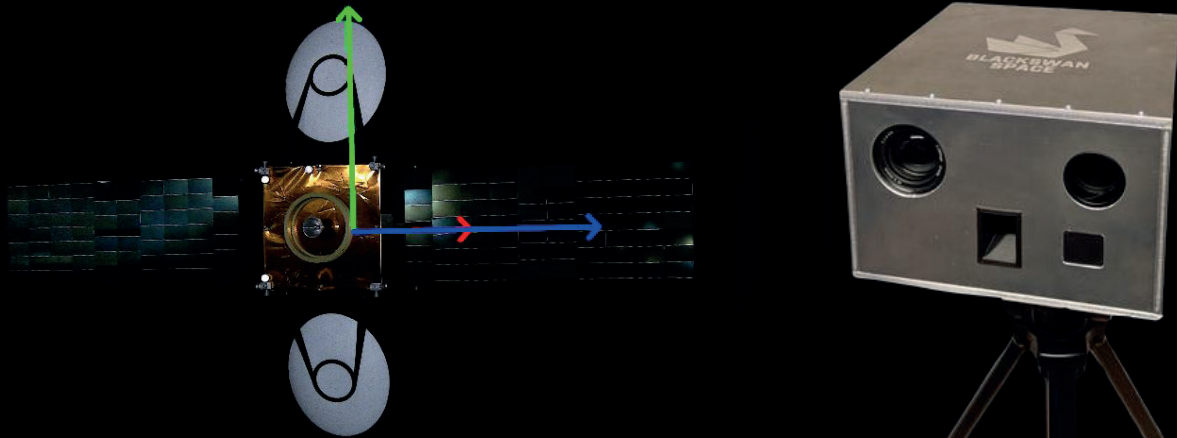


RPO Kit

Autonomy for complex space maneuvers



The RPO Kit is a COTS **plug-and-play** spacecraft payload designed to autonomously perform complex navigation maneuvers, leveraging advanced **vision-based** target identification and tracking.

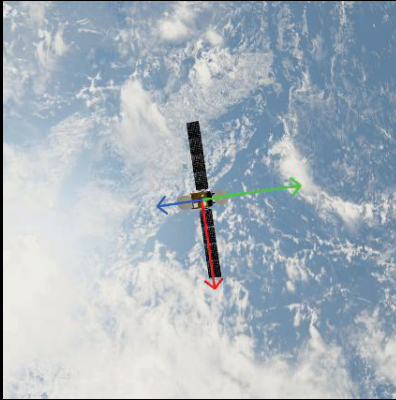
The system is tailored to enable any **rendezvous, proximity operations and docking (RPOD) missions**, including visual inspection, in-orbit servicing, space domain awareness and more.

KEY FEATURES

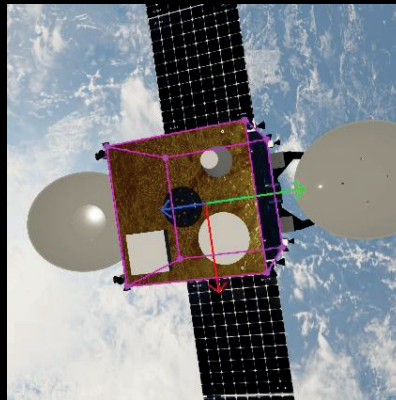
- 6DoF pose estimation
- Real-time onboard processing (10Hz+)
- Modular HW/SW architecture
- Docking accuracy: $\leq 4\text{mm}$, $\leq 0.5^\circ$
- Mass: 5-10kg
- Size: under 6U (30x20x10cm)
- Power: nominal 50W, peak 70W
- Ops range: from 0m up to 5km

Use-case study: Pose estimation of simulated satellite

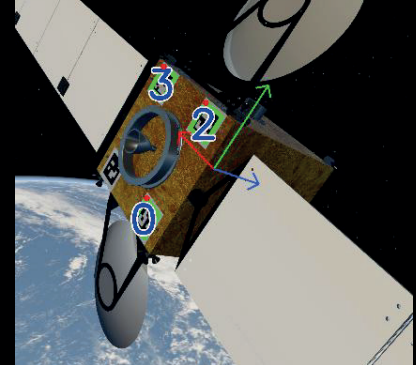
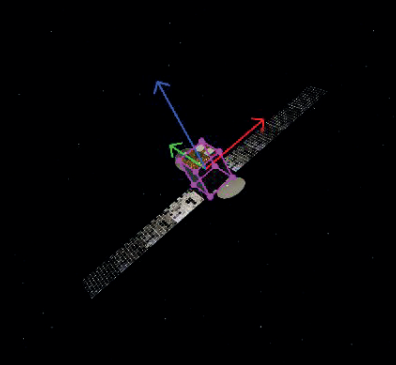
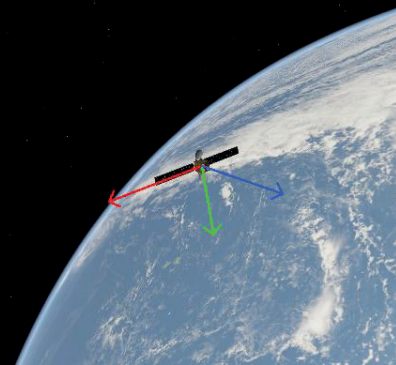
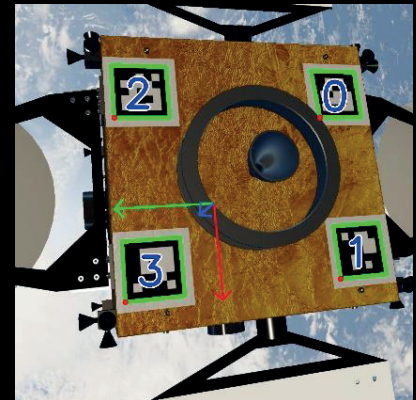
Far Range



Close Range



Capture range



A satellite target (3×1×0.5m) was modeled using Blackswan's Mission Design Simulator (MDS). The simulation produced high-fidelity, photorealistic synthetic data to validate the RPO kit pose estimation against ground truth. Images above show wide-angle (FOV 50°) captures at varying target-chaser distances in LEO. Computer vision outputs – including pose estimation, bounding boxes, and marker identification – are overlaid on each frame.

Parameter	Value / Description	
Dimensions (L×W×H)	<6U (300 × 200 × 100 mm)	
Mass	<10 kg	
6DoF Pose estimation accuracy	Far Range (target fills 2-5% of FoV)	~1 m, ~3.0°
	Close Range (5-80% of FoV)	~10 cm, ~1.0°
	Capture (> 80% of FoV)	~4mm, ~0.5°
Sensor Suite	10Hz Dual-camera system (wide and narrow FoV) with LED illumination 1.55 μm laser rangefinder	
Processing Unit	Radiation-hardened Nvidia GPU MPSoC Xilinx Zynq UltraScale+	
Communication Interface	GigE + Customization options	
Power Consumption	Nominal 50W, Peak 70W, Max Rated 100W	
Thermal Range	-40°C to +75°C	