

**READY SET FLY!**

Duration: 30 minutes- 2 hours

Institution: The Tech Museum of Innovation

Skill level/Age Level: All Ages

Group size: Variable, depending on space constrains; roughly 10-30 participants

**INTRODUCTION**

Inspired by Flugtag, the human-powered flying machine event, we turned out Hands-On Science Workshop into a flying machine shop where you'll get to learn all about the forces of flight, build your own flying machines, and test them out on our human-powered launcher.

**KEY CONCEPTS AND/OR SUBJECT AREA**

- Thrust
- Drag
- Lift
- Weight
- Gravity

**MATERIALS AND TOOLS***Essential Materials:*

- Masking tape
- Index cards
- Craft sticks
- Paper
- Cardboard

*Optional Materials:*

- Craft wire
- Aluminum foil
- Markers
- Foam crafting sheet
- String
- Wooden dowels
- Duct tape
- Binder clips
- Paperclips
- Rubber bands
- Flying machine launcher (note: if you are unable to build a launcher, the flying machines can be launched manually from a high place, paper-airplane style.)

## SET UP

- Set your supplies up buffet style in an easily accessible place.
- Evenly distribute scissors and masking tape along the workspace tables.
- (Outline the landing strip on the floor, marking the distance measurements.
- Demarcate a safety zone around your launch area.

### *Optional:*

- Set out bins for recycling used materials.
- Have markers available to record the distance flown. We used Velcro backed squares for guests to write their names on, but masking tape would work just as well.

## HOW TO OR STEP-BY-STEP

1. Invite participants into the workshop area; orient them to the space (e.g. where materials are, where to build and to test). Explain the design challenge and any additional goals or constraints. Here are a few ideas for additional design challenges
  - a. Engineer your flying machine *without* using any tape.
  - b. Create a flying machine that will glide at least 5 feet, and then burst upon impact.
  - c. Create your flying machine using only one type of material.
2. Allow participants to build. Assist with any material requests but try to limit giving any design hints. Instead use guided inquiry to help them think critically about their design.
3. When guests are ready, assist their launch. Create a spectacle using chants or cheers to help build hype in the workshop. If desired, mark the distance flown on the landing strip. Ask questions to help prompt the participants' reflection. What design elements worked? Why? How might you change your design?
4. Encourage reiteration and retesting
5. Encourage participants to take their creations home or place them into the recycle bins as then exit the workshop.

## FACILITATION TIPS

- Sometimes participants (younger ones especially) will get so wrapped up launching and re-launching their crafts that they lose interest in reiterating. If this becomes a problem, you can put a cap on how many re-launches are allowed per flying machine.
- If workspace is limited, encourage participants to work together in teams.

## MATERIALS SOURCES

Recycling centers

**KEYWORDS**

- Flight
- Needs lots of space
- Constructionist
- Indoor/Outdoor