

# Flying Start Challenge



## Flight Testing

Lesson 5

# Learning Objectives

- Why Testing is Critical
  - Learn what can happen if you don't test
- Why we test?
  - Understand the design & testing cycle
- Experimenting with Design
  - Learn how you can test your glider to improve it's flight

# Why Testing is Critical



# Why we Test?

Click picture to watch video



Design & Test cycle

Fail fast, learn and improve

# Experimenting with the design

- Check centre of gravity:
  - Left/right balance
  - Front/rear balance
- Check the wings are symmetrical and balanced
- Can you reduce drag?
- Can you improve your throwing technique?
- Experiment with changing the angle that you throw the glider and position the wings to find the best setup

**Tip:** Find the centre of gravity by the finding the point where it balances on the end of your finger



# Learning Highlights

- Why Testing is Critical
  - Safety is paramount
- Why we test?
  - Every time we test, we learn how to improve
- Experimenting with Design
  - Change centre of gravity, symmetry, throw and throw again

# Flying Start Challenge



## Lesson & Challenge Summary

Lesson 6

# Summary

- Lesson 1: Introduction
- Lesson 2: Basics of Flight
- Lesson 3: Lift & Drag
- Lesson 4: Materials & Manufacturing
- Lesson 5: Flight Testing

Make sure you understand everything you have been taught



# Lesson 2: Basic of Flight

**Your glider must maintain straight and level flight!**

- To prevent **Roll** - You need **balanced, symmetrical wings**
- To stop **Yaw** - You need a **vertical stabiliser (the fin)**
- To help control **Pitch** - You need two things:
  - ✈ **A horizontal stabiliser (the tail plane)**
  - ✈ **A good weight balance**



## Aircraft Forces

- Lift
- Weight
- Drag
- Thrust

## Basics of Flight Dynamics

- Roll
- Pitch
- Yaw

# Lesson 3: Lift & Drag

- The difference between an aircraft and a glider
- Why wings are different shapes
- How lift is created
- How to reduce drag

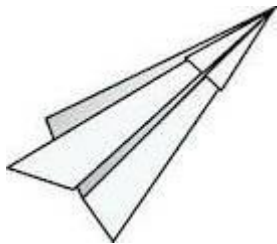
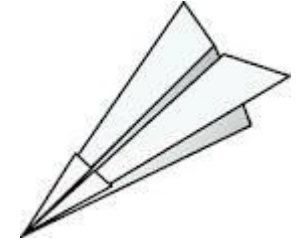


# Lesson 4: Materials & Manufacturing



What will your glider need?

- Strong, lightweight structure
- Good build quality
- Sustainable design



**Think carefully about what materials you want to use and why!**



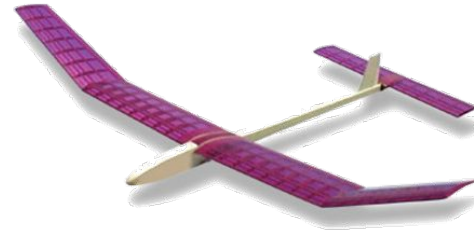
# Lesson 5: Flight Testing

- Aim for straight and level flight
- Launch smoothly
- Make small changes only
- Add, don't take away - unless you are certain!
- Repeat experiments and record your findings



**FLY SAFELY!**

# The Challenge



- To Design and build a hand launched glider which will fly as **far** and as **straight** as possible.
- **Test your design**, modify if needed and then re-test
- Then get ready to launch

# What are the Judges looking for?

## A Brilliant Glider

- Build quality
- Creative and sustainable design
- Manufacturing Methods Shown

## Poster Presentation

- Project plan
- Time & budget keeping
- Sustainable design
- Innovation



## Flight Dynamics Knowledge

- What have you learnt in the lesson packs

## Presentation Quality

- Clear and informative poster

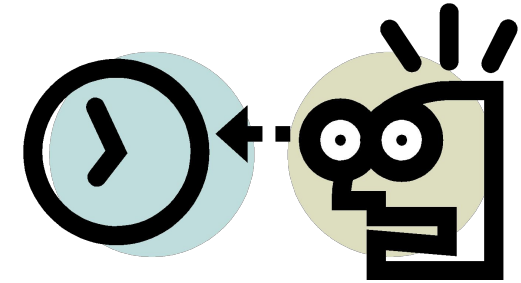
# Glider Requirements

- Your glider must fly as **far** and as **straight** as possible
- Additional Points will be given if the fuselage, wings and tail are made from a **different material**
- The wingspan of the glider must be a **minimum of 30cm**
- The length of the glider must be a **minimum of 40cm**

# Project Planning

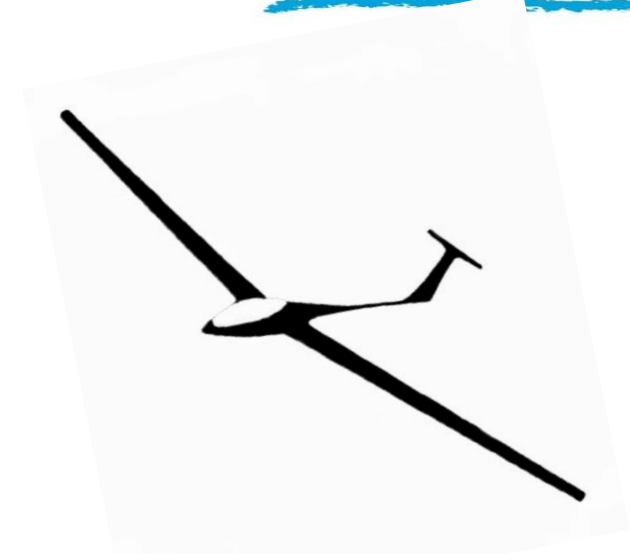
## Plan your project first!

- Design your glider and understand how its going to fit together
- Think about building it in a way that you can test and then make changes
  - E.g. don't glue things together first, use tape or bluetack and glue when your happy with your glider





# GOOD LUCK!!



You now have everything you need for the **Flying Start Challenge**

# Poster Competition

The poster needs to include:

- The design and build process.
- Any drawings related to your design.
- Evidence of testing if conducted
- Improvements made to your glider.
- Your knowledge of lift, weight, thrust and drag.
- Details of any innovative ideas.
- Environmental awareness
- Evidence of planning.
- Evidence of teamwork.

# Poster Competition

Best Engineered		
Knowledge of Flight Dynamics		/10
Manufacturing Methods Described		/5
Environmentally Friendly and Sustainable		/5
Best Artistic Design		
Glider Illustration Quality		/10
Overall Poster Aesthetics		/5
Creativity of Artistic Methods (e.g. paint/colours/collage etc...)		/5
Best Innovative Design		
Novelty of Design (how different from other entries)		/10
New Techniques/Design Features (not mentioned in lessons)		/5
Evidence of Own Research		/5
<b>Total</b>		<b>/60</b>

# Manufactured Glider Competition

Flight Dynamics (does design suggest thought from theory lessons)		/10
Manufacturing Methods Shown (robust, adaptable etc.)		/10
Glider Aesthetics		/5
Creativity of Materials (inventive use of household items)		/10
<b>Total</b>		<b>/35</b>