How to Use and Interpret Scatt Data Acquisition
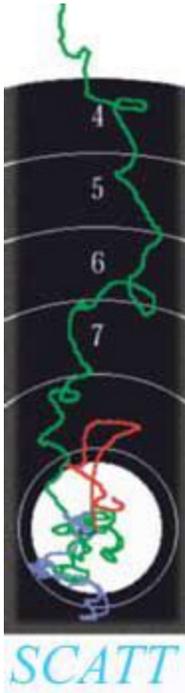
This is a guide was put together by an individual on the use of the SCATT™ brand of electronic trainer. This document was created in early 2003 as the result of reading, discussing and using the program and equipment for a period of several months.

As of the date of this printing, there was not yet a document in English describing the use and interpretation of the SCATT system. It does come with a document that contains information on its set up and initial adjustment, but it does not cover the use of the software and its data.

We are told that a version of a handbook is available in Russian and a German translation is being created but it is not known when the American version will be available.

This document covers software version 4.63 and does not cover a trigger or heart monitor as they are were not yet available in the United States.

This document only covers .22 cal and air rifle usage with the program.

Getting Started
The first screen you come to upon installing the software is the below screen
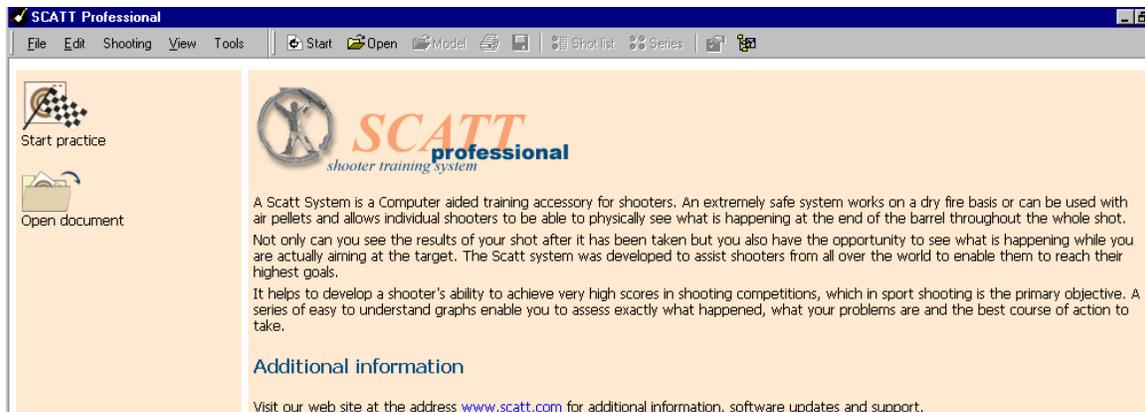
Your first decision is to start a practice or open a previously saved session. Clicking *"Start Practice"* will open the program and it will search for a connected SCATT sensor on the computer. You will be asked to either select a previous

shooter's name or to enter one if it not already listed. Then you will select the course of fire. If you select air rifle, it will automatically defer to International Air and does <u>not</u> allow 3P air specifically.
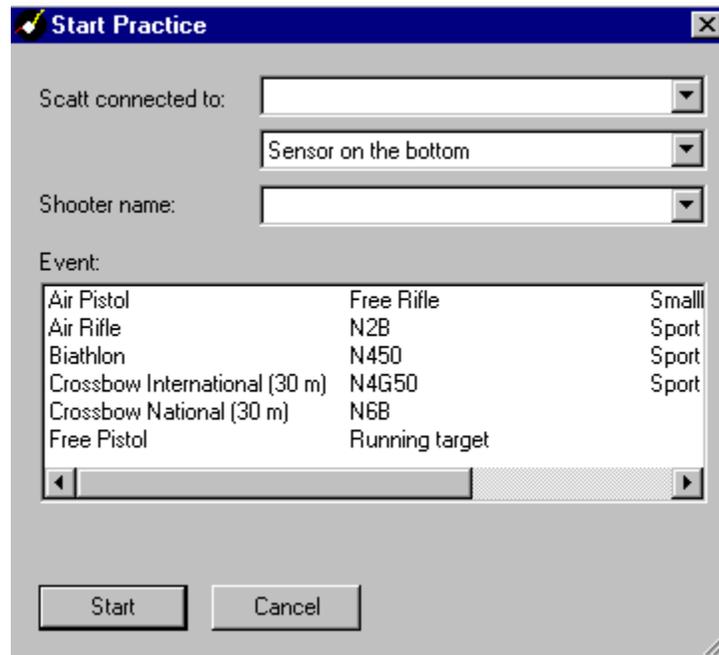
If the SCATT sensor is not connected or not connected properly to the computer, it will show the below screen. If this screen comes up, please shut the computer down and unplug all the connections on SCATT black box. Let the SCATT black box stay disconnected from its power source for a period of about 3 minutes and then reconnect the components to the black box. Connect the power plug last. Then restart the computer. The above sequence of events seems to be foolproof when done in this order.

Sometimes if the black box is connected for long periods of time, but idle, (i.e. plugged in overnight), it may need to be reinitiated as just described above to re-set the unit.

Care must be taken to follow strictly the instructions given in the factory SCATT manual for installation of the software and proper configuration of the device drivers.

Main Menu

The main menu for the SCATT program is of classic design and is very simple and easy to navigate. This menu is shown below.

The menu items are straightforward and only the most significant features will be covered.

FILE

The most interesting feature under FILE is the ability to open a model session.
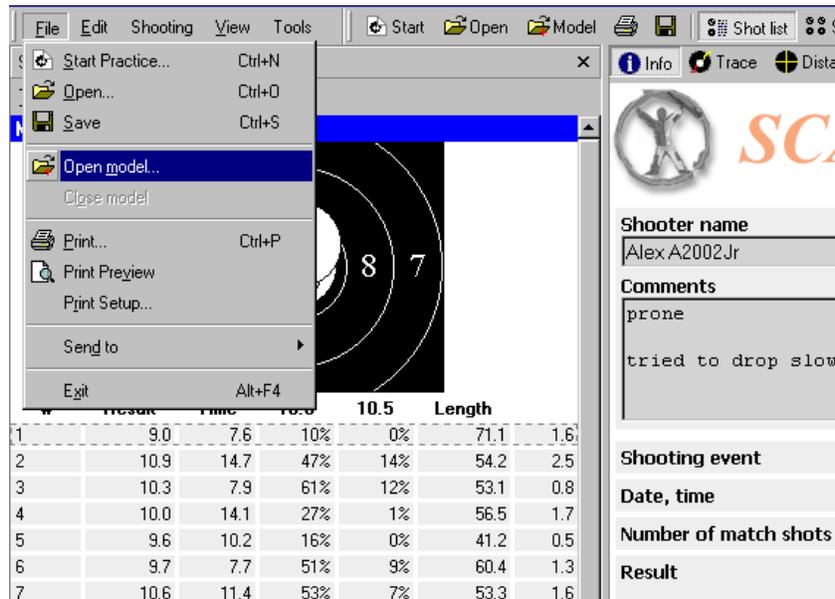
A model is any previously saved session that can be used to compare to another session. For example, if you just shot a standing session and want to compare it to another shooter or another session of your own, opening a model will show you the changes in the performance versus the model.
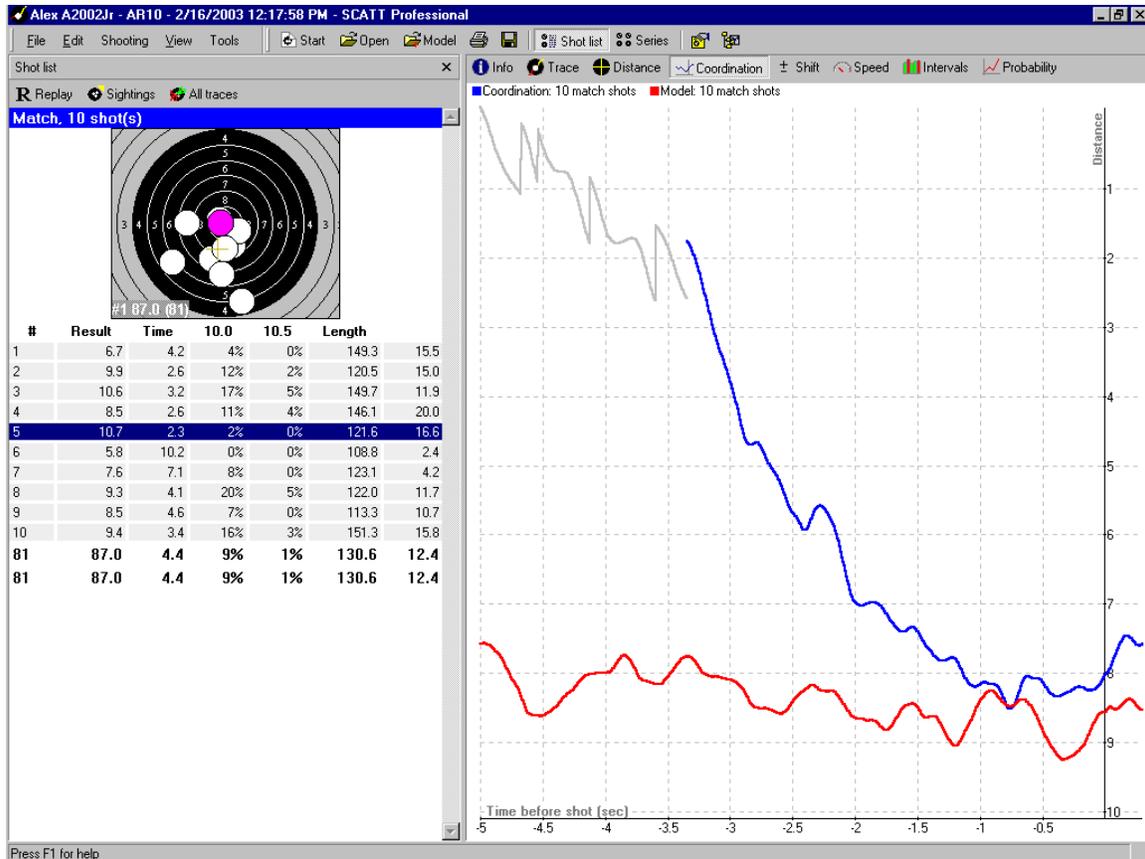
As shown above, the base session (shown in Blue) is compared to a model session (shown in red). Here you can now study the effect of a change in position, equipment or even diet from one session to another or (as shown above) even another shooter [assuming you have their session SCATT file]. A good source for SCATT files of some top Russian shooters can be found at **http://ematch.scatt.com/**. This kind of comparison can be a valuable tool for highlighting differences between different shooters and finding areas of opportunity for improvement.

EDIT

Under EDIT there is the ability to 'hide a shot'. Hiding a shot may be necessary in a session especially when there is a record of an errant shot that was not intended. Such shots can be hidden, but not deleted.

Additionally, you can delete (not hide) all of your sighters. This feature may be useful when you are sharing your files on the Internet or with coaches.

<u>VIEW</u>

One of the most interesting menus is the VIEW. View allows you to basically do all the functions of the top horizontal menu and icon menus, only in list form. Under this item you can change which view of the data captured you wish to see. You can selectively either turn on or off the tools bars and status bars. If you do this, you can still access those features via the VIEW menu.

File   Edit   Shooting   View   Tools   Start   Open

Shot list   Shot list

R Replay   Sightings   Series

Match, 10 shot(s)

General info   F4
Trace   F5
Distance graph   F6
Coordination   F7
± Shift   F8
Trace Speed   F9
Time Intervals   F10
Probability   F11

✔ Toolbar
✔ Status Bar

Display sightings
Display all traces
Display hidden shots

Language   ▶

Full Screen   F12

#	Result	Ti...			h
1	6.7				9.3
2	9.9				0.5
3	10.6				9.7
4	8.5				6.1
5	10.7				1.6
6	5.8				8.8
7	7.6				3.1
8	9.3				2.0
9	8.5	4.6	7%	0%	113.3

TOOLS

The tools menu is one of the most powerful menu items. Here you can modify most of the features of the program and set your personal preferences for viewing and capturing data. Under TOOLS you can modify the shot parameters as well as the program options. Shot parameters should be changed with care as the results of any given session can be affected significantly. Changes under the option menu should be made only under informed circumstances if you wish to get accurate recreation of results between your practice sessions and live fire and as you will read later, requires some data that a lot of shooters will not readily have or easily create.

PRINT A TARGET

A powerful and most useful tool with the SCATT system is the ability to create targets for multiple distances between 3.5 to 10 meters, is the Print a Target feature. By selecting the course of fire and changing the distance that is relevant

to your practice area, you can print a target perfectly scaled to that distance. This function is particularly good for use with the 5-meter sensor or when you are traveling and where the distance available in the hotel room is generally less than 10 meters.
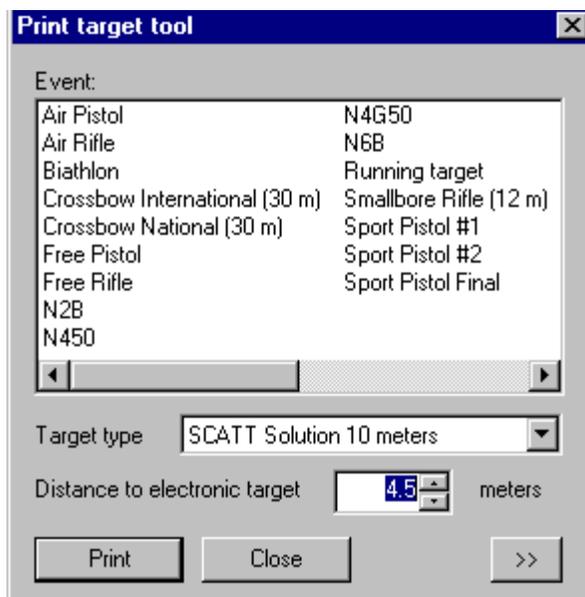
This feature is also useful to create dry fire targets when you are not using scatt to give a perfectly scaled exact replica of a particular course of fire target.

Shot Parameters

The sub-menu for shot parameters is shown below.
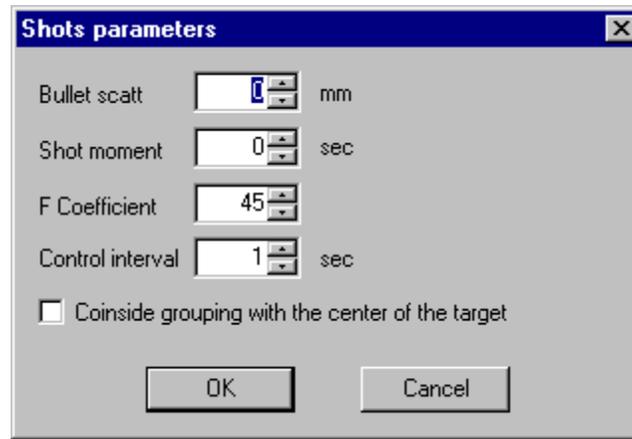
Bullet SCATT

This is a relative measure of the closeness of the match between the pellet/bullet to this particular gun. For example in air rifle you might live fire a grouping of a specific lot of pellets with your rifle that gives a grouping that is 6 mm in diameter. You would then enter a value of 1.5 [6 mm - 4.5 mm] for the Bullet scatt. This will then give information about the result you can expect if you were live firing these same real pellets. This value will change from lot to lot of ammunition and rifle.

For a specific air rifle that has 5 shots of a particular brand and lot of ammunition, in the same hole such that a 6th pellet will not pass through it is considered a 0 value [4.5mm group – 4.5mm pellet size]. Anything larger is a bigger number based upon the diameter of a 5 shot group. This should be done from a shooting vice on a bench. For smallbore, it is critical to factor in the randomness of the bullet in relation to the rifle to accurately represent actual firing. This randomness is based upon the actual vice bench testing of the gun/ammo combination. .

Shot Moment

To change the shot moment is useful to analyze the result or the position of the shots in the context of a time shift. For example if you choose a number below zero (-0.5), than all shots will be drawn impacting 0.5 seconds before the original result. A number higher than zero (0.8 sec) will represent a shot impacting 0.8 sec after the original impact. As a result, you are able to control how equal your recoil or follow through was.

If you were to set the moment to a negative number you can affect a result that is void of trigger release. Theoretically the result may be higher. Setting the value to a positive number can give a representation of the quality of the follow through.

We typically have a reaction time of approximately two to three tenths of a second between recognizing a good sight picture and releasing a shot. If we consistently pull the shot from the center of the target to a less central point of impact we have certainly fired consciously and have to work on a means of setting off the trigger in a more subtle manner.

F-coefficient

F-coefficient is a constant. F-coefficient means "the efficiency of the flight of a projectile" this is affected by a number of factors that include things such as the temperature, humidity, atmospheric pressure, the amount of dust particles in the air, the speed and direction of the movements of the firearm caused by pulse and nerve related movements, the medium of propulsion, the amount of pressure created by the propulsion medium and the velocity of the projectile.

All these things affect how a projectile flies through the air and the Scatt software program calculates this. This calculation is based on Scatt's database of over 400,000 shots done both electronically and live at the same time.

Here are some of the suggested F coefficients that are on in the manual

Air Pistol at 10m	26 ± 10
Air rifle at 10m	50 ± 10
.22 pistol at 25m	20 ± 10
.22 free pistol at 50m	20 ± 10
.32 pistol at 25m	25 ± 10
.22 rifle at 50m	80 ± 10

Control Interval

Here is where you can extend or shorten the time that is captured in the various graphs. It will also extend the L-factor accordingly. If you make this value 3

seconds and look at a prone shift chart, you might be able to see a shooters pulse rate.

It is also possible to extend your trace further than one second <u>after</u> the shot. This is handy for checking that your follow through does in fact exist.

Coordinating results on the center of the target

This is an electronic correction feature that allows you to realign all of your session shots to the center of the target as if your sights were exactly set to precisely dead center. If you are shooting excellent groups but they are all low and left, this feature will give you an indication of score if the sights were perfectly correct and re-calculate a new score based upon the theoretical center of the grouping.

Shot Options

Shot options is a very powerful tool that allows you to change the amount of data captured or how soon after a shot you want a replay to take place. It will also allow you to change the colors of the various trace periods. Further, you can add traces to look at that last 0.3 sec before the shot to see what specific movement occurred just prior to shot release. Did you pull that last one? Adding this 0.3sec trace will give you and indication and looking at other graphs and changing other parameters may give you a clearer understanding or what is actually talking place with the shot release.

Options

- **General**
  - Pause between shots replay 1 seconds
  - Trace replay speed 100 %
  - ☑ Display shot result on trace target
  - ☑ Display trace length on trace target
- **Shot list**
  - ☑ Shot number
  - ☑ Shot result
  - ☑ Aiming time
  - ☑ Steadiness in 10.0 (center of the target)
  - ☑ Steadiness in 10.5 (center of the target)
  - ☐ Steadiness in 10.0
  - ☐ Steadiness in 10.5
  - ☑ Trace length
  - ☑ Distance between average aiming point and breach
- **Target**
  - Breach color
  - Selected breach color
  - Trace color before shot
  - Trace color after shot
  - Control interval color
  - ☑ Enable trace heading 0.100 seconds
  - Additional intervals
  - ☑ Use smooth zoom
- **Practice**
  - ☑ Enable autoreplay 1 seconds after aiming conclusion
  - How much aiming trace to store
  - ☑ Automatically switch to trace target when aiming
  - ☑ Automatically save file after each 10 match shots
  - ☑ Display match time counter
- **Print**
  - ☑ All match shots on single target
  - ☑ General information
  - ☑ Series of shots with shot details
  - ☑ Coordination graph
  - ☐ Time shift graph

[OK]   [Cancel]

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L-Factor (length)

The L-factor is located in the shot list on the trace target in the lower left corner. It gives you the distance the rifle traveled in the last second before the shot. You can change time in Shot list options. The value is measured in mm. On the target this is the line drawn as the yellow line.

The software calculates the length based upon the *control interval* value set as described above. The L-factor is an absolute measure of the total distance that the sight point traversed in that last control period.

For example if the gun moves on a perfectly straight line 1mm long from its center back and forth 10 times in the last second, (a) the total yellow and blue lines (2mm) will be totally covered by the 4.5mm diameter pellet hole, but the L will be 20mm [2mm/pass x 10pass/sec x 1 sec = 20mm].

If the half vibration in the last second is 0.2mm, at 10 times per second, the L-factor would be 4mm for the same score indicating a much more controlled hold. The slower and more controlled the barrel movement, the smaller the yellow line on the target and the more stable the hold, the lower the value of the L-factor should be.
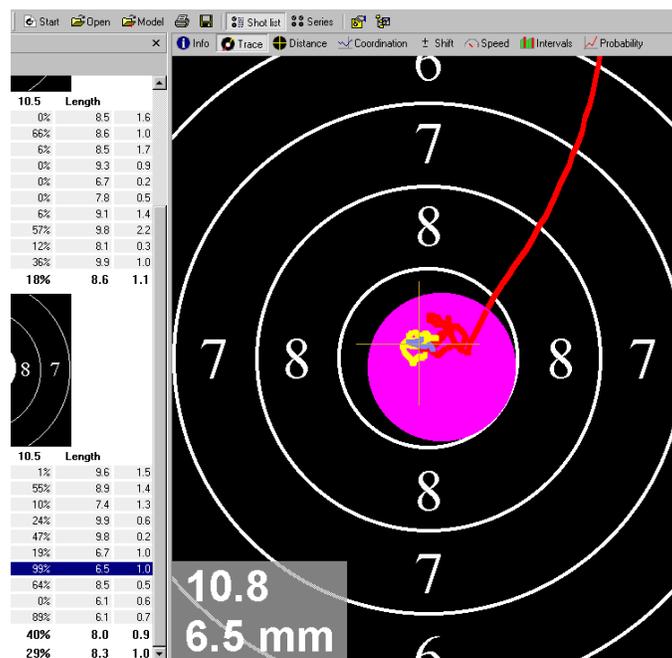
You can say that this parameter will give you a number for your hold. What is good for you? Top shooters have a value on average in off-hand is from 7.5 to 9mm.   What your L-factor should be for your level of shooting is difficult to say. The best thing is to shoot a series of 40 shots and to see what your average is.

Write this number on a piece of paper or on the back off a target and put this in front of you during the next training.

Every time you make a shot you have to look to the result you have achieved on the L-factor. Practicing to continually lower the L-Factor will by itself improve your shooting and is a good objective initially for beginners to SCATT. Contributing factors can then be further explored using the other features and capabilities of SCATT.

The objective is to minimize the length and control of the barrel so that movement is minimized to a very small spot and with minimal horizontal or vertical movement during the control interval.

Coordination graph

The coordination graph shows your ability is to "coordinate" your rifle on the target. The highest possible score during shooting is in the middle of the target. The coordination graph tells you how constant your aiming is on the target, during the control interval, over all the shots (not just over one single shot).

For example, if you aim and make a nice round circle around the eight, the graph shows you a flat blue line (on the height of the number eight on the right side of the graph). If you make a nice circle around the nine, the graph shows you a nice flat blue line (on the height of the number nine on the right side of the graph).

Another example, if you go zigzag around the nine the line is all wobbly; this means that your ability to coordinate your weapon is not good. Because at which moment should you pull the trigger? It is a gamble! So the more the line is wobbly, the worst the result will be.

The lower the line on the graph is the better the result (number 8 is on the upper side of the graph and the 10 on the bottom side). This is a straight reference to the target. If you have on your graph that the line is reasonably flat but on the last 0.5 of a second it goes up, than your triggering is not good, because it is the last movement you make before the shot. With this graph you can examine your last control interval of coordination in great detail for the session.

File Edit Shooting View Tools | Start Open Model | Shot list Series

Info Trace Distance Coordination ± Shift Speed Intervals Probability

Shot list — Replay Sightings All traces

Coordination: 20 match shots   Model: 0 match shots

#1 101.0 (97)

#	Result	Time	10.0	10.5	Length	
1	9.0	7.6	3%	0%	8.5	1.6
2	10.9	14.7	100%	66%	8.6	1.0
3	10.3	7.9	60%	6%	8.5	1.7
4	10.0	14.1	56%	0%	9.3	0.9
5	9.6	10.2	2%	0%	6.7	0.2
6	9.7	7.7	14%	0%	7.8	0.5
7	10.6	11.4	77%	6%	9.1	1.4
8	10.5	7.1	100%	57%	9.8	2.2
9	10.2	10.0	83%	12%	8.1	0.3
10	10.2	11.0	100%	36%	9.9	1.0
97	101.0	10.2	59%	18%	8.6	1.1

#2 103.2 (98)

#	Result	Time	10.0	10.5	Length	
11	10.2	9.9	46%	1%	9.6	1.5
12	10.2	8.8	100%	55%	8.9	1.4
13	9.7	11.4	73%	10%	7.4	1.3
14	10.2	10.5	84%	24%	9.9	0.6
15	10.5	10.4	99%	47%	9.8	0.2
16	10.4	12.9	100%	19%	6.7	1.0
17	10.8	8.7	100%	99%	6.5	1.0
18	10.8	14.4	100%	64%	8.5	0.5
19	9.9	8.2	91%	0%	6.1	0.6
20	10.5	9.5	100%	89%	6.1	0.7
98	103.2	10.5	89%	40%	8.0	0.9
195	204.2	10.3	74%	29%	8.3	1.0

Time before shot (sec): -1 -0.9 -0.8 -0.7 -0.6 -0.5 -0.4 -0.3 -0.2 -0.1 0.1 0.2 0.3

Press F1 for help

Coordination is analyzed by an averaged curve of values. It is plotted as a specific time interval prior to the shot as the value of R(t). In particular the character of the change (increase or decrease) in the final 0.2 – 0.3 second are characteristic of the degree of coordination ability of the shooter. The faster the R(t) value grows in last 0.2 second, the lower the shooter's coordination ability, i.e. more likely the aiming of the rifle or pistol deteriorates in the final moments of triggering.

Speed Graph

The speed graph shows the movement of the end of the barrel in mm/sec. Any change in slope is acceleration. A positive slope is speeding up and a negative slope is slowing down. This graph shows on the top the average of all shots of the series. The bottom graph shows the instantaneous movement for just that one shot.

If the top graph shows a noticeable movement upward in the last 0.3 seconds that indicates that the shooter has gone from focusing on hold to focusing on shooting in their mind. Shooting "unconsciously" or the 'auto-magical' shot would show the slope of the line continuing on the same downward slope as immediately prior or just going to zero slope.
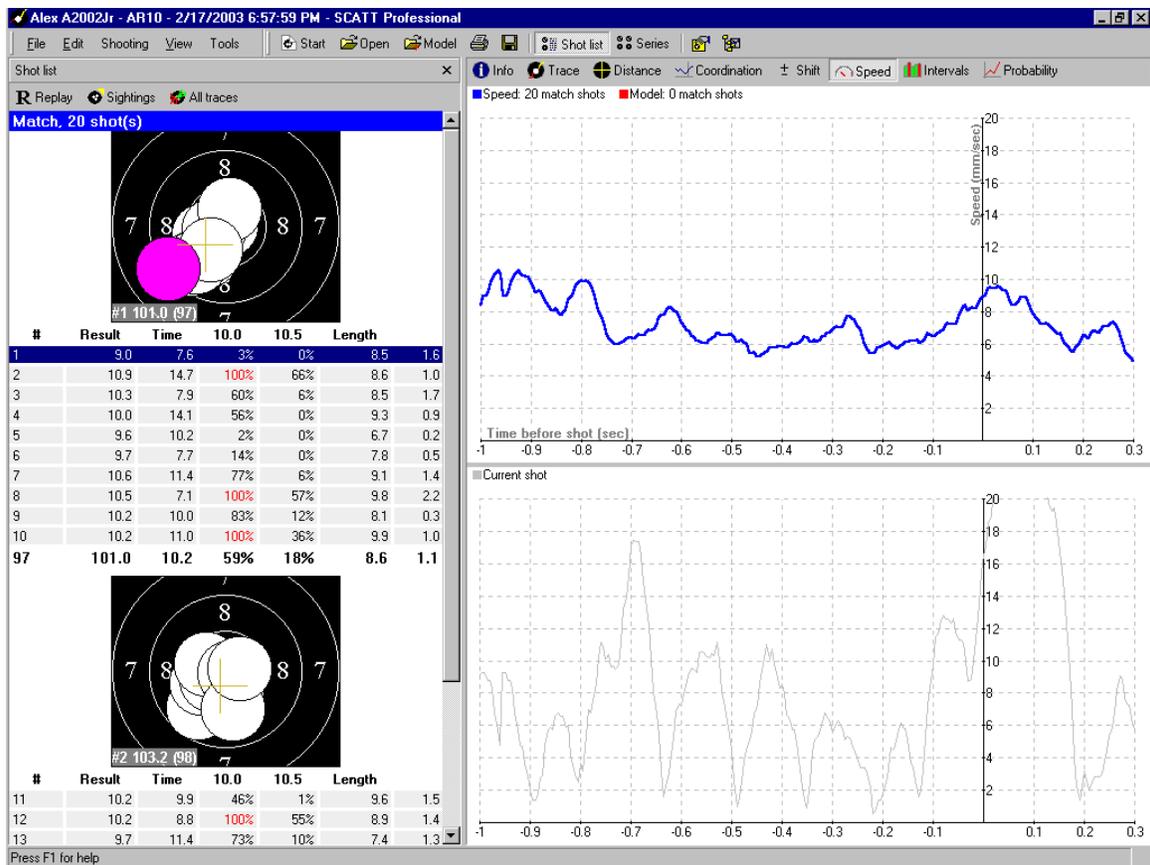
Distance

The distance graph shows both the individual movement of the hold and the cumulative resultant movement as the result of the influence of these two directions. The assumption here is that z-axis is not important or significant to the shot process.

The top graph shows the individual components. The x-axis is in red and the y-axis is in blue. The x-axis is the horizontal movement and y-axis is the vertical movement. The bottom graph shows the combined impact of a horizontal and vertical movement.

These graphs are useful to see the impact of a change in position, i.e. you move your feet, you change the location of the left hand in offhand for a right handed shooter, or a new piece of clothing or equipment

.
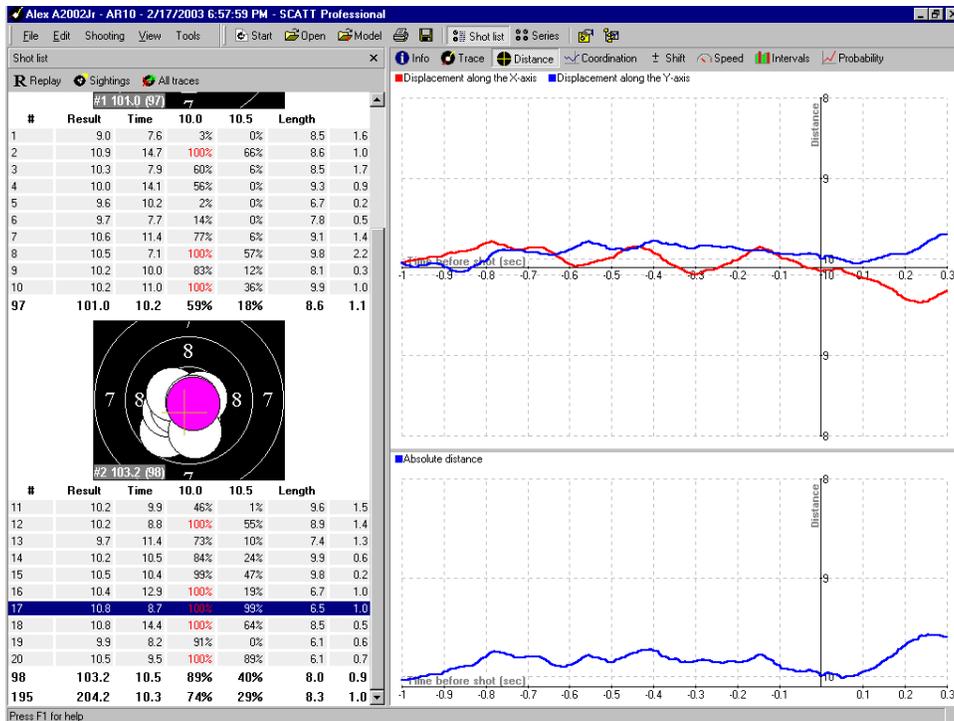
Ideally you want both the x and y axis lines to go to the intercept at the time of the shot release in a controlled manner.

Shift

Shift is the resultant calculation of a series of shots that indicates "what if". What if I shot a second earlier, what would my score have been, or 0.5 second sooner etc. If you take a prone shift chart and extend the control interval to 3 seconds or more, you may be able to actually see the heart beat. As you improve, the other positions will show the same trend. The idea is to shoot between heartbeats when the scoring opportunity is its greatest.

The extent to which the result depends on the moment of shot release is displayed. The blue line represents the activity of the sight's alignment to the center of the target. Broken vertical lines indicate, when would have been the optimum time to fire. This is to say that if the shot had occurred at a slightly earlier moment then the result could have been better.

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Many thanks go to the sources below, in particular Marcus Rabb of Centershot Sports. Marcus was central to helping understand how to start to use this tool as a serious training tool.

Sources:

- Center Shot Sports, **Marcus Rabb** http://www.centershot.com/
- Pilkington Competition Equipment LLC http://www.pilkguns.com/home.htm
- **Dick Grethe, Maik Eckhardt, Dick Boschman**, http://www.scatt.com/english/default.asp