

## **DOND'S FD COF - SUPPLEMENT**

This supplement is intended to serve as homework for the Known Distance event you have registered for. It is in addition to my regular Full Distance COF which will be used at the KD event. While this supplemental work is not required, it is strongly suggested and it will certainly enhance your understanding of the material covered at the KD, as well as improving your understanding of KD rifle knowledge. It is anticipated that some participants with less experience than others may have some difficulty completing all of the material, especially if they are not Appleseed Instructors. Do not despair if this is the case, but it is hoped that everyone will make a serious attempt at completion. The material will be explained at the event and everyone will be brought up to speed, if time permits.

As an added request, **IT IS IMPORTANT THAT YOUR RIFLE BE ZEROED** at either 25 meters or 100 yards previous to the event. This will save everyone much time and trouble.

The material below will enable you to use the Winchester Ballistics Calculator as a tool to calculate come-ups, in minutes of angle (MOA), from the total line of sight drops, in inches, at 100 yard intervals. However, the results will most probably not be quite consistent with your rifle and ammunition. This is partially because the ammunition choices available within the program include only those manufactured by Winchester. Therefore, you must select a cartridge choice which approximates your ammunition as closely as possible.

In using the ballistics program we shall set it up with the assumption that a rifle is zeroed at 100 yards. The program will then yield total line of sight drops, in inches, for fired bullets at sequential 100 yard intervals. This is typical for ballistics programs. Furthermore, books such as "Ammo and Ballistics 4" supply similar information for thousands of factory loads, which can be very useful. However, in order to make the best use of these bullet drops in inches, it is necessary to convert them to come-ups, in MOA. This will enable us to make much more efficient use of a rifle's sights. And that is the main purpose of this exercise. However, it must be kept in mind that these results may not be precise for your rifle even if your ammunition is an exact fit for the program. This is because your rifle may not be the same as that assumed in the program, or book, and because of the atmospheric conditions which exist at the time of firing. While the results may not be exact for your rifle and ammunition, they should be fairly close and should help in finding your come-ups. We will determine the actual come-ups for your rifle and ammunition at the range. Please follow the steps below.

1. Download and install the program:

<http://ballisticscalculator.winchester.com/>

2. From the center of the screen, select Centerfire Rifle.
3. Select 100 yards for the Range Interval.
4. From the lower left side of the screen, select the Cartridge Type, Bullet Type, and Bullet Weight.

5. From the lower right side of the screen, make the following selections:

Sight-in Range, 100 yards.

Max Range, 500 yards

Cross Wind, 0 mph

Temp F, 59 degrees

Sight Height -- With a ruler, measure the distance between the center line of the rifle bore to the center line of your scope, or to the top of your front sight. Enter this in inches, in decimal form. This is not a critical value so it doesn't have to be very precise.

6. Click on "Shoot". This will yield a picture of the trajectory.

7. Click on "View Statistics Chart" near the upper right side of the screen.

8. The Chart will offer a selection to print it out. Do so.

9. Notice the column of total Line of Sight Drop from the zero at 100 yards to the remaining 100 yard distances. We shall construct two other columns based on this one.

10. Construct a column expressing the total Line of Sight Drops in MOA. This just means dividing the drop in inches at 200 yards by 2; the total drop in inches at 300 yards by 3; etc.

11. Construct a column of sequential differences between these total MOA Line of Sight Drops. These will be the come-ups for each succeeding distance. For example, in going from 100 yards to 200 yards, this will be the drop in MOA from 100 yards to 200 yards, which is just the first entry in the previously constructed column. The come-up in going from 200 yards to 300 yards will be the difference between the total drop in MOA at 300 yards to that at 200 yards, etc.

12. Bring this chart, along with your constructed columns, to the KD. We ask that you have previously zeroed your rifle at 25 meters and/or 100 yards and recorded the sight settings for these distances, if possible. This will make it easier to zero your rifle at our range, and the calculations you have just made will give you a good idea of what your come-ups should be for the other distances.

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An important topic we will be dealing with is called Battle Sight Zero (BSZ). This concept simply means that we can choose some distance at which we can zero our sights and then aim directly at a target from contact distance to that distance, and miss our target by only minimal amounts. For many centerfire rifles, an excellent choice is 300 yards. This can be illustrated by running the ballistics program again, assuming a zero at 300 yards instead of 100 yards. The value of this can be easily seen by examining how many inches we will have missed targets at 100 yards and 200 yards. We could also extend this to 400 yards to even further evaluate its effectiveness. An additional feature of this exercise is that it should reveal that if we set our

sights at this BSZ, then we could shoot our qualification test, the KD AQT, without ever changing our sight settings, with the possible exception of a slight alteration at 400 yards.

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The work you have just done is the most important preparation for the KD, and all that I would like to say is “required”. However, I will suggest a couple of other items which should improve your understanding of the material.

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Suppose you are shooting through a paper target at 100 yards while sequentially aiming at and striking the other targets at 100 yard intervals as intended. How many MOA high, and how many inches high, will you hit on the 100 yard target for each of the other targets? Use the come-ups determined in Step 11 above to answer this question. Well of course you can’t actually see all the targets since there are targets in front of them, but you are permitted to assume you have x-ray vision.

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Yet another exercise which could be very useful if you are trying out some new ammunition for your rifle is presented below.

The data in the book “Ammo and Ballistics 4” assumes the rifles are zeroed at 200 yards instead of 100 yards, as was initially done above. The same data that is in the book for the rifle and ammunition you have selected above can be obtained by simply running the ballistics program again, assuming a zero at 200 yards. This data can then be converted to data zeroed at 100 yards by first noting the drop in inches, which is also the come-down in MOA, from 200 to 100 yards. From the remaining line of sight drop in inches, calculate the line of sight drop in MOA from 200 to 500 yards. To obtain the line of sight drop in MOA assuming a zero at 100 yards, form a column with a 0 at the 100 yard entry and for the 200 yard entry, enter the magnitude of the come down from 200 to 100 yards, and for the remaining entries, add to the previous values the magnitude of the come-down from 200 to 100 yards. Then to obtain a column of the come up values from 100 yards to 500 yards, sequentially calculate the differences between the values in the column just completed.