BASIC ARCHERY MANUAL

CHAPTER 1 - EQUIPMENT

1.1 Bows

Bows are either traditional (recurved and long bow) or compound. Some commercially available bows are suitable for target shooting and others for bowhunting. Whichever kind of bow you want to use, you will have to find the right balance between speed and stability. Obviously, when you shoot, you want as much pressure behind your arrow as you can get, but you must also remember that it can make your shooting less precise and your bow less less easy to handle. Poundage, or draw weight (the drawn force of your bow given in pounds) is not the only measure of performance in terms of the speed with which the arrow is released. The most important factor here is the geometrical design of the bow itself. You will be able to get a fairly good idea of a bow's main strengths and weaknesses just by looking at it. Units of measurement used in archery

We recommend a bow with low draw weight for starting out with. Before you master the technique you will find it much harder to learn to shoot, if you are forced to struggle against your bow string when you draw it. Generally speaking, not more than 15 lbs draw weight is recommended for kids aged 10-12, and 20-25 lbs for the over sixteens. These draw weights may be raised slightly if you use a compound bow. With such bows, bow length should be adjusted to your personal draw length (see section 2.2). This does not apply to long bows or compound bows, but recurved bows should never be shorter that 62" if your draw length is over 28".
All bows have risers (the stiff middle part of the bow stave taken as whole) and two limbs. The limbs traditionally have tips to which the bow string is attached. Please remember that long and recurved bows must be strung and unstrung each time they are used. When you buy a bow, you will find that the technical specifications are given on the riser or one of the limbs of traditional bows and on the lower limb of compounds.

There are right- and left-handed bows. Which bow you must choose depends on your dominant eye. Right-handed bows are held in the left hand and the bow string is drawn by the right hand (reverse procedure for left-handed bows). To simplify matters, only right-handed bows will be dealt with in this manual. The essential difference between the two is that the arrow rest of left-handed bows is on the left side of the riser. Your bow hand is the hand you hold the riser with, and your string hand is the hand you use to draw the bow string. We shall name your shoulder, elbow, fingers etc. in the same manner.

1.1.1 Recurved bows

Recurved bows combine speed, efficiency and elegance. Archery schools generally use recurved bows since they are more suitable for learners. Recurved bows may be "self" (i.e. one piece) or "take-down". These bows are modern versions of the ancient oriental bows of the Persians, Chinese and Mongols. The traditional bow-making materials were horn and tendon, combined with wood. The technique of "sandwiching" materials is still adopted, but nowadays we use fiberglass and wood. The amount of traction being stored on the limbs when you draw a bow will amaze you (together, of course, with the compression on the "front" or "belly" of your bow stave). Scientifically speaking, it is the difference between the traction and compression (on the back and front of the limbs respectively) which generates the force with which the arrow is released. Choice of materials is therefore crucial. Both in terms of traction and compression, fiberglass - since it is both light and robust - is the perfect bow-making material. These laminated bows are made up of two layers of fiberglass between which a sheet of wood is sandwiched. The wooden layer determines limb recovery. The recurved shape of the bow itself increases the force

with which the arrow is released and evenly distributes the load both when the bow is being drawn and when the arrow is finally released. A good recurved bow should not become too stiff when you draw it - above all, when it is fully drawn; which is to say that the load should increase more or less according to the extent (given in inches) to which the bow is drawn. One advantage of take-down bows is that you can replace limbs very easily and increase draw weight quite simply by buying stronger limbs as time goes by. The main advantage of take-down bows, however, is the fact that you can pack them away very easily after use and save a lot of room. You can choose between wooden and aluminum alloy riser. Wood has a warmer feel to it and is nicer looking. In theory, aluminum makes for a stronger riser, but it will also be heavier. Recurved bows made completely out of wood are a true monument to the bow makers' craft, as many of these are highly customized for very personal and specific needs.

Choosing your recurved bow.
The more the end curves of the limbs are "set forward" (i.e in the direction of the arrow's line of flight) the faster your shot will be. However, it will also be less stable.
The wider the limb the slower the arrow will be released. If the bow is thick and heavy at the ends, release will be slow but the bow will be that much more stable.
As you reach full draw length, drawing will become jerkier and jerkier the larger the size of the riser compared to the limbs. Riser length should therefore never be more than a third of the length of the bow taken as a whole.

The greater the volume of the riser is, the further forward it will be set (i.e in the direction of arrow flight)* NOTE - (deflex geometry) the less chance you have of your bow torquing as you release the arrow. Since expert bow makers can smooth out this difficulty very satisfactorily at the design stage this does not mean that a lighter riser necessarily leads to a less stable bow.
The shorter the distance between bow string and stave, the faster but less controllable the bow will be.

1.1.2 Long bows
This is the classic Robin Hood bow, the kind of bow used in medieval warfare. When drawn, it forms a single arch (i.e. no end curves of the kind we find with the type of bow described in the preceding section). Modern long bows may be made of two laminated pieces of wood strengthened with fiberglass. Traditional (self) bows are made of a single piece of wood which may be yew, ash or elm, or, alternatively two pieces of wood with differing characteristics such as elm and yew (laminated bows). The tips of these bows may be made out of bone or horn. When long bows are not drawn, they tend to be straight. Their risers are considerably smaller than those of recurved bows. These risers may be contoured to strengthen the archer's grip. In addition, the riser contour may feature a sight window.

Choosing your long bow
The best thing to do is to examine the bow without drawing it. If it is perfectly straight you will have medium performance. Compared to a recurved bow with the same draw weight, long bows are both slower and more unyielding when you attempt to full draw.
If the limbs seem to point slightly in the direction of the arrow's line of flight (**) NOTE - reflex bow (i.e. away from you), the bow will be faster but it will probably "kick back" in your hand as you release the arrow.

If the limbs tend to bend backward toward you, the bow will be weak but relatively stable. If, instead, the grip is set forward and the limbs also curve in this direction we have the perfect long bow, combining speed with stability.
What we said about recurved bows also applies to long bows (i.e. the greater the volume of the tip, the slower recovery will be; the nearer the bow string is to the bow stave, the faster - but less controllable - the bow). When you string your bow, your bow will be easier to draw if the curve is smooth (i.e. more or less the perfect arch of a circle). Your bow will be unyielding if its limbs remain straight for a fair distance up and down from the riser (i.e. curve considerably only at the ends).

1.1.3 Compound bows

This is where technology takes over. Compound bows use a system of eccentric wheels and cables which reduce by up to 65% the effort involved in drawing the bow while you take aim. The arrow is released at greater speed than is possible with traditional bows (the shaft is also lighter in relation to draw weight). The draw weight and draw length of this kind of bow can be "tuned" according to needs. The most sophisticated models include a peep sight and a stabilizer.
As you start to draw your bow, you will notice that the load increases very sharply until it reaches peak-weight. How long this peak lasts depends on the model you use. If you carry on drawing after peak-weight, the effort needed will gradually fall until you reach the valley, or minimum value, of 50-65% peak- weight. This fall is called let-off. If, for example, your compound is tuned for a let-off of 65% and the peak-weight is 50 lbs, the valley will be just 17.5 lbs.

You can change peak-weight by means of the large limb tiller adjustment bolts connecting the limbs to the riser. By the way, "tiller" means the distance between the limb and the bow string. One full turn of the bolt more or less corresponds to 2 - 4 lbs (compounds can be adjusted within a 10 - 15 lbs range). Never turn the upper bolt more than once before turning the lower one (and vice versa, of course).

Another adjustable feature is the draw length. Suppliers generally provide for 2" - 4" adjustment, although there are some compound bows in which this is not possible. You can adjust the wheels yourself, but we advise you to consult your dealer before doing so.
The let-off of some compound bows can be adjusted, but this is a very delicate operation and you will definitely need expert help here.

Choosing your compound bow

The shorter the bow, the more problems you are going to have with your string hand. However, the speed will be greater. The further back the riser is set (reflex) the faster you will find the bow, but it will be more sensitive to your wrist movements and is therefore more likely to torque. Risers which are set back are recommended above all for high precision shooting. They are also more suited for archers with a fair amount of experience.

Let's compare two compound bows with equal draw weight, the one in which the string and the stave are further apart will be slower (but it will also be more "lenient" when you make mistakes!). American manufacturers make a big thing about producing bows which provide faster and faster release, but the further you go in this direction the less controllable bows are going to be.

Manufacturers love giving special names to their wheels. Don't be fooled. Basically there are three kinds of wheel: round wheel, high energy and modified (or energy) wheel. These wheels are made up of two cams (which we may define power cam and counterbalance cam). Compound bows have two wheels and therefore four cams. Round wheels are more "lenient" and are best for beginners (your arrows will be slower, however). A long compound bow (more than 43" with the riser not set back, plus round cams, is perfect for beginners. It's smooth to draw, the peak is brief and the valley large. It will also tolerate small variations of draw length; such variations will not greatly affect the speed with which the arrow is released).
High energy wheels are the exact opposite. These are used for large game hunting. Arrow speed is very high. These bows are generally unstable and difficult to control, and certainly not recommended for beginners. The peak lasts very much longer and the valley is very brief. You will find yourself having to draw the string back inch by inch with this kind of bow.
Basically, modified wheels are a mix (generally speaking, the large cam is round and the small one oval), the idea being to reach an "ideal compromise" by combining the advantages of the above two kinds of wheel. Manufacturers are mostly interested in this kind of wheel and produce a number of versions according to price and technical requirements. Bows with this kind of wheel are fast and fairly stable. Both peak and valley are fairly brief and you don't have the jerkiness we associate with the high energy wheel jerky effect, which we referred to above (i.e. the rounder, as opposed to oval, your counterbalance wheel, the lighter and smoother the draw will be).

The limbs of compound bows bend very little. This kind of flexibility is less important than in traditional bows. They mainly function as a wheel support. Laminated limb compound bows with a wooden layer sandwiched between two fiberglass layers are fairly expensive. Carbon-fiber limbed bows are even more expensive and not really for beginners, since the advantages of these bows can only be appreciated by experienced archers).
Over recent years, machine profiled risers for compound bows have been becoming more and more popular. These risers are made from a single block of aluminum alloy and have a more jagged and sharp profile than cast or molded risers. They are also stronger and, of course, more expensive.

1.1.4 Strings and brace-height

The most frequently used materials were once dacron and fast-flight. Fast-flight bow strings are considerably less elastic than dacron, and arrow release is faster, but they can only be used on bows which have been specially adapted for their use. Most strings are now made of synthetic materials such as “450” or “452”. They stretch very little.

Two kinds of bow string can be used with traditional bows. On the one hand, we have strings with serving (servings are the protection wrapped round the string) and loops (eyelets at the end of the bow string attached to the bow at the tip). Alternatively, we have handmade Flemish bow strings, without serving. However, in both cases, the bow string around the nocking point is protected with serving to avoid all contact between strands of the bow string and the forearm or fingers of the archer. You will also notice that the upper loop is wider. This is for the purpose of stringing (see 3.2).

Generally speaking, beginners needn't worry about the length of the bow string or its height, known as brace-height, or fistmele (i.e. distance between pivot point - the furthest point on the riser from the string when the bow is fully drawn - and the bow string itself). In fact, this is one of the most important factors we must consider on judging our bow.

You may twist and untwist your bow strings until you get the brace-height and length you need (Flemish bow strings may be twisted many times over). A difference of one or two inches will change both the shot itself and arrow speed. It goes without saying that you must wind the bow string in the same direction as the serving (if you don't, your serving will come apart!).
Check how noisy the arrow release is! If you hear a thud or a thumping sound, then your bow string is probably too long. Don't forget to wax your bow string regularly if you want it to last (see section 1.3.6).

1.1.5 Nocking point

This is a mark on the string for correct positioning of the arrow nock at all times. If it's a metal strip, use special tweezers. Alternatively, you may use Dacron or dental floss and melt these on. Another method is 3 or 4 cm of adhesive tape (width 2 cm.). We recommend a paper strip in this case. This is a very simple method as you can replace the nocking point whenever you wish to make adjustments. Once you find the correct position you can fix the strip with a drop of fletch glue. Use a bow square to locate nocking point. The initial position is 1/8" above the 90 degrees of the bow square and above the thickness of the nock. Further adjustments will be approx. 1/32" up or down according to anchor point, the thickness of your fingers (the thicker they are the higher the nocking point) and your physical attributes. You must test correct nocking point location by shooting. If the flight of the arrow is "clean" and straight, all is well. If your arrow "porpoises", something's wrong. Remember also that if your string is new it will lengthen somewhat and after a while you will probably have to control nocking point location once more. Once your string has been run in you should have no more problems on this score.

1.1.6 Arrow rest and center shot

The arrow rest may be plastic or metal, with or without a cushion plunger (also called Berger button), or it might be just a simple arrow shelf made out of leather or some man-made material (in this case, the shelf is part of the sight window). Your arrows must have feathers and not plastic fletches if you use this simpler kind of shelf. Traditional bows without a right-angle between the vertical stave and the horizontal sight window (as is often the case with cheaper recurved bows) are not suitable for use with a shelf. If you really do believe you need one, then you will have to square up the vertical and horizontal planes to get a right angle.
If your compound bow sharply curves in at the height of the sight window this means the bow has been designed to take short arrows. Rather bulky bowhunting broadheads can be used with this type of bow (but you must shorten the arrows by about 2"). If the bow curves as described, you will be able to install an over-draw rest on the riser and use even shorter arrows. If your dealer sells you a compound bow of this kind with a plastic rest but without giving you precise instructions on how to use it, you may find yourself having to thicken the vertical plane of the arrow rest by a few millimeters using double-sided plastic adhesive tape.

We must now consider the point of contact between arrow and stave on release. If your arrow is not located correctly, you will never get center shot: when the arrow and the potential line of flight are prefectly lined up. Center shot depends on the path of the bow string itself on release. In theory, for optimum arrow flight performance, the path of the string and the line of flight of the arrow should line up perfectly. This is impossible with longbows. However, correct placement is absolutely vital for shooting with modern recurved bows equipped with sight windows, or with compound bows. This also applies to modern recurved bows. Nock an arrow, look down the arrow from behind and vertically line up the bow string and the middle of the limbs. Your arrowhead should be about a fifth of an inch left of the bow string. If it isn't, you must adjust center shot (see 4.3.2). With a cushion plunger, this will be very easy. However, if

you don't (and only when the arrow is to the right), you will have to thicken the base of the rest as explained above for the compound bow, or, alternatively, the vertical plane of the sight window.

1.1.7 Cushion plunger

Arrow rests are often combined with a device mounted on one side of the bow stave with which the archers can modify arrow placement prior to release according to the characteristics of the bow. This device is the cushion plunger. It is an absolute must, both for the more sophisticated compound bows (when used without mechanical release) and for precision recurved bows. It consists of a button placed directly above the pivot point which comes into contact with the arrow. The cushion plunger is used for adjusting center shot and offsetting shaft resilience (see 4.3.2).

After installing your cushion plunger, check to see how far in and out the button will go (i.e. how tight or loose you can make spring adjustments). Count the number of turns you need to go from tight to loose (or loose to tight) and, on the basis of this, adjust to midpoint setting. You can now set center shot.

1.1.8 Sights

Our advice for beginners is to learn to shoot without using a contour sight. Keep both your eyes on the target. Many types of peep sights are available for target shooting or bowhunting. Sights generally feature a magnifying lens for target shooting. The peep sights of hunting bows include adjustable pins. You adjust these according to the mistakes you make. If the arrow group (three or more arrows) is too high, move the pin up. If the group is slightly to the left, move your pin left, and so on.

1.1.9 Stabilizer

The main task of the stabilizer is to eliminate undesired torquing when the arrow is released. The longer the stabilizer fitted to your bow, the more effective it will be. You will most definitely feel the effect of the stabilizer if your bow is light.

1.2 Arrows

You must choose your arrows very carefully. Your bow and arrow are like a team. They must work together and not against each other. Generally speaking, your arrows should be thicker and stiffer according to the bow's draw weight and your own draw length. The spine of the arrow shaft depends on structural properties. Even though spine is measured in predominently static terms, in-flight performance depends very much on this factor.
Arrows are made up of a head, a shaft, fletches and a nock. Arrows may be made of wood, aluminum or carbon-fiber.

The most widely used arrows are aluminum and we recommend these for beginners (except for beginners on long bows). Carbon or aluminum-carbon fiber arrows are very strong and light. They are very stiff, practically unbreakable and much thinner than aluminum ones but offer the same spine. Since they are, they can be shot from the same bow at much higher speeds. It is worth pointing out that when they do break, minute splintering takes place and these minute splinters will very easily get under your skin. Tournament archers practically always use these arrows.

Easton - the biggest producer of arrow shafts in the world - publish a table which classifies shafts according to diameter and thickness and relates these parameters to the draw weight of the bow. Once you know your draw length and true (as opposed to theoretic or calculated) draw weight of your bow, you can then choose your arrow (see section 4.1). There are tables for aluminum, and Easton aluminum-carbon fiber arrows or for Easton, Beman or AFC carbon-fiber arrows. These may be for target shooting or bowhunting. Consult your dealer if you choose wooden arrows. Remember that your dealer will have to know the draw weight of your bow if he/she is to recommend the most suitable shaft diameter.

1.2.1 Fletches

Generally the feather used is turkey, but you may prefer to use plastic fletches. Plastic fletchings can be used for all types of arrow. Feathers are is lighter and stabilizes the arrow more effectively, but they are also more prone to wear and tear and are less reliable in wet weather. They have a natural "texture" or "grain", as it were, which is (of course) that of the bird's wing. If you compare two arrows with the same shaft weight, you will see how the feathered arrow is faster on release than the one with plastic fletches. The former start out faster but will slow down after twenty to thirty yards. The speed of the latter is, instead, more sustained.
The most widely used arrows are three-fletched. When you nock your arrow, the lead or cock fletch must face away from the sight window. It will therefore be at a right angle to the bow string. If the fletch is positioned in this manner, contact between the arrow and the stave - and, consequently, interference with the line of flight - are kept to a minimum. Lead fletches are generally a different color.

Special flu-flu fletches are used for shooting at moving targets. There are four or more of these (up to eight) and they are larger (height: 1"; length: 5"). Flu-flu fletches are designed to slow the arrow down. Alternatively, the arrow may have a single 10"- long fletch, which can either be straight or helical. Whichever kind of fletch you choose, the range will fall off after a few dozen yards and you can be quite sure you will not overshoot.

Straight fletches are mainly used for target archery and helical fletches for bowhunting. Helical fletches will slow your arrow down more and stabilize it more effectively and they are therefore recommended when using broadheads.

1.2.2 Arrowheads

Arrowheads vary according to needs (i.e. target, field, bowhunting or fishing). The length of the fletch increases proportionately according to the weight of the arrowhead. Identical arrow shafts with different heads will differ in terms of dynamic spine. The Easton tables provide precise indications on this variable (even though shafts are classified according to static spine), but the most important thing to remember is that the heavier you make the arrowhead, the more flexible and resilient your arrow must be.

Arrowheads are glued to the shaft (special glues are available for this purpose). On the other hand, they can be installed by screwing into a ferrule on the aluminum shaft. This means that arrowheads can be very easily changed according to needs. If you screw your arrowheads in, remember to use special rubber or plastic "O rings" to make sure they don't come loose again.

1.2.3 Nocks

These are generally plastic and are available in various sizes according to the diameter of the shaft (1/4", 9/32", 5/16", 11/32" ferrules). The recess in the nock should not be tight; otherwise it

will pinch the bow string. Clearly, it should they not be too wide either - to avoid your arrow falling to the ground. Check for the right size by nocking an arrow and pointing the bow downwards. Only when you lightly tap the bow string should the arrow fall out, and not before. Carbon-fiber nocks are snapped onto the arrow. Your dealer should be able to give you all the necessary details.

For three-fletched arrows, your nock must be at a right angle to the cock fletch. However, some traditional bow makers do not agree on this point, and advise archers to turn the nock clockwise 30 degrees for maximum arrow rest clearance.

Hunting nocks have a small ridge along the side which you line up with the cock fletch to find this fletch by feel alone. The advantage of these "speed nocks" is that you will be able to nock your arrow without taking your eyes off the target. This is very useful when you are shooting against time.

1.3 Accessories

There are many bow accessories available, but only a few are essential.

1.3.1 Protection

The acessories you will need for protection are an arm guard, a chest protector and a glove. You can use a (three-fingered) glove instead of a finger tab if you wish. These (leather or plastic) items protect your forearm, chest, and string fingers.

1.3.2 Sling

This is a strap which holds the bow stave to the bow hand. If you use this sling, you will not need to grip the riser to avoid dropping the bow accidentally when you release the bow string.

1.3.3 Mechanical releases

Mechanical releases oscillation of the bow during recovery and direct all movement of the bow affecting the arrow itself along the line of flight. This is an advantage because you can use more flexible, lighter bows. You can choose between trigger or trigglerless clipper or rope, releases. The most sophisticated mechanical releases are used with compound bows. Accessories of this kind are for the experienced archer.

1.3.4 Quiver

You have a choice of leather or plastic shoulder or side quivers. The special bowhunting models are installed on the bow itself. Although you may have problems with balance at first, after some practice you will find this kind of quiver highly practical for "roving".

1.3.5. Bow-squares

You should always bring a bow-square with you when you go shooting. The most common kinds of bow-squares are made of aluminum. On one side of the bow square, the measurements are given in inches and fractions of inches and, on the other, in millimeters. You will be able to check all the functional specifications of your bow (i.e. nocking point, brace height and tiller). Always check these specifications before you start shooting.

1.3.6 Bow string wax

This is very pure beeswax applied to the bow string for protection. It is supplied in the form of a stick. You should first warm the bow string by rubbing it vigorously.

1.3.7 Targets
These are either concentric circles or 3D models of game animals. There are many kinds of target available. The best are made of braided and pressed barley straw. Foam targets cost less, and are not as long-lasting. Alternatively, you can make your own, using strong adhesive tape and a box full of old newspapers or you can fill an old sack with rags.

CHAPTER 2 - FIRST THINGS FIRST

2.1 General advice
1) Your bow and its draw weight should take into account your body size and physical strength.
2) Make sure your bow and arrows are compatible, at least according to Easton table specifications. If you shoot arrows which are incompatible in terms of spine and length, the results will be poor and you may well damage your equipment.
3) Make sure you do a few warm-up exercises before shooting. This could save you a whole lot of trouble later on.

2.2 AMO or traditional draw
Measure your draw length. This is essential before choosing your bow or before you actually use it. If you do not, you will never know the true draw weight of the bow you think might be right for you and the best arrows to go with it (by the way, arrow length is vital).
It's very frustrating to see archers who insist on using arrows which are too long because they will never be able to get the best out of their bows.
Your draw length depends on the length of your arm, how wide your shoulders are, and your stance. The length of your draw is the distance between the nocking point - when you fully draw back the bow string and the pivot point. The easiest way to measure draw length is to draw a low draw weight bow as though you were going to shoot an arrow but using a special graduated arrow instead of a normal one.

The AMO (American Manufacturing Association) defines international standards for archery as follows: true draw plus 1 3/4" (e.g. 29" AMO is 27 1/4" + 1 3/4"). Once you know your true draw, add 1 3/4" for your AMO or "traditional" draw specification before consulting the Easton tables.

2.3 Measuring the true draw weight of your bow
True draw weight of traditional bows depends on true draw. The draw weight given on your riser or limbs is the a standard measure. As we pointed out above, AMO 28" is true draw of 26 1/4" + 1 3/4". The more you bend your bow (i.e. the greater your draw length) the more load you put on your fingers.

With compounds, on the other hand, true draw weight is the peak- weight declared by the manufacturer. So all you have to do in this case is check this against the Easton tables. Naturally, the measurements given on the bow itself will not be much use you if you change draw weight of your bow.

To find out the true draw weight you are dealing with, use a force gage to measure the force of your bow fully drawn.

Another method is first to establish your true draw length, then calculate your AMO draw. You then subtract standard AMO draw from your own AMO draw. Divide the draw weight given on your bow by 20. According to whether the difference between the two results is positive or negative, add or subtract the result of the division multiplied by the difference from the draw weight. This procedure will be clearer if we use an example. Given a 50-lb bow with 28" AMO and a true draw of 28" (AMO 29 3/4"), the true draw weight is 54.375 lbs. You then make the following calculation:
29.75 - 28 = 1.75
50 /20 = 2.5
50 + (2.5 x 1.75) = 54.375

2.4 Dominant eye
We pointed out above that there are right- and left-handed bows. Do not choose a right-handed bow just because you normally use your right hand for certain tasks. You must carefuly check which is your dominant eye (i.e. the eye which transmits visual messages considered dominant by your brain). Many people are left-handed without knowing it! Often, naturally left-handed children are taught from an early age to use their right hand.
Try the following test to find out which is your dominant eye. Make a ring with your forefingers and thumbs. Stretch your arms out in front of you and, with both eyes, concentrate on an object through the ring you have made with your fingers and thumbs. Keep your fingers and thumbs in this position and bring your hands rapidly toward your eyes. If your hands go toward your right eye, this is your dominant eye (and vice versa). Repeat this movement rapidly without consciously thinking about what you are doing. If you find out that your dominant eye is the left one, then you will need a left-handed bow.

2.5 Warming up
Get into the habit doing some of warm-up exercises before you start shooting. It will help your coordination and aim. You will also avoid straining your muscles or ligaments.
Firstly, wave your arms around to loosen up your shoulder blades and muscles. Then do some stretching. You should relax your muscles and concentrate on them for some time. Ease them out length-wise. Your muscles will feel a bit stiff at first and more contracted than they should be. Relax and stretch your muscles. Don't make any sudden or jerky movements.

Exercise 1
This exercise is for the muscles of your shoulder and triceps. Put your right hand on your left shoulder and, with your left hand, push your right elbow toward your left shoulder for about 20 seconds. Reverse procedure and repeat.

Exercise 2
This exercise is also for the muscles of your shoulder and triceps. Place one hand between your shoulder blades and keep your elbow up. Press for about 20 seconds.

Exercise 3
This exercise is for the muscles of your forearm. Stretch out the fingers of one hand and gently push them back toward your forearm with the palm of your other hand. Do this for about 20 seconds. Reverse procedure and repeat.

You are now ready for arm bending exercises. This is the final warm-up stage. Pretend to shoot as though you really had a bow in your hands. Remember to tense your muscles while you do

this. Push your bow arm as though you were actually holding a bow. Pull the "bow string" with your bow string arm. Pretend you really have a bow string in your hand and that you are actually drawing the bow.

CHAPTER 3 - SHOOTING

3.1 Safety

1) Never release the string without an arrow nocked. The results can be disastrous for both the archer and the bow!
2) Children must never use equipment without adult supervision.
3) Before shooting, make sure all your equipment is in perfect working order. If your bow string is frayed or there are broken strands, you must change it. Make sure it is thoroughly waxed. Check the bow stave. The slightest crack on the handle or limbs will considerably weaken your bow. Check your arrows. This is absolutely necessary if you use wooden arrows. If there is bending or you see cracks in the shaft or the nock, sooner or later your arrow is going to break. Immediately replace damaged items.
4) Make sure your arrows are compatible with your bow's draw weight. An arrow which is too light will break the bow string or even the bow itself.
5) When you are in a group shooting at the same target, you must all shoot from the same line. Keep well back from the other archers while they shoot and never stand in front of them, at least not until they have finished all their arrows. An arrow with a broken nock can fly erratic.
6) Your target must be in reasonably good shape (in any case, strong enough to stop an arrow and hold it).
7) Even without a arrow nocked, you must point your bow from the foot marker (i.e. line you shoot from) only in the direction of the target and never towards people or animals. Before raising your bow, make sure nobody is sitting or standing near or behind the target.
8) Never shoot your arrow upwards. It could hit you when it comes down (that's why it's called "bowman's suicide"!). If you raise your bow higher than is absolutely necessary, your arrow might fly hundreds of yards and cause considerable damage.
9) Before shooting or recovering your arrows you must tell the others what are going to do by shouting it out. Do not move until you are sure everybody is aware of your intentions.
10) Never run toward the target. Before you pull the arrows out of the target, make sure nobody is behind you. The back of an arrow can hurt too!

3.2 Stringing your bow

Since you have to string and unstring your recurved bow or longbow each time you use it, the best thing is to learn the technique right off. The most correct method is to use a bowstringer, which is an accessory with leather caps at both ends. One cap is bigger than the other. One type of bowstringer has a leather cap on one end and a loop protected by a plastic strip or sheath on the other.

3.3 Stance and posture exercises

1) First, try out the drawing stance without a bow. Stand with your legs well apart (the distance between your feet should be equal to the width of your shoulders). This should be a comfortable well-balanced stance. Your feet should be parallel and at a right angle to the direction you shoot in (i.e. they must be side-on to the target). Raise your bow arm to shoulder height and, with the palm of your bow hand pointing down, stretch your arm out toward the target. Without moving your arm, rotate your hand until your thumb sticks up. This is the correct posture for bow shooting.

You can self-check for correct posture by bending your elbow toward you. If your hand goes toward your chest, your posture is correct. If your hand goes toward your face, your elbow posture is incorrect.

2) At last the time has come try out these movements with your bow. We'll get to the arrow later. The idea behind this exercise is that you "merge" with your bow, you must become part of it.

You must also concentrate on coordinating your breathing as you draw the string. Make sure your stance is correct at all times.

Raise your bow and make sure you feel the pressure of the stave on the inside of your thumb. Your bow hand should be open like a Y. Don't grip the handle too firmly. Hook your fore, middle and ring fingers. You do not use your thumb or your little finger, so there is no need to flex them at all. You will find that the bow string will naturally fit into the cavity between the first and second phalanxes of your fingers. Your wrist and the back of your hand should be level. Your fingers should be at nocking point height. Start by drawing your bow string back a bit. The bow string should fit snugly between your fingers and you should feel slight pressure from the stave of the bow. Breathe in and then out once.

As you begin to draw the string, you will find that the bow does not slip out of your hand even without gripping it. Of course, if you want to, you can hold your bow with your ring finger and thumb. You can continue to do so when shooting to make sure your bow doesn't slip out of your bow hand on releasing the arrow. If you use a sling won't have any worries at all about this. Now, breathe in. Hold your breath and carry out the following movements. Keep your eyes on the target. Raise your bow with your bow arm as if you were indicating the target to someone standing next to you. Raise your bow string arm at the same time. Your bow string elbow should be the same height as your shoulder. Begin drawing the bow string back while pressing your bow arm forward. Pull your bow elbow back.

You will soon realize that you are using a lot of muscles (mainly your back and shoulder muscles). As a beginner, as you fully concentrate on drawing your bow, you will probably notice the amount of strain your muscles are taking.

Your arms are in fact only doing part of the work. You will also feel the strain on your back muscles (your shoulder blade will press in on your thorax and lock in as you fully draw your bow. At this stage, you are pushing with your bow arm and hand, and pulling with your string arm and hand. When you reach the stage in which you are fully aware of all the movements as described, your coordination is already at a fairly advanced stage.

Watch out for your posture and stance: keep your head and neck up and keep your eyes on the target. Draw your bow string toward your face (not vice versa!). You must find your own personal point of contact between your bow string and your face. This is called anchor point. Once you find the right positions, your shooting will become constant and your arrows will be released with the same force each time. There are various anchor points; we will illustrate two of these.

One is obtained as follows: raise your string hand and hold it firmly up against your jaw. The bow string will touch your nose and lips (use this position for future reference).

The second anchor point (the one we recommend) is as follows: raise your string hand so that your forefinger touches the corner of your mouth. Your hand should rest lightly on your cheek. This is the best posture for instinctive shooting.

Gradually ease the tension on your string until it reaches its original position (let down). Remember that at this stage you have not yet nocked an arrow!
Repeat this exercise until these movements become perfectly natural and are well coordinated. Make a habit of always doing this exercise two or three times before you start shooting.

3.4 Shooting, afterhold and follow through
First check for correct correct shooting stance. Hold your bow vertically or slightly canted to the right. Nock your arrow and make sure the cock fletch points away from the sight window and that the bow string fits snugly into the nock. Hook your middle and ring fingers. Make sure your forefinger is above, and your middle and ring fingers below the nock. Do not squeeze the nock. The time has come to draw your bow. Do so according to the instructions given in the preceding section.

When you feel your stance is correct, ease off finger pressure. Your bow string will do the rest. Your arrow will be released in the direction of the target. Keep the same stance for a few seconds after releasing the arrow (afterhold). Don't move. Wait a while before lowering your bow and arms. Follow the arrow until it hits the target (follow through). After follow through, you may lower your arms, and the bow. Afterhold and follow through are vital if you wish to shoot correctly.

As you gradually acquire the technique you will become aware of some fundamental points. To stop your bow falling out of your bow hand on releasing the string, you should close your bow hand only after your arrow has left the bow (of course, this does not apply if you use a sling). Do not raise your bow shoulder. Keep it at the same height as your string shoulder. You must not consciously open your string fingers. You must quite simply ease off the pressure (please remember, at this stage you are not trying to get a bull's eye...). You are learning to shoot. What we are interested in here is correct shooting stance and movements. Practice target shooting at close range (about 5 yards) and pay particular attention to your overall body movements. If you move correctly, chances are your arrow will go where you want it to go. Don't become demoralized if it takes time before you learn everything. The most important thing at this stage is regular and constant practice.

3.5 Instinctive shooting
Most modern schools immediately teach beginners target shooting. They reckon beginners will feel encouraged if they see their arrows grouping more or less together on the target. The alternative approach, which we suggest, is to concentrate more on the natural and creative aspects of archery: to attempt to create a harmony between body and mind so that, through repetition, your arching stance and movements will become as natural as riding a bicycle or tossing a basketball into a basket. Instinctive archers don't calculate their shots, they feel them. Point your arrow toward the target. Don't take your eyes of the target. Forget everybody and everything around you. Everything must take place on a subconscious level. What you feel is what you get!

Admittedly, this is the long way round, but it will be worth it in the long run. It's all down to practice at this stage. Only by practice will you be able to direct your energy through your arrow.

You must humbly accept that you need a lot of practice before all your body movements become natural. When you get your first bull's eye, you'll see what we mean. Nobody's talking about tournament trophies at this stage. It will be worth all the effort you put into your shooting at this stage just to see your arrow flying beautifully where you want it to go. The sheer power packed into that arrow when it's suddenly released will amaze you. Your fingers won't even know they've left the string. You will feel the tautness of your shoulder and hand merge with the movement of the bow itself, and - as it sets out along its line of flight - the whistle of the arrow will be like the cry of an eagle.

CHAPTER 4 - MANTENANCE

4.1 The Easton tables

Use the Easton tables to choose exactly the arrow you need, but you should always remember that mathematical models are not perfect, nor are the specifications offered by the manufacturers (these are based on their own statistical market research data). The information gained from these tables only provides an indication. It's up to you to find out exactly what you need; and, to do so, you will have to try out a number of options.

The Easton tables are for aluminum, carbon-aluminum and carbon- fiber bowhunting and target shooting arrows and the Beman and AFC tables for carbon-fiber arrows.
Check the specifications of your equipment (true draw weight, weight of arrowhead, AMO draw) and look up the corresponding space in the table.

First, check peak bow weight (left hand column) and arrow length (the line on the top, to the right). For recommended arrow specifications (bold face), check one off the other in the table. You will also find the "Shaft size" numbers on your arrows. If you have a 2213 alumininum shaft arrow, for example, 22 means 22/64", indicating the external diameter of the tube. 13 means 13/1000" (thickness of wall). "Shaft weight" also includes the weight of the ferrule for the arrowhead (plus 35 g, which is the average weight of plastic fletch or feather and nock). This table refers to standard equipment. If your equipment has been specially adapted for personal needs, you will have to read the table according to the changes that have been made (see below).

Short bows (43") with draw of 28": move down a space (4-6 lbs more)
Draw weight above that indicated: move one space to the right (1" more) for each 6 lbs added
Dacron string: move one space up (3 - 5 lbs less)
Arrows longer than 32": move one space down for each added inch
Arrows shorter than 32": move one space up for each inch taken away
Weight of arrowhead: add or subtract 1.5 g for each 10 g added or taken away
Mechanical release: move one or two spaces up (3-5 lbs less)
Let-off of compound more than 50%: move one space to the left

4.2 Making your own arrows

First select the most suitable type of shaft. You can buy arrows ready made or simple shafts to which you attach arrowhead, nock and fletches. Whichever you decide to use, you will probably find that the shaft is longer than your draw and you will therefore have to scale your arrow down accordingly. Use a modeling saw for wooden shafts. You will need a pipe-cutter for aluminmum shafts. If you choose carbon-fiber shafts, you must have it cut by your dealer since a special electric cutter is necessary.

If you want to shorten ready-made arrows, you must heat the end with a cigarette lighter until the glue melts before extracting the arrowhead with tweezers or small pincers (if the glue is the kind that melts, of course!). Once you have cut your arrow, you will have to glue the arrowhead in again. If your shaft is the normal simple kind, you may now fit the nock and fletches.

Pipe-cutters
You can buy pipe-cutters in all hardware stores. Before use, check that the blade is sharp enough and replace it if necessary. Slowly cut the arrow and make sure the vice is not so tight that it will leave a kink on your shaft. We also advise you to file down the cut edge.

Arrow taperer
This is an absolute must for wooden arrow making. The is used to taper your arrowhead as well as the rear end for fitting the nock. Please remember that after you have tapered the rear end of the arrow, examine your shaft section-wise and fit the nock vertically to the wood grain to ensure ideal spine.

Fletching jig
You use the jig to carry out fletching according to the angles required (120 degrees for three fletches; 105/75/105/75 degrees for four fletches, and 60 degrees for six).
Before gluing the fletches, remove all grease and dirt from the arrow shaft with acetone. Fit your shaft onto the jig and remember that the nock angle must be at 90 degrees to the cock fletch (the jig has a marker for exact positioning of the shaft). Some manufacturers recommend rotating the nock 30 degrees clockwise as an alternative to the normal (right angle) set-up for maximum arrow clearance (see 1.2.3). If you choose to rotate your nock, you can only do this manually. After setting the fletches with the jig, apply the glue to the edge. Make sure you have contact for the entire length of the fletch. Please note that the further back you install the fletch, the more stable your arrow will be in flight. Do not set it so far back that it touches your fingers. Leave the glue to dry for 15-20 minutes, rotate the jig and repeat. Finish off by adding a drop of glue to both ends of each fletch to strengthen the hold.

Special jigs are available for helical fletches.
You can choose from a number of special fletching glues (Fletch Tite, Bjorn, Bear Cement). These will dry and harden fairly slowly. If you wish to speed up the process, you can use cyanoacrylate (superglue) drop or gel glues. If you glue the fletch to the arrow with a cyanoacrylate glue, we recommend going over the edge with a few drops of one of the special fletching glues, since cyanoacrylate glues are not very elastic and may become unstuck during use.

Use fletching - not cyanoacrylate - glue. If your arrow is aluminum, remove all grease with acetone before using the glue. You can use hot melt glue for the arrowheads. Let the glue cool down and strip away all excess glue. If you don't want to use a hot melt glue, you can use an epoxy resin. If you do, remember you will no longer be able to replace or substitute your arrowhead or nock. The above instructions apply to wooden or aluminum arrows. Carbon and aluminum-carbon arrows require specific glues (i.e. cyanoacrylate glues or epoxy resin such as Super Fletch Tite or Arizona).

4.3 Tuning

This is an important but delicate task and it certainly is not for beginners. You must become a skilled archer first. To tune your bow (i.e. assess the effects of adjustments) you must first know how to aim and be able to group arrows on the target. A single arrow will not provide you with adequate information on bow and arrow performance.

Shooting precision is directly influenced by the following variables or factors: 1) brace height, 2) nocking point, and 3) definition of center shot. See section 1.1.4 (bow strings) for all information you will require on brace-height at this stage. You can get further information from more advanced manuals later on. For the time being, we shall provide information on nocking point location and definition of center shot.

4.3.1 Nocking point
We already mentioned the "porpoise" movement of your arrow (see 1.1.5). This can happen with any bow and it depends on nocking point location. There are two methods for checking your nocking point.

Bare shaft method
This is a very simple and effective method. You must shoot toward the target at close range using bare shafts (i.e. shafts with no fletching). Your arrow shaft should be the kind you normally use. If your shaft hits the target with the butt higher than the point, your nocking point is too high (and vice versa). Continue shooting until your shaft is more or less level when it hits the target.

Comparative method
Create an arrow group of three fletched arrows from a distance of about ten yards. Then shoot your bare shaft. If it hits the target below the group (at least 20 cm), the nocking point is too high (and vice-versa, of course). You should try to get both fletched and bare shafts grouped together. Repeat this procedure until results are statistically consistent.

4.3.2 Center shot tuning
When you release your string, the arrow will fishtail as it leaves the bow (this is also called archer's paradox). This movement falls off as the arrow travels toward the target. If your bow and arrow are compatible and in tip-top condition, the fishtailing will stop within a few yards of flight, and the resulting trajectory will not be deflected. If you have not tuned center shot, your arrow will hit the target either left or right of the bull's eye.

Here too, you can use the bare shaft or comparative method as described in the preceding section. If you want to try out the bare shaft method, you shoould remember that if the rear end of the shaft lies to the right of the point of contact between the shaft and the target (or if the shaft is left of the group) it is too stiff (and vice-versa). If your shaft is too stiff, center shot should be shifted closer to the plane of the bow string movement on release (i.e. the riser of the bow). If your arrow is too weak, center shot should be moved left.

We recommend verifying choice of arrow and, in the eventuality, changing type. Alternatively, you can adapt the arrow to personal specifications. If your arrow is too stiff, use a heavier point and/or use a longer shaft (and vice versa, of course).

If you use a cushion punger, you can compensate for arrow defects by modifying the draw weight of the bow and length of draw. If your bow includes a cushion plunger, center shot can be

moved according to how much contact there is between bow and arrow on release. If your arrow is very weak, you will see it bend and feel the force with which it pushes in the cushion. The arrow will fly to the right in right-handed bows. If your arrow is too stiff, then it will veer to the left. If it is too weak tighten the cushion plunger; if it is too stiff, ease off cushion pressure.