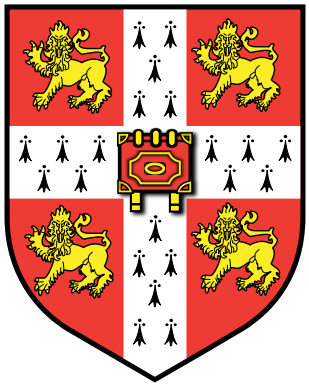
Preliminary Design Review

Cambridge University Unmanned Air Systems Society

University of Cambridge



Team Members

Nathanael West	Engineering,	4th year
Philip Salmony	Engineering,	4th year
Ximin Sun	Engineering,	3rd year
Ricky Kawagishi	Engineering,	1st year
Conor Hocking	Engineering,	1st year
Jeff Wang	Engineering,	1st year

Supervisor

Dr. Richard Roebuck

Sponsors

Cambridge University Engineers Association
Cambridge University Engineering Society
Student-led Projects and Industry Partnership (The Boeing Company, Marshall Aerospace and Defence Group, McLaren Technology Group)

1 Project Management

- project plan with main activities, lead times, and dependencies
- table summarising risks and their mitigation

2 Requirement Verification

	Requirement	**Verification**
Req. 1	MTOW of 6.9kg.	Weight budget supported by component and final assembly measurements.
Req. 2	Maximum 4 cell LiPo battery.	Voltage measurement.
Req. 3	Payload: Single First Aid Kit, one or more Buxton water bottles.	CAD of fuselage in combination with exact dimensions of payload, flight tests.
Req. 4	Completely autonomous operation.	Philip
Req. 5	Take off and landing within 30m	Basic performance calculations and tests.
Req. 6	All radio equipment must be licensed for use in the UK. Radio equipment providing control of the UAS and for the FTS must be 'spread spectrum', must have a minimum range of 1km, and must operate on the 2.4GHz band.	Philip
Req. 7	The UAV must have a FTS which is either activated 5s after the uplink is lost or manually by the flight safety officer via the master controller, and 10s after the downlink is lost. The FTS will also be activated in the case of a geo fence breach.	Philip
Req. 8	The UAS should carry a camera system with target recognition capability to undertake target search.	Philip
Req. 9	The following telemetry must be available in flight: UAS position on moving map, local airspace, QFE, IAS.	Philip
Req. 10	The aircraft must allow for the fitting of a WBT-201 "G-Rays 2" GPS Tracker.	CAD of fuselage, using dimensions of tracker provided in rules document.
Req. 11	Batteries must be coloured brightly.	Visual inspection of batteries.
Req. 12	Carrying and dropping of payload on demand.	CAD of fuselage, flight tests.
Req. 13	The UAV should be as accurate as possible when delivering the payloads.	Usage of flaps for slow flying during payload drop.
Req. 14	Payload must remain intact during impact	Parachutes as speed retardation systems.
Req. 15	The aircraft should carry as much payload mass as possible.	Use of composite materials (CFRP, GFRP) for lightweight airframe design.
Req. 16	The UAV should navigate as accurately as possible.	Philip
Req. 17	The mission should be completed in under 10 min.	Performance calculations factoring in wind and expected distance covered, flight tests.

3 Performance Calculations

preliminary aerodynamic, structural, and peformance calculations supporting the initial sizing, basic stability and control calculations, and weight and balance estimate.

4 Cost Budget

initial budget allocation for COTS items

5 Safety

- table of hazards and mitigating design features
- description of RF compliance
- FTS

6 Design Description

- functional description, rationale for selection of systems (airframe, propulsion, flight controls, navigation & mission control, sensors, image processing, autonomy, payload carriage, fts) $->$ highlight innovative features
- diagram showing hte preliminary system architecture and data flowfor navigation and mission control, flight control, vision sensors
- overall layout & description with three-view scale drawing

7 Test Plan

short summary of any testing (flight testing, structural loads)