ARTICLE

Accelerating Space Missions with Proven, Upscreened Image Sensors.

February 2026

TELEDYNE | Space Imaging

1. INTRODUCTION

The modern space market, often referred to as New Space, is changing rapidly. One of the biggest differences is a switch from being solely concerned about the reliability and performance of parts, to a trade-off between reliability, performance, time to market and cost. Striking a balance between those competing requirements is one of the most critical functions of modern New Space companies, as too rapid a development cycle could leave their systems functionally useless, while too slow of one could see their competitors blow by them and take a majority of the market share.

Figure 1. The NewSpace industry demands an approach that treats time-to-launch, low cost, and component reliability as critical parts of a mission's success.

Traditionally, space companies had to choose between two options. The first is space grade components that had extremely long lead times and extremely high price tags, but would be guaranteed to operate in the space environment. The alternative was commercial-off-the-shelf (COTS) parts that were commonly used in other industries — which made them cheap with short lead times — but with an unproven reliability when subjected to the harsh environment of space.

To bridge that gap between those choices, Teledyne has introduced the UpScreened Variants (USV) product line of image sensors designed for use in New Space applications. These sensors provide access to the most modern technologies much faster than traditional space procurement systems allow, while also offering validated components that are optimized for modern low Earth orbit (LEO) satellite constellations.

The space industry is diversifying, supplementing its bespoke 'flagship' missions with a new, complementary model: mega-constellations consisting of thousands of mass-produced satellites. While the traditional space procurement process might have worked for flagship missions, any company wishing to compete in the New Space market can't wait for the long lead times of traditional space component development.

THE RIGIDITY IN TODAY'S SOURCING OPTIONS

The "traditional space" approach to development typically involves custom development cycles that are slow, expensive and tailored specifically to fit a single mission. This has the advantage of assuring the highest level of reliability, typically by achieving a Qualified Manufacturers List (QML) Class V, which is the highest reliability standard in the semiconductor industry. However, individually qualifying every part of a 500-satellite constellation is prohibitively expensive for a New Space satellite company, where failure of one satellite has a far lower cost.

On the other hand, if the company decides to use COTS equipment, they lack the proof that it will survive the harsh radiation environment of space. COTS parts are particularly susceptible to radiation failure modes such as single event latch-up (SEL) and total ionizing dose (TID). The chances of those failure modes happening increases the longer the satellite is in orbit, creating a ticking clock of operational time before the satellite becomes unusable. These clocks can also be shortened by unavoidable events such as a particularly bad solar storm.

THE QUALIFICATION GAP

In between these two extremes, there is room for a product that combines the speed of COTS components with the radiation validation of traditional space-readiness. Teledyne's USV product lines of space-ready imaging sensors are uniquely positioned to fill that gap.

Teledyne leveraged its 40-year track record of servicing space missions to develop a product line that combines their world-class sensor engineering and manufacturing process with a qualification system that ensures they are ready for use in the harsh environment of space. By leveraging designs that were originally created for industrial, medical and science markets and then checking their ability to operate in space, Teledyne offers an imaging solution that does not require any additional non-recuring engineer (NRE) expenses for sensor development while offering significantly faster times to market as well as lower price points than traditional space-ready sensors.

In order to bridge the gap between industrial pricing and space-grade reliability, Teledyne employs a rigorous testing methodology known as "upscreening."

THE UPSCREENING PROCESS

Upscreening is a data-driven process designed to "de-risk" industrial sensors for space use. Instead of designing a custom chip for each application, Teledyne utilizes existing high performing industrial sensors originally developed for other markets and subjects them to a battery of tests to verify their ability to operate in the space environment. This allows spacecraft design engineers to select proven industrial technologies with world-class resolution, speed and interconnectability that have also been shown to withstand the rigors of space.

TWO LEVELS OF ASSURANCE

The USV portfolio provides two distinct levels of assurance, depending on the differing risk profiles of different missions:

- U1 (ESCC 9020 like flow): Designed for missions using more rigorous standards, this standard ensures the parts meet high-reliability commercial requirements.
- U3 (NASA INST 002 Class 3- tailored for image sensors): highest space level grade offered for USV sensors, aligned with rigorous NASA Class 3 requirements. It is intended for use in mission critical government and high-value commercial applications.

DELIVERABLES AND CRITICAL DESIGN REVIEWS

Teledyne's USV portfolio's value is not just in the world-class hardware, but also in the data that accompanies it. Each sensor comes with comprehensive deliverables, including lot validation testing and detailed radiation reports covering TID and SEL parameters.

This documentation is critical for program managers and systems engineers when attempting to pass their critical design reviews as part of the project timeline. With the extensive documentation provided as part of the USV portfolio, no further NRE expenses are necessary to qualify the sensors used in the design, which cuts down on testing time and overall project expense.

PRODUCT SPOTLIGHT: THE USV PORTFOLIO

Teledyne's USV portfolio features three separate image sensors, each of which is designed for a different use case in satellite and spacecraft mission design, from navigation to high-resolution Earth observation.

Ruby 1.3 USV: The guardian of orientation

Designed primarily for the essential tasks of attitude control and platform stability, the Ruby 1.3 USV sensor is a compact powerhouse.

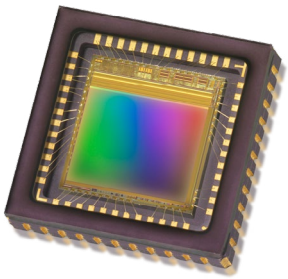

Figure 2. Ruby 1.3 USV sensor.

Primary applications	Star trackers, inspection cameras and space domain awareness
Key features	Low power consumption and small package
Mission value	Highly reliable solution for small satellites, particularly their attitude control systems, which require constant monitoring without being a huge drag on their power budget

Emerald Gen2 12M USV: The eye of automation

Satellites are becoming more and more integrated with robotic systems. The Emerald 12M USV sensor is tailored precisely to serve as a vision system for robotics and docking systems.

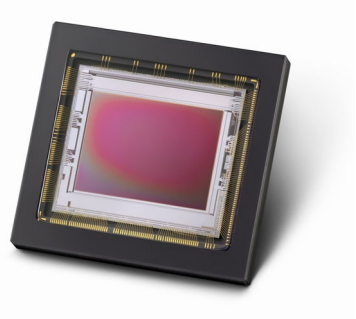

Figure 3. Emerald Gen2 12M USV sensor.

Primary applications	Docking maneuvers, space robotics and high-end situational monitoring
Key features	Medium resolution paired with low noise performance; MIPI CSI-2 interface that allows it to integrate easily with AI and machine learning processors; can use edge computing to identify hazards and targets in real-time
Mission value	Immediate and unclear understanding of the spacecraft's surroundings; easy integration with intelligent systems enables advanced robotics and interface systems

Emerald 67M USV: The flagship enabler

This sensor specializes in observing the planet below, offering unprecedented resolution and high speeds, the Emerald 67M USV is ideal for New Space priced Earth observation.

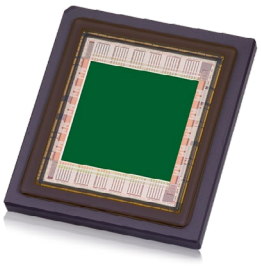

Figure 4. Emerald 67M USV sensor.

Primary applications	Earth observation and high-resolution mapping, space situation awareness
Key features	Delivers 8K images in ultra-wide format; high speeds ensure no motion blur, even when the satellite it is mounted on is moving rapidly
Mission value	Can enable "flagship" image quality with a reasonable budget, allowing a more democratic spread of high-fidelity geospatial data

STRATEGIC SUPPLY CHAIN ADVANTAGES

In a market where timing is everything, the USV portfolio offers advantages that go beyond technical specifications:

- Supply chain security: Obsolescence is a major concern for long-term programs. Teledyne manages obsolescence proactively and can provide silicon for five- to 10-year timeframes. This ensures that a constellation can be replenished with identical technology for years after the initial launch.
- Increased speed to orbit: Since testing has been previously completed, the USV portfolio sensors dramatically lower the time to acquire flight-ready hardware from years to weeks.
- Lower cost: The upscreening testing eliminates the need for NRE costs that are incurred when a customer attempts to qualify parts themselves. Teledyne spreads the cost of this qualification across its USV portfolio, passing the savings along to the customer.

THE TELEDYNE ADVANTAGE

The New Space industry demands a different approach from its suppliers; one that treats time-to-launch and low cost as critical parts of a mission's success along with the reliability of its components. The Teledyne USV sensor portfolio eliminates the risk of using unproven COTS parts to meet those demands, while also lowering the cost and time needed to qualify sensors to work in space.

For program managers and systems engineers looking to speed up their time-to-orbit, control their budget and ensure their system works correctly when it really matters, the next step is clear. Request an engineering model kit of Teledyne's USV image sensors today to begin validating them for a future mission, or contact Teledyne to learn more.

TELEDYNE | Space Imaging

For further information, please contact:

Frédéric Devrière
Marketing & Business Development,
frederic.devriere@teledyne.com