**AVCS GYRO**

**Differences Between AVCS Gyro and Conventional Gyro**

Compared to a conventional gyro, the AVCS gyro has a substantially improved tail control capacity. Gyro operation also differs from that of conventional systems in a number of ways.

The following sequentially describes the conventional gyro and the AVCS gyro.

**Conventional gyro**

The conventional gyro detects movement of the helicopter’s tail and controls the rudder servos so that movement of the tail stops. Now, consider hovering when the helicopter is exposed to a side wind, the tail drifts. When the tail drifts, the gyro detects the tail rotation angular velocity and operates the servo in the direction that stops the tail from moving. Drifting of the tail is stopped by control of the gyro. When the tail stops drifting, the control amount from the gyro becomes zero. Since the helicopter is always exposed to side wind, even in this state, the tail starts to drift again. When the tail drifts, the gyro tries to stop it again. The “drifting stop” operation is repeated and the tail continues to drift in the wind direction in this manner. The higher the gyro sensitivity, the smaller the amount of this drift. However, if the sensitivity is high, hunting will occur and, therefore, the sensitivity amp has a limit.

**AVCS gyro**

This follows describes how the AVCS system works when the helicopter is exposed to a side wind while hovering, the same as the preceding item. When the helicopter is exposed to a side wind, the tail begins to drift. The gyro controls the servo so that the movement of the tail stops, the same as a conventional gyro. At the same time, a sensor is controlled so that the tail is rotated in the opposite direction (returns to the original position). In short, the conventional gyro performs an operation known as a “drifting stop,” but the AVCS system performs an operation that stops drifting and returns to the original position”. The return to original position operation added to the AVCS system improves rudder trim operation. In other words, the gyro can automatically trim the rudder against side winds. This also applies to reverse flight. When a helicopter is flying in the forward and reverse directions, the rudder trim is changed to advance, but with the AVCS system, this trim change is performed automatically and instantaneously so that the tail remains extremely stable during high-speed reverse flight. The AVCS system requires a high-precision angular velocity sensor. The GY400 realizes a high-precision angular velocity detection function and extremely small output drift by using a new type of gyro sensor. This minimizes rudder neutral position drift during flight and eliminates the need to trim the rudder during flight.

**Differences in rudder control method**

The following describes the differences between conventional gyro and AVCS gyro rudder control. The conventional gyro sends the rudder control signals from the transmitter to the rudder servo and starts to move the tail. When the tail moves, the gyro detects this movement and generates a signal to stop it. If the tail continues to move even in this state, a rudder control signal larger than the signal from the gyro must be applied from the transmitter. That is, the difference between the rudder control signal from the transmitter and the control signal that attempts to stop this from the gyro becomes the actual amount of movement of the tail. Ordinarily, the rudder control signal is amplified several times over by the gyro amp and is balanced with the gyro control signal so that the transmitter can be used at the normal steering angle.

The AVCS system uses a different rudder control method. As described in the preceding section, it has additional functions that “attempt to return movement by external force to the original position” and that generate an angular velocity proportional to the rudder control signal. That is, it functionally controls the speed of rotation of the tail. The original AVCS (Angular Vector Control System) came from this.

In the AVCS mode, when the transmitter rudder stick is moved while hovering, the rudder servo controls operation until the tail reaches the specified rotational speed.

**SET CONTENTS**

- The GY400 comes with the following accessories:
  - GY400
  - Double-sided tape (2 sheets)
  - Mini screwdriver (for adjustments)

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Rudder neutral check method

In the AVCS mode, the servo does not return to the neutral position even when the rudder stick is returned to the neutral position. When you want to check the servo neutral position during linkage neutral check, etc., select the normal mode, or remain in the AVCS mode, and move the rudder stick left and right at least 3 times at an interval of 1 second or less, then immediately return the stick to the neutral position. This operation returns the rudder servo to the neutral position.

One point advice

Relationship between servo horn length and gyro sensitivity

Gyro sensitivity also changes with the length of the servo horn. When the sensitivity is too low, lengthen the servo horn. Conversely, when hunting does not stop, shorten the servo horn.

Caution

Mounting Precautions

Always use the accessory sensor tape to install the gyro to the fuselage. This is necessary to securely fasten the gyro to the fuselage so that operation of the gyro does not transmit unwanted fuselage vibrations directly to the sensor.

When mounting the gyro, provide a little surplus so that the gyro connection cables are not too tight. If the connection cables are too tight, the gyro will not display its full performance. If the gyro cables are loose, the servo will not be in a dangerous situation.

When using the gyro with a helicopter, install the GY400 at least 10cm from the driver motor. The driver motor generates strong electromagnetic noise. This noise may interfere with the gyro sensor and cause erroneous operation.

Mount the GY400 so that metal or other conductive objects do not touch the gyro case. The GY400 uses a conductive resin case to reduce electromagnetic interference. Because the surface of the case is conductive, metal objects may cause a short circuit.

Insert the connectors fully. If a connector works loose due to vibration during flight, control may be lost and result in a dangerous situation.

Always check the direction of operation of the servos. If you attempt to fly the model when a servo operates in the wrong direction, the fuselage will spin in a fixed direction and enter an extremely dangerous state.

Mounting Precautions

Never move the fuselage for about 3 seconds after turning on the gyro power (shared with receiver). Since the data inside the gyro is automatically initialized as soon as the power is turned on, if the fuselage is moved, the neutral position will change. This occurs when the power off and on again again. When turning on the power, set the transmitter switch to the AVCS mode and turn on the transmitter power switch, then turn on the gyro power.

Do not operate the rudder trimmer while flying in the AVCS mode. When the power is turned on, the GY400 assumes that the rudder stick is in the neutral position. If the rudder trimmer is moved during flight, the neutral position will change.

Avoid sudden temperature changes. Sudden temperature changes cause the neutral position to change. For instance, do not fly the model immediately after removing it from inside a heated vehicle in the winter or an air conditioned vehicle in the summer. Let the model stand for about 10 minutes to allow the temperature inside the gyro to stabilize before turning on the power. Also, consider sudden temperature changes when the gyro is exposed to direct sunlight or is installed near the engine. Take measures so that the gyro is not exposed to direct sunlight.

When using the gyro in the AVCS mode, set revolution mixing to 0% or OFF. In the AVCS mode, all rudder correction are made by the GY400. Therefore, if revolution mixing is ON, the model will operate the same as if the neutral position changed.

Check the operating time of the receiver, gyro, and servo batteries at the adjustment stage and decide the number of remaining flights while allowing a margin.

Fuselage Maintenance Precautions

Do not turn the sensitivity trimmer with too much force. The trimmer may break. Always use the miniature screwdriver supplied to make adjustments.

Make positive maintenance of the fuselage tail section a habit. The right side of the tail section has a large effect on gyro performance. Therefore, keep the rudder and tailpipe aging also have a large effect on the characteristic.

Service the fuselage with a little vibration as possible. Fuselage vibration has a very adverse effect on gyro performance.

AVCS mode usage precautions

In the AVCS mode, always set revolution mixing to OFF. If revolution mixing (pitch+rudder mixing) is ON, the pitch operation signal changes the rudder neutral position. The gyro judges that an angular velocity command was received and rotates the tail, therefore, the neutral position changes. The model flies in the same rudder trim position (including sub trim) as when the power was turned on (neutral position memorized in the gyro). When flying in the AVCS mode, set the rudder trim to the same position under all flight conditions, including hovering and dive up. In the AVCS mode, the gyro automatically trims the rudder so that trimming during flight and other precision rudder trim adjustments are unnecessary.

GY400 FUNCTION

Monitor LED

Indicates the operating status of the GY400. The display contents are shown below.

Limit Trimmer (LIMIT)

Sets the maximum travel of the rudder servo. Move the rudder stick to the left and right and adjust the limit trimmer so that the servo operating angle do not strike the linkage. During flight, the servo will not operate beyond this angle and the linkage is protected. When the trimmer is turned clockwise, the servo operating angle increases.
### Gyro operation state

<table>
<thead>
<tr>
<th>LED display</th>
<th>Gyro operation state</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rapid flash</td>
<td>Displayed while data is being initialized at power ON.</td>
</tr>
<tr>
<td>Steady light</td>
<td>Indicates that the gyro is operating in the AVCS mode.</td>
</tr>
<tr>
<td>Off</td>
<td>Indicates that the power is OFF, or the gyro is operating in the normal gyro mode.</td>
</tr>
<tr>
<td>Slow flash</td>
<td>Displayed when there are no rudder operation signal being input from the transmitter.</td>
</tr>
<tr>
<td></td>
<td>At this time, the rudder servo does not operate.</td>
</tr>
<tr>
<td>Intermittent flash</td>
<td>Alarm display when the power was turned on in the normal gyro mode.</td>
</tr>
<tr>
<td></td>
<td>For the rudder neutral signal to be read correctly, set the transmitter to the AVCS mode and turn on the gyro power again.</td>
</tr>
<tr>
<td>Double flash</td>
<td>Displayed when the rudder signal from the transmitter in the AVCS mode is different from the normal signal memorized in the gyro. Also flashes when the rudder stick was operated.</td>
</tr>
<tr>
<td>Single flash</td>
<td>Displayed only when the transmitter sensitivity switch is rapidly switched between the normal and AVCS positions at least 3 times, then returned to the AVCS position and the transmitter rudder stick was rapidly moved to the left and right at least 3 times. After this display goes off, the rudder is in the neutral position.</td>
</tr>
</tbody>
</table>

### Rudder servo linkage check

1. Set the transmitter gyro sensitivity switch to the AVCS position and turn on the transmitter power, then turn on the gyro power. GF400 initializes the data when the power is on, set the rudder stick to the neutral position and wait for approximately 3 seconds. Next, switch the transmitter switch to the normal gyro mode position and check the linkage. Move the rudder stick to the left and right, and check the tail rotor operation direction. If the tail rotor rotates in the wrong direction, adjust the direction with the transmitter reverse function.

### Gyro sensitivity setting criteria

The gyro sensitivity differs with the servos used and fuselage parts. Generally, the faster the servo operates, the gyro sensitivity is higher. Also, when the main rotor speed is raised, the tail sensitivity of the gyro itself rises and the gyro sensitivity at idle up must be dropped below the sensitivity when hovering.

### Gyro operation direction check

If the rudder servo moves to the left when the nose of the helicopter moves to the right, the gyro operation direction is correct. If not, the gyro operation direction is wrong. You must switch the transmitter reverse switch to the reverse direction.

### Limit setting

Move the rudder stick to the left and right and adjust the limit trimmer so that the servo operating angle does not strike the linkage. During flight, the servos will not operate beyond this limit to protect the linkage.

### FLIGHT ADJUSTMENT

In the AVCS mode, according to the gyro automatically change the rudder neutral position and it makes the mechanical rudder neutral position changes are unknown. When the rudder neutral position changes substantially, a left and right rudder error is generated.

### Rudder neutral position adjustment

1. Set transmitter revolution mixing (pitch→rudder) to 2% or OFF.
2. Set the transmitter gyro sensitivity switch to the AVCS position.
3. First, turn on the transmitter power, then turn on the gyro power (shared with receiver). Since the GF400 initializes the data when the power is turned on, set the rudder stick to the neutral position and do not move the helicopter for approximately 3 seconds.

If the monitor LED lights, the gyro is operating in the AVCS mode. When the power is turned on in the normal mode, the monitor LED will display and alarm by flashing intermittently. At this time, set the sensitivity switch to the AVCS position and turn on the gyro power again.