



## Flight Advisor Corner      by      Hobie Tomlinson

September 2005      **Hand Propping**

Last month we finished the series on Tailwheel Transition and I thought it would be appropriate to talk about “Hand Propping” of aircraft, otherwise known as the “Arm Strong” starter.

When I look at the new Sport Pilot rule and the “Graying” of my peers, I think the old 65/75Hp Cubs, Champs, Taylorcrafts and the like may be making a comeback. (Anyone remember the Aeronca L3, Chief, Ercoupe 415C, Interstate Cadet, Luscombe 8A or Piper J4?)

The big driver in this will be the privilege granted Sport Pilots to fly without obtaining a medical, which was previously limited to Glider & Balloon Pilots. There are a couple of “Excepts & Gotchas” in this, but I will save that for a future article on the Sport Pilot rule. Because of the above fact, I think aircraft which qualify are going to see an increase in market value and restorations. New “Sport Aircraft” are going to be priced in the \$100K range and even with the increased cost of acquisition and restoration, these aircraft are still bargains.

The Sport Aircraft category restricts Maximum Certificated Takeoff Gross Weight to 1320 pounds, so most 65/75HP. aircraft instantly qualified, even though they are certified aircraft under the old CAR3 regulation. When the 85/90HP. versions came along, the gross weight also increased causing these aircraft to “step over” the line and not be eligible.

The reason for the 85/90Hp versions was to incorporate starters, generators and electrical systems as light aircraft were starting to interface with the developing ATC system of the 1950’s. The 65/75 HP engines of the 1940’s were designed without accessory drives for these features, as they added weight & were not needed. (DC generators are quite heavy due to the permanent magnets) Having said all of that, hand propping of aircraft has become a lost art which may be resurfacing with renewed use of these aircraft.

I just completed my first Sport Pilot Certification Flight with Mr. Ronald B. Webster (a Commercial Glider pilot @ Sugarbush/OB7), so had the opportunity to put some “old skills” to recent use. He was flying their Taylorcraft BC12-65.

**Hand Propping an aircraft entails risk, which like everything else in aviation (and life) must be properly understood and managed for a successful outcome.** Years ago (we’ll leave that there) when many of us started our aviation careers, these airplanes were still in common use as trainers. Leaning to “prop” an aircraft was just part of the pilot course. That has long ago disappeared, so before you get involved in propping an aircraft it would be wise to seek instruction from someone currently operating or teaching with these type aircraft.

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**Communication** is vitally important when propping an aircraft, so the first step is a safety briefing between the pilot and the person propping the aircraft. The sequence of events and callouts used must be briefed and adhered to by both parties. Failure to do so dramatically increases the chances that someone will get hurt!

**The Callouts** typically used are “**Brakes On,**” “**Switches Off**” and lastly, “**Brakes & Contact.**” The last one evolved into the “**CLEAR**” callout currently used in modern light aircraft.

**The Starting Sequence** is: 1) Safety briefing. 2) Communication. 3) Insuring aircraft secure 4) Evaluating “footing.” 5) Pulling thru 6) Priming and 7) Starting.

**The Safety Briefing** is the vitally important first step in the process, especially when working with an unfamiliar aircraft or pilot. This should include the starting sequence, the callouts to be used and their exact meaning, and whether the aircraft is to be secured by brakes alone, brakes and chocks, or even be tied down. Consideration should be given to the surface and “footing” in front of the aircraft, the removing of chocks or tie downs once the engine is running and lastly the position of and signal from the person propping the aircraft which will confirm to the pilot that it is safe to taxi the aircraft.

**The Communication** used in hand propping an aircraft is always “looped communication”, that is everything said by the person doing the propping is repeated verbatim by the pilot, after it is verified correct. The first callout is **Brakes “ON”.**

**Insuring the aircraft is secure and will not roll forward** is step 3. As these are light aircraft, they can easily be pulled forward by a single person. Grasping the prop at the hub, pull forward to see if the aircraft will move. It should not budge. If the aircraft still has the old mechanical brakes, wheel chocks are highly recommended. *Needless to say, one should not prop an aircraft alone.* If it must be accomplished solo, it is imperative the aircraft be securely tied down until the engine is idling. These aircraft are no different than a big model airplane & they fly just fine without a pilot. Many are the stories of aircraft getting away while being propped solo and then wreaking havoc during their destruction!

**Evaluating the footing** is next. Insure you are on a level surface which has good footing. It should not be slippery or have any loose stones or gravel. Once the engine starts you will be standing very close to a lethal object and it is important to not slip.

**Pulling the engine thru** is step 5. I use this step for a couple of reasons. The first is it lets me feel the compression level on that particular engine and the force it will take to pull the prop thru compression. The second is I can evaluate the blade position where the engine comes up against compression for suitability of hand propping. All these aircraft were designed for hand propping so the propeller blade should be at the 10 to 11 o'clock position when it comes up against compression. If it does not, the propeller should be removed and repositioned on the hub. Lastly, I evaluate my grip and finger position on the propeller blade.

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Engines with inverted cylinders (Ranger) or radials (Kinner, Jacobs, etc.) require pulling thru to insure trapped oil in the inverted cylinders does not form a “hydraulic lock.” If the engine locks during the pull thru, the lower spark plugs must be pulled and the trapped oil drained before proceeding.

Before moving the propeller, the commands “**Brakes ON**” & “**Switches Off**” should be given by the person propping and repeated by the pilot after he has verified the brakes are on and the magneto switches are off.

The propeller is always treated as if the mags are “hot” and the engine will start. The body should be positioned at a comfortable arms length from the propeller with an erect posture. It is very important to not lean forward when pulling the prop thru, but to pull from the shoulder using just the shoulder muscles and not waist muscles. The hands should grasp the propeller with the flat of the hand firmly against the prop face and only the finger tips extending around the trailing edge of the blade. This is because, if the engine should “kick back” it will be easy to release your grasp and not be pulled into the prop arc.

Priming the engine is the last step before starting. Verify that the fuel selector is “On” and if a mixture control is installed, that it is in the “Full Rich” position. This is where knowledge of an individual engine’s “personality” is invaluable. Most of these small engines, on a “cold” start with typical summer temperatures, will take a couple of shots of primer. Some primers don’t draw much fuel with the first stroke, hence the “three shots” of prime. Lastly pull the engine thru two or three revolutions to draw the fuel air mixture into the cylinders. Stop with the descending propeller blade positioned between the 10 & 11 o’clock position. We are now ready to start.

Starting the engine is the final step. If the engine is well maintained, in frequent use, and we have completed the process correctly, it will usually start on the first pull. The command “**Brakes and Contact**” is now given and repeated verbatim by the pilot, after he has verified the brakes and mags are on. Position the hands and body as described above. This time we will start by lifting our right leg and swinging it forwards much like a baseball pitcher who is preparing to throw a pitch. We now swing our right leg back underneath us, stepping back while we simultaneously smartly pull the propeller thru compression. Insure that you maintain an upright posture, pulling the prop through with the shoulder, not waist muscles. Continue the arm motion until you arms are down by your sides and step back from the now (hopefully) idling engine. If the start attempt was not successful, the final process is repeated until it starts. If several attempts are unsuccessful, we may have to reprime. If the engine becomes flooded, it will be necessary to pull it thru backwards to “clear” excess fuel from the engine. As always, if nothing works the next step is maintenance.

Always, Always, Always leave the front of an idling engine by walking parallel to the wing leading edge, around the tip and back the trailing edge. More than one aviator has “met his Maker” by walking directly into the propeller after a successful start!

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**With the engine idling**, proceeded around the wing tip and approach the cockpit from the back of the wing. If it was a “solo” start, the aircraft can now be untied and the chocks removed. **Always go around the rear of the aircraft when the engine is running!** If a two person start, remove the chocks; then position yourself at the prearranged spot (so that eye contact can be made with the pilot) and give an “aircraft clear” signal.

**Floatplanes** are propped from behind the propeller. Position yourself on the right float (cockpit door side) in front of the wing strut. Reach behind you with the left hand and grasp the strut or other aircraft structure, while using the right hand to prop the engine. Be sure you have good footing on the float & a firm grasp on the strut, as the aircraft will be “under way” as soon as the engine starts. Also be sure to position the aircraft (using the paddle if necessary), so that it will not drift into anything while being started or taxi into anything while you’re returning to the cockpit. Some people use this as an alternate method to prop a land plane “solo”, but I think it’s safer to just tie it down.

**Tricycle gear aircraft** are not good to prop, because the lower propeller hub tends to make you lean forward when propping, especially if the propeller comes against compression at the wrong blade position. This may well be the case, as it is not a consideration when installing a propeller on these aircraft. Also avoid high compression, fuel injected engines. They are best left to maintenance & starters.

The propeller (like a firearm) should be treated with respect, not fear, and **always assumed to be hot** (or loaded)! **It can be lethal!**

The thought for this month, **“Wisdom understands the future consequences of current actions!”** So until next month, **Think Right to Fli-Rite!**



**Attempting a “Light Sport” Aircraft “Relight”**