



Midlands Innovation CubeSat Newsletter



Aug 2023

WUSAT Satellite Engineering

Warwick – Aston – Birmingham – Cranfield – Keele – Leicester – Loughborough – Nottingham

All Change for WUSAT!

A busy 6 months and a new team (mostly) in place!

This Newsletter includes the following items:

1. **WUSAT-4 Team News**
 - a. **WUSAT – European Space Agency (ESA) Activity**
2. **WUSAT Space Strategy Work**
 - a. **Warwick Manufacturing Group (WMG)**
 - b. **MI Space Research Workshop**
3. **WUSAT Promotion and Outreach**



WUSAT-4 Team News

The 2022-23 WUSAT Team (below) have completed the first important year of development for our current WUSAT-4 satellite mission (see mission summary at end of Newsletter).



2022-23 WUSAT Team

Back L-R: Dr Bill Crofts (WUSAT Director), Pritesh Shah, Seb Fieldhouse, Joshua Wong.

Front L-R: Adam Rich, Zitai Jin, Harvey Holliday-Williams.

They have completed much of the very important initial analysis that has defined the WUSAT-4 mission as a

configuration model and the incoming team can now progress towards an **engineering model** of WUSAT-4 that will be used for extensive testing.

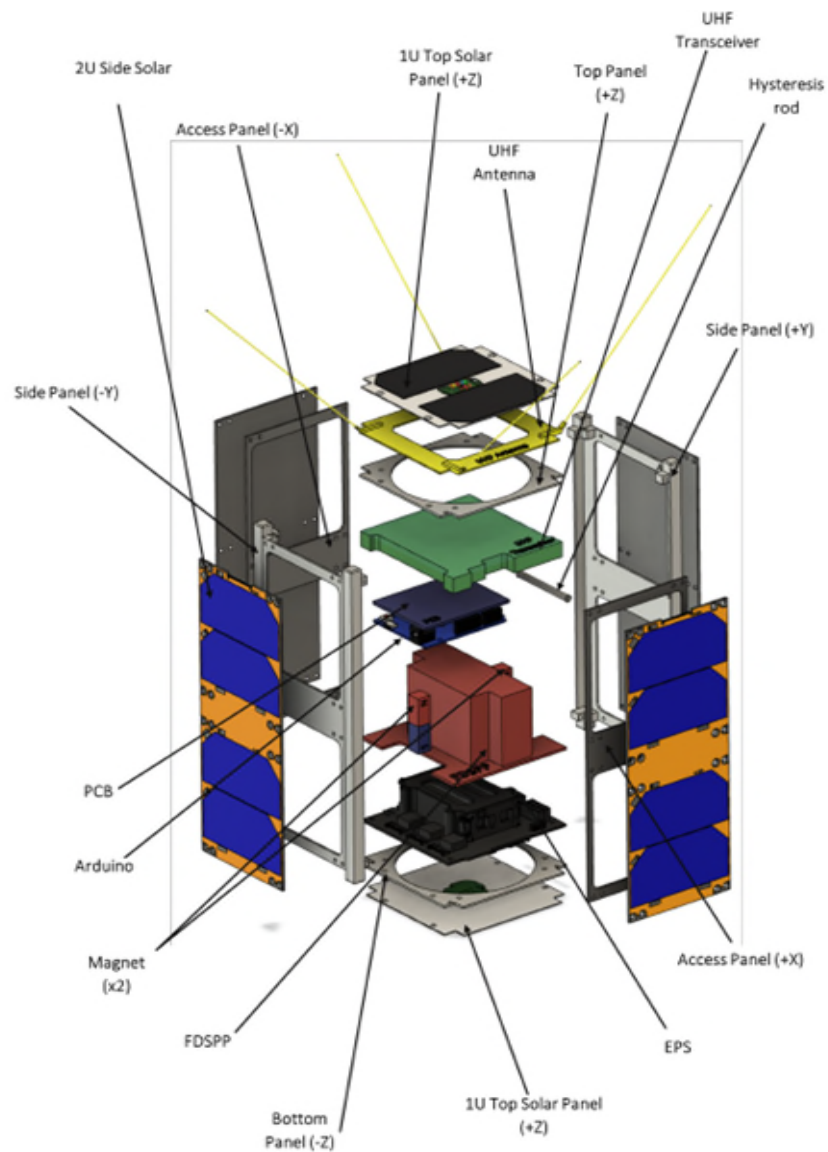
In Space System Design terms, they have managed to complete most of the following phases.

Phase 0 – Mission Analysis

Phase A – Feasibility

Phase B – Preliminary Definition

One of the main outcomes of this is the WUSAT-4 configuration model. An exploded view of this can be seen below.

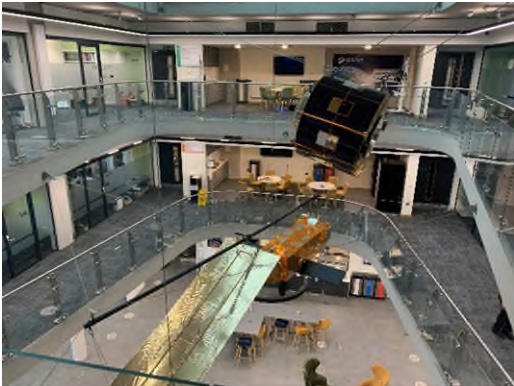


WUSAT-4 Physical Configuration Assembly Model

Events have been organised to help the team reach this stage of development. These include,

Space Park Leicester & University of Exeter –

Team members held an online discussion with **John Holt** (Fluorescent Deep Space Petri-pod [FDSPP] Payload Engineer at Space Park Leicester) and **Tim Etheridge** (FDSPP Researcher at University of Exeter) in order to complete detailed analysis of the payload, satellite and mission requirements. This was later supplemented by an **onsite visit and FDSPP workshop held at Space Park Leicester** where the team were able to establish more detailed agreement on the mission requirements, etc. Thanks to John Holt for hosting this.



Space Park Leicester



Engineer John Holt



Researcher Tim Etheridge

AIRBUS – Team Presentation Review



Apr '23 – Airbus engineers kindly gave their time to attend a presentation on the level of development of WUSAT-4 given by the WUSAT team. Their feedback and advice via this exercise was much appreciated. Thanks to **Alex Bolland** and **Tahrim Uddin** (both Airbus) for their assistance with this.

Incoming 2023-24 WUSAT Team

Jun '23 – Six members of the incoming WUSAT team gave up a Saturday to attend a **handover event** in the WUSAT lab. It was a very positive meeting, led by WUSAT Director Dr Bill Crofts, and we worked through some of WUSAT's 17 years of Space heritage before looking at detail in the portfolio document produced by the 2022-23 team. The incoming team are hoping to spend some time in contact with each other over the Summer and we hope to reasonably 'hit the ground running' when we start fully in October. We are expecting at least two additional members to join us before then. The current team comprises,

Anya Akram (Systems Eng), **Harrison Wise** (Electronic Eng), **Mario Cristobal** (Mechanical Eng),

Santhiya Chandrakumar (Mechanical Eng), **Jake Pittaway** (Mechanical Eng), **Matthew Kho** (Electronic Eng),

Marieta Kysela (Systems Eng) is undertaking a 3rd Yr project with Bill and will join the team to assist with Space Systems Engineering Design. We hope she will progress to the 2024-25 WUSAT team and have two years of WUSAT experience.

Dr Bill Crofts & Prof Julia Hunter-Anderson, Co-Directors of the WUSAT Programme, www.warwick.ac.uk/cubesat

WUSAT – European Space Agency (ESA) Activity

Feb '23 – Following ESA's acceptance of our submission on the concept of WUSAT-4, four students were selected to attend an **ESA Training Programme on Satellite Concurrent Engineering Principles**, held at ESEC Galaxia, Belgium. This was a great experience for the four students (pictured below), and positive feedback from ESA on the potential adoption of WUSAT-4 for eventual launch/operation.



Seb Fieldhouse



Harvey Holliday-Williams



Joshua Wong



Pritesh Shah

Concurrent Engineering is of fundamental importance in our Space Systems Engineering approach to customised satellite design.

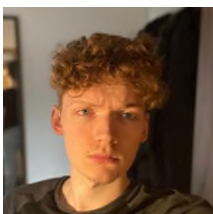
Members of the 2022-23 team also attended ESA training courses on,

- Satellite Communications
- Spacecraft Operations

Given the highly competitive, European-wide, application process for these ESA training courses, we continue to do very well with the number of WUSAT entries that are accepted.

Members of the incoming 2023-24 WUSAT team are already being supported in their European Space Agency applications for,

- Spacecraft Systems Concurrent Engineering (Sept '23)
- Spacecraft Operations (Oct '23)
- Earth Observation Satellite Systems Design Training (Nov '23)



We have already heard that **Jake Pittaway** has been selected for the Concurrent Engineering programme in September. That will be a great experience for him, very useful for the team's work during 2023-24, and we hope others will be successful in these ESA applications and others in the coming year.

Space Strategy Activities

We plan to align WUSAT activities to suitable areas of research over the next two or three years. Hence, our developing links to the following areas UK Space Strategy are an important part of this plan.

Warwick Manufacturing Group (WMG)

- Bill has been working with WMG Senior Technology Officer, **Dan Cox**, to investigate beneficial links between WUSAT's seventeen years of Spacecraft design heritage and WMG's aspirations to direct elements of their considerable technology resource towards Space development. This may specifically involve WUSAT links to WMG's key specialisms in manufacturing technology, materials/composites, joining technologies (welding, etc), battery design, testing techniques, etc.
- To assist this activity, Bill was also invited by Dan to attend a meeting of the – recently formed – **Space Manufacturing Working Group**, that is part of the **High Value Manufacturing Catapult** (representing UK Manufacturers). The group are compiling a white paper on a range of topics related to Space developmental needs in the manufacturing industry and how this can be pursued.



Dan Cox, WMG

WMG will write part of this white paper on topics such as, e.g., Electrical power supply design, battery thermal management, cybersecurity, materials/manufacture/surface treatments, etc. **WUSAT** can add information on Space compliance and standards.

- Bill is currently planning to host a '**WUSAT Showcase & Research Collaboration**' event that will include members of the School of Engineering, WMG, and the Physics department to look at how we can collaborate in key areas of research and enhance our approach to opportunities available through the National Space Strategy. More on this in the next newsletter.

Midlands Innovation Space Research Workshop

- (Jun '23) – The workshop was hosted by **Cranfield University**, and **University of Warwick** attendees were **Dr Bill Crofts (WUSAT)** and **Dr James Blake (Physics – Centre for Space Domain Awareness)**. James and Bill gave a presentation on the general topic of **Space sustainability – Debris removal and Space situational awareness**.
- The general outcome for Warwick is to lead on the following research topics –
 - **Materials/Sustainable Engineering** – (WUSAT via WMG [as above] and others TBD)
 - **Surveillance/Sensors/Situational Awareness** – (Physics – CSDA group, as above)

WUSAT Promotion and Outreach

As always, Bill has completed a wide range of outreach activities to promote **WUSAT & our partners**, the **School of Engineering**, and the **University of Warwick**. These include,

- Jan '23 – **Girl's Day School Trust** – in support of **Women in Engineering** and specifically for Sutton High School, Head of Computer Science, **Nicola Buttigieg**, who developed the **GDST Space Technology Diploma**, Bill gave an online lecture on the **Concepts of Spacecraft Orientation** to a number of the GDST schools who have signed up to study this module.
- Jun '23 – **Girl's Day School Trust Conference**. Held at the Amazon Web Services HQ building in London, Bill was invited to attend a conference where teams from the GDST schools presented their final work to those in attendance and online. On behalf of WUSAT, Bill then gave a short speech and presented the awards to the winning groups and individuals. **Nicola** did an amazing job in having a number of Space scientists/engineers from, e.g., **NASA**, **NASA Goddard Space Flight Centre**, **Cambridge University Space Flight** and **Launch Access Ltd** who assisted in this event, and it was a privilege to see then giving time for this. Part of the awards presented was also connected to a **Royal Society STEM Partnership Grant** where the students were required to present a possible solution to a **Royal Foundation's Earthshot Prize** theme. *Wonderful to see so many capable young women being directed towards science and Space in particular!*



- Feb '23 – **Engineering for Deeply Uncertain Times** – WUSAT's **Adam Rich** provided a support exhibition for attendees at this Warwick conference.
- Apr '23 – **Princethorpe College** – Bill gave an invited talk entitled “**Engineering Space Technology for You**” to an audience of approximately 50 people.
- May '23 – ‘**Our Fragile Space: Protecting the Near Space Environment**’ – Coventry Cathedral – a WUSAT stand to support this exhibition of photographs on the theme of **Space Debris** and **Space Sustainability**. This was organised by **Catherine Constable** of the Warwick Habitability GRP Programme and exhibited the work of international photographer and science communicator **Max Alexander**.



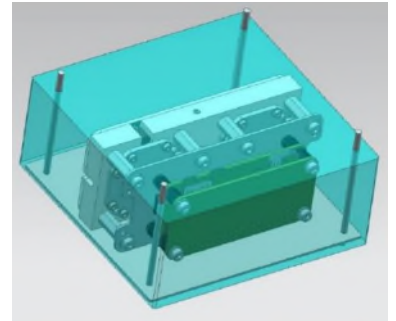
- Jun '23 - **IEEE AP-S / MTT-S Tangiers, Morocco (online)** – Bill gave a presentation entitled ‘**WUSAT – A Satellite Engineering Team**’ to this conference on Antennas, Microwaves, Wireless and Radar Technologies for Sustainable Development
- **University of Warwick, Open Days** – Bill provided a WUSAT exhibition and supporting talks to potential students on four Saturdays in March, May and June (x2).
- Jul '23 – **Resonate Festival** – University of Warwick Arts Centre - Bill provided a WUSAT exhibition and supporting talks to festival visitors.

Summary of the WUSAT-4 Mission!

Due to the requirement of submission to ESA's Concurrent Engineering Programme, with expected progression to an ESA launch programme, we had to limit the submission of WUSAT-4 to a single payload based on the Space Biology experiment designed by the University of Exeter and Space Park Leicester.

FDSPP Experiment Unit – includes 'pods' that accommodate the microscopic worms, sealing interface and pod window, and PCBs for internal electronics.

Unfortunately, the beacon transmitter (BEAP) payload for UK Launch Services was not yet developed to a level where the team could integrate it into WUSAT-4.



Our partner companies/organisations

AIRBUS

m&c
Marks & Clerk

HARWIN

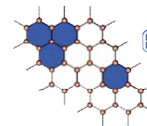


SPAN
SPACE ACADEMIC NETWORK



BLUE-SPACE

Roke
Part of the
Chemring Group



ESATAN-TMS
thermal modelling suite

Best wishes,

Bill & Julia

