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Configurable Camera System as an Enabler of Enhanced Spacecraft Health Monitoring for Zero Debris Space Environments

Clean Space Days 2026 | Michał Kos, Scanway S.A.

Agenda

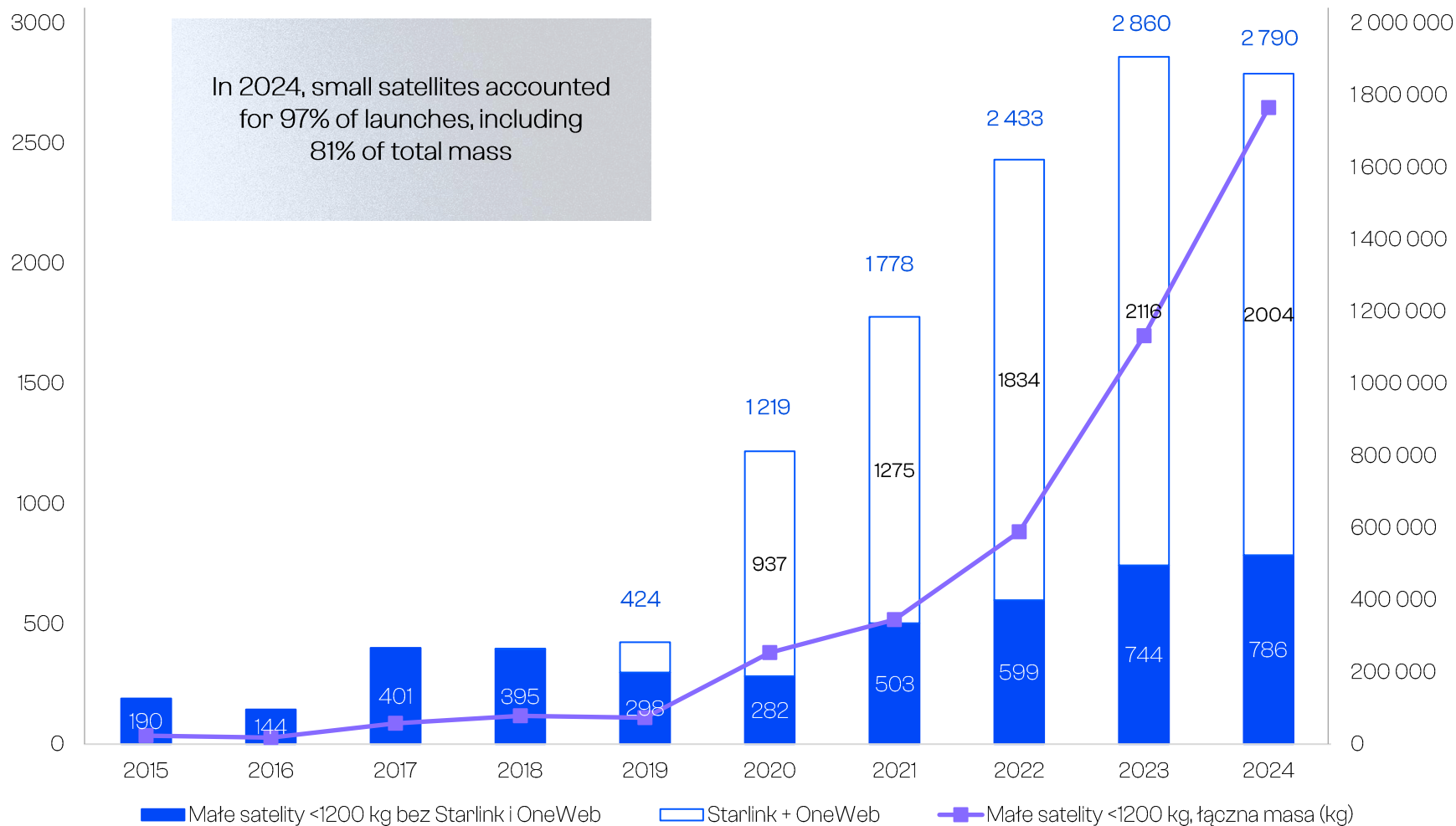
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Critical Role of In-Orbit Cameras

Small satellite market – below 1200 kg (BryceTech)

Number of satellite launches (2015-2024)



Key information

- Over 10x increase in small satellite launches over the past decade.
- Over 70x growth in total mass of small satellites (1 766 070 kg in 2024).
- Significant share of Starlink (USA) and OneWeb (FR+UK) constellations.
- Continued growth trend in 2020-2024, even excluding Starlink and OneWeb.
- Average small satellite mass
2015: 125 kg
2024: 633 kg (223 kg excluding Starlink and OneWeb).

The gap in spacecraft health monitoring

- Spacecraft operators need **visual inspection data** to support decisions across the full mission lifecycle - from deployment verification to in-orbit operations and end-of-life disposal.
- This type of data is one of the most **direct and intuitive sources of situational awareness**, especially for structural condition, appendage status and post-anomaly assessment
- Yet dedicated on-board cameras for health monitoring are still **not a standard subsystem** in many missions.
- A key barrier is the perceived **cost, qualification effort and integration complexity** of mission-specific imaging hardware.
- As debris mitigation and end-of-life requirements become stricter, this lack of routine visual monitoring becomes a growing operational gap.

Mission-critical decisions still rely on limited visual feedback, even though spacecraft increasingly need continuous insight into deployment status, structural condition and disposal readiness.

In-space imaging: critical for Swift LINK mission

- The LINK mission to boost Swift's orbit highlights the importance of on-board vision systems in robotic servicing missions.
- Cameras are essential for rendezvous, inspection, alignment and safe proximity operations around an existing spacecraft.
- Missions like this show that visual situational awareness is becoming a core capability for servicing and zero-debris operations.



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About Scanway

We are experts
in optical data processing

One of few companies worldwide developing complete optoelectronic systems for Earth Observation from orbit

We specialize in the optical data processing chain: Acquisition, Processing, Analysis, and Prediction (APAP)

Space sector – we provide hardware solutions (optical instruments such as telescopes and cameras) as well as imaging analytics

Industry sector – we offer image-processing solutions, including complete quality control systems

Strong synergy between *Space* and *Industry* – technology and expertise developed for space missions are applied in industrial solutions, and vice versa

Company goal: to provide customers with end-to-end access to critical optical data, from data acquisition to advanced analytics

We provide cameras for

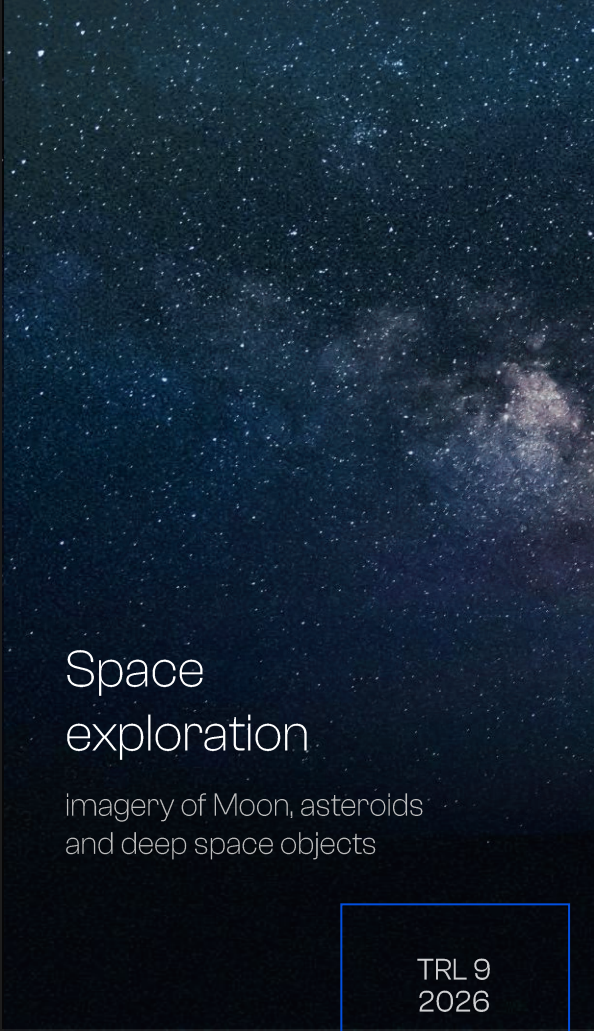
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Earth Observation

precise EO with specific
optical parameters


TRL 9
2023



Space exploration

imagery of Moon, asteroids
and deep space objects

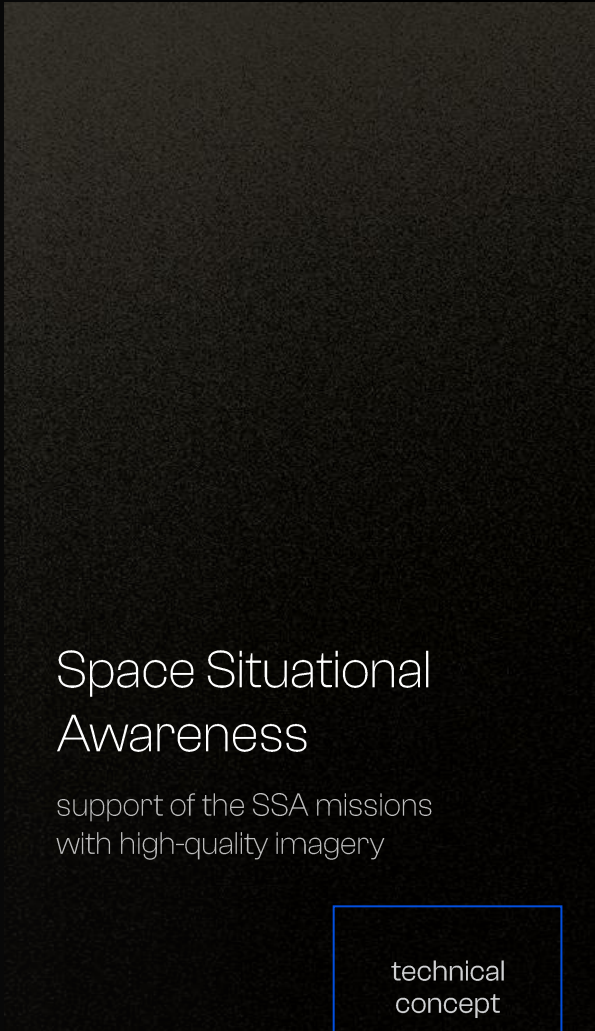
TRL 9
2026



In-space operations

satellite deployments, docking
missions, fairing separations

TRL 9
2024



Space Situational Awareness

support of the SSA missions
with high-quality imagery

technical
concept

Our missions

cameras systems for space applications

SCANWAY.

FLYTRONIC
WB GROUP

GHALAM

SPACE
INVENTOR

marble
imaging
Earth
Observation
reimagined.

GERMAN
ORBITAL SYSTEMS

ICEYE

UNIBAP
SPACE SOLUTIONS

NARA SPACE

OUR PARTNERS

last delivered

demo mission

NarSha

100 mm multi-instrument
for methane detection in
VIS, NIR and SWIR bands

SEMOVIS

450 mm multi-instrument
for VIS-SWIR real-time
Earth Observation

PIAST

2 optical instruments for
security purposes

Chors

Optical instrument for
mapping the lunar surface

STAR VIBE

Demonstrational mission
with optical instrument and
camera system

EagleEye

200 mm high-resolution
optical instrument for
civilian and security

Scanway Optical Payload[®]

for Earth Observation and other
remote sensing applications

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APERTURE

20-450 mm

GSD in RGB
from 500 km

up to
submeter

SPECTRAL BANDS

RGB/PAN
NIR/SWIR

Scanway Camera System

for space applications

TRL 9

CAMERAS

1+

INTERFACES

UART, SPI,
GigE

CAPTURE

frame & video

The most common in-space cameras applications

Achieving zero-debris objectives requires a well-informed decision chain across the full spacecraft lifecycle - from deployment verification and in-orbit health monitoring to end-of-life disposal readiness.

In this context, visual inspection data provides a direct and intuitive source of information on spacecraft condition, helping operators verify the status of critical subsystems, detect anomalies early and assess structural integrity during operations.

By making routine visual monitoring more accessible, space-qualified camera systems can support safer operations, more reliable passivation and more confident execution of post-mission disposal procedures.




SATELLITE DEPLOYMENT MONITORING



DOCKING AND RENDEVOUS SUPPORT



THERMAL INSULATION OBSERVATION



DEPLOYABLE MECHANISM MONITORING



SOLAR ARRAY HEALTH INSPECTION

Scanway Camera System

cameras systems for space applications

	SINGLECAM	MULTICAM	SMARTCAM
TYPE	Space Camera Unit	Space image Acquisition System	Space image Processing System
FEATURES	<p>camera, optics</p> <p>different interface options</p>	<p>multiple singlecam modules</p> <p>optional basic image processing</p> <p>tailored communication interface</p>	<p>multicam features</p> <p>advanced data processing</p> <p>AI capabilities</p>

SCS key features

flexible integration

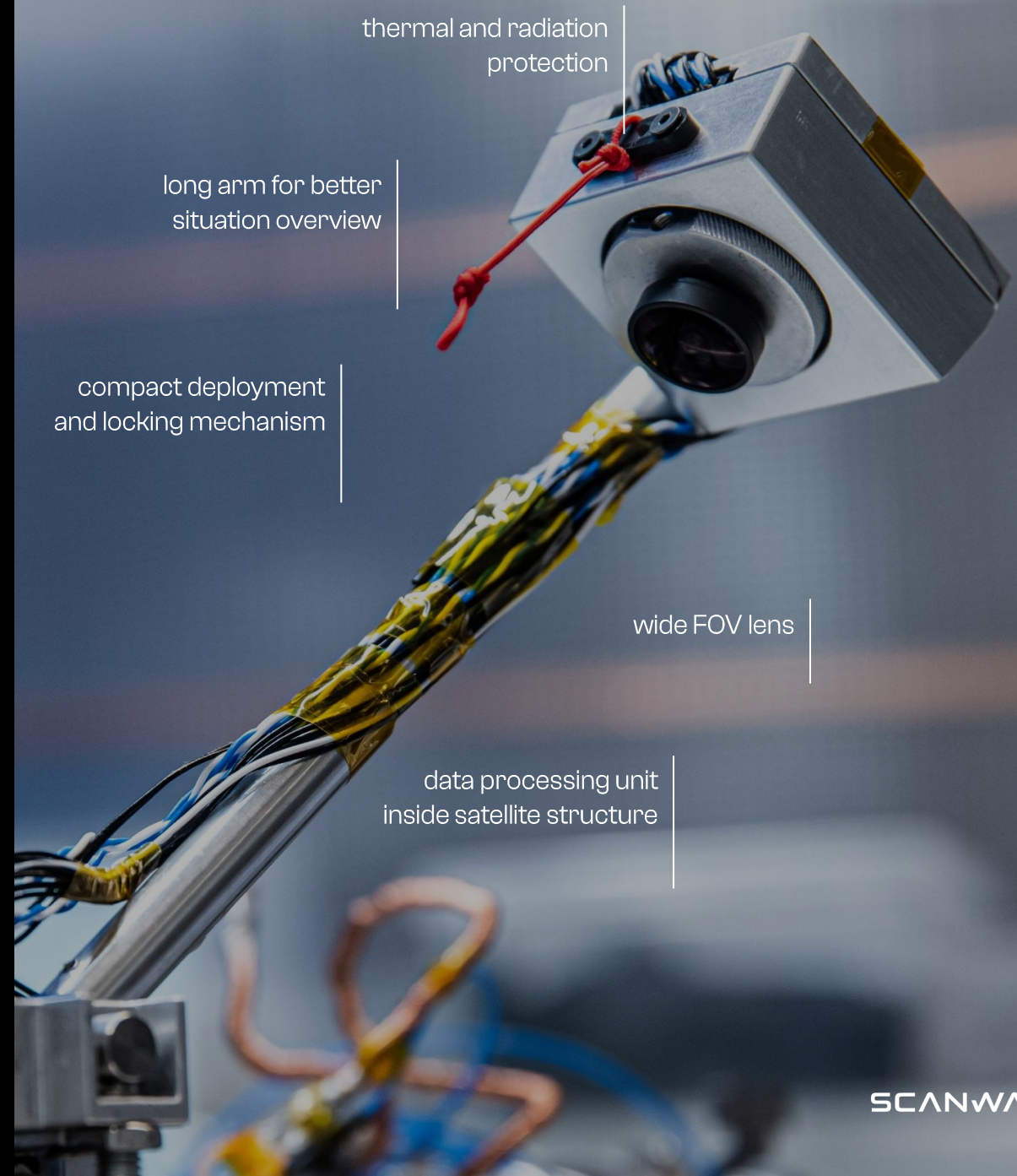
situational cameras

variety of image
formats

video acquisition

applications for on orbit
operations

multiple applications



thermal and radiation
protection

long arm for better
situation overview

compact deployment
and locking mechanism

wide FOV lens

data processing unit
inside satellite structure

2 Cam System

for YPSAT mission (Ariane 6)

Mission details

NAME	YPSat
PARTNER	ESA
STATUS	Launched 09/07/2024

Business value

YPSat mission & commercial sales to undisclosed customer

Configuration details

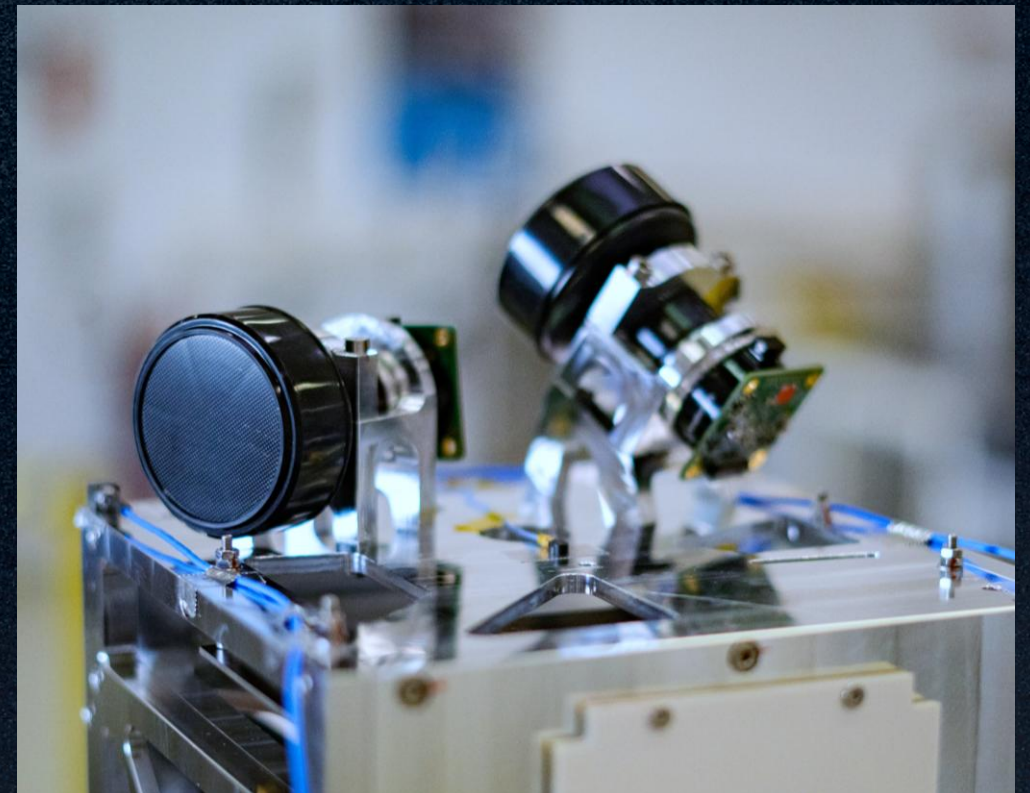
VOLTAGE & POWER	12 VDC, 3
INTERFACE	SPI, UART, Ethernet
IMAGE SIZE	4056x3040 pixels
IMAGE MODE	video, photo

NUMBER OF CAMERAS

2

FIELD OF VIEW

136 x 102 °

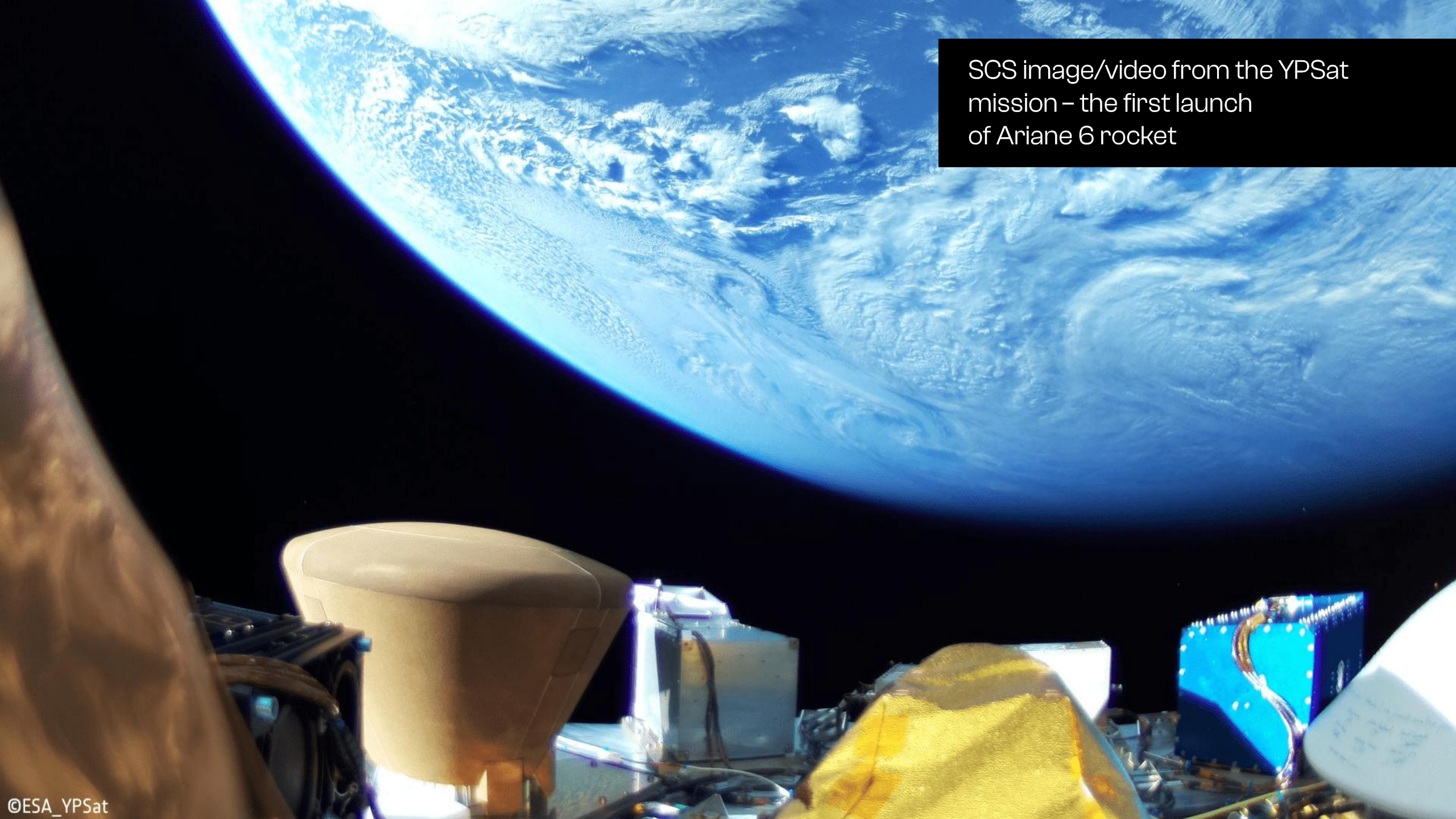


SCS image/video from the YPSat mission – the first launch of Ariane 6 rocket

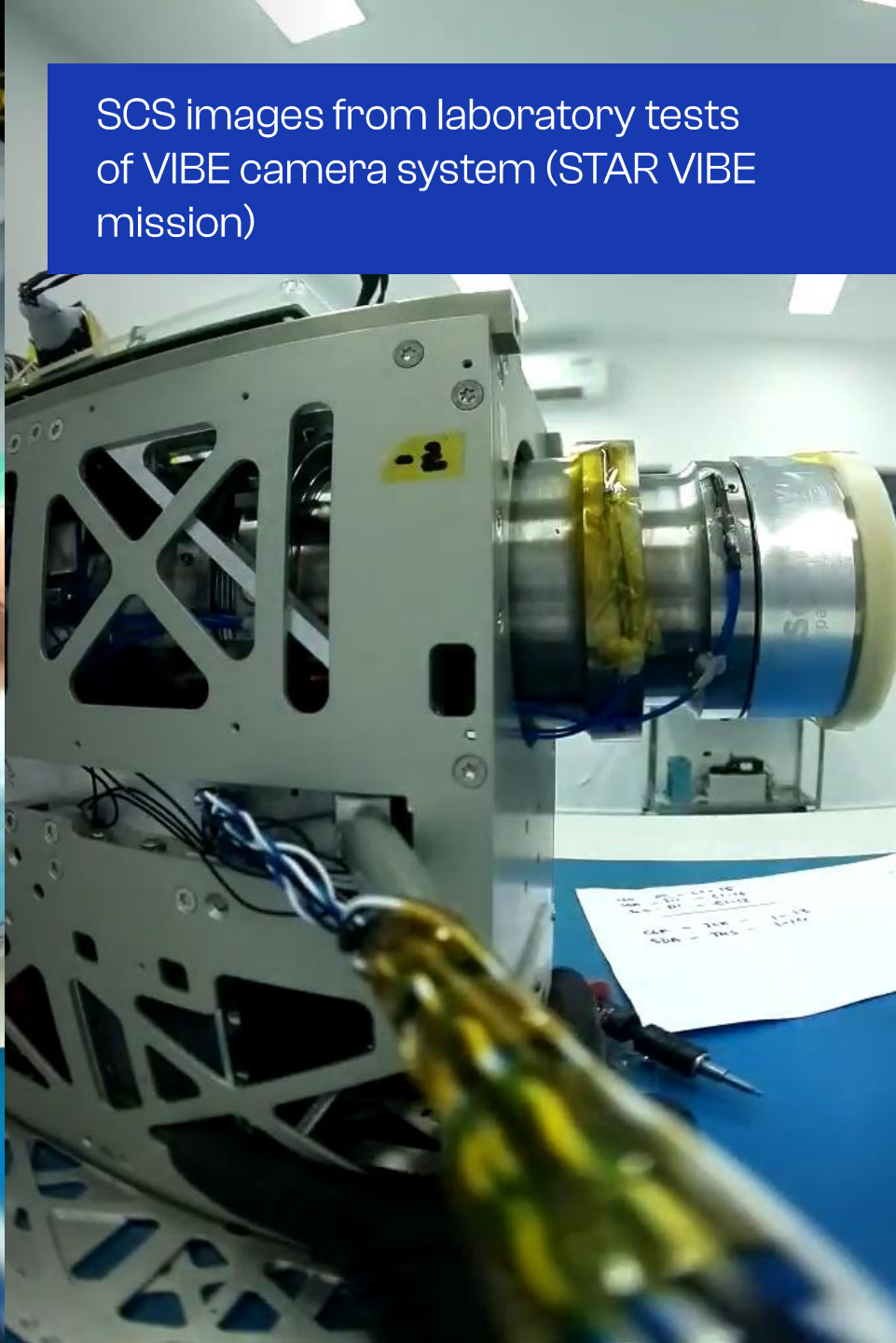
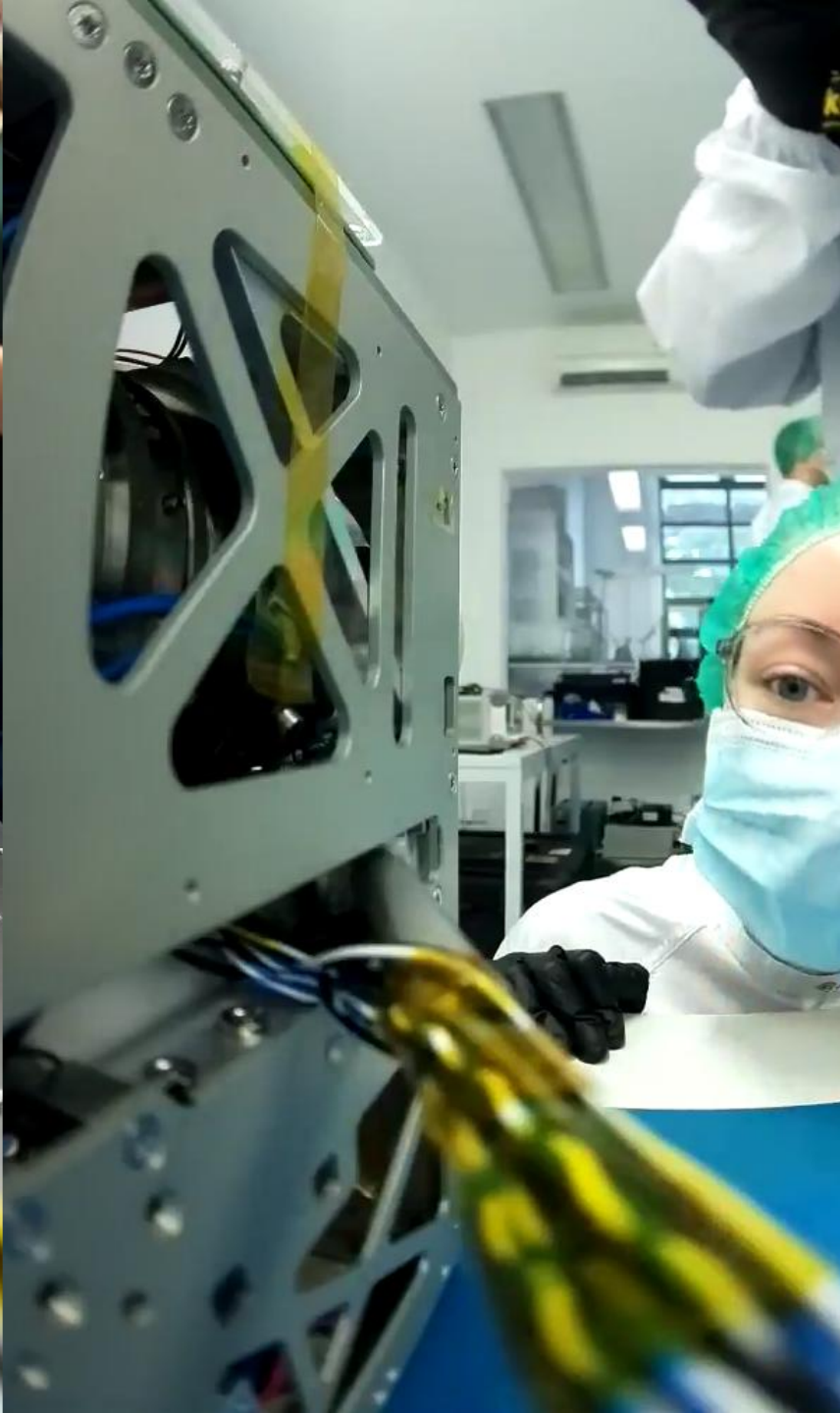
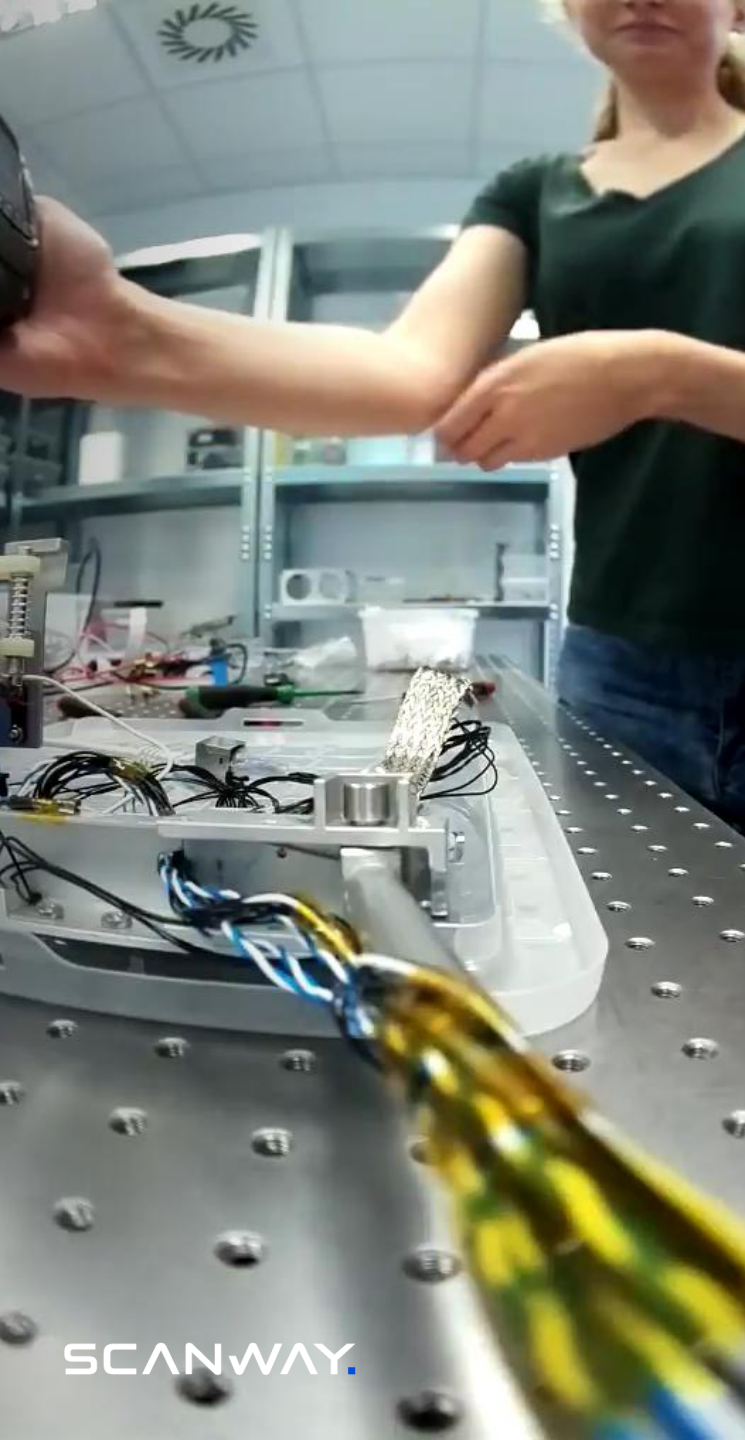


SCS image/video from the YPSat mission – the first launch of Ariane 6 rocket



A wide-angle view from the YPSat mission showing the Earth's surface from space. The Earth's blue oceans and white clouds are visible against the blackness of space. In the foreground, various satellite instruments and equipment are visible, including a large white cylindrical component, a gold-colored thermal blanket, and a blue rectangular component with a white cable. The scene is illuminated by the bright light of the Earth.

SCS image/video from the YPSat mission – the first launch of Ariane 6 rocket



SCS images from laboratory tests of VIBE camera system (STAR VIBE mission)

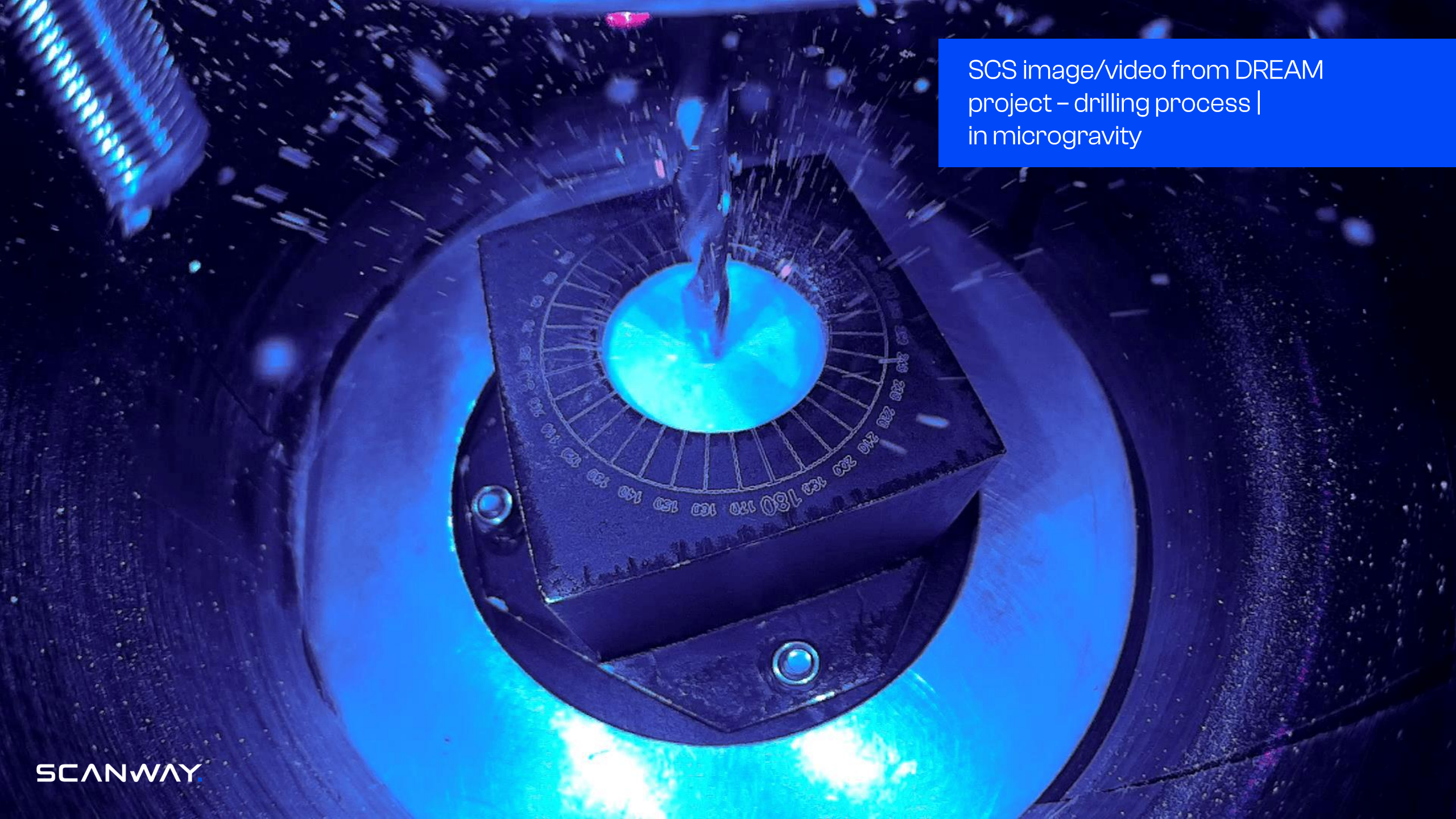
SCS image from stratospheric
test of VIBE system for STAR VIBE
mission

**DON'T
PANIC**

SCS image/video from Suborbital Express 3 Mission by the Swedish Space Corporation



SCS image/video from DREAM project – drilling process | in microgravity



SCS module for rendezvous, proximity operations and docking (RPOD) mission

Summary

- Dedicated spacecraft health-monitoring cameras are still not a standard subsystem.
- SCS lowers the cost, qualification effort and eases the integration complexity by delivering visual health monitoring as a ready, modular subsystem rather than a tailor-made, mission-specific build.
- Flight heritage (YPSat / Ariane 6, STAR VIBE) and completed environmental testing – including TID radiation – lower qualification effort and de-risk adoption.
- An automotive-adopted architecture (proven sensors, ruggedized optics, standard compute platform, long range interface) keeps cost and lead time down.
- Scalable variants and configurable optics adapt the same core to each mission - from deployment verification, through in-orbit inspection, to end-of-life operations.

SCS makes continuous visual insight into spacecraft condition a proven, easy-to-integrate subsystem - available across the full mission lifecycle and ready for stricter debris and end-of-life requirements.



Scanway Camera System – C-Mount Camera

Contact

SCANWAY.

space@scanway.pl

scanway.pl

Scanway S.A.
Wroclaw, **Poland**

—

Scanway Space Corp.
La Crescenta, **US**



Scanway
optical payloads provider