

UNDER CONTROL:

Safe and Reliable RC

A presentation to the Stetson Flyers

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This Presentation

Themes

- How to maintain **safe, reliable control** of RC models
- Need for **failsafe** in case of control loss

Topics: Requirements for safe, reliable RC:

1. A **transmitter** that works
2. A **receiver** that fits the task and is properly installed
3. Suitable **servos**, properly installed
4. Adequate **power** to the receiver and servos
5. **Failsafe** set correctly to minimize risks

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1. Transmitter

- **Battery** in good condition, adequate charge level
- **Antenna** and cable not damaged internally or externally
- **Wiring** within transmitter not crushed or frayed
- **Gimbals** not damaged
- Regular **range checks** done to verify normal operation
- Correct **model memory** selected
- **Controls** set up correctly (not reversed!)
 - Note need to reverse Futaba throttle for electric models

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2. Receiver

- Suitable receiver **type** for the specific model:
 - Different requirements for small foamies, large glow, giant gas, multicopters, CF fuselage gliders, etc.
 - Reliable brand, legitimate source
- Protected from **vibration** as required (especially for IC power)
- **Antenna(s)** properly located and aligned:
 - Away from battery, wiring, ESC, CF, etc.
 - Straight, well separated and at right angles (if dual)
- **Satellite** receiver (if used) properly installed
 - Well separated, with antenna at right angles to main receiver's
- **Switches, connectors, wiring** secure and in good shape
- **Range tested** with model in all attitudes to check installation

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3. Servos

- Suitable **type and size** for the model
- **Tested** for proper operation, no broken teeth, jumping
- **Linkages** set up correctly, no binding, no risk of disconnect
- **Current draw** normal
- **Connectors and extension cables** secure
- Electric **landing gear** not jamming

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4. Power for Receiver and Servos

- **Suitable power supply** for type of model:
 - ESC with internal BEC of ample rating (switching BEC preferred)
 - Separate BEC of ample rating
 - Battery of ample capacity and current capability (NiMH, LiFe)
 - Battery and voltage regulator (LiPo)
- **Voltage to receiver tested** with all servos operating
- NiMH batteries tested by **cycling** periodically
- At each flying session: battery properly **charged**, tested under load between flights

5. Failsafe

Purposes of failsafe: In the event of control failure:

1. Protect **people and property** from harm
 2. Minimize harm to the **model**
- Note the priority – people first, then property, finally model!
 - Hence in most cases, cutting power is prime requirement
 - We'll talk about the exceptions later
 - Failsafe is a receiver function (though Tx involved in setting)
 - Failsafe is what the receiver does when it can't hear the Tx
 - Failsafe can't work if control loss is due to power failure
 - Different radios work differently. The key message here is:

Understand how your radio works, ***set failsafe*** appropriately, and ***test*** that it works correctly!

5a. Types of Failsafe

1. **Throttle-only Preset**
 - Throttle channel (CH1) goes to throttle stick position at time of bind
 - Other channels hold current position
 - Familiar as Spektrum "SmartSafe"
2. **All-channel Preset**
 - On loss of signal, all channels go to preset positions
 - Setting process may use special bind procedure (Spektrum), button on Rx (FrSky), Tx command (Futaba), etc.
3. **No Pulse**
 - On signal loss, pulses shut off on all channels, no setting required
 - Relies on ESC to cut power
 - Not suitable for models that use a throttle servo

5b. Who uses what failsafe?

- **Spektrum**
 - Throttle-only Preset (CH1) is default for all receivers (SmartSafe)
 - High-end Rxs offer All-channel Preset option (special bind procedure)
 - Failsafe is set at time of bind
- **Futaba**
 - 7 channel and below receivers have Throttle-only Preset (CH3)
 - 8 channel and above receivers have All-channel Preset
 - Failsafe positions are stored in Tx and sent to Rx at turn-on
- **Hitec**
 - All-channel Preset
 - Set by pressing button on Rx with Tx controls in desired positions

5c. Who uses what failsafe? (cont.)

- **Tactic**
 - 8 channel receivers have All-channel Preset
 - 4 and 6 channel receivers have Throttle-only Preset (CH3)
- **FrSky (Taranis)**
 - All-channel Preset (option of No Pulse)
- **Turnigy/FlySky**
 - No Pulse
- **Orange**
 - Throttle-only Preset (<7ch), All-channel Preset (7ch+)
- **Lemon**
 - Throttle-only Preset (6ch DSM2), No Pulse (7ch), All-channel Preset (6ch DSMX and 8ch+)

5d. Suggested Failsafe Settings

- Typical Fixed Wing
 - Throttle must go full low (idle for IC)
 - Other channel settings make minimal difference. Hold is OK.
 - Set gear and flaps up if possible to minimize damage
- Helicopter
 - Throttle must go full low (idle for IC)
 - Moderate negative pitch might produce autorotation
- Glider
 - Throttle low
 - Rudder to avoid straight fly-away
 - Spoilers, flaps, etc. to produce rapid low-speed descent
- Multicopter (autopilot)
 - Set flight controller for Return To Home or auto-land

5e. Testing Failsafe

- You must verify that failsafe works correctly
 - Wrong failsafe may be worse than nothing
- Electric model: remove prop(s), start Tx and Rx, set throttle partly open, turn off Tx.
 - Motor(s) should stop, restart when Tx turned on again
 - For All-channel Preset, check controls go to appropriate positions
- IC-powered: start Tx and Rx, open throttle, turn off Tx.
 - Throttle should go to idle position, reopen when Tx turned on again
 - Other controls as appropriate
- Note: Failsafe must be retested any time the setup is changed or the receiver re-bound

Concluding Thoughts

- Remove props when programming electric models
- Use a throttle lock switch to disable the throttle stick
- Don't point the Tx antenna directly at the model
- Loss of power to the receiver is the most common cause of control loss – it's almost 100% preventable
- If you have a problem, gather information, make notes.
 - What exactly happened? Did it go to failsafe?
 - Was radio working afterwards, were receiver lights on?
- Big models need appropriate RC technology!
- **Radio safety and reliability is your responsibility:**
Understand your radio!