Competition Rules 2026

UAS CHALLENGE

Institution of MECHANICAL ENGINEERS

Version 1, 250907

INTRODUCTION

The Unmanned Air System (UAS) Challenge is an educational challenge organised by the Institution of Mechanical Engineers (IMechE) for the purpose of educating and preparing students of engineering disciplines for their future careers.

The IMechE is supported by volunteers from Industry and Academia that together form the UAS Challenge Committee (the Committee). The rule set for the competition is continuously reviewed and updated at least once a year with the aim of providing the best educational experience for students and volunteers whilst maintaining the highest standards for safety.

CONTENTS

SECTION A – ADMINISTRATIVE REGULATIONS

A1 COMPETITION OVERVIEW

A1.1 Competition Objectives

A1.1.1 The competition challenges teams of university students to conceive, design, build, and compete with their UAS. This year, the envisaged use case is an agricultural mission.

A1.2 Competition Procedure

A1.2.1 The competition is held over the course of an academic year and is intended to be an activity included in or alongside academic studies.

A1.2.2 There is a schedule of deliverables throughout the competition which are intended to replicate so far as is practicable the typical deliverables expected in industry when delivering a new design to a customer.

A1.2.3 The finale of the competition is a live fly-off event held at the British Model Flying Association's (BMFA) National Visitor Centre near Buckminster in the UK. The event includes a series of judged non-flying and flying activities. Points from the deliverables, non-flying and flying activities contribute to a team's overall score. At the end of the fly-off event is the award ceremony – specific category and overall score awards are presented.

A1.3 Competition Dates

Event	Date
Welcome Webinar	12th November
2nd Webinar	27th February
3rd Webinar	22nd April
Pre-Flyoff Webinar	10th June
Live Event	29th June – 2nd July

- *Note: It is in team's best interest to attend the webinars.*

A2 DEFINITIONS

A2.1 UAS

A2.1.1 The UAS will consist of an air vehicle, transport and storage container, and a ground control station (GCS). It shall be compliant with and designed to perform the mission required by this ruleset

A2.2 Language

A2.2.1 'Shall', 'must', or 'will' denotes a mandatory requirement.

A2.2.2 'Should' or 'may' denotes a highly desirable requirement.

A2.2.3 *Blue italics* or "*Note:*" indicates a point of guidance or clarification rather than a requirement.

A3 ELIGIBILITY

A3.1 University Student Competition

A3.1.1 The UAS must be conceived and designed by this year's student team members for the purpose of this year's competition.

A3.1.2 The student team may use information from professionals or from academics provided this information is given as a discussion of alternatives with pros and cons and shall not be given as a directive.

A3.1.3 The students must make all design decisions.

A3.1.4 All design decisions should be evidence based. The team will be asked to provide evidence for design decisions through deliverables. The team will be asked to discuss design decisions by the scrutineering team at the fly-off event.

A4 RULES OF CONDUCT

A4.1 General Officials Authority

A4.1.1 The officials reserve the right to revise the schedule, date and location of the competition and/or interpret or modify the competition rules at any time and in any manner that is, in their sole judgement, required for safe and efficient operation of the challenge.

A4.1.2 All team members are required to cooperate with and follow all instructions from the officials.

A4.1.3 Official announcements shall be considered part of the rules.

A4.2 Plagiarism

A4.2.1 Use of, or iteration on, previous years' UAS and deliverables is not permitted. Students will only be scored on work that is deemed to have been conducted this year for this year's competition.

A4.2.2 For the deliverables, re-use of previous years' work, unattributed use of external sources (books, websites, images, models, consultants etc), unattributed use of AI/LLMs is not permitted. Any work that is deemed to have not originated within the team will not be scored and may attract a penalty. The judges' ruling on this will be final.

A4.3 Official Instructions

A4.3.1 At the fly-off event, failure of a team member to follow an instruction or command will result in 15 penalty points being deducted from the team's overall score.

A4.4 Arguments with Officials

A4.4.1 At the fly-off event, argument with, disobedience, or any other offensive behaviour to any official by any team member, academic supervisor, or related party may result in the team being disqualified from the competition.

A4.5 Unsporting Conduct

A4.5.1 In the event of unsporting conduct by any team member, academic supervisor, or related party, 25 penalty points will be deducted from the team's overall score. Persistent violations may result in the team being disqualified from the competition.

A4.6 Rule Consistency

A4.6.1 While best efforts are made to prevent them, discrepancies or ambiguity in the ruleset may occur. If you believe that you have identified a discrepancy or the wording is ambiguous the team should contact the IMechE.

A4.6.2 The first team to identify a specific error, omission, inconsistency, or ambiguity in the rules, which contributes to a rule amendment, may be awarded 5 points. Teams subsequently identifying the same issue in the rules will not be awarded points.

- *Questions and error submissions may be submitted to the UAS Challenge Judges inbox: UASJudges@imeche.org*

A4.7 Violations of Intent

A4.7.1 Violation of the intent of a rule will be considered a violation of the rule itself.

- *Note: It is far better to raise a question early on than to find that some aspect of your UAS fails to meet the intent of the rules once it has been built.*

A4.8 Protests

A4.8.1 A team may protest any rule interpretation, score or official action which they feel has caused some actual, non-trivial, harm to their team, or has had a substantive effect on placement in the competition.

A4.8.2 All protests must be filed in writing and presented to the officials by the team leader, before the hangar is closed at the end of each day. For protests pertaining to the final day, the protest must be delivered within 30 minutes of the team's score being posted.

A4.8.3 To have a protest considered, a team must post a 50-point protest bond which may be forfeited if their protest is rejected.

A4.8.4 The decision of the officials regarding any protest will be in written form and is final.

A5 GENERAL REQUIREMENTS FOR TEAMS & PARTICIPANTS

A5.1 Team Members

A5.1.1 Each team must have one team member identified as the Team Leader. The Team Leader is the main contact person for the officials during the competition period.

A5.1.2 Team members must be enrolled as degree seeking undergraduate, graduate or postgraduate students in any university. Team members who have graduated within the seven-month period prior to the last day of the fly-off remain eligible to participate.

A5.1.3 Team members must be at least 18 years of age by the fly-off event.

A5.1.4 There is no limit on the number of team members who can contribute to the concept, design, and manufacture of the UAS, or the compilation of deliverables.

A5.1.5 **There may be no more than 8 team members** registered to attend at the fly-off event. Teams may not rotate team members to be present.

A5.1.6 All team members attending must be present at the safety briefing on the first day of the fly-off event.

A5.2 Academic Supervisors

A5.2.1 Each team must have an academic supervisor or professionally registered engineer to act as supervisor.

A5.2.2 The supervisor may not design, build or repair any part of the competition UAS or directly participate in the development of any documentation or presentation.

A5.2.3 The supervisor must review and sign for all the competition deliverables.

A5.2.4 The supervisor may attend the fly-off event in addition to the registered team members.

A5.3 Sponsorships & Industry Support

A5.3.1 Universities are encouraged to approach potential commercial sponsors, particularly aerospace companies at any time prior to or during the Challenge, for both financial support and technical advice.

A5.3.2 Where technical advice has been received, teams must declare the extent of the advice.

A5.3.3 All other industry support must also be declared so that the judges can determine which aspects of the UAS are the work of the students.

A5.4 Team Insurance

A5.4.1 Teams are required to confirm that adequate (at least £10M) insurance cover is in place.

A5.4.2 This may be provided through BMFA membership details on the IMechE website.

A5.4.3 Declaration that cover is in place must be provided at the team's FRR. Teams will not be permitted to participate without this confirmation.

A5.5 Team Insurance – non-UK University Teams

A5.5.1 Non-UK University teams' Public Liability Insurance requirements whilst in the UK will be met by a BMFA membership details on the IMechE website. Declaration that cover is in place must be provided at the team's FRR. Teams will not be permitted to participate without this confirmation.

A5.5.2 You will also need to present evidence of medical insurance covering participation in the UAS Challenge fly-off event.

A5.6 Multiple Teams per University

A5.6.1 A university may enter multiple teams. If this occurs, the teams must be fully segregated.

A5.6.2 Teams must identify all team members at the point of registration. Team members may only contribute to the concept, design, and manufacture of the UAS and the competition deliverables for their team. Any instances where it is perceived that teams have been working jointly will be considered plagiarism, will not score points and may attract a penalty.

A5.7 Joint University Teams

A5.7.1 Multiple universities may enter a joint team.

A5.7.2 Teams which are formed with members from two or more universities will be treated as a single team.

A5.8 Registration & Entry Fee

A5.8.1 Details on team registration can be found at:

https://www.imeche.org/events/challenges/uas-challenge/team-resources/register-your-team

A6 DOCUMENTATION & DEADLINES

A6.1 Competition deliverables

A6.1.1 Several documents must be delivered prior to the competition live fly-off event. Full details of the documents are provided in their relevant sections.

A6.2 Submission

A6.2.1 Documents are to be submitted to the IMechE "Mashoom" site. Access details for this will be provided on registration.

A6.2.2 Team Leaders are responsible for ensuring that all their team's submissions are uploaded or sent no later than the published deadline.

A6.2.3 The maximum penalty that will be applied to a given deliverable will never be greater than the maximum score for that deliverable. i.e. a deliverable will never result in a negative score.

A6.3 Late Submission or Non-Submission

A6.3.1 The penalty for submitting documents later than the deadline is 10 points per day, up to 50% the maximum value of that submission. Thereafter no points will be awarded.

A6.3.2 Teams may still receive some qualitative feedback on their submissions even if they are late – especially if the deliverable is expected to contain some safety related information.

A6.3.3 Volunteer judges evaluate all the required submissions; it is essential that they have enough time to complete their work.

A6.4 Re-submissions

A6.4.1 For some critical omissions, the team may be requested to resubmit documents in whole or in part. A new submission date will be indicated with the request for resubmission. Failure to re-submit on time will incur further penalties.

A6.4.2 Depending on the level of safety or airworthiness of the omission, a team may be denied permission to fly at the live fly-off event if they do not resubmit evidence of compliance.

A7 TRANSPORT OF AIRCRAFT TO FLY-OFF EVENT

A7.1 Transport

A7.1.1 The teams must ensure that they have adequately considered the requirements to transport their UAS to the fly-off event.

- *Note: This can be a non-trivial planning/management aspect of the competition and teams are encouraged to look into this as early as possible. This is especially important for teams who will be travelling from outside the UK.*

A8 RESOURCES

A8.1 UAS Challenge Website

A8.1.1 https://imeche.org/events/challenges/uas-challenge

A8.2 Webinars

A8.2.1 *Briefing webinars will be provided, on Zoom, by the IMechE and UAS Challenge Volunteers throughout the year.*

A8.3 UAS Challenge Mentoring Scheme

A8.3.1 *For UK university teams, the Mentoring Programme pairs an Industry Partner with a UASC team on a random basis. The period of engagement in the programme is between three to nine months. The aim of the Mentoring Programme is to: provide teams with a point of contact for general queries regarding the plan, design, build, test and marketing of the UAS for the purpose of the Challenge; to help the team integrate with the concept of the Challenge and its guidelines and provide teams with general guidance, advice and a professional role model in terms of a career in engineering.*

A8.3.2 *Due to the limited number of industry mentors, not all teams will be able to enter the scheme and those that are provided the opportunity are strongly recommended to engage with their mentors and make full use of the opportunities the Programme provides them.*

A8.3.3 *To express interest in the mentoring scheme, please email uaschallenge@imeche.org. Once assigned an industry mentor, the team is expected to engage with the mentor on a regular basis. Failure to engage with the industry mentor on a regular basis for a duration of a month, will result in your team being removed from the mentoring scheme and replaced by a new team. For more information on the mentoring scheme, please refer here:* https://www.imeche.org/events/challenges/uas-challenge/team-resources/challenge-document-library

A8.4 Project Management Software

A8.4.1 *An online project management software is available free of charge from Mashoom:* www.Mashoom.co.uk

A8.5 UAS Challenge Member Session

A8.5.1 *Each team may request a one hour long virtual session with a member of the UAS Challenge event/committee to ask any advice/guidance. Please contact* uaschallenge@imeche.org *to arrange availability.*

A8.5.2 *Additional sessions may be permitted depending on availability of Challenge team members and uptake of this offer.*

A8.6 The UAS Challenge Live Fly-off Event

A8.6.1 *The fly-off is itself a really useful resource. Even if you cannot complete your aircraft in time for the fly-off event, we would encourage you to bring your team, and your aircraft (in whatever stated of build) to the event anyway. You will be able to interact with your fellow challenge competitors, competition volunteers, the sponsors, and see aircraft flying. We believe that it is an unrivalled opportunity to learn, gain experience, see the diversity of design and approach to the challenge. Don't forget that you have your knowledge and your experience to offer other teams too.*

A9 PRIZES AND AWARDS

Prize	Award Criteria	Notes
Grand Champion	Highest aggregate score from the Design & Development documents, X-Plane Simulation, and the Pre-Mission and Flight Demonstration. All elements of the Challenge, including the Business Presentation must be completed to be eligible.	Scoring as per D1.3
Runner Up	2nd highest aggregate score from the Design & Development, X-Plane Simulation and the Pre-Mission and Flight Demonstration. All elements of the Challenge, including the Business Presentation must be completed to be eligible.	Scoring as per D1.3
3rd Place	3rd highest aggregate score from the Design & Development, X-Plane Simulation and the Pre-Mission and Flight Demonstration. All elements of the Challenge, including the Business Presentation must be completed to be eligible.	Scoring as per D1.3
Innovation	The most innovative concept taken through to flight demonstration. This could include an innovative layout of propulsion and flying surfaces, aerodynamics, structures, use of materials, and manufacturing methods.	Assessed from the Design Reports, confirmed at the demonstration event.
Design	For the entrant with a well-structured design approach, the most elegant and well thought through design, as described through the Concept Paper and Design Review stages that fully meets all the requirements laid down in the rules and taken through to demonstration.	Evidence of the design trade-offs considered between systems, structures, aerodynamics etc. Elegant solutions to meeting the mission requirements.
Simulation	For the entrant with the highest overall score achieved for their X-Plane Simulation Model. This will include likeness to their proposed design and submitted documentation.	Assessed from the X-Plane submission and design reports.
Scrutineering	The best presented UAS that is fully compliant with the competition rules and meets the technical, build quality and supportability objectives of the competition.	Judged by the scrutineers at the Demonstration event.

Prize	Award Criteria	Notes
Safety	For the entrant developing the best combination of a well-articulated safety case, with evidence that safety has been considered throughout the design and development stages and demonstrating safe operation and team behaviour.	Judged from the Design Report and from the Flight Demonstration Event.
Environmental	For the air vehicle demonstrating the most environmentally sustainable design in materials, noise and energy usage.	Assessment of materials selection, and flight energy efficiency score.
Airworthiness	For the entrant demonstrating the best approach to airworthiness, through design, well-engineered features, use of sound engineering practice and attention to the aircraft's suitability for flight.	Judged by the scrutineers at the Demonstration event.
Operational Supportability	For the team who can most quickly and professionally go from a fully stowed to flight-ready UAS safely, whilst demonstrating the best team-working.	Judged by scrutineers during the pre-flight inspections.
Business Proposition	For the entrant with the most promising business and marketing case presented to a panel of sponsors, reflecting a well-articulated understanding of the market and good alignment of the UAS capabilities and cost projections with the target market.	Judged by a panel of the event sponsors at the Flight Demonstration event.
Most Promise	For the entrant which couldn't quite make it all work on the day, but where the team showed most ingenuity, teamwork, resilience in the face of adversity, and a promising design for next year's competition.	This could either be a team that failed to make it to the Flight Line, or one that did not reach its full promise during the flight trials/simulation.
Advancement Award	Highest scores for a university that has not previously taken part or has excelled compared to previous years' entries.	
Media and Engagement	For the team which engages most effectively with local media, schools, social media, and gets engaged with schools as part of the STEM Outreach Programme at the event, to promote participation and engagement with the Challenge.	This is assessed from the evidence of a team's Media & Engagement and STEM activities. **Please use #UASC2026 and tag the UASC in whichever platform(s) you are using.**

SECTION S – MISSION SCENARIO

S1 SCENARIO

S1.1.1 This year's UAS challenge scenario is based around an agricultural mission.

S1.1.2 Your team is required to design, build and demonstrate a UAS capable of autonomously navigating whilst carrying a water payload and then dispense a set amount of water along a defined track between two waypoints.

S2 MISSIONS

S2.1 Mission types

S2.1.1 There will be three flown missions for this year's challenge. They are known as:

- Short mission (autonomous)
- Long mission (autonomous)
- Manual handling

S2.1.2 To manage scheduling, the missions must be flown on specific days.

- *Note: if you are not ready to fly on the first day of the fly-off, you may miss out on the opportunity to fly all of the missions.*

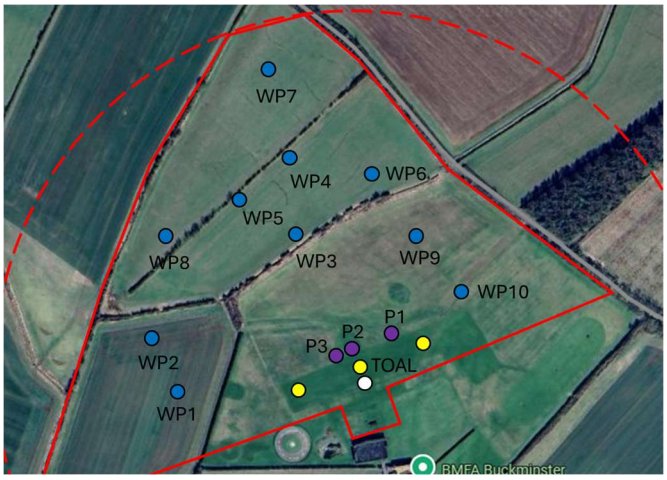
S2.1.3 All the missions will be operated within visual line of sight.

S2.2 Mission Elements

S2.2.1 All the missions are made up of combinations of the following mission elements:

- Take-off – within a specified area
- Landing – within a specified area
- Waypoint navigation – around waypoint circuit in the order specified
- Payload release – at the location(s) specified
- Handling assessment – exploration of an aircraft's response to inputs and controllability

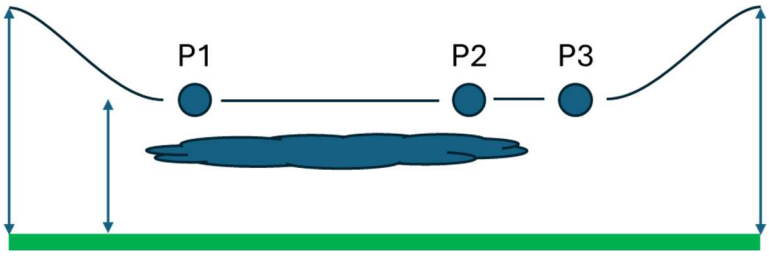
S2.2.2 An example of the waypoints is provided below:



- The white dot is approximately the location of the challenge pilot and team during each mission flight.
- The yellow dots are the Take-Off And Landing (TOAL) point and two alignment waypoints.
- The blue dots are an example set of waypoints – the actual waypoints will be provided at the final webinar.
- The purple dots are the payload drop points
- The solid red line is an example of the geo-fence boundary.
- The dashed red line is approximately 500m radius from the white dot (the CAA's definition of the limit of Visual Line of Sight (VLOS)).

S2.2.3 In addition to the navigation waypoints, waypoints will be provided for the payload release.

S2.2.4 An example of the payload drop is shown below (flown from left to right, viewed from the side):



- The aircraft will start at the navigation altitude.
- It will then descend to drop altitude prior to drop point 1 (P1).
- The aircraft must start dispensing water prior to P1.
- The aircraft must continue dispensing water until it has passed drop point 2 (P2).
- The aircraft must have stopped dispensing water before it passes drop point 3 (P3).
- The aircraft will then return to navigation altitude AGL.

S2.3 Mission 1, Short Mission – 1st flying day

S2.3.1 The short mission is fully autonomous and comprised of:

- Take-off
- 1 lap of waypoint navigation
- Payload dispersal between two waypoints
- 1 lap of waypoint navigation
- Landing

S2.4 Mission 2, Long Mission – 2nd flying day

S2.4.1 The long mission is fully autonomous and comprised of:

- Take-off
- 1 lap of waypoint navigation
- Payload dispersal between two waypoints
- 1 lap of waypoint navigation
- Payload dispersal between two waypoints
- 1 lap of waypoint navigation
- Landing

S2.5 Mission 3, Manual Handling – 3rd flying day

S2.5.1 The manual handling mission is manually flown by the competition pilot and is comprised of:

- Take-off
- Handling Assessment
- Landing

SECTION T TECHNICAL REQUIREMENTS

T1 LEGAL REQUIREMENTS

T1.1 UK Law for UAS Flying

T1.1.1 It is the responsibility of the team leader to ensure that they are aware of and operate within the requirements of UK laws governing the flying of UAS whilst in the UK: https://www.caa.co.uk/drones/getting-started-with-drones-and-model-aircraft/

T1.2 Fly-off event

T1.2.1 An individual from the team, or a nominated individual from the team's university, shall obtain a UK CAA Operator ID (see above link). This operator ID must be displayed on the air vehicle.

T2 AIR VEHICLE GENERAL

T2.1 Design

T2.1.1 Any air vehicle configuration is permissible.

- *Note: Points and incentives are awarded for novel configurations*

T2.1.2 The design and construction of the UAS shall employ good design practice with appropriate use of materials, and components.

- *Note: the quality of the air vehicle design and construction will be judged and scrutineered. Failure to pass scrutineering will result in you not being permitted to fly.*
- *Note: It may be helpful to get your UAS inspected during build by an experienced aeromodeller to help with construction details and best practice.*
- *Note: designing for ease of manufacture may also make it easier to repair your air vehicle if/when it is damaged in testing or at the fly-off event.*

T2.2 Mass

T2.2.1 The maximum take-off mass (MTOM) of the air vehicle shall not exceed 10.0kg.

- *Note: this includes the payload, tracker and GPS.*

T2.2.2 The air vehicle shall have the empty centre of gravity (CG) indicated on the outside. Empty in this case meaning in flyable condition but without payload or trackers. The

marking in the form shown below shall be on both sides of the fuselage or the top and bottom of the wing where that is not possible and with a minimum diameter of 12 mm.

T2.3 Materials and Environmental Impact

T2.3.1 Lead shall not be used in any part of the airframe.

T2.3.2 The teams should consider and attempt to minimize the environmental impact of their choice of materials in all aspects of the UAS. In the design process consideration should be given to the use of non-hazardous and recyclable/recycled materials; low pollution; low energy usage; low noise.

- *Note: innovation and novel materials are encouraged.*

T2.4 Manufacturing & COTS Items

T2.4.1 The students should manufacture and assemble as much of the UAS as possible. Outsourcing to external organisations or reliance on university workshop staff should be limited.

T2.4.2 Where the team have been unable to manufacture or assemble components or systems, these will need to be identified.

T2.4.3 Commercial Off the Shelf (COTS) are defined specifically as items that are bought and not made. For the purpose of this competition, exclusions to this are:

- Materials:
  - Sheet or block materials – woods, metals, plastics, composites etc
  - Additive manufacture consumables – filaments, resins, powders, etc
  - Hardware – bolts, nuts, screws, rivets, tension wires, etc
- Electrical:
  - Circuit components – resistors, capacitors, diodes, transistors etc
  - Wires and connectors
- Consumables:
  - Adhesives, tapes, etc
- *Note: If you are unsure if something counts as COTS or not, contact the IMechE.*

T2.4.4 The total cost of COTS components used in the air vehicle should not exceed £1,300. Any cost above this figure will need to be justified.

T2.4.5 COTS composite pultruded or extruded profile spars and beams may not be used in the construction of the air vehicle.

T2.4.6 COTS components may be transferred between aircraft from previous years.

T2.5 Fly off envelope limitations

T2.5.1 The air vehicle shall not exceed 40 kts ground speed or 200ft AGL at the fly-off event.

- *Note: These are limits imposed due to safety considerations. It is expected that for autonomous flights this will be controlled by the aircraft's flight computer. During manual flying the competition pilot will judge airspeed and altitude.*
- *Note: The airfield at the BMFA site is not at sea level and the site slopes.*

T2.6 Weather Limitations

T2.6.1 The UAS shall be designed to operate in winds of up to 20kts gusting to 25kts and light rain. The air vehicle should be capable of take-off and landing with crosswind components of 5kts with gusts of 8kts and on wet ground.

- *Note: It is always the Team Leader's decision whether to fly their aircraft or not.*
- *Note: handling the aircraft on the ground within weather limits should also be considered by the teams.*
- *Note: There is, on average, rain on every other day in July in the UK.*

T2.7 Take-off and Landing

T2.7.1 The air vehicle shall be designed to take-off and land from within a 20 m x 20 m box. There are no obstacle clearance requirements.

T2.7.2 After landing the air vehicle shall be capable of being flown again with a fresh battery but without repairs. If this is not the case, the landing portion of the flight will be penalised.

T2.7.3 The aircraft shall be capable of operating from any hard or grass surface.

- *Note: At the fly-off event, operation will be from a short grass runway.*

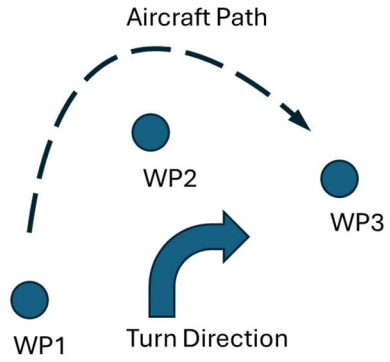
T2.7.4 Use of launch assistance equipment shall not be permitted.

T2.7.5 Hand launching the air vehicle shall not be permitted.

T2.8 Navigation

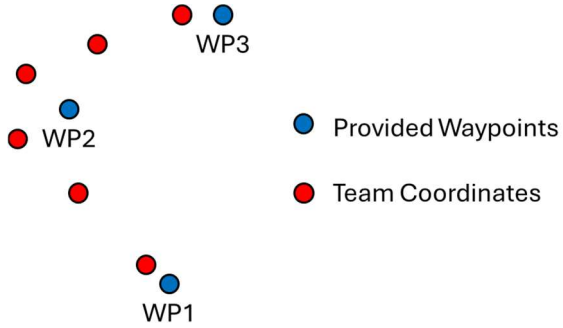
T2.8.1 The air vehicle shall be capable of automatically navigating around the course defined by waypoint coordinates, which will be provided by the organisers at the final pre-fly off webinar.

T2.8.2 The air vehicle must fly around the "outside" of the waypoints. For example, in a turn to the right, air vehicle must pass the waypoint to the left (example below).



T2.8.3 The air vehicle must remain within a pre-designated geo-fence. The coordinates will be provided by the organisers at the final pre-fly off webinar.

- *Note: The waypoints that will be provided are the locations of the course turns. It is up to the teams to provide adequate instructions to your air vehicle to successfully navigate those turns whilst remaining within the geo-fence boundary (example below).*



T2.8.4 Apart from during take-off, landing and payload drop, the aircraft shall fly no lower than 150ft AGL and no higher than 200ft AGL.

T2.9 Mission Range and Endurance

T2.9.1 The air vehicle shall be designed to fly for 15 minutes with 20% battery capacity remaining.

- *Note: Battery power remaining will be measured at the end of each autonomous flight.*

T2.9.2 Each lap of the autonomous missions will be about 1.5nm/2800m measured waypoint-to-waypoint.

- *Note: You should assume that your aircraft will fly a longer path to ensure that it correctly passes the waypoints on the outside of the turns.*

T2.10 Propulsion Systems

T2.10.1 Only electric motors shall be permitted for propulsion.

T2.10.2 Propellers, rotors, ducted fans or other mechanical means of converting power from the electric motors to thrust are allowable.

- *Note: Points are awarded for novel solutions.*

T2.11 Land away recovery

T2.11.1 If the air vehicle lands (controlled or otherwise) away from the runway, it shall make an audible and visual alert.

T2.11.2 The aircraft will be flying above farmland. At least 25% of the upper, lower and side surfaces of the air vehicle shall be coloured to contrast with landscape which will consist of greens, browns & yellows – for example:

T3 PLATFORM ENERGY STORAGE

T3.1 Batteries

T3.1.1 Only 6s 6000 mAh Li-Po batteries with XT90 anti-spark connectors are permitted to be used on the air vehicle.

T3.1.2 Teams may use multiple batteries.

T3.1.3 Batteries shall be positively secured to prevent movement in flight.

T3.1.4 Batteries shall be located such that there is some impact protection in the event of a crash.

T3.1.5 Batteries shall be easily accessible and removable without the use of tools. Teams will be required to demonstrate that the batteries can be removed from the aircraft within 60 seconds.

T3.1.6 Any electrical power / battery architecture deemed a high risk in the opinion of the scrutineering team at the fly off event will be prevented from flying.

T3.1.7 All teams should note legal requirements on transport of hazardous materials.

T3.2 Power Safety Links

T3.2.1 The air vehicle shall have a clearly identified and accessible, externally removable XT-90 anti-spark link to isolate power to the whole air vehicle, for example:

- *Note: this is a requirement so that in the event your aircraft lands away from the runway and requires the recovery team to retrieve it, they can immediately cut off all power from the batteries to the aircraft.*

T3.2.2 The air vehicle shall also have a clearly identified and accessible, externally removable XT-90 anti-spark link to isolate power to all motors.

- *Note: this is a requirement so that the team may power on the air vehicle, minimising risk to the team, whilst work is done on the aircraft prior to flight.*

T3.2.3 Both safety links shall be positioned away from any propellers so that there is minimum risk of injury when making safe the aircraft.

T4 RADIO EQUIPMENT & CONTROL

T4.1 Manual/autonomous control

T4.1.1 The air vehicle be capable of flying fully automatically from initiation of take-off to a full stop landing, including navigation and payload operation without input from the competition pilot or team.

T4.1.2 It shall be possible for the competition pilot to revert to manual control at any point in the flight. Any manual intervention during an automatic flight will result in loss of points.

T4.1.3 It shall be possible for the competition pilot to manually trigger a Flight Termination System at any point in the flight.

T4.1.4 The air vehicle shall be capable of flying a circuit manually by the competition pilot.

T4.1.5 The controller for manual flight shall be set up to operate in Mode 2 configuration: yaw and throttle on left stick and roll and pitch on the right stick.

- *Note: the competition pilot(s) will be flying a lot of aircraft. It is to your benefit to make it easy for them to identify the controls necessary for your UAS.*

T4.2 Flight Termination System (FTS)

T4.2.1 An FTS shall be incorporated as part of the design and demonstration of the functionality is a mandatory requirement to achieve a Permit to Fly.

- *Note: the purpose of the FTS is to bring the air vehicle down as quickly as possible within the shortest horizontal distance from initiation, to ensure the safety of people. It does not necessarily mean the aircraft will be undamaged.*

T4.2.2 The FTS shall bring down the air vehicle as soon as possible after initiation.

T4.2.3 The FTS shall immediately set all motors to off.

T4.2.4 For air vehicles in fixed wing flight, the FTS shall be set to

- Pitch: full nose up
- Roll: full right
- Yaw: full right
- Any other moveable surfaces (flaps/spoilers etc): full deflection
- Deployment of any other additional recovery means, for example parachute.

T4.2.5 For hybrid VTOL aircraft operating in a powered lift flight, the FTS shall not trigger a transition.

T4.2.6 The FTS must not trigger a “return to home” function.

T4.2.7 The FTS shall be triggered automatically by:

- Breach of geo-fence
- After 5 seconds of RC signal loss

T4.2.8 After no more than 10 seconds of data link loss with the GCS the air vehicle may enter a loiter mode so long as the aircraft remains within the geo-fence and doesn’t contravene any other competition rules. This is to allow for the competition pilot to subsequently take manual control of the aircraft.

- *Note: the FTS functionality identified above is required for the fly-off event as part of this competition. Teams may require different failure management controls whilst undertaking flight testing in their local environment. It is always the team leader’s responsibility to ensure that the air vehicle is operated safely and within the law.*

T4.3 Ground Control Station

T4.3.1 The UAS shall include a GCS which shall display the following information to be visible to the Operators, Flight Safety Officer and Judges during the mission flight:

- Current air vehicle position on a map
- Local Airspace, including the geo-fence flying zone
- Height AGL (QFE) (ft)
- Ground speed (kts)
- Indicated airspeed (kts)

T4.3.2 The air vehicle shall have a suitable port for a wired connection to the GCS to enable data transfer and mission programming without the need to transmit RF.

T4.4 Radio Equipment

T4.4.1 All radio equipment shall comply with Ofcom regulations for Licence Exempt Short Range Devices, permitted for airborne use:

https://www.ofcom.org.uk/spectrum/radio-equipment/short-range-devices

T4.4.2 Radio equipment providing control of the air vehicle and FTS shall be “Spread Spectrum” compliant on the 2.4 GHz band.

T4.4.3 The Radio equipment must have sufficient range to ensure the aircraft remains under control throughout the live flying activities.

- *At BMFA Buckminster the air vehicle will not operate at ranges greater than 500m from the competition pilot.*

T4.4.4 Evidence of compliance shall be presented in deliverables.

T4.5 Additional Competition Equipment

T4.5.1 The air vehicle must provide space and payload capacity to carry two additional devices which will be provided by the competition officials at the fly-off event. These are: a GPS tracker, which is used to record the flight path of the air vehicle for scoring purposes, and an RF locator which is required to aid in locating the air vehicle in the event of a fly-away. Both devices are provided per flight and must be removed between flights.

T4.5.2 Both devices shall be positioned on the upper surface of the air vehicle and must have a non-conductive, RF transparent cover over them.

T4.5.3 The RF locator is 60mm x 34mm x 18mm and weighs 30g.

T4.5.4 The GPS tracker is 78mm x 28mm x 18mm and weights 32g.

T4.5.5 Both devices will be activated by the competition officials but will be fitted to the aircraft by the team.

T5 MISSION PAYLOAD

T5.1 Payload Description

T5.1.1 The aircraft is required to carry and release water.

T5.1.2 The team may utilise any means to contain the water in their air vehicle.

T5.1.3 The water shall be delivered to the air vehicle already in its container(s). The payload container(s) should not be filled whilst in the aircraft.

T5.1.4 It must be possible to load the payload into the top of the aircraft.

T5.1.5 It must be possible to load the payload without the use of tools.

T5.1.6 The person loading must be able load the payload whilst keeping all parts of their body free of the swept arc of any propeller or rotor.

T5.2 Payload Delivery

T5.2.1 The air vehicle must be capable of selectively releasing water over extended periods and on multiple occasions. It must be possible to carry out at least two releases per flight.

T5.2.2 Only water may be released during flight.

T5.2.3 Payload release will happen at no greater than 20ft AGL.

T5.2.4 Payload release will occur over a distance of 75m (P1-P2).

T5.2.5 Payload release must stop within 10m of the shut-off point (P2-P3).

T6 STORAGE & RE-ASSEMBLY REQUIREMENTS

T6.1 Container

T6.1.1 The teams shall design and make a storage container to safely transport their UAS and GCS. No score will be awarded for COTS storage containers without modification or justification.

T6.1.2 This should be as small as practical, but the external dimension shall not exceed 1500mm x 600mm x 600mm.

- *Note: these are the **external** dimensions.*
- *Note: these external dimensions are for the whole container. Any items, including but not limited to, hinges, handles, casters, or other protrusions must remain inside these dimensions.*

T6.1.3 The container should allow for the air vehicle and its components to be secured in place.

- *Note: innovation is encouraged. The Storage Container may also be designed with additional functionality.*
- *Note: for teams outside of the UK the container may be split down into smaller containers so long as the total container dimensions do not exceed the dimensions identified above.*

T6.2 Re-Assembly

T6.2.1 The teams shall design the UAS for routine assembly without the use of any tools.

T6.2.2 The only exception to this rule is propellers and rotors, which shall be fitted and torqued according to their specs.

T6.2.3 Major subassembly component connections (e.g. wing to fuselage) shall have a secondary retention mechanism (e.g. cotter pins, pip pins, locking wire, etc). These will be items of inspection by scrutineering. If scrutineers do not believe that suitably safe and robust connections are in place, the aircraft will not be permitted to fly.

- *During assembly the team will likely have to reconnect various electrical and/or mechanical connections. Teams should consider how they design these connections to physically prevent incorrect configurations.*

SECTION D – DELIVERABLES

D1 INTRODUCTION

D1.1 All Deliverables

D1.1.1 Over the academic year, team will prepare and deliver the following documents:

- Concept Paper
- Preliminary Design Review (PDR) meeting minutes
- Flight Test Report (FTR) for Simulation Activity
- Design and Development Specification (DDS)
- Critical Design Review (CDR) meeting minutes
- Flight Readiness Review (FRR) meeting minutes

D1.1.2 In addition to the documents, the team will prepare the following:

- Form 701 (F701)
- Business Case presentation

D1.1.3 All deliverables must be uploaded to Mashoom by the scheduled dates, or they will incur a late penalty.

D1.1.4 All documents must be in .pdf format, A4 page size in portrait, with a minimum font size 9 and text must be single column.

D1.1.5 Each document must have a cover page with the following information

- Team number, university name, team name
- A perspective image of your proposed vehicle
- A list of team members, their courses and year
- Name(s) of supervisor
- Signature of person compiling the document (usually the team leader)
- Signature of person authorising its issue (usually the academic lead)
- Sponsor logos (if applicable)

D1.1.6 A page limit is provided for some deliverables. Some individual sections of deliverables will also have a page limit. Any part of the deliverable that is outside of this page limit will not be scored. Annexes/appendices to documents must not be added and will not be scored.

D1.1.7 All files uploaded to Mashoom must have their file name in the following format:

Team number. University name – Team name – Deliverable Name

For example: 17. Daystrom Institute – Phoenix – Concept Paper.pdf

D1.1.8 Failure to comply with the file naming convention may result in a score penalty being applied.

- *Note: these deliverables will add to the overall competition score as well as some of the individual prizes.*

D1.2 Deliverables' due dates

Deliverable	Date
Concept Paper	21st November 2025
X-Plane FTR and PDR	16th February 2026
Design & Development Specification and CDR	20th March 2026
Flight Readiness Review	12th June 2026

D1.3 Competition Scoring Summary

	Activity	Section Score	Score
Pre-Fly-off Event	**Design and Development**		**350**
	Concept Paper	50	
	X-Plane Model	80	
	Preliminary Design Review (PDR)	25	
	Design and Development Specification	120	
	Critical Design Review (CDR)	25	
	Flight Readiness Review	50	
Fly-off Event	**Storage & Re-assembly**		**50**
	Scrutineering		**50**
	Mission Flight # 1		**240**
	Automatic Take-off	10	
	Navigation to payload delivery	80	
	Payload Delivery)	100	
	Return Navigation	10	
	Automatic Landing	40	
	Mission Flight # 2		**420**
	Automatic Take-off	10	
	Navigation to 1st payload delivery	80	
	1st Payload Delivery	100	
	Navigation to 2nd payload delivery	20	
	2nd Payload Delivery	100	
	Return Navigation	10	
	Automatic Landing	40	
	Energy Efficiency	60	
	Manual Flying Quality Assessment		**50**
	Design implementation		**25**
	Conduct and Professionalism		**50**
	Business Case		**50**
		Total	**1285**

D1.4 Innovation Scoring

D1.4.1 The challenge aims to encourage innovation and novel solutions. Based on the Concept Paper, X-Plane model and Design & Description Specification, the judges will identify the top 3 teams who have been assessed as having the most innovative designs. These teams will receive a score multiplier for all the Fly-off Event scores. The multiplier does not allow the score for an individual aspect to exceed maximum points.

- Most innovative: 1.15 multiplier
- 2nd most innovative: 1.1 multiplier
- 3rd most innovative: 1.05 multiplier
    - Example: 2nd most innovative team scores 300 points on Mission #2, with multiplier, they are awarded 300 x 1.1 = 330 points. On the manual flying, they score 48 points, 48 x 1.1 *exceeds* maximum score and so they are capped at the maximum 50 points.

D2 CONCEPT PAPER

D2.1 Description

D2.1.1 The concept paper is a short description of the team's chosen concept to meet the requirements of the UAS Challenge.

- This is worth 50 points

D2.2 Content

D2.2.1 The report is limited to 8 pages and shall contain:

- A cover page
- No more than 5 pages of text
- 1 page of drawings/sketches – with labels
- 1 page project plan

D2.2.2 It must provide enough information to convey the overall design of your UAS and should be used to highlight major features and the basis for their selection. Examples of items to be covered include:

- Air vehicle configuration
- Propulsion system
- Control system
- Payload system

D2.2.3 The project plan shall be a simplified Gantt or similar chart showing the major steps in your design and development process and the competition project deliverables covered in section D.

- *Note: it would be wise to allow plenty of time for manufacturing, testing and contingencies. Test subsystems as early as possible – initial testing can be carried out before integration. Make allowances for things going wrong – you may break things, shipping may be delayed, team members may be unavailable.*

D3 PRELIMINARY DESIGN REVIEW (PDR)

D3.1 Description

D3.1.1 The PDR is a meeting of the whole team and chaired by an independent person, either an academic supervisor or a Chartered Engineer. The purpose is to review the initial design to confirm that it will address all the mandatory requirements set out in these rules, that it can achieve performance targets set and that the project plan can be achieved. The deliverable for this are the minutes of this meeting.

- This is worth 25 points

D3.1.2 The PDR is to be held no more than 1 month after the start of detailed design. It shall be held on the date identified in the project plan contained in the Concept Paper.

D3.2 Content

D3.2.1 The PDR minutes shall be a written summary of discussions taking place during the PDR meeting.

D3.2.2 Any slip on the project plan shall be identified and rectification/implications identified.

D3.2.3 For any actions raised, there should be named owners and deadlines.

D4 FLIGHT TEST REPORT FOR SIMULATION ACTIVITY

D4.1 Description

D4.1.1 An X-Plane model should be created by teams following completion of their concept paper and should be developed through its design lifecycle up until CDR. The FTR should represent this development and in particular detailing how X-Plane has been used to test design parameters of the aircraft. It is expected the initial X-Plane design would not be the final version of aircraft submitted as part of this competition deliverable.

D4.1.2 The FTR is a document created by the team to showcase their design iteration process within their aircraft development phase within X-Plane. Teams shall create their X-Plane model within X-Plane 11 Planemaker toolset and shall do flight testing within X-Plane 11. (It is possible to use the free version of X-Plane 11 to complete flight test activity).

- This is worth 40 points

D4.1.3 Your submitted X-Plane model will be flown by the simulation judges in a manual handling flight – take-off, cruise, landing.

- This is worth 40 points

D4.2 Content

D4.2.1 The document is limited to 15 pages including a cover page and the following sections:

D4.2.2 **Overview of Initial X-Plane model**, 1 page.

D4.2.3 **Test Plan**

- Sufficiently detailed to allow the team to assess the key characteristics of their aircraft design within X-Plane

D4.2.4 **Test Results**

- Results for each test run
- Assessment of the design based on the tests
- Subsequent design modifications (if any) based on the results
- Optionally any additional simulation activities used to inform the finalised design of the aircraft

D4.2.5 **Design Limitations**

- Detailed description of any design limitations encountered with the creation of the team's aircraft model in X-Plane.

D4.2.6 **Conclusion,** 2 pages

- A conclusion section detailing the key design features of the team's final X-Plane model e.g. wingspan, propeller size, aircraft chord, weight, payload mass and C of G.

D4.3 Submission Requirements

D4.3.1 The FTR will be uploaded to Mashoom as a pdf like the other deliverables.

D4.3.2 The X-Plane 11 model required for submission is only the final version of the aircraft design. The model shall be submitted onto Mashoom in a single zip file containing all the required data.

D4.3.3 If your model throws an error on load, the judges will not have time to fault find and rectify the issue. You will score 0 for the manual handling flight aspect.

- *Note: we strongly advise teams to load their model into a fresh install of X-Plane to confirm that they've packaged everything correctly.*

D4.3.4 The zipped folder shall follow the naming convention for all deliverables.

D5 DESIGN & DEVELOPMENT SPECIFICATION

D5.1 Description

D5.1.1 This document is a description of the design and its development, including diagrams, tables and charts. This document must demonstrate that all the mandatory requirements will be met and that the UAS will be safe to fly.

- This is worth 120 points

D5.1.2 The document shall be structured as identified below and each section will start on a new page.

D5.2 Content

D5.2.1 The document is limited to 26 pages including a cover page and the following sections:

D5.2.2 **Design Summary**, 1 page (10 points).

- A description of the proposed design.
- Any significant changes since the Concept Paper and their reasons.
- Any contributions from sponsors
- A table listing the key features/parameters of your design and must include: configuration, wingspan, MTOW, number of motors, number of batteries and total mAh, payload weight.

D5.2.3 **Project Management**, 2 pages (10 points).

- Progress against your project plan with any amendments and further detail for the remaining steps.
- It shall show lead times and dependencies.
- A table summarising the project risks and their mitigations. (e.g. resourcing, skills, procurement, manufacturing etc.)
- *Note: project risks are not safety risks and vice versa*

D5.2.4 **Requirement Review**, 3 pages (10 points).

- A table of all technical requirements and how they are being met, for example:

Rule ID	Requirement	Response
TX.X.X	All up mass <= 10 kg	A detailed weight budget has been produced with a 10% contingency allowance.

D5.2.5 **Design Description,** 10 pages (30 points). This is the principal area where the team shall provide the evidence and justification for all your design decisions.

- You should cover:
    - Airframe
    - Propulsion System
    - Flight Controls
    - Navigation & Mission Control
    - Sensors
    - Autonomy
    - Payload Systems
    - Flight Termination System
- You should highlight and justify any novel features
- You should provide calculations covering:
    - Aerodynamics
    - Flight performance
    - Energy management
    - Structural performance
    - Mass estimation, including a detailed weight breakdown and CG position

D5.2.6 **System Architecture Diagram**, 1 page (10 points).

- Diagram showing the system interconnections and data flows, including removable safety links.

D5.2.7 **3-view Drawing**, 1 page (10 points).

- A dimensioned and labelled 3-view scale drawing including the position of the CG

D5.2.8 **Safety**, 2 pages (20 points). In this section you will identify how safety will be assured and system airworthiness established.

- This section shall include a risk assessment listing potential hazards during manufacturing, testing and operating your UAS and how they will be mitigated.
- You shall use the severity and probability criteria for both pre- and post-mitigation assessments identified below:
- *Note: damage to your UAS is not considered a high severity event but injury to people is!*

Severity	**Definition**
Marginal	Irreparable damage or loss of the UAS
Minor	Minor injury to participant. Damage to public property
Major	Single major injury to a participant. Single injury to a member of the public
Catastrophic	Multiple injuries. Death of any part

Probability	Definition
Frequent	Likely to occur frequently during UAS Challenge
Occasional	May occur occasionally during UAS Challenge
Remote	Remote possibility of occurring during UAS Challenge
Improbable	Highly unlikely to occur during UAS Challenge

D5.2.9 **Manufacturing**, 2 pages (10 points).

- The proposed manufacturing process and construction techniques to be used, including any safety and environmental issues and how they will be addressed
- Justification of material selections with special attention to environmental impact.
- Any special equipment required.
- Any outsourcing of major subsystems with a justification.

D5.2.10 **Support**, 1 page (10 points).

- The storage container for transporting the UAS, including a sketch or drawing.
- The support equipment, handling and storage fixtures necessary for the development flight trials and prototype customer demonstration at BMFA Buckminster.

D5.2.11 **Qualification Test Plan**, 1 page (10 points).

- A table summarising planned ground and flight tests indicating how each performance and safety requirement will be verified. So far as possible it should include numerical values for objectives and success criteria and test results or date results expected. Examples in the table below:

ID	Objective	Method	Success Criteria	Test results and date
QTP 1	MTOW of 10.0kg	Weigh fully loaded aircraft using scales	≤10.0kg	10.0 kg with 1.5kg of payload
QTP 2	Land within 20m box	Measure aircraft landing run when at MTOW	≤ 20m	Awaiting flight test phase expected 20/05

D5.2.12 **Cost Breakdown**, 1 page (10 points).

- A table listing all bought items with their actual or estimated costs. Any costs incurred from outsourcing manufacturing or parts/services donated by sponsors must be included.
- A total cost and a separate sub-total cost for COTS items.

D5.3 ***Guidance on how the DDS will be assessed***

D5.3.1 *The judges will be looking for several factors, including:*

- *Demonstration of a sound systems engineering approach to meeting the design requirements.*
- *A structured design process adopted by the team, and how the derived performance requirements are developed for each of the sub-systems such as wing (or rotor), airframe, propulsion, control, navigation, payload handling etc.*
- *Extent of innovation.*
- *Adherence to the rules.*
- *Depth and extent of underpinning engineering analysis.*
- *Design and planning to meet safety and airworthiness requirements.*
- *Evidence of sound project management, planning, budgeting.*
- *Overall quality of the submission.*

D6 CRITICAL DESIGN REVIEW (CDR)

D6.1 Description

D6.1.1 The CDR is a meeting of the whole team and chaired by an independent person, either an academic supervisor or a Chartered Engineer. The purpose is to review the matured design to confirm that it is ready to be manufactured and will address all the mandatory requirements set out in these rules, that it can achieve performance targets set and that the project plan can be achieved. The deliverable for this is the minutes of this meeting.

- This is worth 25 points

D6.1.2 The CDR is to be held at the end of the design phase. It shall be held on the date identified in the project plan contained in the Concept Paper, or an updated plan in the DDS.

D6.2 Content

D6.2.1 The CDR minutes shall be a written summary of discussions taking place during the CDR meeting.

D6.2.2 Any slip on the project plan shall be identified and rectification/implications identified.

D6.2.3 For any actions raised, there should be named owners and deadlines.

D7 FLIGHT READINESS REVIEW (FRR)

D7.1 Description

D7.1.1 The FRR is a meeting of the whole team and chaired by an independent person, either an academic supervisor or a Chartered Engineer. It is to be held once all systems ground

testing has been completed. FRR is held to establish that the UAS is ready for flight testing and that all safety and legal requirements have been addressed and that a suitable flight-testing programme is in place.

- This is worth 50 points
- *Note: A suggested flight test plan is to carry out at least 10 flights of varying complexity and length to explore the flight envelope and specific manoeuvres for your air vehicle. You should try to include at least 2 full mission-representative flights. Furthermore, this is an opportunity for the team to practice the practicalities of storing, transporting, unpacking, readying and recovering your UAS.*

D7.1.2 The FRR must be held before the first flight of the UAS.

D7.2 Content

D7.2.1 The FRR minutes shall be a written summary of discussions taking place during the FRR meeting.

D7.2.2 For any actions raised, there should be named owners and deadlines.

D8 FLIGHT READINESS REVIEW CERTIFICATE - FORM 701 (F701)

D8.1 Description

D8.1.1 The IMechE's F701 is a tailored and simplified version of the UK's Ministry of Defence's MoD F701. This is a real-world document that is used as part of aircraft and airworthiness management.

D8.1.2 This form does not attract any points directly. Failure to complete the form will result in you not being permitted to fly. You will be required to complete this form and bring it to the fly-off event.

D8.2 Content

D8.2.1 The content of the form is a summary of evidence used in support of the airworthiness assessment of your UAS by the scrutineering team.

D8.2.2 The exact content of the form for this year's competition will be finalised at a later date

D9 BUSINESS PRESENTATION

D9.1 Description

D9.1.1 The Business Presentation given at the fly-off event and consists of 10 minutes to present your business proposition to a panel of judges, followed by 5 minutes of questioning.

- This is worth 50 points

D9.2 Content

D9.2.1 The Business Presentation should include:

- A well-articulated understanding of the market that your UAS will be competing in.
- An outline of your revenue model.
- An estimate of your sales projection, your costs and the selling price of the production system and operational costs.
- Considerations of support model.
- Discussion of how your design minimises its environmental impact in production and operation.

SECTION F LIVE FLY-OFF EVENT

F1 OVERVIEW

F1.1 Outline Timings

F1.1.1 The following are not strict timelines and are provided as a guide for what teams should expect at the fly off event. Specific timings will be promulgated closer to the fly-off.

F1.1.2 The fly-off event will run from Monday through to Thursday.

- Monday
  - Teams' arrival and registration.
  - The Hangar tent will be open for teams to unload their aircraft and set up their pit from around mid-day.
  - There will be a mandatory safety brief for all participants in the afternoon.
  - Scrutineering and unboxing start.
- Tuesday
  - Mandatory team leader briefing in the morning.
  - Flight line opens – "short mission" day.
  - Business presentations start.
  - Scrutineering and unboxing continues.
- Wednesday
  - Mandatory team leader briefing in the morning.
  - Flying continues – "long mission" day.
  - Business presentations continue.
  - Scrutineering and unboxing available if required.
- Thursday
  - Mandatory team leader briefing in the morning.
  - Scrutineering and unboxing available if required.
  - Business presentations continue.
  - Competition flying finishes in the early afternoon – "manual handling" day.
  - Hangar pits tidy.
  - Competition awards presentation.
  - Challenge end.

F1.2 Business Presentations

F1.2.1 Teams will be given a business presentation slot, you will not be able to choose when you do your presentation. It is the team captain's responsibility to ensure that the presentation team are available at this time.

- *Note: it is recommended that the presentation team are not required to be present for flying the UAS in the event of a schedule overlap.*

F2 GENERAL RULES

F2.1 Removing the UAS from the Hangar

F2.1.1 At the live fly-off event, teams may not remove their UAS or parts thereof, except for laptops, from the Hangar tent. Any team found doing so will be penalised 25 points.

F2.1.2 Teams may not move their aircraft from the Hangar to the flight line until they are instructed to do so by the flight scheduling team.

F2.2 Multiple Airframes

F2.2.1 Only one air vehicle per team will go through the scrutineering process and so only one air vehicle will be permitted to be flown at the fly off event.

F2.3 Safety Briefing

F2.3.1 At the life fly-off event, all team members from all teams must attend any announced or scheduled safety briefings. Teams failing to attend may be prevented from flying.

F2.4 Moving Around on Site

F2.4.1 All participants and challenge staff must not run on site. This includes the flight line, hangar and spectator areas.

- *Note: repeat offenders may have points deducted from their team and may be barred from the flight line.*

F2.5 Propellers/Rotors

F2.5.1 Propellers and rotors shall not be fitted to the UAS unless instructed to do so by challenge officials.

F2.5.2 In any event propellers and rotors shall never be fitted whilst in the hangar tent.

F2.6 Dirty Work

F2.6.1 Any work on the aircraft that produces swarf, dust or fumes may not be carried out in the hangar tent.

F2.6.2 Such activities must be conducted in the repair tent with the permission and under the supervision of the repair tent officials.

F2.7 Repairs

F2.7.1 Repairs may include replacement of systems and airframe components with spare parts.

F2.7.2 Any repair work must be subsequently reviewed by the scrutineering team to confirm that it does not invalidate the airworthiness of the UAS.

F2.8 Battery Charging

F2.8.1 This may only happen on the designated battery charging station.

F2.8.2 There must be at least one person (from any team) present at the battery charging station whilst batteries are being charged.

F2.8.3 If the officials discover unsupervised batteries charging, they will be disconnected from their charger.

F3 SCORING

F3.1 Scrutineering (50 points)

F3.1.1 Scored by the Scrutineers on the quality and preparedness of the UAS being presented for scrutineering.

F3.2 Design Implementation (25 points)

F3.2.1 Scored by the judges on how well the UAS design described n the team's Design & Development Specification has been taken through to the final manufactured product.

F3.3 Conduct & Professionalism (50 points)

F3.3.1 Scored by the IMechE challenge staff and volunteers on the overall conduct and approach to the competition of each team, as individuals and all together.

F3.4 Storage & Re-assembly (50 points)

F3.4.1 Packaging and storage. Maximum 30 points based on size, novel features, security and protection of components.

F3.4.2 Re-assembly. 20 points for time ≤ 8 minutes. Time to assemble and ready UAS for flight, starting with the UAS packaged in the closed Storage container. Includes the installation of batteries, an empty payload and performing all control function and other pre-flight checks to the satisfaction of the Scrutineering Official. Propellers/rotors must not be fitted.

F3.5 Short Mission Autonomous (240 points)

F3.5.1 Take-off. Maximum 10 points.

- 10 points for automatic take-off within box. 5 points if manual or outside box.

F3.5.2 Navigation to release point. Maximum 80 points.

- Calculated by: Mass of payload (kg) x number of waypoints flown x 2.

F3.5.3 Payload delivery. Maximum 100 points.

- 20 points for release initiation prior to P1.
- 60 points for continuous release past P2. 30 points for discontinuous release. 10 points for release over less than half distance P1 to P2.
- 20 points for release cutoff between P2 and P3.

F3.5.4 Return navigation. Maximum 10 points.

- 1 point per waypoint.

F3.5.5 Landing. Maximum 40 points.

- 40 points for touching down and coming to a full stop within the box. 20 points for touching down within the box but stopping outside. 10 points for a manual landing or a landing which damages the UA.

F3.6 Long Mission Autonomous (420 points)

F3.6.1 Take-off. Maximum 10 points.

- 10 points for automatic take-off within box. 5 points if manual or outside box.

F3.6.2 Navigation to first release point. Maximum 80 points.

- Calculated by: Mass of total payload (kg) x number of waypoints flown x 2.

F3.6.3 First Payload delivery. Maximum 100 points.

- 20 points for release initiation prior to P1.
- 60 points for continuous release past P2. 30 points for discontinuous release over most of P1 to P2. 10 points for release over less than half distance P1 to P2.
- 20 points for release cutoff between P2 and P3.

F3.6.4 Navigation to second release point. Maximum 20 points.

- 2 points per waypoint.

F3.6.5 Second Payload delivery. Maximum 100 points.

- 20 points for release initiation prior to P1.

- 60 points for continuous release past P2. 30 points for discontinuous release. 10 points for release over less than half distance P1 to P2.
- 20 points for release cutoff between P2 and P3.

F3.6.6 Return navigation. Maximum 10 points.

- 1 point per waypoint.

F3.6.7 Landing. Maximum 40 points.

- 40 points for touching down and coming to a full stop within the box. 20 points for touching down within the box but stopping outside. 10 points for a manual landing or a landing which damages the UA.

F3.6.8 Energy efficiency. Maximum 60 points.

- Points awarded to top 10 performances, calculated by: Waypoints navigated x Payload mass [kg] / Energy consumed [Wh].

Posn.	Points	Posn.	Points
1st	60	6th	15
2nd	45	7th	12
3rd	34	8th	9
4th	26	9th	6
5th	20	10th	7

F3.7 Manual Handling Assessment (50 points)

F3.7.1 Take-off. Maximum 20 points.

F3.7.2 Manouevering. Maximum 10 points.

F3.7.3 Landing. Maximum 20 points.

F4 FLY-OFF PROCESS

F4.1 Flying Days

F4.1.1 This year each team will be limited to 1 flight per day and the missions for the day will be proscribed:

- First day flights will be short mission Autonomous
- Second day flights will be long mission Autonomous
- Third day flights will be manual handling

F4.1.2 All flights are limited to 10 minutes.

F4.1.3 If an aircraft exceeds the mission time limit, the competition pilot will take manual control, bring the aircraft back and land the aircraft.

F4.2 Scheduling

F4.2.1 To manage the competition a flight schedule is utilised. This tracks the team's progress through scrutineering and judging towards flight and manages the flying programme. For this system to work, teams will need to communicate their readiness at each stage with the flight scheduling team.

F4.2.2 If a team report that they are ready but cannot progress when called, they will be moved to the back of the queue for whatever stage they are at.

F4.3 Scrutineering

F4.3.1 To be allowed to fly, each team will need to complete scrutineering and demonstrate to the satisfaction of the scrutineering team, that their UAS is airworthy.

F4.3.2 This process consists of the following activities:

- F700 inspection
- Aircraft visual inspection and discussion with scrutineers
- Unboxing demonstration
- Battery removal demonstration

F4.3.3 On completion of scrutineering the team may report their readiness to fly.

F4.3.4 If a team fails scrutineering, they will be given guidance on how to rectify the faults.

F4.3.5 If an aircraft is modified or requires repairs, the scrutineering team will need to review the changes.

F4.4 Flight Line

F4.4.1 The flight line is the demarcation between the ground activities and the flying activities. There will be a physical barrier – typically a rope fence. Access to the flight line is controlled by the flight line staff. No-one is allowed to cross the flight line without permission of the flight line staff.

- *Note: Team members behaviour at the competition is always being noted. However, on the flight line this is especially critical. Unsafe or otherwise unprofessional behaviour will be noted. Depending on the perceived severity: you may lose points for your team, individually be requested to leave the flight line, your team not be permitted to fly or your team disqualified.*

F4.4.2 The schedulers will call teams individually, as they reach the front of the queue, to take their UAS to the flight line.

- *Note: it is always the team leader's responsibility to decide whether, or not, to fly their UAS.*

F4.4.3 The team will report to the flight line with their UAS and their completed F700 and wait for the flight line staff to call them through the flight line fence. The team should take all items necessary to fly their UAS. No tools – apart from those required for fitment of propellers/rotors are permitted on the flight line.

F4.4.4 Only 4 team members will be permitted on the flight line. They shall be identified as having specific roles – example:

- Flight lead – in charge of the flying activity. Will brief the competition pilot on the operation of their UAS manual controls.
- Mission planner – responsible to the flight lead for the GCS. Will brief the flight line staff on their GCS, indicating their waypoints, geofence and flight instruments.
- Payload – responsible to the flight lead for the mission payload.
- Aircraft handler – responsible to the flight lead for moving and positioning the aircraft on the ground (with the assistance of other team members as required).
- *Note: it is possible to switch team members on the flight line, with the permission of the flight line staff. However, this should be kept to a minimum and will not be permitted when the aircraft is being/has moved to the runway.*

F4.4.5 The team will be asked to prove their quick disconnects, FTS, and demonstrate that their controls are functioning correctly.

F4.4.6 Once this has been satisfactorily completed the team will be allowed to fit their propellers/rotors.

F4.4.7 The team will then join the queue moving to the runway.

F4.4.8 When it is your turn to fly, you will be invited to position your aircraft on the runway, brief the competition pilot and, once they are content, fly the day's mission.