PBS How to generate pdf Abacus.

Version 1.26

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1 Prerequisites

The Rifle, Mounting device, Sight, Amo, Bullet, Zeroing conditions and Shooting conditions are well known.

The CSV files have been created accordingly.

Zeroing has been done and the zero.csv file has been updated accordingly.

2 Manual check

Create a Shooting with all options (except Zeroing), a Target distance of 1000m, Wind 6 m/s coming from II (2) hours. For Coriolis use a shooting direction of 180° and for the Horizontal Angle use 15°.

Use ICAO Atmosphere (Alt. = 0m, Pressure = 1013.25 hPa, Temp. = 15°C, Relative Humidity =0%) and a latitude of 46°22'25" N.

```
0.308 190 772 1000 180 Y 6 2 Y 0.0001 N 15 Y G1 1 C
```

Reset all options to none, Wind speed to 0, Shooting Direction to 0, Horizontal Angle to 0.

Set generate Abacus to Y.

```
0.308 190 772 1000 0 N 0 2 N 0.0001 N 0 N G1 1 Y
```

Generate the Abacus.

Check that the Elevation and Windage for the 1000m distance given by the Shooting card and by the Abacus, the result should be close.

Shooting Card example:

PBS v1.26 2024 Shooting Card					
RIFLE : TIKKA T3X TAC A1 0.308 (inch) Win - Rifle Bore RightTwist 1:11.0 (inch)- Sight Height : 60.0 (mm)					
BULLET : 0.308 (inch) Win190(gr) SIERRA HPBT Matchking - Muzzle Speed 772 (m/s) in ICAO Atmosphere - Ballistic Coefficient in current conditions : G1 0.533 - G7 0.268					
Time Of Flight (s) : 1.97 Bullet Stability Factor Sg = 1.77 - Sg >1.5 Bullet is Stable					
ALTITUDE (m) : 0.0 LATITUDE (°) : 46.37 North - Shooting Direction, relative to the North (°): 180.0 - Coriolis effects =Y					
ELEVATION			**WINDAGE**		
DATA		**CLICKS**	**DATA**		**CLICKS**
TARGET DISTANCE (m) Include Gravity,Drag,Range Wind, Coriolis & Non-ICAO Influences	1000	174.5	BULLET MAX HEIGHT (m)8.68 @ DISTANCE (m)756.9		N A
SHOOTING ANGLE, relative to the horizontal (°)	15.0	-17.3	SPIN DRIFT		-3.0
P (hPa), 1013.25 is the reference	1013.25	N A	WIND Direction (hour)	2.0 WIND Speed (m/s) 6.0	N A
T (°C), 15°C is the reference	15.0	N A			
RANGE WIND INFLUENCE		N A	CROSS WIND INFLUENCE		35.3
AERODYNAMIC JUMP (Due to Range Wind)		-1.3	Coriolis Lateral impact		-1.2
TOTAL ELEVATION		155.9	**TOTAL WINDAGE :**		31.1

Abacus example:

PBS v1.26 2024 Generic Abacus - 308(inch) 190(gr) Bullet - SIERRA HPBT Matchking - Rifle Bore RightTwist 1:11.0 (inch) - Muzzle Speed 772 (m/s) in ICAO Atmosphere - Sight Height : 60.0 (mm) - Ballistic Coefficient in current conditions : G1 0.533 - G7 0.268 - Time of Flight (s) 1.965															
1000 = 167				1025 = 177				1050 = 186				1075 = 196			
Vertical Shooting Angle (deg)				Vertical Shooting Angle (deg)				Vertical Shooting Angle (deg)				Vertical Shooting Angle (deg)			
0	10	20	30	0	10	20	30	0	10	20	30	0	10	20	30
0	-5	-20	-43	0	-5	-21	-45	0	-6	-23	-48	0	-6	-24	-51
Local Absolute Pressure (hPA)															
1088	1073	1058	1043	1028	1013	998	983	968	953	938	923	908	893	878	863
28	22	16	10	5	0	-4	-9	-14	-18	-22	-26	-29	-33	-36	-39
Air Temperature (°C)															
57.5	55.0	52.5	50.0	47.5	45.0	42.5	40.0	37.5	35.0	32.5	30.0	27.5	25.0	22.5	20.0
-25	-24	-22	-21	-20	-19	-17	-16	-14	-13	-11	-10	-8	-7	-5	-3
17.5	15.0	12.5	10.0	7.5	5.0	2.5	0.0	-2.5	-5.0	-7.5	-10.0	-12.5	-15.0	-17.5	-20.0
-1	0	1	3	6	8	10	12	15	17	20	22	25	28	31	34
-22.5	-25.0	-27.5	-30.0	-32.5	-35.0	-37.5	-40.0	-42.5	-45.0	-47.5	-50.0	-52.5	-55.0	-57.5	-60.0
38	41	44	48	52	56	60	65	69	74	79	84	90	96	102	108

Wind Speed (m/s) - Wind Direction (hour) ->	I / V	II / IV	III	VI	IX	VIII / X	VII / XI	XII
2	E: 1.0 W: 7.0 AJ: -0.0	E: 1.0 W: 12.0 AJ: -0.0	E: 0.0 W: 13.0 AJ: -1.0	E: -1.0 W: 0.0 AJ: -0.0	E: 0.0 W: -13.0 AJ: 1.0	E: -1.0 W: -12.0 AJ: 0.0	E: -1.0 W: -7.0 AJ: 0.0	E: 1.0 W: -0.0 AJ: 0.0
4	E: 2.0 W: 14.0 AJ: -1.0	E: 1.0 W: 23.0 AJ: -1.0	E: 0.0 W: 27.0 AJ: -1.0	E: -2.0 W: 0.0 AJ: -0.0	E: 0.0 W: -27.0 AJ: 1.0	E: -1.0 W: -23.0 AJ: 1.0	E: -2.0 W: -13.0 AJ: 1.0	E: 2.0 W: -0.0 AJ: 0.0
6	E: 3.0 W: 21.0 AJ: -1.0	E: 2.0 W: 35.0 AJ: -1.0	E: 0.0 W: 40.0 AJ: -2.0	E: -3.0 W: 0.0 AJ: -0.0	E: 0.0 W: -40.0 AJ: 2.0	E: -2.0 W: -34.0 AJ: 1.0	E: -3.0 W: -20.0 AJ: 1.0	E: 3.0 W: -0.0 AJ: 0.0
8	E: 4.0 W: 28.0 AJ: -1.0	E: 2.0 W: 47.0 AJ: -2.0	E: 0.0 W: 54.0 AJ: -2.0	E: -4.0 W: 0.0 AJ: -0.0	E: 0.0 W: -54.0 AJ: 2.0	E: -2.0 W: -46.0 AJ: 2.0	E: -4.0 W: -26.0 AJ: 1.0	E: 4.0 W: -0.0 AJ: 0.0
10	E: 5.0 W: 35.0 AJ: -1.0	E: 3.0 W: 59.0 AJ: -2.0	E: 0.0 W: 67.0 AJ: -3.0	E: -5.0 W: 0.0 AJ: -0.0	E: 0.0 W: -67.0 AJ: 3.0	E: -3.0 W: -57.0 AJ: 2.0	E: -5.0 W: -32.0 AJ: 1.0	E: 6.0 W: -0.0 AJ: 0.0

Spin Drift (click) : -3 Maximum Y (m) : 9.91 At (m) : 797.0 Time to get there (s) : 1.42

How to use this Abacus ? Read HowToPBS_Abacus.pdf in https://github.com/fabienfigueras/TLD

Cross check :

Shooting Card

Target Distance = 1000m

Elevation:

For distance 1'000m = +174.5 Up

Shooting Angle 15° : Elevation = -17.3

Aerodynamic Jump : Elevation = -1.3

Elevation: 174.5 - 17.3 - 1.3 = 155.9 clicks, rounded to **+156 Up**

Windage:

Spind Drift : -3.0

Cross Wind : 35.3

Corriolis Latéral : -1.2

Windage: - 3 + 35.3 - 1.2 = 31.1 clicks, rounded to **+31 Right**

Abacus

Target Distance = 1'000m , Elevation= +167 Up

Shooting Angle: 15° for Elevation is 10° = -5 for 20° = -20 average is (-5-20)/2=-12.5

Pressure: 1'013.25 hPa Elevation is 0

Temperature: 15°C Elevation is 0

Wind:

Speed: 6 m/s

Direction: 2h

For II/IV O'clock Elevation is 2 Windage 35 and Aerodynamic Jump (Elevation) -1

Windage for Spin Drift is -3

Finally:

Elevation: 167 - 12.5 + 0 + 0 + 2 - 1 = 155.5 clicks, rounded to **+155 or +156 Up**

Windage: 35 - 3 = **32 clicks**

Comparison

Method	Elevation	Windage
Card	156	31
Abacus	155/156	32
Difference (Card-Abacus)	+1/0	-1
Comments	Coriolis is not taken into account in Abacus	Coriolis is not taken into account in Abacus

Applied Ballistic: (iPhone or Kestrel)

For AB as only one value is possible we have taken the average value BC_G1 0.524

For PBS BC_G1 is function of speed

If speed is higher than 689 m/s then BC_G1 = 0.533

If speed is between 689 m/s and 525 then BC_G1 = 0.525

And If speed is lower than 525 m/s then BC_G1 = 0.515

Other parameters are as in the simulation for a Card with PBS

Elevation: 137U

Windage: 33R

13:31

Back | HUD | Reticle | +

Range (m)	Wind (mps)	Dir (clock)
1000	6	2
− +	− +	− +

Rifle: Tikka+Me... **Ammo:** GGG SMK...
Sight CF: E1/W1 **Target:** 1000 **MV:** 772.0 (mps)
Look Ang: 0 **Spin Drift:** ON **Coriolis:** A180°/L46.37‹

E L E V	U13.7 mils*	U137 clicks
W I N D	R3.3 mils*	R33 clicks
L E A D	0.0 mils*	0 clicks

Velocity: 344.3 (mps) Energy: 730.2 (j) Time: 1.994...

Impact Balistic : (Abacus but for a 175gr bullet, 800m/s)

Target Distance = 1000m , Elevation: 143

Shooting Angle: 15° for Elevation is 10 = -2 for 20 = -8 average is (-2-8)/2=-5

Pressure: 1'013.25 hPa 1000 = -2 1050 = +5 delta is +7 for 50 hPa

Elevation is -2 + (7/50)*15 = 0.1

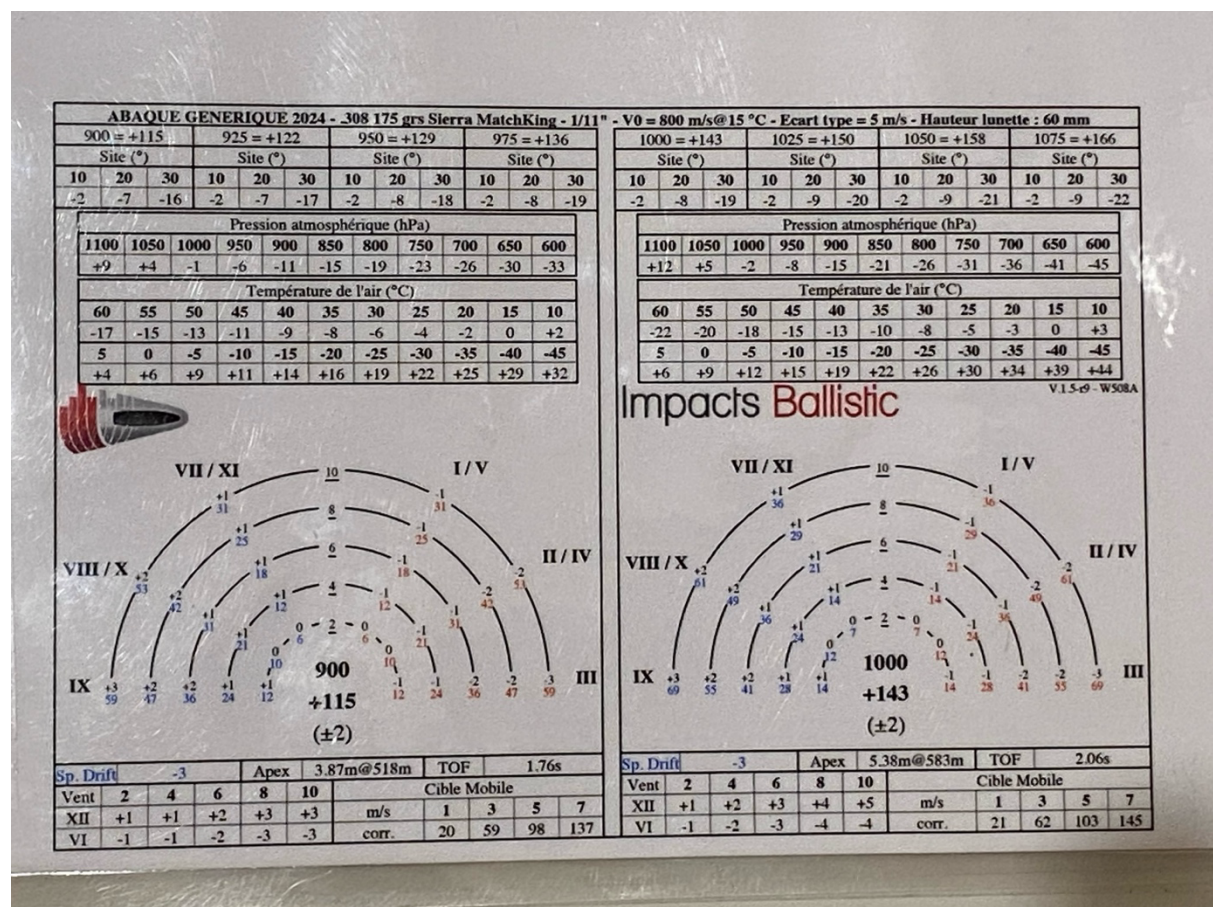Temperature: 15°C Elevation is 0

Wind:

Speed: 6 m/s

Direction: 2h

For II/IV O'clock Windage 36 and Aerodynamic Jump (Elevation) -1

Windage for Spin Drift is -3

Finally:

Elevation: 143-5+0.1+0-1 = 137.1, rounded to +137

Windage: 36-3 = 33

Method	Elevation	Windage
PBS Card	156	31

PBS (Abacus)	155/156	32
Applied B	137	33
Impact B (Abacus)	137	33
Comments	Coriolis is not taken into account in Abacus	Coriolis is not taken into account in Abacus

3 Automatic generation of the Abacus pdf file

Automatic generation of the Abacus pdf file is a multiple steps process.

3.1 Generate the script #1

To generate the bash script (`PBS_Abacus_Creation.bsh`) type this command in a terminal.

```
./PBS_Abacus_Script_Creation.bash
```

3.2 Generate the Abacus

As soon as the new file is generated, this command in a terminal.

```
time ./PBS_Abacus_Creation.bsh
```

All the html file are generated.

```
./PBS_Abacus_Creation.bsh  114.89s user 1.09s system 58% cpu 3:16.57 total
```

3.3 Generate the script #2

To generate the bash script (`PBS_Abacus_HTML2PDF.bsh`) to convert the html files into pdf files, type this command in a terminal.

```
./PBS_Abacus_htmlToPDF.bash
```

3.4 Convert html to pdf

To convert the html files into pdf files, type this command in a terminal.

```
./PBS_Abacus_HTML2PDF.bsh
```

3.5 Merge pdf files

A finally to merge all the pdf files into one single pdf file, type this command in a terminal.

```
python3 ./pdf-merge.py
```

4 Files contents

This bash file is used to generate another bash script, which itself will create all the html Abacus files.

If required, edit the file and change the version of PBS (highlighted bellow).

To launch the script enter : `./PBS_Abacus_Script_Creation.bash`

```
cat ./PBS_Abacus_Script_Creation.bash
```

```bash
#!/bin/bash
Echo "PBS Abacus Creation"
Str1="python3 ./PBS-v126.py 0.224 43 800 "
Str2=" 200 N 0 6 N 0.0001 N 0 N G1 1 Y"
Dist=100
echo "#!/bin/bash" >./PBS_Abacus_Creation.bsh
while [ $Dist -le 1600 ]
do
Cmd="$Str1$(printf "%d" $Dist)$Str2"
echo $Cmd
echo $Cmd >>./PBS_Abacus_Creation.bsh
echo "sleep 5" >>./PBS_Abacus_Creation.bsh
echo "wait" >>./PBS_Abacus_Creation.bsh
Dist=$[$Dist+100]
done
```

This bash file was generated automatically and is used to generate all the html Abacus files.

Execution time 18+5=23 secondes * number of distance to be processed.

We have 100 to 1500 => 15 distances, total duration 23*15=354 seconds, roughly 6 minutes.

To launch the script enter : `time ./PBS_Abacus_Creation.bsh`

`time` is not mandatory but it gives the total time of execution of the script when it ended.

```
cat ./PBS_Abacus_Creation.bsh
```

```bash
#!/bin/bash
python3 ./PBS-v119.py 0.224 43 800 100 200 N 0 6 N 0.0001 N 0 N G1 1 Y
sleep 5
wait
python3 ./PBS-v119.py 0.224 43 800 200 200 N 0 6 N 0.0001 N 0 N G1 1 Y
sleep 5
wait
python3 ./PBS-v119.py 0.224 43 800 300 200 N 0 6 N 0.0001 N 0 N G1 1 Y
sleep 5
wait
python3 ./PBS-v119.py 0.224 43 800 400 200 N 0 6 N 0.0001 N 0 N G1 1 Y
sleep 5
wait
```

```
python3 ./PBS-v119.py 0.224 43 800 500 200 N 0 6 N 0.0001 N 0 N G1 1 Y
sleep 5
wait
python3 ./PBS-v119.py 0.224 43 800 600 200 N 0 6 N 0.0001 N 0 N G1 1 Y
sleep 5
wait
python3 ./PBS-v119.py 0.224 43 800 700 200 N 0 6 N 0.0001 N 0 N G1 1 Y
sleep 5
wait
python3 ./PBS-v119.py 0.224 43 800 800 200 N 0 6 N 0.0001 N 0 N G1 1 Y
sleep 5
wait
python3 ./PBS-v119.py 0.224 43 800 900 200 N 0 6 N 0.0001 N 0 N G1 1 Y
sleep 5
wait
python3 ./PBS-v119.py 0.224 43 800 1000 200 N 0 6 N 0.0001 N 0 N G1 1 Y
sleep 5
wait
python3 ./PBS-v119.py 0.224 43 800 1100 200 N 0 6 N 0.0001 N 0 N G1 1 Y
sleep 5
wait
python3 ./PBS-v119.py 0.224 43 800 1200 200 N 0 6 N 0.0001 N 0 N G1 1 Y
sleep 5
wait
python3 ./PBS-v119.py 0.224 43 800 1300 200 N 0 6 N 0.0001 N 0 N G1 1 Y
sleep 5
wait
python3 ./PBS-v119.py 0.224 43 800 1400 200 N 0 6 N 0.0001 N 0 N G1 1 Y
sleep 5
wait
python3 ./PBS-v119.py 0.224 43 800 1500 200 N 0 6 N 0.0001 N 0 N G1 1 Y
sleep 5
wait
python3 ./PBS-v119.py 0.224 43 800 1600 200 N 0 6 N 0.0001 N 0 N G1 1 Y
sleep 5
wait
```

This bash file is used to generate another bash script, which itself will convert all individual html file into pdf.

If required, edit the file and change the caliber, ammo brand, bullet weight and date (<mark>highlighted bellow</mark>).

To launch the script enter : `./PBS_Abacus_htmlToPDF.bash`

`cat ./PBS_Abacus_htmlToPDF.bash`

```bash
#!/bin/bash
Echo "PBS Abacus html files conversion to pdf"
Str0="python3 h2p-v100.py"
Str1=" Abacus-308_GGG_175_"
Str2="_2024-09-25.html"
Str3=" Abacus-308_GGG_175_"
Str4=".pdf"
Dist=100
echo "#!/bin/bash" >./PBS_Abacus_HTML2PDF.bsh
while [ $Dist -le 1600 ]
do
Cmd="$Str0$Str1$(printf "%d" $Dist)$Str2$Str3$(printf "%d" $Dist)$Str4"
echo $Cmd
echo $Cmd >>./PBS_Abacus_HTML2PDF.bsh
echo "wait" >>./PBS_Abacus_HTML2PDF.bsh
Dist=$[$Dist+100]
done
```

This bash file was generated automatically and is used to convert all individual html Abacus files into pdf (New files are created).

To launch the script enter : `./PBS_Abacus_HTML2PDF.bsh`

`cat ./PBS_Abacus_HTML2PDF.bsh`

```bash
#!/bin/bash
python3 h2p-v100.py Abacus-308_GGG_175_100_2024-09-25.html Abacus-308_GGG_175_100.pdf
wait
python3 h2p-v100.py Abacus-308_GGG_175_200_2024-09-25.html Abacus-308_GGG_175_200.pdf
wait
python3 h2p-v100.py Abacus-308_GGG_175_300_2024-09-25.html Abacus-308_GGG_175_300.pdf
wait
python3 h2p-v100.py Abacus-308_GGG_175_400_2024-09-25.html Abacus-308_GGG_175_400.pdf
wait
```

```
python3 h2p-v100.py Abacus-308_GGG_175_500_2024-09-25.html Abacus-308_GGG_175_500.pdf

wait

python3 h2p-v100.py Abacus-308_GGG_175_600_2024-09-25.html Abacus-308_GGG_175_600.pdf

wait

python3 h2p-v100.py Abacus-308_GGG_175_700_2024-09-25.html Abacus-308_GGG_175_700.pdf

wait

python3 h2p-v100.py Abacus-308_GGG_175_800_2024-09-25.html Abacus-308_GGG_175_800.pdf

wait

python3 h2p-v100.py Abacus-308_GGG_175_900_2024-09-25.html Abacus-308_GGG_175_900.pdf

wait

python3 h2p-v100.py Abacus-308_GGG_175_1000_2024-09-25.html Abacus-308_GGG_175_1000.pdf

wait

python3 h2p-v100.py Abacus-308_GGG_175_1100_2024-09-25.html Abacus-308_GGG_175_1100.pdf

wait

python3 h2p-v100.py Abacus-308_GGG_175_1200_2024-09-25.html Abacus-308_GGG_175_1200.pdf

wait

python3 h2p-v100.py Abacus-308_GGG_175_1300_2024-09-25.html Abacus-308_GGG_175_1300.pdf

wait

python3 h2p-v100.py Abacus-308_GGG_175_1400_2024-09-25.html Abacus-308_GGG_175_1400.pdf

wait

python3 h2p-v100.py Abacus-308_GGG_175_1500_2024-09-25.html Abacus-308_GGG_175_1500.pdf

wait

python3 h2p-v100.py Abacus-308_GGG_175_1600_2024-09-25.html Abacus-308_GGG_175_1600.pdf

wait
```

This python script is used to merge all the pdf file into one pdf file.

To modify the name of the output file, or input file (the caliber, ammo brand, bullet weight) edit the file and change the name (highlighted bellow).

To launch the script enter : `python3 ./pdf-merge.py`

```
cat pdf-merge.py

from pypdf import PdfWriter

OutputFile="Abacus-Ruger-308_GGG_175.pdf"

Str1="Abacus-308_GGG_175_"

Str2=".pdf"

Dist=100

i=0

pdfs = []

while Dist <= 1600:
```

```
        FileName= Str1+str(Dist)+Str2

        pdfs.append(FileName)
#       print("FileNAme [",i,"] = ",pdfs[i])

        Dist += 100

        i+=1
# merger = PdfMerger()

print(" Merging pdfs...")

merger = PdfWriter()

for pdf in pdfs:

    merger.append(pdf)

merger.write(OutputFile)

merger.close()
```