



## TAME AIRCRAFT DESIGN AND FLY COMPETITION

Your team has been chosen to design a new stunt plane for the Thunderbirds, the U.S. Air Force's flight demonstration squadron. This new plane has to be up to some major challenges—fly through hoops, knock over towers, and even have the ability to execute a tail-hook landing! You can build up to three prototypes to tackle these stunts and you will be able to purchase your supplies from a materials store. You have 20 tickets, so you have to track your budget carefully to juggle the design constraints. You will be rewarded for successfully completing the challenges on a low budget. There is a lot to consider as you approach this challenge so you'll need every member of your team working hard. Good luck!

### PROJECT OVERVIEW

Design one or more aircraft that can score your team the most points. Consider the following:

**Cost** – You have to purchase all the raw materials and you have a fixed budget (20 tickets). Your choices will affect your final score – design your aircraft carefully!

**Schedule** – There is a fixed and very limited amount of time (45 minutes) to build these aircraft– use your time wisely!

**Quality** – Your team may decide to build a single expensive plane specializing in multiple challenges or build multiple cheaper planes specifically designed for a single challenge or some variation of both – use your creativity to maximize your performance!

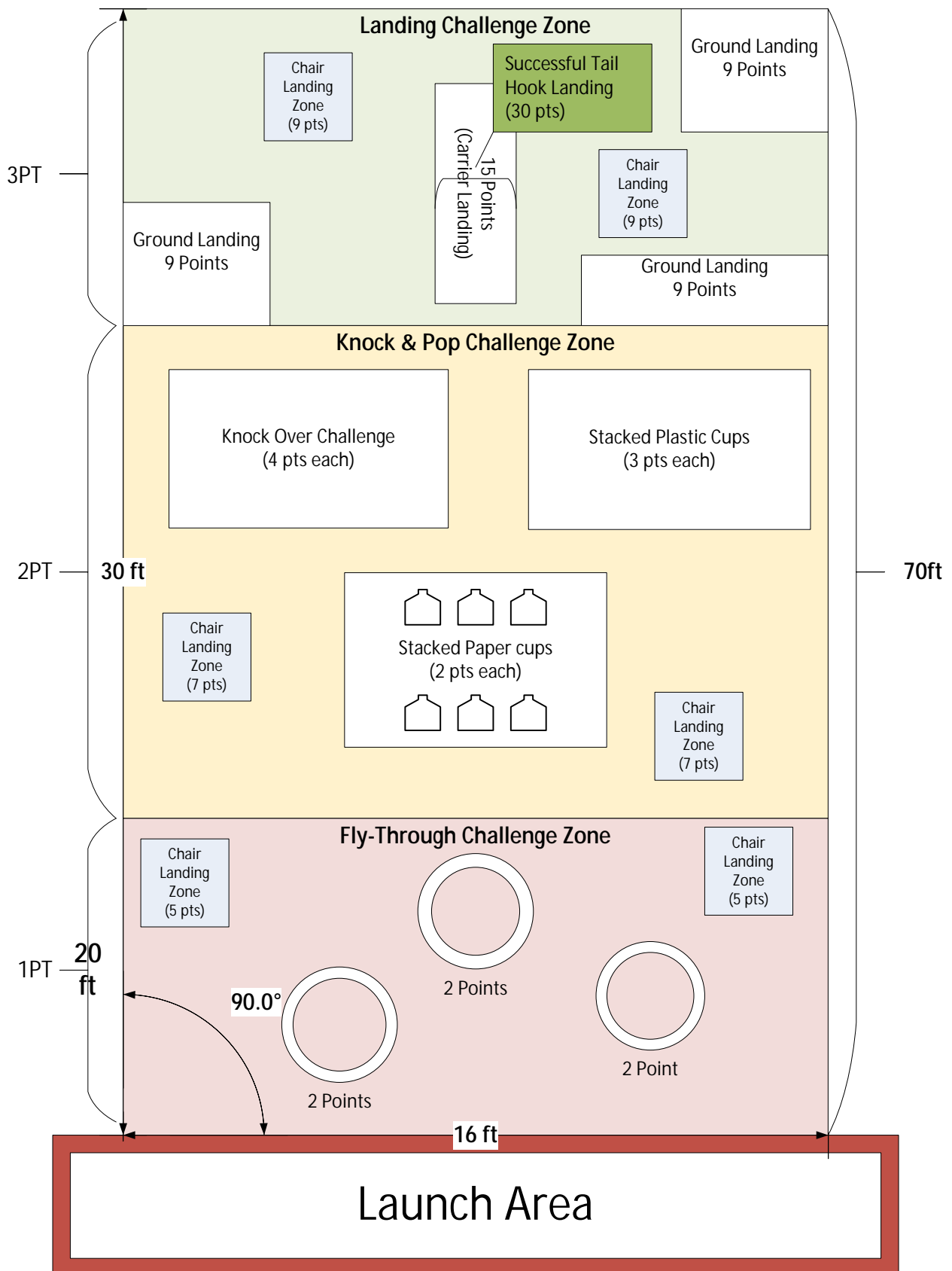
The team that scores the most points wins – Good Luck!

### SCORING DETAILS:

- Complete documentation, number of tickets left after the build process and the plane's landing zone will be used to calculate the base score
- Bonus points will be awarded for each challenge that the plane completes
- If the plane completes a challenge but lands outside the designated course, no points will be awarded!
- In the event of a tie, the teams with the lowest materials cost will win the competition. If there is still a tie, then the team with the more complete documentation will win.

SCORING RUBRIC	
Artifacts / Deliverables	
Is documentation complete, legible and accurate?	5 points / deliverable
Affordability	
How many tickets are left? Points will be awarded for each unused ticket	2 points/ticket
Performance: Landing Zone	
Landing in designated area, on the floor	1, 2, 3 or 9 points
Landing in designated area, on a chair	5, 7 or 9 points
Landing on carrier	15 points
Bonus Points:	
Fly through a hoop	2 points
Knock over stacked paper cups	2 points/cup
Knock over stacked plastic cups	2 points/cup
Pop a balloon	10 points
Tail hook landing, with plane on carrier	30 points

## TESTING ZONE





## MATERIALS

You have 20 tickets to shop for materials and for entry to the glue gun station. You may visit any store or glue gun station. You may only take one plane to the glue gun station at any time.

Materials	Dimensions	Quantity	Cost (Tickets)
Sheet of Copy Paper	8.5 X 11 inches	1 sheet	2
Sheet of Construction Paper	9 X 12 inches	1 sheet	3
Sheets of Tissue Paper	12 x 18 inches	1 sheet	1
Sheet of Card Stock	8.5 X 11 inches	1 sheet	4
Sheet of Chipboard Cardboard	8.5 X 11 inches	1 sheet	6
Scotch Tape	4 inches	1 piece	1
Masking Tape	4 inch strip	1 piece	1
Paper Clip	1 inch size	3 pieces	1
Rubber Band	Various	3 pieces	1
Dental Floss	6 inches	1 piece	2
String	1 foot	1 piece	1
Foil	6 x 6 inches	1 piece	1
Washers	3 washers	3 pieces	1
Hot Glue Use		1 visit/plane	3

## INSTRUCTIONS

- Fill out the Score Sheet completely
- Come up with a TEAM NAME and write it in the space provided.
- Fill in the names and roles of all team members on the PROJECT PLAN

## TEAM MEMBER ROLES

Each team member has at least one specific role. If your team has fewer than 5 members, some members will serve in more than one role. All roles must be assigned and each person is expected to complete the assigned 'deliverable'.

ROLE	Responsibilities	Deliverable
Project Manager	Verifies that ALL documentation is complete and that ALL requirements are met	PROJECT PLAN
Lead Design Engineer	Manages the design process for the team  The Design Engineer must complete a design drawing for each airplane being built by the team	DESIGN DRAWING
Lead Materials Engineer	Responsible for purchasing materials for the team  The Materials Engineer must complete a purchase order for each plane built by the team	PURCHASE ORDER(s)
Lead Flight Engineer	Responsible for launching the aircraft on the team's behalf.	FLIGHT PLAN
Lead Test Engineer	Retrieves aircraft after a launch attempt  Only the Test Engineer and Flight Engineer are allowed into the designated testing area. The Test Engineer must present a completed test plan to the volunteer stationed at the testing zone.	TEST PLAN



## DESIGN AND TESTING REQUIREMENTS

### Design

- The plane must be larger than a 6 x 6 x 6 inch box, but fit entirely within an 18 x 18 x 16 inch box
- Structure must be deemed to be safe for flight by judges (no loose parts/pieces)
- Each plane must have its own unique model name and have the team number and sticker visible
- Non-Aerodynamic designs (ex. Ball of paper) are strictly prohibited

### Materials

- Planes may ONLY use a single material for the body (Copy paper, construction paper, card stock, tissue paper or chipboard) and must match the material designated in its purchase order
- ‘Accessory’ materials like glue, tape, string, etc. may be used interchangeably across models as needed
- ONLY materials purchased from store may be used in the building of the aircraft
- Materials and/or tickets may NOT be shared between teams

### Testing

- Testing is at your own discretion - TAME & Lockheed Martin are not responsible for any damages to aircraft occurring during flight test or judging. 😊

### Scoring

- 25 Points (up to 5 points per deliverable) will be awarded for complete, legible documentation
- 3 Points will be awarded for each unused ticket at the end of the challenge
- Landing points will be awarded if ANY portion of the aircraft is within the course zone
- No points will be awarded if the plane stops completely outside of the course boundary
- In the event an airplane touches multiple non-bonus zones, the team will be awarded the points of the lowest touched zone

#### Bonus Points:

##### Fly-Through Challenge (2 points/fly through)

- Points will be awarded ONLY if the aircraft completely makes it through hoop or structure.
- Aircraft may fly through multiple hoops or structures during a trial to earn additional points

##### Knock & Pop Challenge (2 or 3 points/dislodged cup, 10 points per popped balloon)

- Points will be awarded if a cup is knocked over OR significantly displaced from its original location (ex: knocked off of the table) as a direct result of the aircraft's flight path

##### Landing Challenge (2 points/fly through)

- Aircraft may fly through multiple hoops or structures during a trial to earn additional points

##### Tail-Hook Challenge (30 points)

- Points will be awarded IF and ONLY IF the tail-hook wire on the carrier was used in some form to decelerate and/or stop the aircraft AND the aircraft is touching a portion of the “carrier” landing zone at the completion of the trial

### Judging

- Teams will have THREE (3) trials on the judging course
- Final Aircraft designs must be registered with the judges and placed on the judges table prior to the start of judging
- The LEAD FLIGHT ENGINEER and LEAD TEST ENGINEER are responsible for standing in the proper line on the assigned course in the correct order for judging
- Only the LEAD FLIGHT ENGINEER will be allowed to launch the aircraft
- The launcher may launch from anywhere in the taped off zone
- No part of the launcher's body may cross the line or that launch will be disqualified.
- The LEAD TEST ENGINEER is responsible for waiting until the judges give the signal and quickly collecting the aircraft and returning to the end of the line

NOTE: Repairs to the aircraft are NOT allowed between attempts. If an aircraft is deemed incapable to fly it is disqualified from competing. Aircraft substitutions ARE allowed at any point in the competition as long as they were registered during the building process.



## PROJECT PLAN

Team Name: \_\_\_\_\_ Team Number: \_\_\_\_\_

### Team Members

First Name	Last Name	Chapter	Role
			Project Manager
			Lead Design Engineer
			Lead Test Engineer
			Lead Materials Engineer
			Lead Flight Engineer

Describe your team's overall approach to the challenge

What trade-offs did your team make in accomplishing the challenge?

PROJECT MANAGER: Name: \_\_\_\_\_ Signature: \_\_\_\_\_

## DESIGN DRAWING



DESIGN NAME \_\_\_\_\_ Team Number: \_\_\_\_\_

LEAD DESIGN ENGINEER: Name: \_\_\_\_\_ Signature: \_\_\_\_\_

## FLIGHT PLAN

Free to use and adapt for classroom use. Please contact [programs@tame.org](mailto:programs@tame.org) so we may share your versions with our educators.



Team Name: \_\_\_\_\_ Team Number: \_\_\_\_\_

Describe the building process your team used to build your aircraft.

Describe the technique and considerations that will be used when launching the aircraft(s):

What is the biggest strength and weakness of your design?

LEAD FLIGHT ENGINEER: Name: \_\_\_\_\_ Signature: \_\_\_\_\_

## TEST PLAN



Team Name: \_\_\_\_\_ Team Number: \_\_\_\_\_

Describe what happened when you tested your project the first time:

What changes did you make to address any design challenges discovered through testing?

Describe what happened when you re-tested your design(s):

LEAD TEST ENGINEER: Name: \_\_\_\_\_ Signature: \_\_\_\_\_

**PURCHASE ORDER FORM (1 PER PLANE TAKEN TO JUDGING)**

Free to use and adapt for classroom use. Please contact [programs@tame.org](mailto:programs@tame.org) so we may share your versions with our educators.





Team Name: \_\_\_\_\_ Team Number: \_\_\_\_\_ Design Name: \_\_\_\_\_

Materials	Dimensions	Quantity	Price	Qty. purchased
Body: : ONE TYPE OF MATERIAL /PLANE				
Sheet of Copy Paper	8.5 X 11 inches	1	2	
Sheet of Construction Paper	9 X 12 inches	1	3	
Sheets of Tissue Paper	12 x 18 inches	1	1	
Sheet of Card Stock	8.5 X 11 inches	1	4	
Sheet of Chipboard Cardboard	8.5 X 11 inches	1	5	
Accessories: Use as needed				
Scotch Tape	4 inches	1	1	
Masking Tape	2.82-Inch Wide	1	1	
Paper Clip	1 inch	3	1	
Rubber Band	1.75 inches	3	1	
Dental Floss	6 inches	1	2	
String	1 foot	1	1	
Foil	6 x 6 inches	1	1	
Washers	3 washers	3	1	
Glue Gun Session	1 session (1 plane)	1	3	

LEAD MATERIAL ENGINEER: Name: \_\_\_\_\_ Signature: \_\_\_\_\_

Team Name: \_\_\_\_\_ Team Number: \_\_\_\_\_ Design Name: \_\_\_\_\_

Materials	Dimensions	Quantity	Price	Qty. purchased
Body: ONE TYPE OF MATERIAL /PLANE				
Sheet of Copy Paper	8.5 X 11 inches	1	2	
Sheet of Construction Paper	9 X 12 inches	1	3	
Sheets of Tissue Paper	12 x 18 inches	1	1	
Sheet of Card Stock	8.5 X 11 inches	1	4	
Sheet of Chipboard Cardboard	8.5 X 11 inches	1	5	
Accessories: Use as needed				
Scotch Tape	4 inches	1	1	
Masking Tape	2.82-Inch Wide	1	1	
Paper Clip	1 inch	3	1	
Rubber Band	1.75 inches	3	1	
Dental Floss	6 inches	1	2	
String	1 foot	1	1	
Foil	6 x 6 inches	1	1	
Washers	3 washers	3	1	
Glue Gun Session	1 session (1 plane)	1	3	

LEAD MATERIAL ENGINEER: Name: \_\_\_\_\_ Signature: \_\_\_\_\_

## PURCHASE ORDER FORM (1 PER PLANE TAKEN TO JUDGING)



Team Name: \_\_\_\_\_ Team Number: \_\_\_\_\_ Design Name: \_\_\_\_\_

Materials	Dimensions	Quantity	Price	Qty. purchased
Body: ONE TYPE OF MATERIAL /PLANE				
Sheet of Copy Paper	8.5 X 11 inches	1	2	
Sheet of Construction Paper	9 X 12 inches	1	3	
Sheets of Tissue Paper	12 x 18 inches	1	1	
Sheet of Card Stock	8.5 X 11 inches	1	4	
Sheet of Chipboard Cardboard	8.5 X 11 inches	1	5	
Accessories: Use as needed				
Scotch Tape	4 inches	1	1	
Masking Tape	2.82-Inch Wide	1	1	
Paper Clip	1 inch	3	1	
Rubber Band	1.75 inches	3	1	
Dental Floss	6 inches	1	2	
String	1 foot	1	1	
Foil	6 x 6 inches	1	1	
Washers	3 washers	3	1	
Glue Gun Session	1 session (1 plane)	1	3	

LEAD MATERIAL ENGINEER: Name: \_\_\_\_\_ Signature: \_\_\_\_\_

Team Name: \_\_\_\_\_ Team Number: \_\_\_\_\_ Design Name: \_\_\_\_\_

Materials	Dimensions	Quantity	Price	Qty. purchased
Body: ONE TYPE OF MATERIAL /PLANE				
Sheet of Copy Paper	8.5 X 11 inches	1	2	
Sheet of Construction Paper	9 X 12 inches	1	3	
Sheets of Tissue Paper	12 x 18 inches	1	1	
Sheet of Card Stock	8.5 X 11 inches	1	4	
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Accessories: Use as needed				
Scotch Tape	4 inches	1	1	
Masking Tape	2.82-Inch Wide	1	1	
Paper Clip	1 inch	3	1	
Rubber Band	1.75 inches	3	1	
Dental Floss	6 inches	1	2	
String	1 foot	1	1	
Foil	6 x 6 inches	1	1	
Washers	3 washers	3	1	
Glue Gun Session	1 session (1 plane)	1	3	

LEAD MATERIAL ENGINEER: Name: \_\_\_\_\_ Signature: \_\_\_\_\_