Accuracy of the MOBALL Solution

It's natural to question the accuracy of a ballistic solution, especially one that has to run on the limited resources of a handheld device.

The number one rule regarding the accuracy of a ballistics program is: **the program will not, *cannot*, be any more accurate than the inputs you give it.** So if you rush thru all the input blocks, entering data in the fields you know, guessing at the ones you don't know, and leaving the rest as their default values, you cannot reasonably expect the program to return accurate output. Understanding this fact is fundamental to the use of any program that you expect to return accurate output.

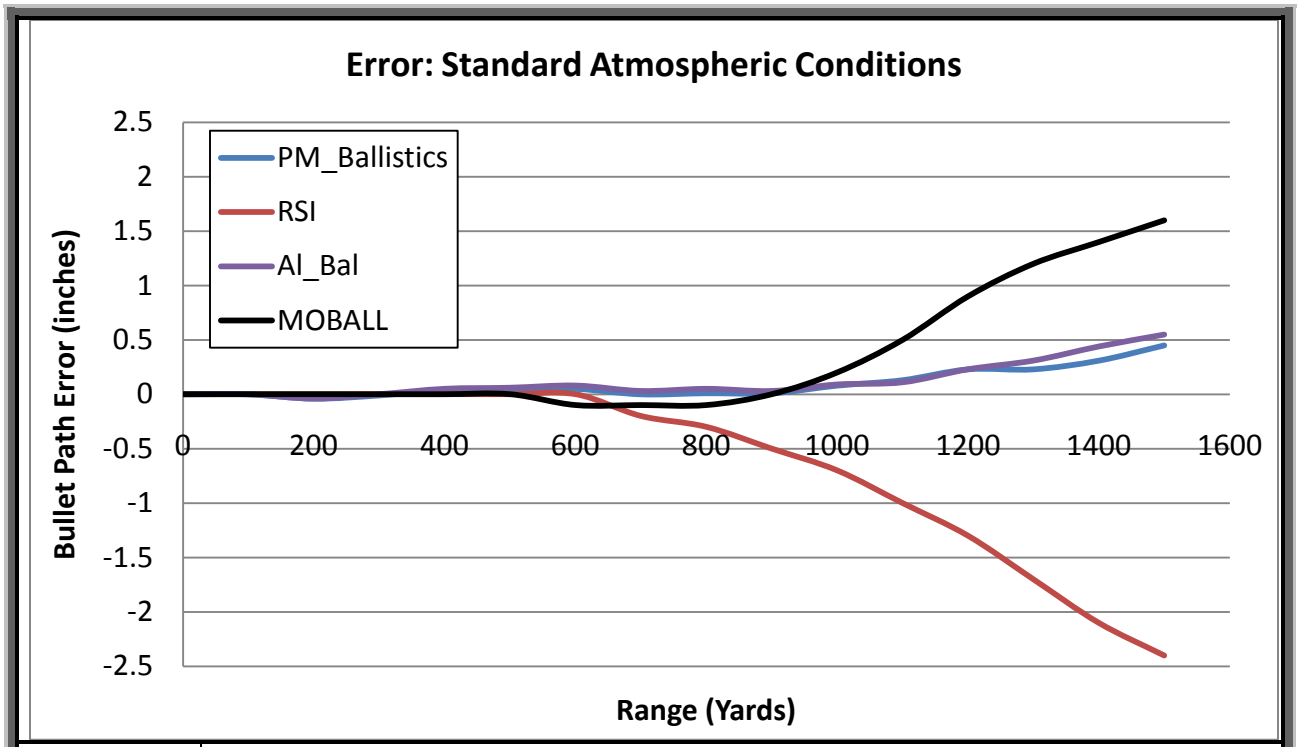
We can verify the accuracy of a new program by comparing it to other programs that are known to produce outputs that agree well with real-world results. One properly written program that has a good reputation among long range shooters for providing accurate trajectory data is the online JBM ballistics solver. For the error analysis in this paper, I'm comparing the output of several other properly written ballistics programs to the JBM solution to show how well they agree. The conditions for the trajectory simulations are:

.30 caliber 155 grain bullet with a G7 BC of 0.233 and a muzzle velocity of 3000 fps
Standard ICAO atmosphere (59 degrees F, 29.92 inHg, 0% RH)
1.5" sight height, 100 yard zero range

The *error* depicted in the following plots is the difference between the JBM output, and the output of the other program. You can see that all 4 programs compare well to JBM. The bullet path calculated by MOBALL agrees with JBM to within 0.2" at 1000 yards, and 1.6" at 1500 yards. Note that the bullet slows to transonic speed at about 1100 yards, and is well into subsonic flight by 1500 yards.

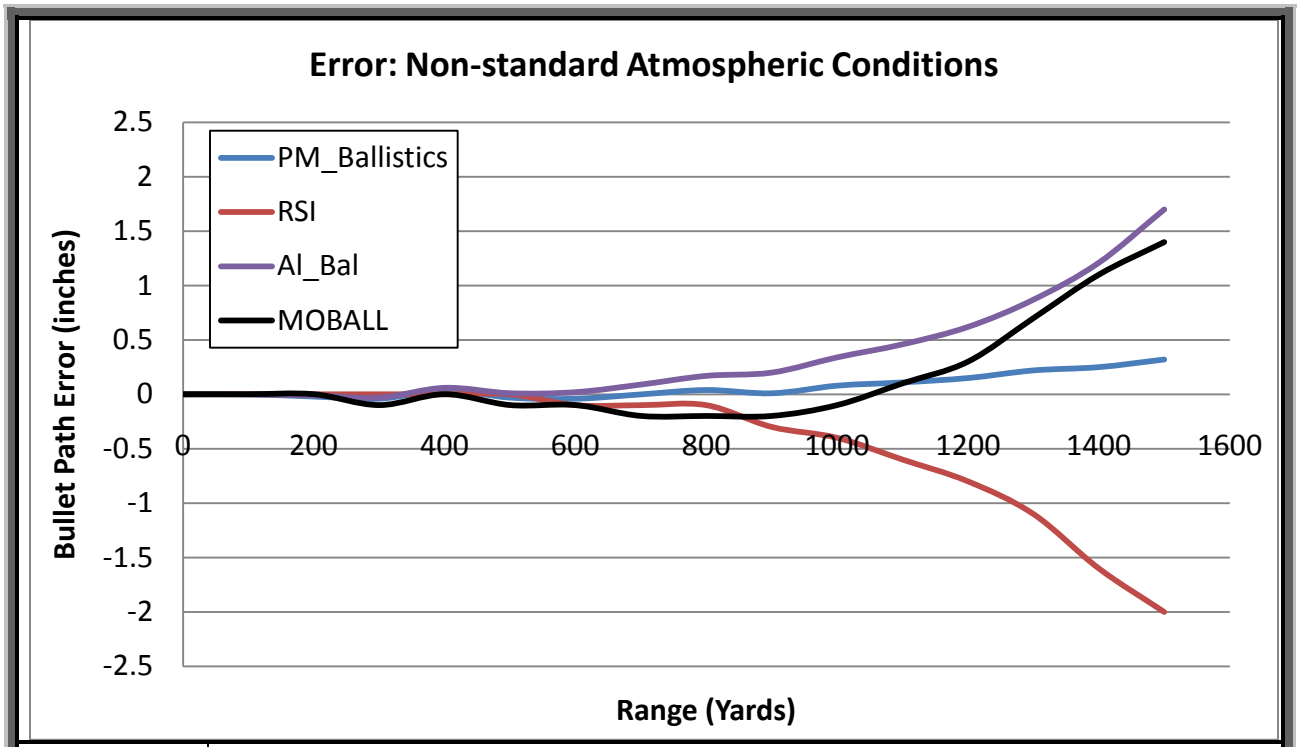
Some programs exhibit good agreement under standard atmospheric conditions, but can fail to properly account for the effects of non-standard atmospheric conditions. The second plot shows the same comparison of the 4 programs with JBM, only this time, the atmospheric conditions were non-standard: 20 degrees F, 25.00 inHG, 50% RH. You can see that the error is different than it was for the standard atmosphere comparison, but is still very small. This indicates that the 4 programs (including MOBALL) are properly accounting for the effects of non-standard atmospheric conditions.

When you go to the field with MOBALL, you can be confident that you're getting a solution that's as accurate as the trusted desktop programs.



Range	Bullet Path calculated by various programs				
	JBM	PM Ballistics	RSI	AlBal	MOBALL
0	-1.5	-1.5	-1.5	-1.5	-1.5
100	0.0	0.0	0.0	0.0	0.0
200	-3.0	-2.96	-3.0	-2.96	-3.0
300	-11.1	-11.09	-11.1	-11.1	-11.1
400	-25.2	-25.24	-25.2	-25.25	-25.2
500	-46.4	-46.44	-46.4	-46.46	-46.4
600	-75.9	-75.95	-75.9	-75.98	-75.8
700	-115.3	-115.3	-115.1	-115.33	-115.2
800	-166.4	-166.41	-166.1	-166.45	-166.3
900	-231.7	-231.71	-231.2	-231.73	-231.7
1000	-314.2	-314.28	-313.5	-314.29	-314.4
1100	-418.0	-418.13	-417.0	-418.11	-418.5
1200	-548.0	-548.23	-546.7	-548.23	-548.9
1300	-709.0	-709.23	-707.3	-709.31	-710.2
1400	-904.0	-904.31	-901.9	-904.44	-905.4
1500	-1135.8	-1136.25	-1133.4	-1136.35	-1137.4

Figure 1. MOBALL compared to other G7 programs in standard atmospheric conditions.



Range	Bullet Path calculated by various programs				
	JBM	PM Ballistics	RSI	AlBal	MOBALL
0	-1.5	-1.5	-1.5	-1.5	-1.5
100	0.0	0.0	0.0	0.0	0.0
200	-2.9	-2.88	-2.9	-2.89	-2.9
300	-10.8	-10.76	-10.8	-10.77	-10.7
400	-24.3	-24.34	-24.3	-24.36	-24.3
500	-44.5	-44.47	-44.5	-44.51	-44.4
600	-72.2	-72.16	-72.1	-72.22	-72.1
700	-108.6	-108.6	-108.5	-108.69	-108.4
800	-155.2	-155.24	-155.1	-155.37	-155
900	-213.8	-213.81	-213.5	-214.00	-213.6
1000	-286.4	-286.48	-286.0	-286.74	-286.3
1100	-375.8	-375.91	-375.2	-376.26	-375.9
1200	-485.3	-485.45	-484.5	-485.92	-485.6
1300	-619.1	-619.32	-618.0	-619.97	-619.8
1400	-782.3	-782.55	-780.7	-783.51	-783.4
1500	-979.2	-979.52	-977.2	-980.90	-980.6

Figure 2. MOBALL compared to other G7 programs in non-standard atmospheric conditions.

References:

The following is a list of the ballistics programs used in the comparisons above.

JBM Ballistics

http://www.jbmballistics.com/

This trusted and free online program employs a properly written numeric solution to the equations of motion.

Point Mass Ballistics

http://www.appliedballisticsllc.com/index_files/Book.htm

This is the software that comes with my book: Applied Ballistics for Long Range Shooting. Java program solves the ballistic point mass equations of motion using numerical integration.

Recreational Software, Inc. (RSI)

http://www.shootingsoftware.com/ballistics.htm

This complete ballistics software package offers many features in addition to a robust and accurate external ballistics solver.

Al_Bal

http://www.jbmballistics.com/software/software.html

This is a simple, basic program written for windows that can calculate trajectories using BC's referenced to several standards including G1 and G7. Free, available for download from the JBM site.

MOBALL

http://www.appliedballisticsllc.com/index_files/MOBALL.htm

This is the program featured in this accuracy comparison.