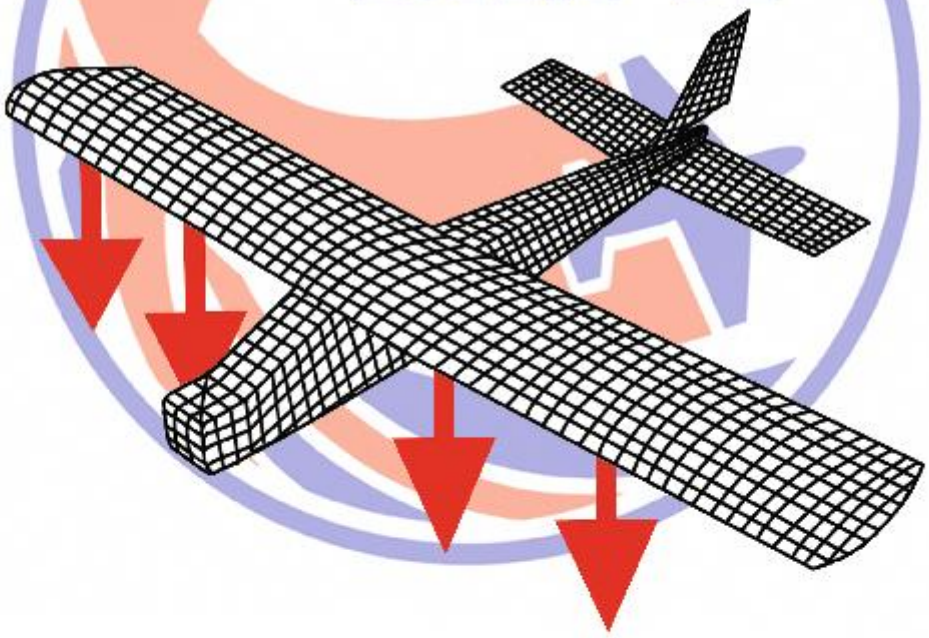
British Model Flying Association

Payload Challenge 3
Weight



2017

ROYAL AERONAUTICAL SOCIETY

British Model Flying Association 2016 University and Schools Payload Challenges

Dates Notice

10th/11th June 2017

Venue and timetable to be confirmed

Supported by

BAE SYSTEMS

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

2017
Payload Challenge 3
Weight

The information contained in this brochure provides a detailed overview of the 2017 Payload Challenge 3 (weight) as well as all information and forms for prospective entrants. We look forward to meeting your staff and students in 2017.

Should you require any assistance please contact
the BMFA Challenge Co-ordinator.
Manny Williamson
(Address as on the entry form, final page)

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 University 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, and this gives them valuable experience operating as a team in much the same way as they will ultimately have to do in their industrial careers. Furthermore, they are given 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 might otherwise not arise.

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.

In Partnership with the Royal Aeronautical Society

- The Royal Aeronautical Society (RAeS) is pleased to be able to once again join the BMFA Payload Challenge event.
- The RAeS will judge and present additional awards for innovation in addressing the competition challenges in each of the event categories.
- The innovation areas to be judged are:
    - Innovation in concept and response to the competition challenge
    - Innovation in design
    - Innovation in construction
    - Innovation in control systems
    - Innovation in organisation and teamwork
- Judging of these additional awards will take place concurrently with the normal judging process for the challenges and the awards will be presented at the conclusion of the competition.

ROYAL AERONAUTICAL SOCIETY

LIST OF CONTENTS

SUMMARY OF RULES

Note: This summary is intended as a simplified guide to the rules. Competitors should ensure that they have read the full rules before committing to design and manufacture of their aircraft.

OBJECTIVES AND SCORING

- The objective is to design and build an aircraft to carry the greatest mass of water in a single flight round a prescribed course.
- The winner of the flying section of the competition will achieve the highest ratio of payload to aircraft empty mass.
- The competitors will be required to provide a written report describing their design.
- Each team will be required to give a presentation of five minutes duration.
- The winner will be the team achieving the highest combined score from all three elements.

CONTEST ELIGIBILITY

- The competition is open to all further education, university and 6th form college students or similar groups e.g. Air Cadets.
- Teams will comprise not more than five students plus a manager and pilot.

PAYLOAD

- The payload will be water.
- Teams will have to provide their own containers.

THE AIRCRAFT

- The aircraft must be fixed wing but otherwise the configuration is free.
- There is no limit on wingspan.
- The aircraft will be required to carry a simulated sensor which will be a 150mm diameter polystyrene ball.
- The ball is to be positioned in accordance with the diagrams shown under rule W3.

- The power system will comprise one E-flight Power 10 motor, an E-flight 40 amp speed controller and a 3 cell Lithium Polymer battery of not more that 2200 mAh capacity.
- The electrical circuit must include the specified isolator wired such that the motor cannot be run with the isolator removed.
- The aircraft undercarriage must be designed to operate off a range of runway surfaces including short grass.

RADIO CONTROL

- Control of the aircraft will be by means of radio control operating on the 2.4 GHz waveband.
- The use of gyros and auto-stabilisation is permitted.
- The pilot must be able to return to manual control at any stage of the flight.
- The system must include an operating Failsafe facility.

SCRUTINEERING

- All entrants will be required to satisfy the scrutineers that their aircraft and control system comply with the regulations.
- The scrutineers must also be satisfied that the aircraft and systems are safe for flight.
- Teams will be required to demonstrate their Failsafe operation.

CONDUCT AND SAFETY

- All members of competing teams will be expected to conduct themselves in a sportsman-like and safe manner.
- Teams not meeting these criteria may be penalised or excluded.
- The word of the contest director is final in all matters.

W 1 OBJECTIVES

Contestants are 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 mass". The aircraft empty mass is defined as the mass without payload, payload receptacle but with flight batteries. In addition to this, the airframe must include attachment of a simulated optical sensor (Polystyrene sphere) to comply with the specification set out within the rules.

Teams are required to produce a technical report describing their aircraft's design and construction together with design drawings. They then have to give a verbal presentation on their aircraft and finally take part in a flight competition aimed at verifying their performance predictions.

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

The winners are the team who are judged to have scored the highest aggregate score for all aspects of the competition. 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 CONTEST ELIGIBILITY

The contest is open to all students in full time education (applications outside of this criteria will be considered on an individual basis). The pilot of the aircraft need not be a member of the group which has entered the competition as designers and builders, but must be a member of the BMFA or the SAA and hold at least a 'B' Fixed Wing Power Achievement Scheme Certificate or equivalent. The maximum number in a team will be five students plus a manager and a pilot. For the flying part of the contest a pilot can be supplied by the contest organisers.

Each team should consider that their drawings, report and model must be fundamentally different from any entry previously submitted from the same group, individuals or organisation. (Similarities can be checked with our extensive database of past entries and may result in appropriate penalties or even exclusion!)

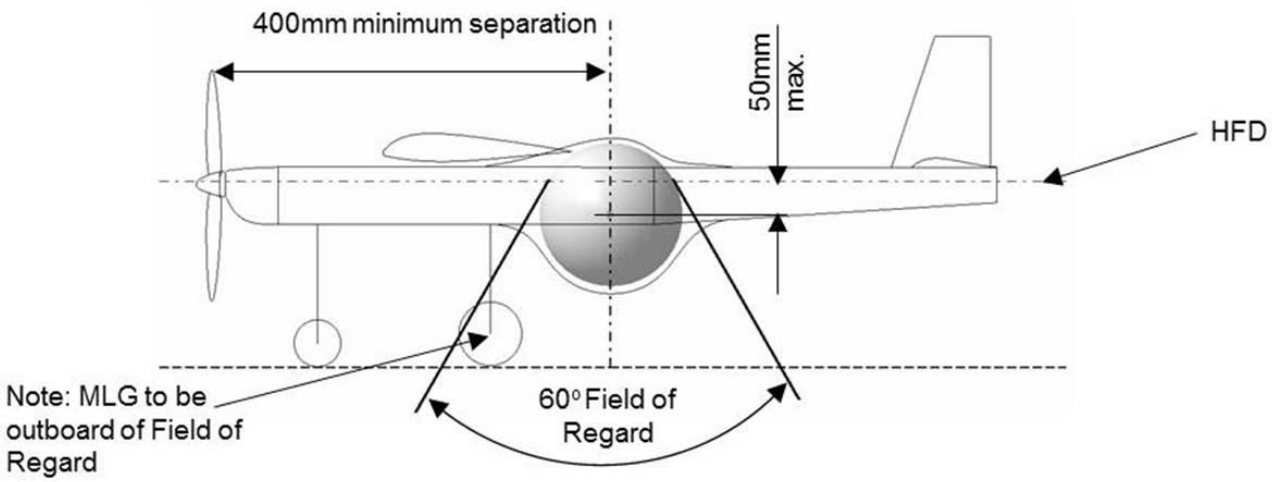
W 3 AIRCRAFT CONFIGURATION & MISSION SENSOR PROVISION

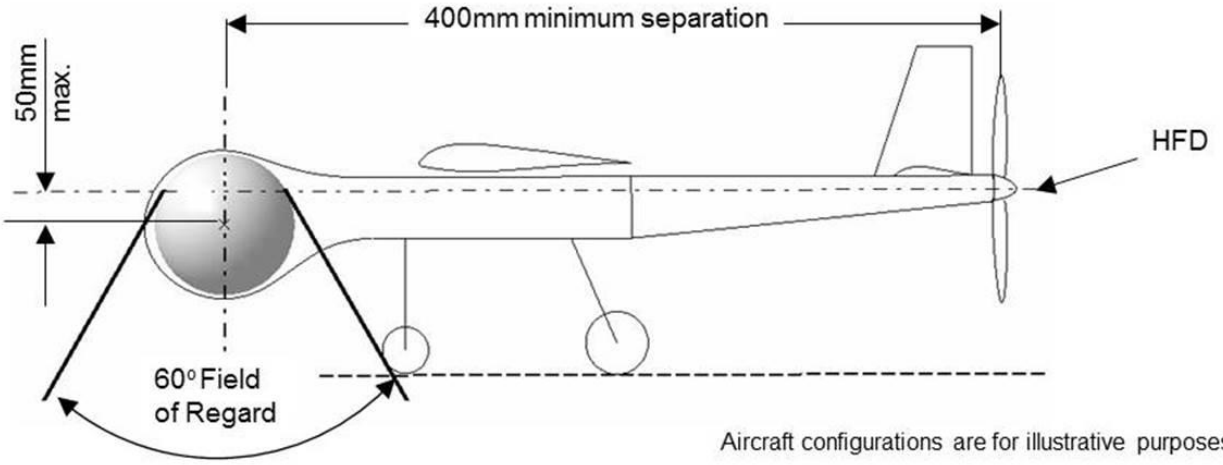
W3.1 Only fixed wing designs will be allowed to enter the competition. There is no wingspan limit. Rotary lifting surfaces are not permitted.

W 3.2 A spherical "Sensor" (Expanded polystyrene ball, 150mm diameter) is to be located inside the fuselage of the aircraft. Each team will supply their own, unmodified 150mm diameter polystyrene sensor ball.(**May be created by the team,**

but spheres are commercially available from Hobbycraft, Tesco, Amazon etc). **The permitted tolerance for the sphere diameter is plus or minus 6mm.** The centre of the sphere is to be located on the centreline of the fuselage, between vertical limits of the HFD and 50mm below the HFD (Horizontal Fuselage Datum). The centre of the sphere is to be located at least 400mm from the propeller disc centre or motor centre, whichever is closest.
(This simulates desirable separation of RF noise generation and delicate sensor equipment.) The sphere is to be retained securely and will be closed to the elements inside a detachable fairing, allowing quick installation and removal of the sphere from the aircraft. Effects of the sensor provision on drag and stability are to be considered in the design of the vehicle. (Note : For the competition, the HFD can be defined as an infinite line passing through the nose (or spinner centre if fitted) of the fuselage, emerging at the fuselage aft extremity (or prop disc/spinner centre if fitted).

W 3.3 The mass of the sphere, retaining media and fairing is to be included in the basic "dry" mass of the aircraft. The sphere is to be located to allow a clear 60 degree conical view vertically down as shown in the accompanying graphic. Any fuselage structure, internal system elements and fairing which pass within this conical region can be considered to be transparent, but any other airframe elements such as landing gear, payload containers or flying surfaces must be clear of this "field of regard". (See rule W10.3 below).





Aircraft configurations are for illustrative purposes only.

W 3.4 Propulsion unit is to consist of one E-flight Power 10 motor and one E-flight 40A speed controller (available at cost direct from the BMFA office). The battery must be a 3 cell Lithium Polymer with a capacity not to exceed 2200 MAh, the pack must have the manufacturers label with the capacity shown. No modification to the motor, ESC or battery is permitted, however gearboxes and variable pitch propellers are acceptable additions.

W 3.5 The specified "isolator" (fuse unit) **must** be fitted in order that the motor and speed controller can be isolated from the main power supply for the purpose of safe payload transfer, the "isolator" must be mounted in such a location as to be readily accessible by team members and also easily visible to flightline marshals.

W 3.6 Additionally, the Isolator unit must be located a minimum of 100mm from the propeller arc and orientated so as to promote removal of the fuse predominantly away from the direction of the propeller arc (25 degree minimum). It is important that the unit is affixed to a suitably sturdy area of the airframe in order to prevent damage when fitting or removing the fuse.

W 3.7 It is required that a tag or pennant is affixed to the fuse to aid removal and visibility.

W 3.8 Only one flight battery may be used per flying round.

W 3.9 A propeller spinner or rounded safety nut must be fitted on forward facing motors.

W 3.10 The aircraft must include provision to carry the liquid payload, and this must consist of a removable container(s) and can be either mounted internally or externally on the airframe. Any type of receptacle can 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. The design of the payload receptacle should not intentionally add structural stability to the design. Empty payload receptacles must weigh no more than 10% of their filled mass.

W 3.11 The payload for the competition will be the total mass of the liquid and receptacles. Immediately after flying the payload must be presented at the weighing/scoring station with the appropriate flight card.

W 3.12 BE ADVISED: Payload will be rounded down to the nearest 100 grams.

W 3.13 The recorded payload that is given by the organisers' scales will constitute the value that is used in scoring calculations for the competition.

W 3.14 In order to facilitate the calculation of the "payload/aircraft empty mass" ratio, the empty mass of each competing aircraft will be measured before the flying competition on the afternoon of the presentations. The measured empty mass will be rounded up to the nearest 10 grams. The aircraft empty mass is defined as the mass without payload, payload receptacle but with all batteries. If during the flying competition it is necessary to make repairs to the aircraft, such repairs must not reduce the empty mass.

W 3.15 The aircraft undercarriage must be designed to operate off a range of runway surfaces including short grass.

W 4 RADIO RESTRICTIONS

W 4.1 Flight may be effected either autonomously or by radio control, 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. Teams utilising autonomous systems must satisfy the competition organisers that the above requirements can be complied with before autonomous flight is authorised.

W 4.2 Radio installations will be scrutinised by the organisers and must be deemed fit for the intended application. Contestants must ensure that servos and linkages are capable of handling the anticipated air loads.

W 4.3 Computer transmitters are permitted, however any extra functions (such as wheel brakes), mixing or advanced programming must be explained and demonstrated during the presentation to the judges.

W 4.4 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 4.5 Equipment on the 2.4GHz band only.

W 4.6 All radio equipment must be UK compliant.

W 5 COMPETITION PROCEDURES

W 5.1 There will be two elements to the competitions in which all participants are required to compete. The first, the design competition, will enable the contestants to present their designs and demonstrate their calculations in predicting the maximum payload that their aircraft will lift. Valuable points can be gained here! The second, the flight competition, will determine which aircraft can achieve the highest value for the “payload/empty aircraft mass” ratio.

W 5.2 Each team must display their designated entry reference on the wing of the aircraft in characters a minimum of 100mm high in a contrasting colour. Aircraft not fulfilling this requirement will not pass scrutineering and processing.

W 6 DESIGN COMPETITION

W 6.1 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.

W 6.2 Each team should consider that their drawings, report and model must be fundamentally different from any entry previously submitted from the same group, individuals or organisation. (Similarities can be checked with our extensive database of past entries and may result in appropriate penalties or even exclusion!)

W 7 DRAWINGS:

W 7.1 Each team must submit detailed drawings for the aircraft which is to be flown to a standard that would permit a third party to construct a working airfame. The drawings must contain fully dimensioned front, side, and top views and wing section details. These must all be drawn to scale and with the scale shown. The plan view must contain a listing of all the relevant aerodynamic surface areas. Drawing minimum size is A3 and maximum size is AO, all sheets must be the same size. Materials and sizes are to be indicated. Detail drawings, which are deemed necessary to explain structure of the aircraft and the range of movement of the aerodynamic control surfaces, are also to be included.

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

W 7.2 Teams are to submit the drawing set by email in PDF format. 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 7.3 A maximum of ten sheets of drawings are permitted. The drawings will be worth **50 points**. *For more guidance on drawing content, see Appendix A, Para. i.*

W 8 REPORT:

W 8.1 Each team must submit a report which details the design philosophy, structural and aerodynamic design. The report should also include performance calculations and must quote a prediction of the maximum payload to be carried in the Flight Competition. Any original or innovative ideas should be described, together with the use of unique or advanced structural techniques and materials. The report is worth **50 points** and should comprise no more than 25 double-spaced, typewritten pages of A4 paper, including any appendices and diagrams. Minimum type size to be 12 point. Where an institution enters more than one team, the designs, reports and drawings are to be produced by each team independently.

Each page of the report will include the name of the team in the footer or header. If a report exceeds 25 pages only the first 25 pages will be marked. If a cover or front sheet is used it will be included in the total number of sheets. As per the drawings, the report may be submitted in PDF format.

For more guidance on report content, see W18, Para ii.

W 8.2 Copies of all drawings and reports are to be sent to both judges at least 30 days prior to the start of the flight competition (do not send them to the competition director).

W 8.3 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.

W 8.4 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 9 PRESENTATION:

W 9.1 PRESENTATION: Prior to the first competition flight, each team will present their aircraft design before a panel of professional engineers.

W 9.2 Order of presentation will be established by the organisers and announced at the start of the competition.

W 9.3 Each team will be allocated five minutes in which to describe and promote their design, content falling outside of the allocated time will not be considered during marking.

W 9.4 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. The aircraft should be available for the presentation and a **10 point** penalty will be incurred if the complete aircraft does not feature as part of the presentation.

- Balance and continuity
- Articulation
- Technical highlights

W 10 SCRUTINEERING:

W 10.1 Subsequent to each team's presentation, aircraft details will be recorded, this will include a physical check of the critical dimensions and features, a safety and airworthiness inspection will also be conducted at this time to enable teams to address any item requiring attention before flight.

W 10.2 All payload receptacles must be made available to the scrutineers (inspection for compliance with paragraph 3.6)

W 10.3 Build Penalties

20 points to be deducted where either or both the following infringements a and b are present:

a) The sphere installation does not comply with the dimensions specified and illustrated in W3.2 and W3.3.
b) Where any element of the aircraft other than the adjacent structure and fairing intrude into the 60 degree conical field of regard.
(Removal of the fairing will allow this to be checked by the scrutineers with a cone gauge.)

Note that any design which omits the provision for a fully enclosed 150mm diameter spherical sensor is unacceptable and will render the aircraft ineligible for the flying competition.

W 10.4 Correct Failsafe operation must be demonstrated at this time (note: Failsafe = a system whereby the throttle moves to the closed position if the receiver experiences any external interference or loss of signal).

W 11 FLIGHT COMPETITION

W 11.1 First Round: Each aircraft is required to complete a flight (*Take off, circuit and landing in accordance with competition procedures*) 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 11.2 Second Round: Each aircraft is required to complete a flight carrying a maximum payload of 2kg. The payload can exceed 2kg, but only 2kg will score. Points awarded as per Appendix E.

W 11.3 Third Round: Each aircraft is required to complete a flight carrying a maximum payload of 4kg. The payload can exceed 4kg, but only 4kg will score. Points awarded as per Appendix E.

W 11.4 A team which has successfully completed the qualification flight at the second attempt (ie; during the Second Round) may attempt the full 4kg lift in the Third round.

W 11.5 Payload is measured in 100-gram increments. Contest directors will verify the payload once a successful flight has been made. The team captain or his appointee will be present at the official weighing after each flight. The payload recorded will be:

(Total mass of water plus receptacle) rounded down to the nearest 100 grams

W 11.6 During each round of the flight competition, the team will have a defined period on entering the Start-up Box in which to complete their flight. 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 11.7 Completion of a 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 his appointee. A team may make any number of take-off 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. An attempt is deemed to have begun when the aircraft begins its take-off roll.

W 11.8 At the end of the defined period the team will leave the Start-up Box and may not return until their next flying slot.

W 11.9 The aim is for each team to fly three eight 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 11.10 The aircraft must take off from a stationary start within the designated 61metre runway, fly a circuit (either left-hand or right-hand, according to the prevailing conditions), and then touch down within the designated landing area.

W 11.11 During its circuit, the aircraft will be required to perform an additional 360-degree turn in the opposite direction to demonstrate its manoeuvrability. The designated touch down area will be 122 metres in length, but may not be orientated into-wind. Every attempt will be made to provide a smooth runway, but the quality of the surface cannot be guaranteed. Although every effort will be made to ensure that take off is predominantly into wind, crosswinds may be encountered.

W 11.12 Lift-off beyond the 61metre mark (indicated by a red flag) will be penalised by a **10 point** deduction from the overall score.

W 11.13 Once in flight and clear of the runway, touching down outside of the 122 metre area, or crashing, invalidates that attempt. However, further attempts to fly can be made subject to the flights being made within the allotted defined period (subject to airworthiness and safety considerations). A good landing is defined as a controlled touchdown in the designated 122metre landing area and rolling to a stop. The rollout must commence within the 122metre landing area, but may carry the aircraft beyond it, the airframe must also be deemed fit to fly again.

W 11.14 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 11.15 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. The aircraft must finish with its original parts, with the exception of its propeller and landing gear components, which may be substituted or changed at any time on the

ground. No spare parts, with the above exceptions, will be permitted. Any other alteration from the original design will result in a score of zero points for the Flight Competition. All repairs to be checked by the Contest Director before flight.

W 11.16 Any protest must be filed in writing to the Contest Director by the faculty advisor or team captain. Any protest must be filed no more than 10 minutes after the Flight Competition is announced as being completed. In order to have a protest considered a team must be willing to put up **25 points**, which may be forfeit, if their protest is rejected or not upheld. The Contest Director may call upon a jury of interested parties to help with his decision. This decision is final.

W 12 SCORING

Overall score =

Drawings score (**max. 50**)
+ Report score (**max. 50**)
+ Presentation score (**max. 30**)
– (Late Penalties + overrun penalties + Build Penalties)
+ Total Flight Score

Penalty points are assessed as follows:

- **2 points** deducted for each day or part day late in delivery of plans or reports
- **2 points** deducted for each ten second time period or part thereof by which the presentation overruns its allotted 5 minutes
- Build Penalties as detailed in Para. 6.4.
- **10 points** deducted for overrun of the 61m take off distance

W 12.1 Subject to weather conditions and time constraints for the event, 3 rounds will be flown by each team:

W 12.2 First round will be with NO PAYLOAD CARRIED. A score is awarded for this qualification flight as per 11.1. Teams who record a “No Fly” can make a second and third attempt at qualification during the subsequent rounds.

W 12.2 Second round will be with a maximum payload of 2.0kg. (Note that the actual payload carried should marginally exceed this value to avoid rounding down at the weigh-in).

W 12.3 Third and final round will be flown with a maximum payload of 4.0kg.

W 12.4 The payload round scores are calculated from the formula in W19, these are added together with the qualification score to give the Total Flight Score for the flying competition.

W 13 GENERAL CONDUCT AND SAFETY

W13.1 The word of the contest director is final in all matters.

W 13.2 It is important that all team members including the pilot attend the morning briefing; this will consist of safety information as well as other information pertinent to the day's activities.

W 13.3 In the event of unsportsmanlike conduct, the team will receive a warning from the Contest Director. A second violation will result in expulsion of the team from the competition.

W 13.4 Deliberate or repeated violation of safety rules will result in the team's expulsion from the competition.

W 13.5 All competing aircraft must be fitted with a serviceable failsafe that, as a minimum, returns the throttle to idle or stop on loss or corruption of the radio signal.

W 13.6 The Competition Director reserves the right to ground any aircraft if in his opinion, or that of his appointee, the aircraft does not meet a safe standard of construction or radio installation.

W 13.7 The extent of the flying area will be announced during the morning briefing, any pilot flying within the briefed "no fly" areas will be asked to land immediately.

W 13.8 Safety is of paramount importance and pilots must be prepared to "ditch" their aircraft on the order of the flight-line director, should he deem it necessary.

W 14 PRIZE AND AWARD DETAILS

1st Place

The 2017 Heavy Lift Challenge will reward the winning teams with the following.

The Doodson Heavy Lift trophy *

£200.00 Cash prize, paid to university department or school.

£50.00 Cash prize, paid individually to each team member (up to a limit of five persons)

* Note: the Doodson Heavy Lift Trophy is presented to the winning team on an annual basis and remains the property of the British Model Flying Association. The trophy must be returned 28 days prior to the competition of the following year in order that it is available to present at the event.

W 15 ENTRY DETAILS

PLEASE SEND ALL YOUR COMPLETED ENTRY FORMS TO THE CHALLENGE CO-ORDINATOR AT:

The British Model Flying Association
The Development Officer
Chacksfield House
31 St Andrews Road
Leicester
LE2 8RE Tel: 0116 2440028

Or by email marked for the attention of the Development Officer (Manny Williamson) at admin@bmfa.org

To facilitate planning, we must receive, by January 30th 2017, a formal notification of your intent to enter the 2017 competition and also payment of the appropriate entry fee.

W 16 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 both judges:

andrew.white@baesystems.com and nigel.revill@baesystems.com

W 17 GUIDANCE NOTES FOR COMPETITORS:

i. DRAWINGS

The drawings should be of good quality and sufficient detail to enable a third party to construct a duplicate of the machine. The drawings must include a three-view General Arrangement with all of the main dimensions shown. These include, but are not confined to:

Wing span, chord, area and section
Tail plane span, chord, area and section
Fin dimensions and area
Tail plane and fin moment arms
Propeller diameter and pitch
C.G location
Control surface dimensions and deflections
Lateral and longitudinal dihedral

Sufficient information should be provided to allow an assessment to be made of the structures strength in respect of:-

Wing bending
Wing attachment
Fuselage bending
Tail unit attachment
Landing loads

This means that all materials and their sizes should be specified, together with the required adhesives and fasteners. These specifications should include, for example, covering materials, paints and dopes. Where reinforced plastics are used, the number of laminations, lay-up orientation, resin types, etc, should be shown.

ii REPORT

The report should give the names of the team members and include a list of its contents. The technical responsibilities of the individual team members should be defined.

The topics to be addressed and the maximum points that can be scored are as follows:

Overall design philosophy	**8 points**
Aerodynamic design, stability and control	**10 points**
Performance	**8 points**
Structural integrity	**16 points**

A further 8 points can be scored for the overall layout of the report, its readability, etc.

Overall design philosophy should be a description of the logic used to derive the chosen configuration.

Aerodynamic design should be addressed under three-sub headings:-

Wing	section, planform etc.
Propeller	diameter, pitch, rotational speed
Controls	areas, moment arms, etc.

Stability and control should address longitudinal and lateral stability including the assessment of the neutral point, C.G and static margin.

Performance assessment should address thrust and drag, take-off, climb, level flight and landing, leading to a prediction of take off distance at maximum payload.

iii FLYING COMPETITION

Care should be taken in the preparation of your weights. If you fly with 3.99 kg, you will only score a flight load of 3.9 kg, since all loads are rounded down to the nearest 100 gm. Better to fly with 4.01 kg.

The figure below shows a sample set of flight scores.

		Round 1 (Qualifying) No Payload Needed		Round 2 (max 2kg)			Round 3 (Max 4kg)			
Example Heavylift Entries	Empty Aircraft Mass	Outcome	Score	Payload Attempted	Outcome	Score	Payload Attempted	Outcome	Score	Total Score
Walford	5000		30	2000		32.00	3000		48.00	**110.00**
Ambridge	3860		0	0 Qualification		30.00	4000		82.90	**112.90**
Emmerdale	2665		30	2000		0.00	3500		105.07	**135.07**

This shows that failure to qualify in the first round or to successfully complete a round can be offset by later success, even when carrying less than the maximum payload permitted. The points margin is sufficiently narrow that a good report and drawing can still give a team the edge!

We can provide experienced pilots for your team, should you need them. Most teams do need pilots and we have accumulated a few “old hands” over the years who will be able to fly your aircraft competitively. Nonetheless, it is best if the pilots can test the aircraft prior to the competition date and assess their handling, etc.

Please don't be afraid to ask for assistance with your projects: the BMFA has a large membership of experienced aeromodellers, so contact the Competition Director should your team require assistance.

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.

Each year several teams fail to complete their projects by the date of the Flight Competition.

W 18 POWERTRAIN NOTES:

The specified motor for the Payload Challenge is the Eflight Power 10 1100kv Brushless Outrunner (one of).

This is to be coupled to an Eflight 40amp speed controller (one of).

Only aircraft utilising the specified powertrain will be eligible to compete in the challenge.

Horizon Hobbies who are the UK importer of the Eflight range have kindly agreed to supply these units at a much reduced cost to teams competing in the challenge. These are available directly from the BMFA office (one set per team entered) at a cost of:

Eflight Power 10 motor £34.50 inc VAT

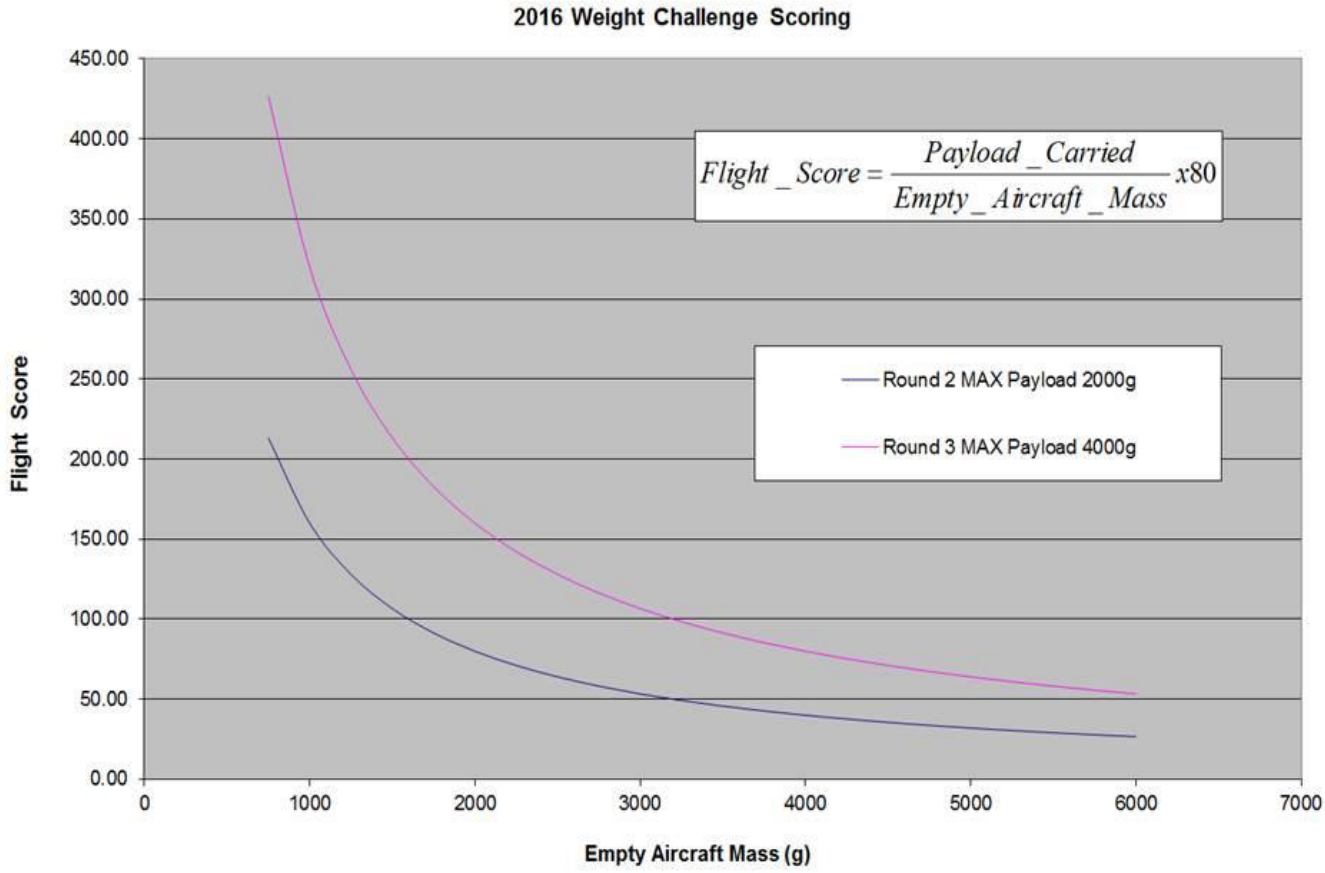
Eflight 40amp speed controller £36.50 inc VAT

Fuse Holder Unit 60A £9.50 inc VAT

Time Delay Fuse 40A £2.00 inc VAT

Postage and Packing will be charged at £10.00 per order

W 19 SCORING GRAPHIC



W 20

Entry form for 2017 Payload Challenge 3 Weight

Note: Please copy this form and complete one form per team entered

Name of University or School: _____

Name of Tutor/Teacher responsible for entry: _____

Team Name: _____

Names of 5 Team Members:

1. _____

2. _____

3. _____

4. _____

5. _____

Pilot: _____

Name and Address of Team Manager

Name: _____

Address: _____

_____

_____

Contact Number: _____

Email: _____

All correspondence relating to the 2017 Challenge will be conducted through the addresses and numbers given on this form

Do you require technical assistance from local aeromodellers? YES / NO

Do you require a pilot? YES / NO

Please note a fee of £35.00 is payable per Team entered (non refundable).

Cheque to be made payable to BMFA or alternatively to pay by credit/debit card please contact the office.

Cheque enclosed ☐

BMFA
Chacksfield House
31 St Andrew's Road
Leicester
LE2 8RE

Telephone: 0116 2440028

Please note on receipt of completed Entry Form and payment each team will be issued with a unique reference number which must be quoted in all correspondence including submissions to the judges and also displayed on each aircraft as detailed in the Rules Brochure.

Office Use Only

Payment Received: ☐ **Date:** _____ **Signature:** _____

Reference Number: _____