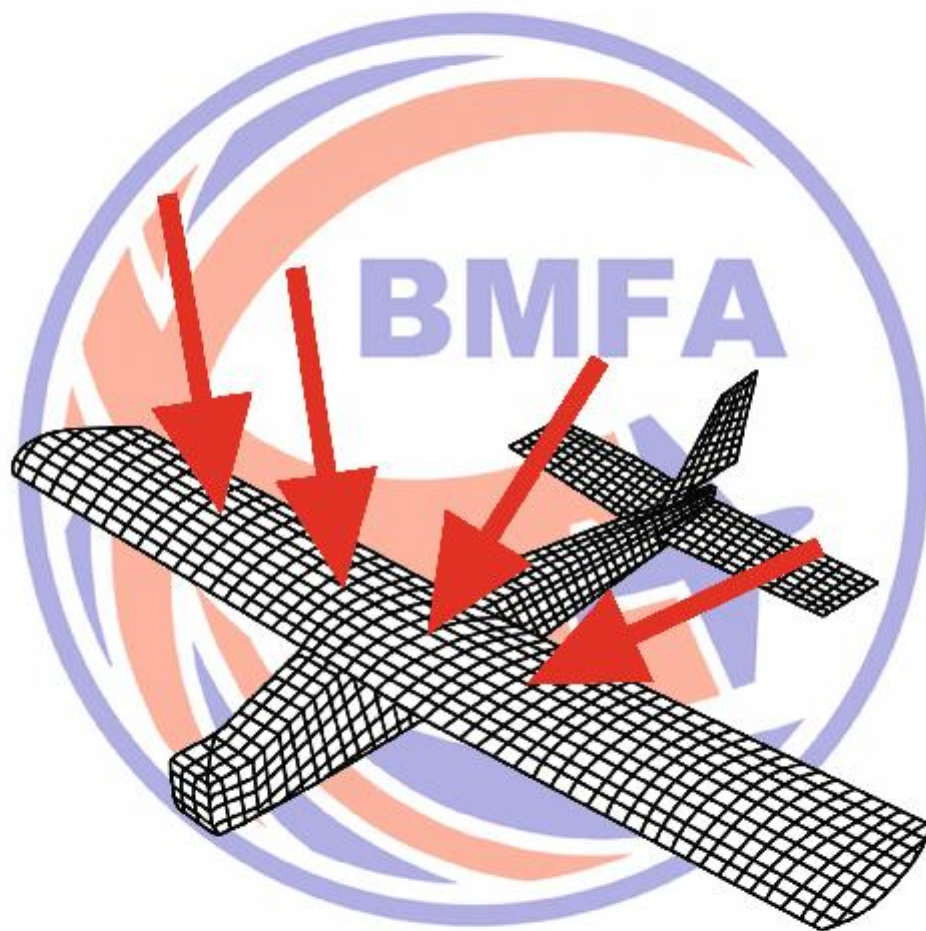


**British Model Flying Association
Payload Challenge 2
Quantity**



2017



**ROYAL
AERONAUTICAL
SOCIETY**

British Model Flying Association
2017 University and Schools Payload
Challenges

Dates Notice

10th/11th June 2017

Venue and timetable to be confirmed

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

2017 **Payload Challenge 2** **Quantity**

The information contained in this brochure provides a detailed overview of the 2017 Payload Challenge 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 organisation/department and the individual members of the winning team.

INTRODUCTION

The Payload Challenge 2 (quantity) has continually evolved to present fresh challenges to teams taking part in the competition.

This year's challenge utilises tennis balls as the payload or "passengers" to be transported, and having designed a suitable airframe for this challenging task, teams are required to submit drawings for their aircraft and conduct a 5 minute presentation to a panel of judges that addresses the salient points of the design, as well as outlining the thought processes and considerations involved.

For the flying element of the competition, teamwork, planning and a well-structured approach combined with a well designed and practical airframe will be key elements to success in this competition.

Please note that it is strongly recommended that the help of an experienced aero modeller is enlisted from the very start.

Local contacts are available from the BMFA office.

We look forward to receiving your team's entry for the 2017 Payload Challenge 2 (quantity).

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.



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SUMMARY OF THE 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 transport the greatest number of tennis balls around a specified course in an eight minute slot.
- Any number of flights may be made within the slot.
- 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 students in full time education 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 standard tennis balls supplied by the organisers.

THE AIRCRAFT

- The aircraft must be fixed wing but otherwise the configuration is free.
- There is no limit on wingspan.
- 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 than 2200 mAh capacity.
- Only one battery may be used in each slot.
- 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.

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.

Q 1 OBJECTIVES

Contestants are to research, design, build and prove an electric powered, radio controlled aircraft, to transport the greatest number of tennis balls around a predetermined triangular course in a prescribed 8 minute time slot utilising a standardised propulsion unit.

Teams are required to compile a technical report outlining their aircraft's design and construction together with design drawings. Teams are then required to give a verbal presentation in front of a panel of judges on their aircraft and finally take part in a flight competition to demonstrate the performance of their aircraft.

Competing aircraft are permitted to make any number of flights during the prescribed time period and competitors must arrive at a strategy that best utilises the characteristics of their design within the time available (i.e. the two extremes would be a very fast and agile aircraft that carries only a small number of tennis balls but may complete several cycles or a larger slow aircraft that will carry a larger number but may only complete one or two cycles).

The winners are the team who achieve the highest aggregate score for all the parts of the competition.

Q 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!)

Q 3 AIRCRAFT CONFIGURATION

Q 3.1 Only fixed wing designs will be permitted to enter the competition. There is no wingspan limit.

Q 3.2 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 is permitted, however gearboxes and variable pitch propellers are acceptable additions.

Q 3.3 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.

Q 3.4 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.

Q 3.5 It is required that a tag or pennant is affixed to the fuse to aid removal and visibility.

Q 3.6 Only one flight battery may be used per flying round.

Q 3.7 A propeller spinner or rounded safety nut must be fitted on forward facing motors.

Q 3.8 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. Aircraft not fulfilling this requirement will not pass scrutineering and processing.

Q 3.9 The aircraft undercarriage must be designed to operate off a range of runway surfaces including short grass.

The specified fuse and holder assembly is available from the BMFA at cost and is detailed at the rear of this brochure.

Q 4 RADIO RESTRICTIONS

Q 4.1 Radio control will be used to fly and manoeuvre the aircraft.

Q 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.

Q 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.

Q 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.

Q 4.5 Equipment on the 2.4GHz band only.

Q 4.6 All radio equipment must be UK compliant.

Q 5 COMPETITION PROCEDURES

Q 5.1 There will be two elements to the competition 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 to a panel of expert judges.

Q 5.2 The second, the flight competition, will determine which aircraft is able to transfer the greatest number of tennis balls from the “departure lounge” to the “arrivals gate” via the prescribed course in the fixed time period.

Standard size tennis balls will be provided by the organisers for use during the competition.

Q 6 DESIGN COMPETITION

Q 6.1 DRAWINGS: Each team must submit detailed drawings for the aircraft which is to be flown. The drawings must contain fully dimensioned front, side, and top views. These must all be drawn to scale and with the scale shown. Drawing files must be of sufficient resolution to permit all detail to be clearly noted. Materials and sizes are to be indicated. Detail drawings, which are deemed necessary to explain structure of the aircraft are also to be included.

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

Teams must submit the drawing set by Email in PDF format only to the address supplied at the rear of this document.

Q 6.2 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

Q 6.3 A maximum of three sheets of drawings is permitted.

The drawings will be worth **25 points**.

Q 6.4 REPORT: It is intended that the written report will be less academically rigorous when compared to the Heavy Lift Challenge. Each team must submit a report which outlines the design philosophy of the aircraft, team roles and responsibilities, choice of configuration, payload distribution, manufacturing techniques and any practical testing undertaken. No prediction of the total payload to be transported is required. Any original or innovative ideas should be described, together with the use of unique or advanced structural techniques and materials. The report is worth **25 points** and should comprise no more than six double-spaced, typewritten pages of A4 paper, including any appendices and diagrams (not including the front cover sheet). 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 as well as the designated reference number (supplied with confirmation of entry). If a report exceeds six pages, only the first six pages will be marked. As per the drawings, the report must be submitted in PDF format.

Q 6.5 Drawings and reports are to be submitted by Email to both judges at least 30 days prior to the start of the flight competition. 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. Do not send reports to the contest director.

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.

Q 6.6 PRESENTATION: Prior to the first competition flight, each team will present their aircraft design before a panel of professional engineers.

Q 6.7 Order of presentation will be established by the organisers and announced at the start of the competition.

Q 6.8 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.

Q 6.9 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.

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

- Balance and continuity
- Articulation
- Technical highlights

Q 6.10 Subsequent to each team's presentation, aircraft details will be recorded. A safety and airworthiness inspection will also be conducted at this time to enable teams to address any item requiring attention before flight.

Correct Failsafe operation must also be demonstrated at this time so it is important that the transmitter and batteries are made available to the scrutineering team.

NOTE: Experience has shown that teams do not make the best use of the opportunity to gain addition points that the presentation offers, remember, your teams 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. Each year several teams fail to complete their projects by the date of the Flight Competition.

Q 7 THE FLIGHT COMPETITION

Q 7.0 The aircraft must be rendered “safe” on all occasions that it is handled by the team for the purpose of payload transfer, a team member must display the isolator/breaker for the benefit of the flight line marshals during loading and unloading.

Q 7.1 The payload may be carried on or in the airframe in whatever manner is deemed appropriate. Duplicate removable module(s) are **not** permitted and it is important that the payload is distributed and secured in such a manner that it cannot significantly alter the centre of gravity of the airframe in flight. It should be borne in mind that the payload will need to be transferred to the scoring receptacle in the shortest possible time in order to maximise the overall scoring opportunity.

Q 7.2 Any number of flights may be made during the allocated time slot.

Q 7.3 At the start of the prescribed time slot the aircraft should be without load, on being given the start signal the team must load the aircraft from the “out box” with an appropriate quantity of tennis balls. The aircraft must then be carried to the take off line and set down facing predominantly into wind, at this time the power system can be rendered “live” by inserting the “isolator”.

Q 7.4 The aircraft must take off from a standing start (no pushing) utilising it’s own undercarriage.

Q 7.5 Take off must be completed within 61 metres in order to record a scoring flight. The model must proceed to pylon number one whereupon a flag will be raised immediately the model has passed the pylon. The aircraft will then proceed to pylon two where the same process will apply. The aircraft is then flown on a path that most effectively lines up for a landing in the prescribed area.

Q 7.6 Should a successful take-off not be completed, teams may retrieve the model for further attempts without reloading and the payload may be reduced at this time if required.

Q 7.7 Touchdown and landing roll must be completed within 61 metres of the take off line. The aircraft must touch down and remain on the far side of a marked 10 metre line and the motor must be fully stopped as soon as all landing wheels are deemed to be firmly on the ground (no taxiing). Only when the aircraft has come to a complete standstill (see note 2) may a team member approach, disarm, then retrieve the aircraft and return it to the loading bay where the payload will be transferred to the “in box”.

Q 7.8 Further flights within the time slot will commence immediately with loading from the “out box” followed by a repeat of the previously outlined process.

Q 7.9 At the end of the time slot the “in box” will be closed and the contents checked and recorded by the CD.

Q 7.10 No transfer of payload will take place after the end of the time slot has been reached.

Q 7.11 No transfer of payload may take place outside of the designated area (other than to reduce payload).

Q 7.12 The original design of the aircraft as presented in the Design Competition may not be altered during the course of the competition and must finish the slot in an airworthy condition and with the original parts. The only exception being the propeller and undercarriage components.

Q 7.13 The aim is for each team to fly three, 8 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.

Q 7.14 The distances indicated on the flight plan sheet are for guidance purposes only, these will be set and announced at the morning briefing to reflect the prevailing wind conditions and location on the airfield.

Q 7.15 Time for trimming flights will not be available on the day of the competition. Entrants should test fly their aircraft with a full load prior to the competition.

Q 7.16 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 **20 points**, which may be forfeit, if their protest is rejected. The Contest Director may call upon a jury of interested parties to help with his decision. This decision is final.

NOTE

- 1) Note this rule will be strictly enforced in the interests of safety and fairness, teams should note that there are no limits on the number of functions utilised therefore a “braking system” (for example) could be considered as a compliant addition to the airframe.

Q 8 SCORING

**Overall score = Drawings + Report score (max. 50)
+ Presentation score (max. 30) - Penalties + Flight score**

Penalty points are assessed as follows:

- **2 points deducted for each day or part day late in delivery of plans or reports**
- **10 points deducted for no aircraft at presentation**

The flight score will be normalised, **100 points** will be awarded to the team who transport the largest quantity of tennis balls in their **best*** round and all other scores will be calculated as a percentage of this figure (*this has been implemented in order to maintain a valid balance between the points available for the drawings, presentations and flight score).

Q 9 GENERAL CONDUCT AND SAFETY

Q 9.1 NOTE: THE WORD OF THE CONTEST DIRECTOR IS FINAL IN ALL MATTERS.

Q 9.2 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 weekend's activities.

Q 9.3 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.

Q 9.4 Deliberate or repeated violation of safety rules will result in the team's expulsion from the competition.

Q 9.5 All competing aircraft must be fitted with a serviceable failsafe that returns the throttle to stop on loss or corruption of the radio signal.

Q 9.6 All competing aircraft must be fitted with the specified unit for isolating the flight battery from the motor for safety during payload transfer and handling.

Q 9.7 The pilot of the aircraft should satisfy himself before flight that all systems are functioning correctly and that all controls have full and free movement as well as operating in the correct sense.

Q 9.8 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.

Q 9.9 The extent of the flying area will be announced during the morning briefing, any pilot flying within the briefed "no fly" area's will be directed to land immediately.

Q 9.10 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 on safety grounds.

Q 10 ENTRY

PLEASE SEND 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

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.

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 sent by email to both judges:

Andrew.white@baesystems.com and Nigel.revill@baesystems.com

NOTE: On receipt of your completed entry form you will receive a confirmation and also your unique team designation reference; this reference must be quoted in **all** correspondence and appear on the aircraft wing as detailed in Q 3.8.

Q 11 PRIZE AND AWARD DETAILS

1st Place

The Doodson Challenge Trophy*

£100.00 Cash prize, paid to university department or school.

£25.00 Cash prize, paid individually to each team member (up to a limit of five persons).

* Note: the Doodson 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.

Q 12 POWERTRAIN NOTES

The specified motor for the Quantity 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

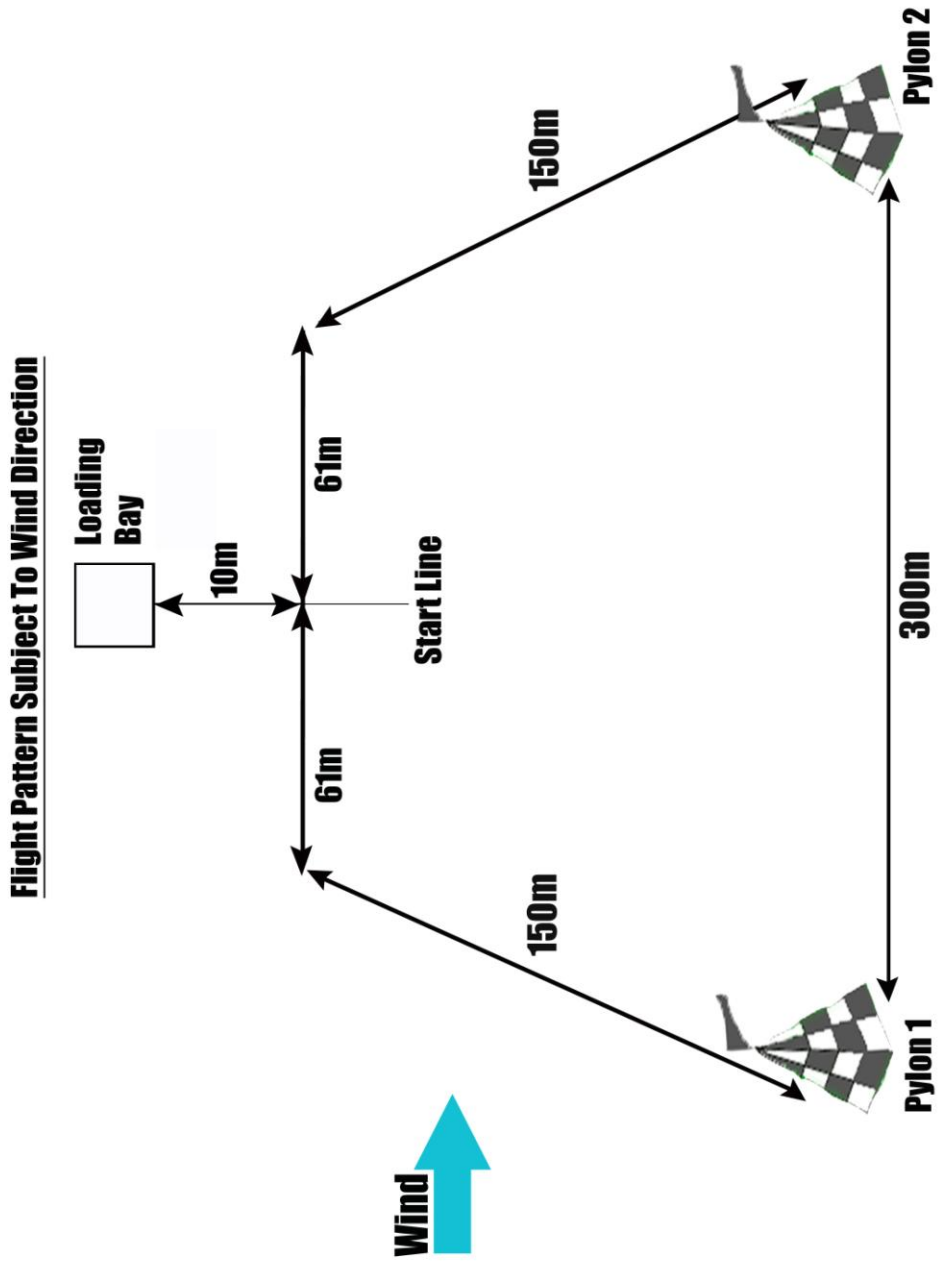
Eflight 40amp speed controller £36.50 inc VAT

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

Q 13



Entry form for 2017 Payload Challenge 2

Quantity

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: _____