

STARLINK

Starlink Increases SpaceX Recovery Fleet Throughput By 5900%, Reduces Costs By 70%

As the world's leading provider of launch services – and the only provider with an orbital class reusable rocket – SpaceX operates a fleet of 10 ocean going vessels designed to safely and reliably recover rockets and spacecraft that take both humans and cargo to orbit.

The mission critical nature of these operations places a significant demand on offshore network solutions to deliver data on the spot, regardless of operating location or weather conditions.



Three of the 10 vessels in SpaceX's recovery fleet, including one of our dronships (center) which is used to land rockets at sea.

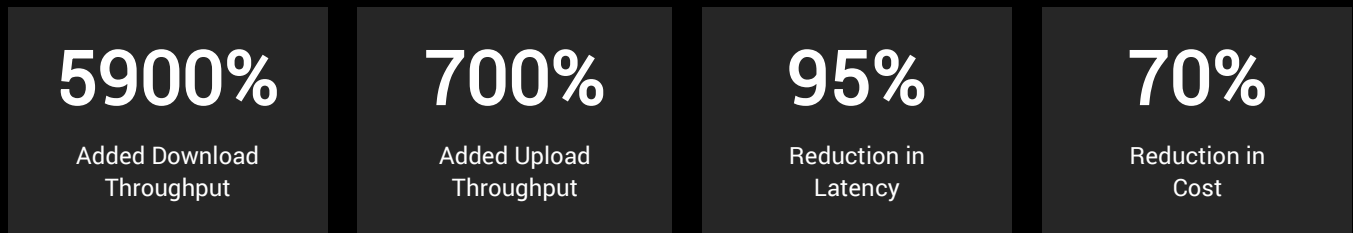
UNRELIABLE CONNECTIVITY AT A HIGH COST

Prior to Starlink, SpaceX's maritime recovery fleet relied on traditional geostationary satellite internet service (VSAT), which came with high latency, low bandwidth, and poor reliability. The systems were also challenging to install and required frequent maintenance.

At over \$165k per month for 25 Mb/s download by 25 Mb/s upload of pre-paid bandwidth, satellite internet was one of the top operating costs for SpaceX's recovery fleet. And because the vehicle can generate 100s of GBs of data, SpaceX regularly paid costly overage fees.

TRANSFORMATIONAL IMPROVEMENTS WITH STARLINK

Under an experimental license, SpaceX recovery teams had the opportunity to test and develop Starlink's maritime terminals prior to market release with dramatic results:



With a max upload speed of 40Mb/s on each installation, Starlink has enabled the transfer of 100s of GB of data within hours of the rocket landing. This was not possible with the VSAT system.

Starlink also reduced latency to just 50ms, allowing operators to respond faster for even greater control over their fleet.

MONTHLY SPACEX FLEET INTERNET COST



At a flat rate of \$5k per vessel per month, SpaceX will see a nearly 70% reduction in monthly internet cost for the fleet after implementation of Starlink, all while expanding capability and total throughput.

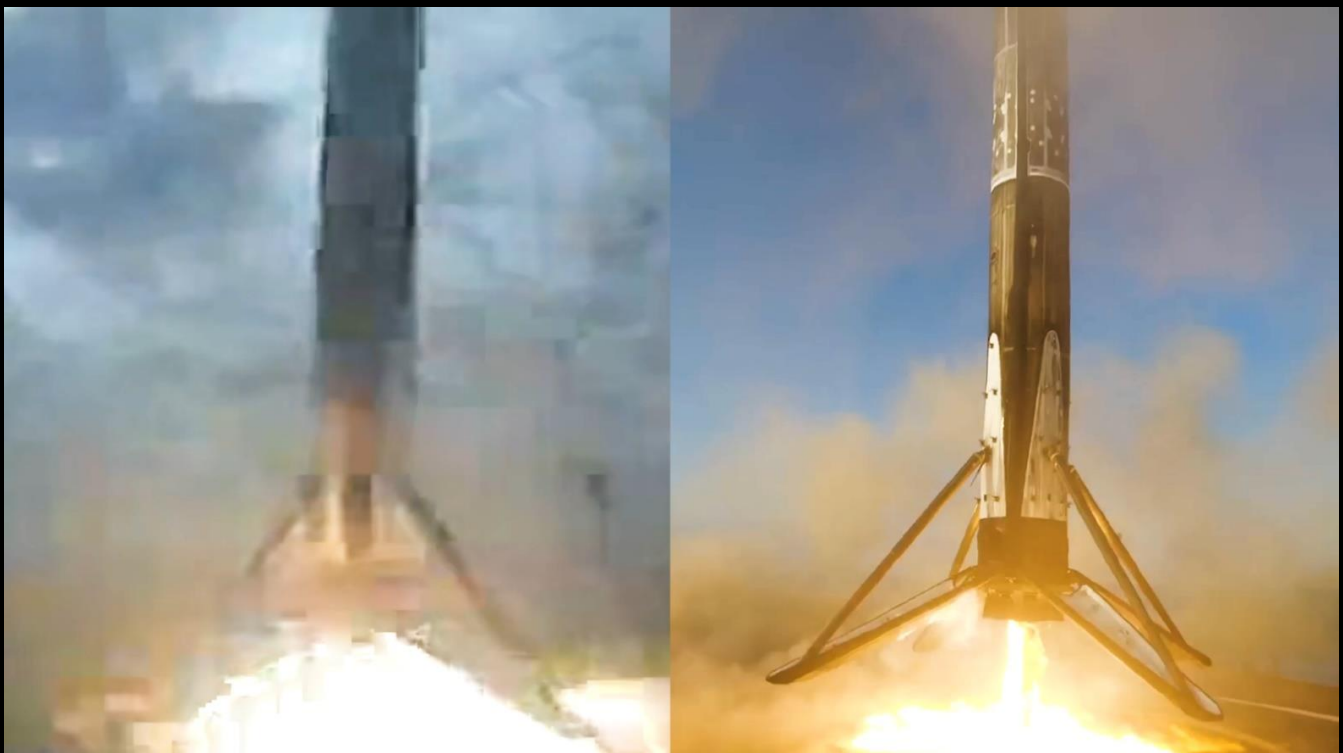
A HIGH-PERFORMANCE SOLUTION FOR REMOTE OPERATION

As the maritime industry moves toward an autonomous future, affordable, low latency bandwidth to deliver terabytes of data back to shore command centers is paramount.

SpaceX lands the first stage of its rocket on remotely operated, dynamically positioned vessels called “Droneships” stationed in the ocean downrange from the launch site. These vessels are self-propelled, unmanned systems monitored by a remote operator in the Launch and Landing Control Center. From this remote console, the operator has total visibility, control and maritime domain awareness over the unmanned vessel, as well as communication links to personnel in multi-purpose support vessels nearby.

Before Starlink Maritime, the 1-2 second latency of VSAT would cause lag and delayed feedback from gigabytes of telemetry, closed-circuit television (CCTV), and navigation data streaming from the Droneship. With a latency of 50ms, Starlink enables even greater awareness on systems offshore, empowering operators to make the most informed decisions.

In addition to latency challenges, with VSAT, the lack of bandwidth coupled with the intense vibrations from the rocket engines often led to total dropouts in video and data.



LEFT: frame of a Falcon 9 rocket landing at sea using VSAT systems. RIGHT: frame of a Falcon 9 rocket landing at sea using Starlink.

With Starlink, the throughput boost combined with exceptional connection stability enables continuous live video during rocket landings and improved the video quality.

CREW SAFETY AND MORALE

As SpaceX's launch cadence has accelerated in recent years, the time spent by the teams and vessels offshore has increased significantly. More time at sea drives additional risk to crew, and communications are key to minimizing that risk.

With Starlink, SpaceX has seen improved connection reliability, including in thunderstorms and thick cloud cover, which has helped reduce crew isolation while at sea.

SpaceX recovery members are now able to have video calls with their families during long stretches at sea. During off-time, they can stream movies and play online, latency dependent multiplayer games, all while offshore.

For more information on Starlink Maritime, visit starlink.com.

