



November 2013

Brian Burke, editor

NEXT CLUB MEETING

Date: Saturday November 23, 2013

Time: 11:00 AM

Place: Gyro club hangar, Lansing Muni Airport

Agenda Topic(s):

- *Upcoming events*
- *Awards Banquet Planing*
- *Cylinder Leak Down Testing*
- *January 1st. Polar Bear Pot Luck*

Hangar Rent Due November

Any deadbeats need to beat it harder!

October Meeting Summary

This past meeting's nominees: Ray for Treasurer, Larry for VP Jon for Secretary, Adam for President
The single nominee for each position was accepted

Tom will send out a mass e-mail regarding the Kehoe items.

There will be an auction at the next meeting to sell both 25' sets of blades with a \$2500 reserve each. Bids can be emailed to Tom in advance, but there will be a LIVE auction at the next meeting.

The Club trailer will be made roadworthy and nearby storage of the trailer will be sought..

What is Larry Doing?



Can't Wait, see next page.

Hangar Housekeeping

We are going to take pictures of items whose ownership have been left unidentified and are of no foreseeable use to the club. Brian will send out an email letting people know this stuff has to be moved, it will be brought down here for 1 month, then afterwards will be disposed of.

Ray has offered to prepare an estimate for modifications to the hangar including a wall, stairs and a deck for added storage space.

UPCOMING EVENTS

**Novemberr 23
January 1, 2014**

**Club meeting
Polar Bear Fly-in**

**Lansing Arprt.
Lansing Arprt.**

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Prop Pitch and Thrust

October saw two more items checked off Larry Zimmerman's gyroplane "to-do" list. The first item was setting the pitch of the prop. The prop is a Warp Drive 60" diameter, 3-bladed prop with nickel edges and rounded tips. The correct pitch should allow Larry's Rotax 503 UL DCDI to operate at 6500 rpm static at WOT(wide open throttle). In flight the rpm should peak at 6800 rpm. A prop pitch gauge which quickly sets blade pitch was used to set all blades to 7.5° as a suggested starting point.

A Gyroplane relies on the prop thrust for forward flight and the rotor autorotation to provide lift. With a 2-stroke engine, such as the Rotax 503 UL DCDI, the power band or peak torque is narrow, between 6000-6500 rpm. Rotax goes further to state that operation at 6800 rpm is permissible for one minute. When the engine is being operated at WOT in a stationary position each propeller blade moves through the air of the previous blade and prop cavitation occurs. This "dirty air" is why engine rpm is lower. As the gyroplane accelerates into flight the prop unloads and rpm increases a few hundred rpm because prop efficiency is increased in "clean" undisturbed air. Accordingly, a desired static pitch of 6500 rpm should enable a 6800 rpm in flight. However, because an open frame gyroplane is so draggy in flight the increased engine rpm realized doesn't add a great deal to the upper end of the performance envelope.

The second item on the list was to perform a thrust test. This test is valuable in determining the correct prop pitch and static engine rpm. The goal is to set up the engine to operate at WOT and achieve maximum rpm, peak torque with the best fuel burn. If the prop/engine combination is correct, the Rotax 503 UL DCDI develops 50 hp according to Rotax's performance sheet.<http://www.leadingedge-airfoils.com/503info.pdf> <http://www.rotaxservice.com/documents/582perf.pdf>

What does the data tell us? A propeller blades "lift", or its thrust depends on the angle of attack and engine rpm. The twist in the blade does a good job of keeping that lift constant throughout the blade length. A low pitch reading (blade angle of attack) will enable good low speed acceleration and climb or pulling power. The engine reaches max rpm at a lower airspeed. A high pitch setting (greater angle of attack) will allow a higher airspeed and better fuel economy but the take-off will be longer, or slower acceleration. The Results based on the weather conditions that day showed that at WOT the engine operated at 6400 rpm static. The thrust of the prop/engine combination was 400 lbs. of thrust. By decreasing the pitch by one degree, the engine rpm should increase about 200 rpm and the thrust should drop a little. This adjustment will allow the engine to operate up to the 6800 rpm limit once in flight. Temp = 650 F Humidity = 81% Due point = 560 F

Test Update A few weeks later Jack and Albert performed thrust tests on their gyroplanes. Weather conditions at the time of the test: Temp = 460 F Humidity = 79% Due point = 400 F

Jack's thrust test results were: Rotax 582 Mod. 99 6400 rpm WOT = 500 lbs. thrust 5800 rpm(cruise power setting) = 380 lbs. thrust The engine/prop combination is correct.

Albert's thrust test results: Rotax 503 DIDC 6800 rpm WOT = 375 lbs. thrust 6400 rpm(cruise power setting) = 350 lbs. thrust The pitch could be increased a degree to bring rpm down and increasing airspeed in cruise. **Ad**

