ANTELOPE OBC

On-board computer designed to keep your mission safe

ABOUT **ANTELOPE**

Antelope on-board computer (OBC) is the combination of a **Telemetry, Tracking & Command (TT&C)** module and a **Data Processing Unit (DPU)**. It is the powerful heart of the satellite, responsible for satellite control and basic task performance such as communication handling, monitoring the satellite's subsystems, handling the classic **Fault Detection, Isolation and Recovery (FDIR)** mechanism and performing planned tasks. Thanks to the powerful **(160 GOPS) FPGA system** it can also handle complicated on-board data processing tasks enabling Earth Observation (EO), telecommunication and other demanding data processing applications.

Antelope was designed to **maximize spacecraft safety**. Thanks to customised mechanisms which protect against effects related to space radiation it can be applicable in more demanding missions. An optional layer of security is provided by the **machine learning algorithms** which, on the basis of telemetric data, **detect events which may be considered as threatening to the security of the mission**. If such an event is detected, the computer will notify the operator in order to take corrective action.

Antelope is part of the **Smart Mission Ecosystem** – hardware, software and AI-powered algorithms designed to complete your mission.

ANTELOPE IS BUILT OUT **OF 3 KEY ELEMENTS**

TT&C

The Telemetry, Tracking & Command (TT&C) module with increased reliability, **is responsible for collecting subsystem telemetry**, telecommand processing and supervising the operation of the Data Processing Unit.

Data Processing Unit

The Data Processing Unit (DPU) supporting the calculations has a computing performance of **over 160 GOPS enabling Earth observation**, telecommunication and AI-based applications.

Fault Detection, Isolation and Recovery

A mechanism of detection, isolation and error repair for nano- and microsatellites, extended optionally by the functions of point, contextual and collective Smart Anomaly Detection (SAD), allowing the **detection of situations impossible to detect by classic FDIR mechanisms**, especially while using out-of-limit (OOL) techniques.

OPERATING **SYSTEM**

Antelope is managed by Oryx - a modular flight software tool developed for the mission control of small satellites. Thanks to its modular architecture, based on building blocks, it supports the rapid development of the mission's software by using a vast library of components - **logging, scheduling, testing and communication** to name but a few.

Oryx exposes an API that can be accessed by the small Lua scripts, providing access to selected sensors and peripherals, which is definitely a game changer!

KEY **ADVANTAGES**

1 Mission Safety

- 20 kRad tolerance and SEE protections.
- Classic FDIR mechanisms.
- Optional Artificial Intelligence for preventive failure detection of all types of anomalies: point, contextual, collective.

2 Mission Power

- 160 GOPS of computing power enables exciting possibilities in Earth observation, telecommunication and AI-based applications.

3 Mission Extensibility

- Compatibility with Leopard Data Processing Unit. By pairing Antelope and Leopard you can extend the on-board processing power by 3000 GOPS to enable the processing of more demanding calculations.

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TECHNICAL **SPECIFICATION**

	TT&C	DPU
PROCESSING CORES	TMS570 Hercules microcontroller: ◆ Dual 300 MHz ARM Cortex-R5F with FPU in lock-step	Equipped with Zynq UltraScale+ MPSoC ZU2EG/ZU3EG/ZU4EG/ZU5EG: ◆ Quad ARM Cortex-A53 CPU up to 1.5 GHz ◆ Dual ARM Cortex-R5 in lock-step ◆ FPGA for custom function implementation DPU with Kintex Ultrascale is also possible on request.
MEMORY	◆ 12 MiB of MRAM ◆ ECC protected Program Flash ◆ 1-4 GiB SLC flash-based filesystem storage with ECC ◆ 256 kiB of FRAM	◆ 1-2 GiB DDR4 with ECC
INTERFACES	◆ Interfaces: CAN, I2C, GPIO, LVDS, SPI, RS422/485, UART ◆ Additional custom interfaces upon request: SpaceWire, Ethernet ◆ LVDS/RS422 interfaces compatible with X/S-Band radios and CCSDS-compatible communication channel upon request	◆ Interfaces: LVDS, SPI, RS422/485, GTY and GTH transceivers ◆ Additional custom interfaces upon request: SpaceWire
SPECIFICATIONS	◆ Supply Voltage: 5.5 to 14 V (VBAT) or 5V regulated ◆ Operating Temperature: -40 to 85 °C ◆ Supercap-powered RTC ◆ Flash FPGA for custom function implementation	◆ Supply Voltage: 5.5 to 14 V (VBAT) or 5V regulated ◆ Operating Temperature: 0 to 100 °C ◆ FPGA bitstream loaded by TT&C (reconfigurable in orbit)
SOFTWARE ECOSYSTEM	◆ KP Labs's On-board Computer Software - Oryx	◆ 64-bit Linux or bare-metal applications
FORM-FACTOR	◆ PC-104 board	◆ 70x45mm daughter board compatible with TT&C

PW-SAT3 **CASE STUDY**

Antelope will be utilized by the PW-Sat3 satellite, coupled with KP Labs's on-board computer software - Oryx. PW-Sat3 is an in-orbit demonstrator of a new cold gas propulsion and is planned to be launched at the beginning of 2023. **Antelope will be responsible for satellite management and mission safety.**

ABOUT US

KP Labs is a NewSpace company based in Poland. We deliver AI computers and software to bring autonomy to demanding space missions. We are a team of more than 50 space enthusiasts who do not think that the sky is the limit.

SOUNDS GOOD?

Contact us at **sales@kplabs.pl** to attain the benefits your organization deserves!

KP LABS | KP Labs Sp. z o.o. | st. Konar skiego 18 C, 44-100 Gliwice, Poland | +48 32 461 22 99