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**Sent:** Sunday, June 16, 2024 5:16 PM  
**To:** TowPilots@gbsc.groups.io; CFG@gbsc.groups.io  
**Subject:** High Temperature Forecast

Glen Kelly asked earlier this spring for me to put together something about operations in high temperatures and the effect of Density Altitude. I apologize but it has been on the back burner. I had planned a small booklet with tables.

We have temperatures approaching the high 90s forecast for this week.

First, most of the Tow Pilots are aware of how the Pawnee and BirdDog fly with and without a glider on tow. Normal climb out without a glider, off the ground quickly and climb rate well more than 1000fpm. Add that heavy 2seat glider, probably half the climb rate. With the Pawnee or BirdDog, if I'm getting more than 500fpm, I figure I'm in lift.

Effect of Temperature (Density Altitude), Standard Pressure and Temperature is 29.92inHg and 15C (59F) at Sea Level.

Sterling Field elevation 460ft MSL, StdTemp is roughly 14C. DA is 451ft. Raising the temperature to 20C (68F) raises the DA to 1154; 25C (77F), 1726; 30C (86F), 2287; 35C (95F), 2836. We could reasonably expect Density Altitudes between 2500ft to 3000ft this week.

What effect does that have on performance. The performance table available for the BirdDog are enlightening. The table is based on 2100# aircraft, Max GW, we are flying slightly below MaxGW. Takeoff data is provided as distance to clear 50ft AGL with the Ground Roll as a percentage of the total distance. 0 (zero) degree flap, ground roll is 44% of the distance; 30Degree Flap, ground roll is 28% of the distance. We use about 10degree flap with a glider in tow at 70mph.

**Remember these numbers do not reflect a glider on tow. These numbers are based on a paved surface.** Yes, the initial takeoff roll is paved when departing Rwy 34.

Temp	0 Flap, Climb at 78		30 Flap, Climb at 73mph	
	50ft Obs	44% Ground Roll	50ft Obs	28% Ground Roll
60F	1005	442	1015	284
80F	1065	465	1075	301
100F	1130	497	1140	319

I watched some takeoffs yesterday with the glider on tow and did some measurements on Google Earth. Saturday was not too hot, 80F with a nice 10knt headwind.

**Ground Roll with a 2-seat glider was about 1100ft with a headwind!** More than twice, almost 3 times, what "the book performance" suggests.

Lifting off by the cross taxiway (Rwy 34) you have approximately 1200ft of "runway" remaining.

**Climb Rates:**

Normal rate of climb, NO GLIDER, Max Continuous Power 2300RPM (BirdDog) at 86mph, Flaps UP, expect 965fpm (60F); 935fpm (80F); 905fpm (100F).

We know we normally get about 500-600fpm with a glider climbing at 70mph with apx 10degree flaps to not over speed the glider. **We achieve about ½ the published climb rate with a glider on tow on a "normal" day.**

We know from experience that normal departures with a glider on tow, we are “above treetop” height using that last 1200ft of grass to accelerate after liftoff and initiate the climb. Add the heat, humidity and expect slower acceleration and initial climb rate. I’m not ready to halve that climb rate again to 200-300fpm in 90F temperatures.

**Heat/Humidity/Hydration:** Please remember the need to take care of yourself. Dehydration leads to problems, physically and mentally. Heat exhaustion is critical. Both lead to making poor judgements.

I have experience in high density altitude operations. It is a wake-up call when you realize your nice powerful 250HP Pawnee cannot climb more 200fpm with that ballasted single seat, glider in tow. You are hoping for a thermal to help you climb. After struggling to 2500ft AGL, a thermal pops, the glider releases, and you start breathing again. Back on the ground, you do the math and realize that 5500MSL runway you departed on already had a DA of 8100ft (80F) and it is only 11 am. Then figure out that the Max Service Ceiling on that Pawnee is about 12,000ft and you took off from 8,000ft DA. 3K AGL and you are not climbing anymore with that glider. Thankfully, I had no hills to out climb, no trees in the way, just low desert scrub and the occasional 10ft Joshua Tree.

I remind pilots of the MAX CONTINUOUS POWER limitation on the BirdDog. Full throttle will net you almost 2600RPM, 213HP, you may see higher RPM in this high DA environment. That is a 5 min limit. Pull the power back out of the yellow arc to 2300RPM, 190HP, when safe to do so. I normally do that at about 1400AGL.

Be safe out there.

Bill