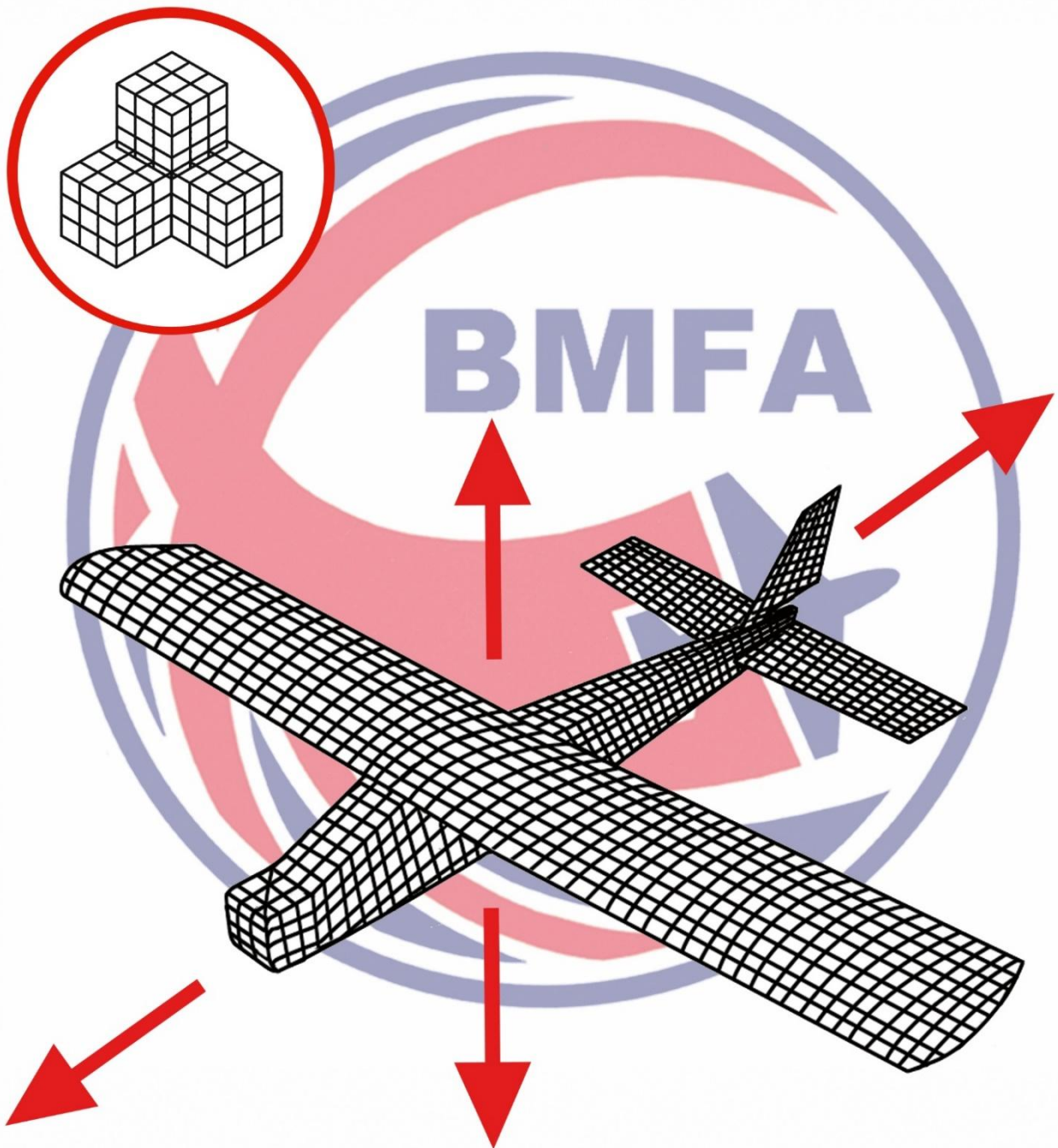


British Model Flying Association

2027

Payload Challenge 2

Cube Lift



British Model Flying Association

2027 University and Schools Payload Challenges

Dates Notice

9th & 10th June 2027
(Practice date 8th June 2027)

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

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 **ROYAL AIR FORCE Engineering**

 **ROYAL AIR FORCE**
model aircraft

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

2027
Payload Challenge 2
Cube Lift

The information contained in this brochure provides a detailed overview of the 2027 Payload Challenge 2 Cube Lift as well as all information and forms for prospective entrants. We look forward to meeting your staff and students in 2027.

Should you require any assistance please contact
the BMFA Challenge Co-ordinator.

Manny Williamson
manny@bmfa.org

INTRODUCTION

The Payload Challenge 2 Cube Lift has been developed as a follow on to the Challenge 1 Egg Lift (note Challenge 1 will not be run for 2027) which forms an initial introduction to the concepts of aircraft design and build and also as a meaningful lead in to Challenges 3, 4 and 5 which require a more comprehensive understanding of design and build principles.

Challenge 2 utilises the same base wing as Challenge 1 but with the addition of a more challenging payload shape and weight to further explore the limits of airframe design.

Teams are required to consider their aircraft as on a specialist mission delivering sensitive material to operatives "in the field".

In this instance the payload is Rubik's Cubes (even covert operatives get bored sometimes.....).

CORE OBJECTIVES

1. Construct a lightweight and cost-effective aircraft utilising the provided wing template from foam-board or 'Depron' / expanded sheet polystyrene foam.
2. Develop a payload module to be attached to or incorporate into the aircraft, to accommodate and safely transport the payload of up to 4 standard size 3x3 Rubik's Cubes.
3. For the flying element of the competition, teams are required to demonstrate their aircraft in flight in its unladen state as well as with the payload in place with the ultimate aim of a safe delivery to and from the prescribed landing area via the competition circuit.

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 2027 Flight Challenge 2 Cube Lift.

Sponsored by the Royal Aeronautical Society

- The Royal Aeronautical Society (RAeS) is pleased to be the headline Sponsor for the 2027 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/>



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.

Reference image – the correct XT-60 Wall isolator unit (from 4Max Models)



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 8th 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

- C 1 OBJECTIVES
- C 2 CHALLENGE ELIGIBILITY
- C 3 PAYLOAD
- C 4 AIRCRAFT - POWER REQUIREMENTS
- C 5 SCRUTINEERING
- C 6 PRESENTATION
- C 7 THE FLIGHT COMPETITION
- C 8 SCORING
- C 9 PRIZE AWARD DETAILS
- C 10 ENTRY DETAILS
- C 11 WING SPECIFICATION DRAWINGS AND WWW.LINKS
- C 12 FLIGHT PATTERN

Competition resources supported by



www.4-max.co.uk/bmfa

Visit their website to purchase materials for the 2027 Payload Challenges.

Please note: the BMFA does not stock competition materials.

C 1 OBJECTIVES

- C 1.1** Teams are to construct an airframe which includes a fixed wing of specified dimensions
- C 1.2** Teams are required to develop a payload module to be attached to or incorporate into the aircraft, to accommodate and safely transport the payload of up to 4 standard size 3x3 Rubik's Cubes.
- C 1.3** Teams are required to give a 5 minute presentation on their aircraft.
- C 1.4** Teams are required to participate in a flight competition to demonstrate the performance of their aircraft.

C 2 CHALLENGE ELIGIBILITY

- C 2.1** The contest is open to students in full time education up to the end of secondary education. Teams may be from schools, cadets, scouts or other youth groups.

C 3 PAYLOAD

- C 3.1** Payload will be up to 4 standard size 3x3 Rubik's Cubes.
- C 3.2** Rubik's Cubes will be supplied by the competition organiser.
- C 3.3** Cube specification: 57mm x 57mm (+/- 5mm), 65 grams (+/- 10 grams).
- C 3.4** Only cubes supplied by the organisers may be used in the competition.

C 4 AIRCRAFT - POWER REQUIREMENTS

- C 4.1** The aircraft is to utilize a standard fixed wing of specific dimensions. Teams may wish to make themselves aware of the 'Flite Test Versa' wing which meets these specifications and gives less experienced teams the option of downloading files and following the on-line guidance for construction. The aircraft must be substantially made of foam /paper based materials. Plywood etc may only be used for motor mounts and spars for local stiffening and adhesive tape/glass weave tape may be used as required. Control horns, servo mounts and hinges must be securely fixed so as to meet scrutineering requirements.
- C 4.2** The aircraft may or may not be fitted with an undercarriage (wheels)
- C 4.3** Propulsion unit is to consist of:
- 1 x 4 Max PO-2830-1350 motor
 - 1 x 4 Max 4M-HESC30A speed controller
 - 1 x 4 Max XT60-Wall panel mount Isolator Unit
 - 1 x 3 cell Lithium Polymer battery capacity 1300mah (supplied fully charged by the organisers for each competition round)

C 4.4 Only batteries supplied by the organisers may be used for competition flights. Batteries will be fitted with XT 60 connectors (negative to pointed end)

C 5 SCRUTINEERING

C 5.1 All aircraft must pass through scrutineering and receive a “passed” sticker before being eligible for all elements of the challenge.

C 5.2 More than one aircraft may be submitted for scrutineering.

C 5.3 Where multiple aircraft are presented teams must indicate which is their primary aircraft.

C 5.4 Aircraft must be presented for scrutineering with the following items: -

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

C 5.5 Aircraft scrutineering will cover the following points:-

- General airworthiness/structural integrity
- Compliance with competition rules
- Correct operation of failsafe

C 5.6 On completion of successful scrutineering “passed” stickers will be affixed to major/detachable airframe components.

C 5.7 Duplicate/replacement aircraft will receive a different colour “passed” sticker.

C 5.8 Following any repair, aircraft must be re-scrutineered and approved for flight by the Contest Director or their appointee.

C 5.9 Where major components are substituted this must be cleared with the Contest Director or their appointee and indicated to the flight-line team

C 5.10 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.

C 6 PRESENTATION

C 6.1 Presentation: Prior to the first competition flight, each team will present their aircraft design before a panel of professional engineers.

C 6.2 Each team will be allocated five minutes in which to describe the build process and the design of the payload module(s). Content falling outside of the allocated time will not be considered during marking.

C 6.3 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.

C 6.4 The presentation is worth **30 points**. Judging criteria for the presentation will include:

1. Choice of materials.
2. Structures in addition to the main wing such as fuselage, tail plane etc
3. Consideration of the payload accommodation requirements
4. Innovation in structure and airframe
5. Innovation in manufacturing processes
6. Novelty factor such as styling/humour/aesthetic theme

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

C 7 THE FLIGHT COMPETITION

C 7.1 The aircraft must be rendered "safe" on all occasions that it is handled by team members (other than for launch). A team member must display the isolator/breaker for the benefit of the flight line marshals during loading and unloading.

C 7.2 At the start of the prescribed time slot the model should be without payload, on being given the start signal the aircraft must then be carried out to the flightline by the designated "launcher", at this time the power system can be rendered "live" by inserting the "isolator".

C 7.3 The aircraft may then be launched at any time within the specified time period.

C 7.4 Having completed a successful launch the model must proceed to pylon number one whereupon a flag will be lowered (dropped) immediately the model has passed the pylon. The aircraft will then proceed to pylon two where the same process will apply.

C 7.5 Following a completed full circuit of the course without payload the aircraft should be landed, rendered safe and returned to the loading bay where the payload module is to be loaded with two Rubik's Cubes (supplied by the competition organisers). A second circuit should then be flown.

C 7.6 After landing, the aircraft should be rendered safe and returned to the loading bay where the payload bay contents are to be transferred to the "in-box". The aircraft is then to be loaded with four Rubik's Cubes from the "out-box" and a third circuit should be completed. On landing the aircraft is to be recovered from the runway and the Rubik's Cubes transferred to the designated receptacle at which point the elapsed time will be recorded.

C 7.7 At the end of the prescribed time slot the details of the flight will be recorded. This will be 6 minutes or when the cubes are in the receptacle.

C 7.8 Should a successful launch not be completed, teams may retrieve the model for further attempts without reloading the payload within the allotted time period.

C 7.9 Running repairs may be made during the allocated time period.

C 7.10 The aircraft must be rendered "safe" and the isolator fuse must be removed and be visible to the flightline controller at all times while the aircraft is being handled.

C 7.11 The aim is for each team to fly five rounds of three circuits with the best three from the five to count to the final score, 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.

C 7.12 The distances indicated on the flight plan sheet are for guidance purposes only, these will be decided and set prior to the commencement of the flight competition.

C 7.13 Time for flight testing may not be available on the day of the competition. Entrants should test fly their aircraft prior to the competition.

C 7.14 For protest information see General Rules but in this category the team will need to put up 20 points in order to register a protest.

C 8 SCORING

The flight score will be normalised, **100 points** will be awarded to the team who transport the specified payload in the shortest total time over all rounds. 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 presentation and flight score).

5 points will be awarded for each correctly transferred cube at the completion of each round. A total of 30 points will be available if all 3 rounds are flown successfully.

If all three rounds are flown successfully the total flight time will be recorded and points awarded as $1080 - [\text{total flight time}]$. If the round was not completed, either by exceeding 6 minutes or not carrying the full load of cubes in one or more flights, a flight time of 360 will be recorded.

For the presentation a maximum of 5 points will be awarded in respect of each of six key categories as follows:

1. Choice of materials.
2. Structures in addition to the main wing such as fuselage, tail plane etc
3. Consideration of the payload requirements
4. Innovation in structure and airframe
5. Innovation in manufacturing processes
6. Novelty factor such as styling/humour/aesthetic theme

See Scoring Panel for detail and examples

Challenge 2: Cube Lift Scoring

Presentation (5 minutes)

Category	Points Available	The judges would like to know:
Choice of materials	5	What is the main wing made from?
Additional Structures	5	Material used for the fuselage, tail etc.?
Cargo	5	How are the cubes held in place?
Design Innovations	5	Any special structure and airframe concepts to show?
Manufacturing Innovations	5	Any processes or techniques developed to make the parts?
Novelty Factor	5	Show styling, theme, humour, aesthetics
Total Max Points	30	

Flight Competition

	Circuit 1	Circuit 2	Circuit 3	Cubes	Flight Time
Round time starts as Aircraft is launched	Fly empty and land	Load 2 cubes fly circuit and land. Transfer cubes to "in-box"	Load 4 cubes from "out-box" and fly final circuit. Aircraft is landed and the 4 cubes transferred to the "in-box" and the clock is stopped	Total number of cubes recorded	Flight time is recorded

Scoring examples

	Team A	Team B	Team C	Team D	Team E
Presentation Score	25	22	19	28	28
Round 1 Flight time for all three circuits in seconds	270	195	200	220	200
Round 2 Flight time for all three circuits in seconds	265	190	210	230	290
Round 3 Flight time for all three circuits in seconds	245	180	200	200	360 (not Completed)
Number of Cubes Round 1	6	6	4	6	6
Number of Cubes Round 2	6	6	6	6	6
Number of Cubes Round 3	4	4	6	6	0
Cube Score (Number of cubes x 5)	80	80	80	90	60
Adjusted time (1080 – total flight time)	300	515	470	430	230
Normalised time (adjusted time x 100/ largest adjusted time)	58	100	91	83	45
Score (sum of Presentation Score, Cube Score and Normalised time)	163	202	190	201	85
Penalties	0	0	0	0	0
Position	4th	1st	3rd	2nd	5th

Summary

Presentation	Max possible score	30 points
Cube Score	Total over 3 rounds	90 points
Normalised flight score	Fastest Team aggregate of 3 rounds scores 100 points others as a percentage	100 points
Penalty 1	No aircraft at presentation	-10 points
Penalty 2	Protest not upheld	-20 points

C 9 PRIZE AND AWARD DETAILS

1st Place

Presentation of the BMFA University and Schools Payload Challenge Trophy.

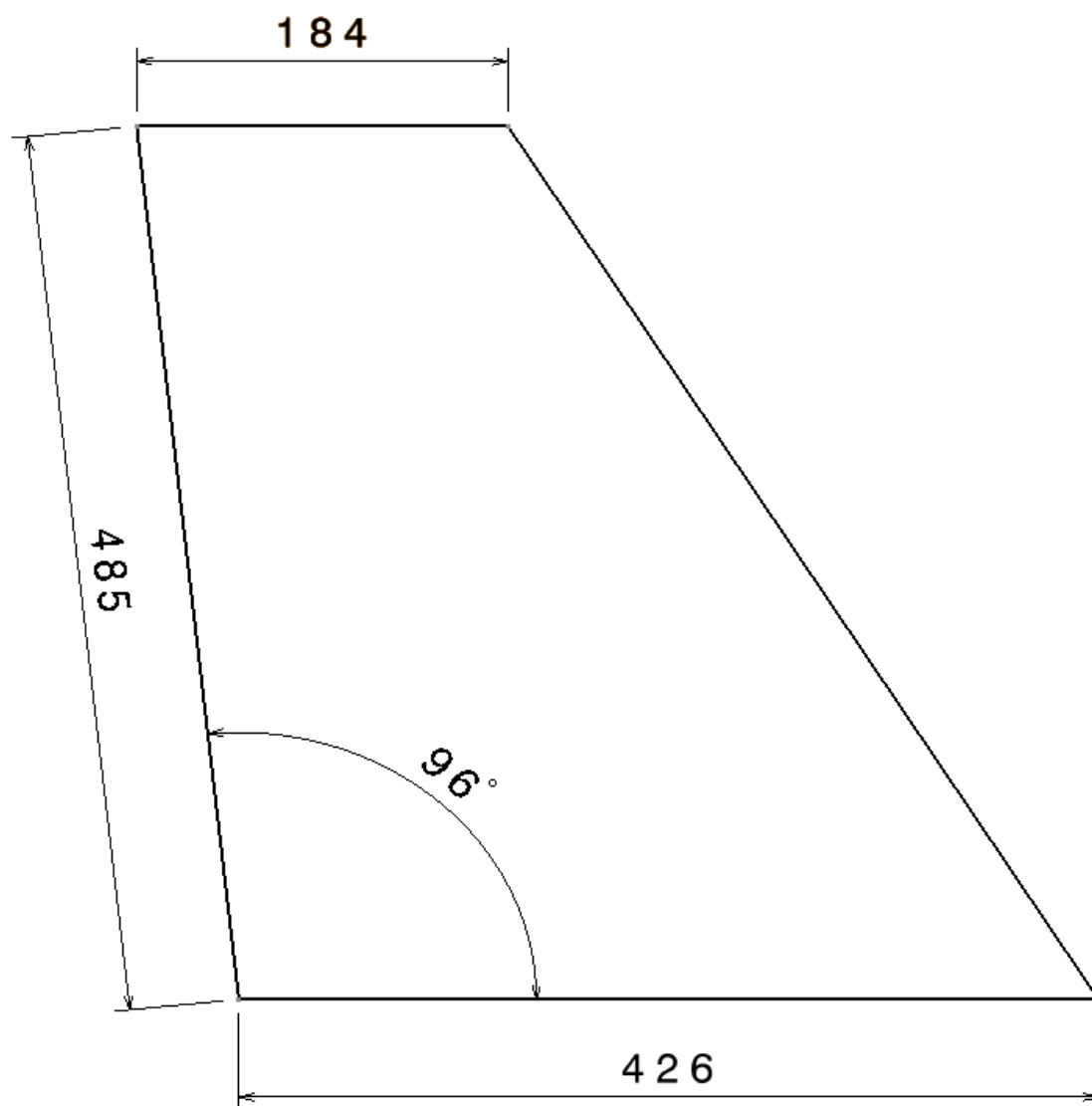
Certificates will be awarded to all competitors.

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

C 10 ENTRY DETAILS

Please complete the online Entry Form and payment to register your team's entry for the 2027 Payload Challenge.

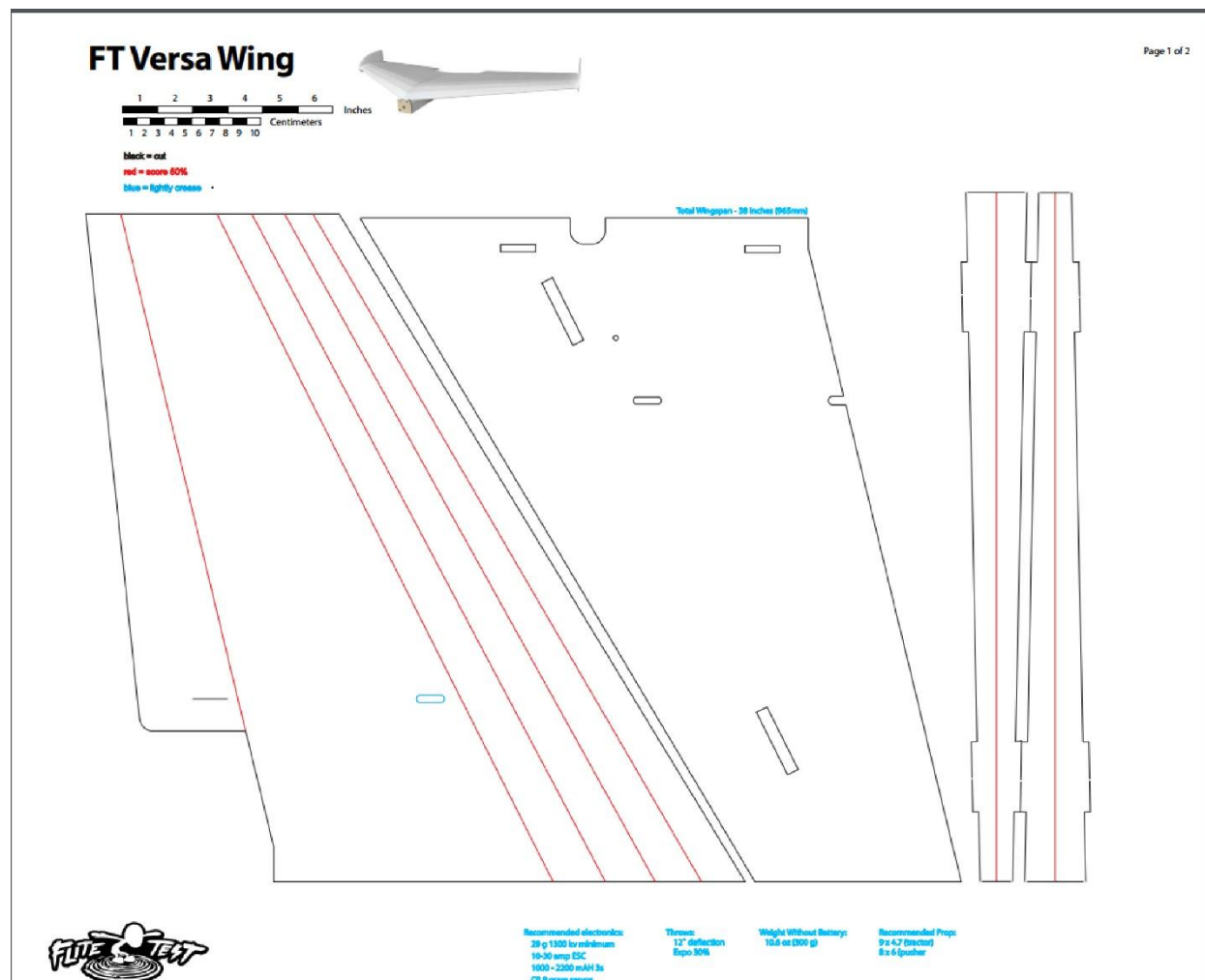
To facilitate planning, we must receive, by 1st April 2027, a formal notification of your intent to enter the 2027 competition.



The wing is to be made within a tolerance of +/- 10mm and +/- 1degree from these dimensions.

Competition Wing Specification

Teams may choose to build an open source wing such as this to meet the wing criteria



Do not scale this drawing. It may be downloaded from FT website

<https://www.flitertest.com/articles/ft-versa-wing-build>

BMFA is not responsible for content of this website

Flight Pattern Subject To Wind Direction

