

Paper Planes

Challenge Booklet 2027

Organised by:

DSO NATIONAL LABORATORIES

SCIENCE CENTRE singapore

Supported by:

MINDEF SINGAPORE

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1. INTRODUCTION

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

For Category Paper Planes, teams made up of **TWO (2)** to **THREE (3)** members, are expected to design and fold paper planes to achieve the longest, farthest or most accurate flight.

2. PAPER PLANE AWARDS

The judges make all scoring decisions and their decisions are **final**. For arbitrary cases, the SAFMC Organising Committee will have the **final** say.

There is no limit to the number of awards that a team can win. For example, it is possible for a team to win Range Award, Time Aloft Award and Presentation Award.

a. CHAMPIONSHIP AWARD

This is the most prestigious award that a team can win under Paper Plane. 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. The table below shows the weightage of each individual score that counts towards the Championship Award.

Component	Weightage
Range	20%
Precision	20%
Time Aloft	20%
Presentation	40%

Total	100%

Each score will be normalised with the highest score in the class to obtain the weightage.

E.g. Calculating Precision Score:

$$\text{Precision Score used in Championship Award} = \frac{\text{Team's Precision Score}}{\text{Best Precision Score in Competition}} \times 20\%$$

b. BEST RANGE RECORD

This award is given to the team that beats the current standing Best Range Record of 40m for Paper Plane since the inception of SAFMC. The standing Best Range Record can be found on our website at www.safmc.com.sg.

c. BEST TIME ALOFT RECORD

This award is given to the team that beats the current standing Time Aloft Record of 11.46s for Paper Plane since the inception of SAFMC. The standing Time Aloft Record can be found on our website at www.safmc.com.sg.

d. RANGE AWARD, TIME ALOFT AWARD AND BEST PRECISION AWARD

These awards are given to the team whose paper plane obtains the highest score for the range challenge, longest time aloft, and highest

precision score in the competition.

e. BEST KNOWLEDGE AWARD

This award is given to the team that scores the highest in the team's learning journey criterion, highlighted in their Presentation. This award recognises the team's knowledge in aeronautics, theory of flight and design, as well as the quality of their learning journey.

Teams are not required to submit the engineering notebook documenting the learning journey for Paper Plane. The learning journey should be presented and incorporated into the presentation component of the competition where teams are able to explain their learning process.

f. BEST PRESENTATION AWARD

This award is given to the team that scores the highest in the Presentation Criterion during the presentation. This award recognises the team's ability to deliver a presentation with confidence, clarity, and flair.

g. PRIZES

PAPER PLANE				
Awards	**Medals**	**Trophy**	**Cash Prize**	**Remarks**
Championship Award	✓	✓	$400	1st and 2nd Runner Up will receive **only** Medals
Best Range Record		✓		Current Record: 40m
Best Time Aloft Record		✓		Current Record: 11.46s
Range Award	✓		$160	1st and 2nd Runner Up will receive **only** Medals
Time Aloft Award	✓		$160	

Best Precision Award	✓		$160	
Best Knowledge Award	✓		$160	
Best Presentation Award	✓		$160	

Note: Prizes may not be given out if minimum standard is not met or if there are insufficient participants. The SAFMC organising committee will have the **final** say and the decision made is **final**.

3. PAPER PLANE

PAPER PLANE – PRESENTATION (40%)

Judging Criteria for the Presentation is shown in the table.

It will be split into two main categories:
1. Presentation (50 Points)
2. Learning Journey (50 Points)

	Criteria	Points
Presentation (50 Points)	**Delivery** 1. Exhibits good body posture 2. Good diction and articulation 3. Maintains good eye contact with audience	**15**
	Clarity 1. Content is clear, concise, and coherent to audience 2. Software, PowerPoint slides, props, or any visual aids used for the presentation is neat and easy to read.	**10**
	Confidence 1. Displays knowledgeable responses to questions 2. Ability to handle miscues	**10**
	Overall Presentation Style 1. Displays clear preparation for the presentation e.g. well-rehearsed without referring to a script 2. Team presented in an engaging and unique way that draws in audience 3. Evident teamwork between members	**15**

Learning Journey (50 Points)	**Flight and Aerodynamics Knowledge** 1. Wing design and drag consideration for every challenge 2. Techniques to fold, hold and throw paper planes for each challenge	**10**
	Research and Authenticity 1. Depth of research made 2. Displayed improvements made from initial plane design and able to explain the learning process from first design onwards 3. Reflections of what works well and what can be further improved	**15**
	Uniqueness of Plane 1. Aesthetic of the planes 2. Unconventional designs compared to other teams	**10**
	Overall Learning Outcome 1. Final designs of planes and methods used for folding and throwing can achieve respective aims 2. Results are clearly presented (through providing videos of trials) 3. Thoughts and ideas are logical and displayed strong comprehension of the challenges	**15**
Total		**<u>100</u>**

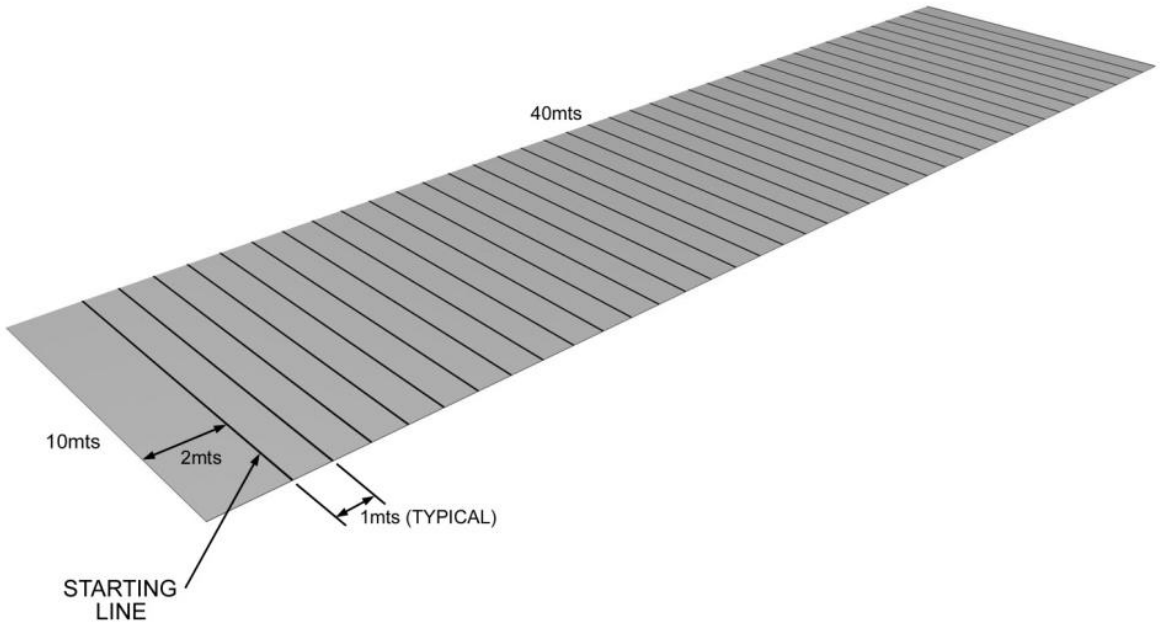
PAPER PLANE – CHALLENGE (Total 60%)

Each team should consist of **TWO (2) to THREE (3) members**.

Design and fold paper planes to achieve the longest, farthest or most accurate flight.

a. <u>RANGE CHALLENGE (20%)</u>

Teams are to launch their planes behind the starting line to obtain the best distance score in the field below:

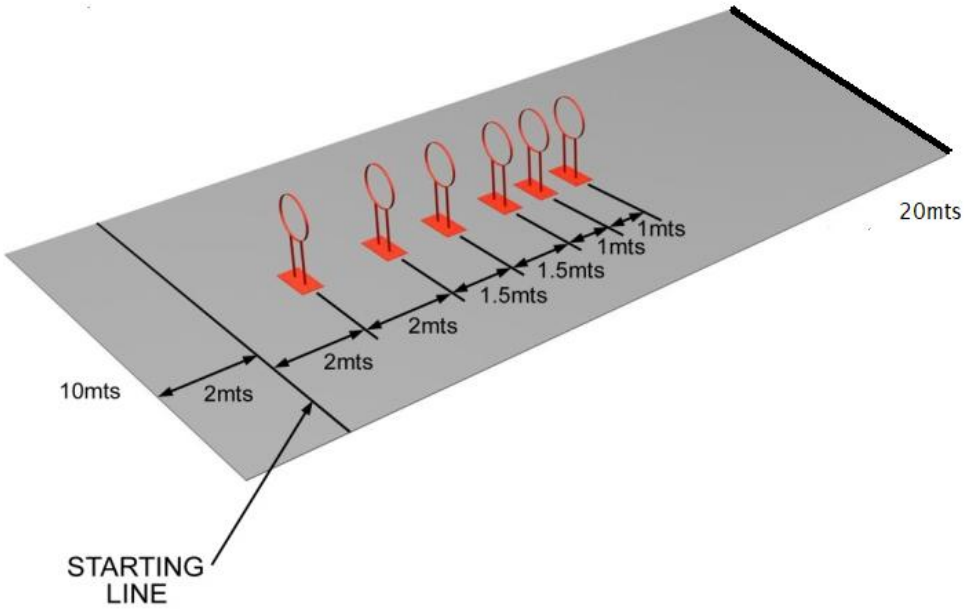


3.a.1 RANGE CHALLENGE RULES & SCORING

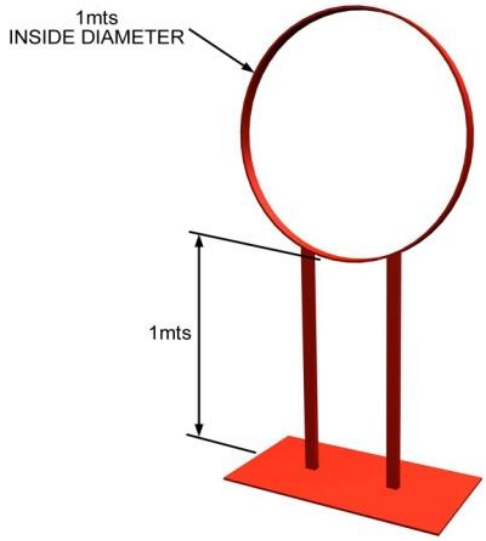
1. Teams are to launch their plane from behind the starting line onto the field.
2. The score (in metres) will be taken from the starting line to the 1st point of contact, within the playing field, where the plane touches the ground, any other objects (other props or netting), or the point where it flies over the netting.
3. If the plane flies the maximum length of the field and hits the wall at the field end, the maximum field length will be awarded to the team.
4. The distance will be taken lengthwise along the playing field.
5. The plane's flight time will also be used in the event of a tie, if any.

b. PRECISION CHALLENGE (20%)

Teams are to launch their planes from the Starting Line to obtain the best precision score in the field below:



Details of the hoops are as follows:



Each team will be given 2 attempts for the challenge. Height and Size of Rings may vary in the actual day of the competition.

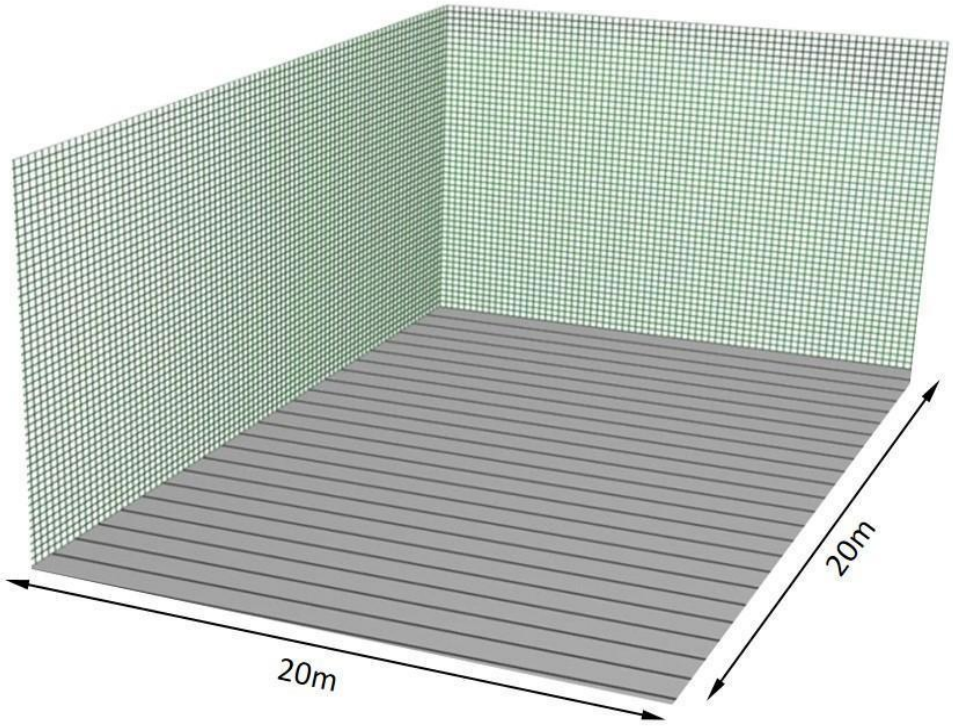
3.b.1 PRECISION CHALLENGE RULES & SCORING

1. Teams are to launch their plane behind the Starting Line into the loops.
2. The scores will be awarded based on the loops that the planes fly through after leaving the participant's hand till 1st point of contact, within the playing field, where the plane touches the ground, any other objects (other props or netting) or the point where it flies over the netting.
   a. The first loop is worth 5 points.
   b. The second loop is worth 15 points.
   c. The third loop is worth 30 points.
   d. The fourth loop is worth 60 points.
   e. The fifth loop is worth 100 points.
   f. The final loop is worth 140 points.

3. The points are accumulative; the more loops the plane goes through the more points the team receives.
4. Points will only be awarded once for each loop.
5. The plane's flight distance and time will also be taken to be used as a tie breaker, if any.

c. TIME ALOFT CHALLENGE (20%)

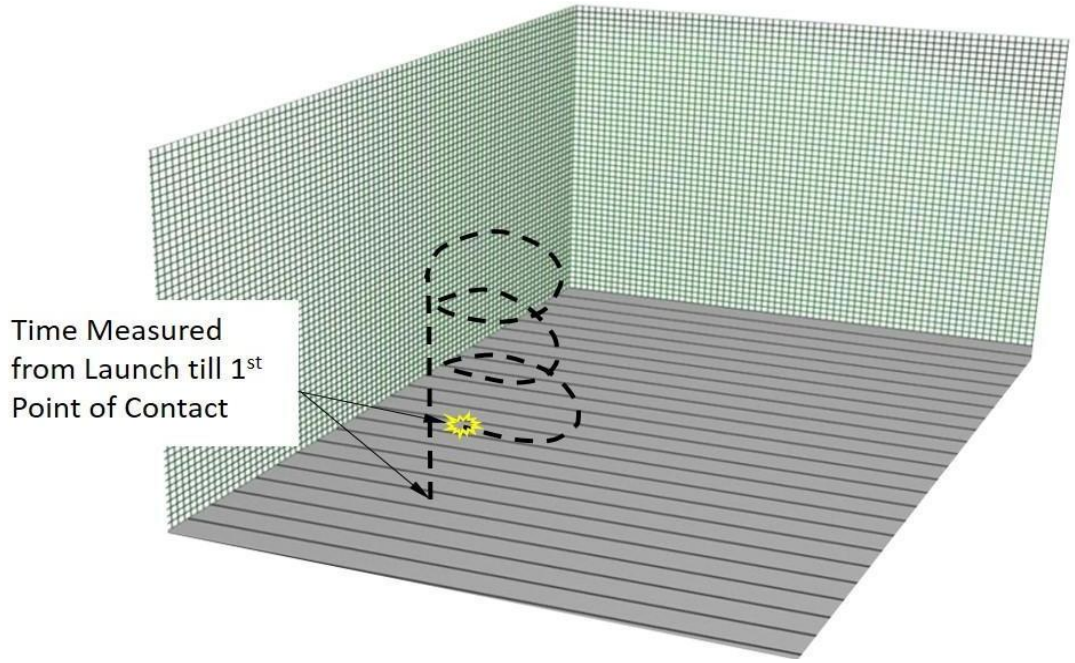
Teams are to launch their planes from within the playing field to obtain the longest time aloft score in the field below:



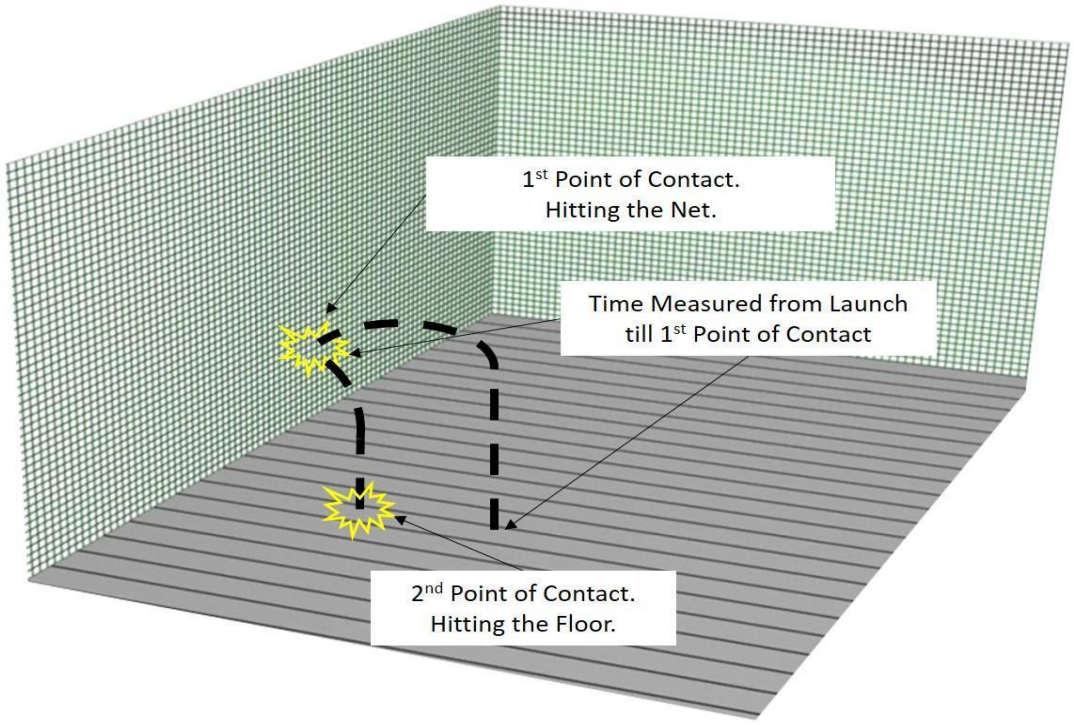
3.c.1 TIME ALOFT CHALLENGE RULES & SCORING

1. One participant from each team is to launch their plane from within the playing field.
2. The score (in seconds) will be taken from the time the plane leaves the participant's hand till the time the plane first touches any point in the field, any other objects (netting), or when the plane flies out of the playfield.
3. In the event of a tie, the tied teams are to do a "fly-off", to compete against each other for the best score to break the tie.

The example below shows the plane launch and flying until hitting the floor. The score is taken from launch till impact on the floor.



The example below shows the plane launch and in flight until hitting the net, and then the floor. The score is taken from launch till impact on the net.



4. PAPER PLANE CHALLENGE SETUP

1. Teams are not allowed to bring in paper planes, books, manuals, notes, drawings or any material, printed or electronic, related to folding instructions or paper plane competitions. SAFMC officials may check the teams for possession of such items and teams must comply immediately.
2. Teams will be given a total of **THIRTY (30)** minutes to create **THREE (3)** paper planes, one for each challenge. No time extension will be given.
3. Towards the end of the **THIRTY (30)** minutes, teams must submit their planes to the SAFMC officials for them to be stored in a box. The officials will inspect the planes to ensure all the regulations are met. Any planes that fail the inspections will be given **FIVE (5)** minutes to rectify the problem. Failure to meet this may end in the team's disqualification from the challenge.
4. The planes will be quarantined till the teams are called up again for the challenge.
5. When the challenges start, teams will be called upon, and **TWO (2)** participants are to report at the Reporting Point to collect their plane for the specific challenge. One participant will throw the plane and the other will retrieve the plane upon the referee's signal.
6. Each challenge consists of **TWO (2)** attempts, and both must be completed within **THREE (3)** minutes. The best score will be taken for each team.
7. Only one plane can be used for each challenge. A single plane cannot be used for different challenges.

8. Teams may not modify their planes at the launch area (i.e. starting area, starting line), or add any items on the playing field.
9. Upon the Referee's signal, the challenge will start, and the participant may launch the plane.
10. All planes must be launched within the specified launch area for each challenge.
11. Each paper plane must be launched by hand and unaided (not using slingshots, elastic bands or any forms of launchers) by one participant.
12. The participant must be physically in the launch area provided for each challenge from the start of the attempt to launch until the completion of the launch (when the participant lets go of the plane).
13. For the Range Challenge, the participant, <u>when necessary,</u> may run up, fast walk or jump up when launching the plane. Participants must not jump/step out of the starting line even when the plane is released from the participants' hands.
    - *If there are violations to the launch rule, it will be considered a failed attempt and the scores/points gained will not be recorded.*
14. At the end of the challenge, the Referee will complete the score sheet and the participant must sign on it to acknowledge the score.
15. If any team disagrees with any of the Referee's decisions and wishes to appeal, they must inform the Referee after the challenge and before leaving the playing field area.

16. The Chief Referee may call for a re-attempt if necessary. However, the following are not valid reasons to call for a re-attempt:
    - *Participant's launch technique.*
    - *Any deviations in the playing field setup, within the declared margins.*
17. Teams must heed the instructions of the referees during the game play.
18. Any teams found in violation of the rule(s) may forfeit the challenge and be awarded **zero (0)** points or may be disqualified from the competition. Multiple violations by the team may result in the school to be disqualified from the competition.
19. The SAFMC Paper Plane Chief Referee has the final say on all rules and regulations.
20. The Chief Referee and Referees will not review any form of recording at any time during the competition.
21. Teams found acting in a disrespectful and/or rowdy manner may be disqualified from the competition. Multiple violations by the team may result in the school being disqualified from the competition.
22. Teams are encouraged to clear any doubts about the challenges or rules before the start of the competition.

5. PAPER PLANE FOLDING REGULATIONS

Teams participating in Paper Plane must construct their paper planes according to the rules below. The SAFMC Paper Plane Chief Referee has the final say on all rules, regulations and the paper plane design compliance.

1. Each paper plane **must** be made on-site during the competition with the SAFMC Official Paper that is provided. Each sheet of paper is standardised at A4 (297mm x 210mm), 80GSM.
    a. Each team will be given **THREE (3)** sheets of papers of different colours by the SAFMC Officials on the day of the challenge. Teams are not allowed to use their own paper.
        - Range Challenge = Pink-coloured Paper
        - Precision Challenge = Orange-coloured Paper
        - Time Aloft Challenge = Blue-coloured Paper
    b. Teams are not allowed to make a plane from more than **ONE (1)** sheet of paper.
    c. Teams will be given **ONE (1)** additional new sheet of paper per colour. However, the entire sheet of paper must be returned to obtain a new one (portions of the paper cannot be missing).
    d. Paper planes should not be created by multiple papers or different coloured papers.
2. Teams are allowed to fold, cut, or tear the paper to create the plane. Any portion of the paper that was cut and detached may be reattached.
3. Teams are allowed to use the standardised UHU® stick that is provided. Each team will be given **ONE (1)** UHU® glue stick by the SAFMC Officials on the day of the challenge. Teams are not allowed to use their own glue.
4. All paper planes must be made only with materials provided by the SAFMC Officials on the day of the challenge.

5. Teams must write their team number and team name on all their planes. The number and name must be clearly visible to the SAFMC Officials.
6. Teams are not allowed to bring any additional tools/ materials into the competition. Teams will be provided the following items to create the paper plane:
    - ONE (1) UHU® glue stick
    - ONE (1) scissor
    - ONE (1) ruler
    - ONE (1) pencil
7. All paper planes must reasonably resemble **a fixed wing structure**. A crushed paper does not qualify as a paper plane, and it will not be allowed in the competition.
8. Teams must create their paper planes in a safe manner (no running with scissors, throwing items at others, etc.). Any teams behaving or using a method of building which is deemed unsafe by the SAFMC Officials may be disqualified.
9. The colours of the papers may change on the day of competition. However, the weight of the paper and size will remain the same.