March 2016 Volume 27 Issue 3

# TURBULATOR

**Newsletter**
of the Rio Rancho
Radio Control
Flying Club

AMA Club #2770

WATERMAN FIELD ELEVATION 5840 FEET 35° 17.2'N 106° 44.8'W


## PRESIDENTS CORNER

**"Da Prez Sez"**

March is upon us and that means Spring and Summer are almost here. February was a good month this winter with a lot of above average days. Many flyers took advantage of the temps, and put up with the wind to get out and fly. Our indoor flying on the holiday had a nice turn out allowing some of the working members to get together with their retired friends and enjoy some indoor fun. With a Saturday at the Star Center coming in March I hope to see many more members there. Vic works hard getting us this time and we do appreciate his hard work, Thanks Vic.

Coming Events

1. Indoor Flying at the Star on the following Dates
Saturday March 12th from 9-11
Monday March 21st from 9-12
2. Next Meeting March 7th at 7:00pm at the Wallen Club House
3. Swop meet at the March meeting

## How do RC Servos Work?

## THE BASICS OF RC SERVO OPERATION

RC servos come in an amazing range of sizes, speeds, strengths, weights, shapes colours and varieties but they all work on the same basic principles.

The job of an RC servo is to position its output arm to a position that exactly corresponds with the movement of the corresponding stick, switch or slider on the transmitter. What's more, it should do this as quickly as possible and provide a high level of accuracy regardless of the effects of aerodynamic loads or other factors.

Most servos, regardless of brand or type, consist of several main parts:

The mechanics. These are the gears and the case.

The motor. This provides the motive force to drive the output arm

The feedback pot. This allows the servo to measure the actual position of the output arm

The amplifier. This is the electronics that hook all those other bits together to make it work

Now let's take a look at those bits in more detail...

The Mechanics

Most RC servos have a plastic case, the top section of which contains a set of gears that can be either plastic or metal. The strength and rigidity of these mechanics play a significant role in determining the robustness and weight of the servo, with metal gears usually being significantly stronger (and heavier) than plastic.

The choice of gear material depends very much on the type and size of model in which the servo will be used. Generally speaking, plastic gears are only suited to models up to 5-6 lbs in weight.

Bearings

The output shaft and gear of a servo experiences significant side-loading during its operation and this means it needs some kind of support to stop it from moving out of mesh with the rest of the gears.

Cheap servos tend to simply rely on the plastic shaft rubbing against the plastic of the case and for small/slow models this isn't too much of a problem. These servos are often caleed 'bushed" and, because there has to be some clearance between the shaft and the case, usually demonstrate some side-to-side slop in the output shaft, which can appear as a degree of rocking up and down of the output arm.

However, precision and hi-torque servos really do benefit from the addition of a ball-bearing or two on the output shaft. This significantly reduces the friction, virtually eliminates wear and means there should be no slop at all in the output shaft.

Good servos have a single bearing (usually in the top of the case) while even better servos have two bearings -- one in the case and one at the bottom of the output shaft.

The Motor

There are basically three different types of motors used in model servos, the most common of which is a brushed motor with three or five-pole armature. The benefit of these motors is their low cost and robustness. The downside is that, because of their heavy iron armature, they tend to respond more slowly.

The second most common type is the coreless motor which, as the name suggests, does not have an iron-cored armature but instead has a lightweight plastic armature on which the field windings are formed. This has the advantage of being able to start and stop far more quickly (due to its low mass) and also produce more torque -- since the diameter of the windings is much greater than with a cored motor.

Because they cost more to manufacture, coreless motors are usually only found in expensive servos designed for very fast transit times (such as used on heli tailrotors).

The final motor type is the brushless variety being offered in just a few servo models from big-names like Futaba. The brushless motor can be designed to provide very high levels of torque and has no brushes to wear out. Servos with brushless motors are few and far-between right now though because of the costs involved.. Pots and Amplifiers

Inside every servo is a tiny circuit board that contains a bunch of components.

It is the job of this circuit (which is called an amplifier) to convert the signal from the receiver into a signal that drives the servo's motor to position the output arm to the requested position.

Way-back, when proportional RC gear was first developed, there was only one kind of servo amplifier: the analog amp, but today we also have digital versions.

Standard/analog Servo Amplifiers

Modern receivers send a series of pulses to each servo. Those pulses vary in width from about 1 thousanth of a second (1mS) to two thousandths of a second (2mS) -- with the center-point being around 1.5mS.

These pulses are sent at a rate of about 50 per second and every time a pulse arrives in a standard/analog servo, the amplifier checks to see if the servo's output arm needs to be moved one way or the other.

If the amplifier decides that the servo arm does need moving because the transmitter stick has been moved then it sends a short burst of power to the motor in order to rotate the gears and (ultimately) the output.

For most applications, this works just fine but since the servo motor isn't being driven continuously (only for a moment every time a new pulse is sent from the receiver), the full torque potential and speed of the servo isn't fully realized.

Another issue with standard servos is that the torque tends to drop off quite dramatically as the difference between the requested position and actual position of the output arm gets smaller. In fact, when this diference is very small, the torque of the servo be insufficient to move the arm against a slightly binding linkage and the result will be a buzzing noise.

Digital Servo Amplifiers

Since the standard/analog servo amp was designed, electronics have moved on significantly and now manufacturers can put tiny computer chips called microcontrollers in servos.

These little computers can provide significantly improved speed, torque and accuracy.

They do this by allowing the servo's motor to be driven far more frequently than was the case before.

Instead of only driving the motor each time a pulse arrives from the receiver (a mere 50 times per second), they effectively remember the length of the pulse and then drive the motor almost continuously (or at a much higher frequency).

The result is that the motor produces more torque and can accelerate/stop more quickly.

Digital servos are often easily identified when running because of the different sound they make as a result of this increased motor-drive. Hitec digitals will "sing" at a high frequency and some others like Futaba and JR will "growl".

Which is best?

Clearly, because of their greater torque, accuracy and speed, digital servos are usually superior to standard servos but in many cases, such as sport models, that extra performance might not be worth the extra price.

Feedback Pots

So how does a servo know exactly where its output arm is so that it can command the motor to move it to the position commanded by the transmiter stick?

Well that's the job of the feedback potentiometer ("pot" for short).

The pot is just a tiny version of the volume control knob on older-type radios and TV sets. It's a variable resistor which can be used to create a voltage that changes as the servo's output arm moves.

That voltage can then be used by the servo amp to work out the exact position of the arm and decide whether it needs moving and if so, which way to drive the motor.

Good servos use high quality pots, cheap servos tend to use inferior ones and the quality of the feedback pot is very important to the accuracy and reliablity of a servo. When a pot becomes worn or dirty, the servo can jitter and become erratic in movement. Cheap pots may also be adversely affected by high-vibration environments.

# MEETING MINUTES

## Minutes from the February 2016 Club Meeting

The meeting was called to order with 12 members present.

**Minutes:** Accepted as published.

**Treasurers Report:** Accepted as presented

**Membership Report:** 35 Members rejoined for 2016.

**Field Report:** Cracks in the runway are widening and we need to repair them as weather warms. Garry Wallen volunteered to locate a rubberized/silicon repair material to fill the cracks.

**Safety:** Flying at the field has been minimal due to the weather so there isn't much to report on the safety front.

**Unfinished Business**: There will be a Swap meet at the March Meeting, bring your unwanted items and or cash to acquire items.

**New Business:** 1. Andy Wilson gave a report on the health of life and founding member Bart Boricious. He's now 97 and his health is waning. Andy will keep in touch with Bart and his family and keep the club informed.

2. There is a committee working to find a cost effective solution to put a small weather station at the field, so members can remotely view the wind and temp conditions.

3. Bill Ryan(Our Treasurer) is working with the state to have the club recognized as a non-profit.

The meeting adjourned at 8:00pm.

**Turbulator:**
Editor Don McClelland
We are always looking for articles, pictures and your input!

For comments, or suggestions Please Email Don at
macmoke1@gmail.com

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**RIO RANCHO RC CLUB**

AMA Charter #2770

www.rioranchorcflyers.org

**Next Club Meeting**

March 7th, 7:00pm at the Wallen Club House. 5545 Lilac Pl.