My Pilot Tools

"Engineers can build airplanes, but they cannot fly such ones." I hope it is not true: working on my Private Pilot License (PPL) I came up with some ideas to support myself when flying (as *"cockpit organization"*). Here an overview about my '*Pilot Tools*'.

OK, you can fly with an iPad, but as a student I am not 'allowed' to do so, I should learn the 'old way' (I agree and I do not want to fiddle around with tools which I am not familiar with, e.g. turn the heading bug on my glass cockpit or spend 'hours' during VFR flights looking at your iPad not looking for traffic outside anymore). So, here some of my ideas how to improve the 'legacy way' when flying (anyway, the 'legacy tools' are quite good: they do not stop working just because the battery is empty or there is a software bug or communication link issue).



Figure 1: my pilot tools

All my pilot tools

So, what I have 'invented' during my flight lessons (clock-wise listed):

- a calibrated (for my airplane) fuel measurement stick
- a heading and altimeter reminder tool
- a VOR and heading measurement circle
- a sticky pen on my knee board ('Velcro attached')
- highlighted charts and airport diagrams
- a diversion ruler to measure distance, time, fuel and other stuff (for 'my airplane')
- pens acting as distance rulers ("how far away am I from VOR reporting points?")

My knee board

It has a '*sticky pen*'. It is a permanent marker pen so that I can write on laminated docs (see later). I use '*Velcro*' so that the pin sticks quickly at a certain place and I know where it is: no need to look where to put it back or where to find it.



Figure 2: knee board with a 'sticky pen'



Figure 3: use 'Velcro' in order to attach your pen on a knee board

BTW: use a push-pen: to release the writing means, and a permanent marker if you write on laminated, plastic surfaces (e.g. as all my charts and diagrams are)

A push-pen avoid mess on your clothes, airplane interiors etc.

A handy notepad

Often, you have to remember vectors, ATIS etc. Where to write and see it?

I have a separate laminated sheet on my knee board in order to do so. It has also 'Velcro' so that I can attach it on my knee board and find it there when flying.



Figure 4: with 'Velcro' attached notepad sheet

BTW: all of my tools, sheets, pens, documents etc. should be usable as a measurement tool: so, this sheet has rulers to measure my heading or the distance. If I had to take it into my hands anyway: why not using it immediately to measure something after an instruction was given to me or when I had to divert?

A knee board is pretty tiny and handling more than one page on it it 'tricky'. So, why not placing a second page in a reachable and visible place?



Figure 5: a notepad page with rulers for (TAC) distance and magnetic course

How far away is it?

'*Ups'*, I have to report where I am? How far away am I from a VFR reporting point? How to get the distance in [nm] from a chart?

OK, *let me use my pen*, which I use so often during a flight: *measure the distance with my pen*: my pens have markings in [nm], related to the Terminal Area Chart (TAC, scale 1:250.000). So. I could place my pen on a chart and see the distance easily.

My fancy one is made with a lathe, a metal tube over a pen with markings. The simple one is a plastic pen with cuts done via a cutting knife, in steps of 1 nm related to the TAC charts.



Figure 6: my measurement pens - all items should be tools

What heading or VOR radial to fly?

If I had to divert to another airport and when flying VOR radials, often I cannot read the degrees from the chart.

So, here is my HDR and VOR tool: place it over a VOR (or way point), just align the north approximately (or use the VOR 360degree line) and measure your bearing and heading.



Figure 6: VOR and HDG ruler

BTW: Is has the same 5 nm radius of VORs presented on TACs and you can also measure distance in the range of 0 to 5 nm. The red Magnetic Variation depends on you location (I fly most of the time at the same region with -12E), it helps to align this circle on a VOR circle displayed on a chart.

Again: all plastic cheats and tools are laminated so that I can create a small marker with my pen and read it later above an empty white sheet on my knee board.

Remark:

Please, be aware of the fact that VOR radials can have a different magnetic variation as all other info on charts, e.g. -12E for my regions in order to convert True to Magnetic, but VORs have still -15E variation and given so on charts. Align the VOR ruler with the VOR 360degree line and measure a VOR radial.

Upps – divert to another airport!

When you had to divert to another airport, how much information you had to collect and check?: *distance, heading, wind correction angle, ETE, fuel required* ...

And your E6B calculator is in the back, it takes too much time to do all the steps with it? Why not having a ruler which gives me all the information I need when to divert to another airport?



Figure 7: Diversion Ruler (fuel consumption and glide distance is plane specific)

My ruler provides this help:

- measure the distance from where you are to the new destination (in [nm])
- estimate the time (ETE) based on a particular cruising speed
- get the fuel consumption (for my specific airplane and cruise RPM) for this leg
- measure the heading (True Curse) to the destination
- get a clue about the distance to glide on a given altitude (airplane specific, glide ratio!)
- get a clue about the Top Of Descent point (TOD) before the airport diverting to (500 fpm with descent air speed)

So, just find the alternate airport (within 25 nm distance) and get all the information you need (for your specific airplane, here an *Evektor Sportstar EVSS*). Mark it with your permanent marker when place over your chart, read it over an empty white sheet on paper on your knee board where you will write all the diversion decision information anyway.

What was the heading?

For me, when "*flying under the hood*", I forget all the time after few seconds, what the intended heading (HDG) and altitude (ALT) were. OK, I could use my HDG and ALT bug on my glass cockpit. But pressing all the buttons, turning the knobs distracts me so much (not flying the plane at first anymore, "*aviate, ….*") and it takes so much time … - I need a faster way to remember HDG and ALT!



Figure 8: my 3D- printed HDG, ALT reminder

As a big fan of 3D-printing I came across with the idea to have my own, 'old way' mechanical bugs. I can tune in separate digits for HDG nor ALT much faster and so remember what direction to fly. And often I had to tune only one single digit, no need to twist knobs so much to set all digits.

BTW: you could also use your smartphone: with a simple APP running on it: you can enter HDG and ALT just to remember when you have started already to fly the new vector.



Figure 9: HDG, ALT bug as a smartphone APP

Or: the simple way: use a pocket calculator and enter the HDG and ALT, e.g. separated by the decimal point, to 'store' the new vector.



Figure 10: remember HDG and ALT with a pocket calculator: here: "*fly (0)80* heading at 024(00) altitude"

My highlighted charts

After I did some night flights and thinking about "*how to read charts in the darkness*", all my charts are now *highlighted* and augmented. I use permanent text markers and 'invisible UV makers' in order to augment my charts. Better to read during the day and already prepared for my night flight. The 'highlighter ink' glows in (blue) UV light.



Figure 11: my printed, augmented and highlighted charts

BTW: you can download all the FAA charts for free from the FAA web site (e.g. as GEO TIFF files). With a graphic tool on PC (I am using Corel Draw) – I can cut, augment, print etc. my chart (just do not do a mistake by 'scaling' the result or print).

Night Flights with VOR charts

During the night, flying VOR – how to read charts with a dimmed red light? So hard to see the details, all colors are the same and nothing to see really. Red and other colors turn into black - "*ufff*". So, why not using UV light, UV spot lights, and mark the chart with fluorescent markers (or additional invisible UV markers, an UV ink jet paint etc.)?



Figure 12: night VFR chart highlighters for UV light



Figure 13: the augmented chart in UV light

Remark:

I have printed at the beginning all on metallic ink paper. It looks bright and very nice and sharp. But when I was flying in sun light (at noon) – it was so reflective that I could not see anymore or way too bright. So, think about when using glossy printer paper if it will be used during day or night.

Have all airports listed



Figure 14: all (un-towered) airports in my region for my knee board as a single page

I have a created a small chart (not scaled!) with the major information for (un-towered) airport in my region. If I would need on diversion – have the main info (ATIS, TWR) ready.

Know your VORs



Figure 15: all the VORs in my region

The same for VORs. Sometimes, not all VORs are so easy to find on chart. Also, if you need a quick guess about the next (SoCal) Approach frequency at your location ...

My own Char Supplement



Figure 16: print your own airport diagrams, augment those by Google satellite images, major information listed ...

I use different colors on the footer (light red for un-towered, blue for towered airports), so that I can find quickly an alternate airport.

It seems to be important: if you create your own diagrams: use always the same syntax, abbreviations, colors, structure, location on sheet in order to provide similar information. '*All pages should look identical*'. Otherwise your eyes are wandering around, your brain is decoding/translating and at the end you are lost or you will waste time.

Remark:

Make sure and verify carefully that all information is correct and esp. <u>up-to-date</u>! Use the official original and current data, e.g. chart supplements, resources provided by FAA.org (not other nice looking web sites)!

I had some cases where I have not taken the correct Traffic Pattern Altitude (TPALT) by using older third-party web sites.

Wind Aloft Circle



Figure 17: Wind Aloft Circle

Be prepared for a Deviation to another airport. Before you start flying, you had to check the weather (WX) anyway, also for the Wind Aloft in your region.

Calculate all Wind Correction Angles (WCA) and the resulting Ground Speed (GS). Place the results in a 360degree circle. Now you could check during the actual flight what the wind condition would be in any direction when diverting to.

Where to store all the stuff?



Figure 18: a fishermen vest also for your items during flights

Often, in small General Aviation airplanes such as C172, DA40 or EVSS there is not so much storage space for your tools, items etc.

Why not wearing a fishermen vest where you can store all the times, esp. during a night flight to put your flash light in a 'well known' location?

I could imagine also to use '*Velcro*', so that I could attach important, often used tools and items right at the surface of my jacket – easy to find and to put it back.

Conclusion

'*Be creative*': there are several different ways to improve your <u>cockpit organization</u>, to make your flying easier. What works for you? – you had to figure out! It is not the tool itself, esp. if you do not know how to use or what does it tell you – don't get distracted.

It is the **FLOW** in the cockpit – your entire **COCKPIT ORGANIZATION**!

Figure out during every flight what could be supported, automated, simplified and be done better. Then it might result in your own tool (in order to accomplish next time more easily the same task with less stress and effort).

The best tool for me?: using '*Velcro*' and put the pen on knee board or to have all airport diagrams handy, so that I could also draw taxi instructions onto it or prepare the arrival procedure by drawing lines, to mark the runway to land on etc.

Also the issue: *where to store all, where to find all, where to put it back after use* - is very important for me. (I do not like to think "*where is it*?" when needed)

"Automate your OWN procedures with tools – but DO NOT USE (unknown) automates/tools by adapting yourself to those". They have to be adopted to you!

(If you are distracted, irritated, confused ... by tools or they stress you just a tiny bit more – they are not 'your' tools! Automate with tools just what is an often repeated procedure - not 'anything' potentially needed – always with an obvious advantage for you (less time, less stress, less distraction, larger certainties ...)

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