

# Seeing Beyond the Horizon

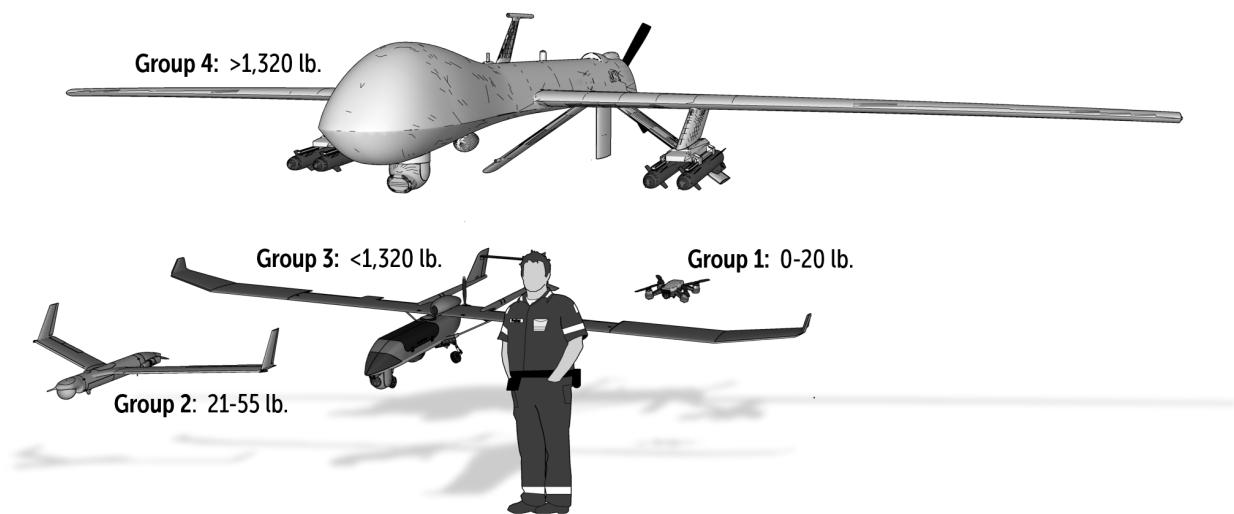
How Paradise Modems are Enabling Better Visibility in Dangerous Areas



## Introduction

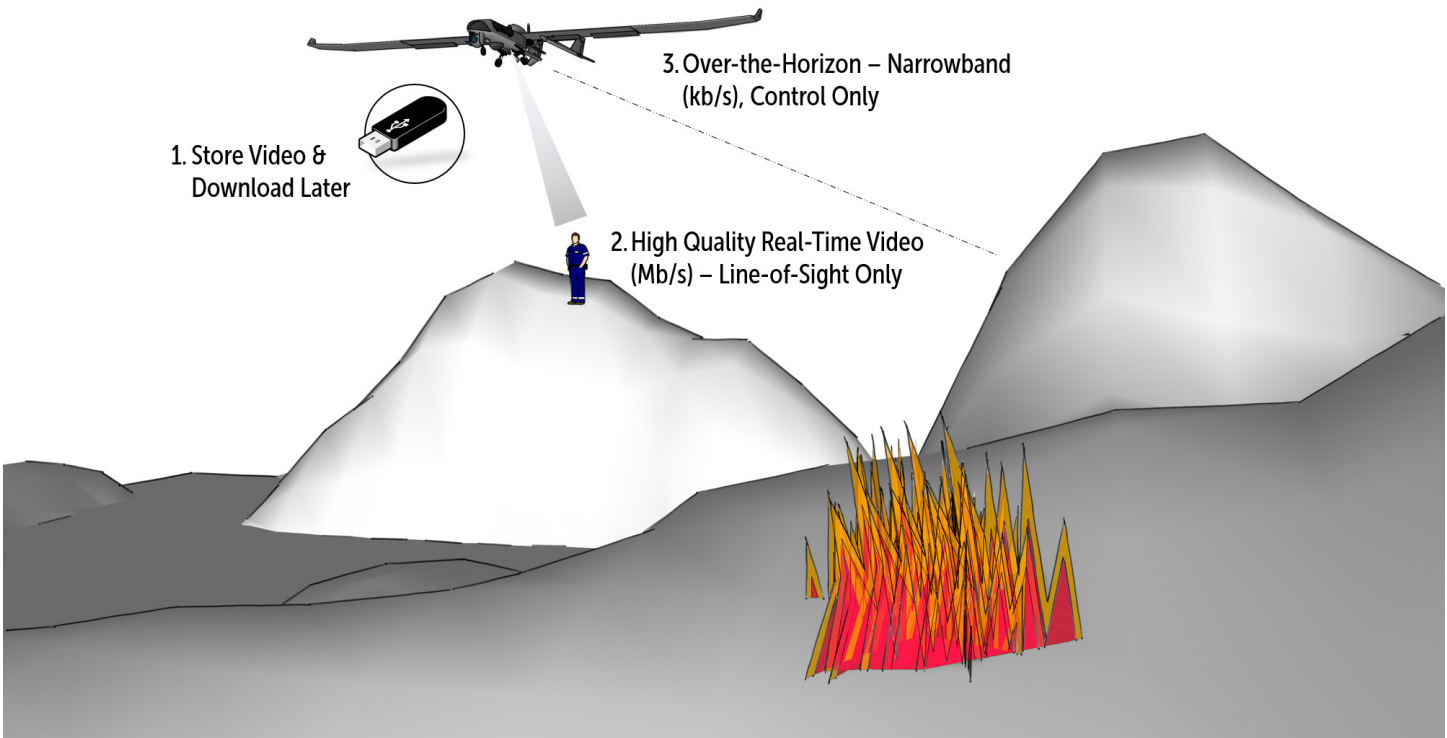
Drones are an increasingly common sight in civilian life for both work and play. In a military setting, they are crucial to keeping troops and local populations safe. In the case of natural disasters, from earthquakes, to floods, to wild fires, they are increasingly saving lives and allowing rescue coordination that was never possible before. However, making the best decisions in the moment depends upon having as detailed a view as possible, in as near real-time as possible, and often with the utmost security. It also depends upon having sensors in the right locations for as long as possible.

Very large drones have become a fixture in military operations around the world. Typically, they are very expensive and relatively few in number. There is a trend towards use of smaller drones; these can be lower in cost and therefore deployable in more civilian and military situations, and in greater numbers, than was possible before. One classification system identifies different size classes by aircraft weight, and is illustrated below.



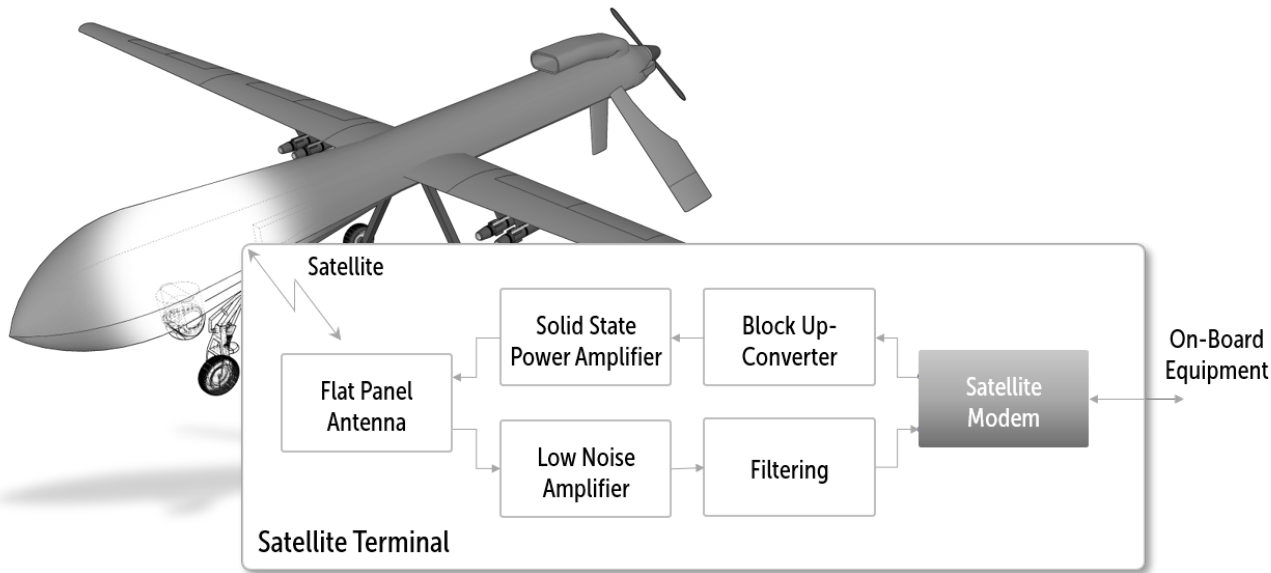
Even for the largest drones, size, weight, and power (SWaP) are critical, but for smaller Group 2 & 3 platforms, the pressure is magnified. Beyond the smaller available space and smaller payload capacity, smaller batteries mean less range unless the internal systems can be engineered to draw less power. It can also mean less ability to communicate.

An example is shown on the next page where a small drone is being used to identify the development of a wildfire to manage and coordinate a response. Even small consumer drones can transmit high quality video line-of-sight, but in many situations, line of sight is not possible. For operation of small drones over-the-horizon, links are often restricted to narrow bandwidth (kilobits per second, or kb/s), allowing control only, with video stored on-board for download once the aircraft lands – not ideal in rapidly evolving situations.



An advantage confined to large drones with large payload capacities has been the use of fast, secure satellite links to provide enough bandwidth (Megabits per second, or Mb/s) for high quality video to be delivered securely, and in real time. However, **the big problem is** that the equipment required to deliver high quality video over satellite is too large and too heavy to be flown on smaller drones.

Referred to as a satellite terminal, the collection of hardware that connects on-board equipment to a satellite network is shown below.



**Smaller, Lighter, Going More Places**

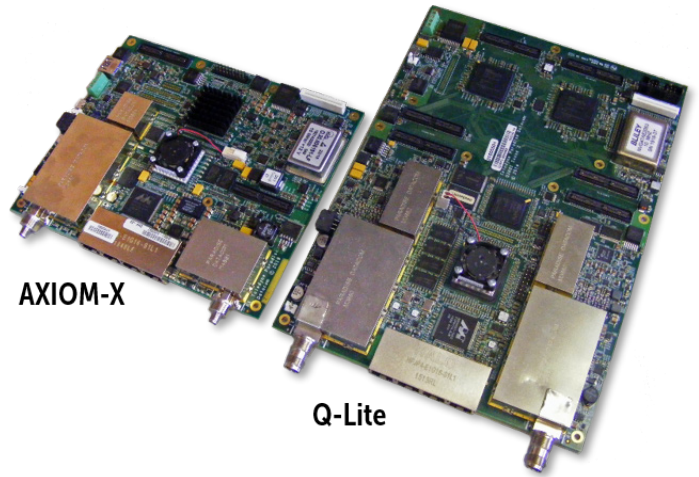
Paradise Datacom works with many providers of satellite terminals for UAVs. A close partnership with one, and their desire to push more capability down to smaller drone platforms, heavily influenced the development of the recently introduced AXIOM-X modem.

In this case, the terminal needed to be equipped with enough data throughput capability to transmit high quality video; it also had to do this securely, and with dedicated bandwidth so that the feed would not degrade or drop when the network got busy with other users. Secure, dedicated links with wide, nailed down bandwidth are hallmarks of Single Channel Per Carrier (SCPC) modems, such as those made by Paradise. This terminal manufacturer also already valued our ability to deliver small SCPC modem models with AES-256 encryption and/or WGS certification.

In applications like these, every millimeter matters, as does every gram. Shaving off size and weight brings real-time video capability to smaller and smaller UAVs, allowing them to be deployed in greater numbers, more affordably and in more situations. It was with this in mind that we developed the AXIOM-X SCPC satellite modem.

Like our industry standard Q-Lite modem, the new AXIOM-X models support DVB-S2X, and up to 256APSK. However, they are smaller and lighter, as shown in the photos and comparison table. These improvements make a material difference to our customer’s ability to address Group 3, and even down into Group 2 UAVs with their terminal, and to provide secure real-time video in increasingly small platforms.

By providing a suitable SWaP optimized modem, our partner is able to offer a capability that significantly increases the Intelligence, Surveillance, and Reconnaissance (ISR) capability within a national emergency situation or battlefield.



Parameter		AXIOM-X	Q-Lite
Max Data Rate (Mb/s)	Tx	345	345
	Rx	230	345
Weight		0.29kg	0.4kg
Size		184 x 152 x 18mm	255 x 184 x 18mm
Available Model with AES-256 Encryption		Yes	Yes
Available Model with WGS Certification			Yes

**About Paradise Datacom Modems**

Paradise modems are used wherever secure satellite links are essential. In addition to the capabilities described here, we provide encrypted and WGS modems trusted by the most demanding security and military customers worldwide. Our solutions include point-to-point, point-to-multipoint and mesh modems, and we provide solutions for rack-mount and small form-factor mobile/airborne applications.

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