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- [HeliQuad](#)
- [\[\]\[\]\[\]\[\]](#)_____ / Ground School
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Trex 600, ArduPilot, RC, FPV

<https://youtu.be/FWTb2-sdNW8>

ArduPilot Copter · Traditional Helicopters · CC BY-SA 3.0



Dual Heli Frame** . Copter , (-heli) .



-  ESC  8 
- ** 
- **FRAME CLASS**  11()
- **H DUAL MODE**

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□ □ , □ □ □ □ □ □ ** RC8 OPTION □ □ 32 □

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□ **traditional-helicopter-swashplate-setup** for basic information on how to setup each swashplate using the parameters below.

Tandem (Longitudinal)

../images/dual heli chinook.jpeg

This setup assumes that the forward rotor swashplate is controlled by servo output 1, 2, and 3 and the aft rotor swashplate is controlled by servo output 4, 5 and 6.

Parameter Settings:

- **H_DUAL_MODE** - Set to 0 for the longitudinal configuration
- **H_DCP_SCALER** - Scales the differential collective output to the rotors for a pitch axis input

- **H_DCP_YAW** - Feedforward input to yaw axis for pitch axis (DCP) inputs
- **H_YAW_SCALER** - Scales the differential lateral cyclic based on yaw axis input. This is a positive number for this setup.
- **H_COL_MAX**- PWM for maximum collective pitch on forward rotor head that corresponds to **H_COL_ANG_MAX**
- **H_COL_MIN** - PWM for minimum collective pitch on forward rotor head that corresponds to **H_COL_ANG_MIN**
- **H_SW_TYPE** - Swashplate type for forward rotor head
- **H_SW_COL_DIR** - Swashplate collective direction for forward rotor head
- **H_SW_LIN_SVO** - Enables linear servo feature for forward rotor head
- **H_COL2_MIN** - PWM for minimum collective pitch on aft rotor head that corresponds to **H_COL_ANG_MIN**
- **H_COL2_MAX**- PWM for maximum collective pitch on aft rotor head that corresponds to **H_COL_ANG_MAX**
- **H_SW2_TYPE** - Swashplate type for aft rotor head
- **H_SW2_COL_DIR** - Swashplate collective direction for aft rotor head
- **H_SW2_LIN_SVO** - Enables linear servo feature for aft rotor head
- **H_DCP_TRIM** - Removes pitch I term bias due to center of gravity offsets or discrepancies between rotors in swashplate setup. If pitch axis has I term bias while hovering in calm winds, use value of bias in DCP_TRIM to re-center I term.

These are only needed for the forward swashplate if **H_SW_TYPE** is set to H3 Generic.

- **H_SW_H3_ENABLE** - Do Not Set Manually! This is set automatically once **H_SW_TYPE** is set to H3 Generic
- **H_SW_H3_SV1_POS**
- **H_SW_H3_SV2_POS**
- **H_SW_H3_SV3_POS**
- **H_SW_H3_PHANG**

These are only needed for the aft swashplate if **H_SW2_TYPE** is set to H3 Generic.

- **H_SW2_H3_ENABLE** - Do Not Set Manually! This is set automatically once **H_SW2_TYPE** is set to H3 Generic
- **H_SW2_H3_SV1_POS**
- **H_SW2_H3_SV2_POS**
- **H_SW2_H3_SV3_POS**
- **H_SW2_H3_PHANG**

This parameter is not used for the longitudinal configuration - **H_YAW_REV_EXPO**

Side-by-Side (Transverse)

[../images/dual_heli_transverse.jpg](#)

This setup assumes that the left rotor swashplate is controlled by servo output 1, 2, and 3 and the right rotor swashplate is controlled by servo output 4, 5 and 6.

Parameter Settings:

- **H_DUAL_MODE** - Set to 1 for the transverse configuration
- **H_DCP_SCALER** - Scales the differential collective output to the rotors for a roll axis input
- **H_DCP_YAW** - Feedforward input to yaw axis for roll axis (DCP) inputs
- **H_YAW_SCALER** - Scales the differential longitudinal cyclic based on yaw axis input. This is a positive number for this setup.
- **H_COL_MAX**- PWM for maximum collective pitch on left rotor head that corresponds to **H_COL_ANG_MAX**
- **H_COL_MIN** - PWM for minimum collective pitch on left rotor head that corresponds to **H_COL_ANG_MIN**
- **H_SW_TYPE** - Swashplate type for left rotor head
- **H_SW_COL_DIR** - Swashplate collective direction for left rotor head
- **H_SW_LIN_SVO** - Enables linear servo feature for left rotor head
- **H_COL2_MIN** - PWM for minimum collective pitch on right rotor head that corresponds to **H_COL_ANG_MIN**
- **H_COL2_MAX**- PWM for maximum collective pitch on right rotor head that corresponds to **H_COL_ANG_MAX**
- **H_SW2_TYPE** - Swashplate type for right rotor head
- **H_SW2_COL_DIR** - Swashplate collective direction for right rotor head
- **H_SW2_LIN_SVO** - Enables linear servo feature for right rotor head
- **H_DCP_TRIM** - Removes roll I term bias due to center of gravity offsets or discrepancies between rotors in swashplate setup. If roll axis has I term bias while hovering in calm winds, use value of bias in DCP_TRIM to re-center I term.

These are only needed for the left swashplate if **H_SW_TYPE** is set to H3 Generic.

- **H_SW_H3_ENABLE** - Do Not Set Manually! This is set automatically once **H_SW_TYPE** is set to H3 Generic
- **H_SW_H3_SV1_POS**
- **H_SW_H3_SV2_POS**
- **H_SW_H3_SV3_POS**
- **H_SW_H3_PHANG**

These are only needed for the right swashplate if **H_SW2_TYPE** is set to H3 Generic.

- **H_SW2_H3_ENABLE** - Do Not Set Manually! This is set automatically once **H_SW2_TYPE** is set to H3 Generic
- **H_SW2_H3_SV1_POS**
- **H_SW2_H3_SV2_POS**
- **H_SW2_H3_SV3_POS**
- **H_SW2_H3_PHANG**

This parameter is not used for the longitudinal configuration

- **H_YAW_REV_EXPO**

Intermeshing

[../images/dual_heli_intermeshing.jpg](#)

This setup assumes that the left rotor swashplate is controlled by servo output 1, 2, and 3 and the right rotor swashplate is controlled by servo output 4, 5 and 6.

Parameter Settings:

- **H_DUAL_MODE** - Set to 2 for the intermeshing configuration
- **H_DCP_SCALER** - Scales the differential collective output to the rotors for a yaw axis input. For a positive value the left rotor would spin counter clockwise to give the proper yaw response.
- **H_YAW_SCALER** - Scales the differential longitudinal cyclic based on yaw axis input. This is a positive number for this setup.
- **H_COL_MAX** - PWM for maximum collective pitch on left rotor head that corresponds to **H_COL_ANG_MAX**
- **H_COL_MIN** - PWM for minimum collective pitch on left rotor head that corresponds to **H_COL_ANG_MIN**
- **H_SW_TYPE** - Swashplate type for left rotor head
- **H_SW_COL_DIR** - Swashplate collective direction for left rotor head
- **H_SW_LIN_SVO** - Enables linear servo feature for left rotor head
- **H_COL2_MIN** - PWM for minimum collective pitch on right rotor head that corresponds to **H_COL_ANG_MIN**
- **H_COL2_MAX** - PWM for maximum collective pitch on right rotor head that corresponds to **H_COL_ANG_MAX**
- **H_SW2_TYPE** - Swashplate type for right rotor head
- **H_SW2_COL_DIR** - Swashplate collective direction for right rotor head
- **H_SW2_LIN_SVO** - Enables linear servo feature for right rotor head
- **H_YAW_REV_EXPO** - Yaw reverser smoothing exponent, smoothen transition near zero collective region. Increase this parameter to shrink smoothing range. Set to -1 to disable reverser.

These are only needed for the left swashplate if **H_SW_TYPE** is set to H3 Generic.

- **H_SW_H3_ENABLE** - Do Not Set Manually! This is set automatically once **H_SW_TYPE** is set to H3 Generic
- **H_SW_H3_SV1_POS**
- **H_SW_H3_SV2_POS**
- **H_SW_H3_SV3_POS**

- `H_SW_H3_PHANG`

These are only needed for the right swashplate if **H_SW2_TYPE** is set to H3 Generic.

- **H_SW2_H3_ENABLE** - Do Not Set Manually! This is set automatically once **H_SW2_TYPE** is set to H3 Generic
- **H_SW2_H3_SV1_POS**
- **H_SW2_H3_SV2_POS**
- **H_SW2_H3_SV3_POS**
- `H_SW2_H3_PHANG`

These parameters are not used for the intermeshing configuration

- **H_DCP_YAW**
- **H_DCP_TRIM**

Coaxial

[../images/dual_heli_coaxial.jpg](#)

This setup assumes that the counter clockwise rotor swashplate is controlled by servo output 1, 2, and 3 and the clockwise rotor swashplate is controlled by servo output 4, 5 and 6.

Parameter Settings:

- **H_DUAL_MODE** - Set to 2 for the intermeshing configuration
- **H_DCP_SCALER** - Scales the differential collective output to the rotors for a yaw axis input.
- **H_YAW_SCALER** - This parameter is set to zero for the coaxial configuration.
- **H_COL_MAX**- PWM for maximum collective pitch on counter clockwise rotor head that corresponds to **H_COL_ANG_MAX**
- **H_COL_MIN** - PWM for minimum collective pitch on counter clockwise rotor head that corresponds to **H_COL_ANG_MIN**
- **H_SW_TYPE** - Swashplate type for counter clockwise rotor head
- **H_SW_COL_DIR** - Swashplate collective direction for counter clockwise rotor head
- **H_SW_LIN_SVO** - Enables linear servo feature for counter clockwise rotor head
- **H_COL2_MIN** - PWM for minimum collective pitch on clockwise rotor head that corresponds to **H_COL_ANG_MIN**
- **H_COL2_MAX**- PWM for maximum collective pitch on clockwise rotor head that corresponds to **H_COL_ANG_MAX**
- **H_SW2_TYPE** - Swashplate type for clockwise rotor head
- **H_SW2_COL_DIR** - Swashplate collective direction for clockwise rotor head
- **H_SW2_LIN_SVO** - Enables linear servo feature for clockwise rotor head
- **H_YAW_REV_EXPO** - Yaw reverser smoothing exponent, smoothen transition near zero collective region. Increase this parameter to shrink smoothing range. Set to -1 to disable

reverser.

These are only needed for the counter clockwise swashplate if **H_SW_TYPE** is set to H3 Generic.

- **H_SW_H3_ENABLE** - Do Not Set Manually! This is set automatically once **H_SW_TYPE** is set to H3 Generic
- **H_SW_H3_SV1_POS**
- **H_SW_H3_SV2_POS**
- **H_SW_H3_SV3_POS**
- **H_SW_H3_PHANG**

These are only needed for the clockwise swashplate if **H_SW2_TYPE** is set to H3 Generic.

- **H_SW2_H3_ENABLE** - Do Not Set Manually! This is set automatically once **H_SW2_TYPE** is set to H3 Generic
- **H_SW2_H3_SV1_POS**
- **H_SW2_H3_SV2_POS**
- **H_SW2_H3_SV3_POS**
- **H_SW2_H3_PHANG**

These parameters are not used for the coaxial configuration

- H_DCP_YAW
- H_DCP_TRIM

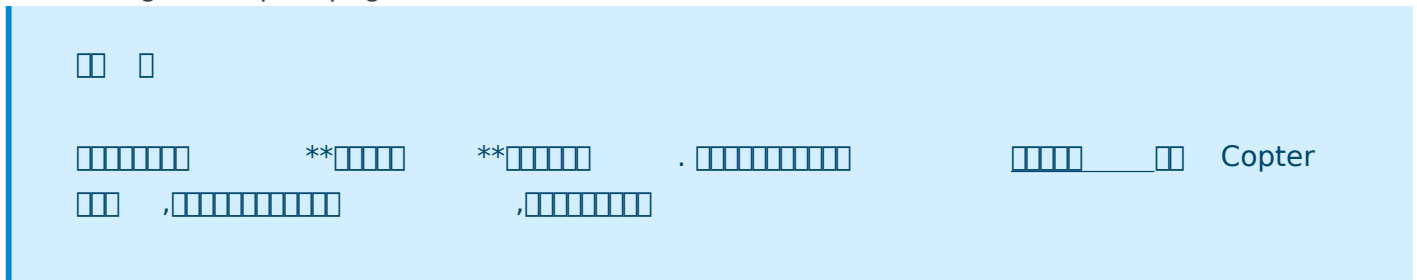
HeliQuad

<https://youtu.be/J6WJ0000000> ,



ArduPilot HeliQuads, .

../../images/heliquad.png



4, Ferrari . , **

?? ?

- WLTOYs Assassin V383 , : WLTOYs.eu ().

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../images/heliquad-pixhawk.png_

- (**, **)
- the motor's ESC should be connected to the autopilot's channel 8 output
- **traditional helicopter firmware ** should be loaded onto the vehicle.

If using the [WLToys Assassin V383 a parameter file is available here](#) and can be used to set all parameters immediately. For other builds these are the standard params that should be set:

- **FRAME_CLASS ** to 13 (HeliQuad)

- **FRAME_TYPE** to 1 ("X" if front right motors spins counter clockwise) or 3 ("H" if front right motor spins clockwise)

Similar to a **traditional helicopter** **an auxiliary switch** **should be set to "Motor Interlock" to turn on/off the motor. Normally this is channel 8 so you could set RC8_OPTION to 32.**

Videos

Inverted flight test

<https://youtu.be/1yEWhOULeGM>

Picture of CanberraUAV vehicle

../images/heliquad-canberrauav.jpg



ArduPilot Copter

 HeliQuads (Variable Pitch Multicopters)

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/ Ground School



<https://youtu.be/sJEO4CUhwjs> (□ (□)).

□ Servos□□□□□

<https://youtu.be/JagHOC0mNQ> (□ (□)).



<https://youtu.be/oA-9FFYC6Ek> (□ (□)).



<https://youtu.be/qfOuZc7J4g> (□).



<https://youtu.be/PPGnhMssyV8> (□).



<https://youtu.be/C3E2f8h1CoM> ([link](#) ([link](#))).



[link](#) *ArduPilot Copter* [link](#) *Traditional Helicopter – ArduPilot Helicopter Ground School* [link](#) · [link](#) · CC BY-SA 3.0





XXXXXXXXXXXXXXXXXXXX (GCS), XXXXXXXXXXXX, XXXXX XXXXX
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XXXXXXXXXX (XXXXXXXXXX) (XXXX)

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- [illegible]



1. **IMU** (Inertial Measurement Unit) sensors, which measure acceleration and rotation, can be affected by vibration, leading to inaccurate readings.

2. **Altitude sensors** (e.g., barometric pressure sensors) can also be affected by vibration, leading to inaccurate altitude readings.

3. **GPS** (Global Positioning System) receivers can experience signal degradation or loss due to vibration, leading to inaccurate location data.

4. **Control systems** (e.g., PID controllers) can be affected by vibration, leading to unstable or erratic behavior.

5. **Structural components** (e.g., motor mounts, frame) can experience wear or damage due to excessive vibration, leading to mechanical failure or even a crash. Excessive vibration can also make altitude hold imprecise or even produce uncontrollable climbs/descents.

One method of testing this, is to secure the helicopter to the ground, and run up the main rotor, watching the artificial horizon in the ground control station. If it moves away from level, you probably have a vibration issue which needs to be addressed. Testing should be done at various collective levels and rotor speeds. Be careful not to over-stress the helicopter with collective extremes.

Setup for ground test:

1. Secure vehicle to the ground.
2. Temporarily reduce Roll, Pitch, and Yaw P,I,and D, PIDs to zero. Be sure to restore them after this test!
3. Set **ACRO_OPTIONS** = 2, temporarily, if not being used already.
4. Change to ACRO mode.
5. Arm and engage motor interlock, allowing the vehicle to spool up at 0 degree pitch, watching for any change from level in the GSC of the artificial horizon. Any significant tilt indicates noise is disrupting the attitude estimate and should be investigated and eliminated.

