Part I: The Airgun Hunters Guide to Guns, Ammo, and Gear

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Part I: Guns and Gear

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The American Airgun Hunter was my first book on airguns and was an overview of how to use them to harvest game, along with a number of stories about some of my favorite hunting trips. The next book, which I wrote with Randy Mitchell, was the Airgunners Guide to Squirrel Hunting. As the title implies, this book was all about how to be successful in the field hunting one of the most popular and abundant small game animals in North America. The following book was a journal that recounted my first safari to South Africa, in which big bore airguns were used for the first time to take big game plains animals.

During the years since I wrote the American Airgun Hunter there have been significant changes in the guns, but more important is the increased awareness of them as a valid hunting implement. Arguably, air powered guns represent one of the fastest growing segments in the shooting sports worldwide, and even in our country where we enjoy the right to possess and use firearms, airguns have taken hold due to their fit with today's hunting needs. On the back of this increased awareness has come regulatory inclusion of airguns as a permitted method of take in many jurisdictions for many small and large game species. In developing this second edition I have borrowed from articles I'd written for Predator Xtreme, Fur, Fish, Game and other outdoor / airgunning publications, so parts may be familiar to those that have followed my writing over the years.

I am not an “Airgun Snob” in that I think a less expensive gun can work just fine for pest control or small game hunting and serve as an entry point for those unable or unwilling to shell out the big bucks to get started. As a matter of fact, one of the value priced spring piston guns from China, or a Korean PCP can serve quite effectively to cleanly harvest game. There are now a couple of excellent and reasonably priced PCP rifles manufactured in North America as well, and we are seeing a lot of innovation coming out of our domestic manufacturers. So in this book I will provide information on a range of guns, from the inexpensive to the premium priced guns, and from springers to pre-charged pneumatics.

I have been lucky in having had the opportunity to hunt many venues and to have spent time in the field with some great airgun hunters and innovators in the airgunning world. Randy Mitchell and I have hunted and written together a lot over the last several years, and he has been a gracious host on my hunts down in Kentucky.
We have had some great squirrel and deer hunts together, and made a memorable trip to hunt with airguns in South Africa a few years back. He hunts small game, varmint, and large game with a variety of airguns ranging from the commonplace to the exotic; springers, pcps, CO2, and classic guns from the past. Eric Henderson and I have had some exciting outings with our big bore air guns over the years. My airgun safaris in South Africa have been enabled by my friends and Professional Hunters Andrew Myers and Robert Dell, these guys are opening the doors for airgun hunters in Africa. They are the experts for the region when it comes to airgun hunting and I’ve been returning to the Eastern Cape for several years now just so I can hunt with them. Ed Schultz is the head of engineering at Crosman Corp, and besides keeping me lined up with new guns to shoot, has hunted with me using those same guns. And the man that builds many of our precharged big bore guns is the common thread that ties many of together; Dennis Quackenbush is

I’ve been exceptionally lucky with my shooting career, and through my writing have been presented with many fantastic hunting opportunities. I am a lucky guy and I know it!! I’d like to dedicate this book to the growing number of airgun hunters across the country and around the world.

A gentleman and a craftsman responsible for some of the coolest airguns in the world. They hearken back to the earlier times when European nobility stalked the woods in pursuit of wild boar with their big bore pneumatic airguns. Tom Jue and Robert Hamilton were
early inspiration to give writing a go and to me, THE airgun hunting writers. I've made several new friends as I take my airguns around the country to hunt; Brian Beck is based in Indiana and is the most effective airgun predator hunter in the country, regularly winning competitions against firearm hunters using his big bore airgun. Chip Sayer and Charles Peebles are very experienced hunters that are recent converts to airguns ...... and in a major way! They've amassed an array of high-end air rifles which they use to hunt squirrel, turkey, and deer down in Virginia. I always have a good time hunting with them and look forward to our trips. I have also gotten feedback and photographs from other experienced airgunners, and would like to especially acknowledge the contributions of two great airgun hunters in Southern California, Cedric.Sophus and Lamar Denney. I'd also like to thank several manufacturers and distributors that have provided me with support on this project; Pyramyd Air has become the driving force in commercializing airguns for the mainstream hunters in North America, Airguns of Arizona, which is the importer of several fine European guns, AirForce of Texas, Cobra Airguns, Airhog, AirgunDepot, and Adventures in Airguns are companies that have provided me with guns, gear, and information. I have developed a close working relationship with Crosman and am a member of their pro-staff, and have also had a great deal of support from Gamo and AirForce, having provided me with equipment and information. My writing home base for the last seven years has been Predator Xtreme Magazine, which is the only US publication with a regular feature on airgun hunting. My editor at PX is the well known outdoor writer and bow hunting guru Bob Robb, who has embraced the use of airguns for predator and varmint hunting and given me a broader forum to write on this subject for the magazine. And finally, like a lot of American Airgun enthusiast. I would not have had access to the guns or technical information in the pre-internet era if not for the dedication and insight of Dr. Robert Beeman. His contribution, though focused on high-end spring piston guns, makes him the Patriarch of airgunning in North America.
A Brief History of Airguns

When I first became interested in adult airguns, I was quite unaware and surprised to learn that they had a history dating back a few centuries. I thought this type of gun was developed in the early 1900s by Daisy, Crosman, or Quackenbush, as these were the names I was familiar with, but with a little research I found that I’d been very wrong. The first documented use of compressed air to propel a projectile dates to the early 1500’s, though folklore has the airgun making its appearance in the early 1400’s. A gunsmith named Hans Lobsigner is credited with manufacturing a production hand held rifle that worked reliably in the late 1500’s, though from what I’ve read this may be lore rather than factual. It is a fact though, that several European countries were producing airguns by the early 1600’s and supplying arms for personal protection. The oldest known example of an air rifle that has survived from these early times resides in the Royal Danish Arsenal in Copenhagen and dates from around 1580.

In the late 16th and early 17th centuries, the technology and use of the air gun seems to have gained popularity with the well to do shooting elite. These guns equaled the power of conventional hunting and military firearms of the period. Many people are further surprised to learn that the early American explorers Lewis and Clark carried an air rifle on their two-year journey with the corps of discovery in 1804 - 1806. This may appear to have been an unusual item to carry along on their expedition, but the large bore pneumatic rifle they carried was capable of killing deer size game thought here is no documented evidence of it being used for this purpose. In addition, it could fire over thirty shots on a single charge. Airguns have also been used as weapons of war in Europe. The air rifles designed and used for this purpose in the 1700’s were quite powerful, and could fire a .50 caliber projectile with killing power out to 100 yards. This fact, along with the ability to fire repeat shots made airguns superior to muskets in terms of fire power. They were reported to have had a more sinister purpose as well, serving as a weapon used by snipers of the day. The guns would be at least slightly less noisy, and more importantly the shooters position would not be given away by a cloud of black powder smoke! At one time in Europe, anyone using a crossbow or airgun would be put to
death; the authorities didn't like the idea of a weapon being silent, in war or peacetime. I have read many times that airguns were also said to have been the tool of market poachers. As these early airguns were very well finished and intricately tooled and affordable only by the upper classes, I doubt that they were in fact a realistic choice for a market poacher, but it does make for a colorful story.

The first large-scale production of an airgun was of the bellows chamber design. As the name implies, a spring-loaded bellows was used to generate power. An expanding ratchet device housed in the butt stock was cranked to wind the spring. These breech-loading guns fired projectiles up to .50 caliber, but were low powered and probably used mostly for close range target shooting, according to airgun historians.

Another design that was first noted around 1600 was the spring piston gun, with several variations of springs used in their operation. By the first part of the 19th century the spring piston gun had established itself in Europe for indoor target shooting. By the mid 1800's this airgun had found its way to the New World in the indoor shooting galleries becoming very popular as a past-time sport. As time and guns improved they were placed into a number of classes for competition, from small caliber - smooth bore to the larger caliber - rifled and so on. Some of the companies in the United States that started producing guns for this market survived into recent times, or are still producing today (i.e. Daisy)

The pump pneumatic gun has been worked on by inventors since the early 1600's, and the technologies applied have been both varied and complex. The size ranged from .30 to .68 caliber bores and required a large volume of compressed air to produce pressures from a few hundred pounds per square inch to several thousand pounds per square inch. This much pressure would fire a .40 caliber lead ball 40 times without re-supplying the reservoir. As a matter of fact, in 1600 when the first pump-up (pneumatic) airguns appeared, they were one of the most accurate large-bore rifles. Even though they were effective, they were uncommon because they were very expensive to make and expensive to own. To be sure the cost was substantially more than that
of an equivalent quality firearms. The skills, knowledge, and great amount of time necessary to make the complex valves, locks and air reservoirs of the early airguns meant that only the wealthy shooters could afford them.

There were a number of other manufacturers from Europe and North America that had success with the airguns of various design for a range of applications; for example there was an Austrian made weapon that ranged from .40 to .52 caliber in bore and could shoot 15 to 20 rounds within a minute. A group of soldiers armed with air rifles could fire several thousand rounds very rapidly, meaning they would have many times the firepower of troops armed with flintlock muskets.

All of the most powerful airguns of the distant past were pump pneumatics. Pumping air into a valved reservoir of the gun charged them. The pumps were sometimes built into the gun but were more often separate, which allowed the shooter to carry precharged reservoirs for fast reloads. Charging a reservoir could take hundreds of strokes of the pump, but as has been pointed out, if you could afford the gun you could afford the servants to pump it up. I know that when recharging one of my precharged pneumatic guns and I'm a hundred or so pumps with a hand pump into it, I wish I could afford the servants to do the work!

The old airguns offered numerous advantages for those early shooters who could afford them. Some could be fired many times per minute -a major improvement over the front-loading powder burners. These guns were not silent but were undoubtedly quieter than firearms of equivalent power, and their lack of smoke and flash did help to make it more difficult to spot the marksman's position. These guns were said to be quite reliable. Other advantages included lack of residual sparks, faster shot time, more consistent power, and extremely light barrel fouling. All of these factors resulted in a better shooting weapon that was easier to maintain than firearms of the era.

In early 20th century America, the spring piston gun had developed to a fairly powerful and sophisticated level and had gained popularity as gallery guns. The pneumatics had reached a high level in Europe with the advent of the cased hunting rifles. The introduction of the firearm
cartridge and smokeless powder killed the development of airguns as arms or weapons of war. The evolution of the pump pneumatics and CO2 guns largely left Europe and appeared here as youth-level, low-power, mass-production guns, while in Europe spring piston airguns became extremely sophisticated and accurate target and light hunting small-bore guns.

In the United States the focus of airgun development was for the youth market, and almost every boy in this country has learned to shoot using a Daisy or Crosman BB gun. It is so ingrained in our culture that one of the most popular movies at Christmas is about a boy hoping against hope that he would receive a Daisy Red Rider from Santa. However, along with this popularity came the misconception in our country (unlike the rest of the world) that airguns were just low power plinking toys that were the playthings of young boys.

A couple of examples of early precharged pneumatic airguns dating to the late 1700’s, these guns were never well known and expensive and difficult to build. Airguns were used for hunting and even military applications in the 1700s. Lewis and Clark carried the best known airgun from early American history.
There is a long tradition of hunting with pre-charged pneumatic (PCP) air guns, dating back to the late 1600s when big bore air rifles were used by European nobility to take large game animals. In more recent years, spring piston airguns became available to the masses, and after World War II there was a dramatic increase in the availability of guns. The sport has continued to grow in much of the world, especially in those locales where gun ownership is not an option for the civilian population. In Europe this tradition has migrated into current times, with many of the finest guns being built in Germany, Spain, and the United Kingdom.

As a matter of fact, the UK is arguably the center of the modern airgunning world. They produce many of the finest spring piston and PCP airguns in the world; they have a vibrant airgun hunting community with several popular magazines dedicated to reporting on and promoting the sport. The British sportsman has insurance companies focused on providing service to airgun hunters and a complete infrastructure in place to facilitate the sport. And while the range of available guns offered to

the market comprises both spring piston and pcp power plants, there has been an upsurge in the pcp market over the last decade.

In the United States serious airgun hunting has been relatively unknown, and even less so when it comes to PCPs. However, anecdotal reports I’ve had from many of the major manufacturers, distributors and importers would indicate that the purchase of airguns for pest control and small game hunting has started to increase here as well. It appears

The Benjamin Marauder in .22 has anchored another squirrel!
that the majority of airguns being sold domestically are spring piston airguns used for plinking and pest control, but there is a growing core of serious air hunters that are supplementing their springers with precharged pneumatic guns. As Americans are faced with increased urbanization, the attraction of the air powered hunting arm becomes ever more attractive; providing a means of hunting in areas that are more densely populated where firearms are a no-go. While many hunters feel that PCPs are easier to shoot accurately and tend to be more powerful than spring piston guns, the fact that a number of springers are quite powerful (for small game), are fully self contained, and tend to be less expensive ensures that both power plants will continue to be used by sportsman for years to come.

In this book I will examine the issues confronting those either currently involved in the sport, or those wishing to take the dive. There are many paths by which people find their way to airgun hunting; some are introduced to hunting with an airgun then move to firearms, returning to airguns when they find that there is not enough time or land to permit them to hunt as much as they want with firearms. Then there are people like me, who after a lifetime of traditional hunting get caught up in the challenge of the sport and the technology of the arms, and migrate to airgunning with a passion.
Why Hunt with an Airgun?

As stated previously, in Europe and much of the world airguns are the only option available to people wishing to hunt. They simply are not allowed to have guns, or the population densities are so high that there is not enough open land to hunt over. But why would anyone here want to use an airgun when they could go buy a .22 rim fire, and achieve more power at a lower cost? Well, there are several reasons; airguns are relatively quiet and have a limited carrying range, they can therefore be used to perform pest control duties and hunt in fairly populated areas, and due to the limited range can even be shot safely in the backyard or down in the basement. The challenge of the hunt is increased, because to ethically take game the hunter must close the distance which requires honed hunting skills. Airgun hunting offers many parallels to bow hunting in this respect, but also incorporates traditional marksmanship.

The modern PCP airgun is capable of tack driving accuracy out to fifty or sixty yards, and most springers can be used with confidence out to thirty five or forty yards. Another benefit is that the hunter can get in a great deal of practice. I will often go down to my basement range and put a couple hundred rounds through a gun I’m getting ready to take with me into the field. You’re not going to be able to do this with a firearm unless you happen to live on a ranch in Montana.

The last reason on my list is the least tangible …. Airguns are cool! There is something about the engineering that goes into these guns, along with the diversity in designs available that makes airguns a highly addictive past time.
A Question of Ethics

One of the most frequently asked questions I get from other hunters that use more conventional weapons is “is it ethical to hunt with an airgun”? This is a fair question, and the short answer is yes. If one knows their gun and what it is capable of, both in terms of power and accuracy, they know what they are capable of with respect marksmanship, and know the animal being hunted, then they can ethically harvest game. This is of course the same set of criteria any hunter using any weapon must exercise. For me personally, it is within my skill and the capability of my Webley Raider to take a jack rabbit with a head shot at 50 yards. I can put pellets into a half inch group all day long, and the pellet retains enough power at that range to drop a rabbit in its tracks. If I was out with a .17 Mach 2 rimfire, I might reach out to 150 yards to shoot the same rabbit, as this is within the capabilities of that gun and me as a marksman. Conversely, the idea of trying for a rabbit at 150 yards with my Webley air rifle would be a nonstarter, as this exceeds the capabilities of the gun and the shooter. You do need to hunt smarter and hunt better with air power than you do with a firearm, and that is a large part of the appeal. I don’t really see the point of trying to reach out to exceedingly long distances with an airgun, where the capabilities are marginal at best, if you want to shoot prairie dogs at long range….. use a .223! Let me be clear on this; it is possible to reach out much further than the ranges I’ve stated, but as you move out further the likelihood of anchoring your quarry with every shot drops. Unless you are doing pest control and the only objective is to remove vermin, I believe the airgun hunter should work on closing the range rather than stretching the capabilities of the airgun.

Another aspect of the sport I’ve moved away from is trying to take ever larger game in an attempt to stretch the use of an airgun to take quarry that is probably too large. For instance, using a .22 pcp rifle that generates 20 fpe to take a jackrabbit fifty yards out is fine, but taking a body shot at a coyote that crosses your path at the same distance is not. Even a head shot is not a guaranteed clean kill on this tough quarry at that distance. When I first started shooting with the big bores for big game, there wasn’t a great deal of information or experience to draw on. But after several years of personal experience, and sometimes
pushing the limit, I believe that when taking larger game the appropriate range must be considered. Trying to take any animal at too great a range, with an inadequate caliber or too little power simply to test the boundaries of what can be done is wrong. Ethics are not simply a question of the tools used to harvest game, but how those tools are applied. I will say that after thirty years in the field hunting with firearms as well as using airguns, that airguns are a viable option for making humane kills on small game and for pest control. Additionally, big bore airguns are capable of taking much larger game humanely and efficiently, but we’ll discuss this as a separate topic later. To summarize; pick the proper gun and pellet, keep it to the appropriate range, know your skills, and you can indeed hunt ethically with air power.

There are two level of questions an airgun hunter should ask, the external factors are related to the legal issues; are you allowed to hunt the intended game with an airgun. The second level is what the hunter ask himself, and is related to knowing that the gun and hunter are up to the shot and the conditions are right.
Regulatory Status of Airguns

So the decision has been made to obtain an air rifle and hit the field in pursuit of game, the next question will typically be what the legalities are? The regulations relating to airguns vary from state to state, and it depends on whether pest control on private property or hunting of small game is the objective.

State laws change every season, and it is the hunter’s obligation to be current on those pertaining to the jurisdictions under which they hunt. Almost every jurisdiction requires that the hunter has a hunting license, even for pest control. A detailed list outlining the current regs for every state is outside the scope of this book; however we will take a look at the regulations in several of the states in which the author hunts most frequently:. These include Arizona, California, Nevada, Indiana, Kentucky, and Texas which will give an idea of the regulatory landscape.

Arizona: Is one of the states that clearly spells out the use of airguns as a valid hunting tool, and allows pneumatic airguns to be used for taking of non-game animals. They even provide for a special limited weapons seasons for tree squirrels, rabbits, and other game. Like most of the west, there is a lot of public land to hunt.

California: Allows the use of gas powered guns for the taking of small game animals, including rabbit, squirrel, quail, and turkey. It is stipulated that when hunting turkey the caliber of the airgun must be .20 caliber or larger. Non game species such as sparrows, pigeons, starlings, ground squirrels, coyote and jackrabbit may also be taken with airguns. California is my favorite airgunning state, because in addition to the intelligent regulation pertaining to airguns, there are literally thousands upon thousands of acres of public land to hunt.

Michigan: Game, including deer, may be taken by firearm, bow and arrow or slingshot and in some instances by crossbow. By state law definition, a “firearm means a weapon from which a dangerous projectile may be propelled by an explosive, or by gas or air. Firearm does not include a smooth bore rifle or handgun designed and manufactured exclusively for propelling by a spring, or by gas or air, BB's not exceeding .177 caliber.” Thus, all air rifles, except smooth bores designed and manufactured exclusively for propelling by a spring,
or by gas or air, BB's not exceeding .177 caliber, could potentially be used to hunt.

**Nevada:** is one of the jurisdictions that do not specifically address airguns, but states that unlike large game, small game may be taken with handguns and rifles without stating the power source. Nothing is contained in the regulations regarding the method of take for non-game animals. There is no closed season on those species of wild animals or wild birds classified as unprotected. Coyote jackrabbit, skunk and weasels, and all species of mammals which are not classified as game, fur-bearing, protected, threatened or endangered animals. These include marmots, chipmunks, English house sparrows, starlings, porcupines, skunks, rats, moles, voles, pocket gophers.

**Indiana:** The regulations don’t call out airguns specifically. However, they do state that gray and fox squirrels may be taken with any equipment and ammunition during squirrel hunting season. The regulations are the same as when hunting with a firearm, you must have a hunting license, meet fluorescent orange clothing requirements while hunting squirrels when the season overlaps deer season, follow the same limits and seasons as firearm. It is legal to hunt squirrels from a boat that is not under power derived from a motor, which is an interesting way to hunt. I gave it a try after reading the hunting experiences of Randy Mitchell down in Kentucky. Shooting into or disturbing a dray or squirrel dens is illegal at all times. This is illegal in almost every jurisdiction and it is really poor form to boot. It is illegal to hunt or possess flying squirrels, which are a protected species in Indiana. Pest birds such as English sparrows, starlings and feral pigeons (except homing pigeons) may be killed at any time and in any number. Brown headed cowbirds, common grackles, red-winged blackbirds, rusty blackbirds, Brewer’s blackbirds and crows may be controlled when they are damaging trees or crops, and hunting under a depredation permit is discussed later.

**Kentucky:** Allows the use of air guns for the taking of small game animals, including rabbit, squirrel, and non game species such as sparrows, pigeons, starlings, ground squirrels, coyote may also be taken with airguns. In 2004, the regulations were reinterpreted to allow
the use of large bore airguns for taking whitetail, but it was further stipulated that the guns must be converted into muzzle loaders and used during the primitive weapons season.

**Texas:** Does not allow the taking of any game animal with airguns, but does allow the taking of non-game and exotic species. Therefore you can take rabbit, ground squirrels, prairie dog, coyote, bobcat, feral hogs, rams, and other non-indigenous species. You cannot take squirrel as they are a game animal in most of the state, though in certain areas they have been delisted and can therefore be taken with air power. Texas is my destination spot for big game airgun hunting.

**Missouri:** Specifically calls out that; guns powered by spring gas or air are allowed for hunting game, with the exception of turkey. Under the tireless grassroots campaigning of airgun hunter Ken Cox down in the Show me state, deer season in 2008 will be the first in which big bore airguns will be allowed. The regulations state that an air powered gun .40 caliber or larger, charged only from an external high compression air source (hand pump, air tank, or compressor) is permitted.

**Virginia:** Has become one of my primary destinations for airgun hunting, offering squirrel, rabbit, predators, and big game (deer and bear). The regulations are very clear, stating “Rifles used for deer or bear must be .23 caliber or larger. Rifles (including air rifles) may be used for taking wild animals and wild birds, except migratory game birds and waterfowl, and where prohibited by local ordinances. Rifles (including air rifles), pistols, and revolvers may be used for hunting crows, except where prohibited by local ordinances. Rifles (including air rifles), pistols, and revolvers may be used for hunting turkeys, except where prohibited by local ordinances.”

**Restricted Jurisdictions**

There are jurisdictions which do not allow airguns to be used for hunting, or restrict their use in a significant way. As mentioned, some states such as Texas allow airguns to be used for non-game animals but not game, which presents an ironic situation in which you can shoot a 300 pound feral pig (non-game) with an airgun but not a squirrel (game animal). Other states such as California allow any small game to
Then there are some states (Pennsylvania comes to mind) that are in my opinion, misinformed or uninformed and do not allow hunting with airguns. However, the law is the law and it is important that you abide by your local regulations before hitting the field to hunt with air or powder. If you live in a state that prohibits the use of air powered guns and disagree with the law, work to change it! Over the last few years there have been several grassroots movements that have been able to attend hearings with their fish and game officials, and present arguments for the inclusion of airguns as a legal method of take. And there have been enough successes in states as varied as California, Kentucky, and Missouri to set precedent and give encouragement to those willing to take up the cause! But in each of these states there was an avid airgun hunter lobbying to allow airguns to be used as a legal method of take (Robert Hamilton in California, Randy Mitchell in Kentucky, and Ken Cox in Missouri).

**Depredation Permits**
Most states give land owners the right to remove pest species that are causing damage to crops or property. In some jurisdictions you need to get the permits before you can actually remove the pest animals, in some you need to notify the authorities within a specific time of taking the animal, and in others you need not follow up.

The federal government also issues depredation permits to allow the take of migratory birds which are causing serious damage to public or private property, pose a health or safety hazard, or are damaging agricultural crops or wildlife. If it is necessary to apply for a permit to kill a limited number of birds, documentation from their office that they have offered advice in the non-lethal control of birds is required as part of the application information.

Airguns are an ideal way to remove animals under a depredation permit, as this often requires animals to be taken in areas that are populated, that have buildings or equipment that could be damaged with firearms. They offer a quiet, effective means to get the job done without sending out an alarm to those that would oppose the legal culling of
these animal pests. Throughout this book we will discuss some of the
general issues related to airguns used for hunting; what power is
required, what accuracy is required, what range must the gun deliver a
pellet to, etc. In the following section we will review several gun designs
along with a discussion of their shooting characteristics and how to
further optimize their performance.

**Regulations Outside of the USA**
The laws applying to the use of airguns for hunting outside of the USA
seem to be as varied as they are between the states. The United
Kingdom has one of the longest histories and best represented group of
hunter anywhere in the world. They have magazines targeting airgun
hunters, insurance programs specifically designed to cover them and
the landowners on their shoots. At the same time they are limited in the
power of the guns they use (without an FAC permit) and the game
available is limited to small pest species (rats, magpies, pigeons, gray
squirrels, and rabbits).

I have seen several examples of airguns being used in Korea to hunt
pheasant and ducks, in the Philippines to hunt dove, ducks, and hogs,
in Mexico to hunt dove, rabbit, iguanas, and jackrabbits, and in several
of the Caribbean islands to hunt doves, small birds, and iguanas, but
have had a difficult time finding any detailed regulation that clearly
articulate what the laws are.

In South Africa, airguns are allowed for native and non-indigenous
pest species. But when we wanted to use bigbore airguns to hunt plains
game we need to get permits from the proper Ministries to be granted
permission. I was told that after these hunts future hunts would be
permitted, but we’d need to obtain special approval before each hunt.

New Zealand and Australia allow pest species such as myna birds,
pigeons, rabbits, and rats to be taken with airguns, and I have seen
reports of hogs and feral goats being taken using bigbore as well.

Where you live or wherever you go, it is prudent to find out from the
local authorities what is allowed...... or even if you can legally bring
your airguns into the country, before you go.
Spring Piston Airguns

Spring-air guns develop power using a piston propelled by a spring under compression. Cocking the rifle causes a piston to be drawn back in a cylinder, drawing air into the cylinder and compressing a coil spring. Pulling the trigger releases the piston, causing the spring to move forward and move a small volume of air through a hole into the barrel, propelling the pellet down the barrel. Spring air guns can be as simple as a mass produced BB gun or as complex as a recoilless match air rifle. They can be simple, low powered guns or high-power rifles developing a tremendous amount of energy. In one modern design out of the UK, the coil spring is replaced by a gas strut containing air or nitrogen under pressure. These types of guns are charged using three different cocking mechanisms; the break barrel which is the most common, the side lever, and the under barrel. I use all three, though my favorite rifles are all break barrels. I have read and heard it said that the fixed barrels of side cocking rifles and under lever rifles allow for better accuracy, however I’ve never noted this to be the case with the variety of guns I have shot.

Spring piston airguns take a bit more practice and skill to shoot well, but if you’re willing to put in the time they are great small game and varmint hunting tools.
manufacturers such as Logun, Air Arms, Air Force, BSA, Crosman, and Falcon, along with some interesting guns coming out of China, Turkey and Korea. There are also some fine custom airguns being built in this country, especially with respect to big bore airguns by the likes of Dennis Quackenbush.

With so many models, calibers, and styles of airgun to choose from when picking a hunting arm, how do you select the right one for you? The best gun for an individual hunter depends on the shooter, conditions under which they hunt, what they can afford, and the type of quarry they will pursue.

While there are variations on the theme, modern airguns fall into one of three general categories; 1) Spring Piston Airguns, 2) Pneumatics and Precharged Pneumatics, or 3) CO2 guns. Before starting a discussion of pre-charged pneumatics, it would be useful to take a fast look at other airgun power plants.
Many springers don’t shoot well until a couple tins of pellets have been fired through them. There may be a lot of dieseling during the initial break in period, but this usually self corrects with time as the excess oil burns off. There are a few things to remember when shooting this type of gun to keep it functioning well. Don’t cock the gun until you’re ready to shoot, as leaving the gun cocked over a long period of time weakens the spring thereby reducing the velocities achieved and reducing power delivered to the target.

None of the spring piston guns I own can be decocked without firing. If you do cock your gun and need to decock it, do not dry fire as this can cause serious damage. Before you start shooting a new spring piston rifle check to make sure the screws attaching the action to the rifle are tight, and check at regular intervals as they can vibrate loose resulting in a marked degradation of accuracy.

Spring air guns generally have fairly heavy recoil that originates from the movement of the piston. It is possible to produce a recoilless spring air gun and there are match rifle designs, which allow the entire action to slide on a set of rails. When the gun is fired, the barrel and action are allowed to slide rearward under recoil, while the stock remains motionless. Even in less sophisticated designs, careful tuning of the spring and transfer port size and shape, combined with spring dampening compounds and devices, can significantly reduce recoil in a standard spring gun.

Many shooters these days are moving to precharged pneumatic air rifles, but I believe there is still a place for the springer in the air gun hunter’s battery. Some shooters find these guns difficult to shoot accurately due to the recoil, but I personally have never had a problem getting good hunting accuracy out of a quality springer. I like them for several reasons; they are pretty much maintenance free, they are easy to travel with and do not require a lot of adjunct equipment, and most importantly quality springers are powerful and accurate. I had this point brought home on a recent hunting trip for jackrabbits. I flew from my home in the Midwest out to California for a shoot with my brother. I packed a new PCP I’d just finished sighting in as my primary gun, and as an afterthought grabbed my trusty old Beeman C1 carbine. When I
arrived on site the guns were uncased and brought to the bench to confirm they were still zeroed (not a bad idea when checking guns with the airlines). After charging my PCP with a hand pump in the 106 degree desert heat, I squeezed off a shot …… nothing happened. We were unable to trouble shoot the problem, so the PCP went into the case and out came the C1, which I used for a great hunt. It can be argued that PCPs are precision guns that are quite reliable, however when I look back over my hunting logbook, I see that over the years I've had significantly less problems with my springers than PCP or CO2 guns. On the big trips, the ones I travel for or that are one of a kind opportunities, I may bring a PCP but I'll always have a springer packed as a back up.

Spring piston airguns are cocked with either a break barrel, under barrel cocking lever, or side lever cocking mechanism. By far and away the break barrel is the most popular and most commonly encountered. It has long been a conventional wisdom that the break barrel is not as intrinsically accurate as the under or side lever guns as the barrel is fixed, however I don't agree with this as even in a break barrel the barrel from the pellet to the muzzle doesn't shift. While it is true that there may be some variation between the barrel and the scope or sights with any variation in lock, I've never found this an issue in a quality rifle. Examples of break barrel rifles I shoot are the Beeman R1, R7, and R9, the Webley Patriot, Walther Falcon, there are literally hundreds of good break barrels at every price point on the market.

The under levers that I shoot the most are the AirArms TX 200, the Chinese clone of this rifle called the BAM B40, the Gamo CFX and an old Favorite the Gamo Stutzen.

The only side levers I have in my collection are the RWS 48 and a little urban hunting gun built on a BAM B56. While I prefer the looks and find the cocking / loading process easier with break barrels, I don't think it really matters if you like the rifle, can shoot it accurately, and it carries well in the field.
How a Springer Works

The main mechanical components are the barrel (A) the compression chamber (B) the piston (C) and the mainspring (D).

In a break barrel design, the barrel is hinged to the cylindrical housing and connected to the piston via a sliding linkage. As the barrel is pulled down it is rotated against the hinge point and the linkage pushes the piston back compressing the mainspring. At this point while the barrel is broken the gun is loaded by placing a pellet directly into the barrel. When the piston has reached its cocked position, the sear (part of the trigger assembly) is engaged.

As the piston is pushed back and the mainspring is compressed, a small volume of air is drawn into the compression chamber. This is the volume of air which will be compressed and drive the pellet out of the barrel.

Once the barrel is closed, there is a closed circuit from the compression chamber to the end of the muzzle, with the pellet sitting between the transfer port and the barrel.

When fully compressed the sear engages and holds the compressed mainspring and piston in the cocked position, until the trigger is pulled. When the trigger is pulled the sear disengages and the piston is released, pushed forward be the mainspring. The piston compresses the volume of air in the compression chamber and forces it forward through the transfer port. It is blocked at this point by the pellet, but when the pressure overcomes the inertia and friction of the pellet in the bore of the barrel, the pellet is propelled forward. The stiffness and length of the spring, and the amount of air drawn into the compression chamber will determine the velocity of the pellet.
You can get an inexpensive rifle that is up to the job of taking small game at around 40 yards. The B26 Thumbhole stock is a Chinese clone of the venerable Beeman R9/ HW95 that sells for about $140.00, or about a third of the original. It doesn’t have the fit or finish of the original, but the rabbit (below) didn’t notice! It’s great to have the best, but not necessary to get started.

One of the things I love about springers is you cock them, load them, and shoot them. They are reliable, and with minimal care will keep shooting for years. The Hammerli rifle (top) in .177 is a budget priced rifle that is an excellent small game gun. The gun wearing the camo stock (above) is a Walther Falcon in .25. This sledgehammer is one of the better lower price springer that is also one of the most powerful spring piston airguns on the market.
Spring piston airguns are pretty simple to maintain; occasional (and very light) lubrication of the hinge points, mainspring, and make sure everything is tightened down. To lubricate the mainspring many guns need to be removed from the stock, then the spring is easily accessed (a and e). A drop or two of a synthetic lubricant from RWS, Beeman, or one of the other major airgunning companies work well. When the gun is reassembled, make sure the stock screws are tight (b) and check frequently as they can loosen with routine use, then lubricate the hinge points of the gun inset (c and d). Clean the barrel every couple tins of pellets, using a degreaser, don’t use conventional firearm solvents.
Tuning the Spring Piston Air Rifle

You may feel that when you lay down the dollars for a product, it should work to perfectly out of the box. This may or may not happen with your new spring piston air rifle. As a rule, the more you pay for a gun the more likely everything is working well, but it is possible that you'll get a high end gun that's either a little rough around the edges, or more likely just not functioning at its full potential. If you go the budget route it is possible you'll get a gun that's a bit twangy and rough to cycle. As a matter of fact, some shooters will actually go for a budget shooter with the intention of tuning it up.

With any springer fresh out of the box, you want to clean the exterior and barrel of any grease, tighten down the screws holding the gun together, and as mentioned previously fire a hundred or so pellets through it just to burn off any excess oil in the compression chamber. You don't need any special tools or materials to do this. But if the gun cycles roughly, or significant spring vibration is present, it can cause the gun to both shoot, and be shot, inaccurately.

The actual tuning of the spring piston gun is outside of the scope this book, but there are some good sources online if you want to give it a try. My first Chinese airguns were bought specifically so that I could tear them down, see how they worked, and try to make them better. I am not particularly mechanically savvy and found this task moderately difficult. Unless you are mechanically inclined or budget constrained, I’d suggest you send your rifle to one of the many great tuners out there. The price is not insignificant but at the same time not outrageously expensive, and a good tune can make a mediocre gun very good and a good gun great.

Regardless of who does the tune, the steps are the same; the gun is disassembled (using a spring compressor) and the compression chamber is opened and mainspring removed. The spring can be reused, but most often a superior quality aftermarket spring is used to replace the original. As a matter of fact, all of the seals and O rings are replaced with new components during the rebuild as well.

The inside of some of spring piston guns I’ve seen are pretty roughly fabricated, with sharp edges and deformations where metal
contacts metal. These edges and malformations are smoothed during the tune, with care taken to round off the sharp edges and remove extraneous materials without taking off too much. Areas such as the spring guide, the cocking slot, the cocking linkage, and any other areas where there is metal to metal contact are inspected and deburred. After this step the components are thoroughly cleaned and degreased. I remember one compression chamber we opened during a tune was full of cigarette ashes, I guess the offshore factory didn’t have a no smoking policy.

Once the gun has been cleaned, it is lubricated with a coating of moly grease at contact points (remember petroleum based lubricants may explode under extreme pressure) and the gun is reassembled. Make sure that in your reassembled gun everything has been tightened down, including the attachment of the action to the stock.

The shooting characteristic of the gun depend on the objectives during the tune. The rifle can be tuned for the ultimate accuracy and smoothness by using a lighter mainspring. It can have the power tweaked up with the use of a heavier mainspring. It depends on what you were trying to achieve with the tune; but in general the shooter will experience a smoother cycling gun with significantly less spring vibration.

Do you need to have your gun tuned? That depends; even a rough shooting gun is probably OK for casual use. Most of the guns in the moderate price range from the major manufacturers are going to be usable out of the box. Could they be made to shoot better with a good tune? Probably. Do you need to do a tune to use them for hunting? Absolutely not.

There are several sources for airgun mainsprings, but arguably the best springs, and widest range, in North America are those produced by Jim Maccari. He produces several tune kits for a number of different rifles. This is also a source for piston seals and lubricants, pretty much everything you’d need for a tune.
Spring Compressor: Tool for the Power User
If you are mechanically inclined and would like to work on your own spring piston airguns, you will need a tool called a spring compressor when removing the mainspring from your gun. Even a low power gun is almost impossible to take apart and put back together again without one, and even if possible is dangerous. The main spring is under substantial tension even in the uncocked state. The compressor allows the spring tension to be gradually released when the gun is being disassembled and compressed to allow the gun to be put assembled after the work is done. The components of this simple device are the base (which hold everything else in place) the bed (which holds the compression tube securely in place), the screw (which allows the mainspring to be decompressed and compressed), and the stop (that holds the barrel in place).

This spring compressor is built by Tim (VPilot) and is a very robust design. It has a stationary end clamp bolted securely with 4 bolts and tee nuts. A moveable center rail delivers more adjustments than ever with the added advantage of being collapsible to 23" OAL for easy storage or transport. The wood knobs Tim added to the cross-bolts allows tool-free operation with the exception of the center clamp location adjustment (rarely needed). Rubber lined clamps protect against scratches and marring of the finish. Screw can be rotated while under pressure for screw-on end caps like the R1.
Gas Piston Airguns

With all the advantages of conventional spring piston airguns, there are downsides; the harsh bidirectional recoil can make accurate shooting more difficult, you can’t leave the gun cocked, and the mechanical noise during firing can be substantial. The gas piston, also called a gas ram or a gas spring can address these negative aspects, and have applicability in optimizing springers for duty in the field hunting.

A gas spring uses a cylinder charged with a compressed gas such as nitrogen. This gas is further compressed behind a piston, analogous to the steel spring in a conventional springer. When the gun is cocked, the gas is further compressed behind the piston increasing the pressure. As with a conventional springer, the piston is held in place until the trigger is pulled, releasing the sear, allowing the piston to be pushed forward by the expanding gas, pushing the small volume of air in front of the piston through the transfer port behind the pellet and down and out of the barrel. As you'll note, besides the mechanical spring being replaced by the gas spring, the guns are virtually the same. As a matter of fact this is why converting a standard gun from a steel spring to a gas spring is a relatively straight forward process.

The traditional spring piston mechanism (top) and the gas spring (lower) can fit in the same gun, allowing many guns to be retrofitted (courtesy of Crosman Corp.)
The advantage of buying a gas ram, or converting your current springer, with respect to hunting guns is that you can leave the gun cocked for a long period of time without damage caused by the spring taking a set. This addresses my major issue with springers in the field. There are some secondary benefits, I find the gas spring guns I’ve shot to have a smoother recoil and be less hold sensitive. This suits me as I prefer to shoot off sticks or a rest while hunting, whenever this is possible. The guns also tend to be a bit lighter, and in the big magnum springers any weight saving is good!

The Benjamin Trail NP Gas Spring Piston gun has all the attributes to make it an excellent hunting gun; accuracy, power, quiet, shootable, and reliable. This is a favorite mid powered hunting gun

I have read and heard others say that the cocking effort is reduced with a gas spring (and I thought this was the case), while others say they are more difficult to cock. I started looking at the chrony results in a gun that had been converted so I had a baseline, and while the cocking effort did seem lower the velocity was concurrently a little lower. Point is
that I don’t think there is enough of a change one way or other to make a difference on a hunting gun that gets cocked and shot less than a target gun as a rule, they seem pretty much the same now that I’ve tried a few more rifles. What you don’t get out of a gas spring is a substantial increase in power. If your gun was producing 18 fpe before the conversion, it will do about the same after. However, I am slowly coming round to think that this is a positive step forward in the evolution of hunting airguns. Although gas springs have been around for several years, it is the recent availability of guns and upgrades at a reasonable price that is delivering the option to more hunters, and is worth a look if you’re looking for a new springer or a facelift for an old favorite.

Anytime, in any weather, with nothing but the gun and a tin of pellets a springer will let you hunt, and do it effectively. These two guns represent a couple of the most popular cocking mechanisms; the left is an under barrel cocking lever and to the right is a typical break barrel design. I favor the break barrel only because they tend to be lighter and easier to mount a sling on.
Precharged Pneumatic Airguns

A more preferable form of pneumatic for target shooting is the single stroke pneumatic airgun. As the name implies, one motion of the cocking lever is all that is needed to compress the air for propulsion. The single stoke format is used on many high end 10 meter match airguns, such as the Beeman/FWB 601. Consistency, accuracy and lack of recoil are the reasons top shooters gravitate to this type of power plant. The downside is low power, but with tack driving accuracy at close range, again the reason 10 meter shooters love them. As a rule these guns are not recommended for a hunting arm, though they are viable for small pest control at short range, such as culling pigeons or sparrows around the barn.

The future of airgun hunting will see the eventual dominance of PCP designs. As awareness of these airguns becomes main-stream, and cost go down more shooters will gravitate to them.

Another type of pneumatic airgun is the pre-charged pneumatic. This is the best of both worlds, and arguably the best selection for a hunting rifle. You can get variable power from low to high in many designs; my Career Infinity for instance, the power can be dialed into settings ranging from 6fpe to 50fpe. Incredible accuracy, easy cocking, and no recoil and lots of shots from an air charge are other advantages of thus power plant. The charge takes little effort on your part because the air is compressed at the dive shop into a high pressure air or SCUBA tank. All you need to do is direct some of the compressed air out of the high pressure tank and into the airgun via a reinforced hose with a pressure
Pre-charged pneumatics are used as competition airguns for the field target set, but I believe they really come into their own as hunting guns. They are powerful; in fact they are without doubt the most powerful airguns available. My Quackenbush .457 shooting a 300 grain pellet (bullet) generates over 500 fpe and is capable of taking very large game. The bulk of production pcp rifles in .177 - .25 will generate between 15- 50 fpe and tend to be much lighter and more compact than spring piston designs. Another nice feature on several pre- charged airguns are multiple shot designs which allows a quick follow up shot without having to fumble for a pellet.

There are several types of air reservoirs for pcp rifles; some are incorporated into the butt stock (Talon, Logun s16), sometimes as a detachable bottle which is part of the forestock (Rapids, BSA Superten), but the greatest number have an integrated reservoir tube under the barrel. The gun is filled by attaching a hose from the fill tank to the gun. Unfortunately, there is not a standard connector and many guns use proprietary probes. If you head to the range with a Webley, a Sumatra, a Logun, and Airforce guns; you will have to take four probes along to fill the gun.

Every precharged airgun, even the same models, will have some characteristics that are unique. This is the reason the first task undertaken when I receive a new PCP gun is to fill it and run it over the chronograph to determine what fill pressures deliver the best performance. The intuitive outlook is that the higher the fill pressure, the higher the velocity, but this is not the case. Each gun has a sweet spot at which the most effective function occurs.

The first step is to fill the gun to the maximum fill pressure, and start shooting across the chrony. What you will often find is that the first shot (or shots) are well below the expected velocity, but actually increase as the pressure drops. There are a couple reasons that this happens; first the pressure gauge on you fill equipment or the guns onboard pressure gauge (if it has one) may be improperly calibrated. The second reason is that if the pressure is too high for the valve spring balance, the valve may close prematurely delivering a low charge of air to drive the pellet.
down and out the barrel. As the pressure drops the valve remains open longer and more air propels the pellets with more force resulting in an increased velocity. Concurrent with this shift in velocity is a shift in the point of impact, which means that you need to understand what is happening with your gun along the shot string to wring the best performance from it.

PCP airguns can be single shot, generally using a bolt or lever action to both cock and open the loading port, or multi-shots. This is in fact an area where the PCP design has a marked advantage over springers. There are several approaches to designing a magazine fed action; a linear fed magazine as seen in the Twinmaster and older Webley raider designs pops up now and again but is not widely used. It is limited in the number of rounds it can hold, and as it sticks out past the receiver it is constantly at risk for damage. In my experience it is a reliable feeder however. The most common mechanisms are rotary magazines that are exposed, or housed in a cassette under spring tension.

These magazines are from the (left to right) Twinmaster Hunting Master .22 caliber, the Evanix Blizzard .22, and the AirArms FAC S410 .22. These magazines hold 5 shots, 10 shots, and 11 shots respectively.
One of the biggest advantages of PCPs over springers in my opinion is that the design lends itself to multi-shot capabilities. I really like a fast follow up, but even more important I like not having to load after each shot when hunting in cold weather and wearing gloves.

But having said this, things can go wrong with magazines. Most are robust and reliable. But I have had catastrophic failures on a couple of occasions where the magazines failed. On one trip to South Africa I loaned my small game rifle to one of my hunting partner, and being unfamiliar with the gun they tried to force the magazine to cycle after the last pellet had been shot. This broke the magazine and I could not do a field repair. For the next two weeks I had to hand load pellets into a gun not designed for single shot feeding. This was very frustrating and cost me a lot of game. Afterwards I vowed not to happen again.

Now I always carry a single shot tray, which is a device that slips into the loading port and puts the pellet at the appropriate position so that the bolt probe could push it forward into the barrel.

In a pinch you can take an eraser and cut a groove in it to that seats the pellet. I wish I’d have thought of this during my South African trip, it would have saved me some headaches!
Precharged Pneumatic 
Onboard Air Supply

In this design the onboard air storage uses a large volume bottle, usually 400 – 500 cc, in the forestock of the gun. The advantage of this system is that you get a large number of shots per fill 60 -120 is typical depending on caliber and power setting.

In this design the onboard air storage uses a smaller diameter air reservoir that hangs under the barrel. This gives a lower number of shots than a bottle, but permits the most ergonomic stock design.

In this design the onboard air storage also uses a large volume bottle, but it is configured in the buttstock. This design allows an inline valve to be used, resulting in a very powerful gun.
The trigger assembly mounts to the bottom of the tube, and a notched arm holds the striker in place after the bolt (7) has been used to cock the gun. When the trigger is pulled it releases the striker, which allows the striker under force of a coiled spring to accelerate forward and strike the valve stem, which overcomes the pressure in the air reservoir and knocks the valve open. This allows a volume of air to pass through the valve, through the transfer port into the receiver behind the pellet, and drive the projectile down and out the barrel.

The power of the gun can be increased by increasing the pressure and/or volume of air in the valve and increase the cross sectional area of the transfer port to allow passage of the larger volume air.

PCPs: A Peak Under the Hood
This photo is a representative example of the components that go into a precharged pneumatic air rifle. The air reservoir (1) in this example is a simple tube under the barrel (2) and constitutes the distal portion of the tube, while the proximal portion houses the valve (4) and the striker (6). The barrel is seated in a receiver (3) which then attaches to tube and has a short tube or conduit from the valve in the air tube to the receiver, which is called the transfer port. In this example there is an integrated manometer for measuring the air pressure in the tube.
How the Valve Works
Most PCP airguns use a knock open valve. When the gun is cocked the striker (1) is pulled back until the sear engages, holding it in place. The distance from the resting position to the locked position is called the Stroke. When the trigger is pulled the striker is released and travels forward striking the valve stem (2) of the firing valve. The valve is lifted off its seat (3) which permits air to flow past. This volume of air moves through the transfer port (4) and into the barrel (behind the pellet). The length of time that the valve remains open is referred to as valve duration.

In conventional designs, as the reservoir pressure decreases the valve duration increases due to less resistance of air pressure on the firing valve. As the valve duration increases a larger volume of air at a lower pressure is allowed to pass. The result in an unregulated gun is an increase in pellet velocity to a point (called the sweet spot) before it starts to decrease.

Some guns use a regulated valve to achieve greater consistency, the least complex regulating devices is the firing valve used in the Falcon line of guns. The area around the firing valve has a set clearance which limits the air passing through. The result is that the gun remains fairly constant from shot to shot as the pressure drops. This would indicate that it is the volume of air rather than the driving pressure which has the major impact on velocity consistency.

A simplified mock up of a valve is provided to give a conceptual demonstration of how an unregulated valve would function.
PCP Filling Gear

One option for filling the gun is to get a carbon fiber tank, which is much lighter, can be charged to much higher fill pressures, but are much more expensive. These tanks give you more fills before they need to be refilled, and allow you to charge at much higher pressures. This is especially important if you are shooting large bore guns with a high pressure rating. My DAQ .457 has a fill pressure of 3500 psi, which is about 500 psi higher than the rating of my steel SCUBA tank. This means that I can’t even fill my gun once, and would have to top off the fill every time using a hand pump, and believe me when I tell you this is not an easy task at such high pressure …. Eminently possible, but very little fun!

The set up I use is a steel tank used for my lower pressure guns and to pre fill my higher pressure guns, a carbon fiber tank for my high pressure guns and to get more fills, and a small carbon fiber buddy bottle I carry in my pack so I can charge my gun in the field. This is useful when out big game hunting with my DAQ .457, which is tuned for maximum power and gets two shots per fill. To be honest, the reason for this set up is I happened to get an excellent deal on the steel tank, but my recommendation is that you get a carbon fiber tank if you can afford the price (around $300 - $700). The premier supplier of these tanks for airgunners is Airhog, which not only offers excellent product at

This is a fully rigged carbon fiber tank, which fills to 4500 psi. The carbon fiber tanks are lighter and give many more full pressure fills than the large steel SCUBA tanks. They cost more, but definitely the way to go! This tank is using the AirHog carrying straps and a the stand which are attached by surgical tubing.
a good price, but can tell you anything you need to know about charging gear and filling your gun.

A strategy I employ when doing a lot of shooting, is to cascade my tanks. I’ll charge up my lower pressure steel tank to 3000 psi, and my two small carbon fiber tanks to 4500 psi. Using the low pressure tank to fill my gun up as high as possible, I’ll switch to the higher pressure tank to top off the gun, thereby increasing the number of fills over what I’d get by simply charging up with the high pressure tanks.

Did You Know: PCPs can be filled with Nitrogen as well as air, and is often found at paintball shops

The fill hoses will attach to the tank either using a DIN fitting (right), or a yoke that fits on to a standard SCUBA tank. If you are traveling and renting tanks at your destination it is imperative to confirm the type of connectors that will be needed. When I rent bottles from a dive shop I’ll mostly use a yoke (left), but just to be safe I bring everything along if space permits. Nothing worse than getting to a hunt site and having air tanks and guns with no way to connect them!
This photo shows a gun and tank connected and in the process of being filled. If the gun has been inadvertently depressurized, air may leak right back out the barrel as you fill. If this happens make sure the gun is unloaded, then cock it until pressure builds up and the valve closes. Also make sure the bleed valve is closed before you start filling. There are different types of hoses available and in different lengths. I prefer the metal mesh hoses 10 to 12 inches long. Hoses that are too short are awkward when filling the gun, those that are too long waste air when bleed for disconnecting.

Some guns have removable reservoirs which can be directly attached to the tank via an adaptor.

Another design is seen in the guns with a bottle reservoir house in the forstock of the rifle, which may be filled either with the bottle in place via a filling port or quick release connector or the bottle can be removed and filled directly.

In most guns that have a detachable reservoir which attaches directly to the tank, it is not necessary to bleed the conduit before detaching the reservoir for remounting.
Hand Pump for PCPs

Hand pumps offer a few advantages and one big disadvantage (in my books anyways); the advantages are that these pumps are the least expensive route to go, they are fully self contained, they require no additional charging fees, and they are easy to travel with. The big disadvantage is that it can take 100 – 200 strokes of the pump to fill your gun. While these pumps resemble a beefed up bicycle tire pump, a 175 lb man will have to put his full weight into the pumping action towards peak fill pressure. This is not easy, and if you’ve got a larger bore gun, one with a large reservoir, or have the gun tuned for maximum power (maximum air consumption), you will get some exercise in! I’ll sometimes take a hand pump on traveling hunting trips as I don’t have to find a place to charge a tank on arrival, there are no hassles with packing a hand pump for air travel, and when hunting the number of shots I will take is more limited. However if target shooting or sighting in a gun, this quickly looses its appeal. The price of a good hand pump will be $175.00 to $350.00, and there are several brands available from FX, Hill, Hatsan, Air Venturi and Crosman (the newest brand to come along). Almost all airgun stores selling pcp airguns will carry pumps.
Many guns these days come with an integrated pressure gauge, also called a manometer, to allow the pressure status to be monitored when the gun is being shot or when it is being filled. The two configurations I am seeing most frequently are either a) The gauge is mounted on a stem to the body of the reservoir and drops into an inlet in the forestock, or b) the pressure gauge is used to cap the reservoir. Both ways work fine, though I never feel very comfortable sticking my face over the muzzle of a gun to check its fill state!

This action has been lifted out of its stock and the connection of the manometer to the reservoir can be clearly appreciated.
Many guns utilize a proprietary probe that connects to a female Foster type quick release coupling on the hose. The probes insert into a fill port on the gun for charging, and they usually have a couple of O rings proximal and distal to snug up the fit and prevent leaking. After filling make sure to bleed the line before trying to pull out the probe, as failure to do so can result in the O rings being blown.

If you are using several different guns and are heading out for a day of shooting or hunting make sure you have the right probes .... I've already mentioned what a downer it is to have air and guns with no way to bring them together! More guns are coming to market these days fitted with the male fitting integrated into the gun, so no extraneous probes or adaptors are required. There are also retrofit kits that allow you to convert the fill coupling on an existing gun. I have modified a number of my favorite guns to use the quick release couplers.

Again, make sure that regardless of whether you use a tank or a hand-pump to bleed the line before you try to disconnect.
So which type of gun is better, the springer or PCP? Like everything in life they both have positive and negative attributes. The springer is more readily available and generally less expensive, with a good model in the $250 - $500 range as opposed to the $400 - $900 for a basic PCP (not to mention the $150 - $600 for charging equipment). The springer is fully self contained and can be quite powerful, but the jarring bidirectional recoil can destroy a standard rifle scope. While you have to carry more gear with a PCP, they tend to be dead easy to shoot as there is virtually no recoil with the small and mid bore guns. PCPs tend to be much more powerful, and are more efficient in larger calibers. These days I hunt primarily with PCPs, however I still have many springers that I enjoy shooting and hunting with. I think there is room for both springers and PCPs in their gun rack.

One of the features found on many of today's PCP airguns are multi-shot magazines, which allow shots to be fired as quickly as you can cycle the action. There are a number of different mechanisms used; the Korean guns tend to use a cylinder very much like that of a revolver, while many of the British guns use a cylinder enclosed in a synthetic housing.
When comparing shot strings generated by a springer and a PCP, you will often note a more consistent velocity plot from the springer. This is because in an unregulated PCP design, the pressure is reduced with each successive shot; therefore the velocity drops a little bit with each pellet you send down the barrel. If the valve is perfectly balanced this spread can be reduced even in unregulated pcp guns. So you expect less shot to shot variation with a springer. Both designs can be inherently accurate, though as a rule springers are much harder to achieve optimum accuracy from.

I find the most accurate way to shoot springers is to grip the forestock loosely, make sure the hand is positioned in the same place each time. With the right technique, even a low cost model (BAM 26) can group tightly
Springers at a Glance: These guns have a lot going for them, and I am an avid proponent of spring piston hunting guns! I have many guns in my collection, but still get out with my springers frequently. There are several manufacturers with a vast array of models and performance specifications available. My favorite springers from a price – performance standpoint are made by Crosman and Gamo. In terms of high quality/high dollar guns it’s hard to beat the offerings from AirArms and RWS, and there are some great budget guns available from BAM, Chinese made guns that are fun to tune and tweak.

Rearward Recoil as air column drives pellet forward

Forward Recoil as piston slams into the end of the compression chamber

Pro+
Self Contained
Budget Friendly
Widely Available
No Adjunct Gear
Robust Design
Effective Hunting Guns

CON -
Longer Dwell Time
Bi-directional recoil
Hold Sensitive
Harder to Shoot Accurately
Magnum Guns are Big
Cocking effort

Manufacturers
Crosman
Gamo
Cometa
AirArms
RWS/Diana
BAM
Precharged Pneumatics at a Glance: Arguably, PCP designs are the first choice of a majority of serious airgun hunters that don’t have a financial limit or difficulty getting tanks filled. Their quiet, powerful and accurate performance in a compact package does move them to the front of the line when I head out on many hunts. There are several manufacturers with a vast array of models and performance specifications available. My favorite PCP from a price – performance standpoint are made by Crosman. In terms of high quality/high dollar guns it’s hard to beat the offerings from AirArms and FX. And for long range shooting a a low start up cost I quite like the AirForce condor.

Virtually Recoiless

Pro+
Extremely Accurate
No (or very low) Recoil
Multi-shot
Quiet
Robust Design
Light and Compact

Manufacturers
Crosman
FX
Evanix
AirArms
AirForce

CON -
Need Adjunct Gear (Air Tanks)
More Expensive
More Prone to Leaks
Limited number of Shots in Field
Less Available (less problematic with online stores)
Multi-Pump Guns

Multi-Stroke pneumatic air guns require several (2–10) pumps from an integrated lever to store compressed air within the air gun. Variable power can be achieved through this process, as the user can adapt the power level for long, or short-range shooting. The design of higher quality and match-grade multi-stroke air rifles can propel a pellet to speeds in excess of 1,000 feet per second.

For beginners and intermediates, multi-stroke air rifles have been a cost-effective choice as they are generally the cheapest form of air gun available. Several manufacturers make multi-stroke air guns including, to name a couple, Sheridan and Benjamin. Modified multi-pump guns, with stronger pump linkages and improved valves, can produce muzzle energies in excess of 30 foot-pounds. These guns are fully self contained and can be adjusted to provide the appropriate power for a variety of game and shooting situations.

This Benjamin has a modified linkage that has provided a consistent stroke effort. The 10th stroke is no harder than the 1rst. The [photo below shows the gun in the ready to fire state.

The FX Independence is a new generation of multi pump, in which a reservoir holds a residual volume of air, and can give multiple shots per filling.
Although I have focused on the spring piston and PCP airguns, and have implied they are the only ones, it is more fair to say they are the most common. CO2 guns are used, both bulk filled and those using a powerlet. Another power plant is technically also a pneumatic airgun, the multi-pump pneumatic, a well known example of which is the Benjamin and Sheridan multi-pump guns that have been around for years. The primary limitation of these guns was the pumping effort; it was noisy, took several pumps between shots, and the effort became greater as the number of pumps increased. A couple of years ago I had the opportunity to shoot an innovative new multi-pump design called the ANA Quigley.

The Quigley utilizes a differential piston design which is comprised of dual air storage chambers. The air-spring chamber is where the precharged volume of air is contained, and this volume is not expended when the gun is discharged. The firing chamber utilizes the air charge obtained by pumping the gun between shots. The unique design features of this rifle is the differential piston that separates the two chambers. The piston diameter in the firing chamber is larger than that in the air-spring chamber. Air under pressure enters the firing chamber through a regulated...
valve housed in the differential piston. The air-spring pressure must exceed the pressure setting of this regulator before air is allowed to enter the firing chamber. Adjusting the regulator adjusts the air-spring’s pressure and as a result the power output for the air rifle. ANA has tested several settings to find the right balance of power output, number of pumps, and pumping effort required. And while the gun I was testing generated around 30 fpe with 10 to 12 pumps, it would be possible to configure the gun to deliver 14 fpe with a single pump.

Shooting the gun was pleasurable, I found that it balanced well and fit my frame as if built for me. During the three months I had this gun; it went along with me on several small game hunts for quarry ranging from squirrels to groundhogs. I ended up using Kodiak pellets as these heavy round nose pellets yielded good accuracy and terminal performance. The Quigley is a big rifle and I kind of felt as though I had a Kentucky long rifle in hand while stalking the woods. As mentioned the gun pointed well from just about any position I found myself shooting from; offhand, rested on a rock wall, or up against a tree tr

Squirrel hunting is where I experienced both the up and downside of the design; the upside is when I shot a squirrel and dropped him then quickly reloaded (which requires a single pump) and put a second in the bag. The downside was when I needed to recharge, there just isn’t a way to do it quietly or quickly. This is not a criticism, rather than a statement of the tradeoff for having a fully self contained gun. The mechanism could be modified to provide hunting appropriate energies with only a couple of pumps.
Currently there are four calibers available in production airguns; the venerable .177, the .20, .22, and .25. The caliber selected is dependent on what the intended use is, and what gun it will be shot out of. I tend to like smaller calibers such as the .177 and .20 out of spring piston airguns, and the larger .22 and .25 with precharged pneumatics. The .177 and .22 calibers are by far the most widely used, and for the purpose of this discussion I’ll use these two to examine the selection of a minor or major airgun caliber. The following is excerpted from an article I wrote for Predator Xtreme hunting magazine:

I was once asked by a first time airgun buyer if I preferred .177 or .22 for a hunting rifle. As with conventional firearms, the right caliber depends on what you’re going to hunt and what type of gun will be used. Where it differs is that regardless of application, there are only four caliber choices when it comes to production airguns; the .177, .20, .22, and .25. The .20 and .25 are the least common calibers; the selection of pellets is more limited and they can be difficult to find. Also there are not as many guns chambered for these calibers, which makes them a less practical option for the casual shooter. By far and away the most common calibers are the .177 and .22. In addition to the wide selection and availability of pellets, there is a virtually limitless range of guns built for these calibers. I use all four, but for the purpose of this discussion will limit the scope of my response to how the .177 and .22 stack up for hunting.

Airgun hunters often quote the old adage “.177 for feather and .22 for fur”. However, it is really not so simple and depends on the distances that will be hunted over, type of power plant used, the style of pellet, as well as the quarry. The conventional wisdom is that the .177 has a flatter trajectory but lacks knock down power while the .22 has a more arced trajectory yet offers better terminal performance. There is in fact a lot of truth to these long held beliefs, but it is not the whole story.

A .177 spring piston gun will yield a higher velocity than the same gun chambered in .22. For example, if a .177 Beeman R1 was generating 900 fps with a 7 grain pellet, that same power plant chambered for .22 would be propelling a 17 grain pellet at 775 fps. The energy generated by the .177 would be 12 fpe while the .22 would be 22 fpe, so in
addition to the larger pellet opening a larger wound channel it would transfer more energy on target. The larger cross sectional area and greater mass of the .22 would also result in more energy being retained as the pellet traveled along its flight path. But there is another factor to consider; the trajectory of the .22 would exhibit substantially more drop at fifty yards than the .177. Gravity acts equally on objects regardless of mass, so there will be a more pronounced drop in the point of impact with the lower velocity pellet because it is in flight longer, and gravity has more time to exert its influence.

So based on these statements it’s fair to say that the .22 is more powerful and the .177 is a flatter shooting caliber. This is true with spring piston rifles as they are not able to generate the power required to propel the .22 at the same high velocity as when chambered for .177. But if the power plant being used is a precharged pneumatic, the story is somewhat different. A PCP chambered for .177 that is shooting at 900 fps can, with a tuned valve and heavier hammer spring, generate 900 fps with the .22 as well. In this scenario the trajectory will be the same with both calibers. As a matter of fact the heavier pellet will shed velocity less rapidly and retain more energy as it travels away from the muzzle. This advantage cannot be offset by increasing the muzzle velocity of the .177, at a little over 1000 fps the smaller .177 pellet can become aerodynamically unstable. For this reason, it is often said that PCP air arms are more efficient with larger calibers.

Another factor to consider is the type of pellets being used. Both the .177 and the .22 can be had in a variety of weights and configurations; including pointed, wadcutter, hollowpoint, and roundnose styles. But this topic covers a lot of ground and will be revisited in a future column. I believe that both .177 and .22 are viable hunting calibers for most small game providing the guns being used are accurate and the hunter selects proper shot placement. I have taken countless squirrels, rabbits, pigeons, prairie dogs and similar sized quarry with both of these calibers, usually opting for a head shot. My personal preference is to use .177 for spring piston guns as I am willing to give up some power to obtain a flatter trajectory. However, when using a PCP my preference is for the harder hitting .22, as both power and flat shooting characteristics
are achieved. Recently .25 caliber has been becoming more popular and the selection of pellets is expanding. I am using the .25 in both springer piston and PCP powered guns quite a bit these days.

![Diagram showing trajectory differences between .177 and .22 pellets]

For hunting applications, bigger pellets make bigger holes. Most larger caliber pellets in most gun travel at a lower velocity (at least initially). So the .177 will fly along on a flat trajectory hitting the target dead on, while the slower moving larger caliber will have an arced trajectory. This means that if you can deal with the arced trajectory in a consistent manner the bigger caliber will bring better results.
Triggers

No matter how much effort has gone into the shaping of the stock, the manufacture of the barrel, the development of the power plant or the inherent accuracy of a gun; if the trigger is not good you will never realize the full potential of your gun. The trigger is where the rubber meets the road so to speak, and a heavy, non responsive trigger will preclude the shooter obtaining the required field accuracy when hunting. The trigger assembly is a fairly simple mechanism that includes the hammer, the sear, the sear lever, trigger spring and a few other small parts which are the vehicle for initiating the discharge of the gun.

In a two stage trigger, when pressure is applied to the trigger a screw in the trigger called the first stage screw moves the sear to a point just before tripping the sear lever. This is the first stage which is light and requires minimal pressure but actually moves the mechanism through most of its range of motion. The second stage is activated when the second stage screw trips the mechanism; it is the heavier component of the triggers pull, but only moves the sear a short distance. If the first stage screw contacts the sear lever too early, the trigger exhibits creep. If the second stage screw contacts the sear lever too late, the lever will be engaged by the first stage screw and the gun will discharge, effectively becoming a single stage trigger. With a proper trigger setup there should be about 1/16" of weightless take up, then 1/32" or so of take up under pressure as the trigger engages the sear, with very little or no creep followed by a snap break at under 4 pounds, excessive take up, roughness, or creep are causes for a concern and should be addressed.

The trigger pull refers to the weight of the pull or how much pressure or weight is needed to overcome the sear and cause the gun to discharge. Sometimes this is referred to as “let off.” The trigger “weight” or “pull” is measured with a trigger pull gauge which is a cylinder shaped spring gauge that measures the actual weight of pull. A too heavy pull will move the rifle at the moment of firing, making precise shot placement difficult at best. I like to set the trigger pull at between two to four pounds on my hunting guns, opting for the slightly heavier pull when it will be very cold or I will be wearing gloves to prevent accident discharge. The “take up” is the distance the trigger will travel
rearward before the sear is engaged, and should not be confused with “creep”. Creep describes how far the trigger must travel after the sear is engaged and before the sear breaks. If the trigger continues to travel after the sear breaks it is termed “over travel”. A good trigger will exhibit very little over travel. Too much over travel can cause the gun to be pulled off target. If your gun exhibits substantial over travel it may be addressed by proper adjustment. If the trigger on your gun is not adjustable, you can install a trigger stop screw through the trigger guard. This screw can be adjusted to stop the trigger and minimize or remove over travel.

The trigger pushes against the back end of the sear, which moves the front end down. This releases the hammer and the spring rapidly propels the hammer backward. As the hammer moves backward it pushes on a raised lip around the valve tube propelling the valve tube backward with a burst of force. This force is greater than the forward force exerted by the rear spring and gas pressure. The valve tube is pushed back for an instant, until the pressure equalizes and the spring pushes it back into place. In this instant, the side openings on the tube are exposed, and the pressurized gas flows through to the barrel. This burst of air is strong enough to propel the projectile forward at a good rate of speed.
A critical factors in determining the accuracy of any given gun is the barrel. The airgun barrel typically has a thinner wall than a firearm barrel as it does not have to stand up to the same internal pressure, but otherwise they are similar. While the barrels of the inexpensive BB guns are smoothbore, the precision pellet gun will have a rifled barrel. Airgun barrels will usually be choked at the muzzle and some time back at the receiver as well, and will have the muzzle crowned. All of these components add up to define the intrinsic accuracy of the gun.

The barrel is rifled is to spin the projectile at a rapid rate, which imparts stability on the pellet that stops it from flipping. I have a very short barreled .22 rimfire pistol that is not long enough to impart spin on the bullet as it exits the muzzle, and the result is that it keyholes the target as it rolls end over end. The rifling “Twist Rate” refers to the distance over which a complete turn occurs; a 1:20 rate indicates that a complete turn occurs in 20 inches. As a general rule of thumb, a slower twist rate is used to stabilize shorter projectiles while a faster twist rate is required to stabilize longer projectile. However, this is not the whole story; what is important is the rate of rotation. This can also be achieved in a barrel with a slower twist rate by increasing the projectiles velocity. The trick is to find the right rifling for a number of projectiles, and if the airgun has an adjustable power setting, the right velocity. I believe that this is the reason a gun like the Talon SS shoots such a wide range of pellets accurately, you can’t change the twist rate but you can fiddle with the velocity until you find the right compromise. Most airgun barrels have a twist rate of 1:16 rate which seems to be the best all all-around choice for field use guns. Some authorities have stated a preference for a faster twist rate when using the longer pellets. I don’t like thinking too much about it. I work a variety of pellets through all my guns looking for the best performer, looking for a medium to heavy round nose pellet that works well. There is an easy method to quickly estimate the twist rate of your airguns barrel. Take a cleaning rod and insert it with a snug patch just barely into the muzzle of your rifle. Put a mark with a sharpie at the 12 o’clock position on your cleaning rod. Make the mark way back next to the handle of the rod. Now insert the patch into the barrel.
The index mark on the rod will start to turn the further you insert the rod. When the index mark on your cleaning rod comes back to 12 o’clock starting position, make another mark on the rod at the muzzle of the barrel. Now remove the rod. Measure the distance between the two marks. The rate of twist is 1 turn in the number of inches from the previous measurement. Another item to look at is the depth at which the lands and grooves are cut; if too deep it will deform the pellet, too shallow it will not grip the pellet resulting in inconsistency. There is interplay between the rifling and the pellet skirt as the blast of air propelling the pellet down towards the muzzle will cause the skirt to enlarge, engaging the walls of the barrel. One last aspect of the barrel to discuss is the impact of barrel length on performance. Unlike firearm barrels, there is little relationship between barrel length and accuracy. In springers a short barrel can be more accurate than a long barrel, or vice-versa. Length alone is not the primary factor once a certain minimum is passed. This minimum length is different dependent on several variables, but as a rule of thumb so long as the air charge has had a sufficient distance over which to transfer its energy and the rifling has imparted the appropriate spin to the pellet, any additional length contribution is negligible. Once the pellet leaves the muzzle, it doesn’t matter whether it has been in the barrel for 14 inches or 28; it is now a ballistic missile and subject to the same physical laws.

I do a lot of shooting with my Talon SS, and AirForce Airguns states that the Talon SS with a 12-inch barrel can shoot one-inch groups at 50 yards which is the same result with the 24-inch barrel. However, the barrel length does influence velocity and one will note an increase in velocity with longer barrels when shooting precharge pneumatic guns. The expanding air has more time to push on the pellet in a longer barrel. I find that the gain in velocity with a longer barrel are not substantial in most cases, and does not offset the advantage of a shorter barrel when in the field. This does not always hold up with the large bore airguns where a longer barrel may be necessary to utilize all the air pressure to drive the projectile before it clears the muzzle.

Previous authors have stated the opinion that in a spring piston gun most of the energy is imparted on the pellet in the first few inches of the
barrel. Gerald Cardew, the author of *The Airgun from Trigger to Target*, stated that a spring gun achieves maximum velocity in the first six inches of the barrel. This would certainly argue that short barrel springers make sense so long as they are long enough to introduce the appropriate twist rate ... and leave enough barrel to exert cocking leverage in break barrel guns. I have a couple of spring piston guns in both rifle and carbine versions and do not find significant differences in either power or accuracy. I have also chopped down a barrel on a Chinese spring piston rifle an inch at a time, and between 16” to 10”, noted little change in velocity output. While neither of these observations were controlled test, the anecdotal conclusion would tend to support Cardew’s statement.

This argument does not however hold up when discussing PCPs, and a longer barrel will generally yield higher velocities. With respect to selecting a rifle or carbine length barrel for a hunting rifle, my preference is for a carbine length for a couple of reasons; first and foremost I find that a carbine is much more practical when hunting in heavy brush or woods where the gun needs to be brought into play with little maneuvering room. The second reason is that if I decide to use a muzzle brake or moderator it will increase barrel length from four to ten inches, which is fine when tacked on to a sixteen inch barrel but is a bit much when added on to a thirty inch barrel. The barrel adds weight and bulk, which is definitely not required when I’ll be spending the day still hunting the woods or desert. But the other reason I like a carbine length barrel is that it yields a shorter lock time; i.e. the pellet is in the barrel for less time than it would be with a longer barrel, which results in improved accuracy. This is due to the fact the there is less time for the shooter to twitch, move, or otherwise throw of the shot before it clears the muzzle.

The Hamerli H2 has an interchangeable .177 and .22 barrels allows the gun to be optimized for different game and different hunting conditions.
Barrel Shrouds and Silencers

One of the advantages that airguns have over firearms is that they are inherently much quieter. Also the sound signature of an airgun is different than the loud crack generated by a firearms report. However it is possible to quiet the sound down to a whisper, even on high power models, using a device called a silencer/moderator or by shrouding the barrel. Any type of airgun can be moderated, but it is especially effective in pre-charged pneumatics and CO2 guns, which tend to be louder than springers anyways. The sound generated by a spring piston gun is largely a product of the mechanical components of the gun moving, such as the spring piston slamming home, though a moderator can help to a smaller degree. The sound generated by a PCP on the other hand is created by the blast of high-pressure air being expelled out of the muzzle, which is quite well suited to suppression using a silencer.

The moderator silences the muzzle crack by providing an enclosed area that allows controlled expansion of the escaping gases. A major contributor of the sound signature of a firearms is the crack of the bullet as it goes supersonic, however most airgun projectiles are most efficient when they stay subsonic. A moderator will not suppress the possible supersonic noise, that generated by a pellet in flight, the impact of the pellet on the target or any mechanical noise from the gun.

There are several types of airgun silencers/suppressors/moderators available on the market outside the USA. If you look in one of the UK airgun magazines you will find several produced by Logun, BSA, Phoenix and others. They work in essentially the same way, the suppressor/moderator/silencer (they are all the same thing) is a tube that clamps to the muzzle with Allen screws, or if the barrel is threaded screwed on. The distal end of the tube is capped with an end piece that has a hole slightly larger than the caliber of the pellet. The inside of the moderator has baffles that break the chamber into smaller sections, and most effective when the baffles are of varying length. There does not have to be baffles for the moderator to work, so even a hollow tube would still be considered a suppressor for legal purposes, but nowhere near as effective as one with baffles.
One work around that seems legal is to build a permanently shrouded barrel. This is a full length cover that fits over the barrel and past the muzzle. The exit port is just a bit larger than the caliber of the projectile being shot, and often has the internal components seen in standard moderators fitted to the muzzle. The conventional wisdom is that these shrouds can not be removed from the airgun once fitted, and thereby circumvent the restriction because there can be no intent or possibility of using the shroud or parts thereof to suppress a firearm.

In much of the world, a silencer is an accepted, in deed and expected piece of kit. However this is not the case for shooters in the USA. This is what the BATF has to say specifically about airgun suppressors: The terms "firearm silencer" and "firearm muffler" mean any device for silencing, muffling, or diminishing the report of a portable firearm, including any combination of parts, designed or redesigned, and intended for use in assembling or fabricating a firearm silencer or firearm muffler, and any part intended only for use in such assembly or fabrication. Numerous paintball and airgun silencers tested by ATF’s Firearms Technology Branch have been determined to be, by nature of their design and function, firearm silencers. Because silencers are NFA weapons, an individual wishing to manufacture or transfer such a silencer must receive prior approval from ATF and pay the required tax. You can get additional information by sending a written request to ATF’s Firearms Technology Branch.[18 U.S.C. 921(a)(24), 26 U.S.C. 5845(a), 27 CFR 479.11]

It is not worth risking jail for a sport, and unless you have the appropriate Class II license I’d suggest you stay away from moderators and definitely don’t build your own. If you need a seriously quiet gun, look into one of the models that come with a shrouded barrel. If you really want to have a silenced gun, and really don’t want a huge fine and a firearms violation on your record, pay the couple hundred bucks and get a Class II. But once you’ve done this, make sure that the venue you’re shooting in doesn’t have additional restrictions on hunting with a silencer, which is a whole other issue.
These baffles are the same size, but they are often cut to differing lengths to dampen the harmonics.

The silencer housing can be made of steel, aluminum, or carbon fiber.

Shrouded barrels and silencers both suppress the sound signature of the gun in essentially the same way. I prefer a shrouded barrel as they don’t significantly increase the length of the barrel.
Airgun Stocks

Whenever I look at a new rifle for the field, the stock is one of the main features I look at. It doesn’t matter how powerful or the inherently accurate, if the stock is not right I’ll never wring the full potential from the gun. I’ll hold the rifle and look at it while getting the feel, place my cheek against the comb to get an idea of how the gun will hold when I have a scope mounted, I’ll grip the pistol grip to see if it fits comfortably and cradle it in my arms to see how it will carry. A common question is how do air rifle stocks differ from firearm rifle stocks? And the answer is that there is not much difference; their shapes are similar, their compositions are almost the same and they serve the same purpose which is to provide a platform for the action to function on. The basic elements of stock design relate to what material's the stock is fabricated from and how the individual components are formed. Almost all airgun stocks are made from wood or a synthetic polymer material, though some designs do incorporate portions of the action metal work or reservoir tank into the stock. The primary objective is to use a with enough flexibility that it can be shaped or modified to fit a range of shooters, which makes wood an obvious choice; it is relatively simple for a skilled craftsman or a machine to shape or reshape, it is very durable, the grain and patterns are often works of art unto themselves, it’s warm and easy to grip, and the expense can range from minimal to very expensive depending on the shooters requirements. Very attractive raw material is available from many sources, and most would argue that wood and blue steel are a natural match for one another.

Most air rifle stocks today are made from beech. It is a common, inexpensive wood that is a straight-grained, fairly hard wood that stands up well to heavy field use. It is light in color and can be stained in a multitude of finishes. Though many different varieties of hardwoods are used, walnut is probably the nicest all around wood for production stocks. There are different grades and qualities to choose from, however make sure that the wood selected to build your stock from has a dense grain and uniform dark coloring. I personally like highly figured stocks, and these are fine so long as the blank is free of knots or other defects.
Composites made of fiberglass and other man-made materials yield some advantages over traditional wood furniture. They offer far greater strength and structural stability than natural wood, and therefore can be more easily shaped with ergonomics dictating design. There are other advantages; synthetics are harder wearing and they do not absorb moisture. On the downside the aesthetics are hard to get away from, to most people (myself included) synthetics lack that appeal which makes you want to handle a gun and look at it. Synthetics are difficult to modify and while these stocks are more rugged, if you do happen to damage on they are quite difficult to repair.

Laminated stocks are made using several layers of laminated wood that are impregnated under pressure with chemically-cured resins. These stocks offer a compromise between the aesthetics of wood and the structural stability of the composites. And if different types or colors of laminates are used, very interesting and beautiful patterns can be obtained. But because of the resins used to bond the layers, these stocks tend to be quite heavy and are therefore not my first choice in a hunting rifle. The shape of the stock is dictated by the type of gun, how it will be used, and the individual shooters preferences. There are many types to chose from; sporter, thumbhole, Tyrolean, takedown, to name a few… however the primary requirement is that it fits the shooter. I like a stock that is light weight with a longish pull, a cheek piece that lifts my line of sight to allow consistent mount of the rifle with the selected optics, a fairly thin wrist and a rounded forearm. It does of course depend on the type of gun I am shooting; the stock of a spring-piston air rifle is limited in many ways by its function. When compared with a pre-charged pneumatic rifle stock, the stock on a spring piston rifle tends to be less well shaped and far less elegant as it must be engineered to manage the stress placed upon it as a part of the cocking process. But when all things are considered, the air rifle stock must be comfortable to mount if one hopes to achieve consistent accuracy, and it must be light enough to carry in the field.

The forearm of a PCP air rifle stock must be wide enough to accept the air chamber. Because of this functional requirement, the stocks of most airguns tend to be quite bulky. There are a couple guns now on the
market which use the air reservoir as the forestock; these include the BSA Super Ten and Theoben Rapids which are really great rifles from a performance point of view, but not my favorite in terms of aesthetics.

The buttstock is the part of the stock which comes into direct contact with the shooters shoulder and the comb is the part of the buttstock that comes into contact with your face. The comb sits atop of the buttstock and has three primary configurations; raised, dropped or straight. The shape of the comb depends on what type of sighting system is to be used on the rifle. If your rifle has open sights that are mounted on the front of the receiver where the barrel breaks, the comb will be dropped. This means that the top line of the comb falls away from the front to the rear. This allows the cheek to be placed against the comb and your eye will be in line with the open sights. If the rifle has a raised comb it was designed for use with a scope. A raised comb places the top edge of the comb moderately above the top of the receiver and places your line of sight more directly in line with the centre of the scope or sighting aperture. A cheekpiece helps improve shooter comfort. Generally speaking, the more generous the shape the more comfortable the rifle is to shoot. Cheekpieces on target and field target guns are sometimes completely detached from the buttstock and incorporate a built-in adjustment mechanism that allows the comb height to be adjusted to fit the individual shooter. However, on a hunting rifle I feel this is too much hardware adding additional complexity and weight to the stock. The shape of a buttstock really depends on the degree of pitch or angle of the buttplate. Most air rifles have negative pitch which means that the buttplate angles forward at the bottom of the buttplate and rearward at the heel of the buttplate. As you increase the amount of negative pitch the rifle feels more muzzle heavy. Decrease the amount of pitch and the rifle feels heavier in the buttstock. Pitch angle helps to balance the rifle and makes it easier to hold steady.

The length of pull or LOP is measured from the forward face of the trigger to the end of the butt plate or butt pad. It should be measured to the point halfway between the heel (top) and the toe (bottom) of the butt plate. LOP is an important measurement on the stock because the
length of the buttstock will greatly affect how well you can hold your rifle and how well you will shoot. If the LOP is too short you will pull your shots to the right. If the LOP is too long the rifle will tend to ride upward and outward during recoil which will usually make you shoot low and to the left (the opposite applies if you are a left-hand shooter). For the air gun shooter, correct LOP can be determined by placing the buttstock along your forearm. Slip your trigger finger onto the trigger.

The Beeman Webley C1 is one of my all time favorite airguns, and it's all because of the stock. Dr Beeman designed this one with a straight wrist such as those used in classic double rifles. It is very fast to the shoulder and points very naturally. I've had this stock replicated for some of my other rifles.

Thumbhole stocks have become very popular in recent years. Many shooters feel that they provide a solid grip for shooting offhand. Many manufacturers offer these stocks as options on their established rifles, and many custom stock makers are producing some outstanding version for the aftermarket.

In many guns form follows function; when the gun incorporates a large onboard air reservoir or air bottle in the design, one of the challenges facing the manufacturer is designing a stock to house these reservoirs, while remaining ergonomic. The AirForce line of guns use the bottle as the buttstock.
and the rest of your fingers around the pistol grip or wrist just like you would do if you were shouldering the rifle. Look down and see if the face of the butt plate or butt pad rests against your biceps. If it touches the surface of your biceps then the LOP is very close to being correct. The amount of drop a stock has allows your head to fit the stock correctly. A stock needs some amount of angled drop along the top of the comb to allow the shooter to place his shooting eye directly in line with the scope. Since a scope will usually sit higher on top of the receiver than a set of open sights, the stock for scope sighted rifles should have less drop than a stock for a rifle equipped with open sights. The drop consists of two different measurements; drop at comb and at the heel. However you can get a good idea of the required drop by placing a straight edge on top of the receiver and making the measurements. This is the simple way to do it but you need to take into account how far the sights or scope will sit above this line so you can make the necessary changes in comb height to allow for correct head placement. Open sights typically require about a half inch drop at comb to be effective. Most scopes require about an inch and a half to two inches of drop to fit correctly. You can adjust the amount of drop with adjustable pads and slip on sleeves that permit you to change the comb height without making any permanent alterations to your stock.

The stocks are inletted in much the same way as for a firearm, and there are usually two or three anchor points where the stock and action are bolted together.
The four guns shown on this page all have stocks where form follows function. The first gun uses a thumbhole stock, which is preferred by many hunters as it provide an excellent hold, and for many is the best design for offhand shooting. There are no design constraints on the action of this gun, other than requiring the forestock to be inletted for the reservoir at the forestock. The other three rifles however, have design requirements that dictate how the stock is configured. The next rifle down has a moderately large diameter air reservoir serving as a forestock and an air bottle incorporated into the butt. The next one down has a large volume air bottle that uses a stock designed with a large and flared forestock to house the bottle, improving both ergonomics and aesthetics. The last gun is a takedown design, and has a buttstock and pistol grip assembly that can be dismounted from the action and air reservoir assembly up front.
Bullpup Stocks
A bullpup stocks is one in which the trigger is moved forward on the action through a linkage that situates it under the barrel. In effect this moves the action towards the butt of the gun which results in a substantially reduced overall length while incorporating a fairly long barrel/shroud assembly.

There are manufacturers, such as the Russian EDgun Company which offer production bullpup configured carbines, but for the most part these are custom and hobbyist built “one off” guns. There have been some very nice bullpups built on the Marauder platform, the major issue being to build a trigger linkage that maintains the responsiveness of the original trigger.

I think that to get the most out of the design the barrel, shroud, and air reservoir also need to be shortened, as the main objective is to render the gun as short and unobtrusive as possible. For the same reason I think that a bullpup should be shrouded, as to have a short, compact gun that is loud to some degree negates the advantages.

It can be argued that a bullpup is the ultimate urban hunting airgun; compact and quiet it can be carried into any situation where stealth is a requirement.

The new Evanix Bullpup comes in .22, .25, and 9mm, and is an excellent urban hunting gun (top). The linkage between the original trigger assembly and new trigger position is one of the challenges in building a bullpup (inset)
I like to mount slings on my hunting rifles, as long hours spent hiking in rough terrain go by much easier with the rifle slung over the shoulder as opposed to carrying by hand, not to mention being vastly preferable when the hunter needs to climb over fallen trees or scamper across steep rock faces and hills. However, finding a convenient way to mount the swivels can be a bit difficult with some types of airguns, but with a little ingenuity can usually be accomplished.

With break barrel springers I’ll generally use a swivel set, such as the Uncle Mikes Quick Detachable Super Swivel set up. This product is designed to be used on tube fed lever action rifles, as the band made to fit the lever actions feeding tube will fit the springers barrel quite well. Mount it low enough that the pressure of carrying the gun does not cause the barrel action to break open, at the same to me making sure it is not so low as to prevent the gun from being cocked. The rear swivel stud is screwed into the stock, and my preference is to position it between the butt and the pistol grip. On PCP and CO2 rifles with a full length forestock, I’ll position a second screw in stud a couple inches in front of where I grip the stock, so it changes a little bit from rifle to rifle depending on the guns balance.

I like a sling to carry my gun, and on long hikes it is a must. Depending on what airgun you’re using, it may take some creativity to get the thing mounted. On my C1 (above), I used the barrel band made for a tube fed lever action 30-30 for the swivel stud. And yes, I know… on some guns I like to flip the sling upside down. This is called an African carry.
Camouflaging Your Gun

For most types of hunting, especially squirrel and coyote, I wear camouflage and want my gun wear it as well. There are a few options available if you want to camouflage your guns for field work. You can use camouflage tape and gun socks, or you can paint it. Both methods have pros and cons; when the gun is camouflage taped you can apply a tape that very closely conforms to the environment, and remove it or change it as required. It is fairly cheap and usually won’t muck up the finish on you gun, however I have experienced some messy residue being left behind if the gun gets wet while wrapped in tape. The adhesive can stick to the metal and wood work, and is tough to remove if this happens, but still causes no lasting damage. On the negative side, it does not have the finished appearance of a painted gun. Painting is also inexpensive and gives a nice appearance to the hunting rifle, if you do it right. However it is permanent and may not be the solution if you hunt a lot of different types of country as I do. One trip I might be in the swamps of the Deep South, and the next trip in the Mojave Desert.

To use tape, I start by disassembling the gun. I take a camouflaged shotgun sock patterned to match the territory I’ll be hunting, and cut off the sock cover. I pull this portion of the sock up to the grip, and then tape with a matching camouflage tape. I then start applying tape from one side of the action inset to the other, so that when I put the gun back together the action will hold the tape in place. You can then apply tape, wrapping it around the barrel from the muzzle back to the fore stock.

I handle the scope a little differently; taking another piece of the gun sock intended for the shotgun barrel I put a slit lengthwise down the sock so that it fits over the scope and mounts, then tape it in place with the camouflage tape. The slit can be pulled open to reveal the adjustors when required for fine-tuning the scope.

The beauty of this approach is that it takes only an hour or two, and can be removed in 15 minutes. There are a variety of different camo colors and patterns, so it is easy to change as my hunting venue changes. There is a new tape on the market produced by which is a stretch type of self sticking non adhesive tape that I’ve used for a couple of years now. I like this stuff a lot, it is easy to put on, has
multiple patterns, can be stretched to conform to any shape, and comes right off with no residue.

If you decide to paint use enamel. Find spray paint with a flat finish in dull brown, olive and green. These colors are ideal for a basic fall camo pattern. You can pick purpose designed camouflage paint kits in the gun departments of many sporting good stores, or for a few dollars you can find appropriate paints at any hardware store.

Before painting the gun has to be disassembled, degreased and masked off to protect the working parts. Sand off any rust that you find and treat with rustoleum or some other anti rusting agent. Degrease and clean your rifle with white spirits. After the gun has been cleaned and wiped down, do not touch it with your bare hands. Before painting plug up the muzzle, tape up the trigger housing and all other moving parts. Break the barrel, place a small piece of tissue in the breech area and close the barrel again so the tissue is trapped in-between; this stops paint getting into the air transfer works. Tape off the scope’s lenses and adjusters being very sure that the masked areas have been sealed up tightly.

Using a cloth camo tape has several advantages over painting the stock. The tape is effective and easy to apply, and can be removed without damaging the guns finish. The tapes are available in several patterns and can be changed to suit the terrain.
The first coat is the base coat, and after it dries apply a coat of olive, which is the best base color for camouflage in almost any environment you may hunt. Make sure you have painted the entire gun and scope, and then let it dry. I suspended the gun on a piece of wire from a rafter in my garage so that I could give it a complete coating on all sides. To finish the paint job spray the darker green paint in a broken pattern, which will blend with the shadow and vegetation in the field. This same technique is applied to the stock, action, and scope. When you are done, leave the gun to dry for the period stated in the paint instructions, and finish off with a good coat or two of varnish.

Examples of the various types of camo tape available. Different colors, patterns, and materials are available. Make sure the tape can be removed without leaving a residue. Of the tapes shown above, stay away from the camo duct tape (LR) for your guns. It is great for permanent tape ups for other gear, but will mess up wood and metal on guns if you try to remove.
As mentioned, not every scope is optimal for use on an airgun. Spring piston airguns can shake a firearms scope to death, and even though this is not typical a problem with PCP guns, the parallax correction on scopes used for firearms is set at way to long a range for use on most airguns. Many manufacturers of standard firearms scopes carry airgun specific designs in their product portfolio. BSA has a large selection of scopes, and in fact is a division of a company (Gamo) that manufactures airgun as well. Their scopes are moderately priced and the quality is good. They have several scopes that are rated to stand up to springers, and all have either adjustable AO or it is set for optimal airgunning range. One of my favorite BSA products is the 3-12x44 A/O TT; which has good optical quality and the AO can be adjusted from 10 yards. I like the fact that the tall target style turrets can be finger adjusted, a feature that is really handy. Burris has a number of airgun scopes that are excellent quality but can be fairly pricey, my favorite is their 4-12x32 airgun scope. It has an adjustable AO, very good light transmission characteristics, and the images are very crisp and clear. As added incentive for North American buyers, this is one of the few optical devices still built in America. Bushnel manufactures a variety of airgun scopes, including some pretty useless low-end
models. However their line of adjustable objective airgun scopes are mechanically capable of being used on magnum powered spring-piston air gun as well as being optically capable of providing parallax free viewing at ten yards. The scope I’ve used the most is the 3-9x32 Sportsman model, which combines good optics and adjustable AO and also has finger adjustable windage and elevation turrets. Leupold is a manufacture of some of the finest quality optics on the market, I especially like the vx-II 3-9x32 Ultralight Airgun scope. It is light, compact, offers outstanding image quality and ah a great tactile response on the magnification control, it is a joy to use. As with all Leupold scopes, you will pay for that joy but it is worth every penny. I had not used Nikko Stirling scopes until recently, and have been very impressed by the quality of product manufactured by this Chinese company. Their scope line crosses a quite wide price point, but all are very good quality. I’ve been using the 4-12x42 Airking scope on springers and PCPs and have been very impressed with not only the optical quality, but the ruggedness and reliability under a couple of torture test outings I brought them on. The one piece mount that comes with this scope stays locked in place; I have one riding on top of a Webley Patriot which has stayed in place without requiring a scope stop to prevent it walking away under the stiff recoil. Tasco is a manufacturer of budget priced optical gear for the outdoorsman and I’d been using their scopes on my slug guns and rifles for years. Their airgun collection is not extensive, but the Golden Antler 3-9x32 has the AO set for airgun ranges and offers pretty good optical quality at a very low price. This scope is rated to withstand the recoil of magnum powered springers as well. In addition the scopes Tasco also offers a number of rings and mounts for the airgunner. I have a number of these scopes on an array of guns, and have used them on hunts from the States to Africa with excellent results. The rule for airgun scopes is the same as for firearms, buy the best glass you can afford. You get what you pay for. On the other hand, if you have a lot of guns you want to keep scoped, you might want, or need to, opt for less expensive glass. There are good choices from the manufacturers listed here if you shop around.
I was contacted by Hawk e and asked to test out a couple of their products that were being introduced to the US market, though the brand has a very strong following in the European marketplace. I’ve used the companies MaxPro and Airmax models extensively, both 3-9x variable magnification, with the 40mm and 50mm objectives respectively. They have been mounted on everything from a Webley Patriot .25 magnum springer to a DAQ .457 pcp, with many other test guns in between. Both of these scopes are well made and built on a shockproof 1” mono tube and have stood up to everything I’ve thrown at them. Hawke scopes use multi-coated lenses that are waterproof and said to be fog proof. I compared the image quality obtained with these scopes to several models of Leapers, Burris, Tasco, Niko Stirling, and Leupold that I own, and would rate the clarity and sharpness of images at the upper end of the scale. I had these scopes out in the low light of very early morning or right before nightfall, and found the light transmission characteristics and image contrast quite good, but will talk about this a bit later when reviewing field performance.

The eye relief on these scopes is just a tad under 3.5” and allowed me to get on target quickly. I found it easy to set this scope up in a comfortable shooting position, and the ability to adjust the ocular lenses permitted me to optimize the image with or without glasses. The two models I looked at were well balanced and fit in a variety of mounts on a wide range of base configurations. Both scopes offered an adjustment ring on the objective lens that allowed correction of parallax distortion from 10 yards to infinity, and facilitated acquisition of a crisp and focused view at any range.

On the Airmax scope the elevation turret is open and can be finger adjusted without necessitating the removal of a cap, which makes sense as this is the most common field adjustment. On the MapPro both turrets were capped.

These scopes are said to be rated for magnum springers, and to put this claim to the test I mounted both the MapPro and the Airmax on three springers that can really hammer a scope; the Webley Patriot .25, the BAM B-40 .177, and the Walther Falcon .25. I shot a few tins of
pellets across these guns and did not experience any shift in POI or other malfunctions. Of course this was a limited evaluation. The real test was to see how they made it through the next couple of squirrel seasons, as I put my gear through some pretty rugged use under a variety of conditions. My experience has been that if a scope is going to come undone as an effect of heavy recoil, it will usually happen in the first tin of pellets, but these scopes have served the test of time as well.

The Multiple Aim Point (MAP) reticle is a very nice feature on these scopes. Essentially, when combined with the companies Ballistics Program. It permits the POI to be extrapolated at various ranges. These

The adjustments on a scope are made with the elevation (up/ down) and the windage (side to side) turrets. Most airgun scopes will also have an adjustable objective to compensate for parallax distortion..

There are several scopes on the market that are geared towards the airgunner. I think a 3-9 variable is about perfect for most hunters, providing the right balance of magnification, light transmission, and physical dimensions.
There are a couple of ways to use the reticle on your scope to be more effective with placing your shots at longer range.

Mil dots can be used to estimate range, and military snipers for whom they were designed use them for this purpose. And if you’re hunting large game where the size of the animal is fairly consistent and you use a consistent magnification, range finding with the scopes mil dots is possible. However, when hunting smaller animals with an airgun, I have never found this very useful. The animals are too small, and it’s never worked for me. But that’s not to say mil dots aren’t useful for the small game airgun hunter.

The way I use them is to shoot targets at various ranges; 20, 40, 60, 80 yards etc, and map the correlation between the mild dots and the bull eye to define which mil dot is centered on the bull's-eye at a specific range. So if zeroed at 40 yards I line up the crosshair dead center, and at 60 yards I line up on the first mildot down. Combine a mildot reticle, a chart taped to your gun stock, and a range finder and you are set for long range shooting.

There is a reticle system called the MAP by Hawke Optics which ties into their ballistics calculator. Using the BC of the pellet and the velocity generated by the gun, it generates a plot of which aimpoints to use at a given distance. These elevation aimpoints are different from standard mildots in they are not equidistant. That is so that the distances the aimpoints relate to are more evenly spaced.
**Trajectory of Pellet**

Air rifles shoot their projectiles at much lower velocities than firearms, which means that gravity has more time to act upon them during flight. The result is that the airgun hunter has to be more adept at gauging the distance to his target and deciding how to compensate accordingly.

In this example the gun is zeroed at forty yards, which means to hit our quarry with a head shot at forty yards, the crosshairs are laid exactly at the position of the desired shot placement.

At sixty yards however, the crosshairs would need to be moved to the top of the target's head to place the pellet at the same spot. The lower the velocity of flight for the pellet, the greater the arc of the pellet's trajectory in flight.

In this example, at seventy yards it would be necessary to hold the crosshair over the top of the target's head to achieve the same shot placement.

*In this example you can appreciate how much easier the shot placement would be using a scope equipped with mil dots!*
Zeros are correlated to the scopes aim points. This allows the hunter to zero at 30 yards, then move one cross hair down at 40 yards, and one further down at 50 yards, so that exact shot placement is quickly achieved when in the field. And we all know that is the name of the game when airgun hunting. I never fumble around with adjusting the scope when hunting, so this type of set up resonated with me immediately.

The MAP 6 reticle was purpose designed for air rifles, and has multiple aim points designed to work with all rifles trajectories. It features three lower hold over aim points and one hold under aim point. The reticle also has windage points. The reticle is easily calibrated to work with all air rifles, as it is compatible with the BRC software. The ballistics program (BRC) is set up to provide quantitative information for the airgun hunter to calculate the trajectory of their shots. It is applicable to both the MapPro and Air Max scopes, for both .177 and .22 calibers, and for various energy levels. The BRC program is discussed in more detail in the section of this book dealing with pellets and ballistics.

While at the Shot Show in Las Vegas I spent quite a bit of time visiting the various scope manufacturers, and another one that really caught my eye was Leapers. I had used one of their scopes while on a hunt with Eric Henderson many years ago and found several characteristics that appealed to me; the image was clear and crisp, the mil-dots were great for ranging shots, and the compact size was nice as I hauled this particular gun all over the hills in pursuit of game.

As I am lucky enough to have a lot of guns, I’m always on the look out for low cost options to keep them well dressed, and therefore decided to give these scopes a go. I contacted Leapers and ordered three of the new Leapers scopes to try out on a variety of guns, including magnum springers and precharged pneumatics. The first was a compact 4x32 with AO and an illuminated R/B reticle, the second was a full size 3-9x50 with AO and an illuminated reticle, and I rounded out the collection with the 3-9x40 with AO. These optics were all the 5th generation line of innovative new airgun scopes just coming to market. I have used these, as well as several others in the Leapers line, for several years now on a
variety of guns. These scopes are all solidly built and precision machined from aircraft grade aluminum to stand up to rigorous field use. The tubes are nitrogen filled and sealed creating a moisture proof barrier to prevent the scope fogging up under adverse weather conditions. The quality of glass used is surprisingly good in a budget priced scope; the application of multi-layer emerald coating results in razor sharp image clarity and outstanding light gathering characteristics. The company states 95% light transmission which is considerably better than many of the more expensive scopes on the market. Both the red and green illumination on the crosshairs results in the ability to optimize your shots at dusk and dawn. I even found that during daylight when it was overcast or when my quarry was sitting back in the shadows, the illuminated crosshairs were very useful for getting on target. The AO correction from three feet to infinity is absolutely superb, allowing the hunter to go to quite high magnification while keeping a crisp, clear focus. And as mentioned previously, the mil-dots are an unquestionable advantage to shooting at variable ranges in my opinion. These scopes represent a very good performance at a very reasonable price with a product range.

**Long Eye Relief Scopes**

A scope with long eye relief is one that is set up so that it is lined up with the shooters eye situated several inches away from the eyepiece. These are traditionally used as pistol scopes or shotgun scope, and have gained popularity in recent years on the Scout style rifles championed by Jeff Cooper. Scopes that have long eye relief are usually, but not always, fairly low magnification in the 1.5 – 4X range. The reason that this configuration works well on pistols is obvious, as the typical style of shooting has the handgun held out with at least partially extended arms. Getting the eye up close to align with a traditional scope is not a natural position for most handgun shooters, especially hunters.

But the advantage of a long eye relief on a rifle is that it allows for very fast sight acquisition with both eyes open, which makes it easy to
keep a close eye on your quarry when shooting. You don’t get lost in
the scope as sometimes happens with a standard scope. There are
also guns where it is most practical to have the scope moved out
towards the middle or distal part of the gun. A good example is on the
multi-pump Bluestreak, where this position gets the scope out of the
way of the pumping arm.
I am in the process of building another compact urban hunting rifle
based on the Evanix AR6 take down rifle, and am putting one of the
new Leapers Long Eye relief scopes on it. These scopes have an
illuminated crosshair, which is useful on a low light hunting gun. The low
magnification power should allow for very fast target acquisition.
Another long eye relief scope that I’ve used with very good results on
handguns and rifles is the Compact Tasco 2x shotgun scope. This is a
low priced fixed 1.5x scope, that can be found at most big box stores. It
has a crosshair set up that I really like there is a small ring around the
crosshair that makes the sight acquisition exceedingly fast. Due to the
low magnification and the long eye relief, these scopes do not require
parallax correction.

Mil Dots
Airgun writer Tom Gaylord wrote a piece on Leapers Mil-dot scopes
that I am going to borrow from here. He explained that “degrees are
measurements of angle, and there are 360 degrees in a circle. As the
circle grows larger in circumference, the number of degrees does not
change, but the distance between each degree along the circle does
increase. Degrees are divided into smaller units called minutes, and a
degree is divided into 60 minutes. At a distance of 100 yards, the angle
of one minute is approximately an inch. So if the centers of the two
pellets farthest apart in a 100 yard group are about an inch apart, it is
termed a minute-of-angle group.” OK, easy enough so far. “One mil of
angle is approximately 3.6 inches long at 100 yards, and that is close
enough to 3.5 minutes of angle to be convenient. In Leapers mil dot
scopes, the centers of the dots are one mil apart. So, if your bullseye is
3.5 inches in diameter and 100 yards away, it will touch the centers of
any two dots next to each other. If it appears only half that size through
the scope (from the center of one dot to half the distance to the next center) your target must be about 200 yards away. If the same bullseye spans the distance between the centers of three dots (two with an extra dot between them), your target is about 50 yards away. Scopes on sniper rifles have mil dots on both horizontal and vertical crosshairs so they can measure height as well as width through their scopes. A six-foot tall man is also 72 inches tall. At 100 yards, he would appear to be just over 20 mils tall. At 1000 yards, he would be close to 2 mils tall." Maybe not as easy, but we're still following you Tom. However, the problem with using a Mil-dot scope for range finding is that you need to know the approximate size of your quarry. Once you have this value it is plugged into a formula, which varies depending on the scopes mil-dot configuration, to calculate the range. I have never found this useful in the field; it is too complicated and takes too much time. Also, when I go out hunting I can’t keep the heights and widths of all the different game I might encounter straight in my head. This might work if I was hunting elk and the difference between individuals height is a couple inches, but on an airgun trip where I might shoot a prairie dog, a ground squirrel, a rock chuck, or a crow it’s a different situation altogether.

The way that I use the mil dots wouldn’t win me any awards in sniper school, but it works for me. First, I don’t use the mil dots for range finding, I use a range finder for that. Say I’m going to take the new Super Sonic Tackdriver Plus rifle out on a prairie dog shoot. I will hit the range and zero my gun to hit dead on at 60 yards, then monitor the shift in point of impact as I shoot at distances from 20 to 100 yards finding what range coincides with one, two, three mildots above and below the crosshairs, and mark these down on a card that I’ll tape to the rifle stock. This gives me a handy reference when shooting in the field, and is easier than trying to eyeball holdover. So on my prairie dog hunt I line up on a dog sitting on his mound at 73 yards (per my laser range finder), and checking my chart see at 70 yards I’m 2 mildots down…. Squeeze the trigger and watch the critter back flip off the mound. I like mil-dot scopes, and even though I don’t use them for range finding do feel that they make long range shooting more accurate and importantly, more consistent. Many airgun scopes these days come
equipped with mil-dots, and is a feature worth consideration.

**Red Dots**

Red-dot sights are another sighting option for the airgun hunter, and in some situations a very good choice. These devices tend to be low/no magnification, so work better on pistols or fast carbines used for up close pest control such as ratting in the barn. Where they don't work as well is at greater distances or in very bright sunlight; even at the highest brightness setting the dot fades to a point where it cannot be seen clearly when rabbit hunting in the desert. They have become so widely used on air pistols and quick shooting carbines, that a word or two about how to use them makes sense. For rapid shooting at closer ranges many hunters prefer to use red dots as they permit very rapid target acquisition like iron sights, but are much easier to use. The problem of being able to focus on only one element (front, rear or target) can make the use of the iron sights difficult.

This problem is circumvented with electronic "red-dot" sights - the target and the dot appear in the same plane. Once zeroed, wherever the dot is on the target when the shot is released is where the pellet will impact. And, because the natural instinct is to seek the center of a circle, there is a noticeable reduction in effort when using this sight. Putting the dot in the center just sort of happens by itself! But, many questions are common when starting to use this system - How big should the dot be? How bright? What color? Where do you focus your eye?

Dot size is pretty subjective, but a good rule of thumb is to choose a size that is approximately 1/2 the area of the black aiming area of the target for bullseye pistol. Smaller dots seem to lead to the tendency to obsess about "getting the dot perfectly in the middle" - sort of like trying to get the "perfect" hold with iron sights - and forgetting to release the shot smoothly while letting the dot (or the iron sights) "float" in the natural hold area. Some red-dot sights allow you to choose between dot sizes, but in general there seems to be two popular sizes: about 3 - 3 1/2
MOA or about 7 - 7 1/2 MOA. Brightness is also subjective, but I recommend using the lowest intensity setting that gives good dot visibility without straining to find it as this will also give the roundest cleanest dot without "rays" emanating from the edges. When in bright sunlight, some sights can be fitted with a dual polarizing filter that allows you to diminish the incoming light to a less dazzling level. These are usually just cheap pieces of diffraction grating film and image quality might suffer, but I prefer not to use a red dot in bright sunlight. Many of these devices allow the use of either an illuminated green or red dot, I prefer the red dot during the day and the green dot at night, but think it is more a matter of personal preference.

I tend to use Red Dots sight only on my handguns, where they are useful in very quickly lining up a shot. For my rifles I prefer to use a scope, however I know several pest control shooters that have mounted them on ratting carbines, with very good results. If you don't need magnification, won't be shooting in very bright daylight, and need fast sight acquisition, these devices are viable options.
When you get a group of airgunners together and they start talking gear, volumes will be spoken about guns and scopes ….. but not much attention is paid to the mounts used to hold the two together. I have to admit that in the past I would grab whatever mount was available at a decent price; stick it on the gun and go. However, after a few bouts of scope creep or loss of zero at an inopportune time, I started to put more thought into this piece of kit. Scope rings come in various configurations; one piece, two pieces, cantilever, and various height profiles. I find that on a magnum springer, a quality one piece mount/ring such as that produced by BKL will hold a scope in position without requiring a scope stop. If I am using a two piece mount on a spring piston airgun, a scope stop is usually used to ensure the scope doesn’t move under the harsh bidirectional recoil this type of gun generates. Scope creep is not so much of a problem on PCP airguns, though mounting options (length of the dovetail) is often more restricted than found on springers which makes the two piece mounts a better option.

Think over what height scope mount will work best with the rifle you’re using, providing the best sight alignment. Match the mount to the type of gun and recoil to be dealt with, and make sure the mount fits the scope; 1” or 30mm. Some short tubed scopes won’t fit into a one piece mount.
When selecting mounts, you need to determine what the scopes tube dimensions are (1” or 30mm), what the rifles dovetail or base dimensions are (11mm or 3/8”), and what height (low, medium, or high) the rings need to be. Most airgun scopes use a 1” tube and have 11 mm dovetails. The height profile depends on how high the dovetail sets above the barrel and the aperture of the scope. A scope with a 50 mm objective requires a high profile mount in most cases. The height of the mounts is also dependent on what height the scope needs to be positioned at to allow comfortable sight alignment, which in turn relates to the height of the rifles comb/cheek piece. To have consistent accuracy, it is necessary to position your hold on the gun the same way every time and for that hold to allow the marksman to look through the scope the same way. If this is not achieved, you will never realize the best that the gun is capable of delivering. I now experiment with different rings and scope position until I have it just right one for each of the guns I shoot. I have a gun with a stock that has a very high comb and cheek piece. If low profile mounts are used it is impossible to get a decent sight alignment, but with high profile mounts this gun comes naturally to the shoulder and offers an excellent sight alignment and is very comfortable to shoot. On the other end of the spectrum, my Career III/300 and Infinity rifles have a high receiver, and if a high profile mount is used with these guns, the shooter can’t rest their cheek on the stock and look through the scope at the same time. But with a low profile mount, these guns are very shootable and consistent.

Leapers is a company that I was unaware of five years ago, but since that time I have been using their scopes and mounts on many of my guns with excellent results. They manufacture a line of single piece and two piece mounts in a variety of profiles and tube diameters. The companies Picatinny Tri-Rail scope mounts allow the hunter to install lights, lasers and other options on their guns, which are especially helpful for night time pest control guns. The product portfolio of airgun specific mounting systems offered by Leapers is one of the most extensive on the market, and can be purchased at many of the online airgun stores. BKL is another manufacturer of quality mounting
These mounting systems are from BKL: the 4” Dovetail to Weaver and the Two Piece Dovetail to Weaver adaptors allow airgunners to mount Weaver style rings to their guns configure with doevtials. This opens up the doors for a scope designed for firearms to be used on airguns.

These mounts and rings are from Leapers; A one piece mount (L), a medium profile two piece (M) and a two piece high profile (L), The one piece can be put on springers without a scope stop and will stay put. The best solution for springers but may limit scope selection. The one two piece designs (which come in pairs) allow great flexibility in positioning and fitting scopes, but may shift on magnum springers unless a stop is used.

These two piece and one piece rings are quick release mounting systems from Leapers. They detach from your rifle for transportation and lock into place retaining the rifles zero. A great product for the traveling airgun hunter!
systems that can handle the strain of the magnum spring piston airrifles. I particularly like their offset mounts as they allow scopes with very short tubes to be mounted even when there is little latitude with the length of the dovetail. And recently I’ve been using the Hawke mounts on some of the higher magnification 30mm tube scopes with good effect.

The fact is that most .22 rimfire rings and mounts manufactured by Weaver, Leupold, Burris, B-Square and all of the other usual suspects can work very well depending on your specific needs.

One piece mounts are a bit more restricted in what scopes they will fit, but even on the heaviest magnum springers are rock solid. I have never used a one piece mount that allowed the scope to walk back on the rails.

A two piece mount will fit any scope, regardless of the length of the tube, position of the mounting groves on the rifle, or position of the magazine. The two piece is susceptible to shifting on magnum springers and may require a scope stop to be mounted.
If you bend the scope tube when mounting it in the rings it can result in elevation and windage malfunctioning. For example, sometimes an adjustment will produce no change in the point of impact or it will jump all over the place. The bottom line is that you are unable to get consistent results when making scope adjustments.

The most frequent cause of a bent scope is when a two piece mount is used and the rings are not properly aligned. It can also be the result of the rings being clamped down too tightly on the scope tube. The way to circumvent these problems is to epoxy bed your scope in the rings, which fills the gap between the bottom half of the rings and the body of the scope tube. It is an easy undertaking, after mounting the rings and aligning them to your specifications, remove the top half of the rings and thoroughly clean the bottom half of the ring that cradles the scope. Put a coating of a wax based release agent on all other ring surfaces to keep the epoxy from sticking to where it will ooze under pressure. Make sure to protect the screw holes used to clamp the ring halves back together, or you will end up with an aligned but unusable scope mount! Place a coating of JB Weld epoxy in the saddle of the bottom rings, spread a couple of millimeters thick. Make sure it is evenly distributed over the entire surface of the ring saddle. Make sure you have coated the scope with the wax release agent, covering the areas which will contact the rings, and place it in the rings. It is necessary to hold the scope firmly but gently in place using the top half of the rings, tightening them down until the epoxy oozes out the sides. Not too tight – just enough to seat the scope tube against the rings. After about six hours the JB weld will start to set up and you can trim up the excess epoxy with a sharp knife or razor blade, leaving only the layer in the bottom of the ring saddles. The replace the scope in the mount and loosely clamp the upper half of the ring while the epoxy cures. Before clamping the scope down in place, sprinkle some powdered resin on the portion of the scope tube which will contact the rings. This will hold the clamps in place under the harshest recoil. Now, I have to be honest and tell you that I don’t go through this process on every gun/scope combination. However, if I have a particularly expensive scope or a gun that I can’t keep sighted in, it is an option worth considering.
Sighting In

I use scopes on all my hunting guns, and believe that it is an absolute necessity to ensure consistently clean kills. There is no way that a set of iron sites is going to fully exploit the inherent accuracy of most modern hunting rifles under field conditions. To achieve optimum performance the hunter needs a quality scope with good light gathering characteristics, which has been zeroed in at appropriate hunting ranges. When a scope is mounted on a rifle, it is not necessarily in alignment with the barrel. My first step is to use a laser bore sighting tool to get my first shot pretty close before I start fine tuning. A few years ago it was hard to find a bore sighting tool that would fit a .177 rifle, but with the rapid rise in popularity of the .17 rimfires, this is no longer the case.

At the most basic, scopes have to post which house positioning controls. The one on the top of the scope is for elevation which moves the crosshairs up and down. The one on the right hand side of the scope controls the windage, or left and right position of the crosshairs. Some scopes also have a third control which corrects parallax distortion and will be discussed later. If the scope is an adjustable magnification, the collar around the eyepiece is adjusted to select the level of magnification. I always start of my sighting at the lowest power magnification.

To get zeroed in, you will need to shoot from a solid rest that negates any possible shooter induced error. I typically set up on a table with a rifle rest and sand bags, which are used to support the rifle. The target is positioned at ten yards and I take the first shot to see if it hits on paper. If I am off (which invariably will be the case), the next step is to use the elevation and windage controls to bring the point of impact to a spot that is vertically in line with the bullseye and 1” low. At ten yards, the clicks on the scope adjustments don’t have much effect on where the pellet strikes and you will have to make big quarter rotation turns at first. Once the pellets start hitting close to the intended point of impact, you can start making smaller adjustments until you’re zeroed. As mentioned I almost always start out by bore sighting my gun using one of the many laser bore sighting tools currently available. These are
essentially a laser pointer with a terminate in a long thin rod into which an adaptor is screwed. This adaptor is inserted into the barrel (make sure the gun is empty and decocked or it could become a projectile!), and opens when screwed perfectly centering the rod in the barrel. The light is turned on and the elevation and windage post on the scope are used to align the crosshair and the laser dot. You still need to fine tune the zero by shooting the actual pellets to be used with the gun, but it quickly gets you on the paper and close to where you need to be!

Make sure you have a solid rest when sighting in your rifle, and for pcps be aware of you air and fill pressures. For springers, lay your hand on the bag and place the forestock in your hand for most reproducible results.
Level for checking cant
Adaptors

Getting on Target

When sighting in, use the laser sighter to make sure you’re on the paper, then start out by seeing where the first shot hits. At 40 yards, it takes about 10 clicks of the windage or elevation turrets to move the crosshair an inch. Go in small increments to move the point of impact (POI) up (elevation or top knob) and over to the left or right (windage on right side knob) until you have the POI centered where you want it. The shoot a three shot group to make sure the crosshair is where you want it to be and you’re good to go!

One of the most useful tools in your kit is a laser bore sighter. There are different types, but essentially it is a small laser pointer which is aligned with the guns bore; either a cartridge with a laser slipped into the loading port, or (like the one shown here) slipped into the muzzle of the barrel. There are several adaptors so the can be used in anything from a .177 up to a .50 caliber barrel. The device is mounted, the light switched on, and the scopes elevation and wind turrets are used to align the crosshair to the projected laser dot. This will not place you spot on, you’ll still have to fine tune it by punching paper, but it will get you very close very quickly. If you have multiple guns, switch scopes, or just need to quickly confirm your zero after pulling your gun out of its case, this is a must have.
Zero Range and Addressing the Trajectory

I have a ten yard range at the shooting bench in my basement, where I do a lot of my initial sighting in during the colder months. Of course most of my shooting at game occurs at 30 – 40 yards, so I like to sight my guns to be zeroed at 40 yards, so need to know where the point of impact at 10 yards will correspond to a 40 yard zero.

\[
\text{\( \frac{1}{2} \text{ Tube OD} + \frac{1}{2} \text{ Barrel OD} + \text{(Top of barrel to bottom of tube)} \)}
\]

I use a program that is available from Hawke Optics on my laptop and my mobile device to calculate the pellets trajectory from a given gun. This program requires the pellets velocity, ballistic coefficient, and the scope mount height. To be considered in the calculation.

Ballistics Programs

The tube outer diameter (OD) will be .50” for 1” tubes and .59 for 30 mm tubes

The best airgun ballistic program you’ll find is Hawke Optics Chairgun, which allows you to select a pellet from the directory (that provides weight and BC), input the guns velocity, and the scope height (discussed above), and from this information plot the guns trajectory. This means that if I zero guns on my basement range at 10 yards, I can see where they will hit at 40 or 50 yards. Conversely you can work backwards, finding where the gun should hit at 10 yards if you want a 50 yard zero.
When sighting in your hunting rifle you can use a couple sandbags or pieces of rolled up carpet, but it’s easier and you’ll get better results with a little bit of gear. Either a steel or plastic bench rest will do the job, but the plastic ones are less expensive and easier to transport. I use a sandbag on the rear rest to help snug the gun in.

You can simply use a cardboard box with a brick in it to tape targets onto, but a stand is quick and easy to deploy. I use bulls eye targets for sighting in, then use animal targets for acclimating to the rifle at longer ranges before the hunt.

But when I am plinking and having fun shooting the gun, which is really the best time to familiarize yourself before going out after game, I like a metallic target that is reactive; I want to hear it ring or watch it fall over when hit. You can either use spinners made for airguns or rimfires, or field target that come in a variety of animal silhouettes with changeable kill zones. These targets can be rest after a hit, which will save you some steps! The perfect place to practice the long shot.
I will review several of the guns that I am currently using or have used to hunt small game, large game, varmint and for pest control. I would predicate this section by telling the reader my requirements for a hunting gun are straightforward; accuracy, power, and shootability in that order. These are not target rifles, but possess the ability to deliver a projectile to the kill zone of my quarry every time if I do my job. Therefore, my ideas of what constitutes a good trigger for instance may differ from others in that I don’t mind a 4 lb trigger pull on my hunting gun. So long as it breaks crisply and cleanly I am satisfied, I don’t want an exceedingly light trigger when tromping through the woods with semi-frozen fingers. Dr. Robert Beeman once said in a review of one of my books that I was focused on results in the field and would use guns he’d not be caught dead shooting. I didn’t know how to take it at the time, but on reflection he was right. Some of these guns are not beautiful to handle or look at, but they all do the job. And in the end what counts is that when you squeeze the trigger, you should have every confidence in your shot placement. Another thing that I believe in doing is showing a variety of guns at different price points, as not everyone can, or wants, to purchase an air rifle for several hundreds of dollars. I pointedly included guns that are not premium priced, but something that a kid could save his allowance for. Having said this, in this book we’ll look at a number of springers, CO2 guns, and precharged pneumatics that I have used in the real world of airgun hunting.

Airgun Development Today
But before getting in to specific guns, it is of interest to take a cursory look at airgun development today. Airguns are produced in many countries around the world today. The American manufacturers have traditionally tended to focus on low cost multi-pump pneumatics and CO2 guns, though more recently Crosman has developed a couple of impressive PCP rifles, as has AirForce Airguns based in Texas. I had the second gun released for evaluation testing and became an instant fan. The other bright spot in our airgunning scene are the custom houses and smaller manufacturers turning out some very nice pistols.
and rifles. The Europeans tend to focus on higher end “serious” hunting and sport rifles, with some less expensive versions coming out of the ex Eastern Block countries. In the last few years, there have been some interesting airguns coming out of China and Korea, which span the range from cheap knock offs of the European styles to some high quality uniquely designed guns. The Chinese tend to focus on spring piston guns (though they do produce the B50/51 clones of the Daystate Huntsman as well) while the Koreans are known for their PCPs (including big bores). Following is a little more in-depth discussion on the guns produced in the various regions.

Airgun Development in Europe

In many respects Europe is the center of the airgunning universe. When I think of the best air guns produced, what invariably comes to mind are the superbly manufactured British guns from companies such as Daystate, Theoben, BSA, Webley, Logan, Falcon, and Air Arms or the German guns out of Weihrauch, RWS, Diana, and Dynamite Nobel, and the Spanish manufacturer Gamo. The difficulty in obtaining firearms in Europe has to a certain degree, driven the development of air arms as a viable alternative for target and hunting applications. These guns as a rule are often finely constructed in terms of their mechanical function as well as the attention to detail and quality of finish.

There is a tradition of building quality air rifles in the UK for hunting and target shooting. With the introduction and rapid growth of field target as a shooting sport, there was a concurrent jump in gun development. While there has always been (and will probably continue to be) a wide selection of spring piston airguns manufactured and sold, there has been a shift towards the pre-charged pneumatics for the British market in recent years. As previously mentioned, in the UK any air rifle generating more than 12 fpe must have a Fire Arms Certificate (FAC). If the hunter in the United States buys a gun over the internet from a European seller, they must be aware that the gun may be tuned down to a lower power setting than if the gun was produced for export to the United States. Another difference in the laws governing guns in
European Precharged Pneumatic (PCP) Rifles

The Falcon Prairie Falcon Profile is another all time great hunting rifle. Great performance, this is the gun I shot off hand better than all others.

The BSA R-10 PCP is another bottle fed gun that provides a high shot count and outstanding performance for small game.

The AA S510 FAC is in my top 3 all time favorite PCP hunting rifles; everything about performance, build, and overall quality is top of the line.

The Brocock Enigma. I used this little takedown carbine for a season, and found it was a great squirrel gun. Easy to shoot offhand, it is a tackdriver with just enough energy.

The FX Royale 500 is another gun that makes it to the top of my list. This gun is a tack drive, generates an honest 40 fpe in .25, and has a very high shot count.
European Spring Piston Hunting Guns

The RWS 350 Feuerkraft Pro Compact is another one of my hunting favorites very powerful, great shooting characteristics, the heavy moderator shifts weight forward to dampen recoil.

The AirArms TX 200 is one of the finest springers made today. Accurate, powerful, a little bit heavy if you’re going to be putting in the miles

The Gamo Hunter Extreme is a very big and very powerful springer that can make potent use of the .25 caliber. I like this for medium sized game.

The Gamo CFX is an under barrel lever cocking rifle that is one of the most accurate springers I’ve hunted with, and it’s attractively priced.

New kid on the block, I found the Cometa Fusion an accurate And powerful small game gun that is a great starter rifle.
the UK and the States is that most guns in Europe are outfitted with a silencer, which is a federal offense to possess here without a permit. With the fall of the eastern block, several imports have been coming out of Russia, Czechoslovakia, and Hungary. The quality of these guns range from superb to abysmal, so do your homework before buying!

There are various importers of European air rifles in the United States; Pyramyd Airguns is one of the largest with an extensive range of guns. Airguns of Arizona imports various guns from the UK and Sweden, and Beeman (now a Marksman Company), handles Falcon, Theoben and Weihrauch products (to name just a couple), and a couple of RWS products. These are great guns, powerful, accurate, and well made. I have to say honestly that I have not shot many airguns from the European manufacturers that I did not find to perform satisfactorily.

A couple of trends to mention since the first edition of this book; the dollar has fluctuated and at times has been very weak against the Euro and Pound Sterling which has caused the guns to go up in price. This may change based on economic swings. The other change has been the strong opposition within Europe to guns (airguns included) and a rash of oppressive laws that make it hard for British manufacturers to sell and ship their products. Some companies, such as the venerated Webley Scott have been forced to cease operations or move them offshore. I hope that we do not see this trend continue, as it would be an end to a rich history and there is no replacement in the market for the product diversity that would be lost.

**Airgun Development in the United States**

Airgun development in the United States has lagged far behind the rest of the world for quite some time. In my opinion, the main reasons for this are that firearms are fairly accessible to most of the population here, there is more open space in which to use them, and there is more large game to hunt. So, while Europeans were developing air arms with which to hunt small game, there was not the same motivation for American companies. In the United States teenagers were often given their first rim fire to hunt with as a preparation for bigger game and more powerful firearms. Airguns in this country devolved into a quasi
trainer/toy state, with most airguns being designed for preteen and early teen shooters. With some exceptions, these guns were low powered spring action or CO2 powered replicas of popular firearms. The companies that dominated the domestic market have been Daisy, Crosman, and Marksman for the mainstream, and Sheridan and Benjamin as our higher quality manufacturers of multi-pump pneumatics. A few years ago, Sheridan and Benjamin merged, and a few years after that Crosman acquired the company and brand, though they have maintained the brand identity.

Crosman has recently introduced a new product line under the Sheridan Benjamin name, which has broken from tradition. They have new magnum break barrel spring action rifles which they have recently released to the domestic market. And they have been leading the way in the manufacture of gas spring designs. These guns represent Crosman’s entry into the higher end adult airgun market, and they followed up with the Benjamin Discovery PCP rifle. This handy little hunting rig hit the trifecta with technological advances, maintaining a low price point, and leveraging their existing distribution channels. This gun generated immediate interest with American shooters, and I suspect sets the stage for future developments with other American manufacturers. They followed up the success of this rifle with the Marauder, which has become one of my favorite guns. It features a shrouded barrel, a match grade trigger, a ten shot magazine and excellent all around performance at a much lower price than most European guns. There is some room for minor improvement, some may prefer to upgrade from the utilitarian stock, but otherwise the gun can be adjusted to near perfection for any shooter. I think Crosman is a company to watch, as they seem to be giving the American market exactly what it needs and wants.

There has been increased activity in the American market with respect to custom airguns and modifications of production guns, precharged pneumatics, and big bore airguns. Designer /air gunsmiths such as Dennis Quackenbush of Quackenbush Airguns are turning out some truly impressive guns. A few years ago he started making dual source CO2 / PCP hunting rifles such as the XL and Light Sporter in
American Guns: A story of refinement and innovation

The Benjamin Marauder in .177, .22, .25 has all the features and performance required for a top end hunting gun, at a fraction of price. A great gun and one I use often.

The Benjamin Discovery was the game changer, an accurate and powerful PCP for the price of a springer. Fills to a low pressure and is ideally suited to hand pumping. One of my favorite traveling guns.

The Benjamin Rogue is another game changer, the first American BigBore airgun, and it is feature packed.

The Marauder Pistol was the first PCP designed specifically for hunters. It can be outfitted with a stock, and is the perfect Urban Hunter.

The other American airgun manufacturer is AirForce. This Condor is a very powerful very accurate single shot that handle the heaviest pellets to make this my favorite for long range shooting.
At the 2011 SHOT Show Crosman released their first big bore air rifle to market, the Benjamin Rogue. Not only is this gun the first production big bore from a major US airgun manufacturer, it is also loaded with innovations.

At first glance of the features; a .357 caliber, six shot rotary magazine, and integrated barrel shroud in a rifle generating over 250 fpe is impressive on its own. This gun has the power to take down hogs inside of a hundred yards, and it is quieter than a .22 rimfire short.

The innovation is that this gun uses an onboard microprocessor to control the electronic trigger and regulate the electronic valve. This permits the guns operating parameters to be optimized for a specific bullet or a specific ballistic performance. It also allows the valve to be dynamically regulated so that the appropriate volume of air is released for the appropriate period of time to ensure that the shot to shot variation is minimized. It will be interesting to see if this technology migrates to other products in the line.
small bore calibers, and more recently have turned out the Bandit rifles in .308 and .457 caliber. These guns are tack drivers capable of taking large game. I've carried both of these rifles (and other DAQs) on multiple trips to South Africa where they have proven effective for a number of large game species including impala, kudu, and warthog. Quackenbush also markets kits to customize stock guns such as the Crosman 2240, producing actions and barrels in .25 and 9mm calibers. These guns are capable of taking small game such as rabbit and squirrel quite effectively. I have one of Dennis's 9mm conversion kits that consisted of the breech, barrel, springs, and even the tools I needed to modify the standard Crosman 2240 which is the platform for this gun. I made my own grips, including a carbine stock if I choose to use it as a rifle, and modified the valve to increase the velocities. I replaced the trigger springs and tuned the trigger, and ended up with a very powerful hunting handgun. When I can stand to part with this gun for awhile, I'm going to have it converted to PCP.

Jim Giles runs another custom shop operating under the name of Crooked Barn that does great work with Crosman 2240 modifications, producing a number of components such as the Ultimate breach, to upgrade this off the shelf plinker into a fine hunting gun. He produces quality pistols and carbines on this platform, which have a very good reputation and a large following in this community of somewhat fanatical shooters.

**Airgun Development in China**

For many years it was believed, and there was some substance to this, that all Chinese airguns were inferior quality; underpowered, inaccurate, and made of poor quality materials with shoddy workmanship. These guns could be bought by mail order for next to nothing, so quantities were sold in this country. My first experience with one of these guns took place in China on an unexpected hunt outside of Beijing, which was a great trip, but I didn't pay too much attention to the gun. My earliest experience with Chinese manufactured airguns in which I paid attention to the gun was not at all a pleasant one. The stock looked like
it had been made out of a fence post, the components all looked plastic and cheap, and the point of impact was anybody's guess. After a couple of months the cocking lever actually broke off in my hand, and this ended my experimentation with these products.

Move ahead a few years; I decided that I wanted to see how an airgun works. I am not the most mechanically inclined person in the world, and when I take things apart there always seems to be parts left over, when and if I get it back together again. For this reason I decided to order another Chinese airgun online. It was cheap and if I couldn't rebuild it – no loss. When the gun arrived and I unpacked the shipping case I found a military looking air rifle completely covered in grease. I cleaned it off, cleaned the bore, and fired a few pellets through it just to see if it worked or not. There was substantial smoke as the gun diedeled, but what really surprised me was that the gun grouped those initial shots fairly well (with iron sights) and that it seemed to impact the target with some authority. So I scoped the rifle and sighted it in, then set about seeing what it would do. The accuracy was consistent with many of my European rifles, and this started my interest in these guns.

There are many changes occurring in the Chinese airgun industry, with a greater number of factories producing air rifles, and doing so with improved manufacturing processes. Many of the guns now reaching the United States are produced in the Xifeng factories. This factory has developed a good reputation for turning out high quality guns, while maintaining a good price / performance position. The quality of these guns can still be hit or miss, and it is very much a case of emporium caveat. I would strongly suggest you do business with a company that has been in the business of importing these guns for a long period of time and has a track record of taking care of their customers. I have had good experience buying from Fun Supply, Bestairgun.com and Compasseco Inc., and know that they stand by their product if I happen to pull a lemon. The Chinese Hercules XS-B18 performs to just about the same level of accuracy and power as the RWS Model 34 I compared it to. There is however, no comparison in the finish and detail between the guns coming out of China and those from Europe. The
Chinese guns, even those that are copies of European designs, do not use the quality of wood or finishes. The trigger actions are much coarser and the sights are generally quite basic. They do make a nice platform for modification and customization though. Sand and reshape the stock, replace iron sights with some good optics, give it some new springs and a tune, and you've got a good gun at a low price. There are several online forums and websites dedicated to Chinese airguns with reviews and information on how to tune and modify the guns. Besides ending up with a nice basic hunting rifle, it's a great way to learn about these airguns.

At the time of first edition of this book, the first Chinese PCP became available. I ordered one from the initial shipment, and actually ordered early enough that I was given the opportunity to obtain one of only two guns configured with a thumbhole stock. The gun is a clone of the Daystate Huntsman MK II, and my hope was that like the QB-78, it would be a lot of quality rifle for the money. When I received the gun I was not disappointed. It is a big gun, weighing in at around 8 pounds and with an overall length of 43.1” and an 18” barrel. The level of workmanship is very nice, the bluing rich and deep, and the stock a nicely shaped Asian hardwood. The finish was a little less than great, but after stripping it down and giving it several coats of oil before waxing it, it was transformed into a truly beautiful rifle. The gun is fairly tolerant to a number of pellets, but seems to have a preference for the heavy round nose pellets I like to hunt with. The gun easily achieved the advertised ¼” groups at ten meters. The gun is charged using either a SCUBA tank or a hand pump that is connected to the gun by a Parker Fitting which allows quick hook up and release without requiring any tools. The XS-B50 is the most expensive Chinese produced air rifle I have purchased but it is a value for the money, costing less than many European springers. Both my experience with this rifle and that reported by other shooters that received and tested the first production found this to compare quite favorably with the original Daystate from which it was cloned. In the years following the first edition, the BAM B-50 has developed a strong following, and is especially favored by custom shops and modders that refine and alter the B50 platform to suit their
Airguns are manufactured all over the world, and in this figure the locations of most manufacturers of hunting airguns are shown. The hotbed of development have been Europe by far, with Korea and China well represented. For the size, or at least potential size of the US market the volume of companies involved and volume of high performance hunting airguns has been low. This is changing, and there are some very interesting American guns coming on the scene.

A lot of guns produced in China, Turkey, and Spain are rebadged and sold in the product lines of several companies, so you may see very similar guns showing up under various labels, badged as Winchester, Walther, Ruger, Remington, etc. The Koreans and Quackenbush in the US own the big bore airgun market, though boutique manufacturers are making inroads.
needs. These guns have been modified to increase power, decrease power, improve accuracy, change caliber, etc.

Chinese guns have a place in the market; they can be a good choice for hunters on a budget, those that want a variety of guns for different hunting applications, or somebody that wants a fun project gun. The level of quality seen in these guns today can be quite good, though you must be careful who you buy them from; all QB-78 variations are not created the same for instance. But for the reasons stated above, many hunters would be well served looking at the Chinese produced airguns.

Airgun Development in Korea
Korea has become a major producer of low cost, good quality, and powerful PCP rifle designs. (In the past these guns could be a bit chunky and not necessarily the prettiest designs, but in my view the fact that they performed well and are loaded with features at a fraction of the price of most European guns ensured them a place in the North American Market. More recently they have been coming out with some designs that are much sleeker and ergonomic, borrowing from the lines of many European guns. There are two main companies producing guns out of Korea; Evanix and Sam Yang, both of which are distributed by Pyramyd Airguns in the States. The Sam Yang Recluse in .357, the Dragon Claw .50 caliber, and the Career 707 in 9mm were until recently the only production big bores available, and still the best value in a big bore gun. I have several Korean guns in my collection, and have taken everything from squirrels to coyotes to whitetail deer with them, and find that they are reliable, powerful, accurate, and the newer guns are quite attractive. One of the trends I’ve noted from these manufacturers is to find ways to maximize the onboard air storage, using various combinations of air bottles and reservoirs to achieve this goal.

But when it comes to airguns, and PCs in particular, a gun is only as good as it’s reliability and the support network behind it. I have been please with the robustness of design, and have put these guns through the ringer. In a couple instances where I’ve had a problem (usually caused by me) the fact that Pyramyd had a domestic service center was a great benefit.
The Korean Connection: These represent some of the best value for money on the market

The Evanix line of guns use the same action, which is a robust and reliable platform that has proven itself as a truly great hunting gun. These are amongst my favorite hunting guns, and for the price it doesn’t get much better!

The Sam Yang Recluse .357 and the Dragon Claw .50 are variations of the tried and true BigBore 909 platform. Very accurate, this is the most powerful of the Korean large caliber guns. Excellent choice for big game or predators.
Evanix has been producing several innovative designs in recent years, that combines new technology while re-purposing the proven technology used in their earlier guns. The Speed and Conquest are Semi/Full auto PCP rifles in several configurations. The newest is the compact bullpup, which by using the barrel, reservoir and action of the standard sized Speed rifle, has maintained the same performance as that achieved in a much more compact package. It has the potential to become a favorite urban predator hunting gun; compact, powerful, accurate. And lots of shots!

The Conquest has a 400 cc air bottle in the forestock while the Speed utilizes a conventional air reservoir. The electrical mechanical action is the same in all three guns and the valve is the same as that used in the Rainstorms family. The result is a unique group of guns that resonates with airgun hunters.
Airgun Development in Turkey

Some very nice shotguns have been coming out of Turkey for quite awhile now, I’ve had a chance to do some wingshooting with a few and have been impressed with the quality and value. Some of the early spring piston airguns I had a chance to look over at the Shot Show in earlier years did not impress me as much. All the guns I looked at were budget priced springers that did not impress as being particularly well made. But then a couple changes came along.

First, the well respected airgun maker (and firearms for that matter) Webley Scott could no longer keep their doors open in the face of difficult financial times and an aggressively anti shooting environment in the UK. They sold all of the equipment used to manufacture their airguns to a consortium based in Ankara (Turkey). One of the first guns they produced was the Webley Patriot, which is one of the most

Airguns from Hatsan in Turkey include the Torpedo under barrel, the MOD 95 SAS break barrel (springers), and their new PCP the AT44W-10. In my books this is one of the most underrated PCPs on the market. It is a dead accurate, powerful multi-shot hunting gun. It mounts and points well, the trigger is made of a synthetic material (not my favorite) but it functions well. My only dislike is that the gun is loud, though it comes with a threaded barrel and with a moderator quiets right down.
powerful spring piston airguns made. Mine was a very high quality and high performance gun that I shoot to this day, but then they ran into production and quality control issues. I shot a string of these guns, and found such a high percentage of lemons that I withdrew my favorable review contingent on them getting it right. As I was about to give up on Turkish guns, I was sent a Hammerli Falcon in .25, a spring piston airgun imported by UmarexUSA manufactured as an OEM product out of Turkey. This gun performed well, was nicely made and stocked in a synthetic camo stock, and provided good value for money. I bought a second one off the shelf in .22, and have used both guns extensively for small game and pest control shooting.

The next experience I had was at a Shot Show when I had the opportunity to visit Umarex and Hatsan and look at not only their springers, but a new family of PCP hunting rifles. These guns had some resemblance to the old Webley Raiders, but some key differences as well. There was a single shot, but they also had a 10 shoot rotary magazine version unlike the Raider I shot which used a 2 shot shuttle magazine. I’ve had a total of four of these rifles to date, all in .22, and have used them for quite a bit of rabbit and squirrel hunting with good results. I’ve found these guns to be accurate, powerful, easy to shoot, and reliable. On the other side, they are a bit heavy and a bit loud, but neither of these would cause me much concern if picking a hunting rifle. They are priced very attractively, and in my opinion a lot of gun for what you pay.

I have spent a good deal of my life living out of the USA, and have an open mind about products from various parts of the world. I think that countries such as Turkey, China, or Mexico can produce good quality products. However, products from these countries often compete to a large degree on pricing, and the quality of materials and construction can suffer. I would not hesitate to buy a Turkish gun, but it is prudent to buy from a distributor that is established and will stand behind the product. This will allow you to deal on a local basis if the gun arrives not working perfectly or develops problems along the way. I have to say that with a couple Falcons, a Patriot, a couple Hailstorms and a couple Pneumas in my collection and receiving frequent use, I’ve had positive experience to date.
Ammunition and Ballistics
Deciding what pellet to use is as important as selecting the gun you will shoot them with. Very often shooters spend a lot of time thinking about the caliber of the gun they will shoot and how much power it will generate, but are not very selective and don’t give a great deal of thought to the style or weight of the pellet they will use. This is unfortunate, because as ethical sportsman we should do everything possible to ensure we hit our target in the right place, and deliver adequate terminal performance to kill it cleanly. Following is a brief look at several of the variables related to pellet selection. I should also include a disclaimer here that much of my personal opinion creeps through. Take it or leave it, my experience has colored my views on this topic more than most.

Anatomy of a Pellet
Historically, the most commonly used pellets are called Diabolos which are lead pellets with a waist that is constricted. The purpose of the waist is to reduce friction and to provide a thin skirt which can expand to form an air seal and easily engage the rifling, even in bores with some manufacturing variation. As mentioned, the advantage using the diabolo design is that there is a limited area of friction between the rifling and expanding skirt. The thickness of the skirt is important, as if it is too thick the blast of will not expand the skirt which in turn engages the rifling. Some manufacturers design serrations into the flared skirt to facilitate its expansion and engagement of the rifling. Diabolo pellets usually are further classified by their head shape as this has the most profound effect on their performance in flight and at point of impact. The shape of the middle area or waist of diabolo pellets also can have an effect on their ballistic efficiency. In general, it seems better to have the waist near the center of the pellet than near the head. A waist near the head results in a very sharp undercut behind the head which may produce greater turbulence, and thus drag, than the gentle slope of the surface behind the head on other pellets. One disadvantage, or advantage depending how you look at it, is that airflow over a diabolo pellets waist is less efficient than a bullet type design and this is
especially noted at higher velocities. This is the reason you don’t see diabolo shaped bullets for firearms. Diabolo pellets slow down more rapidly which is a disadvantage if shooting at longer distances; however this same effect is an advantage in that it helps to limit the range.

**Pellet Materials**

The traditional metal used in the manufacture of pellets is lead; it offers several advantages such as being inexpensive (though this is changing), heavy, malleable, easily cast, and readily available. The majority of pellets manufactured are either lead, or a lead/alloy mixture. However, there is a growing trend in certain parts of the world such as the UK/Europe (and recently parts of the US) to restrict the use of lead, and a great deal of experimentation is being done to find substitutes that give the aerodynamic performance required. I had shot some of the early examples of lead free pellets, and to say I was not impressed is an understatement. However, after shooting some of the current efforts of companies such as Predator International, Gamo, and H&N, hold out hope that we will see a generation of high performance non-lead pellets coming to market. I’ve had the opportunity to shoot several pellets manufactured from these companies, composed of tin, tin/alloy, lead/alloy, and various other materials. The performance of some of these was very promising, and I look forward to a range of non lead pellets coming to market. As mentioned, this could become important on our side of the pond as well, as there has been an endplay by some anti-hunting groups in the States to attempt end hunting by outlawing the use of lead projectiles on public lands.

**Selecting the Best Pellet**

Different airguns / pellet combinations yield different results. The only way to find which pellet is right for your gun is trial and error. Shoot several different types of pellets through it and see which one shoots the best. Competitive target shooters usually use wadcutter pellets, as they punch clean holes on paper. Field Target shooters and hunters use domed pellets because they deliver a lot of weight, tend to be very accurate, and offer good penetration. Some hunters prefer to use
pointed or hollow point pellets, however outside of a couple situations I’ve never had particularly good experience with them. Many dealers will offer sampler packs with a variety of pellet styles that allow the airgunner to try many at a low price. If you shoot a lot, like I do, it makes sense to buy tins of everything available so you always have examples to test. The great thing about airguns is that the cost of ammo is low; even premium brand pellets will only

Roundnose (A) and pointed (B) styles. The roundnose pellets provide the best all around performance in most guns. Boatail pellets (C) are a prototype made for high powered rifles. The Polymag (D) bonds a polymer tip to a hollowpoint and results in good penetration, expansion, accuracy, and impressive terminal performance. The PBA (E) is a super light super hard alloy, that penetrates well, but has accuracy issues in many guns at longer ranges. There are other non lead projectiles such as this tin allow wadcutter (F) that work well in some guns.
cost pennies apiece. I always smile when I hear somebody state they like .177 more than .22 because the cost of ammo is less. When I have paid hundreds of dollars for a gun, I don't really care if a tin of 250 – 500 pellets costs $5 - $10, it's still cheap!

A more reasonable concern than cost in my opinion is availability. One can find .177 and .22 pellets almost anywhere, from sporting good stores to the local Megamart. The .20 and even more so the .25, can be difficult to locate if you don't have access to an airgun specific shop, which most of us don't. I buy my pellets over the internet and find that I have a wider selection available to me and can purchase them at a better price. At any of the online shops you will find pellets made or distributed by RWS, Beeman, Predator, Logun, Crosman, Field Trophy, Eu Jin, Gamo, JSB, Bisely, H&N (one of my favorites), and a host of others in a multitude of styles and weights.

Deciding what pellet weight to use depends on what you plan to use the pellet for; hunting, plinking or competitive target shooting, and what gun your going to shoot it from. The velocity of the airgun you shoot is relevant when deciding on pellet weight as lower power airguns may perform better with a lighter pellet so that a higher velocity and improved downrange trajectory is obtained. The downside is that with a lighter pellet you will have to deal with a more pronounced influence of wind drift and it will shed velocity more rapidly. Heavier pellets will lessen the wind effect but are not as flat shooting at longer ranges than a light pellet with the same gun. Another factor is energy retention. A light pellet doesn’t retain as much energy as a heavy pellet at the same distance and same velocity. For hunting and pest control the energy delivered to the target makes a big difference in the knock down power and the ability to make clean kills. Besides the fact that airguns vary in the way they handle different pellet types, the accuracy of pellets can vary from batch -to-batch. For this reason one should find a pellet that works and buy them in quantity.

Shooting through the same gun, a light pellet will accelerate more rapidly than a heavy one and leave the gun barrel at high speed reducing the time it is in the barrel and theoretically mitigate the effects of an unsteady hold. The light pellet's time-to-target is also shortest so
gravity has less time to work on it and the trajectory is flatter. The speed of a heavier pellet is lower in the same airgun versus a lighter pellet and conversely, due to its slower speed it will take a longer time to get to the target. There will be more drop at greater distances. The drop of the pellet has nothing to do with its mass or weight—all pellets are pulled down by gravity at the same rate. The only thing that affects the trajectory is how much time gravity has to do the pulling. A lightweight pellet traveling as slowly as a heavy weight would have an equally bowed trajectory. If we take this theoretical discussion and see how it applies to the real world, we will also see that things are a bit more complex. As an example, I will tell you about an experience I had shooting two pellets out of a .177 spring piston air rifle I was testing. Using Gamo’s Raptor pellet (a 5 grain hard alloy) the velocity I was getting at the muzzle was approximately 1200 fps, while at thirty yards it had dropped to 650 fps. Shooting an RWS pellet that weighed 11 grains the gun generated velocities just under 1000 fps at the muzzle, which had dropped to 850 fps at forty yards. So the velocity at forty yards was higher with the heavy pellet and therefore delivered higher energy on target. But the real story was accuracy at forty yards; there was only a slight difference in groups at ten yards, with the delta becoming more apparent at twenty yards. But at forty yards the heavy pellet was delivering consistent ¾” groups while the Raptor looked like a scattergun pattern. The message here is that type of pellet, like the gun you select, has more involved than achieving the highest velocity. Match your pellet to your intended use; don’t make muzzle velocity the overriding factor unless you intend to shoot most of your targets ten inches from the muzzle of your gun!

Selecting a Caliber

There is not a clear answer to the question of what airgun caliber is best. A lot has to do with personal preference and what you plan to use the airgun for; casual plinking, competitive target shooting, or hunting. The majority of target shooters and plinkers opt for the .177 caliber while a lot of hunters select .20 or .22 for pest control and hunting. And for bigger game the use of bigger calibers like .25 are available. In fact, there are several much larger
calibers used in some custom airguns (and a few production models) that can be used for deer sized game. These include the 9mm used in the Career and DAQ guns, and the .308, .457, .475 and .50 caliber DAQ guns. As I have mentioned, I like the .177 for its shooting characteristics in springers and I find the killing power acceptable for the game I hunt. Many would argue (and correctly so) that the larger calibers retain downrange energy better so they impart more energy onto the target. But one may be more consistent with shot placement using the flatter shooting .177, and in hunting applications accuracy is at least as important as power.

By far the largest number of airguns are sold in .177 caliber, and this is the pellet size of choice for nearly all target shooting, plinking and for some hunters out for small game. The .177 caliber offers the highest velocity and results in the flattest trajectory. The .20 caliber is a good compromise between the trajectory of a .177 and the killing power of the .22. The 5mm (.20) trajectory remains nearly as flat, but its heavier weight lets it impart more energy on the target at a given velocity. This is a great all around caliber. The .22 caliber has a large gain in pellet weight and requires a magnum hunting rifle to realize the calibers full potential. I have several guns in .177, .20, .22, and .25 calibers residing in my springer collection, and find that I tend to jump between the .177 and .25. When I want something in between I often go with the .20 caliber, however I’ve heard it said that if you can only afford one rifle the .22 would be the best selection. Luckily I don’t have to make that decision. Of the standard calibers, the .25 is unbeatable in carrying the most knock-down force to the target because of its maximal pellet weight and resulting shock value. It is the perfect round for crows, tough to kill ground squirrels and the right caliber in magnum air rifles for some larger animals such as fox, opossum, raccoons, feral cats, and I even took a smallish coyote on one occasion. In a springer a big, heavy gun such as the Webley Patriot is required, which is an important factor if you are going to be hiking all day. It makes a lasting impression on a jackrabbit for sure, but there is no way I am going to carry this gun on a ten mile hike through the Mojave Desert in 104 degree heat. Not when I have a carbine Like the Beeman C1 in .177 that is lightweight, powerful, flat shooting, and dead accurate.
External Ballistics, A Quick Primer
I don’t think a full blown discourse on pellet ballistics is necessary for most airgun hunters; however a basic understanding of the variables that effects how well a given pellet performs under hunting conditions will allow the right projectile to be selected for a given application. The external ballistics of a pellets flight from the muzzle to the point of impact can be determined by several formulae, the simplest of which is:

**Kinetic Energy (KE) = 1/2 MV^2**

Velocity (V) is usually given in feet/second (fps) and mass (M) is given in pounds, derived from the weight (W) of the bullet in grains, divided by 7000 grains per pound times the acceleration of gravity (32 ft/sec) so that:

**Kinetic Energy (KE) = (WV)^2 / (450,435) ft/lb**

This is the pellet’s energy as it leaves the muzzle which is a handy means of comparing airgun performance but is not as meaningful when determining how it will function under field conditions. The ballistic coefficient (BC) will determine the amount of kinetic energy delivered to the target as air resistance is encountered.

**Ballistic coefficient (BC) = SD / I**

SD is the sectional density of the pellet, and I is the term that incorporates the form factor for the projectiles shape. Sectional density is calculated from the pellet mass (M) divided by the square of its diameter. The form factor value I decreases as the pellet becomes more pointed, a sphere would have the highest I value.

Forward motion of the pellet is also affected by drag (D), which is calculated as:

**Drag (D) = f(v/a)k&pd^2v^2**
f(v/a) is a coefficient related to the ratio of the velocity of the pellet to the velocity of sound in the medium through which it travels. k is a constant for the shape of the pellet and $\gamma$ is a constant for yaw (deviation from linear flight). $p$ is the density of the medium (tissue density is >800 times that of air), d is the diameter (caliber) of the bullet, and v the velocity. This means that greater velocity, larger caliber, or denser tissue gives more drag. The degree to which a pellet is slowed by drag is called retardation ($r$) given by the formula:

$$r = \frac{D}{M}$$

Since drag (D) is a function of velocity, it can be seen that for a pellet of a given mass (M), the greater the velocity, the greater the retardation. Drag is also influenced by pellet spin. The faster the spin, the less likely a projectile will "yaw" or turn sideways and tumble. Thus, increasing the twist of the rifling from 1 in 7 will impart greater spin than the typical 1 in 12 spiral (one turn in 12 inches of barrel). Pellets do not actually follow a straight line to the target. Rotational forces are in effect that keep the pellet off a straight axis of flight.

**Drill Down on the Ballistic Coefficient**

The Coefficient of Drag (C.D.) for a projectile is an aerodynamic factor that relates air drag to air density, cross-sectional area, velocity and mass. One way to view C.D. is as the "generic indicator" of drag for any pellet of the same shape. Sectional Density (weight multiplied by its frontal area) can then be used to relate the drag coefficient to different bullet sizes.

**Sectional Density = (Wt. in Grains/7,000) / (Dia.* Dia.)**

You can see from the formula that a 1 inch diameter, 1 pound bullet (7,000 gr.) would produce a sectional density of 1. Indeed the standard projectile for all drag functions always weighs 1 pound with a 1 inch diameter.
Ballistic Coefficients are then the ratio of velocity retardation due to air drag (or C.D.) for a particular projectile to that of its larger 'G' Model standard reference projectile. To relate the size of the pellet to that of the standard projectile we simply divide the bullet's sectional density by it's form factor.

**Ballistic Coefficient = (Projectile Sectional Density) / (Bullet Form Factor)**

Determining the ballistic coefficient accurately is key to getting good data from most exterior ballistics software. An optimized airgun ballistics program should be able to use two velocities and the distance between them to calculate an exact ballistic coefficient for any of the common drag models. This method of calculating a B.C. is most common and can be used to duplicate published velocity tables for a pellet when the coefficient is unknown or to more accurately model trajectories from your own airgun. If the ballistic software does not allow you to select various drag functions it will not be able to calculate B.C.'s or generates an accurate long range trajectory for all pellets.

**Ballistics Programs**

The ballistics program most frequently used by airgunners is a shareware program called Chairgun2. This program allows you to input variables such as muzzle velocity, the pellets ballistic coefficient, scope height and zero distance, as well as environmental factors such as temperature and altitude, that are then used to plot a graph with the pellets trajectory. It can be used to compare the theoretical performance of various pellets. This program is free, it is fully comprehensive, has a good user interface, and a key advantage is that it can be used with any type of scope.

Another program recently released to market is the Ballistic Reticle Calculator (BRC) application from Hawke optics, manufacturer of an excellent line of airgun scopes. This program is directly tied into their Map and SR reticles and was developed with the input of Field Target
guru Nick Jenkinson. The application does several of the same functions as Chairgun, but there are some key differences as well. First, this program is specifically calibrated for use with the crosshair configuration of their scope reticules. When inputting the variables into this program it is necessary to define the scope being used. The output will be a chart that fits into the scope cover and list the range at each aiming point.

The second difference is that the BRC program does not use the ballistic coefficient of a pellet that relates to the projectiles cross sectional density, but rather addresses this term with the Effective Deterioration (ED) value. The ED is calculated by observing the decrease in velocity over a pellets flight at two known distances using two chronographs. There is a utility included in BRC that performs this calculation. I am not a ballistics expert and am therefore not the right person to lead a debate on the advantages and disadvantages between the BC or ED approach, however I can say from considerable experience that the results of using the ED coupled with the Hawke scopes works consistently well.
Pellet Stability
Many airgunner ask for, and therefore many airgun manufacturers try to deliver, airguns that produce ever higher velocities without a detailed exploration of the effects on stability, accuracy and energy retention. There are ultralight alloy pellets that give a substantial boost in velocity out of a given gun, but the accuracy tends to be inferior, the velocity sheds quickly, and the overall performance disappointing at longer ranges .... it is fast, but at what cost and for what purpose?

It is possible, even with less powerful springers to reach supersonic velocities if a light enough pellet is used. But the question is do you want to? Most pellets are designed for optimal performance at subsonic velocity and can become unstable at higher velocities. With most pellet designs there is a lot of dead space around the waist and inside the pellet which compromises the balance of the projectile. And the more unbalanced the projectile, the more it will wobble. A certain amount of wobble is inherent with virtually all pellet designs, but the greater the wobble the less the stability and greater the inaccuracy. This effect is exacerbated if there are any irregularities on the head of the pellet. This is conjecture on my part, but I think this is part of the accuracy problem with pointed pellets. Even when they get the production nailed down, these pellets are often damaged in packing. I also think this might explain why polymer tipped pellets don’t seem to suffer the same poor accuracy, as the tips are more robust.

But even if the pellet is designed more as a bullet than a typical diabolo pellet, the transition from super-sonic to sub-sonic velocity disturbs the flight of the projectile as it passes back through its own shock wave. Unless the projectile remains in a supersonic state up to the point of impact, I think it is better to keep the pellet subsonic at all times to circumvent this transitional disturbance. For this reason it can be argued that the optimal velocity for an airgun is no more than 1050 – 1100 feet per second. If the airgun you are shooting is generating over 1100 fps, my suggestion would be to find a heavier pellet; this will generate more power, conserve more energy down range, and be more stable than a lighter supersonic pellet.
Air Resistance
As the pellet travels down range air resistance comes into play. The effect of air resistance is non-linear; double the speed and air resistance increases eight times. This means fast pellets lose energy more rapidly than slower pellets. In fact, fast, light pellets lose energy so rapidly, after 35 yards or so they can be traveling slower than heavy pellets with a lower muzzle velocity. This is the reason I don’t use light pellets when long-range shots are expected. As an experiment, I took two roundnose pellets of different weights; one was 5 grains and one was 11 grains. I shot both using the same platform, a Gamo CFX. I shot at an indoor range measuring the velocity at the muzzle, twenty five yards, and fifty yards. The lighter pellet yielded average velocities of 1250 fps, 1000 fps, and 675 fps. The heavier pellet yielded velocities of 1000 fps, 900 fps, and 775 fps. This means that if one is looking for a hunting round capable of delivering maximum energy on target, the heavier pellet makes more sense because at typical hunting ranges it will be traveling at a higher velocity regardless of the muzzle velocity.

Accuracy
Assuming that the power plant being used in a particular airgun generates consistent power and always exerts the same force on a pellet, the accuracy of a pellet’s trajectory is affected by various factors which will be explained later in this text. I have used the data published by the Beeman Company and have included some direct quotes from that document. As the pellet is propelled down the barrel it is constrained from going anywhere but straight forward. As the pellet leaves the barrel it is desirable that the barrel lip (or "crown") always presents a concentric surface to the spinning tail of the pellet. Ideally, the barrel loses contact with the entire circumference of the tail of the pellet at the same instant, so that the pellet is not tipped one way or the other. Tipping the pellet imparts a wobble, increasing the cross-sectional area through the air. The result is to effectively increase the pellets surface area, increasing air resistance. This causes the pellet to slow down more quickly than if it had pierced the air perfectly head-on. Manufacturers of quality air guns pay special attention to the crown of
the barrel to assure a uniform grip on the pellet as it exits the barrel. When traveling or in the field with an airgun, the hunter needs to protect the muzzle of their rifle barrel.

Spinning is what keeps a pellet from tumbling, and keeps it facing directly forward as it bores through the air. If a pellet is unbalanced as it spins, the centrifugal wobble will cause the pellet to veer off course as it leaves the barrel. The direction that the pellet veers off course will vary with every shot depending on which direction the excessive mass of the pellet is pointing at the instant it is released from the barrel.

Sub-sonic airgun pellets are less deflected by wind the slower they go. This is due to the higher weight of the slower pellet when shot out of the same airgun. For any airgun, a pellet with a higher "ballistic coefficient" will be less deflected by wind. Generally, heavy pellets have a higher ballistic coefficient than lighter ones.

If an airgun exhibits variance in force produced from shot to shot, even excellent pellets will not be accurate out of that gun. Average quality pellets can have a weight differential of up to a few percent in any one tin. When both pellets and air rifle vary randomly, you will find yourself hitting the target perfectly (on some shots) and missing it completely on others. This is of course, unacceptable for hunting applications where precision is required on every shot so as not to cause injury or needless suffering to the quarry.

I keep a notebook on my guns and have tested a variety of pellets through each, shooting from a rest. I make note of the results, and when I receive a new batch of pellets I pull out all of my guns and add those to my results. I use the best quality pellets available for the gun I will be shooting for hunting and pest control. As I have said several times in this book, ethical hunting conduct mandates that the hunter does everything possible to achieve the best accuracy / power combination to ensure clean kills. Even if you’re on a budget, use high quality pellets when hunting. The cost per shot is pretty low, and if you’re hunting rabbits a single tin of pellets would last a long time. Pellets come in many sizes, even for a specific caliber, and in the extreme case a pellet can have such a loose fit that it falls through the barrel. If the pellets are too small they will bounce around in the barrel.
exiting the muzzle at different angles on every shot, which wrecks havoc on accuracy. Conversely, if the pellet is too large for the barrel it requires that it be forced into place when loading. When this occurs, the head of the pellet can be deformed which negatively impacts its aerodynamic characteristics. This is the reason why premium pellet manufacturers go to great lengths to insure narrow production tolerances and consistent dimensions. Many serious target shooters actually go so far as to use a tool to size their pellets, though I must admit that I've never gone to this extent. Some guns have a slightly over sized breech which facilitates quicker and easier loading, though may allow some blow by which reduces the efficiency and velocity generated, but usually to a relatively small degree. Many of today’s guns have a choked barrel, which is a slight constriction at the muzzle of the barrel. This forces the skirt of the pellet to engage the rifling very closely as it is propelled out the barrel improving accuracy. Most skirted pellets will work in either choked or unchoked barrels as the malleable skirt will expand or compress to accommodate either configuration. However, solid bullet style projectiles may have to be purpose designed specifically for either a choked or unchoked barrel.

Three types of round nose pellets and a Crow Magnum hollow point. (second from left). As you’ll pick up reading this book, I have a strong preference for roundnose pellets for general hunting applications. The Crosman Premier, JSB Exact, and Eun Jin Heavy are all excellent pellets that work well in many of my guns.
When all is said and done, what really matters is how the gun performs in the field. And the way you do that is to take it hunting! But before I go out I’ll shoot groups to get an idea of the intrinsic accuracy and put several pellets over the chrony to find which pellet works best….. At least on paper. From my preparation work I had a pretty good idea that this Beeman Falcon was going to be a hammer in the squirrel woods, and due to the excellent accuracy and power produced when coupled with the Kodiak Extra Heavy pellets had a set up that I trusted on the first trip (and it lived up to that promise in the field)!

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Pellet Sizing

Twenty or thirty years ago the conventional wisdom was that you had to size your pellets to wring the best accuracy out of your guns. This was because the manufacturing process of the time did not produce the same uniform pellet as is achieved today. There are some brands of pellets that still have consistency problems and I think these can be improved by sizing. Using a pellet sizer provides a bit more uniformity, and when the size is matched to your airgun, they can reduce your groups a bit. However I don’t believe that this improvement is important in the context of a hunting gun and think simply buying better pellets makes sense. Almost all high-quality adult airguns these days have choked muzzles, which squeezes the pellet down at the muzzle by one-half of a thousandth of an inch or so. This effectively sizes all the pellets which make the preliminary sizing operation redundant.

Pellet Seater

A pellet seater is simply a plastic or metal instrument that has a ball on the end of a spike a few inches in length. This is used after the pellet has been pressed in to the breach by hand. The ball is used to push the pellets skirt into the rifling. In most cases, the use of this device to push the pellet deeper into the rifling results in a better air-seal between the pellets skirt improving the
consistency and accuracy yielded by their guns. This can also result in a slight bump in the power output of the gun, which to North American shooters is of little relevance, but to shooters in other countries can be the difference between the legal or illegal power output. The seater I use is a little plastic gizmo that I picked up attached as a free give-away to an airgun magazine I bought while on a business trip to the UK, however it is easy to make one or use something like a plastic swizzle stick. Obviously, a seater only works with a single shot gun, and the loading port design of even some single shots will preclude the use of the seater. The net improvement may be outweighed by the extra step in loading when in the field hunting. It is worth a try in your favorite hunting gun so you can make an informed decision as to if you want to use one or not. I don’t use the seater when hunting, however I will use it in some guns when bench testing to wring the best accuracy possible.

Another bit of kit I find useful when it comes to pellets, especially when in the field, is a holder of some type. The three approaches are simply a container, a holder that accepts individual pellets, or a holster for an entire tin to slip into. I use all three under certain conditions, often finding one that addresses a specific need. The first is a container that hold a number of pellets independent of caliber and allows easy access, next is a pad that pellets are pushed into and can be mounted on the rifle stock or strapped to the shooters arm. These are especially useful for single shot guns. The third is a holster that accepts a tin of pellets and keeps the lid from flipping off. I like this when I have a multi-shot gun that won’t require reloading between shots, and even more so I am switching guns, it’s an easy matter to switch out tins at the same time.
Selection of the Hunting Pellet

Pellets for Hunting
There are five commonly available types of air rifle ammunition offered for sale in the American market. These are round nose, flat heat, pointed, hollow point and solid ammunition. I don’t think there is a “perfect pellet” for all applications. When I am in the field I carry my pellets in a small plastic box which is divided into several compartments. These compartments contain pellets of various weights and types which I try to match to the game and the gun. Following is a discussion of pellets in a hunting / pest control context.

Round Nose
Round heads are frequently selected projectiles intended to be used for small game hunting and pest control. This design can be obtained in any of the standard calibers, and they are effective in all these calibers. It has been noted that in .177 caliber, the lighter of these pellets can pass through an animal at close range with minimal distortion, and is called “ice picking”, but will still cause a quick and clean kill if a vital organ is hit. This is especially true if an animal is hit at very close range or at a very high velocity, and in this case even a hollowpoint will not deform as well as one might hope. This pellet style is a good choice for hunting regardless of caliber, offering a good balance of penetration, opening a large wound channel, and knock down power.

I think one of the reasons these pellets provide such good accuracy out of so many guns is that the diabolo pellet with a round nose is a ballistically efficient design at subsonic velocities. The airflow over the head of the pellets streams somewhat smoothly back over the waist and skirts without developing excessive turbulence that would disrupt or interfere with the pellets flight.

I have used this style of pellet on every type of game I hunt; from rabbit and squirrels at the small game/close range end of the spectrum to prairie dog and ground hog at long range end. And find them to function very well even when taking larger quarry such as raccoon, nutria, and woodchucks. While other designs might have a slight edge for specific applications, I think that if one were to select a single all around pellet, it would have to be a round nose diabolo.
Flat Head
Flat head pellets are also known as wadcutters, as they leave neat circular holes in paper targets. They are pretty good hunting ammunition when over penetration is an issue; fast, accurate and hard hitting. The ballistic coefficient of this design is not very high, and the pellets shed velocity, and therefore energy, quickly. The flat head causes high deformation on impact, passing all the pellets' kinetic energy into the target zone, these pellets can kill quickly when used at closer ranges. The slight effects of higher air resistance on accuracy due to the flat head are not important at close range, but do become noticeable at 25 yards and beyond. I use these pellets on lighter bodied quarry out to 20 yards or so when shooting around equipment or buildings where a pass through may cause damage and leave me holding a repair bill. This pellet design is not one that I'd use for a majority of my hunting applications, but if you need accuracy with limited penetration on light bodied quarry at close range they may be just what you're looking for.

Pointed
Pointed pellets are also called hunting or field pellets, but I don't think they should be used for this purpose in most situations and with most guns. Firstly, the shape of the head makes it difficult to achieve uniform pellet size in production, so this type of pellet is not particularly accurate. Secondly, I have noted that the pointed tips of these pellet can sometimes be deformed due to packing in the tin, which negatively impacts accuracy. And finally, these pellets can often over penetrate, especially smaller bodied quarry and especially in the .177 caliber. Even in .22 caliber, these pellets tend to drill right through the target, only causing death if a vital organ is cleanly hit. Shoot a rabbit in the chest using a magnum powered .177 with a pointed pellet, and if you miss all internal organs, the pellet passes straight through and the rabbit lives at least for a while and in pain. This is the previously described “ice picking” effect, and is generally not a positive characteristic. Shoot it in the same place with a roundnose or hollow point, and a more efficient energy delivery will result in a clean kill. On the other hand, this
penetration can be desirable when shooting a thick skin quarry (so long as accuracy is good), such as a chest shot on a marmot. One place this conventional wisdom does not hold up in my experience is with .25 pellets, I have a couple of guns in this caliber that absolutely love the 27 grain pointed Field Trophy pellets. This pellet is pretty accurate in my DAQs and Infinity rifles that I use on larger game such as woodchuck and raccoon. Again, the take away message is match the gun to the pellet and the pellet to the game.

**Hollow Point**

These are similar to flat heads but they have a cavity with a "lip" added around the edge. First let’s state that all hollowpoints are not created equal, some expand fairly well while others hardly distort. The effectiveness is also related to the caliber and the velocity at which the pellets are traveling. In the best scenario, the hollowpoint causes maximum distortion on impact. With optimal results, the head can increase in size while retaining weight. I use these pellets when I want to maximize killing power while minimizing penetration. I sometimes use hollow point when the shots are less than thirty yards and the game is light bodied and thin skinned. I find them to be almost as accurate as round nose pellets in some of my guns, and invariably much more accurate than pointed pellets. They have great knockdown power on smaller quarry when shot at closer range. However, I have had less good results using hollowpoints at distances over thirty yards on most small game.

There are several good hollowpoints available on the market, but two that I am particularly fond of are the Beeman Crow Magnum and the Predator Hollowpoint. The Crow Magnum hollow point pellet is a good projectile that expands well in high powered guns. When testing, I found that shooting these pellets (.22) into putty at 25 yards at velocities between 800 to 1000 fps yielded excellent expansion, yet penetration was still pretty good usually reaching to about 60% of the depth obtained with roundnose pellets. The accuracy of this pellet out of many of my guns is acceptable; and based on accuracy, expansion, and penetration is a viable load for many pest control applications.
The Predator Hollowpoint is a newer pellet on the market and is manufactured by JSB. The pellet design has been tweaked and improved and in my experience is deadly with larger game out to 50 yards.

**Predator Polymag Pellets**

The predator pellet by JSB is a purpose built hunting round. It is a hollowpoint with a polymer point integrated into the hollowpoint cavity. This point facilitates penetration, after which the point disintegrates allowing the hollowpoint to mushroom, which generates penetration through the skin and flesh, while producing a large wound channel. My primary concern with these pellets was accuracy, but found in the right gun at the right velocity the pellets grouped fairly tightly. The design criterion for the pellets was to achieve excellent flight characteristics. I have found while testing these pellets that they seem to work better in the mid power ranges. When shot at very high power settings they destabilized. Two or three pellets might cloverleaf and then the next might produce a flier, but can be rectified by dialing back the power with guns having an adjustable power output.

My first field experience with this pellet design was on a jackrabbit hunt while in Las Vegas for the Shot Show. As mentioned in the article written about that hunt, I had some accuracy problems through the Sumatra Carbine at high power settings, but when I dialed down found the accuracy very good. I have tried these pellets out of a many other guns, and in both springers and pcp's can report favorable results. The .177 polymags in my Beeman C1 are a devastating combination in a mid powered gun, giving great accuracy with much improved penetration and overall terminal performance. In another round of testing I used the Talon SS. The guys on the Talon forum had told me that they had good results using these pellets so it seemed like a good place to start.

To take a look at the terminal performance I set up a test model that consisted of a 4" diameter PVC piping that was 8" long and tightly packed with plumber's putty. Shooting from a rest in my basement
range at 20 yards I shot three groups of the Predator Hunting Pellet, Predator Hollowpoint, Beeman Crow Magnums, and Beeman Kodiak at a power setting of Five (5) on the Talon. Then I dialed the power up to ten (10) and repeated the group. I shot the Kodiak for a comparison of the hollowpoints to a roundnose pellet. The findings were interesting; with a power setting of five (5) the Predator polymer and the Hollowpoint both penetrated less than the Crow magnum, and all of the hollowpoints far less than the Kodiak which was to be expected. But the wound channel opened with the Predator polymer was substantially larger than any of the other pellets.

At the higher power setting the pellet penetrated further, but the wound channel actually decreased. I am not sure of the underlying mechanism for this occurrence, but did note that the hollowpoint all seemed to expand equally at the two power settings. It also seems to me that the net gain in penetration is obtained at a loss of the diameter of the wound channel. The predator polymer tip separated and was found in a small side chamber of the primary cavity at about the halfway point at both power settings, yet was intact at the lower setting and broken into two pieces at the high power settings.

I mentioned that the effect on jackrabbits was striking; 35 yard headshots on rabbits were explosive. It is anecdotal, but I have shot many jackrabbits over the years and these were probably the most destructive hits ever. The pellet ended up on the offside just under the skin, mushroomed to a point it was almost inside out, but I was unable to find the polymer tip. Because the penetration was less than the Crow Magnum (and far less than roundnose pellets) I postulated this would be a good pest control pellet in sensitive areas. To test this hypothesis I took the rifle out and at a power setting of 5 took a few starlings. I reckoned that these light body birds would give me an idea of how the pellets performed with respect to penetration and expansion/knock down power on real quarry under the pest control conditions I planned to use them. I found again that the knock down power can only be termed as explosive. The birds went down hard to virtually any body shot, yet the pellet only exited on one out of seven birds shot.
Saboted Pellets
These pellets I used are manufactured in the Czech Republic, and imported by Skenko. They are lead free and contain no tin, and are fabricated with precision two piece construction. The plastic skirt, or sabot, is said to create a superior air seal and reduce friction in the barrel. These zinc and aluminum alloy pellets are environmentally friendly. They develop approximately 20% higher velocities than typical lead pellets and penetrate better than many pellets available on the market today. I had an opportunity to use these on a squirrel hunt on a farm where the owners did not want me using lead. I managed to take a couple of squirrels, but was unhappy with the performance. The pellets go supersonic and destabilize, which negatively impacts accuracy. I took these pellets back out with my 2240 pistols to hunt rabbits, figuring that this relatively low power gun would benefit from the kick in velocity. In my pistol at ranges out to 20 yards they were in fact, fairly accurate. I managed to bag a few rabbits on a friend’s farm during a depredation hunt. The pellets had good penetration and were accurate enough; however I saw little advantage unless lead could not be used.

Roundball
Most of us started our airgunning using steel BBs, and found that accuracy was so so to pretty good, but didn’t offer the performance of a good lead pellet. However, there are instances where lead roundball is a good option for a hunting projectile. This type of ammunition can out-penetrated diabolo pellets, and in my experience they can be as accurate as conventional pellets in many airguns. One reason to use roundball is a generally lower cost than bullets, another is ease of loading in muzzle loaders. In my Dragonslayer they are more accurate than the cast bullets typically recommended, and I’ve killed coyote at 75 yards with this combination. There is a pretty good selection of lead roundball from the black powder world. A couple of my Quackenbush big bores have a conversion kit to change the guns over to muzzle loaders for primitive weapons season, and roundball is the natural ammo selection as it is easy to load and performs well. I have taken coyote, deer, hogs, and
African antelope with these projectiles. Roundball is not the optimal projectile for every gun and for every application, but they are a viable choice when used for thick skinned or large bodied quarry where penetration is desired over a larger wound channel.

My Favorite Hunting Pellets

Every gun has a preference for the pellets it performs best with, but the pellets above have proven time and again to be great hunting ammo in most of my rifles. The JSB Exacts are probably the most all around accurate from the most guns, the Benjamin .25 Domed are outstanding in the Marauder, but work well in my other .25s as well, the Crosman Premiers in .177 and .22 are cost effective and are digested by almost every gun I’ve shot, the Exact Kings seem to be a preferred pellet in many of the European .25 caliber guns, the Polymags are the only ammo I shoot regularly that is not a domed pellet (in .177, .22 and .25), and the Baracudas (.177, .22 and .25) are not as universal, but the guns that like them like them best.
Lead Free Ammo

While lead is the most common material used for the manufacture of airgun pellets, it is not the only one. Gamo has developed several lead free pellets in their product line, that are primarily directed towards hunting applications. These pellets are made of proprietary alloy compounds and are significantly lighter than lead pellets. There are two characteristics of these pellets; they will give an increase of about 30% out of any given gun compared to lead, and they penetrate very well due to the hardness of the alloys used. Many gun manufacturers use these pellets so that they can demonstrate very high velocities out of their guns, which I don’t think is all that important but in the manufacturers defense it’s what buyers want to know.

What I like about these pellets is that they can up the killing power of less powerful, and smaller more compact spring piston guns. I have a B57(.177) takedown rifle that does about 565 fps which is on the light side for hunting. But with on of the hypervelocity alloy pellets this gun can reach out to 30 yards to anchor rabbits. The other thing I like about them is that in areas I don’t want to use lead, around farm feed lots for instance, they supply a lead free option that let’s me shoot. I have a couple farms that I hunt where they are very concerned about lead, and these pellets set the farmers (wife) mind at ease.

Gamo has been a leader in the development of lead free pellets with several to choose from.
A chronograph is an instrument used to measure the velocity of a pellet shot out of an airgun, and can be used at the muzzle or specific distances along the flight path to determine the velocity, which with the pellets weight can be used to calculate the pellets energy at that position. The measurement outputs you will need includes peak velocity, minimum velocity, average velocity, and standard deviation. The chronograph measures the time required for a pellet to travel over a certain distance, which is defined by a pair of light sensors that are mounted in series within the Chrony box. When a pellet passes between the skyscreen and sensor, they detect a decrease in the light caused by the pellet's shadow. The pellet passing over the first sensor starts the clock, the second stops it thereby defining the time required for the pellet to travel that distance. Velocity is then calculated by the integrated computer, and the velocity displayed on a LCD screen and/or printed out. There is an area of sensitivity formed between the skyscreens diffusers and the sensors which is the shape and size of the trapezoid formed by these components. Adequate light is required or the pellet will not be sensed. The chronograph is an item of gear that I’d suggest any serious.. or even semi-serious airgun hunter invest in. The two key reasons for the airgunner to use this instrument is that it a) allows the shooter to get a quantitative assessment of the energy produced from their guns using different projectiles, b) permits a guns performance to be monitored, and c) when shooting pcps allows the guns “sweet spot” to be determined.

When the hunter gets a new gun to use in the field, they may well wish to know how it compares to other guns; is it more powerful, less powerful, etc so they know what to expect in the field. They can determine if the gun needs to be tuned or serviced, this is especially true when purchasing a used gun. Even with a new gun you should keep in mind that the velocity ratings published are at best, generally achieved with the lightest pellet available without consideration of accuracy or terminal performance..

If you have a gun that has been shooting well and anchoring game, but you start to experience poor terminal performance in the field you can test the gun against its benchmark measurements to see if there is
a degradation caused by a component failure. Or it can be used to help evaluate the tradeoff of pellet weight and velocity when selecting the optimal projectile to use for hunting.

With respect to finding the guns sweet spot, many guns perform best within a specific pressure range. This range does not necessarily coincide with the maximum fill pressure, and as a matter of fact the velocities achieved with the maximum fill pressure may actually be significantly lower than velocities achieved at a lower fill pressure. This spot varies with individual guns, even if identical models are compared. There is no other means to optimize performance in a quantitative way. Basement range setup allows me to shoot 10 meters, and is where I go to sight in new guns. A laser bore sighter is used to get a general zero, then I dial in to hit dead on for initial testing. This puts the POI way high at 30 yards, so the first thing required when I move out to shoot at normal distances of 30 – 50 yards is to get the appropriate zero.

I’ve set up my chronograph to work indoors, allowing me to make quantitative measurements of various pellets at different fill pressures, even when my schedule is busy or the weather is bad. I’m often asked how I make time to do so much testing, well here’s the answer. I can shoot twenty different types of pellets before going out to shoot at distance, so a lot of the leg work can be done in advance. It is necessary to have a light source that approximates daylight. My rig uses a couple of overhead lights (with daylight bulbs) with a couple more spotlights aimed at the diffusers. It takes a little trial and error to get it right, then I taped the base of the lights, the chrony, and the rest in place to allow consistent measurements. I’ve used an old laptop I had lying around to load on the ballistics programs and spreadsheets used during testing. There are four high pressure tanks under the table giving access to refills as needed, and a cabinet next to the table with thousands of pellets of just about any description. I wouldn’t be able to keep up with the flow of guns without my basement range! While most full sized/full featured chronographs are not overly expensive, they are not cheap either. Prices for base models start around $150 and work up from there depending on the features and quality of build. However, there is a company called ComBro that has
My Pro Chronograph is very sensitive and very accurate. My only negative comment is that the lighting system I rigged for indoor use is somewhat temperamental.

There are also chronographs on the market that have integrated microprocessors and the option to use integrated lighting sources for indoor shooting. The next time I upgrade my equipment this is the configuration I’ll go for.
designed one specifically for airguns, and it sells for about $40. They can frequently be purchased online through eBay, or you can check the online airgun stores. This portable chrony is called the Combro CB625 Mk4 chronoscope. It weighs 55grms including the batteries and fits barrels from 12mm to 32mm in diameter, which covers the range of most airguns. The unit attaches to the barrel with a rubber band, not elegant but it works!. The position of the sensors and the tilt of the unit in relation ship to the barrel can be adjusted. The unit is compact, 150x49x23mm. It is advertised to deliver 1% accuracy, my experience is that it delivers results consistent with my full feature chrony.

To function, the pellet passes over two light sensors and the time between these two positions is used to calculate the velocity, as with standard chronographs. The ConBro can be adjusted for pellet weight, but otherwise what you see is what you get. The instrument can be set for Imperial or Metric units and in some versions (there are three) can be interfaced to a computer. It has an internal diagnostic which gives a readout on the screen to show all the options selected and any problems encountered. All equipment for computer compatibility can be bought from the company for a minimal price, and software is free.

I keep on of these in my shooting bag, it is not as ergonomic to use and is not the way to go for shooting long strings, but it is a very useful tool for a quick assessment of a guns performance.
Range Finders

The most important factor for harvesting/hunting small game with an air gun is shot placement. Long distance shooting is improved by the use of a scope and a range finder for the precise shot placement required for quick clean kills (head shots). Range estimation is especially important when using larger caliber airguns for big game hunting, because in these guns the flight trajectory of the pellet will be significantly arced. Most of use are pretty good at making gross observations of distance; is an object close or far away. However, telling whether an object such as a deer or hog is sitting thirty, forty, or fifty yards away is somewhat more difficult. If you hold the crosshairs on the animals shoulder at thirty yards you will hit him high in the lung, while with the same hold on the rabbit at fifty yards you will end up shooting under him. Because of the importance of ranging your shots accurately when hunting with an airgun, many hunters either use scopes with a AO correction and mil-dots or carry a laser range finder to be sure of distance, I prefer a range finder as it more accurate and easier to use.

Laser rangefinders work by sending out an invisible beam of infrared energy that will reflect off the object it's aimed at. A high-speed internal clock measures the time it takes the beam to return and calculates the distance based on that information. Since the propagation velocity of the transmitted signal is known, it is a relatively simple operation for the onboard computer to work out the distance. How well they work depends on the

Truth be told, if I'm still hunting trough the woods on a typical small game hunt, my range finder may not leave my pack all day. But if I'm out to do long range shooting on prairie dogs or woodchucks, it hang by a strap around my neck.
There are a lot of range finders available these days, priced from under a hundred to several hundred dollars. There are also range finding scope models, however these tend to cost more and are bulky. The budget priced hand held units have worked just fine for me.

reflective properties of the target, as well as environmental conditions. Color, surface finish, size, and shape of the target all affect performance. Highly reflective surfaces or colors are easier to "read," and a small target is harder to read than a large object. A target that is at a 90 degree angle to the laser is better than one more angled. Overcast days will provide longer-range readings than will bright sunlight.

Using a rangefinder effectively during your hunts will require a learning curve. If you simply carry it around in your pocket until you see a distant rabbit and then try to measure the range you will likely be disappointed in the results. The units will read off the hair of big-game animals, but it's not a great surface, and small game animals will not register. The work around is to pick a hard object close to the critter, such as a rock or a tree, and read from that. It's also a good idea to range several landmarks when you first reach your stand so you can reference them when an animal arrives, as there is not always time to recheck the distance. When squirrel hunting from a blind I'll measure out the distance between myself and nesting trees or food sources in the area, so I'm ready to play when the squirrels come out.
Binoculars and Spotting Scopes

Binoculars are one of the handiest and most widespread of all optical instruments. Virtually anyone who spends much time outdoors owns a pair of binoculars and I believe they are a necessity for hunters. I was on a hunt in South Africa and had brought a pair of good quality, but weak, clamshell binoculars that I use when hunting whitetail deer in the heavy Midwestern woods. It turned out (much to my surprise) that a great deal of our day was spent glassing the heavy brush and hillsides for game, and I was way under glassed. My professional hunter was seeing all types of game I could not pick up, which I wrote off to his exceptional knowledge of the environment, until he handed me his 10x50 glass and it was like somebody turned on the lights….. I saw game everywhere. I decided right then and there that I would not go out under glassed again.

I will pass along some of the things I learned which is intended to help the hunter who needs some basic information about binoculars. Perhaps the first thing to understand is that binoculars are essentially a couple of small telescopes mechanically linked together. All of the technical details needed to understand telescopes also relate to binoculars. Each side of a pair of binoculars has a prime focal length, an objective lens, an ocular (eyepiece), an exit pupil, and so forth.

Quality is the most important "feature" of binoculars, and as with scopes I would recommend that the hunter spends as much as he can afford to get the best product his budget will allow. A product that is well made of high quality components is "good," and it is always worth the extra money over low quality no-brand binoculars. Quality control costs the manufacturer (and you) money, but it is worth it because the result is a better performing pair of binoculars that can last for many hunts. This is especially true if you are going on the hunt of a lifetime to a foreign destination, a good set of binoculars can spell the difference between filling your bag or going home empty handed.

There are several factors which affect both the quality and the price of a pair of binoculars. These include optical considerations like the type of glass selected for binocular lenses and prisms, the design of the eyepieces, the size and type of prisms, care in grinding and polishing the glass elements, and the type and coverage of anti-reflection
coatings. Important mechanical considerations include the material the lens barrels themselves are made of, the construction of the lens barrels (one or two piece), the way the lenses and prisms are mounted and retained in place, the focusing mechanism, and the outside finish of the binoculars. In many cases the brand name is a guide to quality. Companies like Nikon, Pentax, Zeiss, Leica, and Swarovski, have a long history and a well earned reputation for high quality optical products. Other companies, like Bushnell, Burris, and Tasco have built a reputation on low price. You usually get what you pay for; still even if you are on a budget you can find binoculars that function fairly well, though they may not last as long.

For field applications a 4mm to 5mm exit pupil is usually satisfactory and something in the 6x30, 7x35, 8x30, or 9x35 range binoculars are probably the most useful compromise for hunting. They are bright enough to allow the observer to see into shadowed areas, or in dim light, and compact enough to not be an excessive burden to carry. Higher power binoculars are hard to hold steady without external support and objective lenses of 40mm or larger tend to make for heavy and bulky binoculars that are a burden to carry while hunting.

The woods hunter will be well served by a glass with a generous field of view, like a 6x30. The mountain hunter will probably favor higher power, since he will use them to spot game at greater distances. 8x30 or 9x35 binoculars will serve him well. A pair of the common 7x35 size binoculars is probably about as good for all-around field use as any. Whatever magnification best fits your needs, be sure to buy top quality binoculars and you will not be disappointed.

I carry my binoculars with a chest harness, which prevents them from swinging around while at the same time making them immediately accessible. I also find that this rig helps me stabilize the binoculars over prolonged glassing sessions. A spotting scope is another useful piece of kit when shooting long range. I especially like to use them when shooting prairie dogs or ground squirrels, where I'll be set up in a shooting position for a long time and will be taking a number of shots. A hunting buddy and I will take turns using the high magnification scope to call each others shots, allowing the shooter to make windage and
elevation adjustments as needed.

Although you can use a pair of high power binoculars such as 20x80 for many of the same tasks that a spotting scope will be used for, binoculars are fairly useless when you’re laying on the ground to view prairie dogs dashing around between burrows. Binoculars simply aren’t designed for the specific needs of the long range hunter and a spotting scope is generally a much better choice.

A spotting scope enables the shooter to view the target to determine where the last shot impacted. It can be used when testing loads at the local range, when spotting for a fellow hunter, when competing (looking at your own target when you are in the prone position playing field target), or when spotting for a shooting partner on a varmint hunt. There are several spotting scopes for the airgun hunter or target shooter to choose from when it comes to price, features, quality, and size. Most of the major manufacturers of camera lenses, telescopic rifle scopes, and binoculars also make a line of spotting scopes. Scopes made by such names as Nikon, Bushnell, Leupold, and private labels for Cabelas, Bass Pro Shop, and Gander Mountain as well as several other sources.

Before buying a spotting scope, do a little homework to determine which spotting scope and stand is best for your intended use. The magnification power, light gathering capabilities, for the airgunner should be optimized for use in side of 150 yards. I think a scope with a variable 10-50x magnification and a fairly large aperture is the way to go for airgunning field use. I would also suggest you look for something lightweight and compact, otherwise you won’t carry it in the field,

Not all spotting scopes are sold with a stand, though the lower priced package that work quite well for airgun hunters will often come bundled with a usable tripod. I would not recommend the small table tops tripods that are often packaged with scopes, as they are not flexible enough for the many positions a hunter will need to work from.
Sometimes any optics other than a scope are unnecessary, but when you need them they are worth their weight in gold. I always carry binoculars, and if I’m out in a target rich environment like a prairie dog town, the spotting scope goes into my pack as well.

When shooting long range for prairie dogs, I like to use both a good set of binoculars and a range finder to set up my shots. The wide field of view and the mobility are my reasons for selecting binoculars over a spotting scope if I’ll be moving around.

Geared up and ready to go!
Hunting Packs

There are a variety of packs I’ll carry in the field depending on where I’m going, what I’m hunting, how long I’ll be out, and the need for emergency equipment. If going out on a local farm everything needed will probably fit in a bum bag or a messenger bag. When heading out to a state forest or tract of BLM land, a full pack with gear to keep me going for an unexpected night in the field is a better option. These photos show three of my favorite pack (top), and the gear I commonly take along, which includes binos, range finder, air tank (for pcp) knife, radio, camera, pellets, calls, and shooting sticks.

These three bags represent my go-to carry alls for out in the field. The fanny pack has small pockets along the belt, and is convenient for pellets, calls, range finder, binoculars, but no space for a foam pad to sit on, an extra air bottle, or to carry game home. The messenger bag can carry this additional gear and I like the fact it only uses on strap, which makes it easy to access when I’m on the move. But space is limited and it doesn’t handle a lot of weight. My last bag is a full size pack, which allows me to carry an emergency kit and even an overnight supplies if I’ll be out for a couple days.

In this photo my bag is emptied out and you see my typical gear for a day hunt.
A few years ago I was hunting jackrabbits in the Mojave Desert, and had wandered miles from my jeep. Climbing down through an outcropping of lava rock I made a misstep and took a tumble. When I stood up and put weight on my right leg, I tumbled over again. It was getting late and I was losing light, and even though the car was only three miles away it ended up taking me hours to limp back on what turned out to be a broken ankle. Luckily I had plenty of water, a flashlight, and a sweatshirt stowed in my pack, or the return could have been even more unpleasant.

When preparing for a hunting trip I start by considering the quarry I’m after and the shooting conditions likely to be encountered. There are some items that need to be packed based on the choice of guns (i.e. an air tank for PCP’s) and others that are essential articles of gear that will be packed regardless of the gun being carried.

**Basic Gear**

Let’s take a look at what I call my foundation gear, the stuff that is stashed away in my pack and goes with me on every outing. I am going to further qualify this discussion by saying that we’ll be focusing on gear for a day trip, where the expectation is to return home at some point in the same day.

There are several styles of packs to choose from, and I’ve gone through a number looking for the ones that best serve my purpose. I’ve come up with two favorites, the first is a messenger style pack that has a single strap worn across the chest bandolier style and the second is a larger pack of conventional style. Both have small pockets for external storage and easy access to frequently used items such as range finder, binoculars, and ammunition.

I like to carry a set of compact 8x binoculars, which provide sharp images in the low light conditions often encountered while airgun hunting. These are invaluable for picking out small game such as a squirrel peaking down at you from high up in the trees.

Because the trajectory of an air gun projectile can be rather pronounced, a range finder is very useful. I take my rifles to the range before hunting them, and work out the point of impact at 20, 40, 50, 70
yards, then make a note that is taped to the stock or slipped into the flip up scope cover. This along with the range finder will allow the very accurate shot placement required of the airgun hunter.

Even if only going out for a day, I’ll carry an energy snack and water. You never know when a day might become two due to getting lost or hurt. Granola bars, protein bars, or trail mix and a liter of water are standard in my pack, and have been welcomed on many occasions. A full blown emergency kit is a good idea when venturing into particularly rugged areas. A compass, a GPS, and a cell phone are packed as insurance if I get temporarily turned around as well. Even though a knife is an item that every outdoorsman should have with them at all times, I keep an extra folding knife in my pack with a small sharpening stone. I’ve had many occasions in the field where I’ve lost or forgotten my belt knife and this backup has been called into action.

**Airgun Specific Gear**

I don’t want to scare any prospective airgun hunters away, but a simple truth is that pcp airguns are mechanically more complex than firearms. Things can go wrong that are exclusively airgun related, such as a blown o ring or dirt in the fill valve. I carry a small tool kit in my pack that contains extra o rings, Allen wrenches, a couple of small crescent wrenches, a screwdriver set with slotted and Philips heads, a set of pliers, a roll of Teflon tape, and extra connectors and fill probes. With this set up, if something does go wrong with my guns there is a high probability I can address it in the field.

There are many advantages with pcps that make these designs attractive to hunters; they tend to be more accurate, more powerful, and much lighter than springers. A drawback is that they rely on an external filling source. Depending on what you are hunting, what gun you are using, and how far you will venture from your primary charging source, this might not be an issue. But if I am going to hike miles from my car (and therefore my air tank), am using a gun that gets four rather than forty shots per fill, or am hunting in an especially target rich environment like a prairie dog town, I will carry a small carbon fiber tank
to recharge the gun in the field. I use a carbon fiber tank that charges to 4500 psi and holds 17 cubic feet of air. With this set up I can get several refills with any of my pcp rifles, and it only adds a few pounds.

The last thing that I have stored away in my pack is a small plastic box containing a variety of pellets in different styles, weights, and calibers. The reason for this is that no matter which rifle I take along, if I run out of pellets, loose, or forget to pack them (all of which I’ve done more than once), my hunt is not ruined. If you only use one gun or one caliber this will simplify what needs to be packed, but at any rate adds only a few ounces that are well worth the effort when you need them.

Aside from a few incidentals such as camera gear, this is a pretty concise snapshot of what my airgunning pack looks like. Everyone will have their own variations on the theme; but if you are prepared to stay healthy and comfortable in unexpected conditions, have all the gear on hand to facilitate your hunting success, and are able to make any repairs that may become necessary while in the field, your airgun hunting experience will be enhanced.

It’s good to have everything you need when you need it, but you also don’t want to head into the field with a whole sporting goods shop on you back. The right kit for you will come with trial and error. I always carry binoculars, a compass, a knife, camera, extra pellets, water and a snack. If I’ll be heading deep into the wilds I’ll carry an emergency kit, but not when hunting the back forty on a friends farm. Use common sense and figure out what works for you.

I like this messenger style bag, and it is my first choice on most trips. Easy on and off with no strap on the shoulder I sling my rifle from. It has enough space for my gear (unless I’m doing an overnighter) and it’s easy to access without removing.
Traveling with Airguns

I take my rifles with me quite frequently when traveling. This is of course, pretty easy when taking off on a road trip; throw them into the cargo space and hit the road. The complexity increases though when I’m going to fly to my destination. In the good old days, pre 9/11, I did not bother to declare my airguns when checking my bags and never encountered any problems. But recently the rules have changed; and air arms are now viewed in the same light as traveling with firearms. But before getting on to the topic of checking in at the counter, let’s take a quick look at how I pack the guns in the first place.

An observation made in passing is that people can get nervous when they see a guy walking through an airport or hotel lobby carrying a rifle case. You can get by with this in Utah or Colorado during deer and elk season, it’s an altogether different story when you’re walking through the lobby of the Hyatt in San Francisco or Chicago attired in a business suit. In the past I have used the traditional rifle case, which works well but is not very subtle. For several months now I’ve been using a new set up, which protects my guns very well, is easy to move around, and has the added benefit of being discreet. Walking through the local sporting good store one Saturday morning I spotted a hard sided golf case made by Doskocil (Golf Guard),

My travel kit for flying (top) and a back of seat stowage for car trips...
which is a company specializing in high impact molded plastic containers for the sportsman. As a matter of fact, I had a number of their rifle and pistol cases in use at that very time. As I glanced at the bags, it occurred to me that it was about the right size to fit a couple of Doskocil rifle cases (Gun Guard). So I went bounding over to the gun section and grabbed a couple of standard rifle cases to see if it was a fit, then headed back to the duffers gear. The golf case perfectly housed two rifle cases, so I bought it and headed home with my newest acquisition. Now my wife doesn't mind me buying a new gun or accrualments every now and again, but she has seen me golf and thought my newest purchase was a terrible waste. Ah, but that one spontaneous action has made my life as a highly mobile hunter so much easier! The great thing about this setup is that a) the built in wheels really make it easy to run through the airport, and b) during transit nobody has any idea I'm traveling with my guns – as I look like just another business traveler planning to sneak away for a little golf. Security and airline agents tell me all the time this is one of the coolest setups they've ever seen – and the whole thing cost under $100.00 including the rifle cases.

OK, now here is the fun part, I've got my guns packed and have made it to the check in counter at the airport. The first thing you'll find if you do this a lot is that there is not much consistency in the rules; different airlines and airports handle checking air guns in different ways. But as a general rule of thumb these days, the majority of airlines now will handle air guns just like a firearm. My first step when getting to the ticket counter is to declare the presence of airguns in my golf bag, which I must admit will raise an eyebrow occasionally. Next you will be asked to open the case, and you may or may not have to show them that the gun is unloaded. Some agents don't even want to look at it; others want to examine it closely. You will have to declare that it is unloaded and uncharged. Next you will be given an orange firearm transport card which you sign, date, and place in the case. The case is then closed but not locked, and sent to the security baggage check. The airline might ask you to standby until the bag is cleared - but often they won't. Like I said up front, they change from place to place, day to
day. I've probably been on 10 flights this year with my guns and it's never added more than 20 minutes to my travel time. If you're tempted to argue the process or voice your frustration over the minor delay – don't. These people are only doing their jobs in a difficult time, go along with it and eventually you and your guns will get to where you're going … then the fun starts!

Soft cases are useful for toting your gun from place to place in the trunk of your car, or for protection in camp when not in use. You can use them for long term storage for leaving guns in a closet or gun room. A light hard case, the inexpensive types you find at the sporting goods and big box stores frequently on sale, really fit the same niche. The cases are good for moving the gun from place to place in the back of the truck, but don't use them for long distance travel or when rough handling may occur (such as air travel). I use these cases inside a cardboard box for shipping (LL). For long trips and rough handling, use a heavy case on rollers that has been rated for air travel (B). Don't leave guns directly on foam for long period, as it can harm the guns finish. I wrap mine in a plastic bag or wrap if leaving the gun cased for storage.

Soft case for a single gun is

Semi-rigid soft cases that hold multiple guns are great for the range.

For long range travel, use a case designed for the purpose. Heavily built and with wheels is my preference.