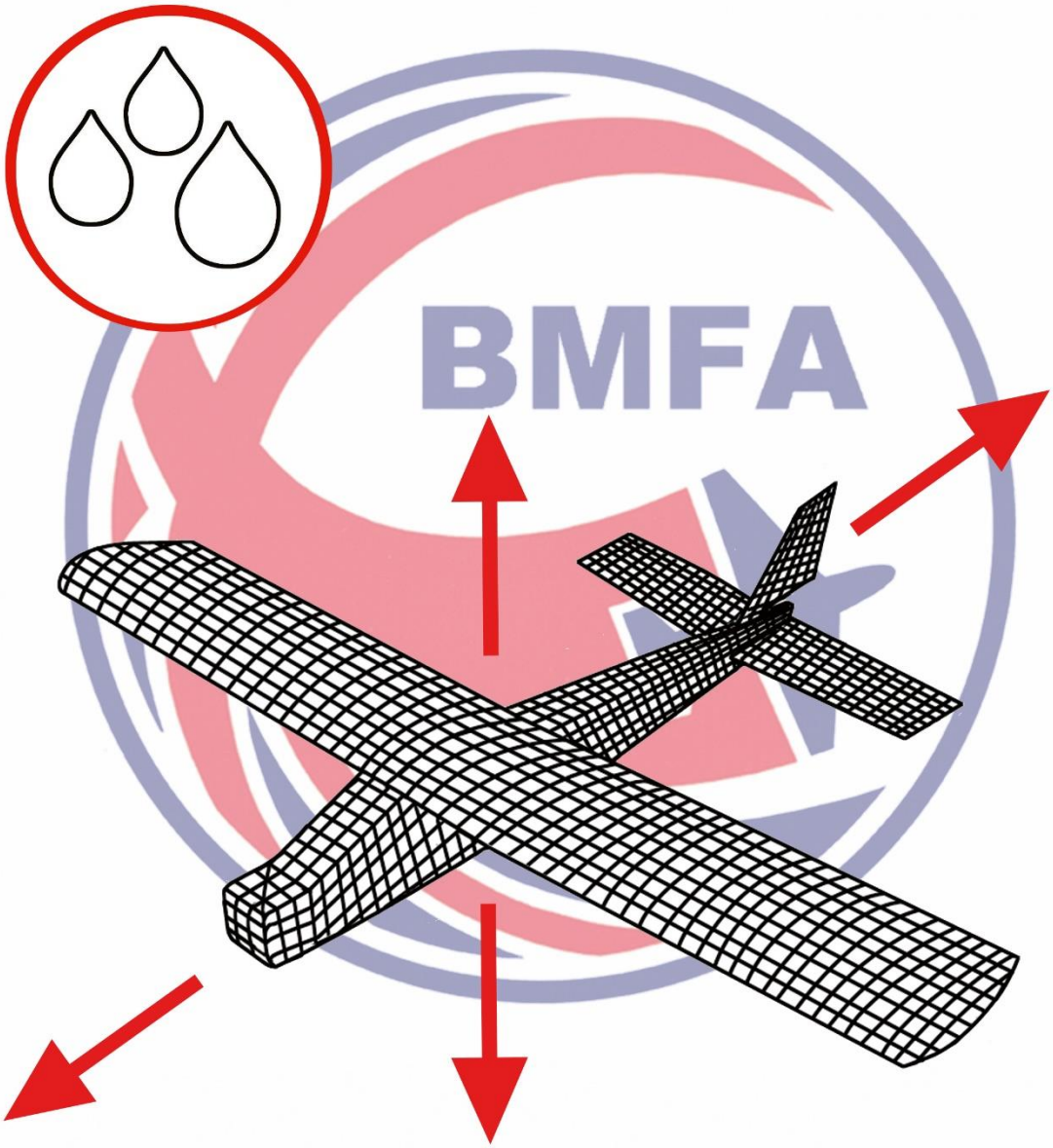
British Model Flying Association

2024 Payload Challenge 5 Weight



British Model Flying Association 2024
University and Schools Payload Challenges

Dates Notice

11th, 12th & 13th June 2024

National Centre for Model Flying
BMFA Buckminster
Sewstern Lane
Grantham
Lincolnshire
NG33 5RW

Sponsored By

ROYAL AERONAUTICAL SOCIETY

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BAE SYSTEMS

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ROYAL AIR FORCE Engineering

ROYAL AIR FORCE model aircraft

The British Model Flying Association invite your university or school to enter a team or teams in the

2024
Payload Challenge 5
Weight

The information contained in this brochure provides a detailed overview of the 2024 Payload Challenge 5 (weight) as well as all information for prospective entrants. We look forward to meeting your staff and students in 2024.

Should you require any assistance please contact
the BMFA Challenge Co-ordinator.
Manny Williamson
manny@bmfa.org

NOTE

These competitions are supported by cash prizes, both for the university department and the individual members of the winning team.

INTRODUCTION

University degree courses in engineering subjects provide an excellent technical and theoretical basis for students wishing to embark upon a career in the engineering or aviation industry. However, it is often the case, that universities lack the facilities to allow students to gain practical experience working on meaningful design, manufacturing and operational projects. This is particularly so in aviation where full-size aircraft projects demand large and expensive facilities if the projects are to be realistic. Although it is perfectly feasible for students to undertake aircraft design projects, these will inevitably feel incomplete unless they result in a real flying machine. The Payload Challenge Competitions are intended to fill this gap, whilst at the same time providing the framework for a compulsive, enjoyable and competitive experience.

Although the competitions centre on the design, manufacture and demonstration of model aircraft, the aim is to relate this, as far as possible, to the activities and processes that would be used in a full-size machine. To this end the competing aircraft have to perform a genuine operational task in terms of payload, power plant type, etc. Furthermore, the aerodynamic and structural design of the aircraft must be properly assessed in order to predict operational performance, and this assessment has to be presented in the form of a design report and design drawings.

The project is intended to be carried out by a student or group of students, providing valuable experience of operating as a team. Teams also have the opportunity to demonstrate their presentation skills when they give a short talk about their machine. The importance of the presentation should not be overlooked, as valuable points can be gained. In past years we have noted that teams often miss this opportunity to gain additional points.

It is not intended that teams entering the competition are necessarily studying aeronautics and indeed many of the past winners have come from universities that do not have an aeronautical engineering faculty. Many students are undecided on their ultimate career direction when they embark upon a university course, and it is the experience gained at university that will often point them in a particular direction. The competitions provide such experience in aviation technology, and this may provoke an interest in aviation that may otherwise not arise.

The Challenge may be incorporated into a formal study programme as a group or individual project if desired, additionally we are happy to consider entries from outside of formal education structure.

It is important that all competitors read the rules carefully in order to fully understand the task which has been set.

It is very strongly recommended that the help of an experienced aero modeller is enlisted from the very start. Local contacts are available from the BMFA office.

Sponsored by the Royal Aeronautical Society

- The Royal Aeronautical Society (RAeS) is pleased to be the headline Sponsor for the 2024 BMFA Payload Challenge.
- The RAeS will provide Aerospace Professional support for judging and operation of the competition.
- This support for the competition is part of the RAeS outreach programmes to schools, colleges, and universities.
- The RAeS also provides career support to aspiring and established Aerospace Professionals and details can be found on its website at https://www.aerosociety.com/careers-education/

ROYAL AERONAUTICAL SOCIETY

GENERAL CONTEST RULES

TEAMS

G 1.1 A team will consist of a maximum of five students plus a manager and a pilot.

G 1.2 For the flying element of the contest a pilot can be supplied by the contest organisers if required.

G 1.3 Only registered team members may participate in all elements of the competition.

G 1.4 The role of team manager is an organisational position, however for teams with less than 5 members, the manager may participate as an active member of the team.

G 1.5 All team members including the manager and pilot must attend the daily morning briefings.

G 1.6 Team pilots will receive an individual flight-line briefing as appropriate.

G 1.7 Teams will be allocated a defined workspace in the hangar building and must work within the designated area.

G 1.8 Teams should familiarise themselves with the contents of the competition rules brochures.

AIRCRAFT CONFIGURATION

G 2.1 Aircraft must be of fixed wing configuration (no rotating lifting surfaces).

G 2.2 The specified power system for each category must be used.

G 2.3 Only the battery pack supplied by the organisers may be used for the flight competition.

G 2.4 No modification to the motor is permitted.

G 2.5 Only the specified “isolator” unit must be fitted (XT60-Wall).

G 2.6 The “isolator” must be mounted in such a location as to be readily accessible by team members and also easily visible to flightline marshals.

G 2.7 The Isolator unit must be located a minimum of 100mm from the propeller arc and orientated so as to promote removal of the isolator predominantly away from the direction of the propeller arc (25 degree minimum).

G 2.8 The isolator unit must be accessible from behind the propeller arc, insertion/removal must not be through the propeller arc.

G 2.9 A tag or pennant must be affixed to the isolator to aid removal and visibility.

G 2.10 Only one flight battery may be used per flying round.

G 2.11 A propeller spinner or rounded safety nut must be fitted on forward facing motors.

G 2.12 The allocated team number must be displayed on the upper wing surface of the aircraft in characters a minimum of 100mm high in a contrasting colour.

G 2.13 Aircraft must display a valid UK Operator ID Number before flying – this is a legal requirement, teams will be provided with a sticker carrying the appropriate number at aircraft scrutineering.

RADIO RESTRICTIONS

G 3.1 Radio control will be used to fly and manoeuvre the aircraft.

G 3.2 Equipment on the 2.4GHz band only.

G 3.3 A correctly set failsafe must be programmed that as a minimum returns the throttle to stop on loss or corruption of the radio signal – this is a UK legal requirement.

G 3.4 Aids to flight stabilisation such as gyros and auto level are not permitted unless stated in the specific challenge rules.

FLIGHT COMPETITION

G 4.1 The flight-line controller has overall responsibility and authority for all matters relating to flight safety.

G 4.2 Once the flight-line has opened for competition flights no other flying must take place other than with the permission of the flight-line controller.

G 4.3 A flight may not commence until the pilot has received a flight-line briefing from the flight-line controller or their appointee.

G 4.4 A flight may not commence without the permission of the flight-line controller or their appointee.

G 4.5 The pilot must perform appropriate pre-flight checks.

G 4.6 Only the registered team members plus the pilot and manager may be in the competition flight box during a competition flight.

G 4.7 Only the registered team members (maximum of 5) may take an active participation and handle the aircraft and payload during the competition flight.

G 4.8 Team members may only enter the active runway for aircraft dispatch/recovery with permission of the flight-line controller or their appointee.

G 4.9 The aircraft must be made safe (isolator removed) before handling, this must be clearly demonstrated to the flight-line controller or their appointee.

G 4.10 Non-compliance with flight-line safety procedures may result in a zero score for the related flight and for repeated violations a zero score for the round.

G 4.11 Pilots must act immediately as directed by the flight-line controller or their appointee at any time an aircraft is in the air and must ditch (forced termination of flight) immediately if directed.

G 4.12 The extent of the flying area will be announced during the pilots briefing, any pilot flying within the briefed “no fly” areas will be directed to land immediately.

G 4.13 The number of flight rounds will be announced at the pilots briefing to reflect the expected weather conditions and number of entries.

G 4.14 The distances indicated on the flight plan sheet are for guidance purposes only, these will be set and announced at the pilots briefing to reflect the prevailing wind conditions and location on the airfield.

CONDUCT

G 5.1 Deliberate or repeated violation of safety rules may result in the team’s expulsion from the competition.

G 5.2 In the event of unsportsmanlike conduct, the team will receive a warning from the Competition Director. A second violation will result in expulsion of the team from the competition.

G 5.3 The Competition Director reserves the right to ground any aircraft if in their opinion, or that of their appointee, the aircraft does not meet an appropriate standard of air worthiness.

PROTESTS

G 6.1 Any protest must be filed in writing to the Contest Director by the team manager.

G 6.2 Any protest relating to the flying element of the competition must be filed no more than 15 minutes after the Flight Competition is announced as being completed.

G 6.3 In order to have a protest considered a team must be willing to sacrifice points as specified in each Challenge, which may be forfeit, if their protest is not upheld.

G 6.4 The Contest Director may call upon a jury of interested parties to help with their decision.

G 6.5 The Contest Director carries the final vote in the event of a split decision.

GENERAL

G 7.1 Time for flight testing will not be available on the day of the competition except at Contest Director's discretion where it is deemed advisable to conduct a test flight after repairing major damage incurred in an earlier round.

G 7.2 Tuesday 11th June is the official practice day for the competition, teams arriving before this date will not be permitted to use the flying area.

G 7.3 Teams arriving from overseas in advance of the competition must not attempt to fly their aircraft at any location other than the official competition venue *

G 7.4 Teams found to be flying unlawfully prior to the competition may be subject to scoring penalties or disqualification.

*** This is a legal requirement – in order to fly a model aircraft in the UK pilots and aircraft are required to be registered with the UK Civil Aviation Authority under the terms of the Article 16 Authorisation granted to members of the British Model Flying Association.**

Non compliance with the terms of the Article 16 Authorisation is a criminal offence under UK Law.

LIST OF CONTENTS

Competition resources supported by

http://www.4-max.co.uk/bmfa-payload-challenge.html

Visit their website to view materials for the 2024 Payload Challenges but it is important that you place your order either by telephone or email in order to receive the discounted payload challenge prices.

Quote **2024BMFA** for 10% discount on competition items.

Please note: the BMFA does not stock competition materials.

W 1 OBJECTIVES

W 1.1 Teams are required to design and build a radio controlled aircraft using the specified design and equipment parameters, capable of carrying the specified **liquid** payload. They should design their aircraft to maximise the value of the ratio "payload/aircraft empty weight". The aircraft empty weight is defined as the weight without payload, payload receptacle but with flight batteries.

W 1.2 Teams are required to produce a technical report describing their aircraft's design and construction together with design drawings.

W 1.3 Teams are required to give a verbal presentation on their aircraft.

W 1.4 Teams are required to take part in a flight competition aimed at achieving the best possible flying scores as defined by the challenge rules.

W 1.5 Flight may be effected either autonomously or by radio control

W 1.6 The flight competition will be judged on the basis of the achieved value of the "payload/empty aircraft weight" ratio.

W 1.7 The winning Team is the Team with the highest aggregate score for all aspects of the competition.

W 1.8 Although normal course tuition and guidance is expected, the reports, drawings and the building of the aircraft are to be treated as though they are examination submissions and are to be the sole work of the students.

W 2 CHALLENGE ELIGIBILITY

W 2.1 The contest is open to all students in full time education including accredited apprenticeships.

W 2.2 Applications outside of this criteria will be considered on an individual basis.

W 3 AIRCRAFT - POWER REQUIREMENTS

W 3.1 Aircraft must be of a fixed wing design (no rotating lifting surfaces).

W 3.2 There are no dimensional restraints on aircraft design.

W 3.3 The power system will comprise one 4-Max PO-3541-1070 motor and 4M-ESC50AV2 speed controller.

W 3.4 The aircraft design must incorporate an XT60-Wall bulkhead mounted isolator unit to disconnect the battery from the speed controller when the isolator plug is removed.

W 3.5 One 3 cell Lithium Polymer battery PPL-60C3S-2200 of 2200 mAh nominal capacity per round (**supplied fully charged by the organisers for each round**).

W 3.6 No modification to the motor or ESC is permitted.

W 3.7 The motor may be used as direct drive or fitted with the addition of a gearbox.

W 3.8 Propellers must be of fixed pitch.

W 3.9 Only batteries supplied by the organisers may be used for competition flights.

W 3.10 Batteries will be fitted with XT60 connectors (negative to pointed end)

DUPLICATE/REPLACEMENT AIRCRAFT

- Teams may submit multiple aircraft for scrutineering.
- Teams must indicate which aircraft is their primary aircraft.
- Replacement aircraft must be of identical design to the primary aircraft.
- Replacement aircraft must weigh no less than the primary aircraft.
- Teams must indicate to the flight-line team when a duplicate/replacement aircraft is being utilised for the flight-line competition.
- A penalty of 15 points will be applied to the flight round score (for that round only) where a duplicate/replacement aircraft is utilised.

W 4 PAYLOAD

W 4.1 The aircraft must include provision to carry the required liquid payload.

W 4.2 Payload containers must be removable.

W 4.3 Any type of receptacle may be utilised, but consideration must be given to secure mounting and damping of payload in order that the aircraft centre of gravity is not significantly altered in flight.

W 4.4 The empty payload receptacle must weigh no more than a maximum of 400g.

W 4.5 The achieved payload for each round will be the total combined weight of the liquid and receptacles.

W 4.6 On completion of a scoring flight the payload/payload receptacles must be presented at the weighing station with the appropriate flight card.

W 4.7 Achieved payload weight will be rounded down to the nearest 100 grams.

W 4.8 The payload weight as recorded by the organisers' scales will constitute the value that is used in scoring calculations for the competition.

W 4.9 In order to facilitate the calculation of the "payload/aircraft empty weight" ratio, the empty weight of each competing aircraft will be measured during scrutineering. The measured empty weight will be rounded up to the nearest 10 grams. The aircraft empty weight is defined as the weight without payload, payload receptacle but with all batteries.

W 5 RADIO RESTRICTIONS

W 5.1 Radio control equipment must utilise the 2.4Ghz band and be UK compliant.

W 5.2 Where autonomous flight capability is utilised the systems used must make provision for the pilot in charge of the flight to regain full control of the aircraft by radio control at any phase of flight, it must be borne in mind that this is a legal requirement as well as a requirement of the competition rules.

W 5.3 Teams utilising autonomous systems must satisfy the competition organisers that the above requirements can be complied with before autonomous flight is authorised.

W 5.4 The use of gyros/auto stabilisation is permitted, however any aids to stable flight must be able to be overridden by pilot command at any phase of flight.

W 5.5 Radio installations will be scrutinised by the organisers and must be deemed fit for the intended application.

W 6 DESIGN COMPETITION

Consider that you are compiling a technical document in support of a competitive tender. Compliance with the following directions will add credibility to your design proposal. Your team will earn more points if the data contained in the drawings corresponds to the values used and derived in your report.

DRAWINGS:

W 6.1 Each team must submit detailed drawings for the aircraft which is to be flown.

W 6.2 Submitted drawings must accurately reflect the details and dimensions of the aircraft submitted for scrutineering and utilised for the flight competition.

W 6.3 The drawings must be to a standard that would permit a third party to construct a working airframe (it is acceptable for novel or complex construction techniques to be detailed in the report rather than on the drawings if necessary).

W 6.4 The drawings must contain fully dimensioned front, end and plan elevations and wing section details.

W 6.5 All drawings must be to scale and with the scale shown.

W 6.6 The plan view must contain a listing of all the relevant aerodynamic surface areas.

W 6.7 Drawing minimum size is A3 and maximum size is AO, all sheets must be the same size.

W 6.8 Material description and sizes are to be indicated.

W 6.9 Detail drawings, as deemed necessary to explain the structure of the aircraft and the range of movement of the aerodynamic control surfaces, must be included.

W 6.10 Each drawing sheet will include the name of the team in the title box and the designated reference number.

W 6.11 Teams are to submit the drawing set by email in PDF format only.

W 6.12 The judges will evaluate the drawings based on a professional standard format. Areas of evaluation will include.

Detail
Completeness
Explanation of structures
Readability
Graphical standards

W 6.13 A maximum of ten sheets of drawings are permitted, where more than 10 sheets are submitted only the first 10 will be scored.

W 6.14 The drawings will be worth a maximum of **50 points**.

REPORT:

W 6.15 Each team must submit a report which details the design philosophy, structural and aerodynamic design.

W 6.16 The report should also include performance calculations.

W 6.17 Any original or innovative ideas should be described, together with the use of unique or advanced structural techniques and materials.

W 6.18 Each page of the report will include the name of the team in the footer or header.

W 6.19 Reports should comprise no more than 25 typed pages of A4 format, using Arial 12 point text, including any appendices and diagrams (this does not include the front cover sheet).

W 6.20 Where an institution enters more than one team, the designs, reports and drawings are to be produced by each team independently.

W 6.21 Copies of all drawings and reports are to be submitted as detailed 30 days prior to the start of the flight competition to lisa@bmfa.org

W 6.22 Late submissions will be penalised, and competitors are advised that, in these circumstances, the judges' comments may be less carefully considered. The organisers are not responsible for lost/misdirected drawings/reports, please ensure that you request an acknowledgement Email when you submit your team's information and do not assume that your Email has arrived if you do not receive this.

W 6.23 Although normal course tuition and guidance is expected, the reports, drawings and the building of the aircraft are to be treated as though they are examination submissions and are to be the sole work of the students.

W 6.24 The report is worth a maximum of **50 points.**

NOTE: The drawings/reports form an important opportunity to gain points, ensure that all submissions are compliant with the rules and submitted on time in order to avoid penalties.

W 7 SCRUTINEERING

W 7.1 All aircraft must pass through scrutineering and receive a "passed" sticker before being eligible for all elements of the challenge.

W 7.2 More than one aircraft may be submitted for scrutineering.

W 7.3 Where multiple aircraft are presented teams must indicate which is their primary aircraft.

W 7.4 Aircraft must be presented for scrutineering with the following items: -

- The controlling transmitter
- The correct propeller (not fitted)
- The isolator plug (not fitted)
- The payload receptacles (not fitted)

W 7.5 Aircraft scrutineering will cover the following points:-

- General airworthiness/structural integrity
- Compliance with competition rules
- Recording of airframe weight
- Recording of payload receptacle weight
- Correct operation of failsafe

W 7.6 On completion of successful scrutineering "passed" stickers will be affixed to major/detachable airframe components.

W 7.7 Duplicate/replacement aircraft will receive a different colour "passed" sticker.

W 7.8 The design submitted for scrutineering must be in accordance with the drawings and reports submitted for judging (see penalties section).

W 7.9 If during the flying competition it is necessary to make repairs to the aircraft, such repairs must not reduce the empty weight or substantially alter the original design.

W 7.10 Following any repair, aircraft must be re-scrutineered and approved for flight by the Contest Director or their appointee.

W 7.11 Where major components are substituted this must be cleared with the Contest Director or their appointee and indicated to the flight-line team

W 7.12 Any repair or modification that alters the design of the aircraft submitted for judging (for example to improve flight performance or controllability) must be approved by the Contest Director or their appointee.

W 8 PRESENTATION

W 8.1 Prior to the first competition flight, each team will present their aircraft design before a panel of professional engineers.

W 8.2 Each team will be allocated five minutes in which to describe and promote their design.

W 8.3 Content falling outside of the allocated time will not be considered during marking.

W 8.4 Visual aids will not be permitted, however teams may utilise material/test samples, aircraft cross section samples and replica components as part of the presentation to judges.

W 8.5 The aircraft must be available for the presentation.

W 8.6 A **10 point** penalty will be incurred if the complete aircraft does not feature as part of the presentation.

W 8.7 The presentation is worth **30 points**. Judging criteria for the presentation will include:

- Balance and continuity
- Articulation
- Technical highlights

NOTE: Experience has shown that teams do not make the best use of the opportunity to gain the additional points that the presentation offers, remember, your team's presentation should aim for a professional standard and "sell" the benefits of your particular design to the maximum.

This competition is as much a test of your organisational skills as of your engineering flair. You may well have a world-beating design....on paper but each year several teams fail to complete their projects by the date of the Flight Competition.

W 9 FLIGHT COMPETITION

W 9.1 The aircraft and design utilised for the flight rounds must be in accordance with the drawings and reports submitted for judging and scrutineering (see penalties section).

W 9.2 Teams are required to fly 3 rounds as detailed below.

W 9.3 During each round of the flight competition, the team will have six minutes from entering the flight box. A score will only be recorded if the aircraft completes its required flight pattern and lands within the designated touch down area within the allotted period.

W 9.4 The aircraft must take off from a stationary start within the designated runway and, be airborne before passing pylon one.

W 9.5 The aircraft must fly one circuit (either left-hand or right-hand, according to the prevailing conditions) and over fly the original point of launch, a second circuit must then be flown and include an opposite direction orbit on the downwind portion of the circuit (see diagram)

W 9.6 The aircraft must then be landed within the designated landing area and come to rest substantially intact to achieve a scoring flight.

W 9.7 Round One (qualification flight): Aircraft is required to complete a flight (*as detailed in W 9.4 to W 9.6*) without any payload or payload receptacle. Successful completion of this qualification round is essential before a payload scoring round can be flown. **30 points** awarded for a successful qualification flight.

W 9.8 Round Two: Aircraft is required to complete a flight carrying a maximum payload of 2.0 kg. The payload may exceed 2.0 kg, but only 2.0 kg will score.

W 9.9 Round Three: Aircraft is required to complete a flight carrying a maximum payload of 4.0 kg. The payload may exceed 4.0 kg, but only 4.0 kg will score.

W 9.10 A team which has successfully completed the qualification flight at the second attempt (ie; during Round Two) may attempt the full 4.0 kg lift in the Third round.

W 9.11 Payload is measured in 100-gram increments. The flight-line team will verify the payload once a successful flight has been made.

W 9.12 The team manager or their appointee will be present at the official weighing after each flight.

W 9.13 The payload recorded will be: Total weight of water plus receptacle, rounded down to the nearest 100 grams.

W 9.14 Completion of a scoring flight will be recorded as the time at which the main wheels touch down for the last time prior to landing roll. It will be judged by the Contest Director or their appointee.

W 9.15 A team may make any number of flight attempts within the defined period which is allotted to them, but it is the final attempt which is the one that scores. i.e., a second attempt invalidates any score from a previous attempt in that round of the competition.

W 9.16 An attempt is deemed to have begun when the aircraft begins its take-off roll.

W 9.17 At the end of the defined period the team will leave the Flight Box and may not return until their next flying slot.

W 9.18 The aim is for each team to fly three six-minute slots. However, a final decision will be announced at the morning briefing to reflect the time available, the number of teams competing and the expected weather conditions.

W 9.19 The aircraft must take off and land with all of the same parts to receive any flight score. No jettisoning; deliberate or otherwise, is permitted. (Damage to propeller, wheels or undercarriage is permitted)

W 9.20 The original design of the aircraft as presented in the Design Competition may not be altered during the course of the competition, but it may be repaired. All repairs to be checked by the scrutineering team before flight.

W 9.21 Any repair or modification that alters the design of the aircraft submitted for judging (for example to improve flight performance or controllability) must be approved by the Contest Director or their appointee.

W 9.22 For protest information see General Rules but in this category the team will sacrifice 30 points for a protest which is not upheld.

W 10 SCORING

Overall score =

Drawings score (**max. 50**)
+ Report score (**max. 50**)
+ Presentation score (**max. 30**)
+ Normalised Total Flight Score **(max. 100)**

Scoring penalties

- **2 points** deducted for each day or part day late in delivery of plans or reports.
- 10 points deducted for aircraft not present at presentation.
- 15 points deducted for use of duplicate/replacement aircraft (for related flying round only)
- **30 points** for unsuccessful protest.
- Disqualification for unsportsmanlike conduct.

- Disqualification for repeated violation of the challenge rules.
- Disqualification for unlawful activity.

W 10.1 Subject to weather conditions and time constraints for the event, 3 rounds will be flown by each team:

W 10.2 Round One is a qualification flight with no payload carried. A score of 30 points is awarded for this flight. Teams who record a “No Fly” can make a second and third attempt at qualification during the subsequent rounds.

W 10.3 Second round will be with a maximum payload of 2.0 kg. (Note that the actual payload carried should marginally exceed this value to avoid rounding down at the weigh-in).

W 10.4 Third and final round will be flown with a maximum payload of 4.0 kg.

W 10.5 The payload round scores are calculated from the formula in W14, these are added together with the qualification score to give the Total Flight Score for the flying competition (the total flight score will be normalised, 100 points will be awarded to the team with the highest total flight score, all other teams scores will be calculated as a percentage of this figure).

Challenge 5: Weight Scoring

Report

Maximum of 25 typed pages of A4 format, using Arial 12 point text, including any appendices and diagrams (this does not include the front cover sheet). PDF format

Category	Points Available	May include, but not limited to
Design Philosophy of the aircraft	8	Aircraft specification, Initial Sketches, concept development, project timeline, resource management.
Aerodynamic design, stability and control	10	Basic sizing and design point, Wing and power loading, static margin, control power, aerofoil selection. If theoretical methods are used (eg CFD) state how these were used to influence the final design.
Performance	8	Take-off distance, rate of climb, turn radius, stalling speed, cruise speed etc., should include an estimation of the maximum payload to be carried.
Structural Integrity	8	Flight Envelope (g and speed), Shear force and Bending moment diagrams, Wing strength estimation, validated with structural testing. Include structural techniques and material allowable stresses. If computational methods are used state the conclusions and relevance to the design.
Empirical Testing	8	Detail any airframe/component testing carried out and describe how/where the data gained was used to influence/improve the design.
Readability	8	Logical progression of detailed analysis, clear and relevant diagrams, credible results of calculations, attention to grammar and spelling, team ident shown in header or footer.
Total Max Points	50	

Drawings

Maximum of 10 sheets. PDF format

Category	Points Available	The judges would like to see:
Detail	10	3 clear views of plan, side and front elevation. Include all template outlines or dimensioned profiles of ribs, frames etc. Include a section through the root wing chord, showing spar size and locations to permit structural assessment.
Completeness	10	Include dimensions for span, length, CG location. Indicate extent of control surfaces, payload provision and R/C gear location. Use a bill of materials or table of parts. Sufficient detail should be provided for a duplicate airframe to be constructed.
Explanation of structures	10	Use section views to reveal crucial internal features. Avoid unnecessary isometric views without dimensions or notes attached. Show payload provision and access features.
Readability	10	Logical progression of explanatory notes. Arrows, labels and part idents to be unambiguous. Where section arrows are used, indicate sheet and grid ref. to locate views.
Graphical standards	10	Neat outlines, clear text, fine leader lines and uncluttered dimensions. Standardised bordered sheet with reference grid and title block.
Total Max Points	**50**	

Presentation (5 minutes)

Category	Points Available	The judges would like to know:
Balance and Continuity	10	Each team is to describe the design of their aircraft. Include any interesting features, especially weight saving and payload placement. Avoid repeating the content of your report and consider this a sales pitch to promote your design. We like to see contributions from several team members. Tell us how the design progressed, what changed and what has been achieved, how could the design be improved?
Articulation	10	
Technical Highlights	10	
Total Max Points	**30**	

Flight Competition

	Round starts	End of round time	Flight Score
	Successfully take off, perform tasks as outlined in weight challenge rules and land safely → 6 minutes round time		
Round 1	* Qualification round. No payload carried		30
Round 2	2 kg max Payload.		$Flight\_Score = \frac{Payload\_Carried}{Empty\_Aircraft\_Weight}$
Round 3	4kg max Payload.		$Flight\_Score = \frac{Payload\_Carried}{Empty\_Aircraft\_Weight}$

*** If a team fails to complete the qualification round, subsequent attempts to gain 30 points can be made in round 2 and round 3, no payload can be carried until the qualification has been achieved.**

Normalisation of flight scores
Upon completion of all three rounds, the flight scores are added together.
The team with the highest aggregate score is awarded 100 points.
All other scores are calculated as a percentage of this figure.

Summary

Report	Max possible score	**50 points**
Drawings	Max possible score	**50 points**
Presentation	Max possible score	**30 points**
Normalised flight score	Highest aggregate flight score	**100 points**
Penalty 1	Late Report and/or drawings	**-2 points per day**
Penalty 2	No aircraft at presentation	**-10 points**
Penalty 3	Protest not upheld	**-20 points**

W 11 PRIZE AND AWARD DETAILS

1st Place

Presentation of the BMFA University and Schools Payload Challenge Trophy.

£250.00 Cash prize, paid to university department or school.

£50.00 Cash prize, paid individually to each team member (up to a limit of seven including Pilot and Team Manager)

Certificates will be awarded to all competitors.

Note: The trophy is presented to the winning team but is not permitted to be taken from the BMFA premises.

W 12 ENTRY DETAILS

Please complete the online Entry Form and payment to register your team's entry for the 2024 Payload Challenge.

To facilitate planning, we must receive, by 1st April 2024, a formal notification of your intent to enter the 2024 competition.

W 13 REPORTS AND DRAWINGS

All reports and drawings must be submitted at least 30 days prior to the day of the flying competition, late submission will be penalised as described previously.

Material should be e-mailed to the Challenge Administrator:

lisa@bmfa.org

W 14 SCORING GRAPHIC