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The CUAVA-2 CubeSat: A second attempt to fly remote sensing, space weather and Earth observation instruments

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ABSTRACT

This paper describes the 6U CubeSat mission developed by the ARC Training Centre for CubeSats, UAVs, and their Applications (CUAVA) at the University of Sydney. CUAVA-2, the second CubeSat project following the CUAVA-1 mission, builds upon lessons learned from its predecessor. CUAVA-1, the first satellite launched by CUAVA, carried first-generation payloads for Earth observation goals and technology demonstrations but experienced communication difficulties. A fault root analysis was performed on CUAVA-1 to inform the design of CUAVA-2. The CUAVA-2 satellite incorporates a GPS reflectometry payload for remote sea state determination. It also includes a hyperspectral imager for applications in coastal and marine, agriculture and forestry environments, urban areas, water hazard assessment, and mineral exploration, as well as secondary payloads for technology demonstration and space weather study. This paper discusses the fault analysis findings, lessons learned, and design inputs from CUAVA-1, showcasing their integration into the CUAVA-2 satellite, which is scheduled for launch in February 2024.

INTRODUCTION

The ARC Training Centre for CubeSats, UAVs, and Their Applications (CUAVA) (1) was established in December 2017 with the goal of training and developing an Australian workforce in sustainable, advanced manufacturing, space, and UAV industries of national significance. The Centre focuses on various areas, including Earth observations, GPS, satellite subsystems, as well as space situational weather and space situational awareness. Since its establishment, CUAVA has launched a 3U pathfinder mission named CUAVA-1 (2). The primary objective of CUAVA-1 was to carry first-generation payloads created by CUAVA partners, with a focus on Earth observation goals and technology showcases. This 3U CubeSat was deployed into orbit from the Japanese Experiment Module (JEM) (3) on 6th October at 21:55 (AEDT) on the International Space Station (ISS). Unfortunately, the CUAVA team didn't receive any meaningful data from the CUAVA-1 satellite after the deployment. On the 2nd Sep. 2022, we were notified that the satellite has re-entered. We have conducted a fault root analysis for the CUAVA-1, which yielded some design inputs for our future satellite missions.

Following the CUAVA-1 mission, CUAVA-2 (4) is the second CubeSat project undertaken by the CUAVA centre. CUAVA-2 is a 6U CubeSat designed with two primary payloads: a hyperspectral imager and a GPS receiver. The science and technology goals of these two payloads are

- **GPS Reflectometry Receiver:** To demonstrate the GPS reflectometry payload developed by the University of New South Wales (UNSW). The payload will measure GPS signals scattered off the sea to determine the sea state remotely.
- **HyperSpectral Imager (HSI):** To demonstrate a novel hyperspectral imager to provide data for applications across agriculture and forestry, coastal and marine environments, urban areas, water hazards and mineral exploration.

There are also seven secondary payloads for technology demonstration and space weather study. The payloads are listed below.

- Electro Permanent Magnetorquer (EPM) payload
- Radiation Counter and Data over Power-bus (RC and DoP)
- Cross Reference Of Stellar System (CROSS)
- Charge Exchange Thruster (CXT)
- The Electron Density and Debris Instrument (EDDI)
- Perovskites in Orbit Readiness Test (PORT)

This paper will report the CUAVA-2 design status and measures taken to mitigate risks identified from the CUAVA-1 mission. The CUAVA-2 satellite has completed its critical design review stage and is scheduled to be launched to a Sun-synchronous orbit (SSO) in February 2024.

SATELLITE BUS DESIGN

Bus selection

The main design driver for the CUAVA-2 mission is to use the existing CUAVA-1 satellite bus where possible while improving the satellite capability demanded by the primary payloads. Driven by the HSI and GPS reflectometry instrument, we have increased the pointing accuracy and downlink communication rate by upgrading the ADCS system (3-axis medium wheel ADCS package with star tracker) and increased the communication rate by adding an S-band radio (up to 5MBd or 15Mbps in QPSK). The rest of the bus system is selected to be similar to the CUAVA-1 satellite to minimize the software design and testing effort for the mission.

Lessons learnt from the CUAVA-1 mission

Another design driver for the CUAVA-2 satellite is to mitigate risks identified in the CUAVA-1 mission. As discussed in (4) some of the highlighted failure root causes include:

- the high computational burden imposed by the operating system on OnBoard Computer (OBC);
- a vulnerable SD card and boot sequence;
- last minute double tie-down requirement for antennas imposed by the launcher;
- Electrical Power System (EPS) compatibility issue with the rest of the satellite bus;
- potential current leakage from a payload switched ON at boot;
- not enough margin for the solar panel sizing;
- insufficient testing time (and COVID impact);

Some of the risk mitigation strategies are listed as below:

- introduce a payload computer to reduce the computational burden on the OBC;
- move the graphical software interface off-line to the ground station computer with the revised software operation system;
- implement a recovery and dual boot sequence;
- change the EPS subsystem for better capability and reliability;
- additional power margin added during solar panel sizing

These changes address and should resolve the CUAVA-1 risks identified above.

CUAVA-2 Satellite bus design

Based on the design drivers stated in the previous sessions, the Commercial-off-the-shelf (COTS) products selected for CUAVA-2 are listed in Table 1.

Table 1: CUAVA-2 bus components

Subsystems/Functional components	Component Description
On-board controller (OBC)	ISIS iOBC Onboard computer
Full duplex UHF/VHF transceiver	ISIS.TrxVU full duplex radio
Deployable VHF/ UHF antenna system	ISIS.ANTS deployable antenna system
Electrical power system (EPS) and battery pack	ISIS Compact EPS Type C (8 outputs and 4 battery pack, 45Whr)
S-band communication system	Satlab SRS-4 Full-duplex High-speed S-band Transceiver
S-band Antenna	IQ Spacecom S-band patch antenna
Solar Panels	2 x ISIS 6U Solar Panel 1 x ISIS 2U Solar panel
Attitude Determination and Control system (ADCS)	CubeSpace CubeADCS 3-axis reaction wheels (1-3Deg pointing accuracy)
Satellite Structure	ISIS 6U CubeSat Structure

Figure 1 shows the internal design of the CUAVA-2 satellite. The satellite bus takes approximately 2U. The HSI and the GPS reflectometry payloads take 1U each and are positioned in the top row of the satellite.

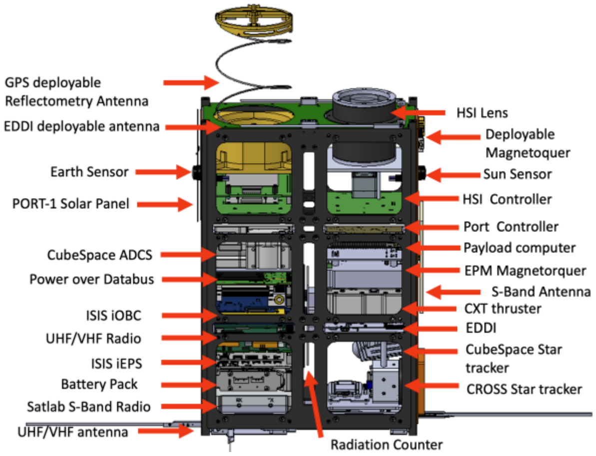

Figure 1: CUAVA-2 system diagram.

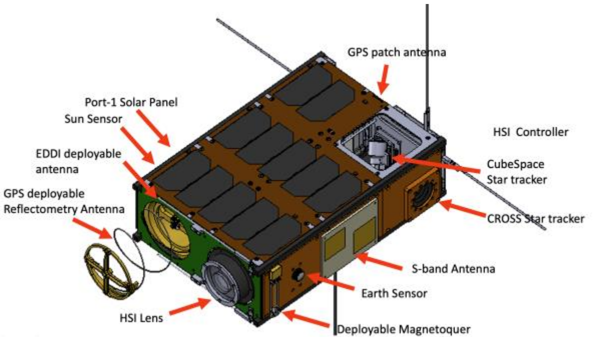

Figure 2: CUAVA-2 exterior design

Figure 2 shows the exterior design of the CUAVA-2 satellite. The satellite is covered with two 6U solar panels, and one additional 2U side panel, providing from 5.78 W (worst day) to 6.46 W per orbit on average. One 6U panel has a customized cut-out to provide an aperture for the CubeADCS star tracker.

PAYLOAD COMPUTER DESIGN

As the CUAVA-2 OBC does not have the capacity to control and interface with all eight payloads we intend to carry, we will use an in-house designed payload computer and payload interface board to provide power and data communication to all payloads.

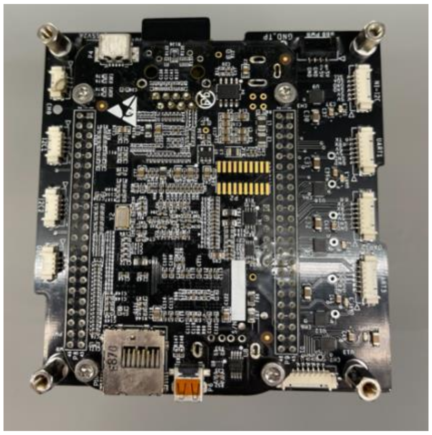

Figure 3: CUAVA-2 payload computer.

The payload computer board (Figure 3) is designed to host a BeagleBone Black board. It breaks out three UART channels and three i2c channels (with isolators at each i2c port). It also takes a 5.4V EPS power input and distributes the power to seven independent power channels. Note that the power channels on the payload computer are designed to have one payload switched on at one time, except for the star tracker and EPM payload, which are designed to be operated simultaneously. This design complies with our CONcept of OPeration (CONOP) and avoids unintended current draw due to accidentally switching on more than one payload.

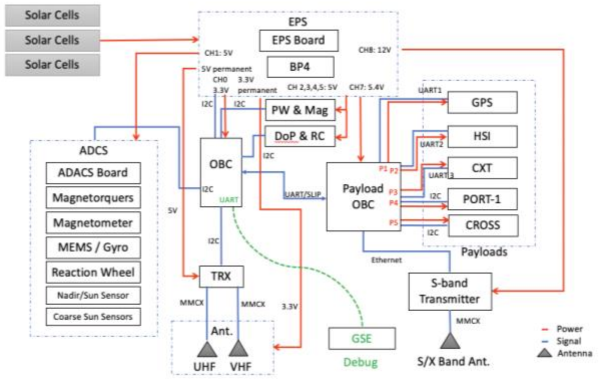

Figure 4: CUAVA-2 system diagram.

The satellite OBC and the payload computer are connected via the Serial Line Internet Protocol (SLIP) over the UART interface as a point-to-point Ethernet connection. The payload computer could also serve as a redundant spare for the satellite OBC and form a mesh network. An interface control document was designed for all payload providers to ensure smooth integration. A system diagram for the CUAVA-2 satellite is shown in Figure 4.

PRIMARY PAYLOADS

CUAVA-2 GPS reflectometry payload

The CUAVA-2 GPS reflectometry payload is developed by a team from the Australian Centre for Space Engineering Research (ACSER) (5) at the University of New South Wales. The CUAVA-2 GPS payload will be used to measure GPS signals scattered off the sea to determine the sea state remotely.

The payload comprises two Kea GPS receivers with flight heritage from the UNSW-EC0 (6), INSPIRE-2 (7; 8) and CUAVA-1 satellite missions.

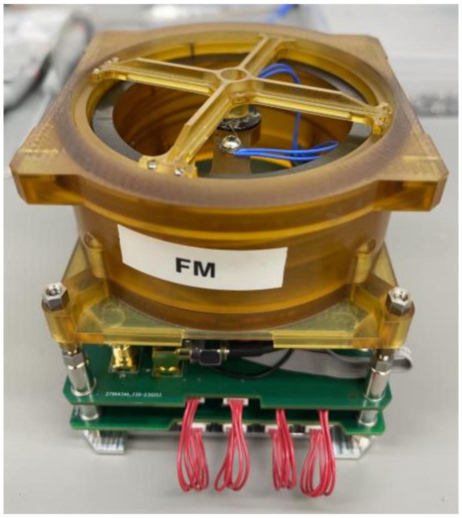

Figure 5, CAD render of GPS reflectometry payload with deployable LHCP antenna

One Kea is connected to an RHCP GPS patch antenna that is body mounted on the bottom side of the spacecraft, which provides positioning, navigation, and time synchronisation to the payload. The other Kea is connected to a deployable LHCP antenna made by Helical Communications Technology (HCT) mounted on the top side of the satellite (Figure 1) as the reflectometry antenna.

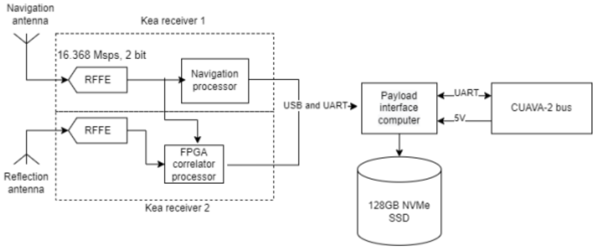

Figure 6, Block diagram of the GPS reflectometry payload.

The two Keas are attached to an interface board controlled by a Raspberry Pi Compute Module 4 (as illustrated in Figure 13). This interface board controls both receivers and provides temporary data storage before transfer to the bus and power to the receivers.

During operation (Figure 7), the RHCP antenna will be zenith-facing for optimal reception of four or more GPS L1 satellite signals, and the deployable reflectometry antenna will measure the reflected signal from the ocean. The reflected signals will be correlated with a replica of the navigation signals, generating delay-Doppler maps (DDMs) at a rate of 1 DDM/sec for each of its 4 correlator channels. The DDMs will be downlinked to the ground to determine the sea states.

Hyper-Spectral Imager (HSI)

The CUAVA-2 HSI instrument is the second iteration of a full CubeSat-ready hyperspectral imager. This payload is designed to demonstrate a novel hyperspectral imager and to provide data for applications across coastal and marine, agriculture and forestry environments, urban areas, water hazards, and mineral exploration. Specifically, the CUAVA2-HSI has two primary goals aligned with CUAVA projects.

- Blue Carbon: The overarching scientific questions are what the potential carbon storage of coastal ecosystems is (mangrove, salt-marsh, seagrass); how this carbon storage varies spatially and temporally (seasonally and inter-annually) both within and between ecosystems; and how these ecosystems will respond to climate change stressors.
- Cal/Val (Post-Launch): Calibration and validation will assess and characterize the in-orbit radiometric quality and stability of the sensor for the life of the mission. The outcomes from this research will be used to re-calibrate images due to sensor degradation or orbital drift over time and to improve sensor design for future missions.

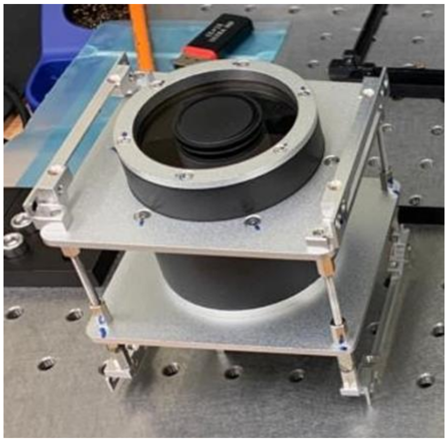

Figure 7, HSI Engineering model for CUAVA-2.

The HSI combines an in-house design for the telescope lens assembly with a Ximea sensor. The Optical Telescope Assembly (OTA) shown in Figure 5 uses the optics from an ‘off-the-self’ catadioptric telephoto lens for mirrorless cameras but with a re-engineered assembly suitable for use in a CubeSat. The 300mm F/6.3 assembly provides a field of view of 20km and a 10m ground sampling distance (GSD) when combined with the hyperspectral sensor. This sensor is an area line-scan camera from Ximea GmbH that incorporates a detector from IMEC Hyperspectral. The IMEC detector uses wavelength filters along rows of pixels, such that a single image captures spatial information on both axes, but along one axis the spectral information varies. Scanning this along the ground like a traditional linescan/pushbroom sensor builds the full hyperspectral data cube. The sensor CUAVA2 is to use 150 bands over the 470-900nm range.

SECONDARY PAYLOADS

The CUAVA-2 satellite was designed with 7 secondary payloads at the CDR stage. As recommended by the CDR review team, one of the payloads, a 25m space tether was removed from the payload list due to material supply shortage and the tight mission schedule. There are still 6 secondary payloads, as briefly discussed below.

Electro Permanent Magnetorquer (EPM)

The Electro Permanent Magnetorquer (Figure 8) is a CubeSat-ready magnetorquer designed by a team at the School of Aerospace, Mechanical and Mechatronic Engineering (AMME) at the University of Sydney.

Figure 8: EPM Engineering model for CUAVA-2.

Unlike conventional magnetometers, the electro-permanent magnetorquer utilizes coiled hard magnetic materials as the core. A driving circuit is designed to alter the dipole moment of the magnetorquer by altering the current through the coils. The experiments show that the electro-permanent magnetorquer can generate 1.3 Am^2 dipole moment in either direction. The magnetorquer works in pulse mode to adjust the dipole moment, requiring a maximum energy of around 0.75 Joule per pulse. A single-axis detumbling experiment has been conducted using only one torque rod on the air bearing table inside an in-house manufactured Helmholtz cage. The experiment results show that the magnetorquer can detumble with a 0.061 kgm^2 moment-of-inertia from an initial speed of around 27 deg/s to zero within 800 s, and total energy of 82.92 Joule was consumed for the detumbling experiment. A single torque rod single axis pointing experiment was also conducted with a sliding mode controller on the same platform. The results show that a single torque rod can achieve a +/- 0.4 deg pointing accuracy for a specified system configuration.

The EPM payload serves as a technology demonstration payload. It has great commercial potential, and we intend to evolve it into a product once it has gained flight heritage.

Radiation Counter and Data over Power-bus payload

The Radiation Counter (RC) and Data over Power-bus (DoP) payload were developed by a team at AMME at the University of Sydney. This payload will be used to 1) measure space weather via high-energy X-rays and gamma rays resulting from energetic particle impacts with the CubeSat; 2) Demonstrate a novel Data over Power-bus solution on a CubeSat.

The RC and DoP have a similar design to the corresponding payload for the CUAVA-1 mission (2).

with reduced size and power consumption. The radiation counter unit is designed with 3 sets of solid-state BG51SM radiation detectors which are used to detect both beta and gamma radiation, including X-rays.

The DoP system contains four data nodes. Each data node contains a switchable regulator and a demodulator. After data is collected by the radiation detector, this data will be used as an early DoP system. It will be carried on the power transmission line and demodulated. We have redesigned the microcontrollers for lower power consumption and smaller form factor. Flying this (improved) payload will enable us to study space weather and radiation effects for LEO satellites and to demonstrate the novel DoP system.

Figure 9 Engineering Model of Data over Power-bus (left) and Radiation Counter (right).

Cross Reference Of Stellar System (CROSS)

CROSS is designed to demonstrate a wide-field-of-view (WFOV) star tracker (Figure 10). CROSS is designed to be a compact and cost-effective star tracker that removes barriers for CubeSats to achieve more complex space missions requiring higher pointing accuracy (9). We aim to use the CUAVA-2 mission to rapidly evolve and mature the CROSS payload into a commercial product.

The optical subsystem consists of a FLIR Black Fly-S 5.0MP monochrome camera with a 20° Field-Of-View (FOV) S-Mount lens. A baffle was designed in-house to reject and absorb stray light from the Sun, Moon, and Earth. Flying this mechanical assembly allows for thermo-mechanical validation of the system in the space environment and determining the effects of vibrations and thermal expansion and contraction on the alignment of the camera with respect to the satellite.

The computing subsystem of the payload features a PocketBeagle, connected to the camera via a USB 3.0 interface and to the satellite OBC via Inter-Integrated Circuit (I^2C) communication system.

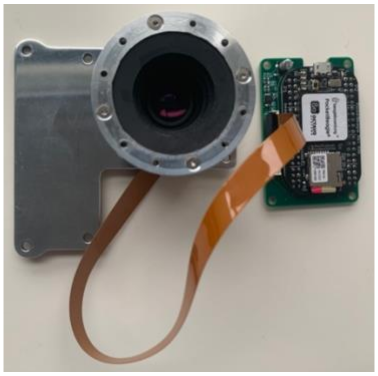

Figure 10, CROSS Engineering model for CUAVA-2.

The full end-to-end software of a single star tracker shall be tested in the CUAVA-2 mission, with the ability to store image data on the PocketBeagle. Planned mission tests include a commissioning phase, basic functionality, and full performance tests. Depending on the test, system telemetry, measured attitude, and raw images will be saved for downlink and analysis. Some or all of these data should substantially improve research outcomes, allowing for improvements to both software and hardware for a final system.

The CROSS team has spun off the company CROSS Space PTY LTD from the University of Sydney. It may develop advanced optical navigation sensors, including the provision of star, horizon, celestial and space domain awareness sensors, that aim to serve national and international markets using a low-cost and modular approach.

Charge Exchange Thruster

The Charge Exchange Thruster (CXT) is a novel electric propulsion system invented and developed at the University of Sydney (10). The device uses fundamental atomic processes within a discharge plasma to produce a plume of very high-velocity neutral particles (>100km/s), generating thrust without the need for an external plume-neutralisation systems.

The CXT aims to address the shortage of available electric propulsion systems for nano-scale CubeSats. The CXT is simple to manufacture using standard machining techniques and is highly flexible, in principle offering a wide selection of viable fuels and a broad range of operational powers (<1 Watt – 100 Watts).

Figure 11, CXT Engineering model for CUAVA-2.

A photograph of the payload is given in Figure 11. The payload consists of a single, self-contained unit with dimensions of 100mm x 90mm x 37mm, and ~350g. Laboratory testing of the thruster system has demonstrated an achievable thrust of 2-5μN for a peak power consumption of 3 Watts. By carrying out a program of experimental validation in orbit, it is hoped that the CXT will demonstrate itself as a viable thruster system for future CubeSat missions.

The Electron Density and Debris Instrument (EDDI)

The Electron Density and Debris Instrument (EDDI) is designed to measure Earth's ionospheric plasma density and temperature and detect sub-mm particle impacts on a satellite body. Such an objective is achieved by continuously measuring the electric field spectrum in the region around a satellite with a dipole antenna connected to a custom-built PCB for signal amplification and processing.

Continuous measurement of Earth's plasma properties will help us develop the first accurate, global, time- and spatially-varying dataset for the cold plasma in Earth's ionosphere. Particle impact data will help us develop better space junk models for debris too small to be detected and tracked from Earth-based radar systems. Designed in the School of Physics, University of Sydney, an engineering model of EDDI is shown in Figure 12.

Figure 12, EDDI Engineering model for CUAVA-2

Perovskites in Orbit Readiness Test Payload

The Perovskites in Orbit Readiness Test (PORT) payload (Figure 13) was designed by the University of Sydney Space Solar Cell Research Team. The PORT payload seeks to be the first demonstration of the capabilities of perovskite solar cells (11) in extra-terrestrial environments. If successful, this mission will pave the way for lower-cost space-grade solar cells.

The payload is needed to increase the Technical Readiness Level for the system, evaluate the efficacy of different encapsulation techniques, and gain flight heritage for the cell and encapsulation combination. It consists of two PCB boards; a current-voltage (I-V) characteristic sweep PCB to be housed internally and an exterior-facing panel with 7 perovskite cell variations and one traditional III-V cell. The two boards are connected with wires and Molex picoblade connections. The main PCB contains an analogue front end designed to sweep the I-V curves of the cells individually, process the data, and communicate with the OBC via the PORT onboard micro-controller.

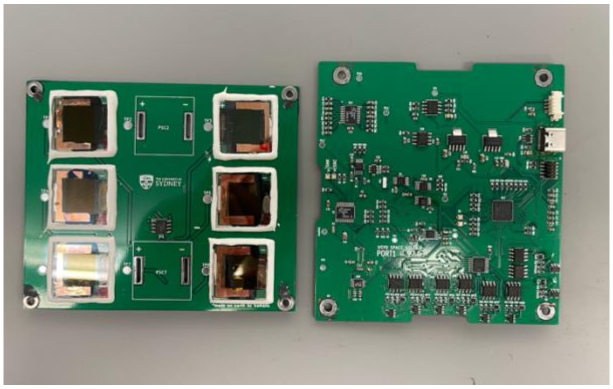

Figure 13: PORT-1 Engineering model for CUAVA-2: Perovskites solar cells (left) and the I-V measurement PCB (Right)

The PORT PCB operates at 5V@100mA. Since the solar cells may degrade quickly due to chemical affects by oxygen, atoms and Ions, the CUAVA-2 operation team must activate the payload once the satellite is commissioned. The cells will be scanned once every 30 seconds, and each scan will produce approximately 20kb of data for all eight cells (i.e., 2.4Mb per hour).

CUBE-OS SOFTWARE DESIGN

The Cube-OS software is being developed in-house by the CUAVA software team at the University of Sydney based on an open-source embedded Linux named KubOS (12). KubOS is a package framework that runs directly on satellite hardware and combines customized Linux distribution, subsystem APIs, and core services. It provides some core functions for satellite developers, such as File Transfer Protocol, mission scheduler etc.

The Cube-OS Restructuring

Kubos uses GraphQL (13) messages on the Service level to command the satellite subsystems and payloads. GraphQL is a very potent debugging tool, with which it is possible to send human-readable messages and receive nicely formatted replies. This, however, comes with a great processing cost on the satellite, as the satellite not only has to host a web server for each service that enables the user to command it, but also all the conversions have to be carried out on the OBC.

The restructuring tries to increase the performance of the whole system by replacing GraphQL with a lighter command handler based on simple UDP messages. This reduces the physical size of the Services on the OBC and also the processing load, as fewer conversions are necessary, and lessens the data load on the communications network by sending data as bytes instead of in strings. With this new implementation, it is now possible to run a "digital twin" of the satellite on the ground, using the same code that runs on the satellite, compiled as a debugger for the ground station and connected to the satellite. The debugger converts the GraphQL inputs into UDP messages to send to the satellite and vice versa.

We have also improved the error handling and rewritten some of the hardware abstraction layer (HAL) libraries and APIs in Rust.

The CubeOS software development kits (SDK) and framework are open-sourced here: https://github.com/Cube-OS.

Recovery Structure

The boot sequence was identified as one of the major areas of concern in the CUAVA-1 fault-root analysis and marked a priority issue for CUAVA-2. Once the satellite is powered, the EPS will try to power on both the OBC and payload OBC. The OBC will first try to boot from its primary SD card and then switch to the secondary SD card if the first three boot attempt fails.

Within each boot process, we also have a recovery structure, which boots the system from an older software version if the current version is corrupted. The boot process will return fail only if all previous versions are tried and failed. More details about the recovery structure can be found in our previous paper (4).

FREQUENCY AND GROUND STATION

Our CUAVA-1 satellite was designed using Amateur frequency bands. For the CUAVA-2 mission, as we didn't obtain suitable support from the International Radio Amateur Union. So we decided after consultation with the ACMA to move to non-amateur bands. The CUAVA-2 satellite network has been published in IFIC 2986 (13.12.2022) as API/A/13178 on 13th Dec 2022.

TT&C ground station

The primary CUAVA-2 TT&C ground station is now upgraded from the previous CUAVA-1 ground station at the University of Sydney. The UHF and VHF ground station will be located on the J03 building roof at the University of Sydney as shown in Figure 16. We also have a spare UHF and VHF ground station located on the Electrical Engineering building roof at CUAVA partner U, the University of New South Wales. The CUAVA team is working on the ground station license application to ACMA.

During the CUAVA-1 mission, we found that the bladeRF Software Define Radio (SDR) in the UHF/VHF ground station setup could introduce unintended DC spikes, which were complained about by other radio amateurs. We have now upgraded the SDR to B200 from Ettus Research. The team also has access to an X310 if the B200 cannot operate stably during the stress testing.

Figure 14. (Left) USYD Ground station on the J03 roof. (Right) UNSW ground station on the Electrical Engineering building

S-band ground station

For the S-band ground station, we have teamed with the AWS GroundStation (AWS GS) Team in Australia. The CUAVA team has signed a contract with the AWS GS team to provide us a functional automated technical Software Defined Radio (SDR) solution. This SDR solution makes use of GNU Radio and the Kratos qRadio SDR to receive and demodulate the downlinked data. The CUAVA team will also get an unencumbered copy

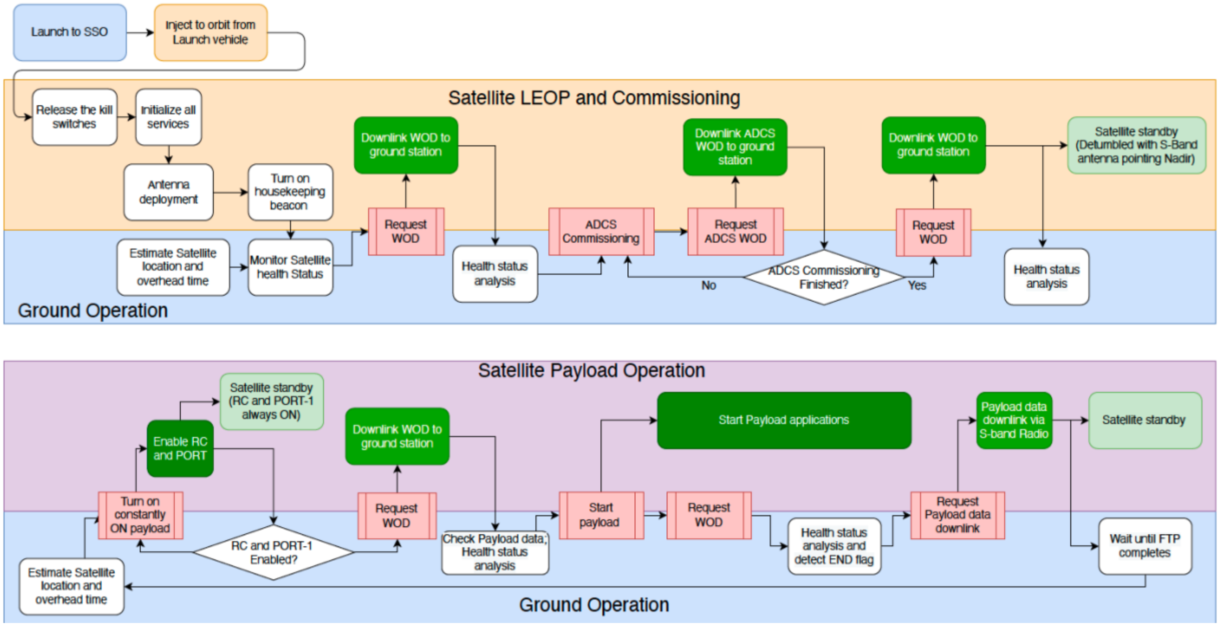

Figure. 15, CUAVA-2 high level CONOP.

of the solution IP. The CUAVA team will also receive a training service, to onboard and prepare the CUAVA team to operate and maintain the system.

CONCEPT OF OPERATION

Figure 15 shows a high-level flow diagram for the Concept of Operation (CONOP) for CUAVA-2. Once deployed into space, the kill switches will be released to begin the process of turning on the satellite. The satellite will initiate the 'ON' sequence 30 minutes after deployment to switch on the main bus components and start housekeeping applications on each subsystem. The OBC will then deploy the UHF and VHF antennas and the deployable magnetometer and start to transmit housekeeping beacon data.

Once communications are established with the ground, the ground operator will start to commission the ADCS system to stabilize the satellite and control the attitude of the satellite into pre-defined nominal flight orientation.

Once the housekeeping beacon is successfully received and all subsystems are confirmed to be working nominally, we will consider the satellite to be fully commissioned and will start to turn on payloads. All payloads will have self-contained mission applications: once turned on, the OBC/payload computer will only be notified when a mission application is completed, and a data transfer is required. The payload computer will be notified to store the data on its onboard memory. The data package will then be downlinked via the S-band radio during a pass over the S-band ground stations. The mission applications can be updated in orbit if needed.

Discussion and Conclusions

This paper reports the CUAVA-2 satellite design based on the payload requirements and the lessons learnt from our previous mission. On the CUAVA-2 satellite, we have two primary payloads, a GPS Reflectometry Receiver and a HyperDpectral Imager, focusing on Earth observation objectives. There are also seven secondary payloads with space weather and technology demonstration objectives. The CUAVA-2 bus uses the same hardware as the CUAVA-1 where possible, with an additional in-house designed payload computer, improved ADCS and EPS, and a S-band transceiver. The flight software for the CUAVA-2 satellite is also restructured from the CUAVA-1 software, with less computational loads and better reliability. The CUAVA-2 satellite has passed the Critical Design Review (CDR) stage and currently preparing for satellite integration and testing.

Beyond the science objectives, as a training centre, it is equally important for us to train students and gain experience for the team. We have involved an average of 15 students each year in our projects and provided them with training and work experiences through our workshops and satellite projects.

With the CUAVA-2 satellite design, we have also started the ride-share project named Waratah Seed-1 (WS-1) (14). Waratah Seed is a pilot Space Qualification Mission initiated by the NSW Government's Space Industry Development Strategy with partial funding from Investment NSW. The goal of the mission is to allow NSW and Australian space industry groups to test their technology in space by flying on a 6U ride-share CubeSat. This project is the first of its kind in Australia, allowing space-tech start-ups and other groups to access a satellite spaceflight to test payloads at a relatively inexpensive rate and in a more accessible way. Both the CUAVA-2 and WS-1 satellites are scheduled to be transported to our launch provider, Momentus Inc. at November 2023, and launched by SpaceX in February 2024.

Acknowledgments

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