

“Mas Tech”

THE MAS TECHNIQUE

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Welcome, in the Premiere Issue of *Rotory Modeler*, I introduced the “Mas Technique”, a style of flying and set-up which I designed over ten years ago. Regardless of its origination almost a decade ago, the “Mas Tech” set-up methods, style of flying, aerobatics, 3D, stunting, switchless or whatever you choose to call it, is presently being adopted as today’s set-up, and is currently being used extensively by most sport and aerobatic pilots including World Champion caliber FAI flyers, worldwide.

The beauty of the “Mas Tech” set-up is that it does not require the mythical two stage set-up, one set of parameters for hover and another for aerobatics. With the “Mas Tech” set-up and the use of fully symmetrical blades, the same set-up you use for aerobatics, may be used for FAI flying as well. Why fly two helicopters with two set-ups, when you can use the same set-up for both.

Shortly after, I wrote a series of articles covering the “Mas Tech” set-up in *Rotory*, (see Jan/Feb & Mar/Apr 1992) I was shocked as to the amount of pilots who had switched over and successfully reached new levels of success with helicopters. I also received some response (mostly 30 size pilots) who mentioned that the “Mas Tech” set-up was too much of a jump from their standard set-up. For this reason, I have developed an intermediate or “Phase 2” set-up which will help transition pilots from their standard set-up to the “Mas Tech” set-up, without such a drastic change in performance and/or transmitter

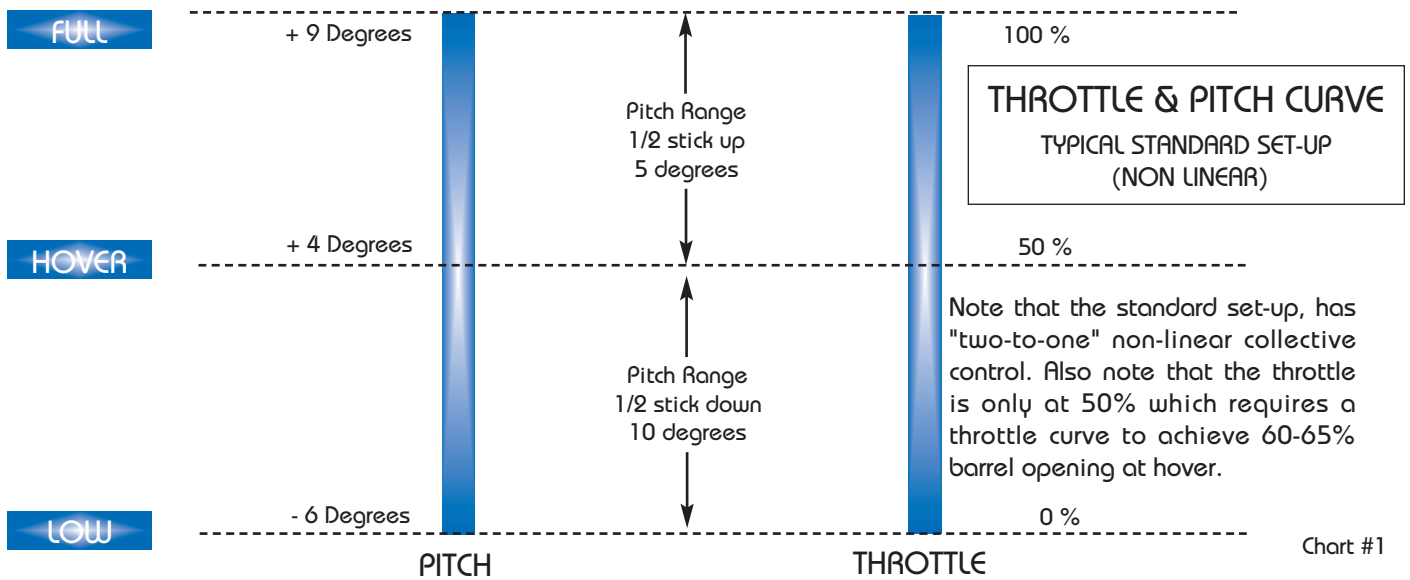
stick orientation.

To bring our new readers up to speed on the Mas Tech, let me briefly go over my set-up, it’s differences and advantages.

As we compare Chart #1 and #2, we can see the evolution of pitch set-ups. On Chart #1, at the half stick position, we find approximately 4 degrees at hover, -6 degrees at low stick and +9 degrees at full throttle. As we move the stick from half (hover) to full stick, we move the collective range a total of 5 degrees. However, as we move the stick from hover to low position, we now move the collective 10 degrees. This means the typical set-up has twice the collective movement from half stick to low throttle, than it does from half stick to high throttle, or a “two-to-one” non-linear collective control.

With this standard set-up, the collective is somewhat smooth and predictable from half stick to full stick, but somewhat erratic from half stick down, the exact area that it is most critical for is autorotations, FAI and aerobatic flying!

For the reasons above, in 1977-78 while preparing myself to fly inverted, I developed the “Mas Technique Set-Up” I called it then, as I call it now, my “Seven & Seven” set-up (Wood Blades) (Chart #2). It’s a totally linear set-up of zero degrees at half stick, seven degrees up and seven degrees down, movement from half stick up is identical to half stick down. The result is a helicopter that responds the same no matter where the collective stick is. The machine is just as happy on its back as it is on its feet.



I'm sure most of you by now are saying, "only seven degrees positive"? Well, there's an important reason for this which I explain in detail in our May/June issue of 1992.

With the "Mas Technique" you set the bell-hiller mixers, collective slider and all bellcranks level at the half stick position where we have zero degrees of pitch. This way all the mixers, bellcranks and sliders will have the same deflection at 5 degrees negative as they do at 5 degrees positive. Another plus about this set-up is, it will work on any radio system regardless of features. I'm using the same set-up today on my 1024Z and PCM-10S transmitters, that I

used on my 5 channel Futaba in 1978.

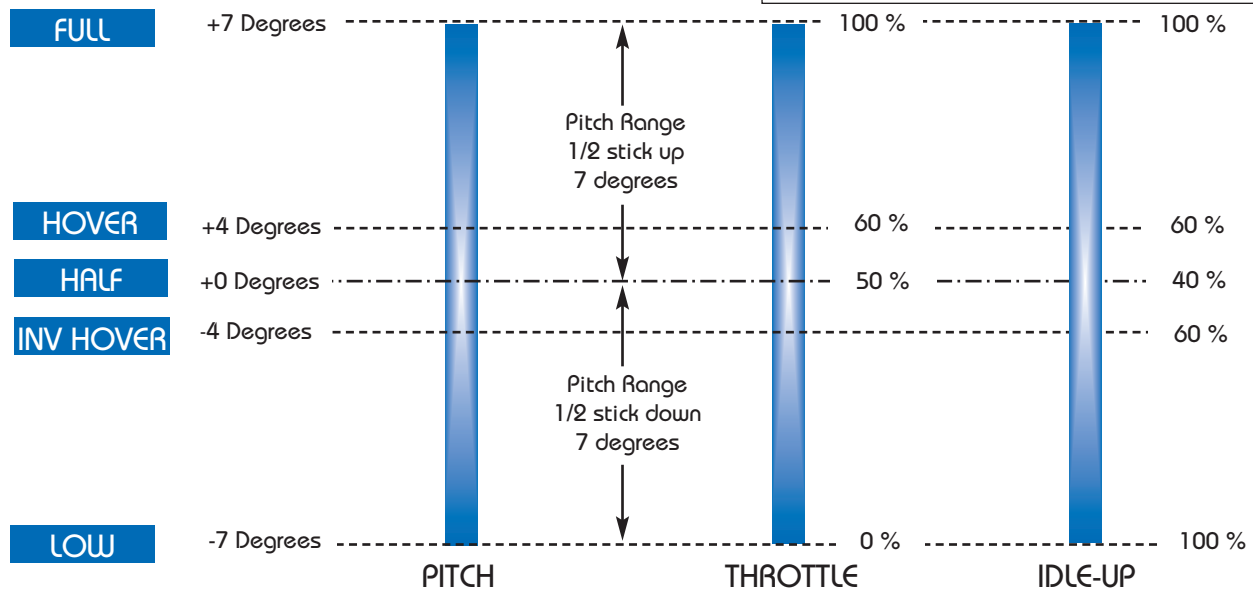
The real beauty of the "Mas Tech" set-up is it uses totally linear curves on the throttle and collective. As we look at Chart #2 & #3, you will notice that the linear pitch curve also provides a linear throttle curve. The "Mas Tech" set-up will automatically give us approximately 60%-70% barrel opening at hover which is exactly what we want to keep the engine slightly ahead of the collective load. Keep in mind that we're using 0 degrees at half stick (2 degrees on "Phase 2") so needless to say the machine won't lift off until the throttle/collective stick is approximately 60%-70% open. This automatically

gives us 60%-70% throttle barrel opening, which is exactly what we want and we haven't touched the throttle curve yet.

The distinct advantage of the "Mas Tech" set-up is you can physically (stick position) and mentally feel and find a zero degree pitch setting any time you desire. This is a common natural point where your machine and rotor disk is unloaded and producing what I call "zero lift". Notice I said the machine and the rotor disk, because they both can exhibit "zero lift" individually of each other. It is the combination of these two points that practically every maneuver, whether it be the "Mas

THE MAS TECHNIQUE SET-UP

Chart #2



Tech”, FAI, etc., that your machine is dependent upon to occur at the same time.

Let’s look at a slow 6-8 second roll as an example. If you’re at 3/4 throttle when you initiate the roll command, as the machine reaches knife edge, you simply move the stick to half position, which is 0 degrees pitch, as you reach inverted you’re at 1/4 stick position. As you reach knife edge again you’re back to half stick, and back upright you’re at the 3/4 stick position again. Everything is linear, your stick position is 25% above half, when you reach the inverted position you’ll be 25% below half. Try moving your throttle stick linear with a conventional standard set-up, or better yet, try finding exactly zero degrees pitch during the roll, it’s hidden somewhere around the 3/8 throttle position. This is why rolls are so difficult for most pilots using the conventional set-up. With the “Mas Technique”, any time you want “zero lift” you simply move the stick to center position, it’s that simple.

Getting back to the “Phase 2” set-up, you’ll find that it will work for practically all model helicopters, regardless of manufacturer and blade design. Aside from the “Mas Tech” set-up providing linear amounts of pitch from 1/2 stick up and down, the secondary benefit is it provides a linear curve on both the throttle and collective servos.

As we examine Chart #3, we find 7-9 degrees (9 degrees for 30 machines) positive top end pitch. I know how much you guys love that top end pitch, however, it’s your enemy. In forward flight it will cause “pitch up” and/or loss of control as well as blade stall, during aerobatic maneuvers. At the other end of the chart, in the low pitch setting, we find only 6-7 degrees negative pitch. While this setting might seem minimal, I assure you that you’ll have plenty of inverted pitch for hovering and climb out.

Remember, the less pitch travel we have, the more overall control we have of our helicopter (see May/June issue 1992). This is especially important with 30 size helicopters, since their control system design has less overall control of the rotor disk. Let’s deviate off a little bit, so we understand this a bit better. Unlike 60 size helicopters, most of our 30 size helis use non-precision type plastic mixers for collective and the steering control system. While this control system was fine five years or so ago, when 30 machines were primarily designed for beginner hovering and moderate forward flight, by today’s standards, the control systems on most 30 size helicopters are not up to par. It’s not uncommon to see a 30 size helicopter performing comparable aerobatics to 60 size machines.

It’s not so much that the control sys-

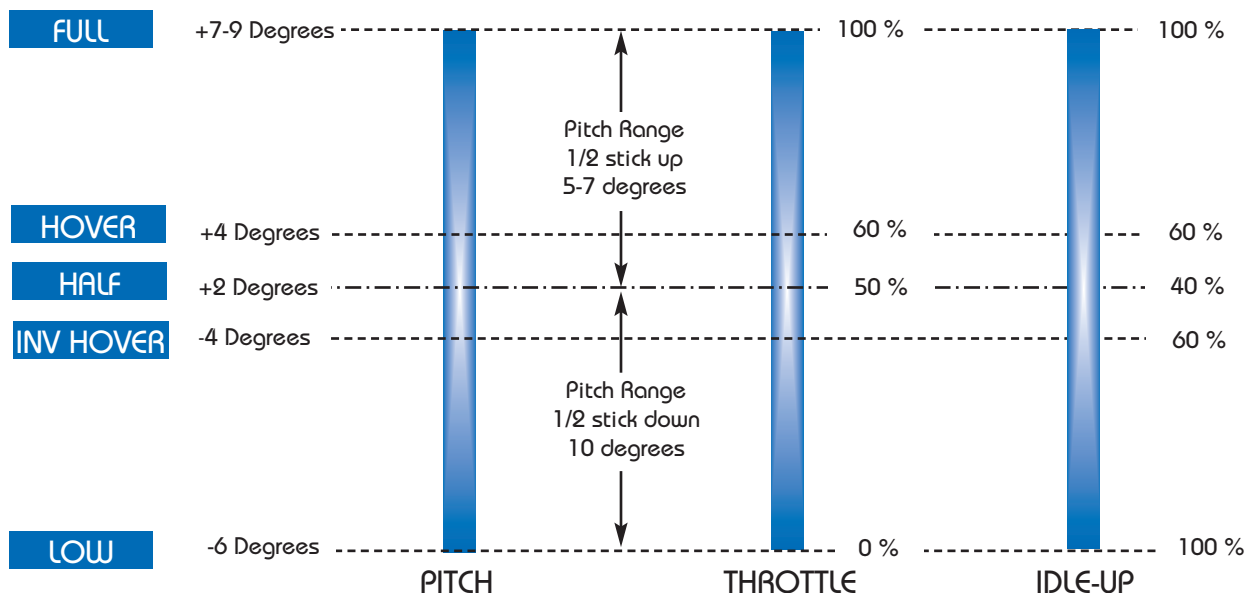
tem on most 30 size helicopters are defective, as it is the fact that the rotor span, and what we expect them to do, has increased to the point that the control system is at its maximum operational design limits.

Four or five years ago, Hirobo introduced a new Shuttle model as we now know it, called the “Shuttle ZX”. The “ZX’s” biggest asset was the fact that it underwent a “stretch job” and offered a rotor disk that spanned almost 50 inches. While that might not sound very big, keep in mind that the sixty size Schluter Heli-Boy, the helicopter which standardized 60 size helicopters, had a 52 inch rotor span. The point I’m getting at is, a 50 inch rotor span is a big disk for a thirty size heli with a plastic control system. Shortly after Hirobo introduced the Shuttle ZX, Kyosho and Kalt followed suite, and also introduced larger disk areas on their 30 size helis as well. If you have been keeping up with the latest machines and updates you no doubt are aware of all the metal hop-up parts available for 30 size helicopters. Most of these mods, such as metal swashplates, ball bearing mixers, anti-rotational devices, etc. all provide additional control for the main rotor system that the original equipment lacks.

Getting back to our “Phase 2” chart, instead of using zero degrees at half stick (as in the original “Mas Tech” set-up) you will find the revised chart has 2

MAS TECHNIQUE "PHASE 2" SET-UP 30-60 SIZE HELICOPTERS

Chart #3



degrees positive pitch at half stick. Needless to say the helicopter is not going to hover at the half stick position with 2 degrees of pitch. As I mentioned, when the machine lifts off, the throttle position will be up just below the 3/4 open position, or about 60%-70% open. This puts the engine throttle barrel exactly where we want it, 60%-70% open at hover, and we never had to touch either the collective, throttle curves or linkage to obtain this setting.

Prior to setting up your helicopter with the "Phase 2" set-up, make sure that your throttle and collective servos are linear in control. That is, at half stick, the servo wheels on the throttle and collective servos should be at their half travel positions. If you're using a computer radio, make sure that both the throttle and collective curves are totally linear and the ATV (travel volume) is set to 100%.

Beginning with the throttle, make sure that the engine carburetor barrel

is positioned at the half open position when you have the throttle/collective stick at half. As you move the throttle from the full open to full closed position (throttle trim full low) make sure there is no binding or under travel. If there is, move the ball link or rod either in or out on the servo wheel. Don't forget, make all initial adjustments on your helicopter mechanically. After you complete this adjustment, make fine adjustments such as full open and closed, with the ATV's (travel volumes), not the throttle curve. Remember, we want the throttle curve as linear as possible.

Next, we will adjust the collective pitch. Again, if you're using a computer radio, you should have a linear curve and the ATV's set to 100%. Move the throttle/collective stick to the half position. You should now obtain 2 degrees positive pitch on the main rotors (regardless of blade design). Next, find the proper position on the servo wheel so you can obtain

9 degrees of positive pitch at full throttle, and 9 degrees negative, at full low throttle. Now that we properly have the collective mechanically set, with the throttle still at full low position, go to the ATV's (if available) and reduce the travel at low collective servo to obtain 6-7 degrees of negative. If you're using a computer radio, do not adjust the pitch curve, use the ATV to reduce the collective travel to obtain negative (6-7) degrees. Using this method keeps the curve linear regardless of how many points you have selected.

With regard to flying, you will find that the "Mas Tech" set-up provides a world of differences and unlimited abilities with model helicopters. The "Phase 2" set-up will provide an easy transition from your standard set-up to the "Mas Technique" set-up. Best of Luck.

RM