UNIFIED:
RC Aircraft Competition

Introduction

FLIGHT TRAINING

- Primary contact: Scott Christopher
- Please keep in mind, I’m doing this project as well

SYSTEM

- Starter Session
- Simulator skill building
- Buddy box Dragonfly flights
- *Free flight
- Try out plane Vanilla

Starter Session

- ~1 hour on simulator with me
- Describe basic control characteristics
- Basic maneuvers:
  - Take-off / Landings
  - Constant banks angle turn
  - Simple circuits
  - Figure 8
- Emergency routines (accident recovery)

Buddy Box

- Trainer has control at all times
- Has the option to “hand off” control
- ‘fairly’ good system
- Help to save potentially fatal crashes
- No guarantees

Flying a Dragon(fly)

- Early in the mornings (6 am-ish)
- In Johnson
- Wing of your choice
  - (I recommend the stock wing)

Flight Testing Time

- Johnson Indoor Track
- Mondays 7:30-9am
- Most mornings before (7) am
- I DO NOT recommend flying outside
  - Most designs will not survive the wind
  - Can give you improper feedback about flight characteristics

Simulator

- Where: Mezzanine of Hangar, outside Col Young's office
- Simulation: G2 RC flight Sim
  - Plane: RCFT BLT Park flyer
  - Any airport to start
  - Try out johnson for an enclosed space
  - Also try: PT40, Simple Flyer, anything else that peaks your interest

PILOTING

- Mandatory for all teams to have a pilot
- Will count towards a grade bonus
- Buddy Box setup
  - Pilot Primary
  - Prof Drela, Col Young, Scott, Adam, Carl or Mikel secondary
- Each pilot given a Cooper-Harper like rating

Battery Charging

- Battery “TO BE CHARGED” box
  - Takes at least 16 hours to charge
  - Dropped off before 5pm will be ready the next evening
    - (Monday afternoon -> Tuesday evening)
- Battery “CHARGED” box
  - Will be put out every evening at 5pm

Radio Replacement

- Please submit (in writing) the symptoms of the radio
- Hand in your Tx and Rx
  - Handing in you servos is also a good idea
- You will get a new Rx Tx combo
- DO NOT REMOVE THE BATTERY OR X-TALS!
  - They get lost and nobody wins

Motor Replacement

- Turn in your motor and speed control unit
- You will get a new motor speed controller combo
- No guarantee on turnaround
- DON’T CRASH!
  - If you do crash, don’t nose into anything

Construction Basics: Contents

- Adhesives
- Balsa
- Foam
- Radio
- Wing
- Surfaces
- Landing Gear
- Motor

Construction Basics: Adhesives

- USE SPARINGLY
  - Save weight and supplies
- CA
  - Balsa to balsa, balsa to rough plastics
  - Stiff and brittle
  - Light
  - Quick(ish) setting
- Epoxy
  - Balsa, foam, plastics, sometimes metal
  - Flexible
  - Heavier
  - Slow setting

Construction Basics: CA

- Do not overuse CA
- If you think you need more CA, use epoxy instead
- Avoid using accelerant if you don't have to
  - Gives a stronger bond if you don't
  - Do use accelerant if a 'difficult' or 'fast' bond
- BE CAREFUL:
  - CA eats foam and some other materials
  - Always test first

Construction Basics: Epoxy

- Know exactly what you want to glue before mixing
- Mix in very small batches
- 1 to 1 mixing ratio resin to hardener
- Mix on paper with SCRAP stick
- Pot time: ½ to 3/5's hardening time

Construction Basics: Balsa

- Cutting:
  - < ¼” think use a razor blade
  - >= ¼” use a small (high tooth per inch) saw
- ~~Measure once, cut twice~~ NO!!!
- MEASURE TWICE, CUT ONCE!

Construction Basics: Foam

- CA eats foam
- Propellant in 3M 77 (spray adhesive) eats foam
- Wood glue does not dry inside foam joint
- Use a hot wire to rough out a cut
- Sand down after cutting
- Mistakes: use lightweight spackle to fix it
- By merely existing, foam will get damaged

Construction Basics: Foam Cutter

- Make sure the wire is taut
- Make sure the wire has been zeroed
- Machine is finicky, test cut on a thin section of foam
- Use leading edge loop option
- DO NOT MESS WITH THE POWER SUPPLY!

Construction Basics: Foam Cutter Cont'd

- The software has a lot of useful features
- Talk to Dave, Col Young, or Prof Drela to learn how to use the foam cutter
- Brush off whiskers after cutting
- Save the foam beds! (may be used in another lab)

Construction Basics: Radio

- Channel 1: Ailerons or Rudder (rudder for 3 channel setup only)
- Channel 2: Elevator
- Channel 3: Throttle (speed controller)
- Channel 4: Rudder (4 channel setup only)
- Channels 5 & 6: Auxiliary or battery (not needed, we have Battery Eliminator Circuits aka BEC)

Construction Basics: Radio Cont'd

- Rule of Thumb for connectors: gold squares on connector go 'UP'
- Other rule: small rounded edges go 'DOWN'
- Other rule: Signal wire (yellow or orange usually) faces towards the inside of a Rx
- Final Rule: If it doesn't work, flip it over

Construction Basics: Radio Cont'd

- 'Open up' all of the pots on the front of Tx
- Check the direction of servo throws
  - Reverse switches are on the bottom or front of Tx
- Centering rules:
- Test fly with (set angles) throws
  - Only after test think about reducing throws

Construction Basics: Surfaces

- ‘Clean’ a surface to be taped by applying and removing some masking tape
- Make sure the hinge line is VERY STRAIGHT
- Overestimate your control throws
- If you need more throw:
  - Increase servo side moment arm
  - Decrease surface side moment arm
- Tape/glue down your push rod sleeves

Construction Basics: LG

- Have enough clearance for the prop when plane is level AND at ~ -20°
- LG are a huge drag contributor
- Make sure your tale surfaces don’t touch the ground, even when deflected

Motor

- Make a motor mount that will prevent slippage in 2 axis (fore/aft, left/right)
- Use a single or double wrap of masking tape to hold the motor in place
  - Holds secure enough for our purposes
  - Saves the motor from damage in a crash/prop strike