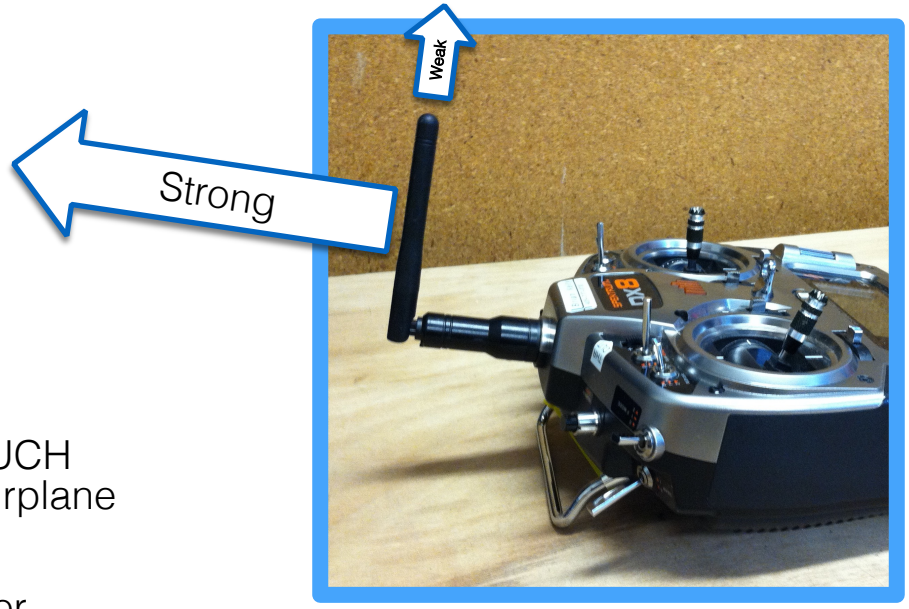
Radios and Electronic Speed Controls

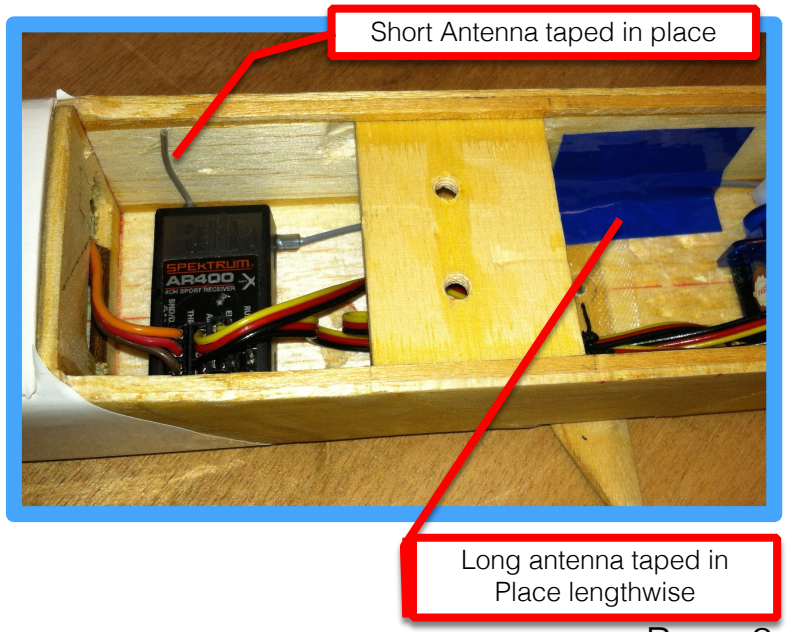
Marymoor R/C Club, Redmond, WA
AMA Charter 1610

Version 3.0 – April 2023

Radio Antennas



- Transmitter - Correct Antenna Orientation
  - The signal from the SIDE of the antenna is MUCH STRONGER. "Pointing" the antenna at the airplane sends the WEAKEST signal.
  - For older 72 MHZ radios extend the transmitter antenna to its full length before flying or range testing the aircraft.
- Receiver – Correct Antenna Installation
  - The 2.4 Ghz antenna needs to be placed inside the model away from moving parts and wires
  - 2.4 Ghz antennae MUST be oriented 90 perpendicular to each other, and as far apart as wiring allows.
- Above all – READ your radio manual instructions



Setting the controls for You

- Stick Forces
- Dual Rates
- “Expo”
- Aileron to Rudder mix
- Throttle cut

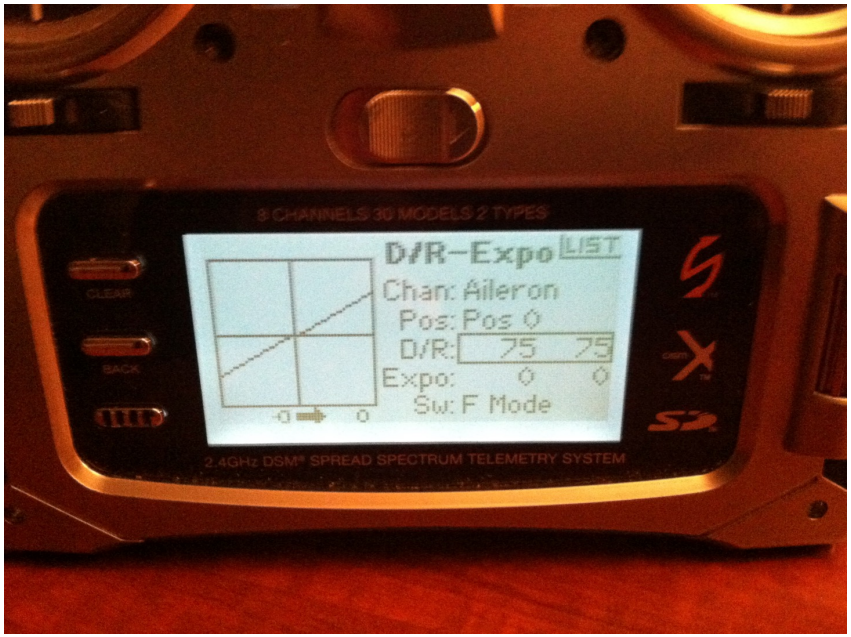
Stick Forces

- Stick forces on many transmitters are adjustable. Read your manual
- Increasing forces can help a lot with over-controlling early in the learning process
- One professional RC flight school even puts custom, stronger springs in their transmitters
- Control forces and Dual Rates are the first things to adjust if your instructor feels that you are over-controlling.

Dual Rates

- Sets up switches on the transmitter so you can select more or less control throw for Aileron, Elevator, and Rudder
- Generally, start with the control throws recommended for your airplane
- For any first flight, it's a good idea to have options. Take off in low rates to begin with
- Rates too high, or too low can cause problems

Example of a programmable "computer" radio screen showing dual rate setup.



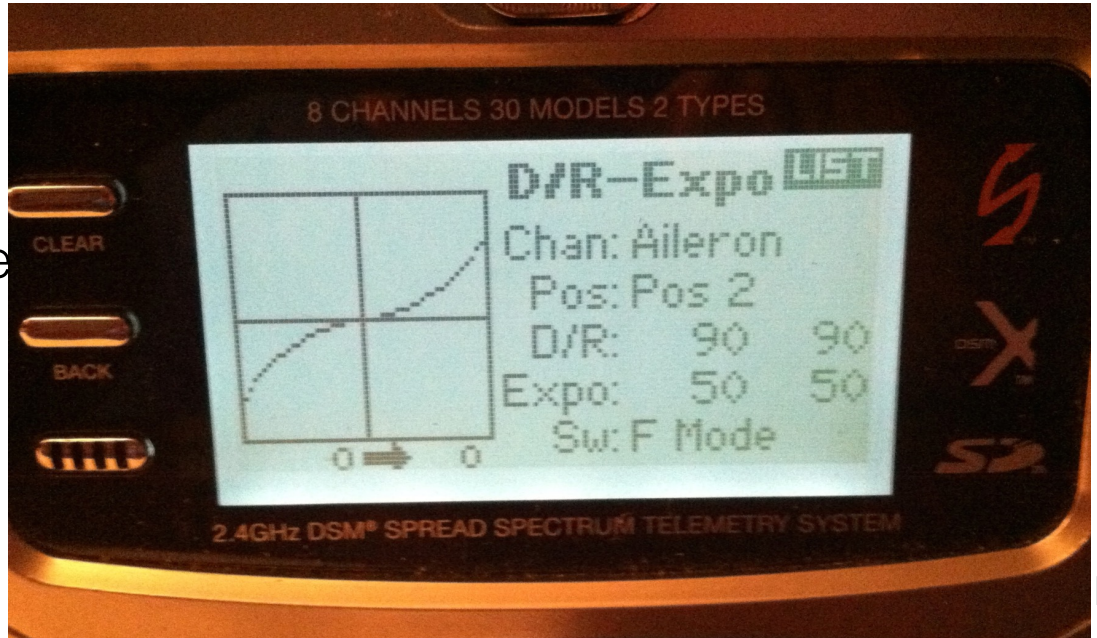
“Expo” (Exponential)

Expo can “soften” the response around neutral and help prevent over-controlling

- Mostly used for high performance 3D airplanes that would be difficult to control around neutral because of their very high control throws (rates)
- Can be used as you prefer for a trainer (not too much though – probably 30% or less
- Not available on some “simple” transmitters

- Expo is NOT the first choice to make an airplane handle nicer – adjust the throws (rates) first
- Too much Expo can cause difficult handling
- Expo the wrong way can be disastrous!
- “Good” expo is a positive number on Spektrum and JR
- “Good” expo is a negative number for Futaba! (Read your Manual to be sure)

Compare this curve to the straight line one the previous slide



Aileron-to-Rudder Mix

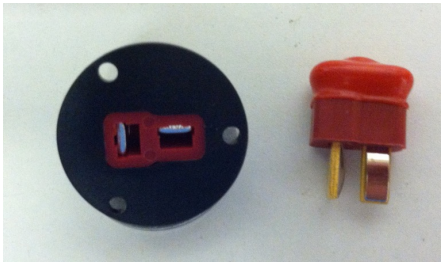
- Causes rudder to move also when the right stick commands ailerons
- Gives most trainers a smoother and more predictable response to a roll (aileron) command from the pilot, especially in slow flight when ailerons are weak.
- If it is not too difficult for you, you should learn to use rudder with your left hand instead of using this aileron-rudder mix.
- If you decide to use this mix, set the “gain” at about 50%, so that rudder moves about halfway when the ailerons are fully deflected. This is about right for most trainers.
- Put the mix on a switch so that you can take off normally, and then try the mix for the first time when at a safe altitude.
- Make SURE that rudder moves Right for a Right aileron command (and similar for Left)
- SHOW THIS MIX AND ASSOCIATED SWITCH to your instructor before you fly

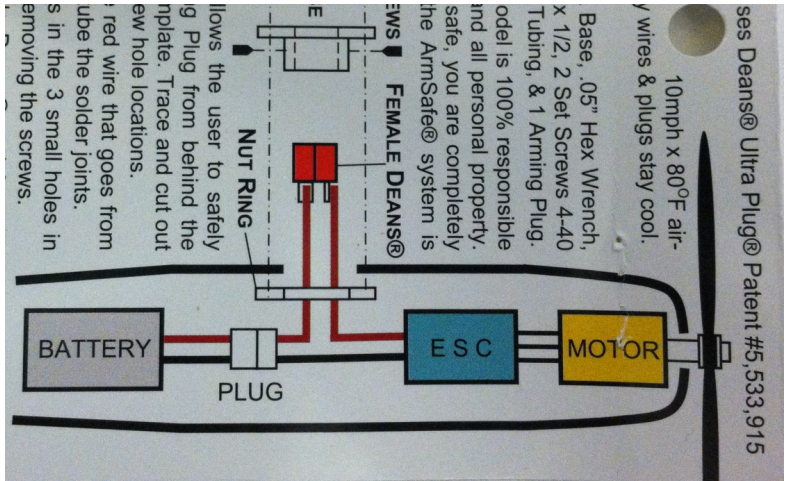
Propeller Safety
Throttle Cut Function

- *Throttle Cut* function enables a switch to tell the transmitter to send zero (or less) throttle no matter where the throttle stick is.
- For gas or glow, remember that the engine cannot be restarted if the Cut switch is bumped
- Assign the function to a switch that you won't bump in flight

Electric Power

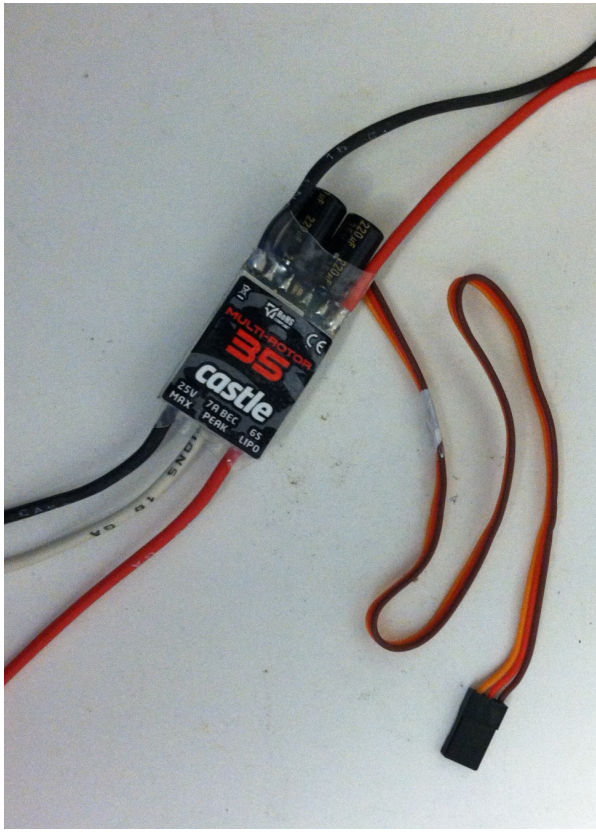
- Use an ESC switch, if your ESC has one
- Or install a safety plug on the airplane like this one:





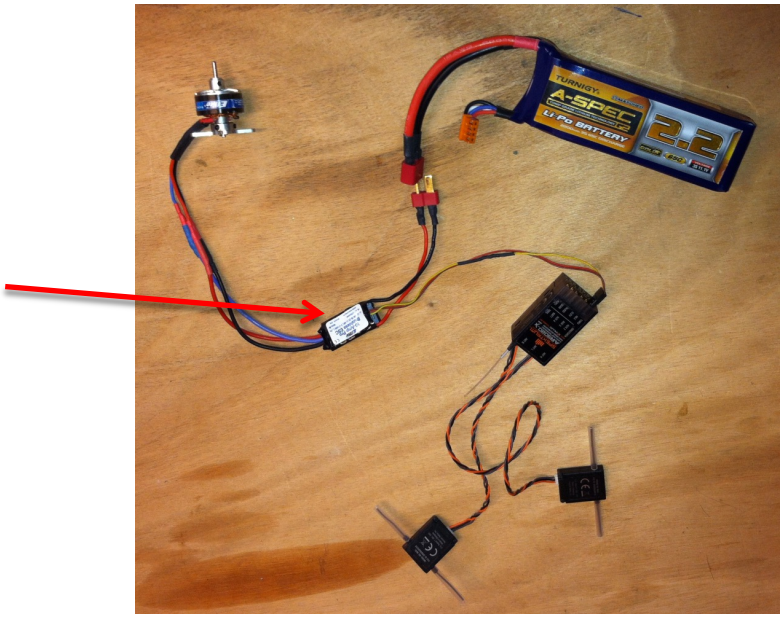
The Electronic Speed Controller (ESC)

- The ESC takes commands from your radio receiver and tells the electric motor how fast to run by turning the power on and off very fast.
- It also powers your radio receiver, (larger planes often use a separate BEC or separate battery for enhanced safety)
- If your propeller is ever blocked for any reason, like if the airplane noses over or runs into tall grass, immediately pull your throttle stick to idle to avoid damaging the ESC
- ESC's usually have safety features to prevent them coming ON when plugged in – but don't rely on that alone. Make sure your stick is at idle before plugging in
    - ALWAYS read the instructions for your ESC. There are differences between brands!



Battery Power for the Receiver and Servos

- Power to the receiver (and the servos) can come from either:
    - The ESC on an electric airplane, if that ESC has a BEC (Battery Eliminator Circuit) or
    - A separate battery, for gas and glow airplanes
- A separate battery for radio is sometimes used on larger electric airplanes, to ensure control of the airplane even if the motor battery dies or if the ESC fails



Electric Motor and Prop

- The right prop is determined by the airplane size, motor size and type, battery, and ESC.
- Too high prop diameter or pitch can cause excessive electrical current and damage the ESC or battery
- Use eCalc or other online tools, or a current meter to determine the right prop. If you don't know for your airplane, don't guess.

Disclaimers

MAR/C provides advice. After you gain solo flight privileges,
only you are responsible for your
model aircraft readiness, your actions, and abilities

Any instructions provided by the manufacturers of
equipment such as but not limited to aircraft, radio controls,
batteries, motors or engines
and anything installed in your airplane have
precedence over any advice provided by instructors, this document,
or the mar-c website..

Flying and teaching techniques
vary widely in our hobby, and vary from one instructor to another.

The goal of this document is to encourage some standardization and
provide a practical minimum amount of knowledge.

Version Information

Version	Author	Date	Description
1.5	Brian Kelly	April 2017	Aligned Flight Training Syllabus with new flight log. Misc corrections and refinements
1.6	Brian Kelly	4/19/2017	Misc edits, repaired links, to prepare for website update
1.7	Brian Kelly	4/26/2017	Corrections and misc edits
1.8	Brian Kelly	9/28/2017	Updated Proficiency Check and misc edits
2.0	Brian Kelly	Nov 2018	Broken into separate standalone chapters for quicker access on the website.
3.0	Brian Kelly	April 2023	Updated to reflect club-owned fleet of electric training planes and miscellaneous improvements