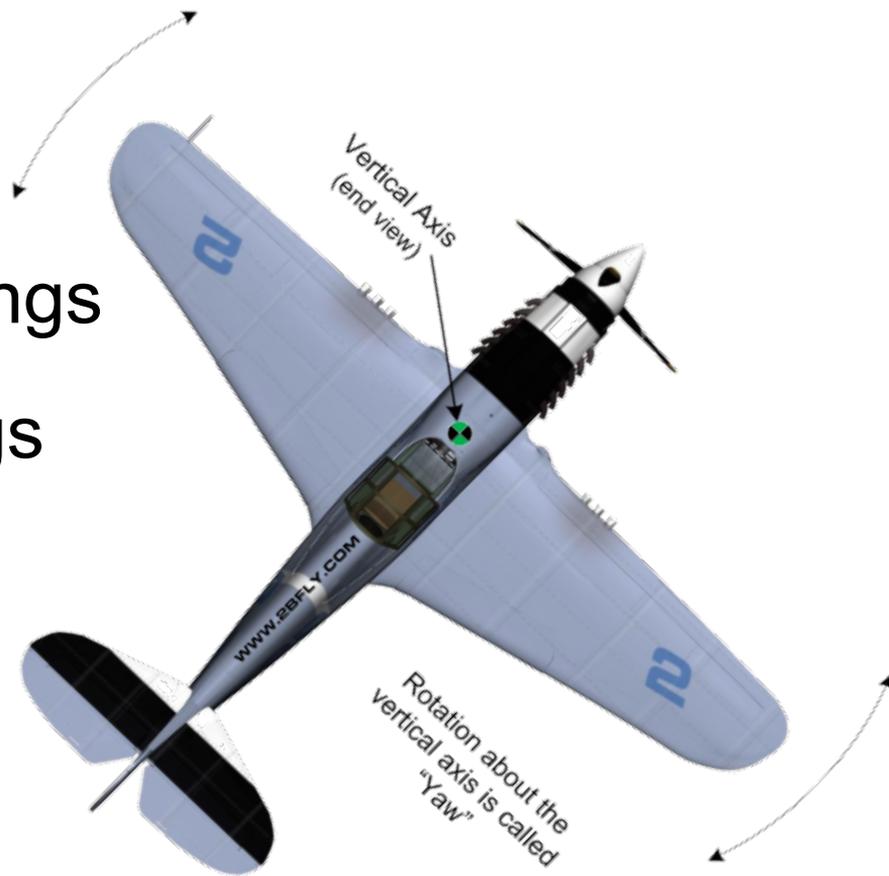




Rotation about the lateral axis is called "Pitch"

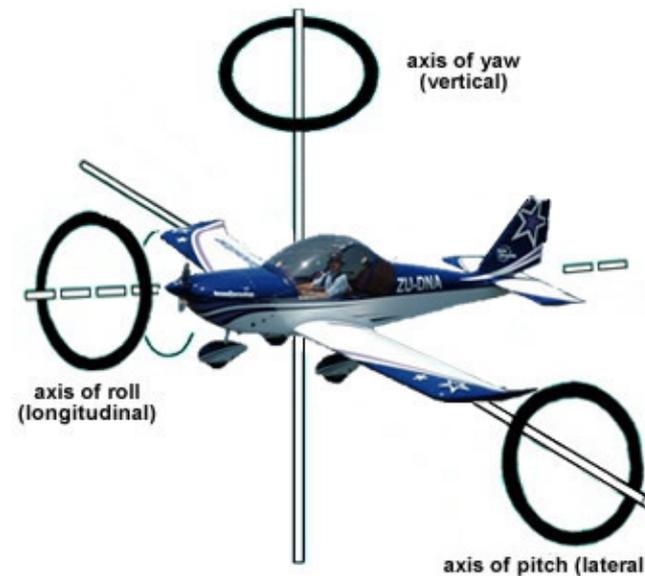
# Setting Airplane and Radio for Precision Aerobatics

- General Principles
- Airplane Key Settings
- Permanent Radio Settings
- Activated Radio Settings
- Flight Conditions
- Organize Radio Deck



## General Principles

- Pilot's Attention
- Safety Solutions



- ❑ Never loose site of the airplane, never look to the radio.
- ❑ Think about the sequence, do not think about your switches.
- ❑ Minimize the use of switches, sliders and knobs.
- ❑ Automate your movements.



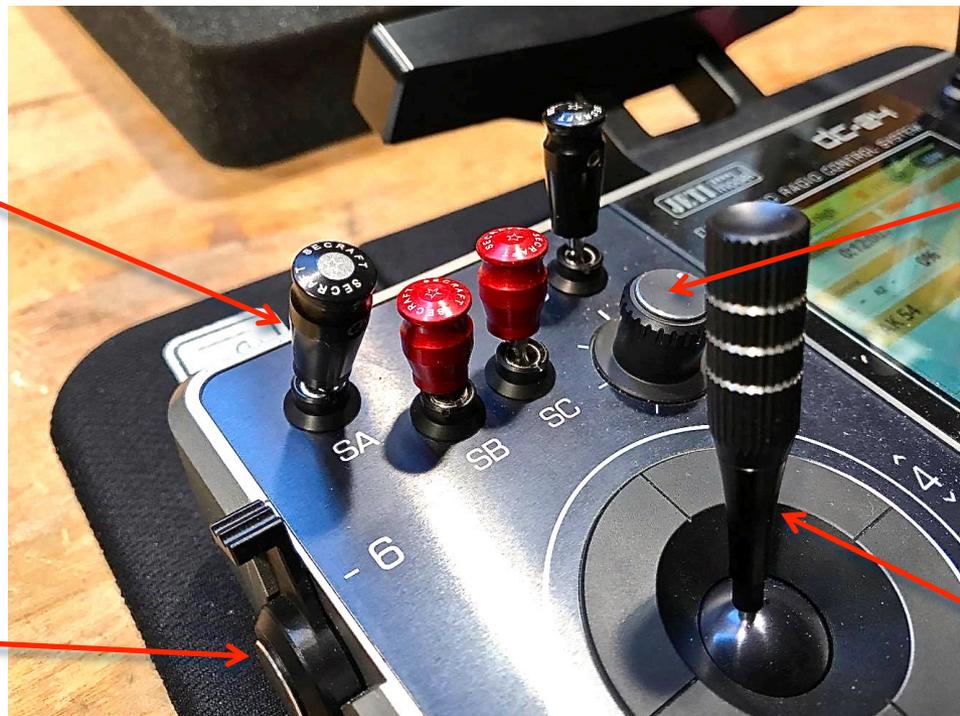
- ❑ Implement 'Stupid Proof' solutions, so that anxiety or lack of attention will never result in a crash.
- ❑ Dangerous commands should go on sliders or knobs.
- ❑ Switches should activate only flight conditions.

**SWITCH**

**KNOB**

**SLIDER**

**STICK**



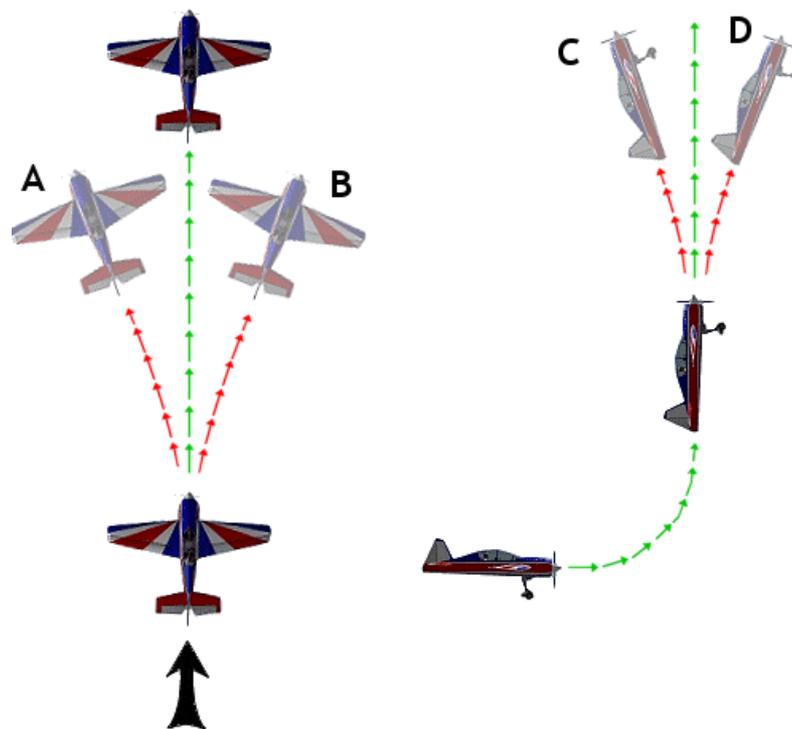
## Airplane Key Settings

- Check engine incidence
- Balance CG
- Set throws
- Align Elevator

# Check Engine Incidence

## BEFORE LEVEL FLIGHT TRIMMING

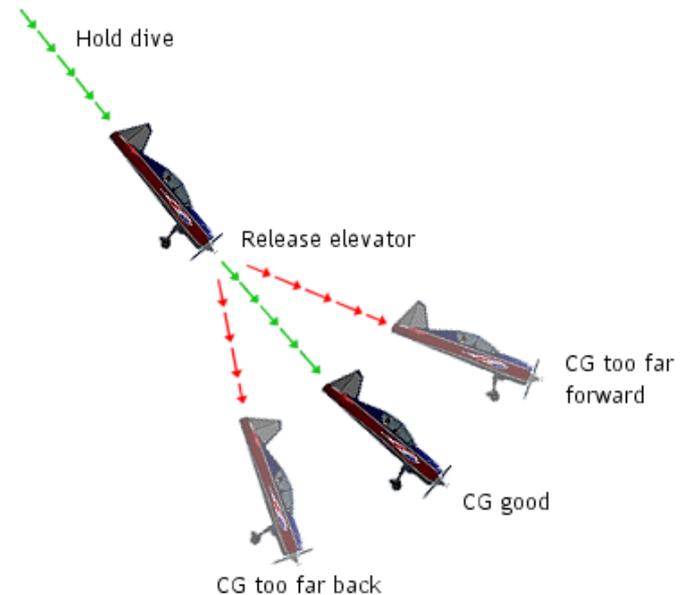
- ❑ **Vertical up-line at full throttle, rudder and elevator centered, observe a significant right or left yaw:**
  - ❑ Modify engine incidence on opposite angle.
- ❑ **Vertical up-line at full throttle, rudder and elevator centered, observe a significant up or down pitch:**
  - ❑ Modify engine incidence on opposite angle.



- A = insufficient right thrust
- B = too much right thrust
- C = insufficient down thrust
- D = too much down thrust

## AFTER LEVEL FLIGHT TRIMMING

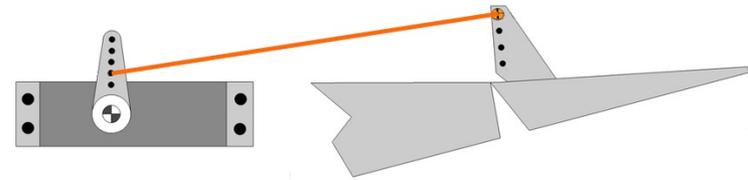
- ❑ **45° down line, moderate throttle, elevator centered, observe positive or negative pitch:**
  - ❑ If Negative: CG too far back
  - ❑ If Positive: CG too far forward
  
- ❑ **Inverted flight, full throttle, elevator centered, observe positive or negative pitch:**
  - ❑ If Positive: CG too far back
  - ❑ If Negative: CG too far forward
  - ❑ If very slightly Negative: right CG



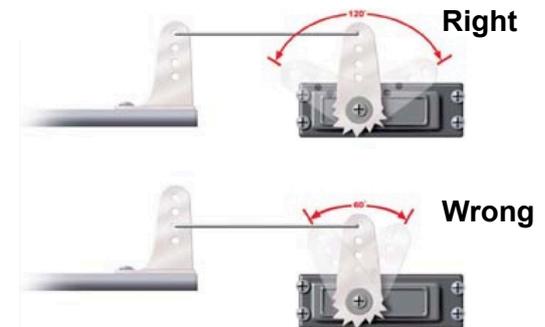
Outcome is determined by the trimming required to maintain level flight at full power

## PRECISION AEROBATICS REQUIRES SENSIBILITY

- ❑ 20-30° movement for ailerons and elevator is enough.
- ❑ Do not de-multiply servo strength installing very long arms on servo and moving surfaces: 1 to 1.5 inches is enough
- ❑ Maximize the use of all servo 180° pixel range.
- ❑ If throws are too extensive, reduce them using ATV or Dual Rates



Less control surface movement,  
more precision and maximum  
leverage

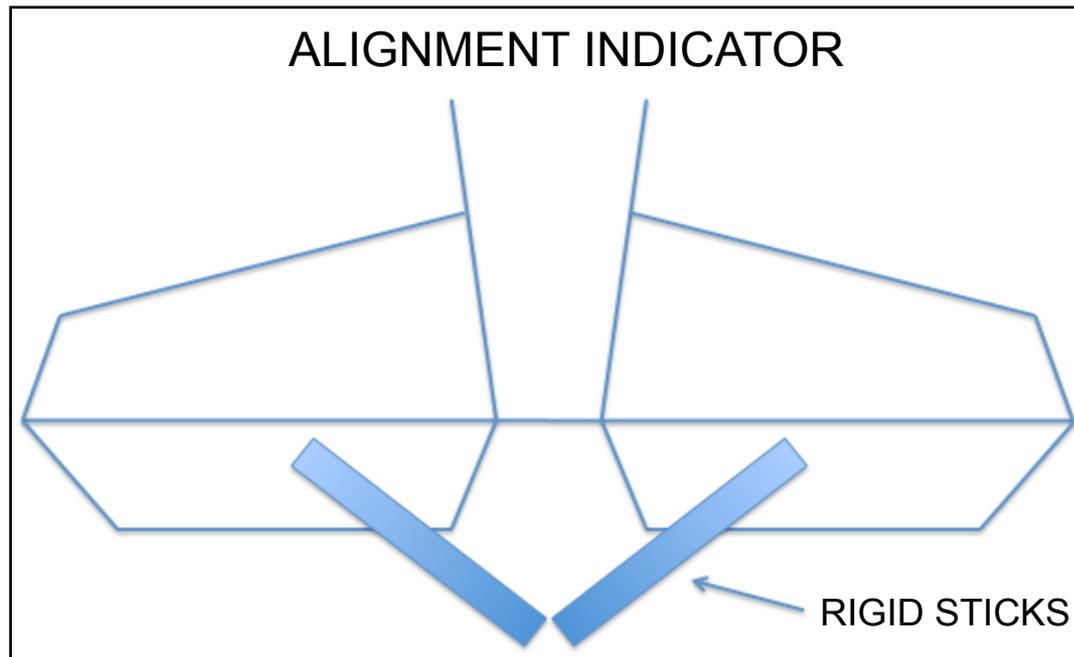


Maximize the use of your radio  
sensibility

# Align Elevator

PREVENT CLIMBS WITH A JAW TO CORRECT

- ❑ Check alignment of elevators:



**However**, if your wings are not level when you pitch, you will still experience the need to correct yaw during vertical climb

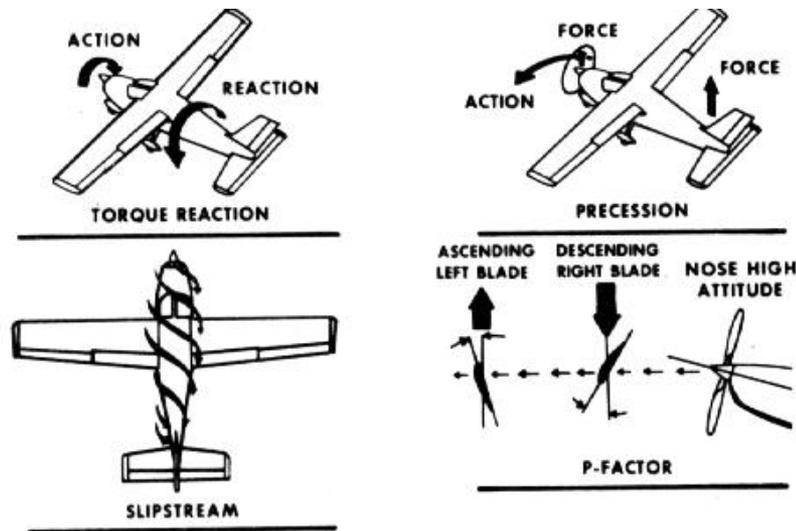
## Permanent Radio Settings

- Left Turn Tendency
- Down Line Positive Pitch
- No Straight Rolls
- No Power Progression
- No Straight Knife Edge

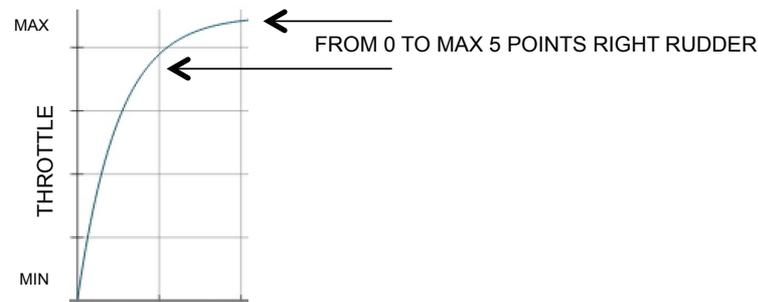
# Left Yaw Tendency

AFTER PROPER ENGINE INCIDENCE SETTING

- ❑ **Vertical up-line at full throttle, you may notice a slight left yaw tendency:**
  - ❑ Introduce a master-slave permanent mix:
    - ❑ Master: Throttle – Slave: Rudder
    - ❑ Moving versus max throttle introduce from 2 to 5 points right rudder
    - ❑ Check servo monitor versus stick position
    - ❑ If more then 5 points are needed, check engine incidence



This tendency is originated by several aerodynamic factors that are often summarized as 'Torque Effect'



AFTER PROPER CG SETTING

- ❑ **Vertical down line at zero throttle, you may notice a positive pitch tendency:**
  - ❑ Introduce a master-slave permanent mix:
    - ❑ Master: Throttle  
Slave: Elevator
    - ❑ At minimum throttle introduce 2 to 4 points negative pitch
    - ❑ Check servo monitor versus stick position
    - ❑ If more then 4 points are needed, check elevator incidence versus wings



# No Straight Rolls

- ❑ **45° Up line, full throttle, sequence of rolls versus left: notice the tendency of flight path to turn right (or vice versa):**
  - ❑ Introduce Aileron Differential:
    - ❑ Reduce down aileron throw versus up aileron throw by 5 to max 15%
    - ❑ If more is needed check wings and elevators incidences

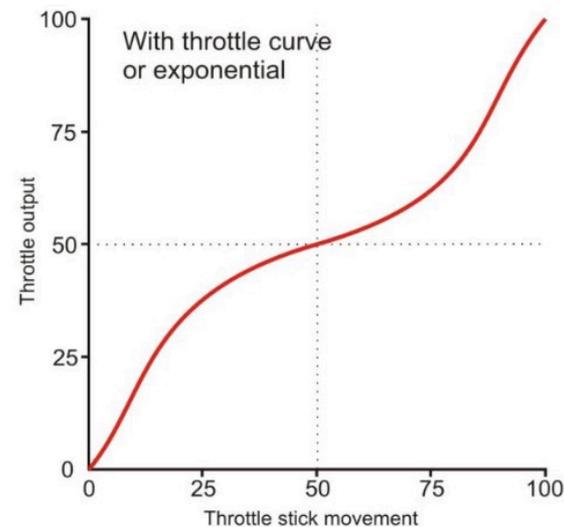
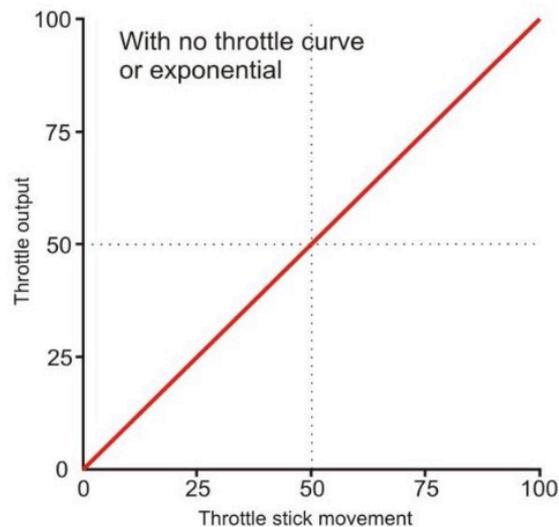


Adverse yaw occurs because a downward deflected aileron causes more drag than the upward deflected aileron. This drag pulls the airplane out of flight path during rolls in a direction opposite to roll versus

# No Power Progression

## SET A THROTTLE CURVE

- Do you experience a 90% power position?
- Do you feel a cruising speed at 60% power?
- Do you experience a slow approach at 30% power?



- If you do not, then set a throttle curve:**
  - Normally throttle is less sensitive at intermediate ranges, because our carburetors, engine power curve and canisters do not provide a linear power progression, as we would expect from our linear throttle stick. Therefore, by adjusting the relationship between ‘throttle stick movement’ and ‘power output’ we can create the feeling of linear power trust.

# No Straight Knife Edge

- ❑ **Positive or negative pitch on knife edge:**
  - ❑ Introduce a master-slave permanent mix:
    - ❑ Master: Rudder  
Slave : Elevator
    - ❑ Add positive or negative elevator in presence of rudder input
  
- ❑ **Right or Left Roll on Knife Edge:**
  - ❑ Introduce a master-slave permanent mix:
    - ❑ Master: Rudder  
Slave : Ailance
    - ❑ Add right or left roll in presence of rudder input



PITCH AND ROLL TENDENCY

Many Pilots prefer this correction as part of a 'Rolling Circle' Condition in order not to disturb normal precision flight

## Activated Radio Settings

- Throttle Cut
- Choke

MAKE SURE YOU CAN KILL YOUR ENGINE AT ANY TIME

- ❑ **Set up a Slider to control Throttle Cut.**
  - ❑ Throttle can be cut by reducing gasoline injection below idle level
  - ❑ Much safer to use an electronic throttle kill switch



**THROTTLE CUT ON A SWITCH IS DANGEROUS**



**ELECTRONIC SWITCHES FOR ENGINE IGNITION CONTROL**

- ❑ **Set up a Slider to control Choke**
  - ❑ On large airplanes it is handy to install a servo to control choke
  - ❑ Many Pilots prefer a manual set up because it is lighter

CHOKE CONTROL ARM

If air in your cowl is turbulent, ensuring a calm air intake helps mid-range stability



## Flight Conditions

- Create Flight Conditions
- Spin
- Rolling Circle
- Snap
- Land
- Organize Radio Deck

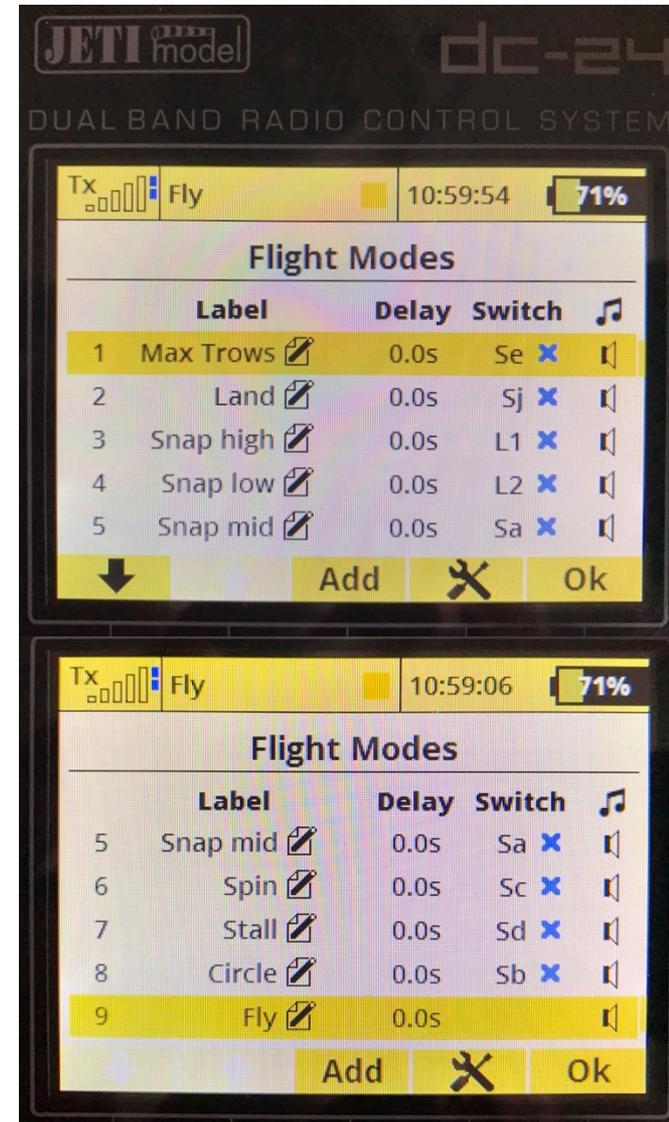
**Setting Flight Conditions is very subjective.**

It depends on Pilot's preferences and airplane performance.

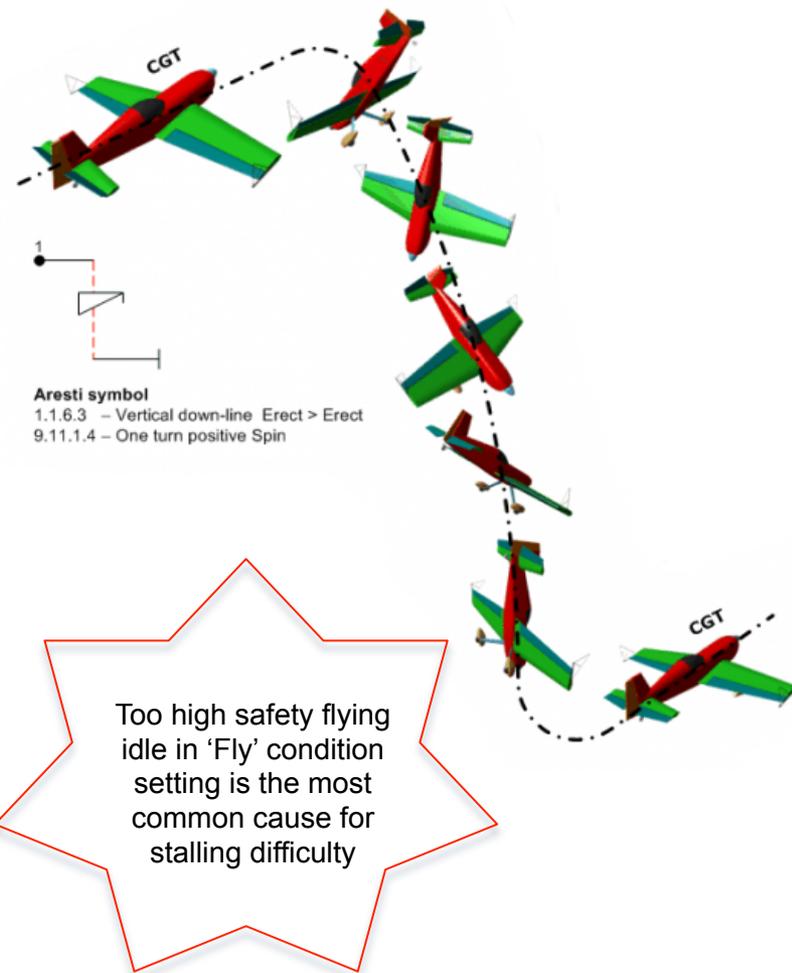
Therefore, the following are just 'Food for Thought' ideas.

# Create Flight Conditions

- ❑ **'Fly' = Default Condition**
  - ❑ **No switches activation – Default**
  - ❑ Small throws to perform smooth aerobatics (1-1.5 in. servo arms and max 20-30° throws)
  - ❑ Safety Flying idle set in this condition
- ❑ **Create a New Condition**
  - ❑ Add it to the list
  - ❑ Name it
  - ❑ Set a Switch to control it
  - ❑ Then activate the Condition with the switch
  - ❑ Then set the changes you desire
  - ❑ Then switch off and control if settings return to 'Fly' default condition
- ❑ **Set Priorities among Conditions**

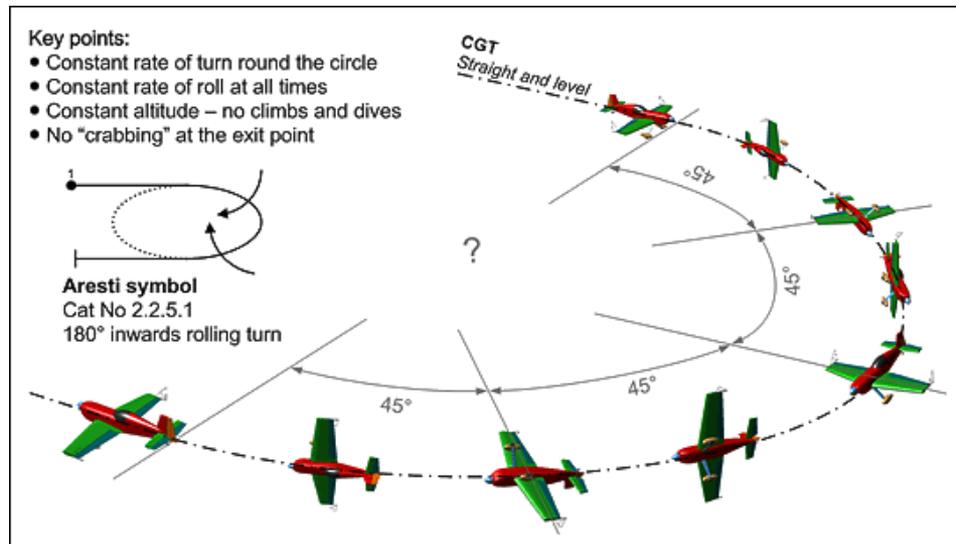


- ❑ **Activate Spin condition on a switch:**
  - ❑ Increase elevator throw (+30%)
  - ❑ Increase rudder throw (+20%)
  - ❑ Set specific spin throttle idle level
    - ❑ Mind cylinders cooling danger during spin, that could provoke an engine cut.
    - ❑ The spin idle level should be a bit lower than the one set in the 'Fly' condition and a bit higher than the one set in the 'Land' condition



# Rolling Circle Condition

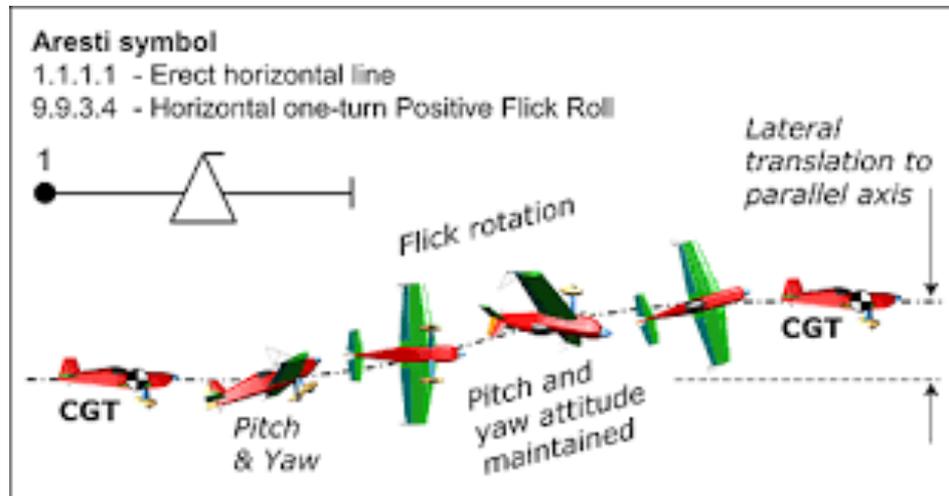
- ❑ **Activate Rollin Circle condition on a switch:**
  - ❑ Reduce aileron throw (-10%)
    - ❑ Reduce exponential (max 5-10% level )
  - ❑ Reduce elevator throw (-15%)
    - ❑ Reduce exponential (max 5-10% level )
  - ❑ Reduce rudder throw (-20%)
    - ❑ Reduce exponential (max 5-10% level )
- ❑ **Activate Knife Edge mixes previously determined**



# Snap Condition

## ❑ Activate Snap condition on a switch:

- ❑ Slightly Increase Aileron Throw (+5-10%)
- ❑ Significantly Increase Elevator Throw (+20-30%)
- ❑ Significantly Increase Rudder Throw (+20%)



**OR**

- ❑ Activate three snap conditions relative to different throttle level ranges: max, mid, low.
- ❑ Activate a logical switch to control the three conditions. The logic is 'and': Snap switch on – 'and' – throttle stick within high, middle or low range. Once the switch is turned on the different conditions will activated automatically according to the throttle position you are applying
- ❑ Regulate throws in each condition in order to accommodate for different snap speeds

Since the snap maneuver is very sensitive to amount of air flowing on the moving surfaces

## ❑ **Activate Land condition on a switch:**

- ❑ Increase Elevator Exponential (+10%-20%)
- ❑ Set landing low idle level



## ❑ By operating like this you will not need to set a switch to control the idle position, as you will already have set the three following idle levels within conditions:

1. 'Fly' condition: safe relatively high idle
2. 'Spin' condition: lower, but safe idle level
3. 'Land' condition: lowest, but safe possible level, enabling drag to facilitate landing

- Activate Taxi condition on a switch:**
  - Max Throw on Elevator
  - Max Throw on Rudder
  - 'Land' idle level



## Organize Radio Deck

# Organize Radio Deck

- ❑ Switches and Sliders should all be activated in the same direction
- ❑ **Either all In or all out**
- ❑ Knobs activated Clock wise
- ❑ **Flight Conditions**  
Switches positioned all in the same deck area on the opposite side of **elevator stick**
- ❑ **Dangerous functions** on sliders or knobs



MODE 2 OR MODE 4