Using the AVCS mode correctly

An AVCS gyro is an angular velocity command type gyro. The gyro constantly compares the transmitter output signals and gyro internal reference signal (transmitter rudder neutral signal) and controls the helicopter tail during a change in speed accordingly. Therefore, for the AVCS function to operate normally, the rudder neutral signal must be memorized in the gyro before flight.

•Rudder neutral signal memorization methods

[Method 1] When the gyro power is turned on, the transmitter rudder neutral signal automatically received at that time is assumed to be the neutral signal and is memorized. The gyro is normally used in this state.

[Method 2] Rapidly switch the transmitter sensitivity switch between the AVCS and normal mode at least 3 times at a 1 second or shorter interval, then set the switch to the AVCS mode position. The monitor LED flashes instantaneously and the rudder neutral signal is memorized. If the trimmer was moved during flight, the memorized neutral position can be updated to the current neutral position by repeating this operation. When performing this operation, land the model and hold the rudder stick in the neutral position.

•Rudder neutral check method

In the AVCS mode, the servos do not return to the neutral position even when the rudder stick is returned to the neutral position. When you want to check the servos return 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 servos to the neutral position.

AVCS mode usage precautions

In the AVCS mode, always set the transmitter to OFF. If revolution mixing (pitch–rudder mixing) is ON, the pitch 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) 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 idle up. In the AVCS mode, the gyro automatically trims the rudder so that trimming during flight and other precision rudder trim adjustments are unnecessary.

Other precautions

•DS switch setting precaution

When the DS switch is set to the ON position, the rudder servo is driven by approximately 270Hz high-speed pulses. This mode is for use with Futaba digital servos only.

When using servos that are not compatible with high-speed pulse drive, other than digital servos, never set the DS switch to ON.

The servo may be destroyed.

•Operation of trimmers, etc.

Miniature trimmers and switches used with the GY401 to reduce its size. When operating the trimmers and switches, always use the miniature switch/servo supplier and do not apply excessive force.

•Servo small step operation

When the model is static, the servos may make a small step. However, this is because the gyro sensitivity is set to a high value and is normal.

One point advice

•Relationship between servos horn length and gyro sensitivity

Gyro sensitivity also changes with the length of the servos horn. If the horn is too short, too much rudder signal is transmitted. Conversely, when hunting does not stop, shorten the servos horn.

Mark Meaning

Danger

Procedures which may lead to an adverse condition and cause death or serious injury to the user if not carried out properly.

Warning

Procedures which may lead to an adverse condition or cause death or serious injury to the user if not carried out properly, or procedures where the probability of superficial injury or physical damage is high. 

Caution

Procedures where the possibility of serious injury to the user is small, but there is a danger of injury, or physical damage which may occur.

Symbol:  Prohibited  Mandatory

Special Markings

Pay special attention to the safety at the parts of the manual that are indicated by the following marks.

AVCS gyro

Conventional gyros send control signals to the rudder servos only when the tail of the helicopter moves. When the tail stops moving, the control signal from the gyro becomes zero. Conversely, the AVCS gyro continues to send control signals to the servos even when the tail of the helicopter stops moving.

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

Operation of Conventional Gyro

Basic operation is described by considering the case when the helicopter is hovering under cross-wind conditions. With a conventional gyro, the helicopter encounters a cross-wind, the force of the cross-wind causes the tail of the helicopter to drift. When the drift stops, it generates a control signal that stops the drift. When the tail stops drifting, the control signal from the gyro becomes zero. If the cross-wind continues to cause the tail to drift in this state, the “stop” operation is repeated until the tail faces downward. This is called the “weather-vane” effect.

Operation of AVCS Gyro

Conversely, with an AVCS gyro, when the helicopter encounters a cross-wind and the tail drifts, a control signal that stops the drift is generated. At the same time, the gyro computes the drift angle and constantly outputs a control signal that resists the cross-wind. Therefore, drifting of the tail can be stopped even if the cross-wind continues to effect the helicopter. In other words, the gyro effectively controls the rudder (auto trim) changes in helicopter tail movement.

Considering operation of an AVCS gyro, when the tail of the helicopter rotates, the servos also rotate in accordance with the angle of rotation of the tail. When the tail stops rotating, the servo judges that it has stopped in that position. This is the auto trim function.
## GY401 Functions

### Monitor LED
- Indicates the operating status of the GY401. The display contents are shown below.

### Gyro Operation Direction Switch (DIR)
- Switches the gyro control direction. It must be switched according to the orientation of rotation of the main rotor and the direction of the rudder linkage. If the rudder servo moves in the cancellation direction when the nose of the helicopter moves, the operations are good— otherwise, turn the rudder stick to the side opposite the direction that the nose of the helicopter is moving, and the rudder stick will be operated in the opposite direction.

### DS Mode Switch (DS)
- Digital servo (DS) mode switch. The ON position is the high-speed output mode for digital servo only. When using a normal servo, always set this switch to the OFF position. If it is set to the ON position, the servo will be destroyed.

### Limit Trimmer (LIMIT)
- Sets the maximum travel of the rudder servo. Move the rudder stick to the left and right and adjust the trimmer so that the servo operating angle increases. When the trimmer is turned clockwise, the delay increases.

### Sensitivity Switching Connector
- Gyro sensitivity switching signal input connector. Connect to the transmitter sensitivity switching signal input channel (normally CH5). This connector is also used in connection with the receiver, and is used to switch between the AVCS and normal operation modes. Since this connector is a single wire signal line, do not pull it force.

### Rudder Input Connector
- Connects to the receiver rudder channel (CH4) output connector.

### Rudder Servo Connector
- Connects the rudder servo.

### Relationship between transmitter sensitivity adjustment and gyro operation sensitivity and operation mode
- The operating conditions of the helicopter change when the transmitter sensitivity switching signal is in the neutral position. The sensitivity can be adjusted to improve the performance of the helicopter. The switch position is the AVCS mode at the + side and in the normal gyro mode at the - side of the switch.

### Transmitter with gyro sensitivity switching function (TW, AVCS mode)

<table>
<thead>
<tr>
<th>Sensitivity</th>
<th>CH4 Input sensitivity</th>
<th>CH5 Input sensitivity</th>
</tr>
</thead>
<tbody>
<tr>
<td>0%</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>10%</td>
<td>10%</td>
<td>10%</td>
</tr>
<tr>
<td>20%</td>
<td>20%</td>
<td>20%</td>
</tr>
<tr>
<td>30%</td>
<td>30%</td>
<td>30%</td>
</tr>
<tr>
<td>40%</td>
<td>40%</td>
<td>40%</td>
</tr>
<tr>
<td>50%</td>
<td>50%</td>
<td>50%</td>
</tr>
<tr>
<td>60%</td>
<td>60%</td>
<td>60%</td>
</tr>
<tr>
<td>70%</td>
<td>70%</td>
<td>70%</td>
</tr>
<tr>
<td>80%</td>
<td>80%</td>
<td>80%</td>
</tr>
</tbody>
</table>

### Transmitter with ATY function (TFZ, FF5S, FF6S, etc.)

<table>
<thead>
<tr>
<th>Sensitivity</th>
<th>CH4 Input sensitivity</th>
<th>CH5 Input sensitivity</th>
</tr>
</thead>
<tbody>
<tr>
<td>0%</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>10%</td>
<td>10%</td>
<td>10%</td>
</tr>
<tr>
<td>20%</td>
<td>20%</td>
<td>20%</td>
</tr>
<tr>
<td>30%</td>
<td>30%</td>
<td>30%</td>
</tr>
<tr>
<td>40%</td>
<td>40%</td>
<td>40%</td>
</tr>
<tr>
<td>50%</td>
<td>50%</td>
<td>50%</td>
</tr>
<tr>
<td>60%</td>
<td>60%</td>
<td>60%</td>
</tr>
<tr>
<td>70%</td>
<td>70%</td>
<td>70%</td>
</tr>
<tr>
<td>80%</td>
<td>80%</td>
<td>80%</td>
</tr>
</tbody>
</table>

### Flight adjustment

**AVCS mode**
- In the AVCS mode, the gyro automatically adjusts the rudder neutral position so that mechanical rudder neutral position changes are unknown. When the rudder neutral position changes substantially, a left and right rudder error is generated and gyro performance may drop.
- When making your first flight and when reconnecting the linkage, set the mechanical rudder neutral position by first flying in the normal mode and then flying in the AVCS mode.

**Rudder neutral position adjustment**
- Set transmitter revolution mixing (pitch/rudder) to 0% or OFF.
- Set the transmitter gyro sensitivity switch to the AVCS position. First, turn on the transmitter power, then turn on the gyro power (shared with receiver). Since the gyro401 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 light for a short time. At this time, set the transmitter gyro sensitivity switch to the AVCS position and turn on the gyro power again.
- Switch the transmitter gyro sensitivity switch to the normal position. At this time, the monitor LED goes off. For further information, see “One point advice.”
- This completes mechanical neutral position adjustment. Land the helicopter and set the gyro to the AVG63 mode. Turn on the transmitter power and connect the transmitter to the gyro. Adjust the delay trimmer so that the servo operating angle becomes 0°.
- The power is turned on in the normal mode, the monitor LED will light for a short time. At this time, set the transmitter gyro sensitivity switch to the AVCS position and turn on the gyro power again.
- With the transmitter power turned on in the normal mode, the monitor LED lights once, after which it turns off. If the display shows “No data,” turn on the gyro power (shared with receiver) and then press the CH5 switch (transmitter setup screen) twice. If the LED flashes twice, the trimmer of that flight condition has been set. Readjust the rudder trim.

**AVCS side adjustment**
- Set the rudder stick trim position for all flight conditions which use the AVCS mode to the trim position after adjusting the helicopter in the normal mode.
- When the power is turned on in the normal mode, the monitor LED will light for a short time. At this time, set the transmitter gyro sensitivity switch to the AVCS position and turn on the gyro power again.
- This operation memorizes the AVCS side neutral data to the gyro. At this time, the monitor LED flashes twice. Once the neutral data is set, the monitor LED will turn off. Set the gyro to the AVG63 mode. This operation turns on the gyro power and then turns on the gyro after approximately 3 seconds. The monitor LED flashes twice, the trimmer of that flight condition has been set. Readjust the rudder trim.

### Use
- Mount and adjust the GY401 as described below.

#### Installing to fuselage

1. **(Gyro installation GY401)**
   - Install the gyro so that the bottom of the gyro is perpendicular to the direction of flight in the helicopter. Charges of this area are also reflected in the roll and lateral axis. The installation direction and location are shown below.

   ![Gyro installation GY401](image)

2. **(Gyro connection)**
   - Connect to receiver sensitivity switching channel (CH5).
   - Connect to receiver rudder channel (CH4).

3. **(Servo selection)**
   - For a digital servo, switch to CH5 on the position.

4. **(Gyro servo linkage check)**
   - Set the transmitter gyro sensitivity switch to the AVCS position and turn on the gyro power.

5. **(Gyro sensitivity setting criteria)**
   - The gyro sensitivity differs with the servos used and the fuselage. Generally, the higher the servo operating speed, the higher the gyro sensitivity. Also, when the main rotor speed is raised, the tail sensitivity of the helicopter begins to move. When the gyro sensitivity is too high, the servo operating speed will be decreased. The sensitivity is set so that the servo operating speed is 70~80% when the monitor LED flashes twice. The sensitivity is set to the AVCS position by adjusting the delay trimmer so that the monitor LED goes off. When the sensitivity is set, proceed slowly while checking.

   ![Gyro sensitivity setting criteria](image)

6. **(Gyro operation direction check)**
   - If the gyro servo operates in the reverse direction, switch the switch.

   ![Gyro operation direction check](image)

7. **(Limit setting)**
   - Move the rudder stick to the left and right and adjust the limit switch so that the servo operating angle does not strike the linkage. During flight, the servo will not operate beyond this limit and the linkage will be protected. If the setting is too low, the gyro performance will be affected.

8. **(Flight adjustment)**
   - In the AVCS mode, the gyro automatically adjusts the rudder neutral position so that mechanical rudder neutral position changes are unknown. When the rudder neutral position changes substantially, a left and right rudder error is generated and gyro performance may drop.
   - When making your first flight and when reconnecting the linkage, set the mechanical rudder neutral position by first flying in the normal mode and then flying in the AVCS mode.

   ![Flight adjustment](image)