The Wright Approach

Gary Wright

Well, another month has rolled around, and everyone's been burning fuel with their new 3D setup...right? Well, I'd like to devote some of this month's column to the correct way to learn 3D flight. I mean the correct way in *my opinion*, but then, my opinions are the Wright opinions, aren't they? <g> *(Ed: Readers are invited to disagree... :-))*

Everyone remember what they went through in grade school with mathematics? First you had to learn rudimentary skills such as addition, multiplication, subtraction, and division. Then you could move on to the next step, and the next, and the next - with each level "building" upon the skills learned in the previous lesson. If someone asked you to factor a polynomial, without first teaching you the concepts of multiplication and division, you probably wouldn't have the slightest clue as to what they were talking about, much less how to do it. RC helicopters, and specifically 3D flying, require the same basic procedures, I.e., you have to crawl before you walk, walk before you run, etc.

You can break down 3D flying into a four basic categories:

- Orientation
- Basic aerobatics
- Compound aerobatics
- Complex aerobatics

Basic orientation skills are simply the ability to fly/hover the helicopter while viewing it at all of the 360 degrees in rotation. Basic aerobatics consist of the loop, roll, and stall turn. Compound aerobatics are a mixture of basic aerobatics, when added to one another, to create more interesting aerobatics, such as rolling stall turns, immelmans (half-roll, half-loop), Cuban eights (loops and rolls together), etc. The complex maneuvers would be compound maneuvers, with multiple orientations, I.e., pirouetting aerobatics, sideways aerobatics, backwards aerobatics.

Basic orientation skills are used in EVERY one of the higher categories, basic aerobatics are the basis for compound aerobatics, and complex aerobatics are a mixture of compound aerobatics with multiple orientation changes. Without learning all of the elements (or at least most) in each of these successive categories, there will be little hope of flying in the higher category. The basics, which I feel are absolutely mandatory, are the hovering orientations, that is tail-in hovering, side-orientation hovering (both directions), and nose-in hovering. Without being comfortable with

ALL of these orientations, it becomes more difficult when moving to the next level of flying skills.

I hear people stress nose-in more than anything, and although it is very important to become comfortable with nose-in flight, it is equally as important to be comfortable with flying the heli looking at either side. Believe it or not, the side orientations can sometimes cause more problems than nose-in. The lesson here is

that when learning anything new, in order to truly "learn" the maneuver it should be executed with all four of the basic orientations before moving on to the next skill. When learning new maneuvers, the first steps that have to be clear are the different orientations, then you develop the "muscle-memory", or reflexes to simply execute the maneuver. As you practice the maneuver, these reflexes become second nature and the brain starts intentionally changing the inputs to "correct" the flight path during the maneuver.

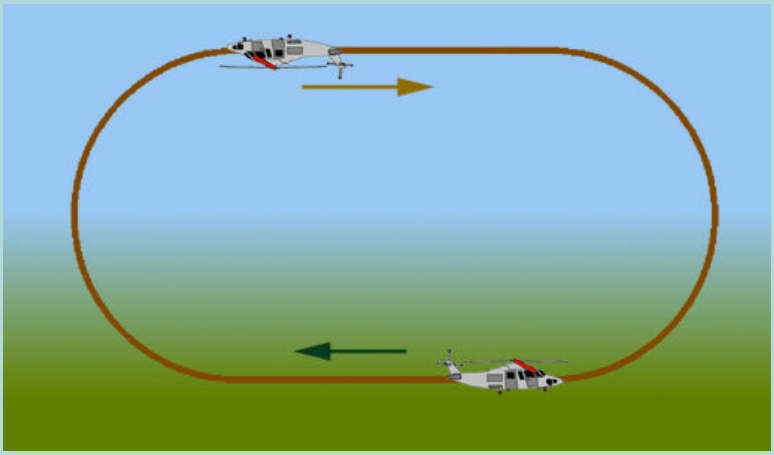
For example, the first maneuver most people learn is the loop. Incidentally, this is the first of the basic aerobatics that I recommend to someone that can execute all of the hovering orientations, and is reasonably competent in forward flight. What do you do to execute your first loop? You go reeeeeal high <g>, and pull back on the cyclic stick. This sets the basis for developing the `muscle memory' for the maneuver. Once you do several of these ugly figure-9 looking loops, it's no longer a scary situation to pull back and watch 'er go around, so you add in a second input. The collective is lowered at the top of the loop. When this all becomes relatively easy, the third evolution of your loop is the process of varying the amount of elevator input, along with the collective movements, to make the maneuver look round. When broken down into "learnable" components, the maneuver wasn't very hard was it?

This is the basic procedure used to learn all maneuvers, no matter how simple or complex. The loop is a very simple maneuver, but the pilot can still break it into components. There are several examples of what I refer to as a "compound" maneuvers. These include rolling stall turns, Cuban eights, reverse inside loops, I.e., I refer to any maneuver that combines 2 or more basic aerobatics and/or orientations as a compound maneuver. The rolling stall turn uses a 1/2 roll and a stall turn as it's "elements". In keeping with the basic learning principles, you must first be able to complete each of the components of the rolling stall turn before executing the entire maneuver. This is a relatively simple one, but a better example of the correct path for learning a compound maneuver is the reverse inside loop. In order to execute a nice looking reverse inside loop, you must be able to do rolls, loops, and straight inverted flight. The maneuver starts with a half roll followed by a short segment of inverted flight, an inside loop, a short segment of inverted flight, and a half roll. The maneuver doesn't look that difficult, but to execute the maneuver correctly, you have to polish every part of it, and this includes rolling, looping, and inverted flight.

Moving on into the complex maneuvers. I qualify any maneuver that is a compound maneuver, in a different trajectory. For example, the backwards Cuban eight, rolling loop, backwards rolling figure eight, pirouetting tumbles, loops, and rolls, etc. These are all compound maneuvers (which are just basic aerobatics, `compounded together') with slight variations. When trying to fly some of the "newer" 3D style maneuvers, it is sometimes overwhelming to think about trying these yourself. However, if you break the maneuver down into its component parts, learn each of the component parts, then start re-assembling the pieces, these new maneuvers are possible.

For example, the backwards Cuban eight sounds like an impossible maneuver, but break it down into it's components - backwards flight, backwards loops, and backwards rolls. Once these components are mastered, the next step would be to learn half the maneuver by starting a backwards loop, but releasing elevator input at the top and rolling out. Now you've done a backwards Immelman. Reverse direction, and do the same maneuver. The reason we would roll out

at the top of the loop, rather than the 5/8 point, is to give us more time to think, react, and develop instincts. When executing the 1/2 roll at the top of the loop, rather than the 5/8 point, the helicopter is "level", therefore the speed will be reduced. If anything goes wrong, you're higher, and the machine is slower, so it's easier to correct the attitude of the machine. Once this



Reverse Double Immelman - in FAI the 1/2 rolls are usually performed after the half loop

is mastered, the loop segment can be increased, until the 1/2 roll is occurring at the 5/8 point on the downline. The machine will be travelling at a great rate of knots once it's "over the top" of the loop, and this is the reason it's best to start with the "backwards Immelman" and sloowly progress to the 5/8 point of the loop for the first half-roll.

Maintenance

Because of a situation that resulted in my totally re-kitting a machine recently, I would like to share something with you. Recently, I was "tweaking" the setup on my FAI machine, when I started hearing a new noise. It sounded as if the rear bearing on an SX was getting "over the hill". The strange thing was that machine had a YS61ST in it, and they are known for not having any bearing problems. Since I had not followed the procedure of running it dry at the end of flying sessions, I thought. `Well I'll take it out and change the bearings tonight'. I continued that flight, and after one more aerobatic pass, the noise got LOUD and the receiver (PCM) went into hold, totally annihilating the helicopter in the crash. This crash busted the case on 3 of the 4 - 9202 servos, got the gears in all of them, the 9203 on the tail became "non-functional", and the piezo gyro amplifier along with the case for the sensor, were also crushed. Upon disassembling the pieces I found my noise. The lower bearing in the start-shaft bearing block had locked up. The start-shaft on the Intrepid is supported by 4 bearings. One is in the clutch bell, and three are in the bearing block between the frames. The lower one is a large bearing that the pinion gear rides in. This bearing had locked up and the pinion on the clutch bell was spinning in it creating the noise. This noise and the associated RF interference had created the hold situation on the receiver.

Since I had not configured failsafe to reduce throttle the engine stayed at full power and the receiver never came out of hold, causing the crash. My general cleaning procedure is to practically "hose-down" the heli with alcohol *(Ed: What a waste! :-))* after a flying session, and then wipe it off. I then place a spot of oil on the tailrotor output shaft and the mainshaft for the sliders to move on. Over time, the alcohol procedure had removed all of the lubrication from the bearing that the pinion rides in. Three things have been learned from this and I hope that by sharing them it might preclude the same situation happening to someone else's helicopter. First, I now have failsafe programmed on all of my machines to place the throttle at a low idle. This would have probably saved my FAI machine, because the frequency of the noise from the bearing would have changed as the throttle was reduced and control might have been restored.

Second, I'm a lot more frugal with the alcohol, and I re-oil any bearings that get in the way of the application of the alcohol. Third, don't ignore "new" noises from the helicopter. That's its only way to talk to you, and it usually doesn't say anything unless something is wrong!

Next article I'll share some findings of the new YS61ST, and setup changes I've had to make for this great new powerplant!

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