Glider Cross-Country

An Overview for Everyone

Jan. 13, 2024

Agenda

Seymour - Greensburg - Seymour

Purpose of the presentation

Getting started today for next season

What to do a few days before the flight

Morning of flight preparation

Takeoff

En Route

Landing

Retrieval

Purpose of Presentation

Overview of a glider cross-country

- Something for everyone
- Provide a high level overview of the planning and execution of a glider cross-country
- Example: Seymour - Greensburg - Seymour
- Long and Short term preparation is a key to success
- Hard and fast rules
- Some techniques— but remember, everyone is different
- First and foremost, keep it SAFE!

Preparation

During the Off Season Months

- Study up
- Analyze last season’s flights (OLC and SeeYou are great sources)
- Update flight computers
- Update waypoint file(s)
- Practice setting up tasks
- Set goals for 2024

Sources of Study

Something to read on cold winter day

- *Cross-Country Soaring*, Helmut Reichmann (the best technical book, ever!)
- *Glider Flying Handbook, Chapter 11*, FAA
- *Understanding the Sky*, Dennis Pagen
- *Glider Pilot's Handbook of Aeronautical Knowledge, Chapter 15*, Russell Holtz
- *Winning on the Wind,* George Moffat (tidbits of good information and interesting narrative seasoned with a healthy dose of pompousity. George will be 97 this year.)
- *Sky Full of Heat*, Sebastian Kawa (recently won the World 15m Championship in Australia)
- *Dancing with the Wind*, Jean-Marie Clément (advanced material on lift— thermal, ridge and wave)
- Any of the Bob Wander's books (short and concise, practical advice)
- SSA rules for badge flying (not easy to understand). Ask for help when interpreting the rules.
- Pilot Operating Handbook for the gliders you plan to fly
- FARs (no kidding)
- Private or Commercial written test guide (great opportunity to brush up)

Preparation

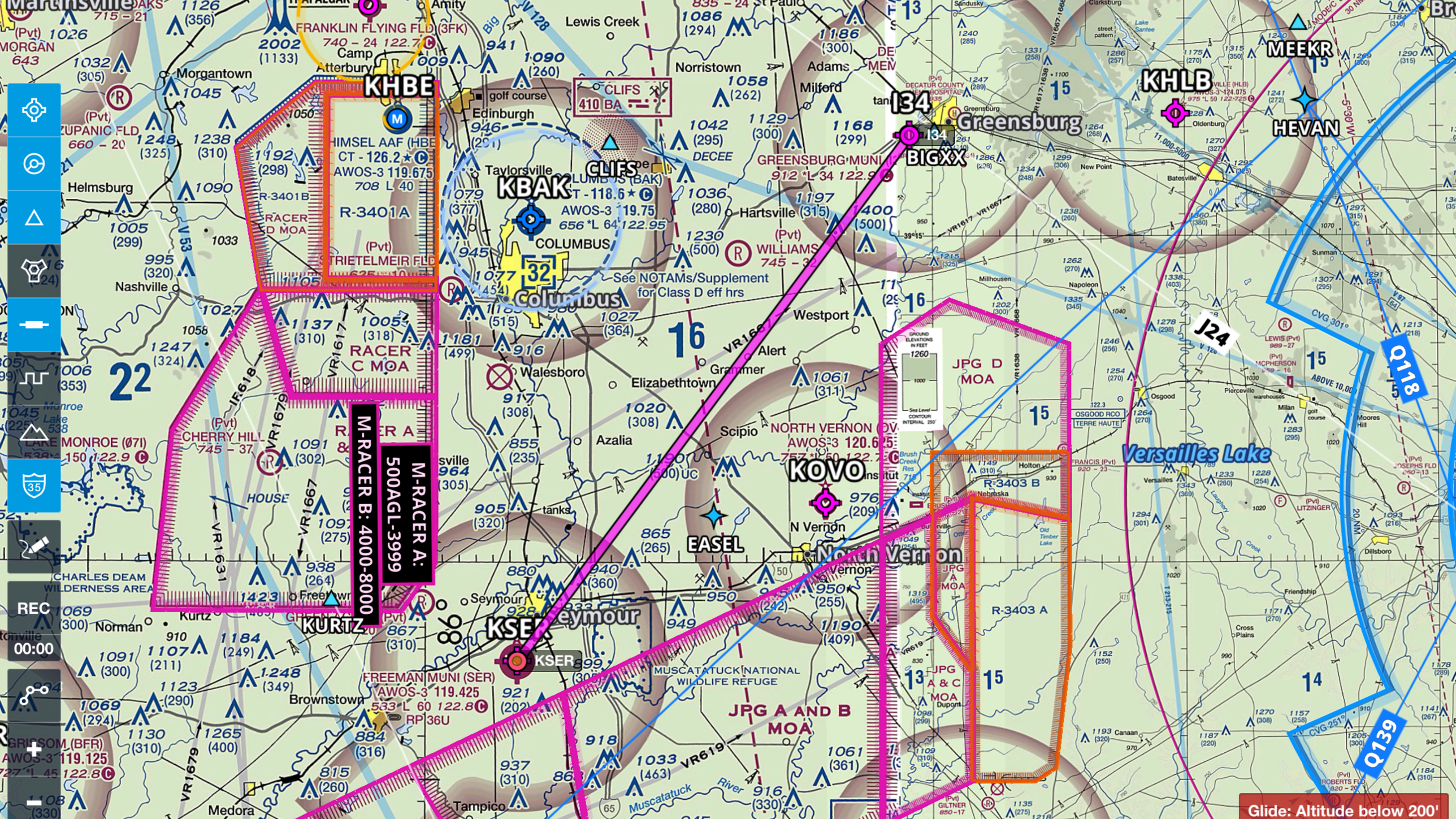
Fly During the Off Season

- Winter weather often includes crosswind takeoff & landings
- Sharpen thermaling skills in weak lift
- Get comfortable with unassisted takeoffs
- Set up varios and flight computers
- Check batteries
- Fly some small tasks for practice
- Prepare the glider
- Inspect and repair ground equipment
- Prepare the trailer
- Use a checklist

Soaring Season Finally Begins

It’s the first good flying day of 2024, and you plan an out and back to Greensburg in PW5

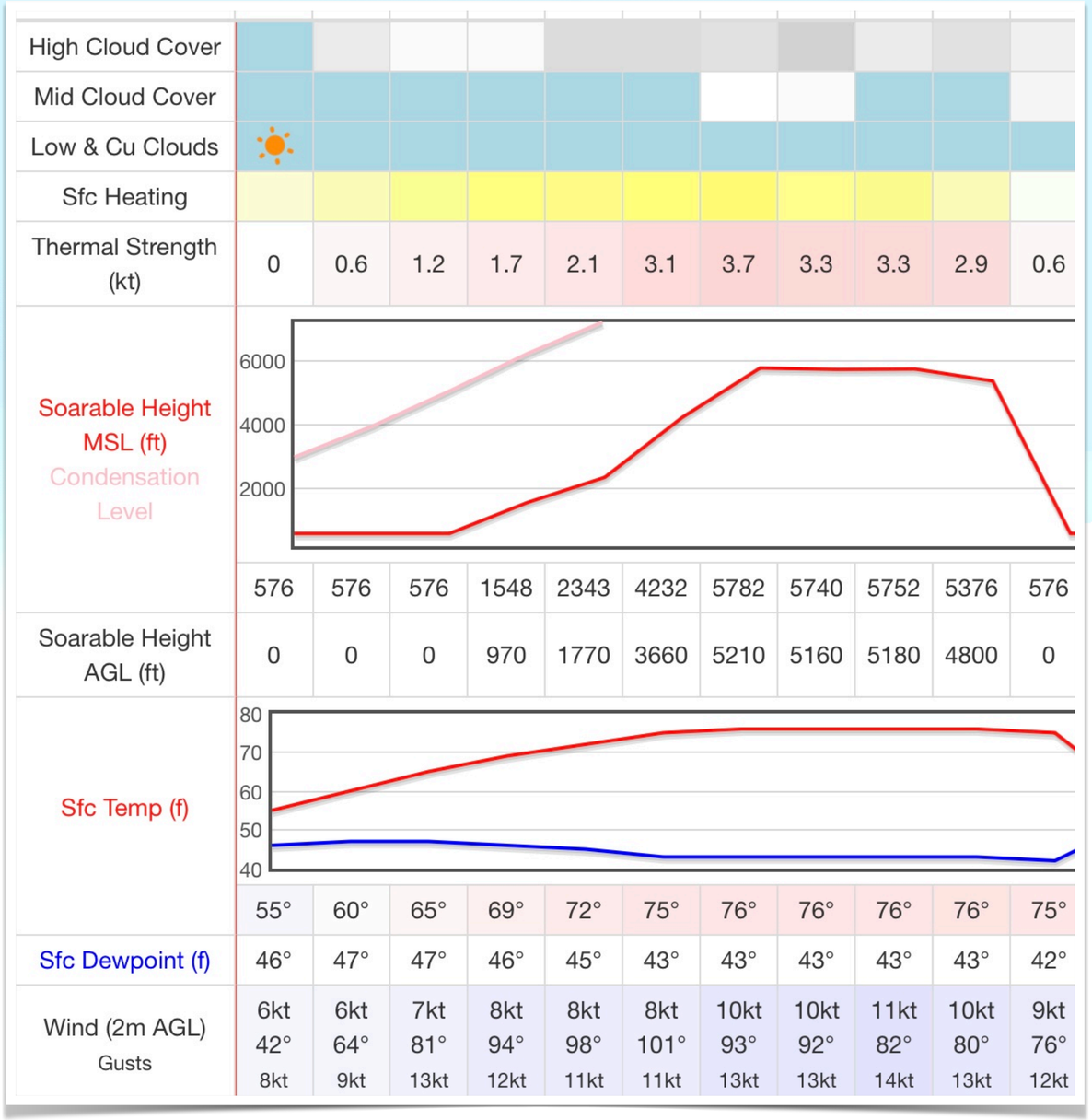
60 NM (69 SM) roundtrip


KHBE
FRANKLIN FLYING FLD (3FK)
740 – 24 122.7
HIMSEL AAF (HBE)
CT - 126.2
AWOS-3 119.675
708 L 40
R-3401A
RACER D MOA
(Pvt) STRIETELMEIR FLD
RACER C MOA
M-RACER A: 500AGL-3999
M-RACER B: 4000-8000
(Pvt) CHERRY HILL
745 – 37
LAKE MONROE (Ø7I)
150 122.9
CHARLES DEAM WILDERNESS AREA
KURTZ
KSER
FREEMAN MUNI (SER)
AWOS-3 119.425
533 L 60 122.8
RP 36U
MUSCATATUCK NATIONAL WILDLIFE REFUGE
JPG A AND B MOA
KBAK
CLIFS
410 BA
COLUMBUS
See NOTAMs/Supplement for Class D eff hrs
KOVO
EASEL
NORTH VERNON (OVO)
AWOS-3 120.625
757 *L 50 122.7
JPG D MOA
JPG A MOA
JPG A & C MOA
R-3403 B
R-3403 A
I34
BIGXX
Greensburg
GREENSBURG MUNI
912 *L 34 122.9
KHLB
MEEKR
HEVAN
J24
Q118
Q139
CVG 301°
CVG 251°
Versailles Lake
Glide: Altitude below 200'
REC
00:00

Days Before Flight

Hoping for Good Lift

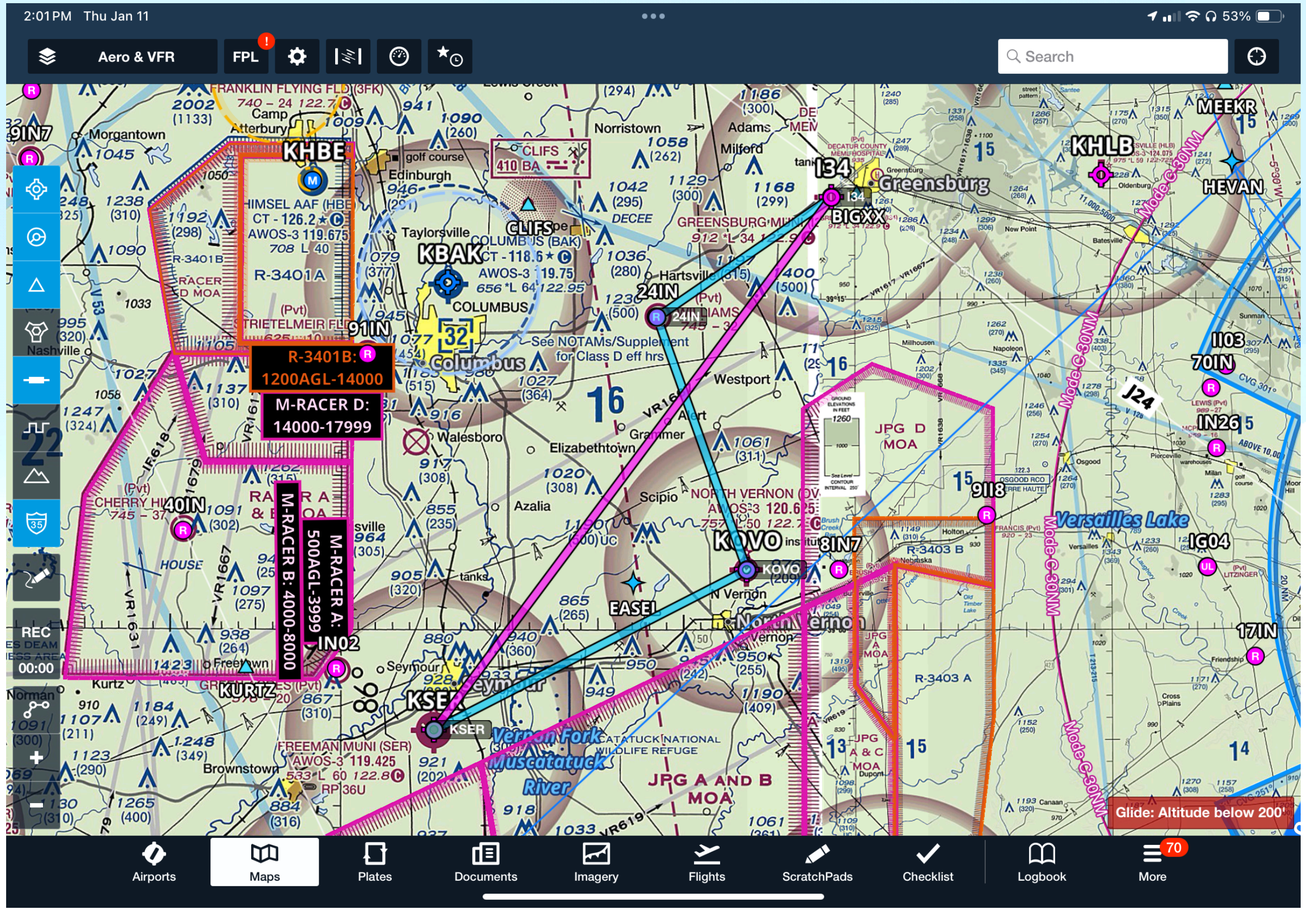
- Review Skysight.io and/or Dr. Jack's Forecasts
- Key items:
  - Thermal heights and strength
  - Winds (surface and aloft)
  - Buoyancy shear
  - Cloud markers
  - Length of soaring day
  - Precipitation and/or storms



Is this a reasonable task in PW5?

How long will it take to fly out and back?

A. 2 hours
B. 3 hours
C. 4 hours
D. Run out of daylight



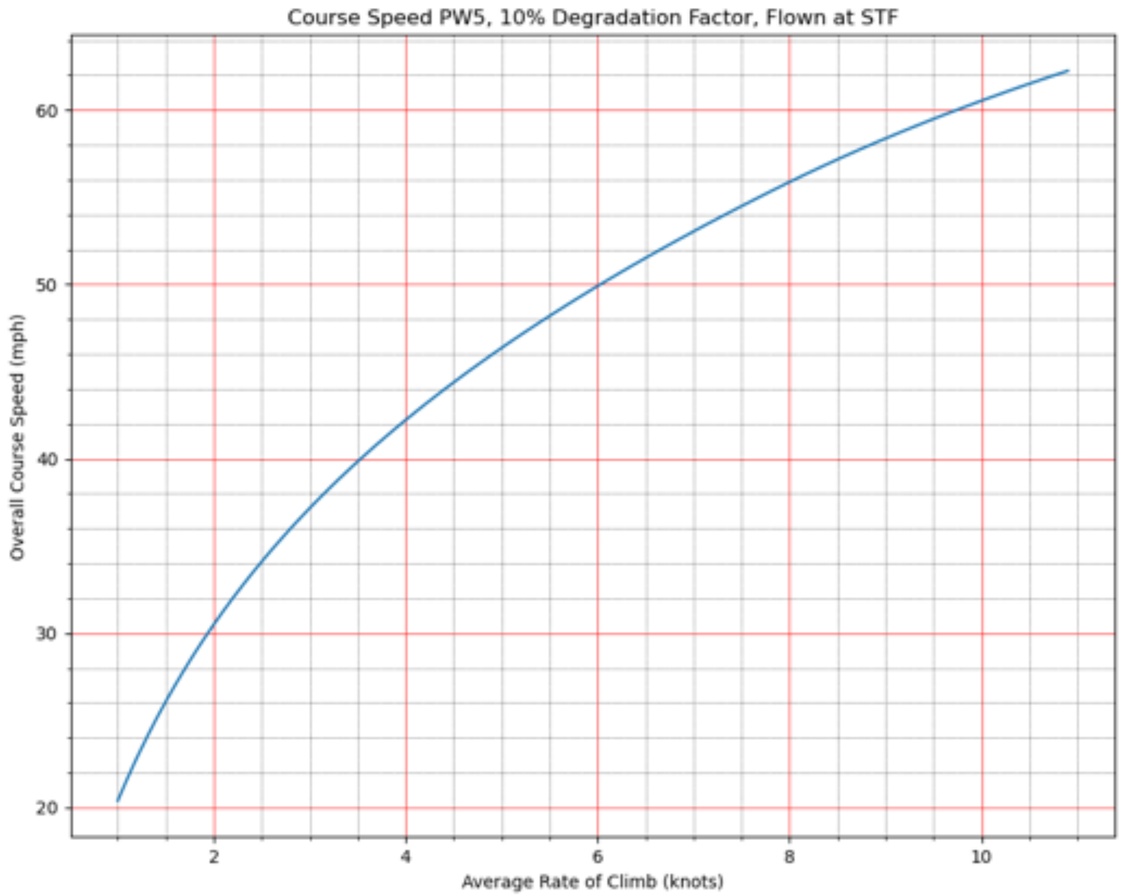
Estimating Course Time

Many Assumptions
Bob's Method

- After takeoff, thermal around Seymour for 30 minutes.
- With 3 knot lift in the forecast, I can usually plan on attaining an average climb of only 2 knots. It takes time to enter, center and depart the thermal. Plus I fly like a Sunday driver. Your results may vary.
- It's 60 NM roundtrip. But I know I'll zig-zag 25% more, for a total distance of 75 NM. Assuming an average groundspeed of 30 knots, total en route time is 2.5 hours.
- Total flight time is about 3 hours
- Therefore, it's a reasonable task to plan!
- **Wait! How did I come up with 30 knots as an average course speed?**

Maximum Course Speed

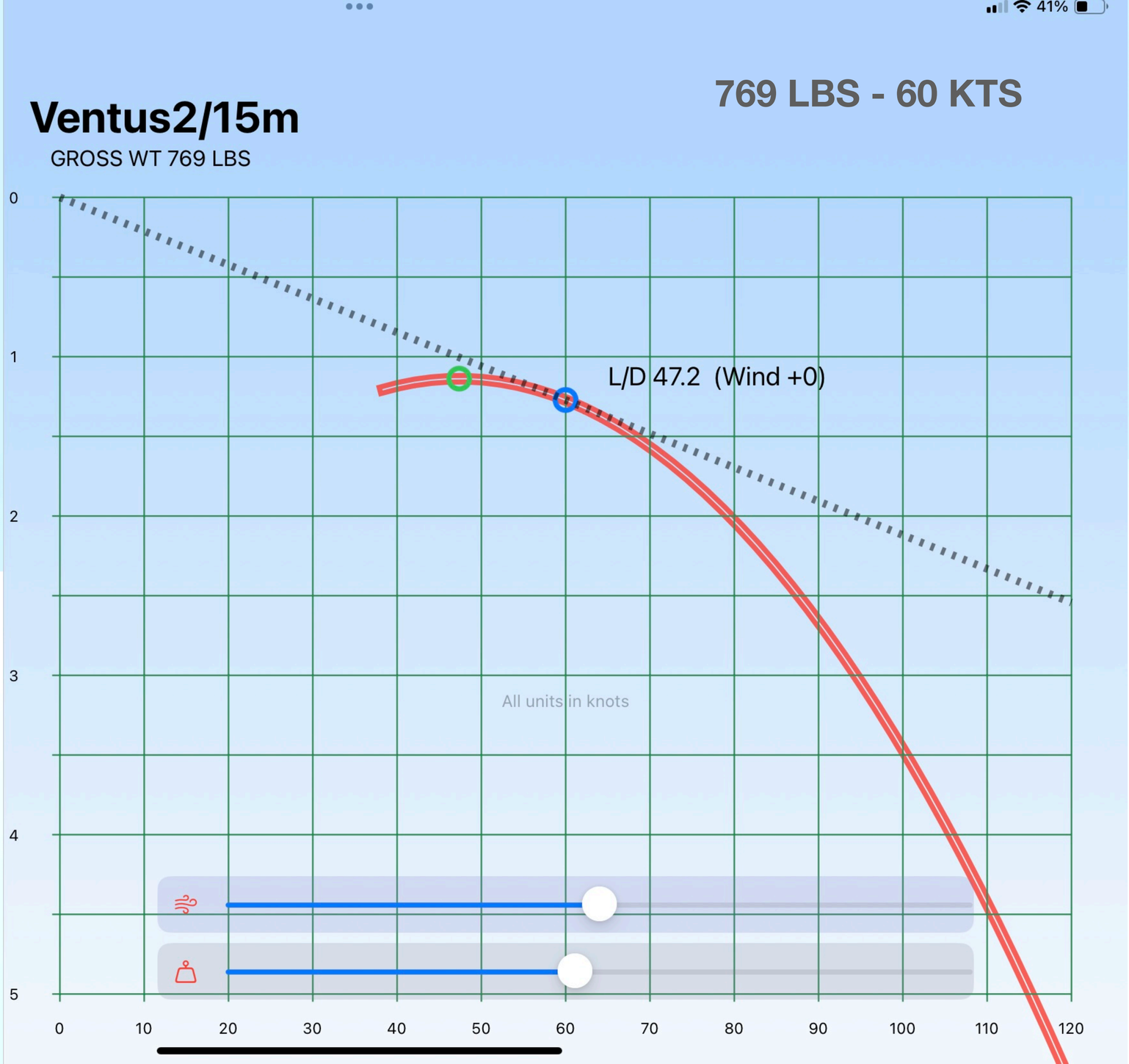
Overall Course Speed vs. Average Rate of Climb

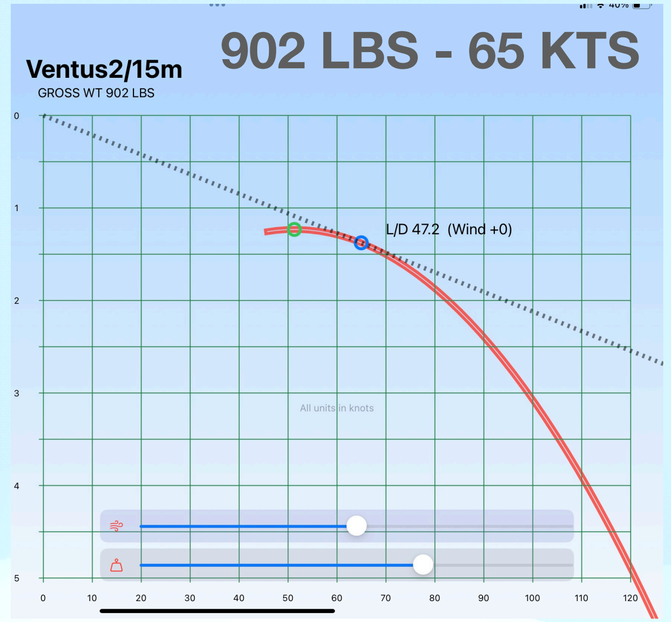


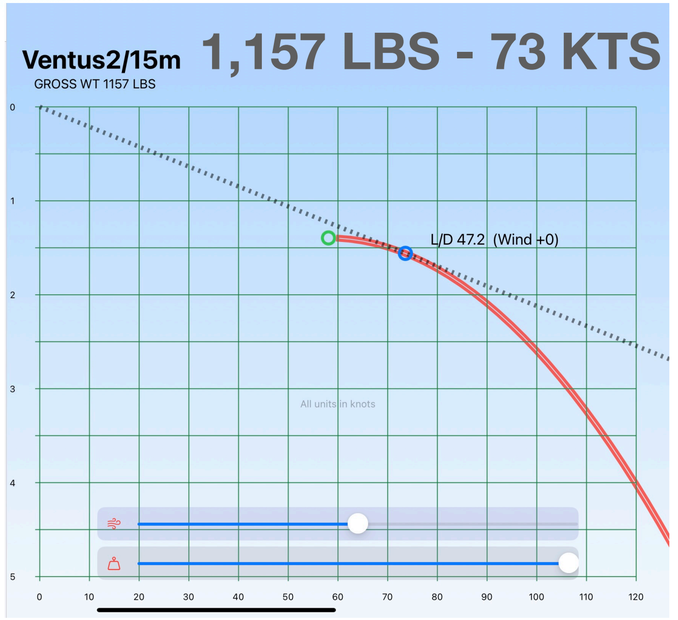
What about Winds Aloft?

Won’t they affect overall course speed?

- For this analysis, the winds aloft are assumed to be calm.
- The effect of wind will be discussed later in this presentation.
- Stronger winds results in slower overall course speed. It’s math.
- A combination of strong winds aloft and weak lift can often result in flying away from a destination. In other words, weak lift and strong winds can make it impossible to fly a task.
- Ballasting a glider often helps improve course speed, especially when winds aloft are strong. Changing the weight of a glider (i.e., wing loading) does not change the best glide ratio (best L/D) — it simply changes the speed at which the the best L/D occurs.


Ventus2/15m
GROSS WT 769 LBS
769 LBS - 60 KTS
L/D 47.2 (Wind +0)
All units in knots


Ventus2/15m
GROSS WT 902 LBS
902 LBS - 65 KTS
L/D 47.2 (Wind +0)
All units in knots


Ventus2/15m
GROSS WT 1157 LBS
1,157 LBS - 73 KTS
L/D 47.2 (Wind +0)
All units in knots

The Day Before the Flight

Things to do…

- Tow pilot?
- Find out what other pilots are planning
- Check NOTAMs and TFRs
- Review weather forecasts
- Charge portable flight computer (eg., Oudie)
- Confirm waypoint files and tasks are loaded
- Charge glider batteries
- Use a checklist

The Day of the Flight

Things to do at home…

- Wake up
- Check soaring forecast
- Coffee
- How are you feeling?
- Weather briefing
    - METARs, TAFs, NOTAMs, TFRs, etc.
- Confirm portable flight computer (eg., Oudie) is charged
- Confirm waypoint file and tasks are loaded
- Glider batteries
- Sectional chart
- Snacks and water for the flight
- License and photo ID
- Use a checklist before leaving house

The Day of the Flight

Things to do at airport…

- Preflight glider (remove tumbleweeds)
- Positive control check?
- Install batteries
- Install portable flight computer (Oudie)
- Check that today’s task is loaded
- Power up at least 10 minutes before takeoff
- Sectional chart & some method of calculating distance
- Talk with tow pilot
    - Emergency plan
    - Planned release location
    - Planned route
    - Possible aero retrieve airports
- Leave keys in car
- Use a checklist

The Day of the Flight

Things to Carry in the Glider

- Appropriate clothes, including hat
- Good shoes
- Food & water
- Sunblock
- Canopy cover
- Towel(s)
- Portable radio (if available)
- Phone
- Satellite tracker (good idea to have when doing longer cross countries)
- Current sectional chart (don’t rely on ForeFlight)
- Tiedowns
- Mini wing wheel (if needed)
- Charging cords
- First aid kit with mylar blanket
- Some small tools, knife and tape might be handy
- Use a checklist

Takeoff

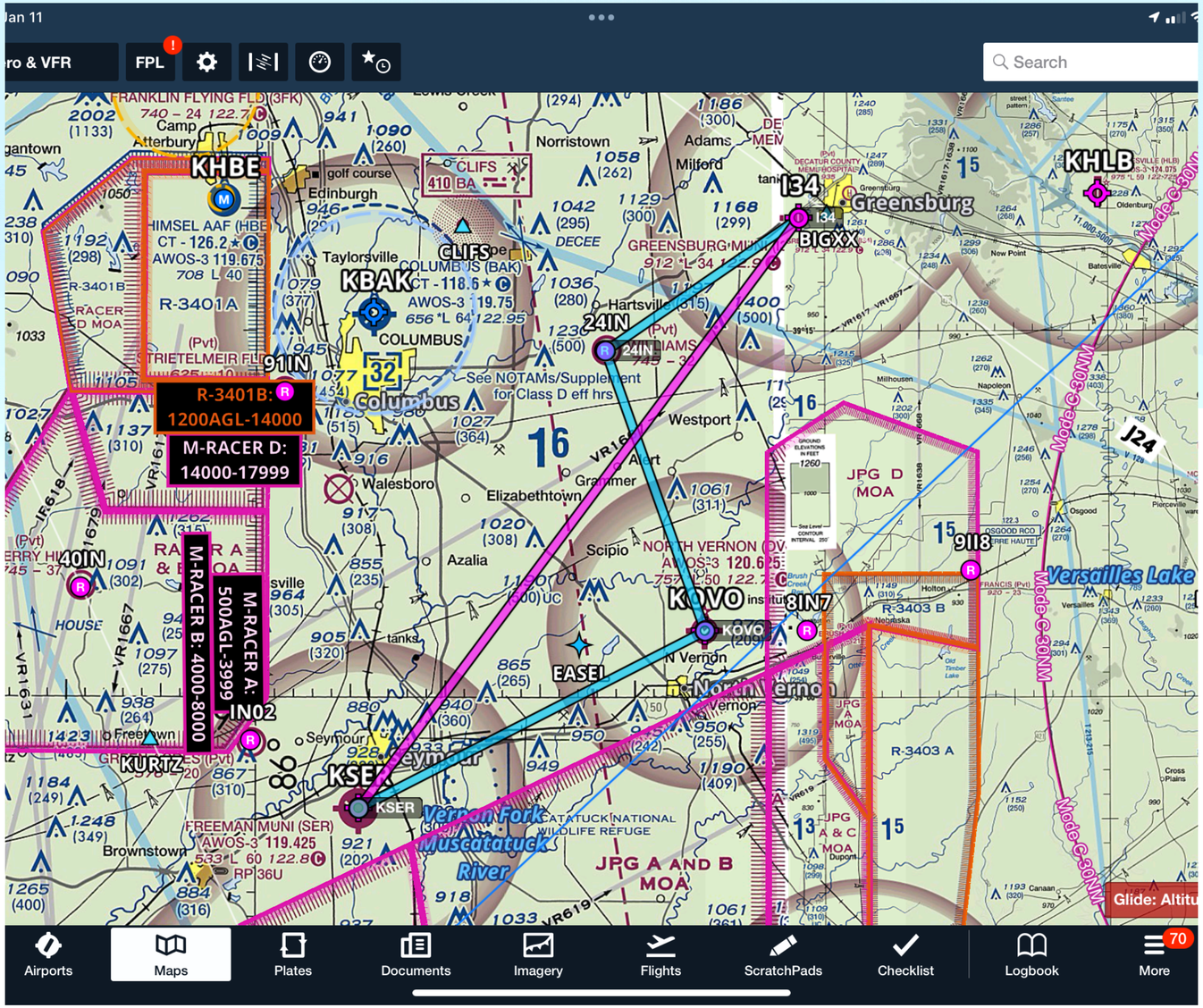
Sampling the Lift

- Don’t release early, especially if others are waiting for takeoff. My advice from experience.
- If a task is declared, practice going through the start line. Note the start altitude. Note: a declared task is not required for the silver distance leg.
- Set a minimum thermal height before leaving the area.

En Route

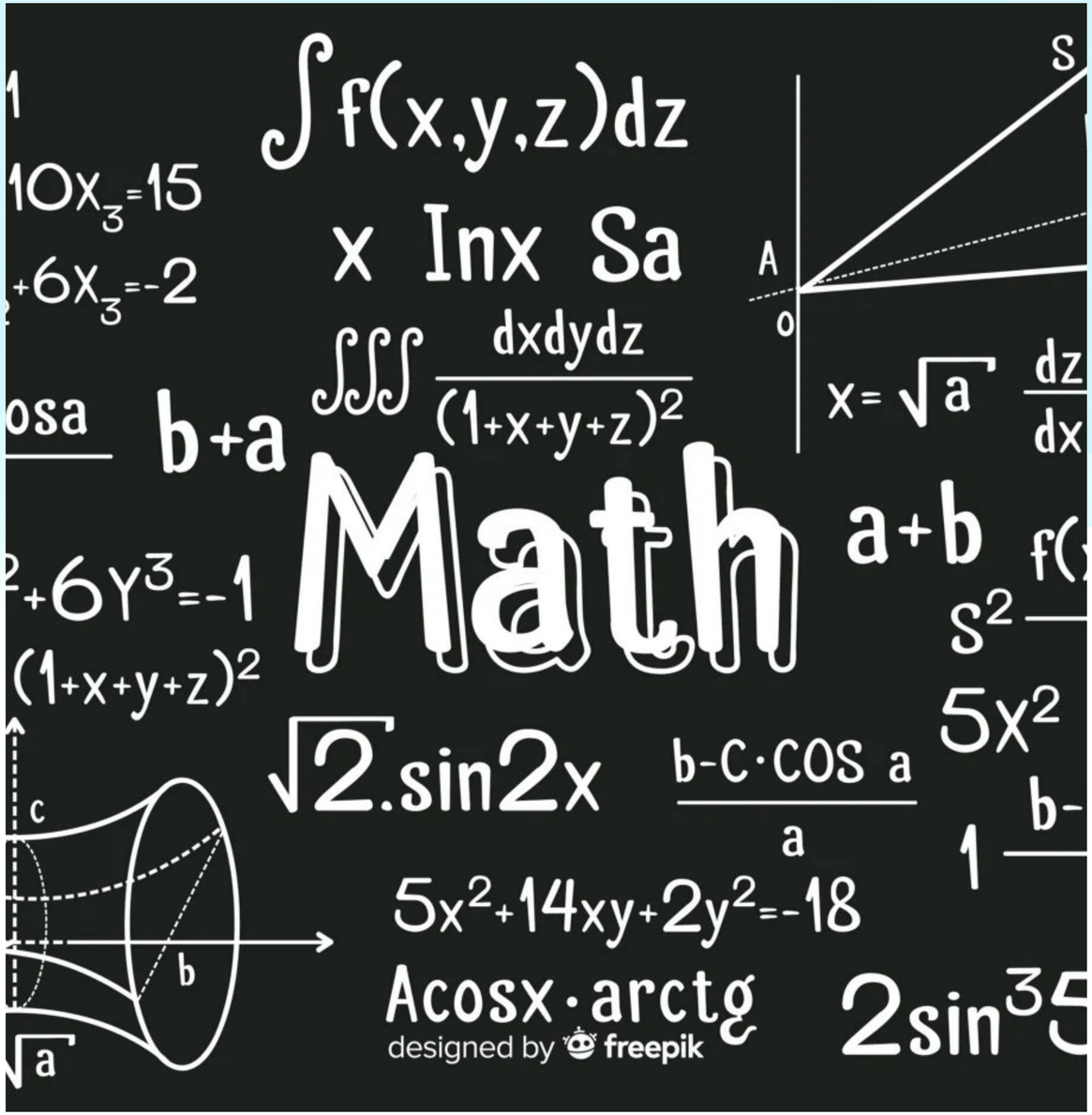
Head “Towards” Greensburg

- Stop and thermal as necessary
- Pay attention to the cloud markers and where the lift is found relative to the clouds.
- Look for cloud streets.
- Is there a big blue hole up ahead?
- Where are the cloud bases?
- Where is the thermal operating band?
- Stay within gliding distance of Seymour until a glide to North Vernon is assured.
- **How will you know if you can glide to an airport?**



Warning: Math Ahead

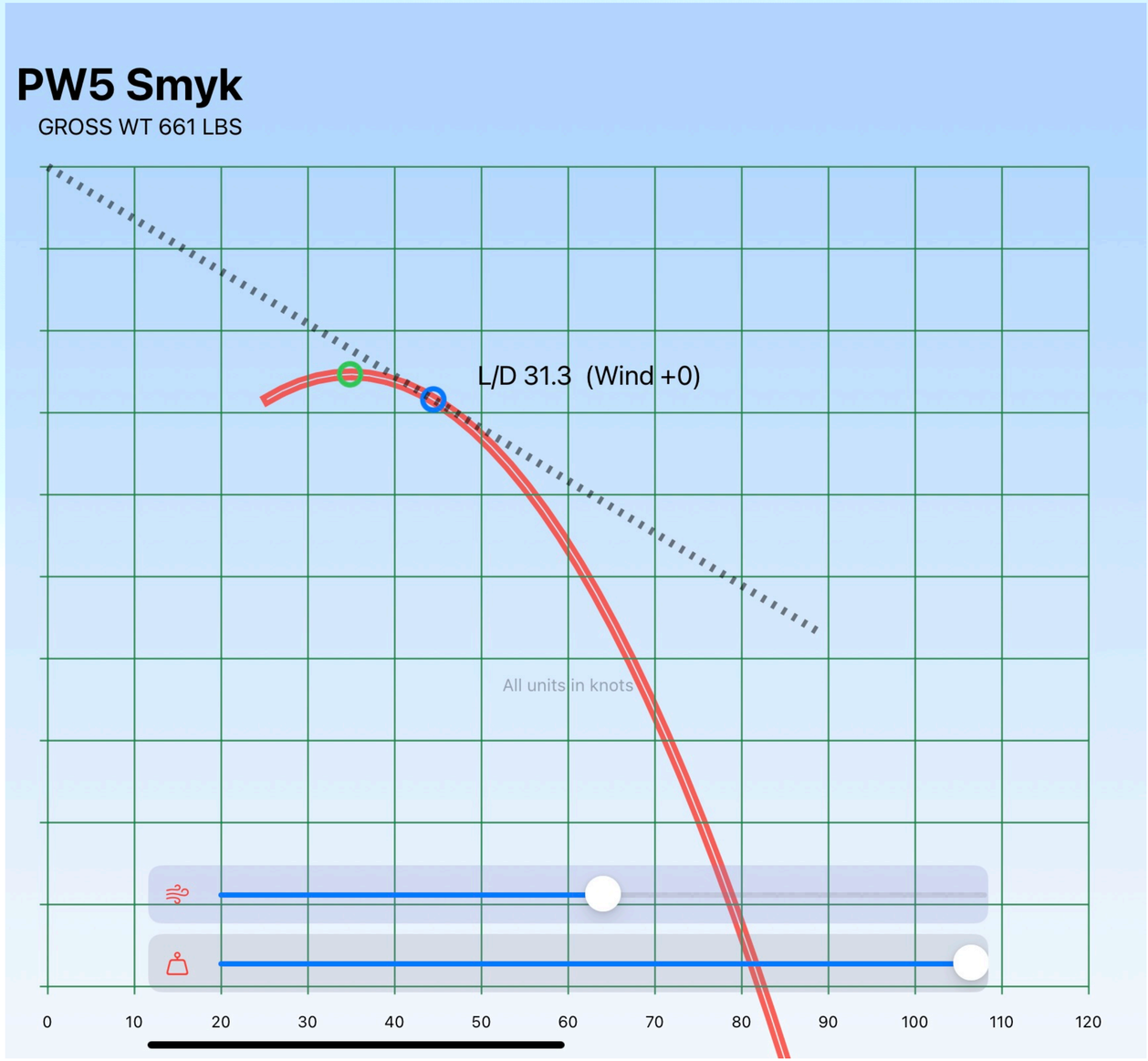
- This example shows how one might calculate a reliable glide path.
- Don’t try this while flying!
- In reality, all of us will use computers. But, we need to be capable of doing some mental calculations when the computers fail.
- The summary table (shown in a few slides) makes the math easy in order to perform reasonability checks of the computer’s calculations.
- For now, don’t focus on the math in the next four slides. Instead, **focus on the methodology.**



How Far Can I Safely Glide?

Example: PW5 No Wind

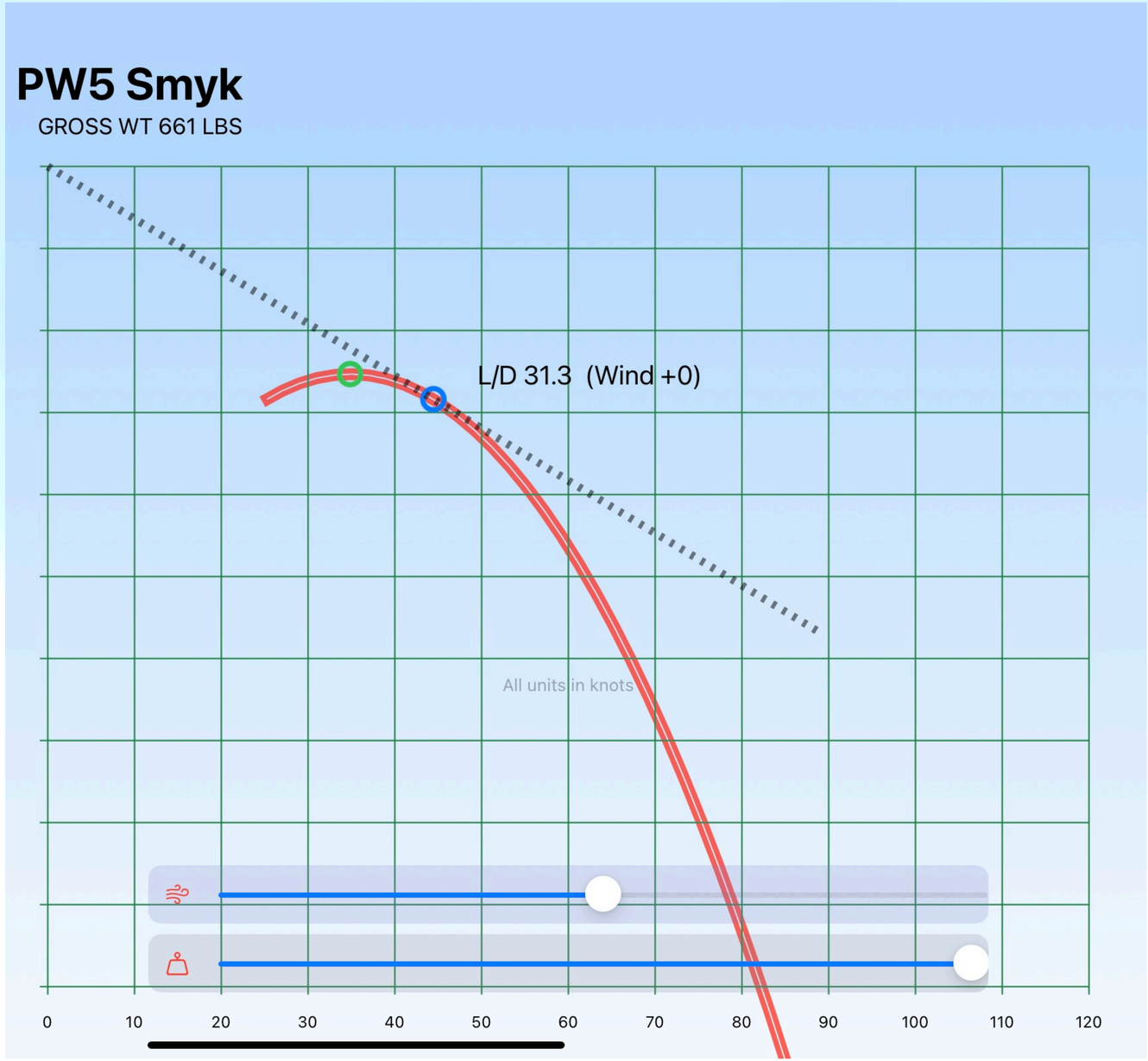
- **Published L/D 31 at 44 knots**
- Use 50% of published L/D for planning,**15.5**
- (15.5 * 1000 / 6076) = 2.5 NM per 1,000 FT
- 1,000 FT altitude loss over 2.5 NM (3 SM, 4.5 KM).
- Example: 5 NM from North Vernon (elev. 757 ft)
- 1,000 ft safety altitude, arrive at North Vernon at 1,757 MSL
- Therefore, one needs 3,757 MSL (757 + 1000 + 2000) to arrive at North Vernon at 1,000 AGL.



How Far Can I Safely Glide?

No one will fly the PW5 at 44 Knots!
Let's use 50 Knots, instead.

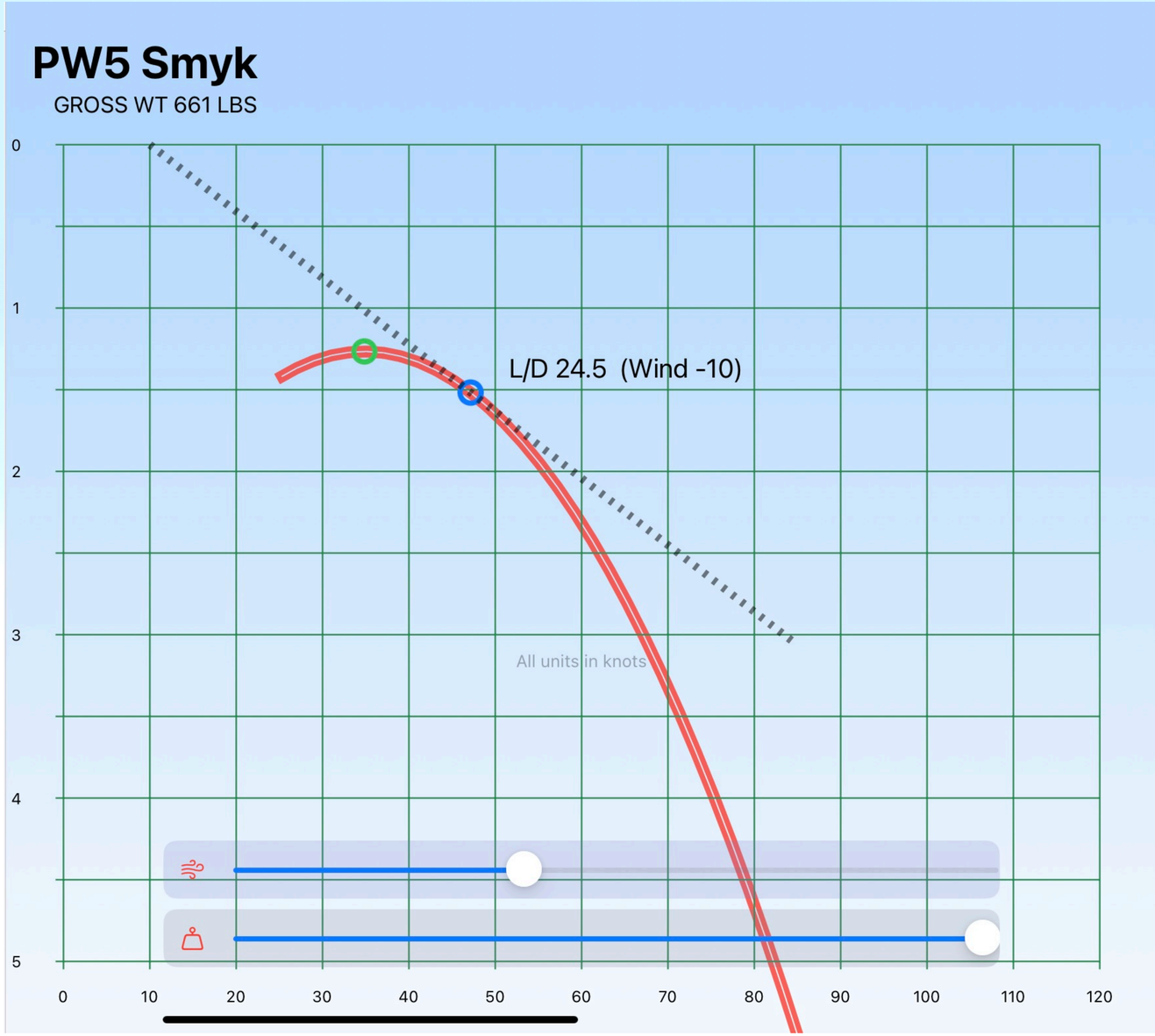
- Let's use a cruise speed of 50 knots
- Published L/D at 50 knots is 29
- Use 50% of published L/D for planning,**14.5**
- 1,000 FT altitude loss over 2.4 NM (2.8 SM, 4.4 KM).
- Example: 5 NM from North Vernon (elev. 757 ft)
- 1,000 ft safety altitude, arrive at North Vernon at 1,757 MSL
- Therefore, one needs 3,837 MSL (757 + 1000 + 2080) to arrive at North Vernon at 1,000 AGL.
- The altitude penalty for flying slightly faster is only 80 ft.



How Far Can I Safely Glide?

Example: PW5 10 Knot Headwind

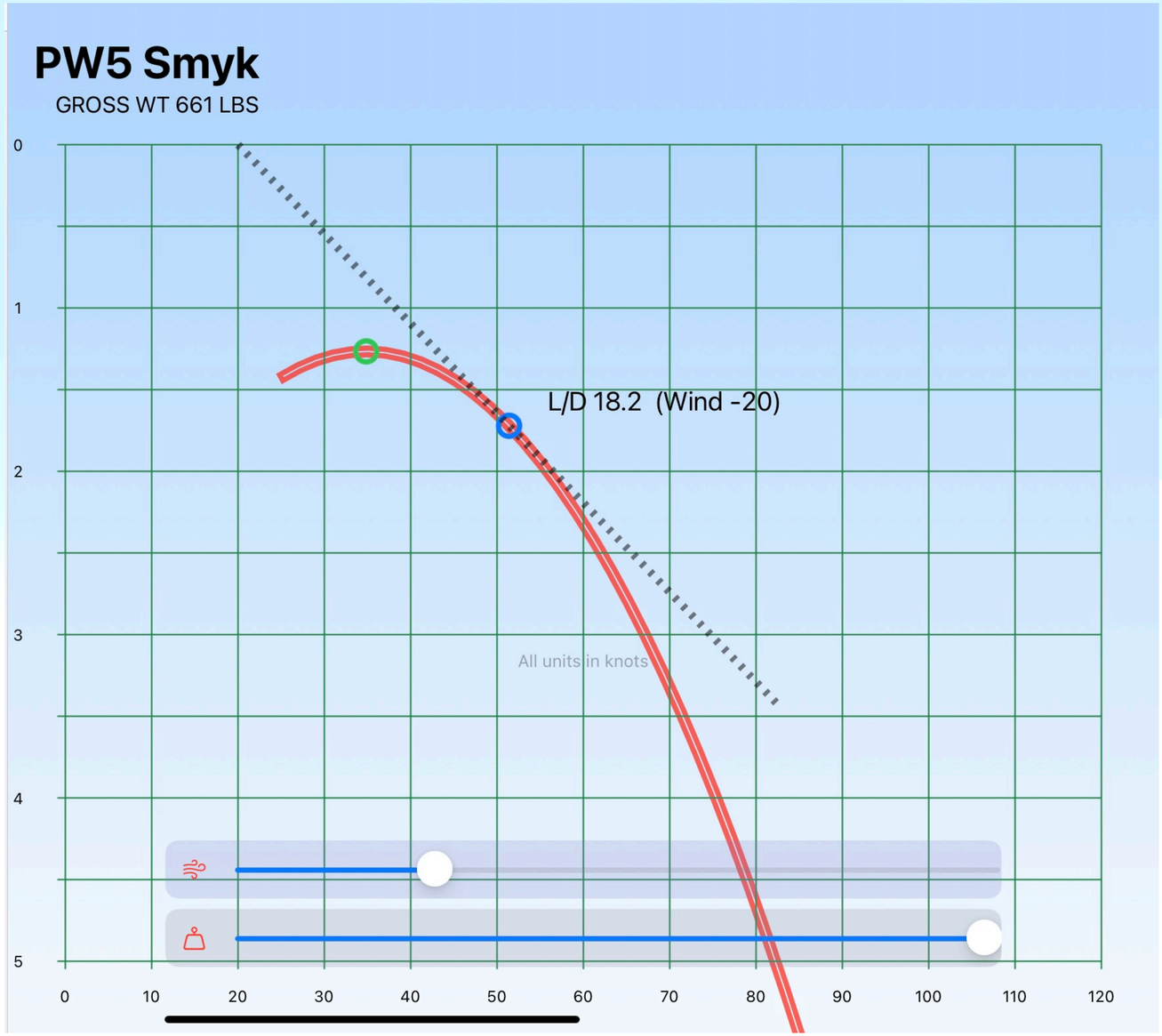
- Published L/D 29 at 50 knots (still air)
- Glide slope relative to ground (corrected for 10 knot headwind): 29*(40/50) = **23.2**
- Use 50% of theoretical L/D for planning,**11.6**
- 1,000 FT altitude loss over 1.9 NM (2.2 SM, 3.5 KM). Waving of math hands, here.
- Example: 5 NM from North Vernon (elev. 757 ft)
- 1,000 ft safety altitude, arrive at North Vernon at 1,757 MSL
- Therefore, one needs 4,388 MSL to arrive at North Vernon at safety altitude (757 + 1000 + 2,631)



How Far Can I Safely Glide?

Example: PW5 20 Knot Headwind

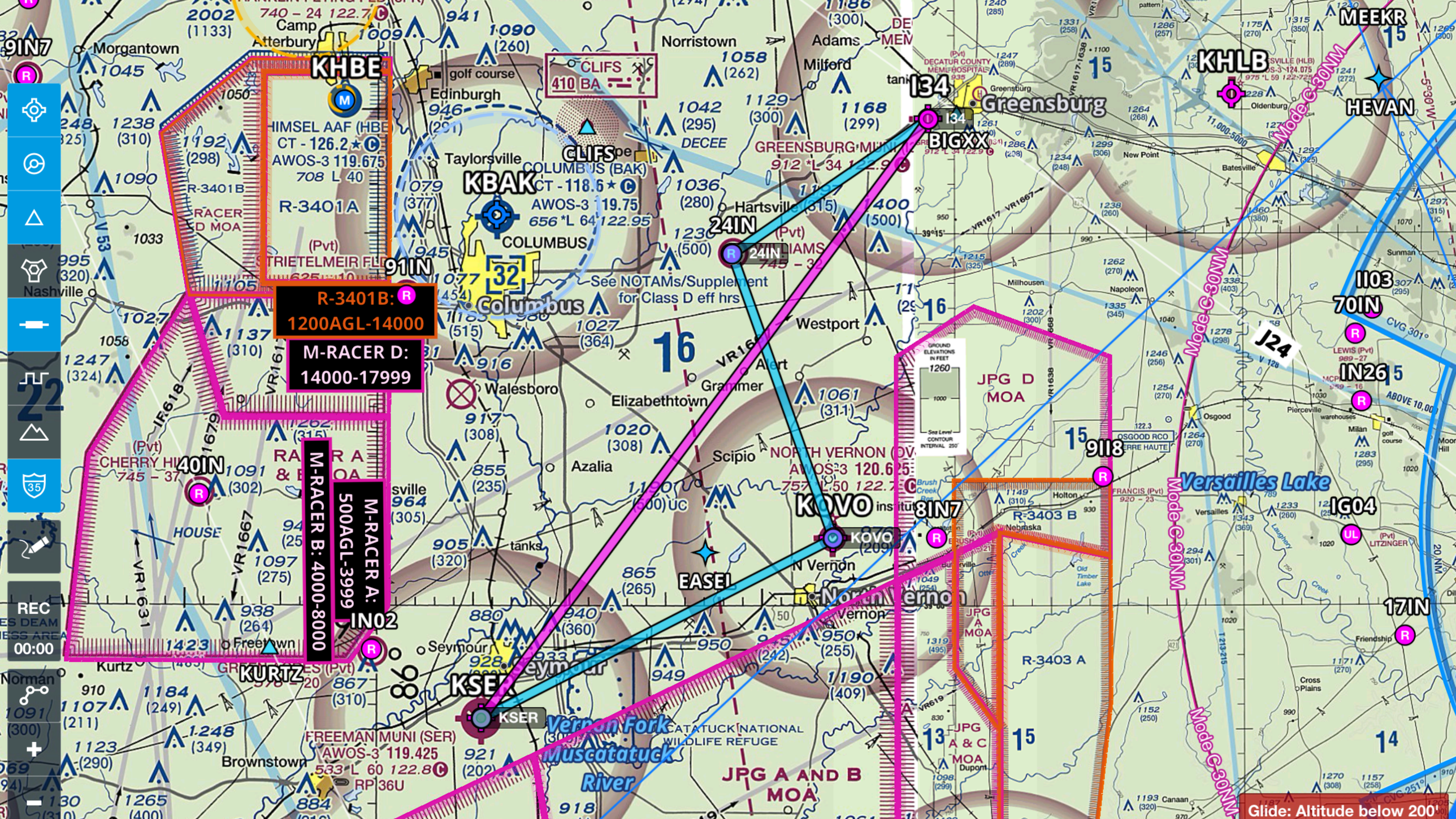
- Published L/D 27.5 at 55 knots (still air)
- Glide slope relative to ground (corrected for 10 knot headwind): 27.5*(30/55) = **15.0**
- Use 50% of theoretical L/D for planning,**7.5**
- 1,000 FT altitude loss over 1.2 NM (1.4 SM, 2.2 KM). Waving of math hands, here.
- Example: 5 NM from North Vernon (elev. 757 ft)
- 1,000 ft safety altitude, arrive at North Vernon at 1,757 MSL
- Therefore, one needs 5,924 MSL to arrive at North Vernon at safety altitude (757 + 1000 + 4,167)



PW5 Planning Summary

EN ROUTE WINDS (KNOTS)	CALM	-10	-20
DISTANCE TRAVELED (NM) FOR 1,000 FT ALTITUDE LOSS	2.5	1.9	1.2

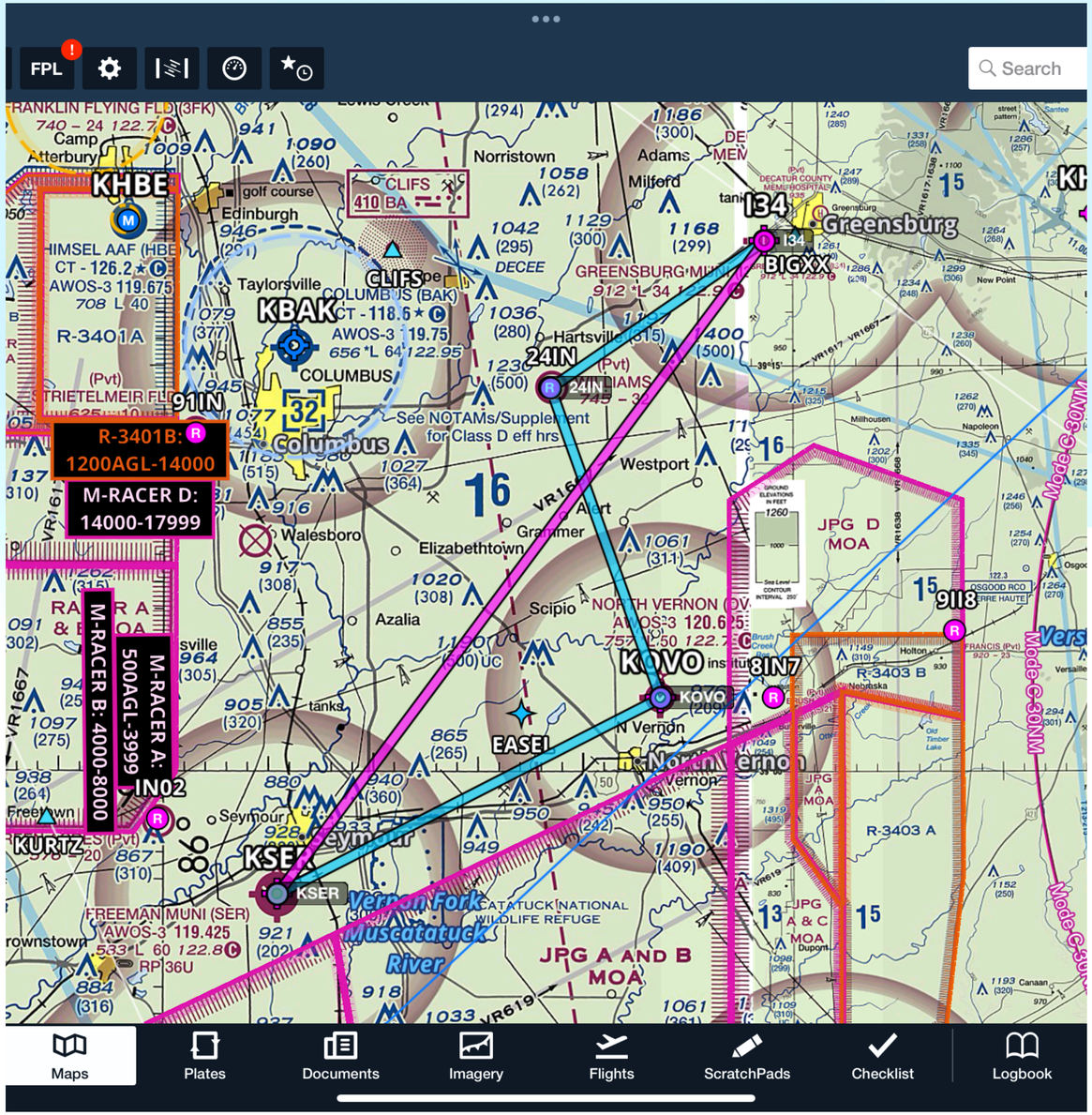
keep it SIMPLE


KHBE
9IN7
Morgantown
Camp Atterbury
Norristown
Adams
Milford
CLIFS
410 BA
golf course
Edinburgh
Taylorsville
KBAK
COLUMBUS (BAK)
CT -118.6
AWOS-3 119.75
656 *L 64 122.95
CLIFS
DECEE
GREENSBURG MUNI
912 *L 34
I34
Greensburg
BIGXX
KHLB
MEEKR
HEVAN
Mode C 30NM
24IN
Hartsville
COLUMBUS
91IN
R-3401A
R-3401B
RACER D MOA
R-3401B: 1200AGL-14000
M-RACER D: 14000-17999
M-RACER A: 500AGL-3999
M-RACER B: 4000-8000
See NOTAMs/Supplement for Class D eff hrs
Columbus
Nashville
Walesboro
Elizabethtown
Westport
Millhousen
Napoleon
Sunman
II03
70IN
J24
IN26
Osgood
Pierceville
Milan
Versailles Lake
IG04
Versailles
Holton
Nebraska
JPG D MOA
9I8
8IN7
KOVO
N Vernon
EASEI
40IN
IN02
KURTZ
Kurtz
Freetown
Seymour
KSER
Vernon Fork Muscatatuck River
CATATUCK NATIONAL WILDLIFE REFUGE
JPG A AND B MOA
JPG A MOA
R-3403 A
R-3403 B
17IN
Friendship
Cross Plains
Dupont
Canaan
FREEMAN MUNI (SER)
AWOS-3 119.425
533 L 60 122.8
RP 36U
Brownstown
Azalia
Scipio
HOUSE
tanks
OSGOOD RCO
TERRE HAUTE
REC
00:00
Glide: Altitude below 200'

Stepping Stones

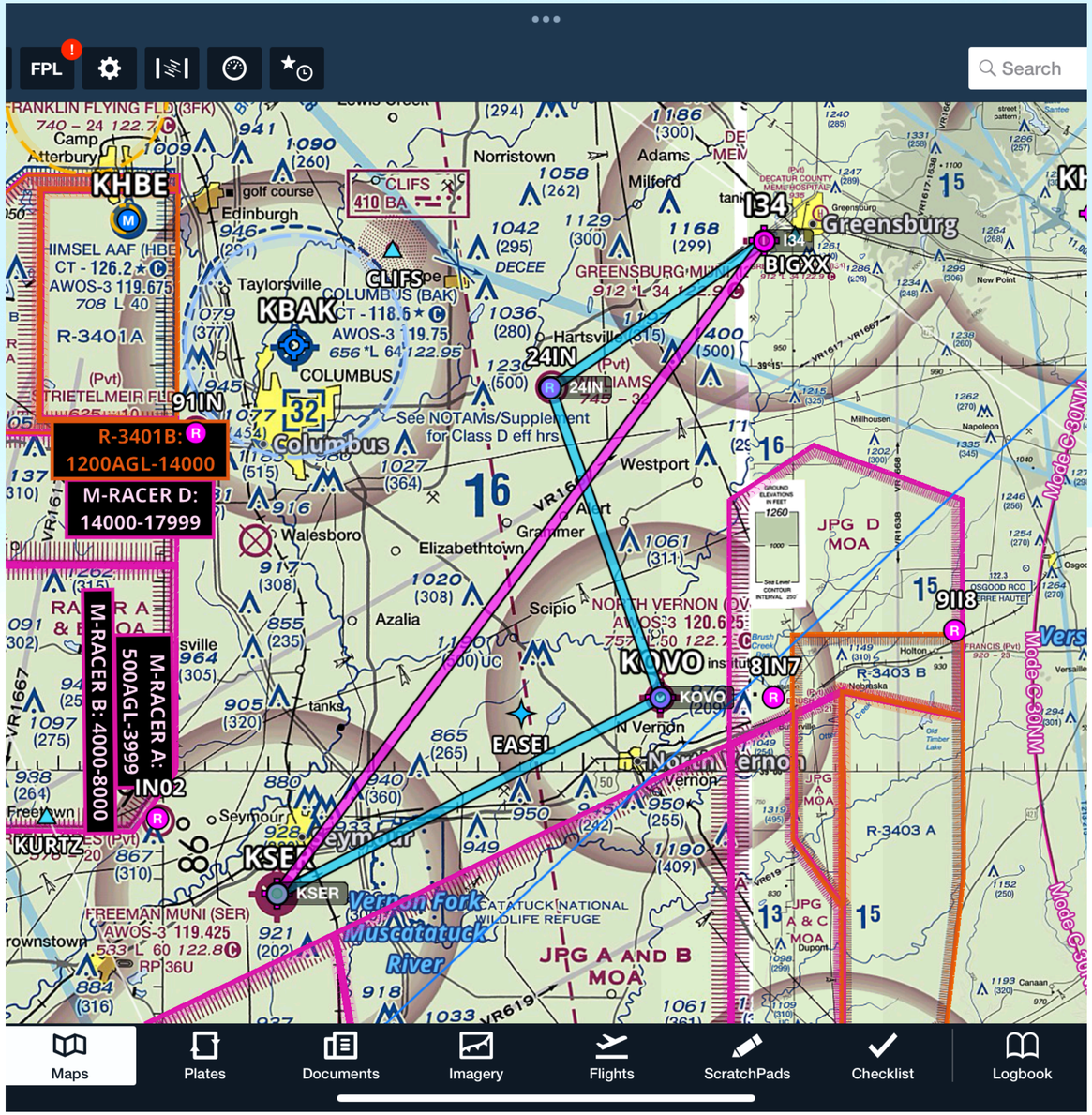
Remaining within glide distance of en route airports

- Safely remain within glide distance of an airport. Be conservative.
- Winds, maximum thermal height, and cloud streets will determine how much zig-zagging is necessary.
- Two computers make for easier navigating.



It’s Important to Understand How the Computer Thinks!

- Blindly following the flight computer can result in landing short. In other words, the computers can often be overly optimistic, especially when flying around Seymour.
- Computers typically calculate arrival altitudes based on MC (MacCready setting) and calculated winds. When MC=0, the computer uses the best L/D. However, this level of glide performance is usually unattainable (as discussed in previous slides).



Computers

Factors in Calculating Arrival Altitude

- Winds
- MacCready Setting (MC)

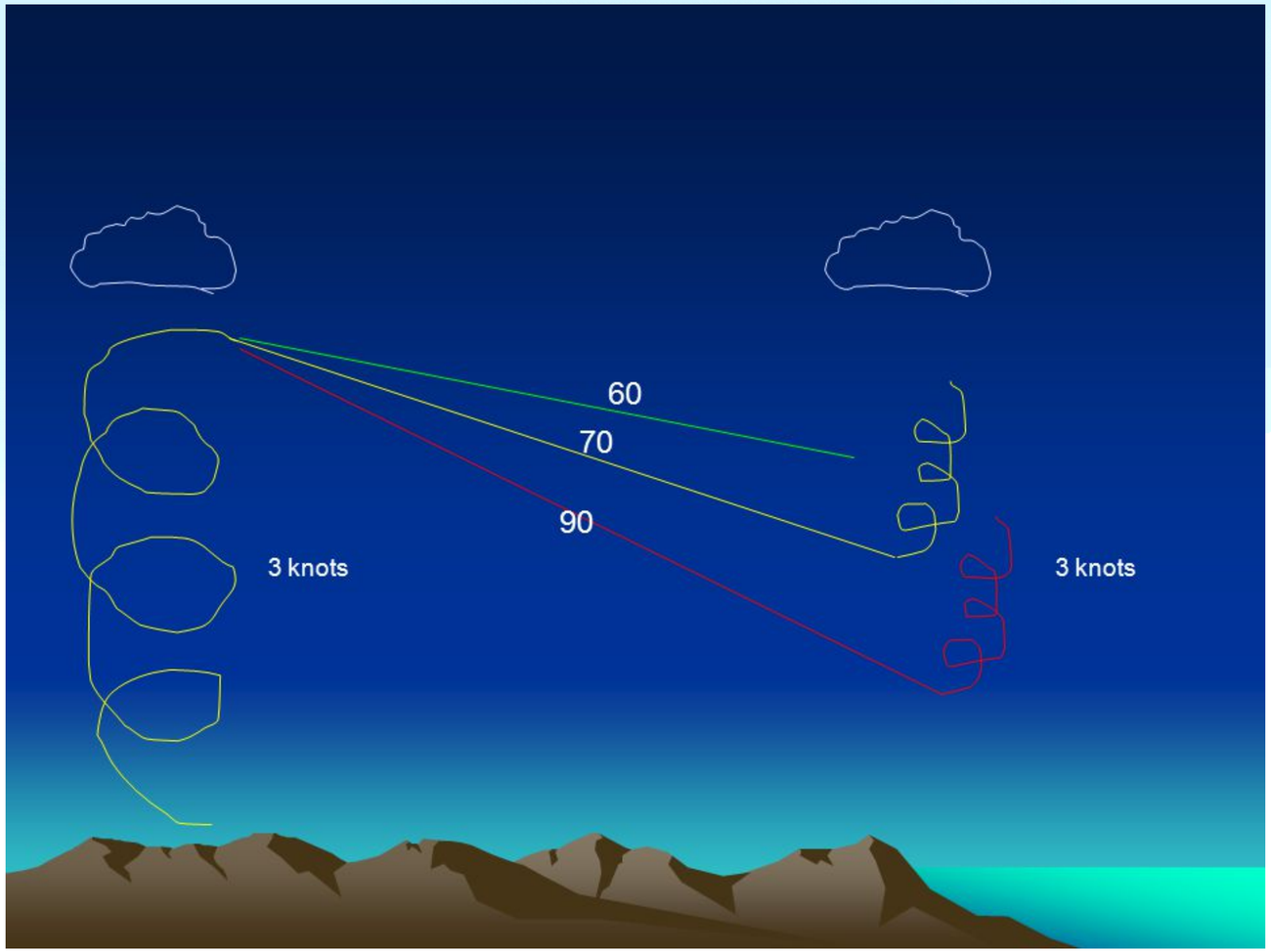
Using a low MacCready setting
will often result in an overly optimistic L/D

MC	L/D	STF (KNOTS)
0	31	44
1	28	56
2	26	61
4	20	71
6	18	79

MacCready Theory

Advanced Topic — A Short Diversion

- **MacCready setting (MC) is a method for maximizing the speed around a course.**
- The MC is set to the average climb rate expected in the next thermal.
- As the MC goes up, the commanded STF (speed-to-fly) between thermal goes up. In other words, the stronger the thermals, the faster one should fly between thermals to maximize course speed.
- The faster one flies between thermals, the steeper the glide angle.

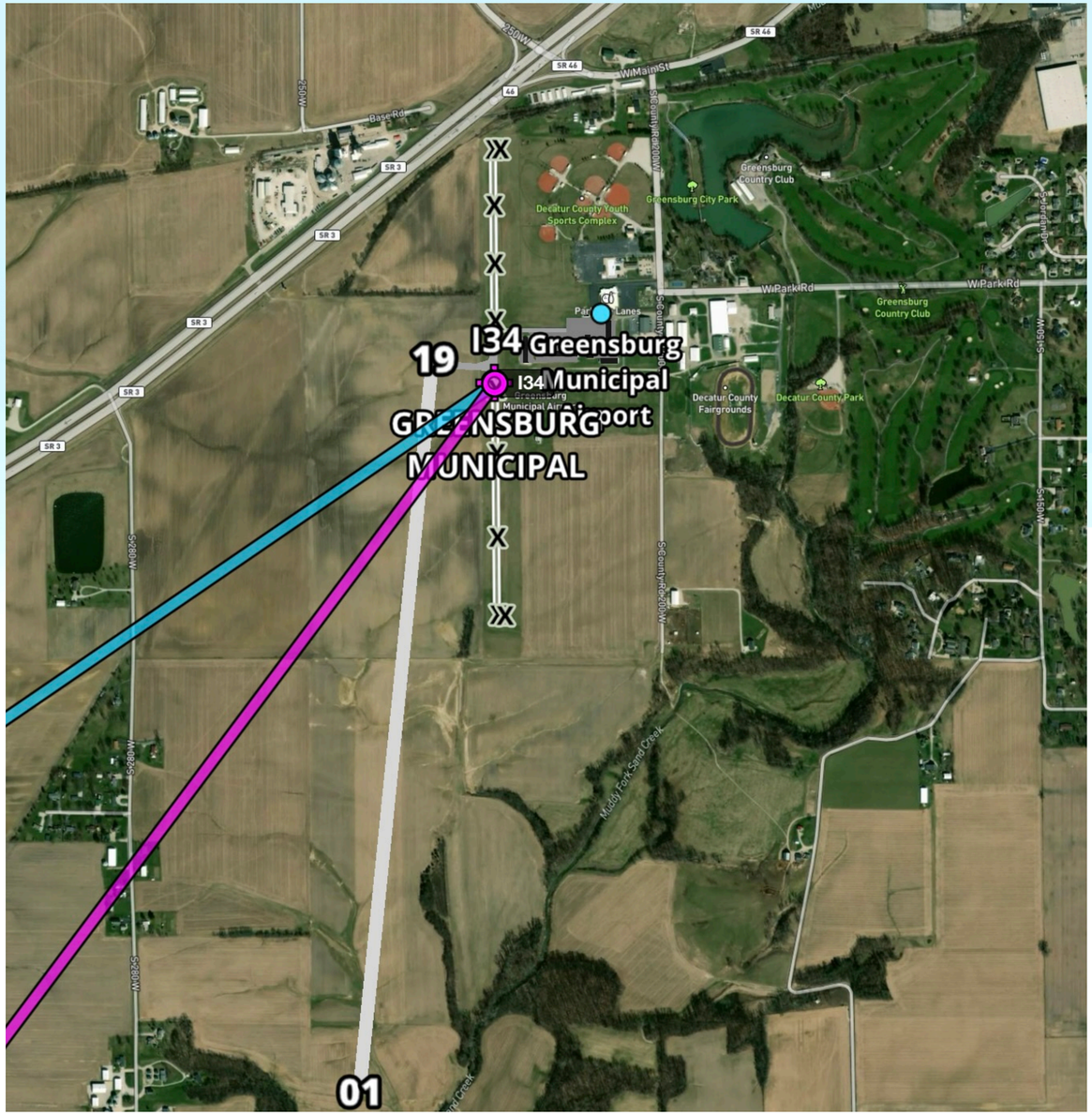


Back to the Problem of Building a Conservatism into the Computer's Calculations

- Admittedly, speed is critically important for long tasks. Therefore, having an accurate MC setting and flying the correct STF is important on long flights.
- **My Method:** I set an accurate MC on Computer #1 while Computer #2 is set to a higher MC thereby providing a glide performance margin when calculating arrival altitude. STF is flown off of Computer #1 and a conservative arrival altitude is shown on Computer #2. I also perform a reasonability check by using 4 NM per 1,000 ft altitude loss.
- No matter how you manage the computer(s). You must ensure that the calculations are correct and you understand the assumptions and limitations.
- Enough said about this topic.

Uttoh— Landing at Greensburg

- Using a paper sectional is best for quickly finding AWOS and CTAF frequencies.
- Listen to local activity on CTAF
- Time permitting, call another LSC glider pilot on 123.5 (or other agreed upon frequency).
- Use the same approach and landing techniques you'd use a Seymour (aim, touchdown and stopping points). Try stopping by a taxiway for easy exit.
- Safety first. Broadcast your position that you're a glider.



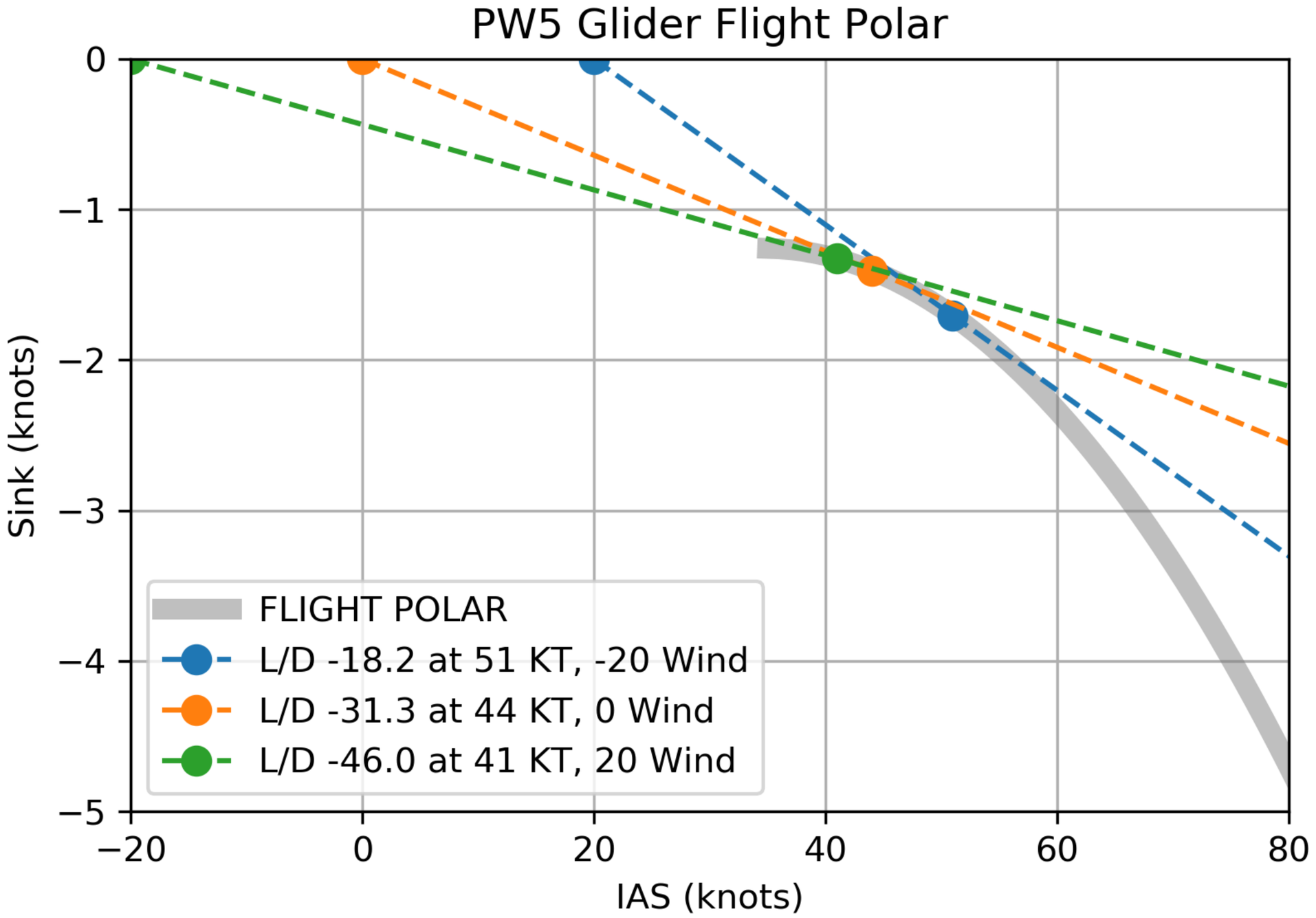
The Aero Retrieve

Some Considerations

- I recommend using the entire runway on grass runways or shorter hard surfaces. Coordinate with the tow pilot.
- Agree on radio usage between glider and tow plane. It makes sense to be using CTAF on takeoff and departure. After clear of airport, both should agree on changing to air-to-air frequency.
- Expect turbulence on windy days when departing from runways sheltered by trees (eg., Cherryhill).
- Some runways can be narrow and have rocks or lights close to the edge. When in doubt, always find someone to help run the wing.
- What are the options during PT3 on takeoff?
- While en route, think about where you would go if the rope broke.
- No fumbling with equipment while on tow. Set up computers before takeoff.
- In level flight, it’s much easier to get slack in the rope. One technique is to have the tow plane do a gradual climb. The PW5 POH does not recommend low tow due to cable rubbing on the front fuselage.

The End

Bonus Slides


PW5 Glider Flight Polar
Sink (knots)
IAS (knots)
0
−1
−2
−3
−4
−5
−20
0
20
40
60
80
FLIGHT POLAR
L/D -18.2 at 51 KT, -20 Wind
L/D -31.3 at 44 KT, 0 Wind
L/D -46.0 at 41 KT, 20 Wind