

Unpowered Gliders
Challenge Booklet 2027

Partner:

Singapore Polytechnic

Organised by:

DSO National Laboratories

Science Centre Singapore

Supported by:

MINDEF Singapore

SAFMC 2027 UNPOWERED GLIDERS CHALLENGE BOOKLET CHANGE LOG

Version	Release Date	Description
1.0		Official challenge booklet release

SAFMC 2027 COMPETITION SCHEDULE

Date	Event	Platform/Venue
TBC	Flight Challenge	Science Centre Singapore
TBC	Combined Presentation	
TBC	Awards Presentation Ceremony	

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SINGAPORE AMAZING FLYING MACHINE COMPETITION 2027

1. INTRODUCTION

General Rules and Regulations can be found in the “General Rules and Regulations” Booklet.

Students who are that are interested in taking part in SAFMC Unpowered Gliders should take note that each team shall consist between 2 to 5 members, from Secondary Schools / Integrated Programmes (Secondary Level).

2. UNPOWERED GLIDERS AWARDS

Award winners will be selected based on either presentation scores, performance on the competition day, or a combination of both.

There is no limit to the number of awards that a team can win, but there may not be a winner for every award. Awards may not be given out if the teams do not meet the minimum standard determined by the SAFMC organising committee, or if there are insufficient participants for each category.

All scoring decisions made by the judges are **final**. For arbitrary cases, the organising committee will have the **final** say.

2.1. CHAMPIONSHIP AWARD

This is the pinnacle award that any team can win. It is bestowed on the team that embodies the spirit of SAFMC. Teams are considered for the Championship Award based on their overall excellence and total learning experience during the course of the competition.

Scoring*	**Weightage**
Performance (Challenge)	50%
Creativity	20%
Knowledge	15%
Presentation	15%
Total	**100%**

*Scoring may be subjected to changes due to unforeseen circumstance that prevents the execution of the physical challenge.

2.2. BEST FLIGHT AWARD

This is awarded to the team that attains the highest score in the flight challenge. The total score from the two scoring rounds will be used to vie for this award. In the event there is more than one team having the same highest score after the two scoring rounds, there will be one final tie-breaker challenge. The teams will attempt to launch their glider and the team who scores the highest points in the attempt wins The Best Flight Award.

2.3. MOST CREATIVE & AESTHETIC AWARD

For the team that shows the most innovative, aesthetically decorated, and original design in their unpowered glider.

Criteria	Areas of Consideration
Creativity	Unique Design or Strategy Flair and Appearance Functionality

2.4. BEST KNOWLEDGE AWARD

For the team that best demonstrates a sound understanding and appropriate application of aerodynamic design principles, as shown by their unpowered glider.

Criteria	Areas of Consideration
Aerodynamics	Aerodynamics Control & Stability Design and Integration

2.5. BEST PRESENTATION AWARD

For the team that best exhibits creativity, fluency, confidence and flair in the presentation of their team's work, and demonstrates that "**WOW**" factor during the interview sessions.

Criteria	Areas of Consideration
Presentation	Fluency Confidence Flair

2.6. MERIT AWARD CERTIFICATION

For teams that exhibit high quality in Design and Flight performance. Overall scores are taken into consideration for this Merit Award.

2.7. PRIZES*

Unpowered Gliders			
Award	Medal	Trophy	Cash Prizes
Unpowered Gliders Championship Award*	√	√	**$900**
Unpowered Gliders 1st Runner Up	√		**$700**
Unpowered Gliders 2nd Runner Up	√		**$500**
Unpowered Gliders Best Flight Award*	√		**$150**
Unpowered Gliders Best Flight Award 1st Runner Up	√		
Unpowered Gliders Best Flight Award 2nd Runner Up	√		
Unpowered Gliders Most Creative & Aesthetic Award	√		**$150**
Unpowered Gliders Most Creative & Aesthetic Award 1st Runner Up	√		
Unpowered Gliders Most Creative & Aesthetic Award 2nd Runner Up	√		
Unpowered Gliders Best Knowledge Award	√		**$150**
Unpowered Gliders Best Knowledge Award 1st Runner Up	√		

Unpowered Gliders Best Knowledge Award **2nd Runner Up**	√	
Unpowered Gliders Best Presentation Award	√	**$150**
Unpowered Gliders Best Presentation Award **1st Runner Up**	√	
Unpowered Gliders Best Presentation Award **2nd Runner Up**	√	
Unpowered Gliders Merit Award		

*In the event that the challenge event could not be executed due to unforeseen circumstances, the committee reserved the right to make changes to the awards.

3. UNPOWERED GLIDERS CHALLENGE

Once the teams have confirmed their registration for the competition, they are expected to start work on the different aspects of the competition, which consists of the Flight Challenge and the Presentation.

Teams are encouraged to provide equal attention to both the Flight Challenge and the Presentation aspects of the competition.

The top team from each category will be presented with the Championship Award at the SAFMC 2025 Awards Presentation Ceremony.

3.1. PRESENTATION

The presentation serves as a prelude to the team's aircraft capabilities and flightworthiness. The teams will be allocated a specific time slot to showcase their flying machine during the actual competition day. Teams will present their flying machine design and learning journey in this competition to a panel of judges. These teams will be assessed for a number of awards.

The presentation plays an integral part for teams who wish to vie for the SAFMC Championship Award. Teams that do not show their flying machines for the presentation may be disqualified immediately. The requirements for the Presentation Segment will be detailed in Section 4.

The Chief Referee or Judge for each category reserves the right to deduct points if the flying machines used in the Challenge is drastically different from the flying machine presented at the Presentation.

3.2. FLIGHT CHALLENGE

For the Flight Challenge, teams are to design, build and fly their flying machines into scoring zones to see how far their unpowered glider can reach in a live capacity in front of an audience. Figure 1 shows the competition set-up for Unpowered Gliders.

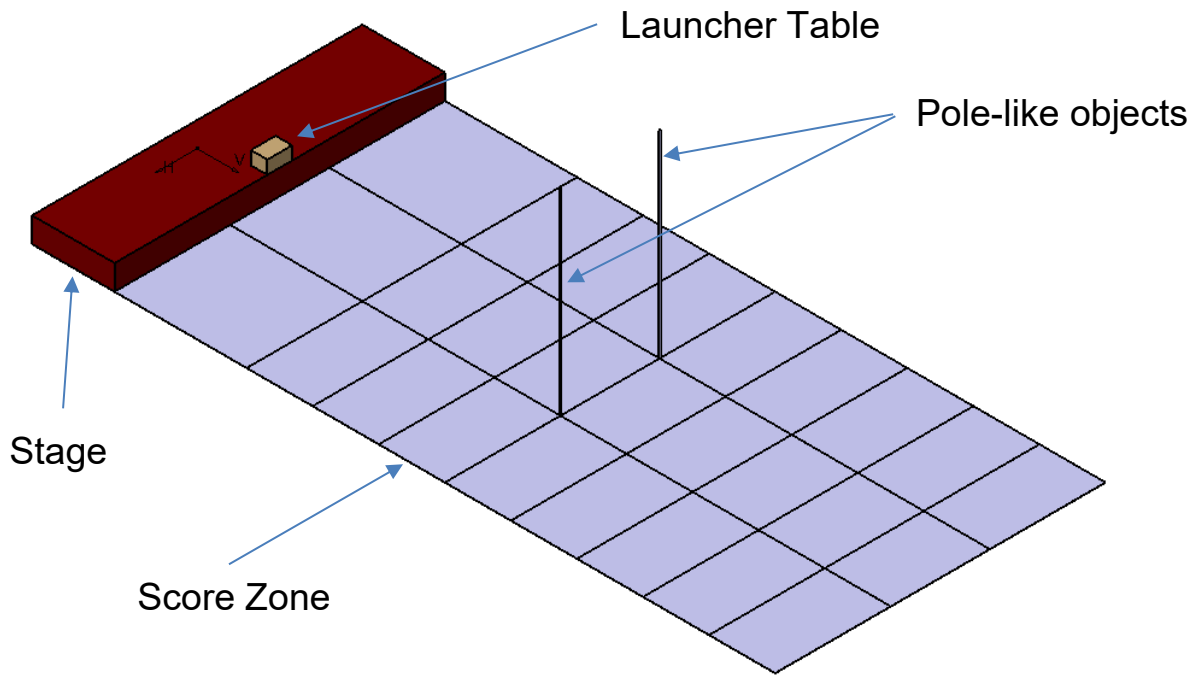


Figure 1: Competition Set-Up of Unpowered Gliders Challenge

On the Competition Day, tables will be provided within the main competition hall for teams to work on their flying machines. Alternatively, teams may be assigned a designated area instead.

Teams should expect the following during the Competition Day:

- Only registered team members of the participating teams can enter the playing field and team booths/holding areas.
- Teams are expected to fully comply with safety rules. Failure to comply with safety rules after the initial warning will result in immediate

disqualification and potential blacklisting from the competition. The organizer will also not be responsible for any injures or mishaps if any participant has disregarded the safety rules.

- No trials will be allowed in the flying area unless specified by the officials.
- The participants will acknowledge that there will be variations in environmental conditions between teams, despite best efforts to control them.
- Additional rules and regulations specific to Unpowered Gliders are detailed in Section 4. Participants will acknowledge that they have read the rules.

3.3. UNPOWERED GLIDERS – GLIDER SPECIFICATIONS

Each team is to design and build **TWO (2) IDENTICAL** unpowered gliders based on the following guidelines:

1. All parts of the glider must be fabricated by the teams. Kits or off-the-shelf models or parts, i.e. servo motor, receiver, transmitter are not allowed.
2. The glider must:
   - have a minimum wingspan (tip to tip) of **0.30m**
   - maximum dimension of **0.60m (measured from wing tip to tip) x 0.60m (long or length of body)**
   - have a wing with an aspect ratio (span to mean chord) of **6.0 or more**
   - weighs no more than **0.2 kilograms**
3. The glider design must incorporate a hook or slot at the base of the glider that allows the glider to be hooked onto the rubber band of the launcher.
4. Metallic materials and fibre reinforced materials (carbon fibre, glass fibre, etc.) are not allowed for the fuselage (main body) and along any leading edges of the glider.

   Only usage exceptions are carbon wing spars and metal ballasts, however, they are to be located at least 10 mm away from leading edges.
5. Balloon or airship designs are not allowed. No gaseous substances lighter than air are allowed.
6. Propulsion of any form (except the use of elastic bands) are not allowed.

7. Teams cannot re-use past winning designs. Points will be deducted or, in the worst case, disqualified if any team is caught re-using past planes.

3.4. UNPOWERED GLIDERS – LAUNCHER SPECIFICATIONS

The reference Unpowered Glider launcher for the challenge is shown in Figure 2.

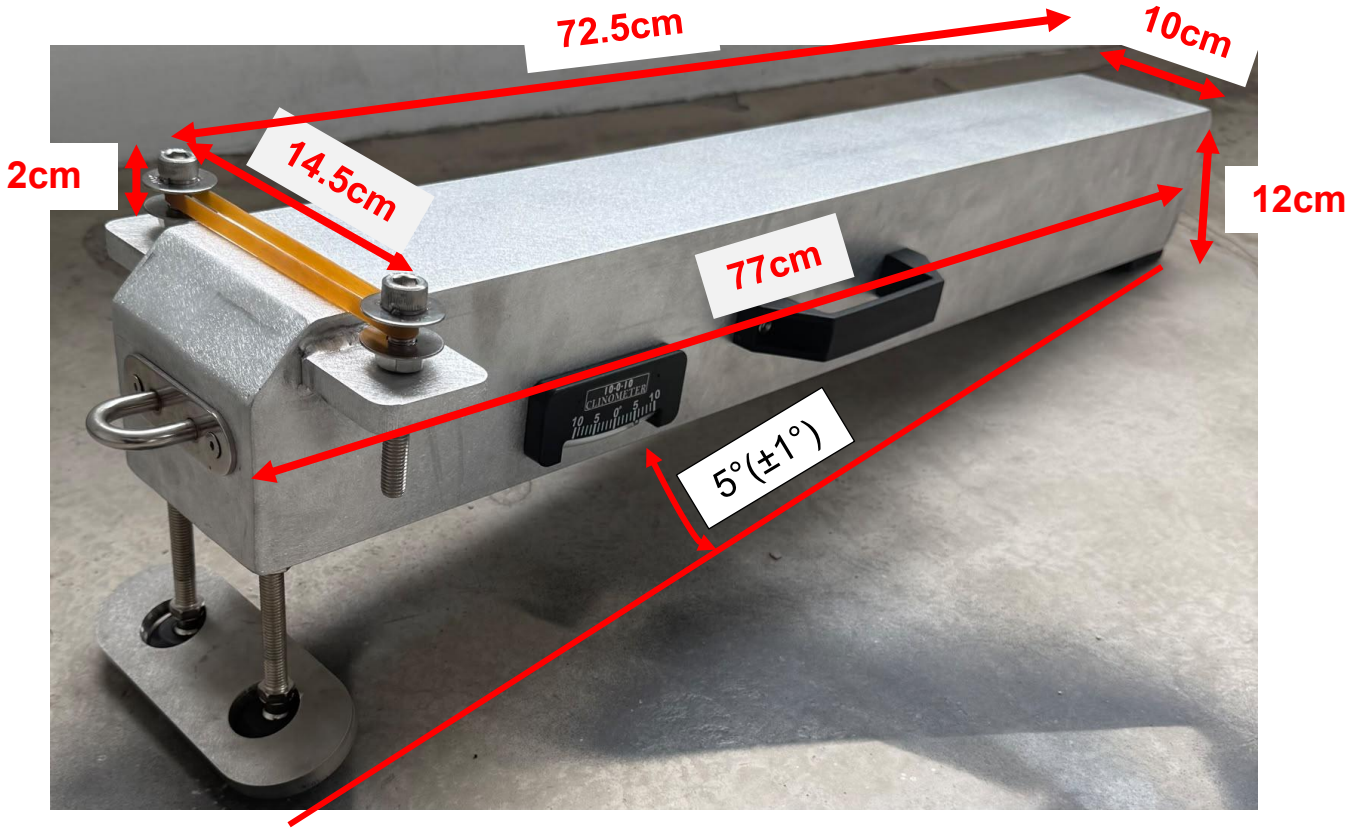


Figure 2: Unpowered Glider Launcher

Teams are allowed to fabricate and bring along their own launcher for the Challenge.

The reference launcher consists of the structure (wooden block or other suitable material), flat rubber band and aluminium frame legs for propping up the angle of the launcher.

The angle of inclination of the launcher shall be kept at **5° (± 1°)** from horizontal.

The elastic band use shall exhibit either of the characteristics, whichever that is achieved first:

- Tension – **4 kgf (± 0.5 kgf)**, or
- Extension – **30 cm (± 1 cm)**.

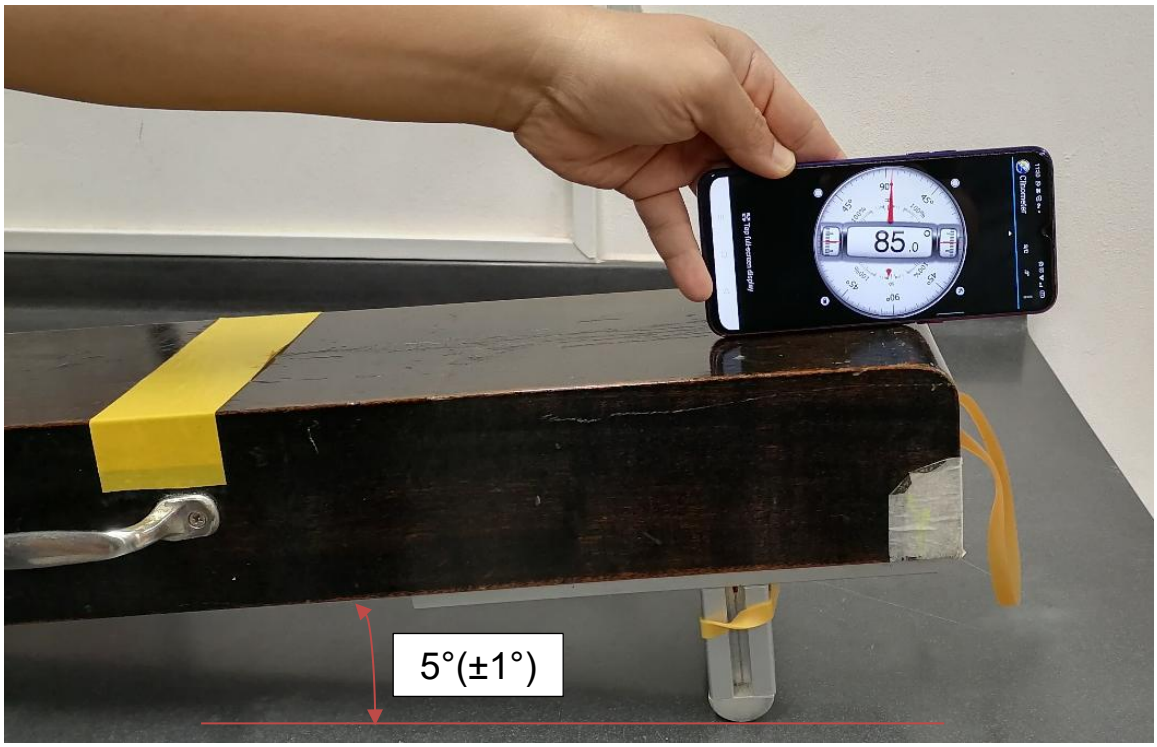


Figure 3: Unpowered Glider Launcher Platform Dimensions

Mandatory dimensions of the launcher are provided in **Appendix A**.

There **must not** be any physical guiding features on the launcher that that could guide or stabilize the glider's flight path during launch — such as, but not limited to:

- **Straight grooves** that might keep the glider aligned, such as aluminium profile bars/frames.

- **Rail guides** that could prevent lateral movement or rotation.
- **Channels or slots** that restrict the glider's motion etc.

Failure to adhere to the allowable dimensions will result in the disqualification of the launcher.

Teams with disqualified launchers or do not have a launcher will use the reference launcher provided by the Organisers.

3.5. UNPOWERED GLIDERS – LAUNCHING OF THE GLIDER

The launcher will be placed on top of a table of approximately **0.75m** in height.

The launch force or extension is the maximum available to you. You are encouraged to adjust the force that you need by using a force gauge or spring gauge and mark out a designated line on the platform as shown in Figure 4, but not exceeding the maximum force or extension as outlined in Section 3.4.



Figure 4: Unpowered Glider Launcher Launching Line

During the launch, teams will hook their glider on the elastic band and draw back the glider. The hook position from the glider will be used as a reference when the glider is being drawn back to the

marked line on the platform. Upon tension to the marked line, the glider can be released.

Each team is required to incorporate a hook or slot onto the underbelly of their glider. An illustration of examples of hook attachment and slot is shown in Figure 5.

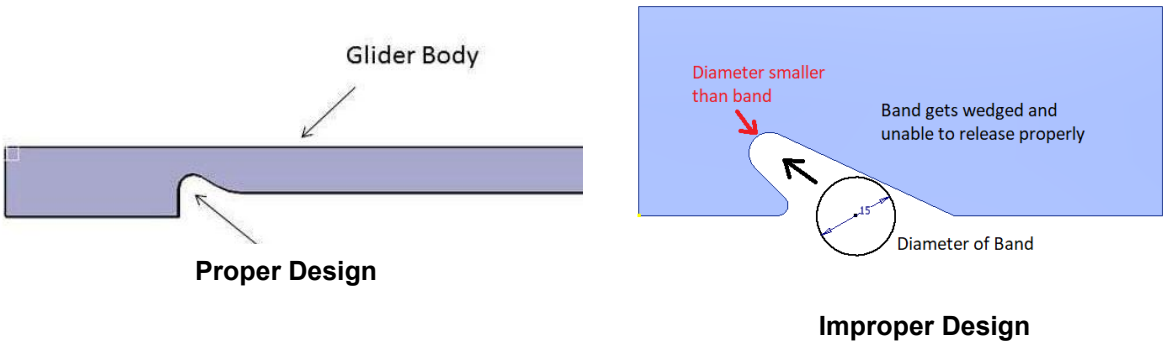


Figure 5: Examples of Hook Attachment and Slot

It is the responsibility of the team to ensure that the hook or slot design on the glider is sturdy to withstand the tension force of the elastic band without giving way when the glider is being drawn back.

The team must also ensure that in the design of the glider, there are no components of the glider that come into contact with the launcher at any time during the launch.

4. SCORING

The competition floor will be segregated into different scoring zones with respective allocated scores for each zone with dimensions as shown in Figure 6.

Distance	7m	6m	7m
40m			
36m	80	100	80
32m	70	90	70
28m	60	80	60
24m	50	70	50
20m	40	60	40
16m	30	50	30
12m	25	40	25
8m	20	30	20
	15	20	15
	STAGE/PLATFORM		

Figure 6: Floor Layout with scoring zones and respective allocated scores with dimensions

4.1. CHALLENGE - LAUNCHING PROCEDURES

1. Gliders that qualify for the challenge event will be allowed some minor modifications, at the discretion of the Tech Chair.
2. Teams will place their glider onto the launcher platform and hook on to the rubber band before drawing back the glider to the designated launching line.
3. Teams will release their glider for launch whenever they are ready. Teams will be given up to **TWO (2)** minutes to launch the glider and they are to adhere to the instructions given by the referees during launching.
4. After the unpowered glider is launched, the **first contact of the glider** with the landing zone will be the landing spot (assuming the glider remains intact).

   Note: In the event that the glider breaks into pieces or drops any loose parts during the flight, the nearest landing spot will be taken to be the glider part contact point.
5. A team member will accompany the referees to determine the landing spot of the glider after the launch.
6. Teams will be awarded the score allocated to the scoring zone where the landing spot of the glider is determined to be.
7. If the glider landing spot falls on the intersection lines between various scoring zones, the highest score of the affected scoring zones will be awarded.
8. If the glider hits and stays stuck to the netting, the score allocated will be the scoring zone directly below the glider. If it is on the intersection lines between various scoring zones, the highest score will be awarded.

FOR SECOND SCORING ROUND ONLY

9. Teams will be given an opportunity to score bonus points in the second scoring round.

10. TWO (2) pole-like objects (e.g. PVC poles) will be placed just before the 50-marks zone (demarcated by the **RED** line in Figure 6).

11. Teams with gliders that flies between the objects will be awarded **1.5 times** the allocated score of the scoring zone when the glider first touches the scoring zone.

12. Teams with gliders that do not fly between the objects will only be awarded with the same allocated score of the scoring zone where the landing spot is determined to be.

13. Summary of point #10 – #12 as reflected in the table below.

Scenario	Score
Land in scoring zones after flying between the objects	**1.5 x scoring zone points**
Land in scoring zones without flying between the objects	**Points of that scoring zone**

14. In the event that the glider hits one of the pole-like objects and land in the scoring zone, the direction of rotation will be observed to determine if the glider has passed through between the pole-like objects and hence the application of bonus points mentioned in point 13.

15. The total score from the two scoring rounds will be taken to vie for **"The Performance Award".**

*The referees make all scoring decisions and their decision is **FINAL**. For arbitrary cases, the Chief Referee will have the **FINAL** say.*

4.2. CHALLENGE – PRESENTATION

Teams are required to deliver their presentation **in person to the assigned judges on the presentation day**. Teams are expected to be present in-person for the **full day**. All teams must participate in the Presentation Segment to receive a score for the presentation component of the competition.

1. **Reporting Details**

Reporting timing will be provided during the Q&A clinic session at a later date.

2. **Presentation Booth**

Each team will be allocated a booth within the hall. The exact booth dimensions and specifications will be provided during the Q&A clinic session at a later date.

3. **Presentation Booth Set-up**

Teams will be given **one (1) hour** to set up their presentation booth **on the presentation day.**

Presentation judging will commence after the stipulated time limit for the booth set-up**.** Teams are required to complete their booth set-up before judging begins.

4. **Power Supply**

Each booth will be provided with **ONE (1) two-gang power socket**, allowing teams to connect up to **TWO (2) electrical devices** at any one time. For electrical and fire safety reasons, teams are strictly **not allowed to connect additional multi-plugs, power strips, or any other forms of electrical extensions**.

Failure to comply with this requirement will result in disqualification.

5. Presentation and Judging

Judges will visit each team's booth individually. Each team will be allocated a maximum of **SEVEN (7) minutes per visiting judge, comprising:**

- **FIVE (5) minutes for the team presentation; and**
- **TWO (2) minutes for Questions and Answers (Q&A).**

Upon completion of each presentation and Q&A session, the visiting judge will award the team **ONE (1) completion stamp** to indicate that the session has been completed. The Presentation Segment will be considered complete only after the team has **collected ONE (1) completion stamp from each judge assigned to evaluate the team**.

Failure to obtain a completion stamp from every assigned judge will result in zero score for the Presentation Segment.

During the presentation, teams will be assessed by a panel of judges on the work they have done for this competition for the following awards:

1. Most Creative & Aesthetic Award
2. Best Knowledge Award
3. Best Presentation Award

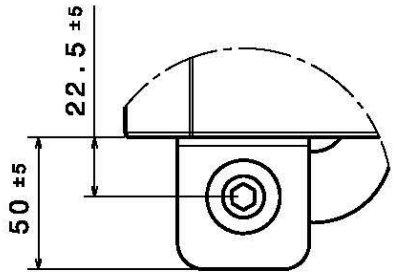
Each team from Unpowered Gliders will be allowed a maximum of 8 slides as visual aid for their presentation. A video of their craft in flight must be included in the presentation slides as well.

The presentation plays an integral part for those teams who wish to vie for the Championship award. Unpowered Gliders teams are required to bring their flying machines that they are using in the competition for their

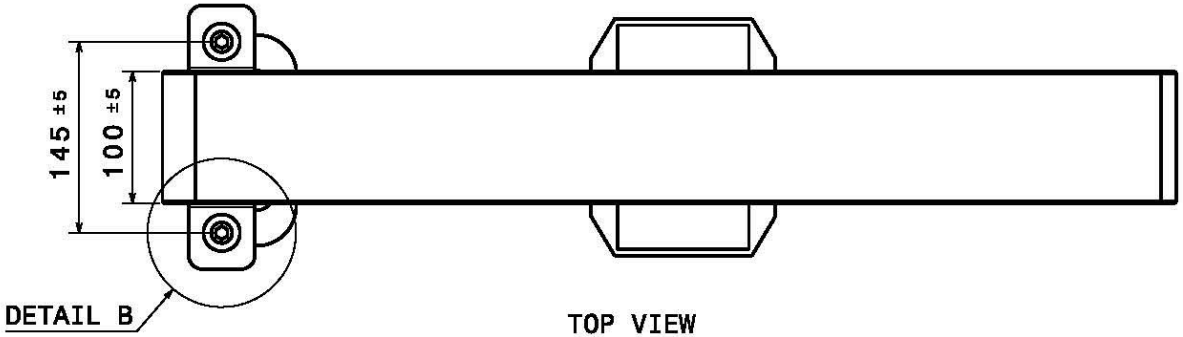
presentation. Teams that do not bring their flying machines for the presentation will be disqualified immediately.

The Committee reserves the right to deduct points in each of the award categories if the flying machine used in the video submission is drastically different from the flying machine presented at the Presentation.

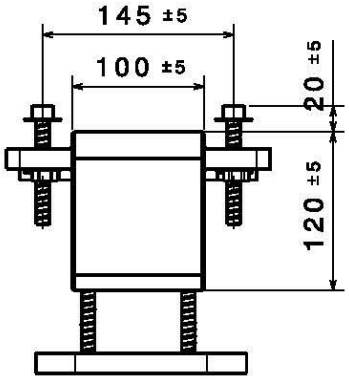
5. APPENDIX A – REFERENCE DIMENSIONS OF LAUNCHER



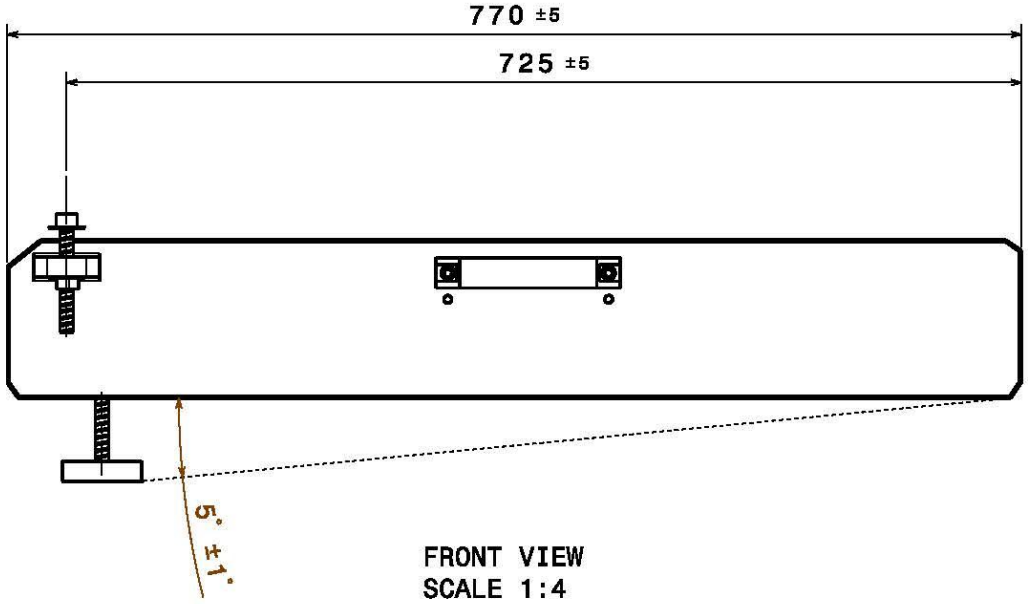
DETAIL B
SCALE 1:2



TOP VIEW
SCALE 1:4



SIDE VIEW
SCALE 1:4



FRONT VIEW
SCALE 1:4

Remarks:
1) All dimensions are shown in mm
2) All dimensions are shown are to be followed