminal Size, Weight and Power (SWaP), weighing only 12.6 lbs. It allows teams to receive and return large quantities of video and sensor data simultaneously, while maintaining the reliability, ease of use, low cost of operation provided by ELERA seamless, global L-band space and ground network.

## General LAISR operation example

LAISR operation includes antennas, core modules, satellite and terrestrial connectivity, service provisioning and monitor and control. In a typical scenario, a customer might partner with us to integrate LAISR on a family of Class Two UAS platforms. Based on the user requirement, the optimized LAISR solution would be agreed to by both parties, integrated onto the platform and evaluated for performance. This evaluation provides the customer understanding of the end-to-end LAISR architecture helping the customer make the best decisions for the required end to end service going forward. Figure 1 depicts how LAISR capacity is provisioned on an I-4 satellite. LAISR configuration via I-4 satellite constellation is shown in Figure 4.

**Figure 4: I4F3 AMER / Americas 98°W**



## Satellite Characteristics

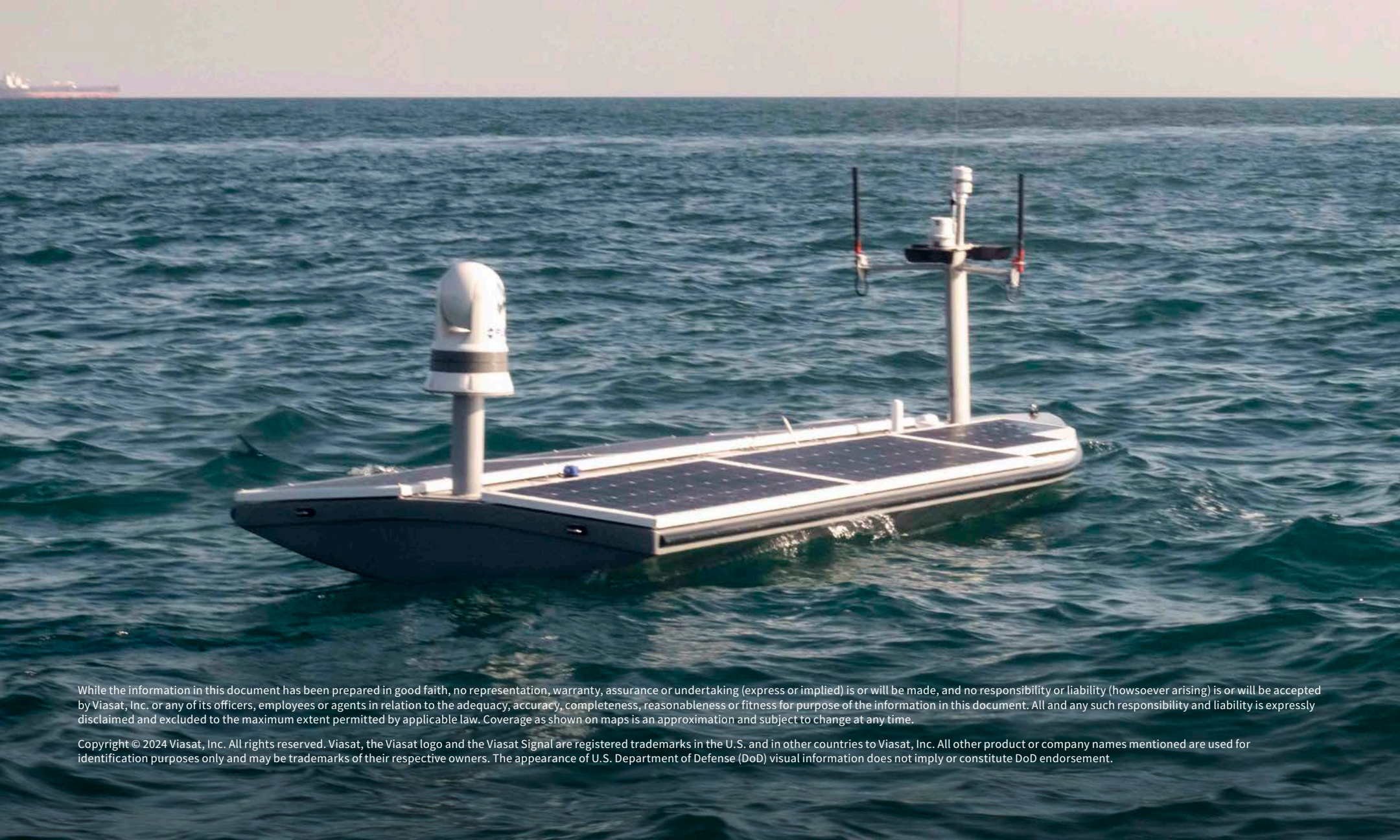
- 630 x 200 kHz channels, dynamically allocated to beams
- 256 beams
- I4 satellite channel size is 200 kHz
- Each I4 channel can be further broken down into two 100 kHz blocks
- Depending on LAISR antenna nad Core Module a single 200 kHz channel can provide data throughputs up to 850 Kbps full duplex
- Up to 4 channels can be bonded together to provide additional data throughputs up to 3.7 Mbps full duplex





# Summary

Today's rapidly changing world requires increasingly sophisticated ISR capabilities. LAISR is an end-to-end managed service for BLOS connectivity for airborne, maritime and land applications, offering very high data rates globally via low SWaP user terminals with guaranteed availability. It provides ISR, Special Operations, manufactures and integrators of the uncrewed systems and customers requiring BLOS situational awareness with small form factor platforms with low SWaP and high-speed BLOS forward and return connectivity via a seamless, global ELERA L-band space and ground network.



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