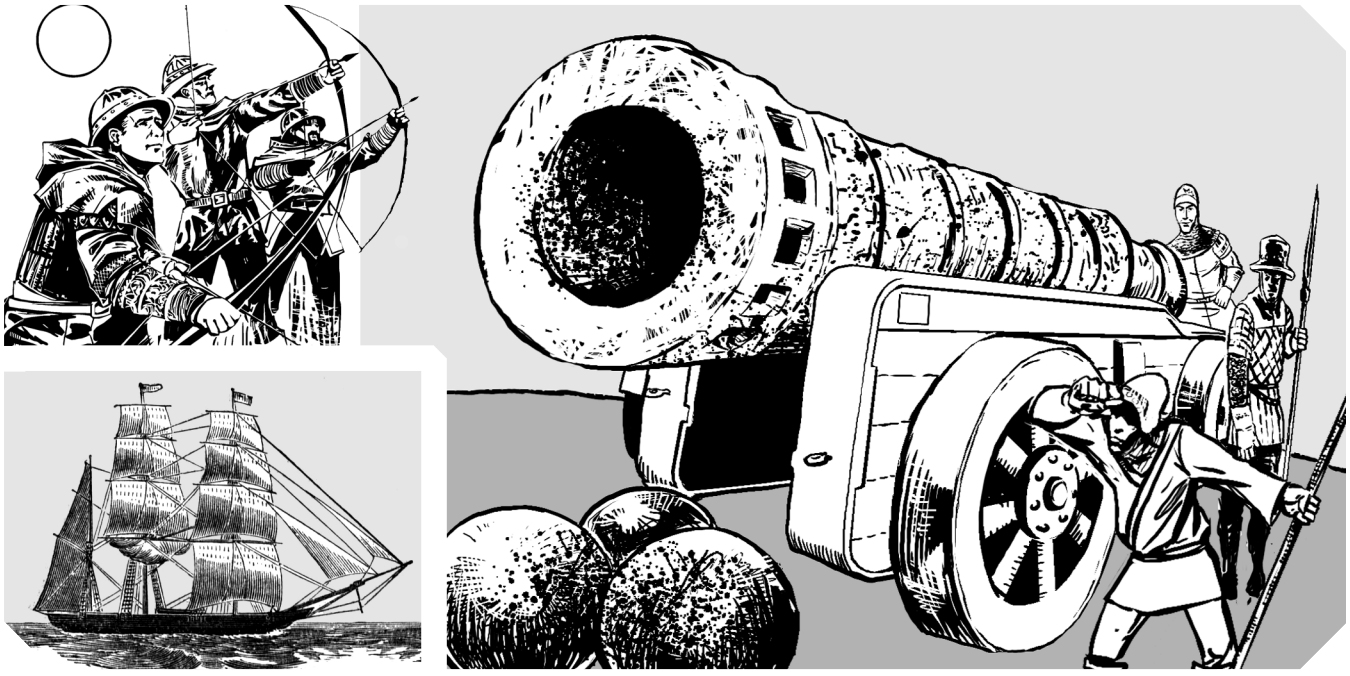
GURPS® Fourth Edition

LOW-TECH™

COMPANION 2

WEAPONS AND WARRIORS™



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Introduction

Most TL0 and many TL1 societies were effectively "pre-military," yet managed to grow and evolve in several significant ways – including weaponry, if only for hunting. Few TL1+ civilizations were able to grow and evolve without a strong military presence, however. When rulers came along, they rarely ruled for long if they couldn't hold onto power and wealth with large armies. Thus, they had to be military commanders as well as civilian leaders. Equipping and feeding a strong military required resources, though, and if those of the homeland were insufficient, then additional conquests were necessary. Of course, new territory required even *greater* forces to keep . . .

GURPS Low-Tech Companion 2 looks at the technologies of warfare. Note that it's an appendix to ***GURPS Low-Tech.*** Many of the concepts discussed here draw on that work, although that supplement isn't *required* to use this one.

About the Authors

Peter V. Dell'Orto started roleplaying in 1981, with ***Dungeons & Dragons,*** and has played ***GURPS*** since ***Man to Man.*** Since 1996, he has been an active ***GURPS*** playtester, editor, and author. He wrote ***GURPS Martial Arts*** with Sean Punch, ***GURPS Martial Arts: Gladiators*** with Volker Bach, and many articles for *Pyramid* magazine, including "Deathball" (with Sean Punch) in *Pyramid #3/3.* Besides his interest in writing RPGs, Peter is an enthusiastic martial artist. He currently trains Kachin Bando and holds *shodan* rank in Kendo. He has fought amateur MMA in the Japanese Shooto organization and competed in Grappler's Quest. His other hobbies include strength training, reading, painting miniatures, Japanese, and music. He currently lives and trains in New Jersey.

Dan Howard started roleplaying in 1984 with ***Middle Earth Role Playing,*** and quickly moved on to ***Rolemaster.*** He switched to ***GURPS*** shortly after its first edition; it has been his favorite system ever since. He started contributing to *Pyramid* magazine in 1998, and soon began playtesting ***GURPS*** publications. His debut contribution to a ***GURPS*** supplement was in the first edition of ***GURPS Low-Tech*** – a work he has been interested in improving ever since, especially in his pet area of armor. Dan has an Arts degree in History and Classical Studies. He holds a second dan black belt in Oh Do Kwan Tae Kwon Do, and has competed internationally. Other interests include historical armor reconstruction, renewable energy, and organic gardening. He currently lives in Maitland, Australia with his wife and three children.

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About *GURPS*

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Errata. Everyone makes mistakes, including us – but we do our best to fix our errors. Up-to-date errata pages for all ***GURPS*** releases, including this book, are available on our website – see above.

Rules and statistics in this book are specifically for the ***GURPS Basic Set,*** *Fourth Edition.* Page references that begin with B refer to that book, not this one.

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Chapter One
Historical Evolution of Combat Gear

As soon as man's ancestors started hunting, they developed the first weapons: sticks and stones, modified to dispatch game more effectively. Later advances in materials and craftsmanship inevitably meant better weapons, while social changes turned these more and more against other human beings. *Armor* didn't appear until the advent of organized warfare, however.

Hunters and Gatherers

A hunter isn't a hunter without *weapons,* which he needs to kill prey, defend against predators, and ward off trespassers on his hunting ground. The earliest weapons, used primarily for hunting, were rocks and sharp sticks. But stoneworking has been dated back more than 2.5 million years, suggesting that it didn't take long for early humans to start experimenting with manufactured weapons – including stone axes and spears, throwing sticks, and bolas. The beginning of the Neolithic saw an explosion of weapons technologies. Even at this early stage, weapons can be separated into two categories: ranged and hand-to-hand.

> *And the staff of his spear was like a weaver's beam; and his spear's head weighed six hundred shekels of iron . . .*
>
> **– *1 Samuel 17:7***

Axes (TL0)

These originated when hand axes were lashed to shafts around 10,000 years ago. The earliest hand axes date to the Acheulean period, also known as the Lower Paleolithic era. These emerged first in Central Africa and later in Europe and Asia. Lashing a hand axe to a shaft increased its reach and let the wielder put more power into a swinging attack, making it far more effective against human opponents. For more detail on stone tools and their construction, see ***GURPS Low-Tech.***

Spears (TL0)

Homo erectus first developed these thrusting weapons for hunting, to enable hunters to strike at targets beyond arm's length. The earliest spears were simply shafts of very hard wood (yew, ash, etc.), 6'-8' in length, sharpened to a point. The tips could be made more durable by hardening in fire. With the invention of suitable attachment techniques, knapped stone tips replaced fire-hardened ones. By the last Ice Age, a leaf-shaped head had been developed to maximize damage.

Throwing Sticks (TL0)

This hunting weapon is essentially an aerodynamic hardwood club used to take down small game. A throwing stick is often multifunctional, serving as a light club, a fire stick, a digging tool, and/or a musical percussion instrument.

A *boomerang* is a lighter, curved variant that returns to the user if thrown correctly. While most commonly associated with Australian aborigines, many cultures have used it, including ancient Egypt. It can be used to flush animals from cover: a successful Thrown Weapon (Stick) roll brings the prey toward the hunter, eliminating the need to sneak closer.

Bolas (TL0)

A throwing device made of weights on the ends of interconnected cords, designed to entangle an animal's (or human's!) legs. Most bolas have two or three weights, but some have up to eight. The thrower grasps the bolas either by one of the weights or at the nexus of the cords, swings it around to generate momentum, and then releases it. For rules, see p. B410.

The First Civilizations

War *isn't* simply group violence – it requires direction by some form of authority, military organization, and a political or economic motive. Although there's evidence of skirmishes between small groups of hunter-gatherers, the elements needed for organized warfare were absent. Institutionalized warfare arose only after humans began colonizing fixed settlements, cultivating and storing crops, and domesticating, breeding, and penning animals. It was a consequence of social issues such as inclusion, exclusion, and personal property.

Early Warfare

As the wealth and size of permanent settlements increased, people began to specialize in certain occupations. The concurrent growth of organized violence ensured that one such profession was that of the *warrior.* He was part of a small, elite band that served as the core for raiding parties or homeland defense.

Warfare occurred between settlements, but more commonly between a settlement and nomadic pastoralists. Nomads traditionally viewed farmers with contempt as plant-eating slaves to their fields – just another resource to be exploited. Even without horses, the pastoralists had a major advantage: mobility. They could attack and flee at will, while their targets were tied to a fixed abode. Archaeological remains suggest that the weapons used during these early raids were mostly stone maces and baked clay sling bullets. Stone arrowheads and spear tips are surprisingly rare at these battle sites.

Clubs and Maces (TL0)

Bludgeoning hand weapons had little use for hunting. The larger animals that humans hunted had thick skulls that were highly resistant to concussion attacks. Spears were far more effective against such beasts, while ranged weapons excelled for dispatching small game. The club – simply a length of wood that's heavier at one end, with the other end fashioned into a hand grip – was likely the first weapon designed *primarily* for attacking humans, as our thinner skulls leave us far more susceptible to head wounds.

A *mace* is an advanced club. In its earliest form, it consisted of a wooden shaft inserted into a stone head. In the Chalcolithic period, copper came into use for mace heads.

Maces and clubs were probably why the helmet was one of the first pieces of armor developed. For more on this, see *Helmets* in ***GURPS Low-Tech.***

Microlithic Edges (TL0)

A *microlith* is a small piece of sharp stone. Microliths were embedded into grooves along the edges of wooden tools and weapons to provide cutting ability. Some of the earliest farming implements utilized microliths, but copper blades soon replaced them in many cultures.

Microliths can be used to construct much longer weapons than can be fashioned from solid stone or copper. The Aztec *macuahuitl* (and its shortsword-length variant, the *macuahuilzoctli*) was as long as later metal swords but made of wood, with microliths embedded along both edges. The Kiribati developed a similar weapon – the *tebutje* – which used sharks' teeth rather than microliths. Microliths were glued into a wooden groove, while sharks' teeth were tied on with hair or fiber. Both were susceptible to breakage in combat, as described in ***GURPS Low-Tech.***

Slings (TL0)

Favored by animal herders, the sling was used to ward off predators and to encourage strays to return to the flock. It was small and portable (it could even be worn as a belt), and ammunition was readily available. The weapon consisted of a length of cord with a pouch in the middle for holding a projectile. It was swung once and then the missile loosed by releasing one end of the cord.

Anyone who carried a sling would constantly be on the lookout for suitable pebbles for ammunition. The GM could reasonably assume that a slinger has a handful of them ready in a small pouch. Against humans, such stones could be lethal at up to 20-30 yards. Manufactured shot – initially baked clay (TL0), and later lead (TL2) – significantly increased effective range.

Blades (TL0)

With increased skill came the ability to fashion longer items from stone. Blades could be two or three times the length of a spear point, but they were *brittle.* Obsidian was especially prized for making stone weapons, and was a trade good for those fortunate enough to have large reserves, such as Çatal Hüyük in Anatolia.

The earliest knives lacked handles; one edge was left dull to give the wielder a grip. Their primary use was as tools rather than as weapons, since they were suited only for cutting and had minimal reach. By the Mesolithic period, knives had wooden or bone handles, and both edges were sharpened. Equally suited for cutting *and* stabbing, and with greater reach, these were far more effective weapons. The first leather sheaths came into use during this era, to protect the blade's edge and make it easier to carry.

The Chalcolithic period (still TL0) saw the first use of copper for blades. Copper blades could be made longer than stone ones, but the metal's inherent softness restricted them to shortsword length. Treat them as cheap quality.

Circumvallation

Defensive walls around fixed settlements provide good evidence to archaeologists as to when organized warfare arrived in a particular region. Generally, this started around 5500 B.C. Violence seems to have accelerated rapidly after this point, and occurred more frequently between fixed settlements than between settlements and nomads, as was the case earlier. Agriculture spread out to cover more and more land. For those who couldn't retreat, the only alternatives were submission or counter-aggression.

Safety in numbers encouraged people to consolidate into ever-larger settlements. Cities became crucibles of civilization, where religion thrived and huge temples and monuments were built. Societies developed until millions were controlled by a warrior elite ruled by a king. This process seems to have occurred first in ancient Sumer – a group of city-states between the Tigris and Euphrates rivers, which the Greeks called Mesopotamia ("the land between the rivers"), in what's now Iraq. It introduced a style of warfare that saw recurrent use for millennia: Violence became the tool for maintaining the balance of power between city-states, and the resulting warfare was short and brutal, with limited objectives.

Massed Combat

The Sumerian Tablets of Shuruppak (2600 B.C.) indicate that even at this early date, Sumer's city-states provided for the maintenance of up to 700 full-time soldiers. A century later, the Stele of the Vultures was carved to celebrate the victory of King Eannatum of Lagash over Enakalle of Umma. It portrays Eannatum, armed with a socket axe, riding a chariot drawn by four onagers (wild asses). The king leads a massed formation of helmeted infantry, equipped with spears and shields. Here we see the ancient world's *phalanx,* fully realized many centuries before the classical societies adopted its use.

The phalanx was a primitive formation that minimized the limitations of poorly trained conscripts while offering good protection, so long as the troops maintained the shield-wall. ***GURPS Martial Arts*** uses the Greek term *hoplomachia* to describe this style of fighting (that book's spear-fighting styles are also relevant). Battle was over quickly, and casualties could be high for the loser. The Stele of the Vultures records over 3,000 Ummaite casualties in the engagement it commemorates.

Around 2300 B.C., a military campaign by Sargon the Great united all of Sumer and provided the world with its first military dictatorship. One account records that Sargon's core military force numbered 5,400 men. Sumer became one of the most advanced of the early Bronze Age civilizations, both culturally and militarily. Defenses consisted mainly of copper or bronze helmets and large shields; some historians argue that metal helmets proved so effective that they drove the mace from the Bronze Age battlefield! The most common weapon was the bronze-tipped spear, but other warriors would have carried a bronze socket axe or a sword such as the *khopesh.* Chariots of the time were slow and awkward, being pulled by onagers rather than horses, and had little tactical value on the battlefield; treat them as wagons for transportation, rather than as military vehicles (see *Carts and Wagons,* p. 33).

The Bow

The bow is one of the most effective tools of war ever devised, remaining in use from its invention in the Stone Age until well into the gunpowder era. Its light weight made it reasonably portable; its dual-purpose use for both hunting and warfare, without exposing the wielder to immediate danger, led many cultures to value it highly. A man could carry 10 times as many arrows as throwing spears, greatly increasing his volume of fire. Each arrow also had far greater range, although it lacked the spears' penetrating power.

The Longbow

Bows made from a single wooden staff were known as *self bows.* The disadvantage of such a bow was that in order to shoot war arrows any great distance, it had to be long and heavy, requiring upper body strength and years of practice to master. The sling was a far more effective ranged weapon for those unable to wield a heavy self bow.

Nearly all self bows designed for battle were *longbows* – a term coined in medieval documents to distinguish them from crossbows, not from shorter self bows. The yew longbow is mistakenly believed to be a medieval English or Welsh invention, but it has seen continuous use in Europe since the Mesolithic period. Yew is an especially useful timber for bow-making because the heartwood is resistant to compression while the sapwood is resistant to tension.

The Composite Bow

When suitable timber was unavailable, alternative materials were substituted to create a laminated construction. Such a *composite bow* was made by layering, for instance, animal horn and sinew. Horn bore compressive loads better than wood, while sinew was far more resilient, with a much higher tensile strength. In some designs, these materials were glued to a wooden core; in others, no wood was used at all. The resulting *hornbow* was far more efficient than a self bow, making possible shorter weapons with similar power – ideal for mounted archery. These were considerably more difficult and time-consuming to construct, however.

The Rise of the Chariot (TL1)

On the Bronze Age battlefield of the 20th century B.C., massed infantry began to replace their spears with bows. Archers rose in importance, with spearmen acting as shield-bearers to protect them. However, the bulk of the fighting was carried out by the infantry elite, who were more heavily armored in leather and bronze scale, with smaller, more mobile shields. Their weapons would have included spears, bows, and shortswords.

The domestication of the horse brought with it a new chariot, which seems to have been developed in the Middle East in the 18th century B.C. and introduced to the Near East a century later. This was more agile than previous war wagons, being first and foremost an archery platform. It was designed to be as light as possible to maximize speed and maneuverability. It had two spoked wheels, and its rattan platform was placed directly over the axle to reduce the load on the horses.

The two-horse chariot, called a *biga,* was most common; there was also the three-horse *triga* and four-horse *quadriga*. It's likely that both driver and archer were heavily armored – mainly in scale, but the Mycenaeans were experimenting with plate (the earliest suit of plate armor, the Dendra panoply, dates to 1400 B.C.) – and the horses covered in some degree of barding (see ***GURPS Low-Tech***). The Hittites developed a slightly heavier three-man version that included a shield-bearing spearman. The longbow or composite bow was the weapon of choice; shortswords and spears were carried as backup weapons. The chariot archer revolutionized warfare to such an extent that he dominated the battlefield in all of the great civilizations – including the Egyptians, Hittites, Canaanites, Mycenaean Greeks, Aryan Indians, and Shang Chinese – until the end of the Bronze Age.

The massed infantry of the previous millennium, so prominent on the Stele of the Vultures, seems to have been reduced to little more than a screen for the chariots to retreat behind to regroup when the situation demanded. In open battle, foot troops took little direct role in the fighting, which was dominated by the chariots. Casualties were much reduced compared to the pitched battles of preceding centuries. For example, at the Battle of Megiddo (1457 B.C.), Egyptian records note that they captured 2,041 horses and 924 chariots, but killed only 83 men.

However, infantry was still used to hold ground, to besiege or assault fortified settlements, and to engage the enemy on terrain unsuitable for chariots. As well, a small corps of well-trained infantry – called "chariot runners" – operated in support of the charioteers, and archers in the infantry cordon would have fired upon any enemy troops in range. The Assyrians used this tactic to great effect; the basic unit in the Assyrian army involved an "archer pair" consisting of an archer protected by a spearman wielding a large shield.

The Ancient World

The collapse of the great Bronze Age civilizations was followed by the emergence of Iron Age cultures. Weapons and tactics became more varied, and military engagements grew more complex.

The Iron Age (TL2)

Contrary to popular belief, iron *wasn't* superior to bronze as a material for weapons and armor. Iron's great advantage was its availability. Bronze was far more difficult to obtain, so metal weapons and armor were largely reserved for the elite. The introduction of iron meant that many more troops could be well-armed and -protected. The Assyrians were the first to clad their rank and file in iron scale armor and helmets, while swords became common sidearms. Countless iron spearheads and arrowheads were produced for armies that were tens of thousands strong.

Decline of the Chariot Archer

By the end of the Bronze Age, the chariot archer was no longer preeminent on the battlefield. The Sumerian-style phalanx returned, and massed infantry largely decided a battle's outcome, with the chariot relegated to a supporting role. Casualties were much higher. During an Egyptian battle with Libya in 1208 B.C., records indicate that over 8,500 of the enemy were killed. Compare this to the chariot-dominated battle at Megiddo two centuries earlier, with its scant 83 enemy deaths! Even the elite abandoned their chariots – Rameses III was the first Pharaoh to be depicted, not in a chariot, but afoot, swinging his sword at the enemy.

Archery, too, declined, in favor of the thrown javelin – possibly due to the increased prevalence of heavy body armor. In the past, only the elite had body armor. In the Iron Age, more of the rank and file wore it. Since arrows were far less likely than javelins to punch through armor, the chariot archer was less effective.

Thus, chariots came to be used differently. Warriors might throw their javelins while onboard, or dismount and fight on foot. The driver would keep the chariot nearby for a quick retreat. These tactics are described in Homer's *Iliad,* which recounts part of the famous Trojan War; to emulate them in ***GURPS,*** see *Heroic Spear Fighting* in ***GURPS Martial Arts.*** Similar changes occurred in all the great chariot civilizations. As far away as China, the Warring States period saw a shift from rulers relying on a personally loyal chariot elite to depending more on the masses.

You talk of food? I have no taste for food – what I really crave is slaughter and blood and the choking groans of men!

– Homer, ***The Iliad***

Horse Archers (TL2)

Small Bronze Age horses were ridden in battle solely by scouts and messengers; they only took a direct role in the *fighting* when pulling chariots. Over the centuries, though, breeding yielded larger horses that made more effective cavalry mounts. Thus, chariot archers didn't abandon the battlefield – they simply moved to horseback. Ninth-century Assyrian reliefs depict an apparent transition from chariot archers to horse archers, showing warriors operating in pairs, riding two horses, with one man controlling both animals while the other shot his bow.

Mounted combat has two main advantages over the chariot. First, it eliminates the chariot's expense. Second, the horses are no longer encumbered with a chariot, allowing them to move faster and over a wider variety of terrain. The major disadvantage of the transitional Assyrian unit was that it still required two horses and two men to function. The development of independent horse archers redressed this problem. Removing the need for a "driver" meant that *each* horse carried a bowman, doubling the available firepower!

See pp. B396-398 for rules for mounted combat.

The Heavy Chariot (TL2)

In the Aegean and the Near East, the chariot first evolved from an archery platform to the javelin platform and "battle taxi" described by Homer, and then was phased out entirely. Further east, however, it evolved into a heavier vehicle for shock tactics. The Assyrians used the chariot to disrupt the enemy phalanx by charging from as many directions as possible to cause confusion and fear. Once engaged, the crews dismounted and fought as infantry. The Persians further refined this tactic by increasing the chariot's weight and adding scythes to the wheels to maximize shock and carnage. The charioteers no longer dismounted to fight but remained on board while the chariot was driven into the enemy's midst, causing as much havoc as possible.

Bring me my bow of burning gold!
Bring me my arrows of desire!
Bring me my spear! O clouds, unfold!
Bring me my chariot of fire!
— William Blake, "Jerusalem"

Decline of the Chariot

The heavy chariot continued in use until the time of Alexander the Great. By then, heavy cavalry was emerging in regions such as Persia and Thessaly, and its principal role was shock tactics – effectively usurping the chariot's last remaining tactical role. Cavalry was also cheaper to maintain than chariotry, and far more versatile, as it could operate in a much wider variety of terrain. Just as the horse archer's appearance had rendered the chariot archer obsolete, the development of heavy cavalry superseded the heavy chariot.

While the chariot no longer had a place on the battlefield as a tactical unit, it didn't vanish overnight. It appeared on various Hellenic battlefields – largely unsuccessfully – for another century or so. Only in a few Celtic regions did it hold on, until it disappeared from the battlefield for good around Julius Caesar's time (first century B.C.). One bit of color in this period was described by Caesar himself: chariot warriors in the British Isles would show off by running out on the pole of a fast-moving chariot to strike at foes! For this, use the following new technique.

Running the Pole

Hard

Default: Acrobatics-2.
Prerequisite: Acrobatics; cannot exceed Acrobatics.

Roll against Running the Pole each turn to avoid falling! Attacks and defenses suffer the usual penalties for bad footing. The default of -2 assumes smooth, level ground. On rough or uneven ground, apply another -2 that *can't* be bought off. The Chariot Training perk in ***GURPS Low-Tech*** halves this extra -2 and eliminates bad footing penalties.

Heavy Cavalry (TL2)

The Parthians developed heavy cavalry to its ultimate conclusion. The *cataphract* consisted of man and horse completely covered in mail or scale armor, charging the enemy with a lance so large that the Greeks named it a *kontos* ("barge pole"). The kontos was gripped in one hand and steadied with the other, which also held the reins.

The additional weight of all that armor required larger horses. The Parthians solved the problem by taking over the Persian Nesaean stud. This was the largest breed known at the time, standing up to 16 hands tall (a typical Iron Age warhorse was only 13-14 hands high). It was well-built, with heavy chest, barrel, and haunches. Selective breeding meant that it still retained a degree of speed and agility, while careful diet and training improved endurance. Maintaining heavy cavalry called for a great deal of wealth and land, so the nobility was reorganized to be responsible for these units – a trend that many cultures would follow for nearly 2,000 years.

Combat Saddles (TL2)

Once warriors started to ride horses in battle, they found that they needed a more secure seat. Early saddles weren't built up at the front and back, and the stirrup hadn't yet been invented, so it was difficult to remain seated in combat. The Sarmatians solved this problem by placing four "horns" on the saddle – one in each corner – which locked the rider's thighs in place, enabling him to direct more energy into attacking with spear and sword. It even provided lateral stability, an achievement often misattributed to the later stirrup. The Celts and Romans were among those who adopted the horned design. Later combat saddles (TL3) had a deep seat with high cantles, making a lance charge more effective and providing protection for the rider's groin and abdomen (DR 3).

For statistics, see *Riding Gear* in ***GURPS Low Tech.***

Engines (TL2)

In 399 B.C., armorers working for the ruler of Syracuse devised ranged weapons more powerful than any bow a man could draw and shoot by hand (see *The Workshops of Dionysius* in ***GURPS Low-Tech Companion 1***). These were cocked by intense physical effort, or by mechanical devices, and remained cocked until the user released them with a mechanical trigger. The first such weapon, the *gastraphetes,* could be pushed into the drawn position by the weight of the user's body. Later designs grew steadily more powerful, until the really large ones could hurl stones weighing nearly 200 lbs.

Known generically as *catapults,* such engines came in many sizes with numerous uses – on city walls, on siege towers, on warships, as field weapons for the Roman legions, and even as armaments for individual soldiers. A parallel evolution occurred in China, which became an influence on Muslim and European designs at TL3, culminating in huge trebuchets that could knock down castle walls. Mechanical artillery of this type served as both a source and a display of the power of rulers until gunpowder artillery replaced it (see *Gunpowder,* p. 11).

Warships (TL2)

Traditionally, naval warfare was just an extension of land-based combat. When the ships were in range, men would fire arrows and throw spears at each other. Once they closed, troops boarded and fought hand to hand.

It's unclear who first invented the prow ram, but it revolutionized naval warfare from the eighth century B.C., turning the ship into a projectile whose target was the enemy's hull. In China, the first naval battles took place during the Warring States period (fifth to third centuries B.C.), and involved similar tactics. To power the ram more effectively, navies increased the number of rowers per warship – first by adding decks with extra rows of oars, and then by having more than one man per oar. Ships grew in size to house large war engines and hundreds of marines.

For more on this topic, see *Naval Combat* (pp. 34-36).

What If: Pneumatic Artillery

The ancient Greek engineer Ctesibius experimented with compressed air for energy storage in artillery. Drawing on his experience constructing organs, he devised bronze cylinders with tightly fitted pistons that could be driven into them and held in place. When released, they recoiled violently under the pressure of the compressed air, which became extremely hot. Ctesibius built an experimental model, but it never came into actual use. Several different problems might have accounted for this:

- Bronze may have cost too much compared to sinew.
- The precision workmanship to make airtight cylinders could have been too expensive.
- The cylinders might not have been airtight, causing their pressure to leak away.
- Producing perfectly symmetrical cylinders may have been too difficult, and uneven forces in the two arms might have spoiled the engine's aim.

If the GM seeks a technological starting point for an alternate history – or if adventurers want to invent something spectacular – it could be fun to explore ways of solving these problems! And perhaps other technologies might have taken off from Ctesibius' work. What if some ingenious Greek artificer had developed the air gun three TLs early?

The Middle Ages

The collapse of the major Iron Age civilizations and the emergence of feudalism in Europe brought new motives and means for fighting wars.

Feudal Warfare (TL3)

The essence of feudalism is granting land in return for military service. This occurred in many cultures across Europe, Asia, Africa, and the Middle East. Initially, it seemed to show up whenever there was no powerful central authority. Later, it became a tool for a strong individual to dominate his peers.

In theory, the ruler owned all of the land and parceled out large portions to the warrior elite in the form of *fiefs*. These "tenants-in-chief" in turn leased out smaller portions to lesser lords, or *knights*. Knights kept a certain amount for personal use and leased out the rest to farmers, who grew food and were obligated to give over a portion of it to their lords in return for military protection. The great lords were required to supply a certain number of knights to the ruler when he demanded it, and the knights were expected to turn up with a certain number of infantry (spearmen and archers).

Just as in ancient Sumer (see *The First Civilizations,* pp. 5-7), warfare was used as a tool to maintain the political balance of power between various fief holders. It also enabled them to work together against external threats. Each landowner held his land by force of arms; he struggled to increase his holding at the expense of his neighbors, while they did the same.

Feudalism was, in theory, a good means of maintaining a large fighting force to serve the ruler at little cost to him. In practice, his power depended on the support of his immediate vassals. If a particular lord chose to rise up against the king, then all those who swore fealty to that lord would fight alongside him. Often, a handful of wealthy landholders could wield more power and influence than the ruler. If a few powerful lords chose to band together, the king stood a good chance of being overthrown!

The Knight

Western warfare during the Middle Ages revolved around the mounted knight, armed with lance, sword, axe, mace, and shield, and covered from head to toe in mail armor.

His chief role was to break through the enemy infantry line. The cavalry did most of the fighting; the infantry seems to have done little apart from holding ground and forming a screen from behind which the cavalry could sally forth and to which they could retreat to regroup. The knight lived off the peasants' labor – he had little incentive to make useful foot soldiers out of them!

Tactics involved charging in orderly serried ranks, hitting the front lines with lances, and either wheeling off if the enemy line held or pressing through if the enemy faltered. Archers were used to help break up the line, and flank attacks were preferred to a frontal assault – but first you had to deal with the opposing knights, who were trying to do the same thing to *your* troops. This style of warfare was seen in both Europe and the Middle East, although Islamic warriors emphasized the bow more. The Mamluks were considered the epitome of the Islamic mounted warrior, and were trained in the martial art of *furusiyya.* See ***GURPS Martial Arts*** for this and other styles of knightly mounted combat.

Whenever there was a deficiency of cavalry, attempts were made to use infantry to redress the imbalance. One example was the Anglo-Saxon nobility, who fought on foot with spears and long axes. Their effectiveness was evident at the battle of Hastings (1066), when they resisted successive Norman cavalry charges for the best part of a day before finally being overwhelmed. In time, new tactics would see infantry once again emerge as the dominant force (see *Resurgence of Infantry,* below).

The Stirrup (TL3)

It's a common misconception that the stirrup led directly to the development of shock tactics and heavy cavalry, but the war saddle (see *Combat Saddles,* p. 8) was far more important there. Steppe nomads developed the stirrup for reasons that had nothing to do with lance charges: to improve horse archery by enabling the rider to stand in the saddle. His knees absorbed the horse's motion, giving him a stable platform from which to shoot, increasing accuracy. In time, the stirrup was dispersed to other horse-riding cultures and became another riding accessory.

Stirrups let a mounted archer Aim while riding (see p. B397); the maximum bonus is Acc+1. Stirrups also make it easier to mount a horse, and provide lateral stability, but don't in themselves improve the power of a lance charge – although they do help keep the rider firmly in the saddle. For rules, see *Riding Gear* in ***GURPS Low-Tech.***

Plate Armor

Starting in the late 13th century (TL3), warriors strapped pieces of plate over mail to improve protection. Mail was especially susceptible to blunt trauma, and the most vulnerable spots were the exposed shoulders, knees, elbows, and shins. These were the first areas covered with plates.

Torso armor initially took the form of a *coat of plates* (treat as segmented plate), but by the 15th century (TL4), solid breastplates were being produced, followed by fully articulated suits that rendered the wearer practically invulnerable to all but the heaviest of blows. At this point, mail was no longer worn under plate; it was used only to cover exposed gaps, such as the armpit, groin, and inside elbow. Knights discarded the shield, and a different style of fighting evolved, emphasizing two-handed weapons, grappling, and thrusting.

For more on knightly armor, see ***GURPS Low-Tech.*** For fighting styles built around it, see *Longsword Fighting* and *Pollaxe Fighting* in ***GURPS Martial Arts.***

The Renaissance

As feudalism gave way to the nation-state, warfare evolved to match. Power became concentrated in the hands of rulers who personally controlled large armies. Often-costly technological innovation fell within the financial grasp of these leaders, who outfitted their troops accordingly.

Resurgence of Infantry

Feudalism declined for two main reasons. The first was the replacement of feudal obligations with monetary compensation. A town could be released from its feudal responsibilities for a certain number of years by paying a fee. A lord could pay *scutage* ("shield money") to his liege instead of sending men. The ruler could then use this money to hire professional soldiers, who tended to be more experienced, more disciplined, and better equipped than feudal levies.

The second blow to feudalism was the resurgence of infantry tactics. Disciplined units of English longbowmen, Genoese crossbowmen, Swiss halberdiers, Flemish pikemen, etc. meant that the mounted knight could no longer guarantee success on the battlefield. His horse was particularly vulnerable to these new tactics, forcing him to dismount and fight alongside his social inferiors. Once again, infantry dominated the battlefield while cavalry played a supporting role.

Munitions Plate

Although plate armor had seen use in the past, it had been reserved for the elite. Two technological developments – the blast furnace and the water-powered hammer mill – enabled its production in much greater quantities, more quickly, and at lower cost. After the Black Death increased the price of labor, plate actually cost *less* to produce than mail, which was highly labor-intensive! Armies began to issue plate armor to the masses. It was neither as protective nor as comfortable as the properly fitted, custom-tailored harnesses of the wealthy, but it provided good protection at a bargain price.

For rules for munitions armor, see *Armor of Quality* in ***GURPS Low-Tech.***

Gunpowder

The development of gunpowder dramatically changed the dynamics of warfare. In the 15th century, its most notable early success was in siege cannon. These weapons forced traditional castle designs to evolve, rendering tall walls and towers obsolete (see *Star Fort,* p. 30). Over the next century, smaller guns were developed for individual soldiers to carry into battle.

The Ottoman Empire led the world in firearms design. One of the first conflicts to see widespread matchlock deployment was Yavuz Sultan Selim's campaign against the Persians in 1514. Three years later, Turkish janissaries destroyed the Egyptian army at Ridaniya.

As the 16th century progressed, firearms use spread across India, the Middle East, and Europe. Matchlock arquebuses underwent gradual improvement, becoming the flintlock musket by the middle of the 17th century. By then, the Europeans had overtaken the Turks as leaders in firearms innovation.

Concentrated musket fire reduced the effectiveness of the heavy cavalry charge, as by now it was powerful enough to penetrate all but the heaviest plate armor (see *Armor of Proof* in ***GURPS Low-Tech***). At longer ranges, heavy cavalry could be undone by musket-wielding peasantry. But once at close range, cavalry could devastate a formation of musketeers, so polearms were still used to keep horsemen at bay. For many decades, infantry formations included a mix of musketeers and pikemen. Over time, the ratio of muskets to pikes increased until the *bayonet* was developed, combining the two weapons.

Firearms and Economics

Matchlock firearms were standard military weapons through most of the 17th century, long after wheellocks and flintlocks were invented. So why didn't armies immediately adopt better weapons? Simple military conservatism played a part, but the main reason was that the new weapons were more expensive. Kings and generals preferred a large army with matchlocks to a small one with flintlocks. Still, armies *did* invest in more advanced weapons when they really needed them.

Long arms were awkward for mounted men – cavalrymen needed pistols. But matchlock pistols were *also* inconvenient on horseback. Thus, the cavalry got wheellocks by the end of the 16th century.

Artillery forces worked with large amounts of powder. Burning slow matches risked setting it off! Soldiers guarding artillery were therefore issued the *fusil* – a flintlock long arm – in the late 17th century, long before ordinary infantrymen got it.

Rifles were more accurate than muskets, but took longer to reload. In mass combat, firing 50% more shots in the same time improved combat effectiveness more than did superior aim. Hunters, however, often worked alone, pursuing wary game; making the first shot count, and taking it from farther away, improved their chances of a kill. So hunters adopted rifles long before soldiers did – and early military sharpshooters were often called "hunters" (*chasseurs* in French or *Jäger* in German).

A man may build himself a throne of bayonets, but he cannot sit on it.

– William Ralph Inge

The Modern Army

Feudalism's death put far more power into the hands of the central authority; the ruler had direct control over standing armies. This reorganization was arguably the birth of the modern state. The numbers of troops involved in conflicts increased dramatically. The percentage of casualties also grew – due largely to poor logistics and the greater lethality of firearms. More taxes were necessary to pay for these armies, which, combined with higher mortality rates and growing bureaucracy, triggered more frequent revolts.

The infantry was armed with muskets fitted with bayonets. Loose shot and black powder dispensers were replaced by mass-produced cartridges, which consisted of a musket ball and a measured powder charge wrapped in a paper tube. Men were drilled ceaselessly until they could fire and reload without thinking. They learned to move in precise formations and to follow orders without question.

Battle formations initially involved many ranks of men but, over time, the trend was toward less depth and more frontage. By late TL4, British formations utilized three ranks; the first would kneel, enabling all three to fire at once. Tactics often involved a slow advance with regular halts to fire and reload. Cavalry would exploit any deficiencies in the enemy formation. If both forces met intact, the result was hand-to-hand combat with bayonets.

Some cavalry evolved into dragoons, armed with pistols and carbines; while they still carried swords, frontal assaults against intact infantry lines rarely proved decisive any more. Cavalry would often dismount to fight, but they were also used for scouting and skirmishing. A classic mounted tactic was the *caracole:* riding into range, wheeling to the side and firing, and then withdrawing to reload (a variant involved riding into range, firing one pistol, and turning to fire a second pistol before withdrawing). Light cavalry used this maneuver to soften up an infantry formation before a heavy cavalry charge.

Body armor had been phased out of most armies by the end of the 17th century.

Naval Warfare

The spread of various empires around the world depended on the development of the *carrack* and later the *caravel,* which were capable of navigating the open sea, and large enough to house cannon. A navy was needed to open new trade routes and protect existing ones. New broadside tactics were developed to enable these ships to use their cannon more effectively. It was difficult to hole a ship below the waterline with cannon fire – shots that hit the water would ricochet – so relatively few vessels were sunk. Ships were more often disabled by targeting the crew and rigging. This was followed by a boarding action fought with swords and pistols.

See *Naval Combat* (pp. 34-36) for more on this subject.

Chapter Two
Weapons and Armor

The history of low-tech warriors' gear isn't for the impatient. While punctuated occasionally by brilliance or disaster, incremental development was the norm, each "new" pattern an outgrowth of countless predecessors. Workaday considerations – notably durability – frequently overshadowed combat effectiveness as the gauge of failure or success. Thus, a ***GURPS*** campaign could be detailed, noting every dent and minute variation . . . laissez-faire, permitting the big, small, anachronistic, and ridiculous . . . or both! Doing this *right* demands many optional rules.

Weapon Design

Warriors aren't always satisfied with a basic selection of weapons. They may want to lengthen or shorten handles, add barbs and hooks, or tack on elements of other weapons. Even the most exhaustive weapon table is bound to miss *some* variations!

Realistic Weapons

It's rarely necessary to design a realistic weapon from scratch. Most weapons, even "exotic" ones, are simply modifications of basic patterns: swords, axes, polearms, etc. Generally, an exotic weapon is just a "normal" weapon type with a different name. For example, a *bisento* is a Japanese halberd, with standard halberd stats, while most swords amount to some form of shortsword, broadsword, or greatsword. A few weapons *are* different enough to require special treatment, though – typically because they've been repurposed or customized.

Repurposing Weapons

Weapons may be wholly redesigned rather than simply altered after the fact. The modifications below are so sweeping that, in general, they have to be done when the weapon is made. Unless otherwise specified, these options *aren't* available as "after-market" tweaks to existing weapons. To get them, buy a new weapon!

Falchion

This modification redesigns a sword or a knife into a heavier variant used primarily for cutting and chopping. The option is named for the shortsword version. Starting with a non-falchion blade of a given type, apply +1 to swing damage but -1 to thrust damage. Falchions of broadsword size or higher are *unbalanced;* add a U to their Parry stat. CF is +0.25. Weight is +50%. Find the weapon's new ST stat from its final weight (see *Determining Weapon ST,* pp. 15-16). *Applicability:* Knives; swords.

Armor-Piercing Weapons

Some weapons were devised specifically to penetrate heavy armor. The ability to pierce armor is a combination of design and construction – a compact penetrating tip, lacking edges, to focus the blow, and hardened steel to avoid shattering or bending on impact. Only steel can achieve this goal, making it a TL3 invention.

The following *optional* modifier makes it possible to forge and shape weapons as armor-piercers. If using it, *don't* use the estoc listed in ***GURPS Low-Tech.*** Instead, the term "estoc" describes any thrusting broadsword with this option.

Armor-Piercer: The weapon is optimized for penetrating armor. Its *impaling* attack gets -1 to basic damage but gains an armor divisor of (2). If it has multiple impaling attack modes, some or all of the heads may be so designed. Decide this when the weapon is forged; it doesn't affect cost. For swords and knives with this modification, change any cutting attack to crushing; other weapons are unaffected. CF is +3 for arrows, swords, knives, and other blades; +9 for all other weapons. No other stats change. *Applicability:* Melee or thrown weapons, or missiles, capable of impaling damage.

Long Handle

Any hafted or pole weapon can have a longer handle. This is most common on spears for massed battlefield use – simply use the stats for a long spear or a pike, as length dictates.

For longer polearms, an additional yard of length gives +1 to swing damage and +1 to Reach, but adds a turn of ready time after an attack. CF is +0.33. Weight is +33%. Base ST on the weapon's new weight (see *Determining Weapon ST,* pp. 15-16). *Applicability:* Polearms.

For longer axes and maces, an additional yard of length gives +1 to swing damage and +1 to Reach. A weapon that isn't already unbalanced gets a U on its Parry stat. CF is +0.5. Weight is +50%. Find ST from the new weight. *Applicability:* Axes; maces; picks.

A long handle *can* be retrofitted to existing weapon.

Short Handle

The three-yard polearms in the ***GURPS Basic Set*** are for formation fighting; such lengths are necessary to strike at a foe held at bay by pikes. Shorter versions are better-suited to self-defense. A historical example occurred during the Hundred Years War, when English longbowmen forced French knights to dismount and advance on foot. They shortened their lances so that they could fight as infantry.

Short polearms get -1 to swing damage and -1 to Reach (minimum Reach 1). Subtract a flat $20 from base cost and 2 lbs. from base weight. Find ST from the weapon's new weight (see *Determining Weapon ST,* pp. 15-16). They no longer become unready after a swing, and can parry on the same turn as a thrust (no U on Parry in that case). They still require two hands, and call for a Ready to adjust Reach. *Applicability:* Polearms with Reach 3+.

A short handle *can* be retrofitted to existing weapon. *Dueling* polearms are *already* shortened in this fashion and can't be shortened further!

Throwable

Melee weapons may be innately dual-purpose, and also balanced for throwing (e.g., javelin or mace); single-purpose (e.g., axe), but with a dual-purpose variant (in this case, the throwing axe); or exclusively single-purpose, with no throwable variant (e.g., swords and polearms).

A normally dual-purpose weapon can be balanced *only* for throwing. Subtract a flat $10 from base cost. It may lack a real handle and possibly *any* useful grip, like a cruciform throwing axe or a dedicated throwing knife. In melee, this gives -2 to skill. *Applicability:* Axes; knives.

A single-purpose melee weapon that's sometimes balanced for throwing can be had in its dual-purpose variant for an extra $10 to base cost; e.g., an axe costs $50, while a throwing axe is $60. Most such weapons already appear on weapon tables. Use this modifier for melee weapons that you know can be thrown but can't find listed as such. *Applicability:* Axes; knives; sticks.

In a fantasy or cinematic campaign, the GM may allow dual-purpose variants of melee weapons that are never balanced for throwing in reality! CF is +1 for swords, +9 for anything else. *Applicability: Any* weapon.

Training Weapons

Training weapons are blunted, less-rigid, padded, and/or made of softer materials. All modifications below are relative to a good-quality weapon.

Blunt: A cutting or cut-and-thrust weapon that isn't sharpened, but could be. Damage type becomes *crushing.* No other stats change.

Flexible: A thrusting-only weapon made whippy, with a button tip. Treat as a blunt that gets -2 to crushing damage. No other stats change.

Heavy Blunt: An overweight weapon – blunt and unable to take an edge, if bladed – designed to develop the muscles used to control it. Damage becomes *crushing,* at +1 for swings but -1 for thrusts. Base cost is 20% usual. Weight is +100%. Calculate its ST statistic from its new weight (see *Determining Weapon ST,* pp. 15-16). No other stats change.

Padded: A wooden weapon wrapped with cloth or other padding. Damage becomes *crushing,* at -2 for thrusts and -4 for swings. Base cost is 5% usual. No other stats change.

Ultra-Light: A light, flexible nonmetallic weapon for competition – usually aimed at an armored target to allow full-powered hits without injury. Damage becomes *crushing,* with an armor divisor of (0.5). Base cost is 5% usual. Weight is -40%. Calculate its ST statistic from its new weight (see *Determining Weapon ST,* pp. 15-16). No other stats change.

Wooden: A hard wooden version of a metal weapon. Damage becomes *crushing* but isn't reduced – such weapons are quite capable of beating someone to death or shattering bones. Sharp-tipped wooden weapons are possible; see *Weapon Composition* in ***GURPS Low-Tech.*** Base cost is 5-10% usual. No other stats change.

In the latter two cases, long weapons (other than spears) are difficult to balance for throwing. Anything with Reach 2+ suffers a penalty equal to (1 - maximum Reach) to ranged attacks, despite being modified for throwing; e.g., a greatsword (Reach 2) made throwable gives 1 - 2 = -1. The long handle modification gives an *extra* -1. For range, see *Throwing the Unthrowable* (p. 17). Making the weapon throwable reduces the -4 to hit given there to the above penalties, but doesn't improve range.

Customizing Weapons

Ingenious armorers have devised numerous small variations on hand-weapon designs. Polearms, especially, exist in almost unlimited variety! Some modifications are purely ornamental, and don't affect performance; their cost, if any, is up to the GM. The options below, however, *do* have combat effects. Where they alter weight, remember to consult *Determining Weapon ST* (pp. 15-16).

Axe Head

A swung, hafted weapon can have an axe head behind its striking head. This inflicts *cutting* damage. On a swung impaling weapon (e.g., pick), this is at +1 relative to its impaling attack. On a swung crushing weapon, this is at -1 with respect to its crushing attack. On an axe, simply use the listed damage for *either* head! An axe with two heads is "double-bitted."

The second head is mostly useful if the first one breaks; on a "broken weapon" result from a critical failure, only one blade breaks and the weapon can still be used. Turning it to use the backup head is a free action. Base cost is +$30. Weight is +1 lb. *Applicability:* Swung, hafted weapons.

Barbs

Harpoons and war arrows are normally barbed at no extra cost. Certain other impaling weapons can be *made* barbed. Such barbs are generally raked cut-outs, not extra bits that stick out and reduce penetration. They don't affect damage – but pulling the weapon out requires a ST roll and inflicts half the injury it caused going in, like a pick (see pp. B405-406). These rules don't apply when using the barbed weapon for a non-impaling attack (like the Tip Slash described in ***GURPS Low-Tech*** and ***Martial Arts***). Base cost is +$60. No effect on other stats. *Applicability:* Spears; polearms with spear points.

Butt Spike

Melee weapons with long shafts can have butt spikes. These come in two varieties. Either disrupts the weapon's balance for throwing: -2 to hit when hurling it.

The first version is a metal shoe that facilitates planting the shaft in the ground. When delivering a butt strike, treat the weapon as a quarterstaff; the spike doesn't do impaling damage, but does give +1 to crushing damage from a thrust. Base cost is +$10. No effect on other stats. *Applicability:* Spears; hafted weapons; polearms.

The second version is a small spear point, allowing a butt strike for impaling damage, at -1 relative to the weapon's usual thrusting damage. Base cost is +$20. No effect on other stats. *Applicability:* Spears; polearms.

For iron-shod staffs, see *Flanges, Spikes, or End Caps* (below).

Chain

A weapon with a thin cord can be made with a chain instead, removing the thin cord vulnerability; see *Breakage When Attacked* (p. 22). For a bolas made with weighted metal chains, stats are unchanged – metal is pricier and denser than cord and wood, but there's much less of it. For other weapons, base cost is +$20 and weight is +0.5 lb. *Applicability:* Bola perdida; bolas; nunchaku; thonged club.

Flanges, Spikes, or End Caps

Blunt, hafted weapons such as clubs, mauls, round maces, and sticks may be given flanges or multiple small spikes – in game terms, the two features are equivalent. These give +1 to crushing damage when swinging or thrusting. Base cost is +40%. No effect on other stats. *Applicability:* Hafted crushing weapons.

Most TL2+ maces, flails, and polearms with crushing attacks are *already* flanged or spiked. Unflanged versions of typically flanged weapons do -1 crushing damage. CF is -0.3. *Applicability:* Flails; maces other than round ones; morningstars; polearms.

Wooden staffs typically have end caps to increase striking damage. Weapon stats on tables *already* account for these. Staffs may lack these, for -1 to swinging and thrusting damage, -$5 base cost, and -1 lb. weight. *Applicability:* Staffs.

Hammer Head

A swung, hafted cutting or impaling weapon can have a hammer head behind its striking head. Damage is that of its usual swinging attack, but *crushing*. Base cost is +$25. Weight is +0.5 lb. *Applicability:* Swung, hafted cutting or impaling weapons.

Hook

A swung weapon – even a sword! – can have a small hook to enable the Hook technique (see ***GURPS Martial Arts***). Hooking inflicts thrust-2 cutting for a one-handed weapon, thrust-1 for a two-handed one. The hook can be blunt in order to snag victims without causing damage, but this is no cheaper. Base cost is +$25. No effect on other stats. *Applicability:* Swung weapons.

Kusari, Two-Yard

A weapon with Reach 1+ can have a short *kusari* (weighted chain) attached. Use the stats on p. B272, but Reach is only 1, 2*. It goes on the head or butt of an impact or pole weapon, on the pommel of a club or sword (to put it *inside* another weapon, see *Hidden Weapons* in ***GURPS Martial Arts***). The wielder may use his weapon normally or swing the chain using the Kusari skill. A butt- or pommel-mounted kusari makes the weapon two-handed, if it wasn't already; one hand controls the chain at all times. A head-mounted kusari may be used one-handed, but the wielder can use only the kusari *or* the base weapon at any given time – choose each turn. Base cost is +$40. Weight is +2.5 lbs. *Applicability:* Weapons with Reach 1+.

Kusari, Four-Yard

As above, but the kusari is full-sized (Reach 1-4*) and always used two-handed. Base cost is +$80. Weight is +5 lbs.

Pick

A swung, hafted crushing or cutting weapon can have a hardened spike at right angles to its haft. Damage is that of its usual swinging attack, but at -1 and *impaling*. Like any pick, it can get stuck (see p. B405). The weapon also gains the benefits of a hook. Base cost is +$50. Weight is +0.5 lb. *Applicability:* Swung, hafted crushing or cutting weapons.

Prongs

A non-Jitte/Sai weapon can have prongs added around the head (if a spear or hafted) or just above the handle (if a blade). It may have one large prong or two smaller ones; the effects are identical. Prongs give the wielder +2 in Quick Contests to disarm. There's no effect on the penalty to hit with a disarm attempt. On a spear, such prongs also prevent enemies from running themselves through to close with you (see *Holding a Foe at Bay* in ***GURPS Martial Arts***). Base cost is +$50. Weight is +0.5 lb. *Applicability:* Weapons not used with Jitte/Sai skill.

Sickle

A swung, hafted weapon can have a small sickle head. Damage is equivalent to that of its usual swinging attack, but at -1 and *cutting* or -2 and *impaling.* The weapon also gains the benefits of a hook. Base cost is +$30. Weight is +0.5 lb. *Applicability:* Swung, hafted weapons.

Spearhead

A hafted weapon can add a small spearhead or spike that does thrust+1 impaling one-handed, thrust+2 two-handed. Base cost is +$20. Weight is +0.5 lb. *Applicability:* Hafted weapons.

A *full-sized* spearhead does thrust+2 impaling one-handed, thrust+3 two-handed. Base cost is +$30. Weight is +1 lb. *Applicability:* Hafted weapons.

Some weapons – especially ceremonial polearms – have *very* long spikes. These add +1 to both minimum and maximum Reach for the thrust impaling attack *only.* Base cost is +$50. Weight is +0.5 lb. *Applicability:* Weapons that already have a thrust impaling attack – if necessary, because of an added spearhead.

Any additional spearhead – long or short – can be multi-tined. A forked or trident head is most common. Multiple tines make the weapon tip-heavy (-2 to hit) and easy to intercept (+1 to Block or Parry vs. thrusting attacks with the tined head), and distribute the force of impact (armor divisor (0.5)), but are tricky to evade (-1 to enemy's Dodge) and cause a nastier wound (+1 damage). For a *full-sized spearhead* or a *long spike,* tines also add a U to the weapon's Parry statistic. While tines mean more points, each spike is thinner; cost and weight are unchanged.

Hilts

A weapon's *hilt* serves mainly to protect the wielder's hands when parrying. Not all weapons have or need a hilt, however. An improvised weapon nearly always lacks one, as it wasn't designed for combat!

Hafted weapons, pole weapons, and sticks rarely have hilts. This is because uniformly solid construction and lack of a preferred parrying surface afford great flexibility when executing parries. The wielder can often parry in a way that puts his grip above the point of contact, causing his opponent's weapon to slide down and *away* from his hand, rather than toward it.

Edged weapons, by contrast, *usually* have hilts. Slender blades require a stiffer area near the grip to parry without breaking. A hilt provides a margin of error for parries so close to the hand, protecting the user's fingers. Exceptions are weapons like dedicated throwing knives, which lack hilts because they aren't meant to be used to defend.

GURPS Low-Tech and the ***Basic Set*** assume that a hilt is included on weapons that need one and absent on those that don't. The Parry statistics on weapon tables reflect this. Historically, though, traditionally hilted weapons were sometimes made hiltless, and vice versa. Thus, hilts offer yet another opportunity for customization. The rules for this are *optional,* intended for gamers who enjoy extra detail.

Adding a Hilt

A hilt on a weapon that normally lacks one gives +1 to Parry but -1 to Holdout. This also changes the weapon's balance; the user fights at -2 to skill until he has familiarized himself with the thing (see *Familiarity,* p. B169). CF is +0.25. Weight is +0.25 lb. *Applicability:* Hafted weapons (axes, flails, maces, etc.); polearms; sticks. Staffs *can* have hilts, but the reduced ability to move the hands around for better leverage and position offsets the +1 to Parry, resulting in an unchanged Parry statistic.

Removing a Hilt

Removing the hilt from a weapon that normally has one gives -1 to Parry but +1 to Holdout (hiltless weapons are easier to conceal!). CF is -0.25. Weight is -0.25 lb., except for weapons that weigh less than 1 lb., which don't change in weight because their hilts are too small to affect overall weight significantly. *Applicability:* Knives (but *not* dedicated throwing knives, which *already* lack a hilt); swords.

Basket Hilt

A *basket hilt* is a metal guard on a weapon's hilt that wraps around and protects the wielder's hand. The hand gets DR 4, cumulative with glove DR – although the hilt is too cramped for *metal* gauntlets. The guard also gives +1 to punching damage. The change in the weapon's balance and feel gives the user -2 to skill until he familiarizes himself it (see *Familiarity,* p. B169). CF for an enclosed hilt (hand DR always applies) is +0.25; weight is +0.25 lb. CF for an open-frame or partial basket hilt (DR applies on 1-3 on 1d) is still +0.25; however, weight is unchanged. Stats for weapons in ***GURPS Low-Tech*** that include a basket hilt already reflect this. *Applicability:* Anything with a hilt.

Combination Weapons

A warrior might want to enjoy the tactical benefits of several specialized melee weapons at once. The obvious solution is to carry a different weapon in each hand – but this is impractical when using a shield or a two-handed weapon. A workaround is to stick the useful part of one weapon onto another. ***GURPS Low-Tech*** describes a few such "combination weapons." For these and user-defined combinations alike, consult *Customizing Weapons* (pp. 13-15) for rules.

Determining Weapon ST

Many weapon customization options affect weight. This may alter the weapon's ST stat. Find its new ST using these rules (which can estimate ST for *any* hand weapon):

1. Apply weight modifiers to *base* weight. For example, a 6-lb. weapon with options that add +50% and +0.5 lb. weighs 6 + 3 + 0.5 = 9.5 lbs.

2. For a one-handed weapon, use full weight to find ST. For a two-handed weapon, use 2/3 of its weight. Treat lances as one-handed here.

3. Read ST from the *heaviest* applicable weight bracket on this table:

Effective Weight	*ST*	*Effective Weight*	*ST*
Less than 1 lb.	5	Less than 10 lbs.	13
Less than 2 lbs.	6	Less than 12 lbs.	14
Less than 3 lbs.	8	Less than 14 lbs.	15
Less than 4 lbs.	10	Less than 16 lbs.	16
Less than 6 lbs.	11	+2 lbs.	+1
Less than 8 lbs.	12		

Actual ST can vary by a point or so, depending on design details. Notably:

- Tip-heavy weapons held near the end, and balanced-but-long ones held near the end (including staffs wielded like swords), generally have a *higher* ST. For example, a mace weighs 5 lbs., which normally means ST 11; however, it's held at the end of the handle, its weight is concentrated at the far end, and it's unbalanced, for final ST 12. A greatsword (7 lbs.) is balanced but controlled using only one hand much of the time, so it has ST 12, not ST 11.
- Well-balanced weapons, blades, and those controlled close to the striking surface may have a *lower* ST.
- The ST stats for spears in ***GURPS Martial Arts*** and the ***Basic Set*** are averages of one- and two-handed figures. ***GURPS Low-Tech*** takes a more detailed approach, listing ST separately for one- and two-handed spear use.

Apply any difference between estimated ST and listed ST for the base weapon to its ST after modifications. For instance, since unmodified maces and greatswords have +1 to ST due to their design, modified ones should, too.

Example 1: Renos wants a pick on the peen of his axe, "Olga." An axe is $50 and 4 lbs., with ST 11. A pick adds $50 and 0.5 lbs. Thus, the axe-pick combination costs $100 and weighs 4.5 lbs; ST remains 11. Damage is swing+2 *cutting* with the axe head, swing+1 *impaling* with the pick.

Example 2: Boris wants a polearm with *everything.* He starts with a dueling halberd, which already has an axe head, a pick, and a spear point; that's $120 and 10 lbs., with ST 12. He adds barbs to the spear point (+$60), a butt spike (a small spearhead doing thrust+2 *impaling;* +$20), a hook (+$25), and a four-yard kusari on the head (+$80, +5 lbs.). This resulting monstrosity costs $305 and weighs 15 lbs. Minimum ST rises to 14. It's an unwieldy weapon, but its many options make Boris happy!

Cinematic Weapons

Fantasy games and sword-and-sorcery movies feature many weapons that are highly improbable – or at least unlikely to be effective without choreographed fights and CGI. Physics and biomechanics go right out the window, as performance has little to do with apparent materials and design, or with the user's size and strength. In short, cinematic weapons are often totally unrealistic!

What matters in ***GURPS*** are the answers to "What skill does it use?" and "What are its combat stats?" In a highly cinematic campaign, the GM can *assign* whatever stats he deems fit.

Cool Ethnic Weapons and Armor

Thanks to hyperbolic descriptions by travelers, national pride, and an echo chamber of inflated claims, a region or culture's trademark weapons or armor might be held in special esteem, their reputation for effectiveness outstripping provable fact. The GM may wish to make some such exaggerations *true* in his campaign. The simplest method is to declare certain items *fine* quality at *good*-quality prices. *Very fine* versions shouldn't be any cheaper. *Good* and *cheap* specimens ought to be rare – this stuff is *cool,* after all!

A more detailed approach is to invent "cool ethnic" modifiers for such gear. These *aren't* realistic! They typically apply to a specific class of equipment (e.g., fencing weapons, wavy-bladed swords and knives, or plate armor) or to one particular item (e.g., katana or lorica segmentata).

Cool Ethnic Weapon: The weapon gets +1 to hit and to damage, and has +1 HT and double HP relative to other weapons of the same materials and weight. This is cumulative with all other quality, material, and weapon modifiers. The weapon is simply *better.* Cost is typically unchanged, but such weapons may be in great demand! Weight is unaffected.

Cool Ethnic Armor: The armor gets +1 DR, weighs 20% less, and has double HP relative to other armor of the same materials and weight. Moreover, the wearer suffers no extra fatigue penalties in hot weather. This armor modifier can "stack" with others. Cost is unchanged.

Overrated Weapons and Armor

Other weapons and armor might be deemed *less* effective than construction and usage suggest. Again, this is largely due to hyperbole; appropriate skepticism about a "cool" item may give rise to overly critical assessments. For instance, advocates of a given design might imply that competing patterns from other cultures are markedly inferior. This phenomenon is hardly new – English weapon master George Silver railed against the Italian rapier, deeming it inferior to English swords!

If the GM wants the rumors to be true, the simplest approach is to consider such goods *cheap* quality at *good*-quality prices. *Fine* and *very fine* examples should be very rare.

A more detailed method is to use specialized modifiers:

Overrated Weapon: The weapon gets -1 to hit and to damage, and has -1 HT and half HP relative to other weapons of the same materials and weight. Cost is typically unchanged – proponents may not realize the inferiority of their chosen instrument. Weight doesn't change.

Overrated Armor: The armor has -1 DR, weighs 20% more, and has half HP. Cost is unaffected.

Realistically, a giant sword would require enormous strength – but cinematically, a petite schoolgirl could use it. Conversely, a tiny weapon might cause tremendous damage, despite being flimsy and easy to use.

Some broad guidelines:

Name: Usually something that sounds cool, alien, foreign, or exotic – but rarely a simple description. "Two swords connected by a chain" is okay. "Sword-chucks" is *much* better!

Skill: Use the skill for the nearest realistic weapon. "Double" weapons require two-handed skills (e.g., a double Axe/Mace weapon uses Two-Handed Axe/Mace) or Staff. "Combination" weapons use either the hardest skill for any constituent part or *several* skills.

TL: This is often based on appearances, not on the technology required to build the thing in the real world. Realistically, an axe with a rotating head might call for TL5+ ball bearings and screws. Cinematically, it could appear in a TL3 sword-and-sorcery setting!

Damage: Choose this by matching the cinematic weapon to a similar-looking realistic one and then adjusting up or down. A simple-but-effective way to handle this is to assess +1 to damage per modifying word. For instance, a kusari does swing+2 crushing damage, but a *spiked, extra-heavy* kusari might get swing+4 crushing. A modifying word can change damage type instead of or as well as amount; e.g., a light club does swing+1 crushing, but a *spiked* light club inflicts swing+1 *impaling*.

Reach: Assign Reach to reflect the weapon's physical appearance. A weapon might be Reach 1-10 if it has a long line or chain attached . . . but a short knife should probably remain Reach C.

Parry: Cinematic weapons seem to parry well despite outlandish designs, although a few are conspicuously unwieldy and difficult to use. Most get Parry 0, but truly ungainly ones have Parry 0U. Flexible and chain weapons are *generally* Parry -2U, but this won't always be the case for those inspired by video games!

Cost: Cinematic weapons are often unique, making them effectively priceless. To buy them as Signature Gear or modify them for quality, however, a cost is needed. Start with the nearest real-world weapon. For a monstrosity with features of several weapons, base cost is that of the *most expensive* item. For a "double" or "combination" weapon, it's the *sum* of their costs. To this base, apply +1 CF per +1 to damage, Reach, and/or Parry, and per unique capacity (different damage type, disregarding ST requirements, etc.).

Weight: Assign as needed. Many cinematic weapons *look* large and ponderous, yet don't seem to encumber their wielders! As with cost, the GM can choose a weight based on the nearest realistic weapon, *summing* weights for "double" or "combination" designs.

ST: Many cinematic weapons seem heavier and harder to wield than their size would suggest, and thus have high ST. Others are suspiciously light and easy to wield, with low ST. Start by estimating ST from weight using *Determining Weapon ST* (pp. 15-16), and then modify this up or down as suits the archetype. Remember that effective ST for damage purposes can't exceed triple the ST stat, so don't drop ST too low for a weapon intended for very strong fighters! The ST range for cinematic weapons should generally center on 10.

Notes: Assign special rules and effects as needed. These need not reflect physical characteristics; e.g., one weapon may be capable of binding, yet lack prongs or a hilt, while another has these features but lacks binding ability. *All* cinematic weapons are in the running for an intrinsic penalty to hit, requiring the Exotic Weapon Training perk from ***GURPS Martial Arts*** to wield properly!

Throwing the Unthrowable

The table below gives the skill used to hurl a weapon not built for throwing. Such attacks have an extra -4 to hit; the GM may let warriors improve this as a Hard technique. Damage is the weapon's usual thrusting or swinging damage – consult the "Attack" column to learn which. Those who know Throwing Art may use that skill instead, at *no* penalty, and get its usual damage bonus. In all cases, Acc is 0; Range is ×0.5/×1 for weapons up to 4 lbs., ×0.2/×0.5 for heavier ones; RoF is 1; Shots is T(1); ST is unchanged; and Bulk is the weapon's Holdout penalty (p. B200).

Throwing Skill	*Melee Weapon Types*	*Attack*
Bolas	Flail, Kusari, Two-Handed Flail	Swing
DX	Swords*	Thrust
Thrown Weapon (Axe/Mace)	Axe/Mace, Two-Handed Axe/Mace	Swing
Thrown Weapon (Disc)	Shield	Thrust
Thrown Weapon (Knife)	Jitte/Sai, Knife, Main-Gauche	Thrust
Thrown Weapon (Spear)	Polearm, Spear, Staff	Thrust
Thrown Weapon (Stick)	Sticks†	Swing

* *Blades* wielded with Broadsword, Rapier, Saber, Shortsword, Smallsword, or Two-Handed Sword, hurled point-first. If the GM permits Thrown Weapon (Sword), use it at no penalty – not DX at -4.

† *Sticks* wielded with the sword skills listed above use Thrown Weapon (Stick) at -4 and inflict swinging damage.

Example Cinematic Weapons

Here are a few ready-made cinematic weapons. *All* downplay the potential downsides or likely consequences of using them in a realistic situation!

Barbed Chain

Common in fantasy art, this is a kusari adorned with sharp edges and nasty spikes and barbs. Use normal kusari stats, except that the barbs give +1 to crushing damage. They also significantly reduce the chance that someone who's entangled (see *Whips,* p. B406) will escape: escape rolls have an extra -2. The many sharp bits are somewhat dangerous to the user – any critical miss means 1d-2 cutting damage to his hands! Cost is *double* that of a similar-length kusari. Other stats are unchanged.

Bladed Flails

What's better than a flail? Why, a flail with heavy, saw-blade-shaped heads! It does *cutting* damage instead of crushing damage, but is otherwise identical to a normal flail. Cost is $120 for a morningstar, $150 for a flail.

Double Crossbow

Sure, repeating crossbows allow rapid fire, but they sacrifice range and accuracy. The double crossbow gives crossbow-toting heroes the best of both worlds. Some models use side-by-side action, but this one has two crossbows bolted together – just flip it over (a free action) to switch to the second crossbow. Ingenious design keeps the loaded bolts from simply falling off. In effect, this gives Shots 2(4i). The standard double crossbow is $600, 10 lbs.; a double *composite* crossbow is $3,800, 11 lbs. Other stats are unchanged.

Double-Ended Sword

This weapon consists of two broadsword-length blades joined hilt-to-hilt by an extra-long handle. Use Staff or Two-Handed Sword to wield it. It functions as a quarterstaff that does *cutting* damage on swung attacks and *impaling* damage on thrusting attacks. Either blade can strike, or both can be used to "cross-check" adjacent opponents – treat as a Dual-Weapon Attack for full cutting damage. $1,500, 10 lbs., ST 12.

Double-Headed Axe

This is a double-bitted great axe with an *extra* double-bitted head at the other end of the haft. Surprisingly, the extra weight makes it *easier* to handle; used with Staff or Two-Handed Axe/Mace, it has Parry +2 instead of 0U! Like the double-ended sword, it can "cross-check" for full cutting damage. $500, 12 lbs, ST 13.

Spiky Bits

Fantasy art often depicts warriors clad in spiked or studded armor. How realistic is this? Read on . . .

Spiked Plate

Historical warriors didn't use spiked plate armor. Some *legendary* ones seem to have fancied it, however. Lord More of More Hall wore it when he defeated the Dragon of Wantley; Sir Peter Loschy fought a worm while clad in it; and Sir John Lambton reputedly donned spiked plate to battle the Lambton Worm.

Treat spiked plate armor as the equivalent of Short Spines (p. B88). It also makes the wearer's unarmed attacks hurt more. Strikes with a body part clad in spiked plate get an extra +1 to damage: gauntlets normally give +1 to punching damage, but this rises to +2 when spiked (such short knuckle-spikes are called *gadlings*); spiked knee guards grant +1 to knee-strike damage; and so on. All damage from these attacks remains *crushing* – the spikes aren't long enough to impale.

Spiked plate has drawbacks, though. The spikes negate one of plate armor's primary advantages – its ability to deflect attacks – giving spiked armor -1 DR. Spikes can't be combined with fluting (see ***GURPS Low Tech***), either. Spiked armor is also awkward, snagging backpacks, making it difficult to sit, attracting fallen leaves and debris, tearing clothing, and injuring people who venture too close (avoid crowds!). The GM should use the Klutz disadvantage (p. B141) for inspiration.

Spiked plate is best worn in close combat (perhaps in an arena), or against creatures that use unarmed attacks. In a normal melee, it's more hazardous to the wearer and his allies than to the enemy.

Only plate armor may have spikes. CF is +2.

Studded Armor

Studded leather and cloth armor – while common in fantasy – never actually existed. Adding studs or rivets doesn't enhance DR. It might even *reduce* DR, given that blows are less likely to be deflected! Historically, studs were used for decoration, as rivets to join together sections of fabric, and to attach metal plates for reinforcement. It's easy to mistake a coat of plates or brigandine for studded armor, though, since the metal plates are concealed under the material and only the rivets are visible.

However, studding could be added to a glove or an elbow to increase damage from unarmed attacks. This gives +1 to damage when striking with that body part. CF is +1. Weight is +20%.

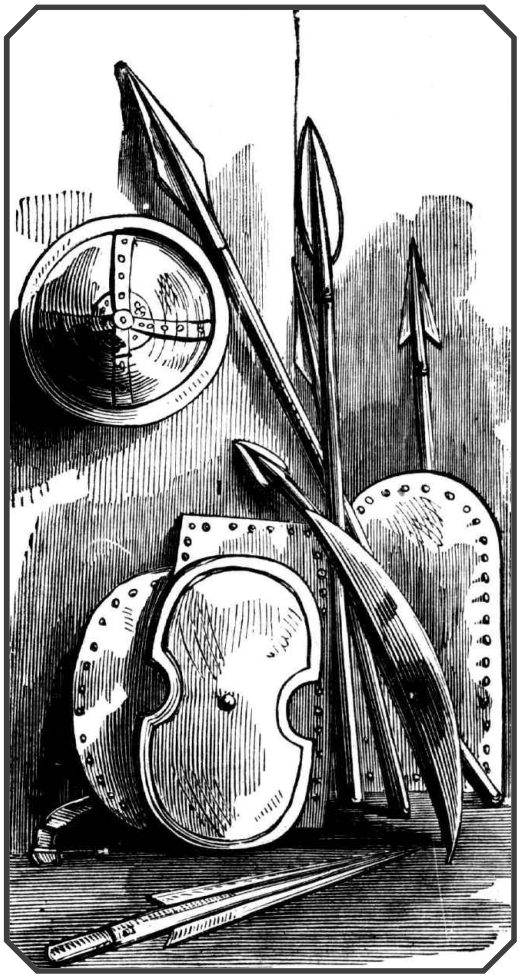
Shield Options

Shields are as valuable in combat – and as customizable – as weapons . . . sometimes more so. These rules add a *lot* of complexity for shields. The GM decides which options apply in his campaign.

Fighting With Shields

Shields are used actively to block (see *Blocking,* p. B375), add their Defense Bonus (DB) to *all* active defense rolls (Block, Dodge, and Parry), and can provide limited cover against firearms (see *Cover,* p. B407). But they aren't limited to defense – they can also be part of a highly aggressive offensive system that involves far more than bashes and rushes (see *Shields,* p. B406), and crushing the occasional swarm (see *Swarm Attacks,* p. B461). Some even have blades or spikes to inflict additional damage (see *Customizing Shields,* pp. 19-20).

Below are several optional rules for shield use. ***GURPS Martial Arts*** offers more; see *Shield-Wall Training* (***Martial Arts,*** p. 51), *Shoves with Weapons* and *Striking at Shields* (***Martial Arts,*** p. 112), and *Multiple Blocks* (***Martial Arts,*** p. 123).



Awkward Shields

The ***Basic Set*** gives -2 to attack rolls when wielding a large shield (p. B547), but *all* shields limit one's options with weapons. Optionally, apply an attack penalty equal to the shield's DB. Thus, small shields give -1 to hit with weapons; medium ones, -2; and large ones, -3. The Shield-Wall Training perk in ***GURPS Martial Arts*** negates this drawback. In close combat, this penalty affects *all* DX rolls (see *Shields in Close Combat,* p. B392).

Advanced Guige Use

The GM may wish to use a more complex set of rules for shields controlled with a *guige* (neck strap):

No Hands: You can block using a guige, but this requires a new specialty, Shield (Guige), that defaults to other specialties at -2. Blocks using only the neck strap for control are at -3.

Grabbing Hold: If you have a free hand, you can grab the shield for better control; this takes a Ready maneuver. After that, you can block at *no* penalty, but your hand is occupied. If your shield has alternate grips (see below), use the Shield specialty – and any penalties – for whatever grip you're currently holding it in. Changing grips requires a number of Ready maneuvers equal to DB.

Ungainly: The shield hangs over one side of your torso, preventing you from using your arms in that direction. Specify what side it's on when you ready it. You can wield one or even two one-handed weapons, or a two-handed weapon, to the *other* side – but these can't parry attacks from your shield side (see *Defending Against Attacks from the Side,* p. B390) or make wild swings to that side (see *Wild Swings,* p. B388). Changing sides requires a Ready maneuver.

Shield-Hand Weapons

It's possible to hold another item – e.g., a dagger, a pair of javelins, a bow, or a torch – in a hand that's gripping a shield of *any* size. Such articles aren't considered ready.

With a *small* (DB 1) shield or buckler, you may opt to hold *both* articles ready for *all* purposes. You can even attack using a weapon held ready this way – just like the Persian archers who fired a bow with a small shield strapped to the forearm, or Scots warriors who attacked with a dirk grasped in the same hand as their buckler. Weapon and Shield skills are at -2 for doing two things at once; weapon attacks suffer the usual off-hand penalties, too. Alternatively, you can hold the weapon unready in your shield hand, in which case you can't use it but have no Shield penalty.

Shield Damage

Shields get damaged during combat; see *Damage to Shields* (p. B484). Sometimes, they're struck deliberately! (Rules for attacking shields appear in ***GURPS Martial Arts.***) Many historical designs couldn't withstand more than a few solid blows.

Heavy, close-grained timber (e.g., oak or linden) is preferred for shields. Metal-wood-hide composite shields have DR 4. Some shield designs are much lighter: stretched hide, wicker, bark, bamboo, turtle-shell, etc. These are easier to lug around but have only DR 2. Blows that penetrate a shield's DR damage its Hit Points.

Use the *Object Hit Points Table* (p. B558) to find shield HP. Shields are considered Homogenous. Note that a *buckler* damaged to the point where it has no HP left may still be used as a dueling buckler with DB 0 (see ***GURPS Low-Tech***).

Light Shields: Lighter timber – like spruce or pine – results in less weight but makes the shield easier to damage. This was typical of Viking shields. *Halve* DR and weight, and adjust HP to match. This option should only be available if using *Damage to Shields* (p. B484). CF is -0.25.

Tough Shields: A shield can be built from layers of wood – like plywood – or from exotic timber, and reinforced for the rigors of combat. Roman shields (see ***GURPS Low Tech***) were routinely constructed this way. Such a shield has +20% to HP and counts as *fine* quality, where important. CF is +1.

Metallic Shields: It's possible to make a shield from a solid metal plate! Historically, this was rare except for small shields (DB 1). A metallic version of a shield has its usual DR and HP, yet weight is -25%. CF is +4.

Customizing Shields

Like weapons, shields can be customized. While a shield aids defense above all, some of these options improve offensive capabilities. To modify *materials,* see *Shield Damage* (above).

Alternate Grips

A shield normally has only one type of grip. You can add a second style, enabling you to wield the same shield with Shield *or* Shield (Buckler). You can even switch between these two grips in combat; this takes a number of Ready maneuvers equal to DB, and the rules to ready that style of grip apply. Base cost is +$20. Weight is +2 lbs.

Blades

Some small bucklers (e.g., the Indian *madu*) have one or two knife blades attached to the grip. Attacks with these are somewhat more effective than blows struck with a knife held in the shield hand – a buckler with fixed blades gives only -1 to Knife and Shield (Buckler), not the -2 under *Shield-Hand Weapons* (p. 19). However, critical failure on a block means the wielder jabs himself with his blade; it inflicts its usual impaling damage on a random hit location. Cost and weight are simply those of the chosen knives.

> *Presently he held before him the perfect circle of his shield, a lovely thing of beaten bronze, which the bronze-smith hammered out for him, and on the inward side had stitched ox-hides in close folds with golden staples clean round the circle.*
>
> *– Homer,* ***The Iliad***

Boss

The standard shield boss is *domed* in shape. All of the shields in ***GURPS Low-Tech*** include such a boss, but this can be omitted. A shield without a boss gets -1 to shield-bash damage. Base cost is -$25. Weight is -2 lbs. If cost would be $0 or less, or weight would be 0 lbs. or less, then the shield in question is nothing *but* boss and can't use this modifier.

One can replace a domed boss with a *conical* one. The point gives +1 to crushing damage in a shield bash (p. B273). Base cost is +$50. Weight is +3 lbs. Adjust HP to match the new weight.

Finally, a shield can have a *long spike.* This, too, gives +1 to shield-bash damage; it also makes the attack *impaling.* It costs and weighs as much as a conical boss (above), but can get stuck like a pick (p. B405). It's also damage-prone. Roll 1d after every block attempt; on a 1, the spike breaks off!

Disarming Spikes

This option adds two or more short spikes to the shield's rim to help catch weapons. On the turn after a successful block, the wielder may attempt to disarm his attacker at +1. Critical failure on a block means that a spike stabs the *wielder:* 1d-3 impaling damage to a random hit location. Base cost is +$30. Weight is +1 lb. (this *doesn't* increase HP).

Guige

A neck strap is a very common shield attachment. It takes some of the shield's weight off the arm while wielding it, and enables the owner to sling his shield on his back when not using it. As long as the shield is slung on the body, the guige lets the carrier apply his shield's DB to defense rolls against attacks on the covered hit location. For other rules, see *Advanced Guige Use* (p. 19). All shields with DB 2+ have a guige factored into cost and weight, but it's possible to have a shield without one. Base cost is -$10. Weight is -1 lb. (this *doesn't* reduce HP).

Lance Cutout

This is a scallop cut into a top corner of a shield. It grants +1 to Lance skill, *not* cumulative with the bonus for a lance-rest (see ***GURPS Low-Tech***). It's normally used only in tournaments. Base cost is +$30. Other stats are unchanged.

Lantern Hook

A hook attached to the center of a shield for hanging a lantern! Base cost is +$20. Weight is +0.5 lb. (this *doesn't* increase HP).

Rim Blade

A shield that's metal-rimmed or made entirely of metal can have the edge sharpened into a blade. This allows an attack for swing-2 *cutting* damage. Usually, only part of the rim is sharpened, to reduce the chance of self-inflicted injury – but that can still happen! Critical failure on a block means the wielder is cut for *half* damage to a random hit location. CF is +0.5. Other stats are unchanged.

Scaling Weapons and Armor

Not every fighter is the size of a typical adult human. Especially in fantasy, giant and tiny warriors need weapons and armor in their size. *Anime*-inspired fantasy often features massive weapons in the hands of petite masters. Oversized and undersized gear also has a place in realistic games: a young prince might require a child-sized sword or mail shirt, while *huge* ceremonial swords and maces are common real-world ritual implements.

Scaling Weapons

These rules are designed to provide giant- or pixie-sized fighters with oversized or undersized weapons – *not* for realism. They scale weapons to the ST required to wield them rather than to length. Select a weapon from a weapon table and follow these steps to scale it:

1. Choose the intended user's SM and consult the relevant line of the *Weapon and Armor Scaling Table* (below).

2. If the weapon's damage bonus is +1 or more, *multiply* it by the factor in the "Damage (+1 or more)" column; round fractions of 0.5 or more *up,* but drop smaller fractions. If the weapon has no bonus, or a damage penalty, *add* the number in the "Damage (0 or less)" column instead.

3. Multiply the weapon's ST stat by the factor in the "Damage (+1 or more)" column, rounding any fraction *up* to the next-highest whole-numbered ST.

4. Multiply weight and base cost by the factor in the "Weight" column.

5. Multiply the weapon's Reach by the factor in the "Reach" column, treating C as 0.5. If the result is 1 or more, round fractions of 0.5 or more *up,* but drop smaller fractions; if it's greater than 0.5 but less than 1, round to 1; and if it's 0.5 or less, treat it as C. For a range of Reach values, do this for both endpoints.

Under the Hood: Weapon and Armor Scaling Table

The *Weapon and Armor Scaling Table* takes the ST typical of someone of the chosen SM and scales the weight of gear to his BL, so that it encumbers him to the same extent that the regular-sized version does someone with SM 0. While not completely realistic, this accommodates fantasy nicely. The math:

- *SM* determines height via the *Size Modifier Table* (p. B19).
- *Typical User Strength* is 5 × (height in yards), rounded up.
- *Damage (+1 or more)* factor is Typical User Strength/10.
- *Damage (0 or less)* is chosen to smooth out the progression.
- *Weight* factor is the *square* of (Typical User Strength/10).
- *Reach* factor is the *cube root* of the Weight factor.

Armor is assumed to have the same thickness regardless of SM.

Using Oversized or Undersized Weapons

Anyone can use a weapon if he meets its ST requirement, regardless of SM. If it's for a SM different from his own, though, its grips may be too narrow or too fat for comfort – and if the weapon is for someone of bigger, its length will be awkward, too. Apply a skill penalty equal to the SM difference.

Specially fitted grips can remove the skill penalty for a one-point SM difference, but not for a larger disparity. CF is +0.5.

Example 1: Thrusting greatsword stats are swing+3 cutting or thrust+3 impaling; Reach 1, 2; $900; 7 lbs.; and ST 12. Consulting the table, we learn that scaling to SM +1 gives a damage multiplier of 1.5, for swing+5 cutting, thrust+5 impaling, and ST 18. The weight multiplier is 2.25, for $2,025 and weight 15.75 lbs. The Reach multiplier is 1.3, for minimum Reach 1.3 and maximum Reach 2.6, rounded to Reach 1-3. Special grips to allow use by a strong SM 0 wielder would raise cost to $3,037.50!

Example 2: For an SM +4 greatsword, suitable for giants or ceremonial display, the table gives damage ×5, weight ×25, and Reach ×2.9. Stats thus become swing+15 cutting or thrust+15 impaling; Reach 3-6; $22,500; 175 lbs.; and ST 60.

Example 3: A greatsword scaled to SM -2 will be lighter and smaller. The table gives damage ×0.5, weight ×0.25, and Reach ×0.6. Stats are thus swing+2 cutting or thrust+2 impaling; Reach 1; $225; 1.75 lbs.; and ST 6.

Example 4: Large knife stats are swing-2 cutting at Reach C, 1 or thrust impaling at Reach C; $40; 1 lb.; and ST 6. Scaled to SM +2, stats become swing-1 cutting at Reach 1, 2 or thrust+1 impaling at Reach 1; $250; 6.25 lbs.; and ST 15.

Scaling Armor

Select the SM 0 armor you want to scale and follow these steps:

1. Choose the intended user's SM and consult the relevant line of the *Weapon and Armor Scaling Table* (below).

2. Multiply weight and base cost by the factor in "Weight" column.

DR is unchanged. For armor of different *thickness,* see *Heavy Plate* in ***GURPS Low-Tech.***

Weapon and Armor Scaling Table

SM	*Typical User ST*	*Damage (+1 or more)*	*Damage (0 or less)*	*Weight*	*Reach*
-6	1	0.1	-1	0.01	0.2
-5	2	0.2	-1	0.04	0.3
-4	3	0.3	-1	0.09	0.4
-3	4	0.4	-1	0.16	0.5
-2	5	0.5	0	0.25	0.6
-1	8	0.8	0	0.64	0.9
0	10	1	0	1	1
+1	15	1.5	+1	2.25	1.3
+2	25	2.5	+1	6.25	1.8
+3	35	3.5	+2	12.25	2.3
+4	50	5	+3	25	2.9
+5	75	7.5	+4	56.25	3.8
+6	100	10	+5	100	4.6

Damage to Weapons and Armor

Realistically, combat is hard on weapons and armor. However, tracking damage to gear adds significant recordkeeping. Some gamers may find this worthwhile, though – it makes fights more realistic, lets fighters win battles nonlethally by targeting equipment, and allows fantasy warriors to defeat fast-healing foes by first reducing the effectiveness of their armor.

Damage to Weapons

Weapons not only deal damage but *take* it. The ***Basic Set*** offers three roads to broken weapons:

1. Parrying a heavy weapon (p. B376).
2. A deliberate attack on your weapon (pp. B400, B483).
3. Critical failure on your attack or parry – or critical success on your target's defense – yielding a "weapon breaks" result on the *Critical Miss Table* (p. B556).

Below are optional rules that apply when a weapon is attacked – and that introduce the possibility of weapon breakage on a *successful* attack!

Breakage When Attacked

Use the rules on pp. B400, B483 when a weapon is attacked deliberately, but consult *Weapon DR and HP* (pp. 23-24) for specific weapon stats, and apply these additions:

Thin Cord: Some weapons – including bows, nets, nunchaku, and slings – have thin cords. Severing such a cord renders the weapon useless. Only a *cutting* attack can target a thin cord, at an *additional* -3 to hit over and above the usual penalty to hit the weapon (-3 to -5, depending on size). The cord has DR 1. *Triple* cutting damage that penetrates this DR to determine injury. Subtract injury from the weapon's HP normally.

Chain: Chain weapons are less vulnerable to breakage. A weapon-quality chain is as strong as any sword or axe head. Moreover, it's *flexible,* making it very hard to damage. Like a cord, a chain can be targeted deliberately at an extra -3. Use the weapon's *full* DR and HP, and treat the chain as Diffuse – not Homogenous.

Breaking Weapons on an Attack

A relatively flimsy weapon can break if used to strike a hard target. *Any* weapon may shatter from the force of striking if used with a ST that greatly exceeds its ST stat. These rules are *highly optional* – in particular, such detail would suit few cinematic campaigns (but see *Quick and Dirty Weapon Damage,* below).

When striking a target that has non-flexible DR 3+, a weapon used with ST that's at least *double* its ST stat has a 2 in 6 chance of breaking; that is, it breaks on a roll of 1-2 on 1d. Add +1 to these odds per additional whole-numbered ST multiple: 3 in 6 at 3×ST, 4 in 6 at 4×ST, and so on. The weapon's quality also modifies the odds: +2 if cheap, -1 if fine, or -2 if very fine.

> *And when the last arrow*
> *Was fitted and was flown,*
> *When the broken shield was hung on the breast,*
> *And the hopeless lance was laid in rest,*
> *And the hopeless horn blown,*
> *The King looked up . . .*
>
> *– Gilbert Keith Chesterton,*
> *"The Ballad of the White Horse"*

Optionally, a low-quality weapon may break against non-flexible DR 3+ when used with ST that's at least *equal* to its ST stat! Base odds are 0 in 6. Thus, a cheap weapon has a 2 in 6 chance of breaking, while a good or better one won't break.

When a weapon breaks under these rules, the attack that broke it still counts *unless* the odds of breakage exceeded 6 in 6. In that case, the weapon broke before inflicting any damage.

In all cases, consult *Broken Weapons* (p. B485) to learn what happens to the weapon afterward.

Quick and Dirty Weapon Damage

For a *faster*-paced version of weapon breakage, use these simplified rules:

Breakage on a Parry: Use the rules on p. B376 but ignore weight multiples. A weapon that parries a weapon three or more times its weight has a 2 in 6 chance of breakage, modified for quality. Don't worry about multipliers past this point. Any weapon that breaks on a parry is useless, but the parry still counts.

Breakage When Attacked: Any attack on a weapon may break it. Don't bother tracking accumulated HP of damage. If an attack exceeds the weapon's DR, roll vs. the weapon's HT. Success means it isn't broken. Failure means it breaks and is useless.

Breaking Weapons on an Attack: Good or better quality weapons don't break when used to attack, barring an unlucky result on the *Critical Miss Table.* Cheap weapons used against DR 3+ have a flat 2 in 6 chance of breaking.

Weapon DR and HP

This table provides information needed to assess breakage for low-tech melee and missile weapons.

Weapon: The weapon's name.

Material: The weapon's composition: *Wood, Metal, Wood/Metal* (a combination of the two), or *Cloth/Leather* (textile). This determines DR.

DR: The weapon's Damage Resistance.

HP: The weapon's Hit Points.

Notes: Applicable special rules listed after the table.

Weapon	*Material*	*DR*	*HP*	*Notes*
Blades				
Backsword	Metal	6	11	
Balisong	Metal	3	6	[1]
Bastard Sword	Metal	6	13	
Bladed Hand	Metal	3	8	[1]
Broadsword	Metal	6	11	
Cavalry Saber	Metal	6	11	
Cutlass	Metal	6	10	
Dagger	Metal	3	5	[1]
Dao	Metal	6	13	
Deer Antlers	Metal	6	9	
Dress Smallsword	Metal	6	8	
Edged Rapier	Metal	6	11	
Estoc	Metal	6	11	
Falchion	Metal	6	11	
Greatsword	Metal	6	15	
Hook Sword	Metal	6	11	
Jian	Metal	6	11	
Katana	Metal	6	13	
Katar	Metal	6	8	
Knife-Wheel	Metal	6	9	
Kukri	Metal	6	9	
Large Falchion	Metal	6	13	
Large Katar	Metal	6	10	
Large Knife	Metal	6	8	
Large Quadrens	Metal	6	11	
Large Throwing Knife	Metal	6	8	
Late Katana	Metal	6	11	
Light Edged Rapier	Metal	6	10	
Light Rapier	Metal	6	10	
Long Knife	Metal	6	9	
Longsword	Metal	6	12	
Macuahuilzoctli	Wood	2	10	[2]
Macuahuitl	Wood	2	11	[2]
Main-Gauche	Metal	6	8	
Pata	Metal	6	12	
Qian Kun Ri Yue Dao	Metal	6	11	
Quadrens	Metal	6	10	
Rapier	Metal	6	11	
Rondel Dagger	Metal	6	8	
Saber	Metal	6	10	
Sai	Metal	6	9	
Shortsword	Metal	6	10	
Shotel	Metal	6	11	
Slashing Wheel	Metal	3	8	[1]
Small Falchion	Metal	6	10	
Small Knife	Metal	4	6	[1]
Small Throwing Knife	Metal	4	6	[1]
Smallsword	Metal	6	9	
Stiletto	Metal	3	5	[1]
Thrusting Bastard Sword	Metal	6	13	
Thrusting Broadsword	Metal	6	11	
Thrusting Greatsword	Metal	6	15	
Two-Handed Macuahuitl	Wood	2	13	[2]
Flexible Weapons				
Chain Whip	Metal	6	11	[3]
Flail	Wood/Metal	4	16	[3]
Heavy Cloak	Cloth/Leather	1	13	
Kusari	Metal	6	13	[3]
Kusarigama	Metal	6	13	[3]
Kusarijutte	Metal	6	12	[3]
Large Net	Cloth/Leather	1	21	[4]
Lariat	Cloth/Leather	1	11	[4]
Light Cloak	Cloth/Leather	1	10	
Light Whip	Cloth/Leather	1	6	
Melee Net	Cloth/Leather	1	13	[4]
Morningstar	Wood/Metal	4	14	[3]
Nunchaku	Wood/Metal	4	10	[4]
Rope Dart	Cloth/Leather	1	6	[4]
Thonged Club	Wood	2	6	[4]
Three-Part Staff	Wood/Metal	4	13	[3]
Urumi	Metal	6	12	
Weighted Scarf	Cloth/Leather	1	8	[4]
Whip	Cloth/Leather	1	10	
Impact Weapons				
Axe	Wood/Metal	4	12	
Blackjack	Cloth/Leather	1	8	
Brass Knuckles	Metal	3	5	[1]
Cestus	Cloth/Leather	1	8	
Combat Fan	Metal	3	8	[1]
Gada	Wood/Metal	4	19	
Great Axe	Wood/Metal	4	16	
Hatchet	Wood/Metal	4	10	
Hungamunga	Wood/Metal	4	8	
Jutte	Metal	6	8	
Khopesh	Metal	6	11	
Knobbed Club	Wood	2	10	
Large Hungamunga	Wood/Metal	4	12	
Long Axe	Wood/Metal	4	14	
Mace	Wood/Metal	4	13	
Maul	Wood/Metal	4	18	
Myrmex	Cloth/Leather	1	5	
Pick	Metal	6	11	
Round Mace	Wood/Metal	4	13	
Scythe	Wood/Metal	4	13	
Sickle	Metal	6	10	
Small Axe	Wood/Metal	4	11	
Small Mace	Wood/Metal	4	11	
Small Round Mace	Wood/Metal	4	11	
Small Throwing Axe	Wood/Metal	4	11	
Tetsubo	Wood/Metal	4	17	
Throwing Axe	Wood/Metal	4	12	
Warhammer	Wood/Metal	4	15	

Weapon	*Material*	*DR*	*HP*	*Notes*
Missiles and Missile Weapons				
Atlatl	Wood	2	8	
Atlatl Dart	Wood/Metal	4	8	
Blowpipe	Wood	2	8	
Bola Perdida	Cloth/Leather	1	8	[4]
Bolas	Cloth/Leather	1	10	[4]
Boomerang	Wood	2	8	
Chakram	Metal	6	9	
Composite Crossbow	Wood	2	15	[4]
Crossbow	Wood	2	14	[4]
Dart Sling	Cloth/Leather	1	6	[4]
Discus	Metal	6	10	
Fowling Crossbow	Metal	6	16	[4]
Gastraphetes	Wood	2	16	[4]
Heavy Sling	Cloth/Leather	1	8	[4]
Hunting Crossbow	Metal	6	18	[4]
Longbow	Wood	2	11	[4]
Military Crossbow	Metal	6	19	[4]
Pistol Crossbow	Wood	2	12	[4]
Prodd	Wood	2	14	[4]
Reflex Bow	Wood	2	10	[4]
Regular Bow	Wood	2	10	[4]
Repeating Crossbow	Wood	2	17	[4]
Short Bow	Wood	2	9	[4]
Shuriken	Metal	2	3	[1]
Siege Crossbow	Metal	6	21	[4]
Sling	Cloth/Leather	1	6	[4]
Slurbow	Wood	2	16	[4]
Staff Sling	Cloth/Leather	1	10	[4]
Stone-Launching Stick	Wood	2	8	
Straight Composite Bow	Wood	2	10	[4]
Throwing Dart	Wood/Metal	4	8	
Tubular Bow	Metal	3	10	[1, 4]
Woomera	Wood	2	10	
Polearms				
Bill	Wood/Metal	4	16	
Dueling Bill	Wood/Metal	4	14	
Dueling Glaive	Wood/Metal	4	14	
Dueling Halberd	Wood/Metal	4	17	
Glaive	Wood/Metal	4	16	
Halberd	Wood/Metal	4	18	

Weapon	*Material*	*DR*	*HP*	*Notes*
Polearms				
Harpoon	Wood/Metal	4	14	
Heavy Horse-Cutter	Wood/Metal	4	18	
Heavy Spear	Wood/Metal	4	14	
Javelin	Wood/Metal	4	10	
Lajatang	Metal	6	15	
Lance	Wood/Metal	4	14	
Light Horse-Cutter	Wood/Metal	4	16	
Long Spear	Wood/Metal	4	13	
Monk's Spade	Wood/Metal	4	14	
Naginata	Wood/Metal	4	14	
Pike	Wood/Metal	4	18	
Poleaxe	Wood/Metal	4	17	
Pollaxe	Wood/Metal	4	17	
Short Spear	Wood/Metal	4	10	
Sodegarami	Wood/Metal	4	12	
Spear	Wood/Metal	4	12	
Trident	Wood/Metal	4	13	
Sticks				
Baton	Wood	2	8	
Bokken	Wood	2	11	
Dusack	Wood	2	9	
Jo	Wood	2	10	
Light Club	Wood	2	11	
Long Staff	Wood	2	13	
Oar	Wood	2	16	
Quarterstaff	Wood/Metal	4	12	
Short Baton	Wood	1	6	[1]
Short Staff	Wood	2	8	
Throwing Stick	Wood	2	8	
Tonfa	Wood	2	9	
Wooden Stake	Wood	1	6	[1]

Notes

[1] Relatively thin and easy to damage, with less DR than normal for its material.

[2] Subject to special breakage rules; see description in ***GURPS Low-Tech.***

[3] Has, or consists entirely of, a heavy chain, which can be targeted; see *Breakage When Attacked* (p. 22).

[4] Has a thin cord, which can be targeted; see *Breakage When Attacked* (p. 22).

Weath the Musician: Give an Arab a sword, he makes a knife!

Ahmed ibn Fahdlan: It works.

Weath the Musician: When you die, can I give that to my daughter?

– The Thirteenth Warrior

Damage to Armor

Realistically, the rules under *Overpenetration* (p. B408) should apply to armor. If you suffered injury because an attack's damage exceeded your armor's DR, then your armor *must* have been damaged!

Look up the armor's weight on the *Object Hit Points Table* (p. B558) and read its HP from the "Homogenous/Diffuse" column. Most armor modifications – e.g., everything described under *Reinforced* in ***GURPS Low-Tech*** – affect the armor's final weight and hence its HP. Ignore weight reductions for high quality, however.

Armor is protected by its own DR at -1. When calculating injury, treat flexible armor as Diffuse and rigid armor as Homogenous; see *Injury to Unliving, Homogenous, and Diffuse Targets* (p. B380). The effects of injury are as described on pp. B483-484, with these extra details:

Less than 1/3 HP left – The armor gives the wearer *half* its original DR (round down). In addition, remove -1 from penalties to target chinks in it; see *Chinks in Armor* in ***GURPS Low-Tech.***

0 HP or less – Roll vs. HT 12 every second to see if the armor falls off. Critical failure means it only *partially* detaches, and hangs awkwardly on the wearer: torso armor gives -1 DX, limb armor restricts the limb as if crippled, and a helmet gets dislodged in such a way that it covers the wearer's eyes! These effects remain until the damaged item is removed; see *Donning Armor* in ***GURPS Low-Tech.*** While the armor is worn, remove -2 from penalties to target chinks in it.

Example: Sir Gnaff is wearing a 24-lb. plate cuirass with DR 7. The table on p. B558 gives it 20 HP. Conan the Bar hits Gnaff with a mace for 12 points of crushing damage. Gnaff receives 12 - 7 = 5 HP of injury. The armor is protected by DR 7 - 1 = 6, so it takes 12 - 6 = 6 HP of injury, leaving 14 HP. Conan's next wallop delivers 7 points of damage. The armor's DR 7 is just enough to prevent injury to Gnaff, but the armor itself has only DR 6, so it suffers another 1 HP of injury, leaving 13 HP.

Gnaff survives the battle but neglects to repair his armor. Another encounter reduces his armor to 6 HP. Since that's less than 1/3 of its original HP, its DR 7 is halved and rounded down to 3, and enemies who wish to target chinks in it remove -1 from their penalty.

Gnaff's next battle reduces his armor to -1 HP. He rolls against HT 12 and fails, so his cuirass falls off!

The London Lobsters

The "London lobsters" was a nickname given to Sir Arthur Haselrig's heavy cavalry by the Royalists during the English Civil War. At his own expense, Sir Arthur outfitted each man in heavily fluted plate armor that was proofed against firearms, giving them a lobster-like appearance. At the Battle of Roundway Down (1643), Sir Arthur himself survived *four* close-range firearms shots and several sword thrusts, and was only unseated after his horse was attacked. King Charles quipped, "Had he been victualed as well as fortified, he might have endured a siege of seven years."

Targeting Armor

It's sometimes possible to disable an opponent's armor deliberately. The options are *denting articulations* and *severing straps*. Only rigid armor has articulations or visible straps and lacing; you cannot target flexible armor this way.

Denting an articulation on plate armor prevents the enclosed limb or extremity from functioning. You must use a crushing attack. Possible targets are the knee (affecting the leg), elbow (affecting the arm), hand, or foot. Roll to hit at -6 *instead of* the location's usual penalty. If the attack gets at least 2 points of damage past DR, then regardless of armor HP, treat the affected body part as crippled until the damaged piece of armor is removed.

Severing the right strap(s) causes the piece to fall off! This requires a cutting attack. Roll at -8 to target a strap. If the attack delivers at least 2 points of cutting damage, then it cuts the strap. You must slice through two straps to remove torso armor, but just one for any other piece.

Quick and Dirty Armor Damage

If tracking HP for individual pieces of armor seems like too much trouble, then simply track HP for the *entire suit*. When the suit has less than 1/3 of its HP left, halve DR *everywhere.* At 0 HP or less, don't roll dice; the armor fails completely (at this point, most of it would have fallen off).

Repairing Armor

Damaged armor can be repaired. This calls for the same skill(s) you would need to make the armor; see ***GURPS Low-Tech Companion 3,*** or simply assume Armoury (Body Armor). Tools are also required, and their quality modifies skill (see p. B345). Use *Repairs* (pp. B484-485) to assess materials costs, skill modifiers, and effects, but note that each attempt takes one hour. Armor that has positive HP needs *minor repairs,* while armor with zero or negative HP demands *major repairs.* If you elect not to repair the armor, you can scrap it for its materials value – say, 5-10% of original cost.

Armor Maintenance

Armor must be cared for or it will deteriorate. If not regularly maintained by someone with at least 1 point in Armoury or Soldier skill, it loses 1 HP per *month* of regular wear or *year* in storage. Deliberate conservation attempts for armor in storage (only) can slow deterioration to 1 HP per *decade.*

Maintenance for regularly worn armor takes 10 minutes per week per piece (breastplate, helmet, gauntlet, etc.) but requires no actual skill roll. For armor with any kind of styling or decoration, *double* this time. However, some decoration methods, such as lacquering or tinning, also halve deterioration (1 HP per *two* months of wear or *two* years in storage).

Chapter Three

Fortifications

Fortification is any attempt to modify a location to make it harder to attack. Such measures fall into three main categories: *field fortifications, city defenses,* and *fortresses.* These differ from natural defenses such as rivers, swamps, and cliffs, but the two may enhance one another. A river could be diverted around a castle to create a moat; a natural depression might be dug out to create a ditch and a rampart; or a castle may be built on a hill to increase its height and aid visibility, or on a cliff edge to restrict access from that direction.

Field Fortifications

These are temporary defenses erected by troops in the field using portable tools and available materials such as earth, brush, wood, and sandbags. To be effective, they must take the attacker's capabilities into consideration. For instance, ditches and sharpened stakes are useful against cavalry charges, but trenches and sandbags are more appropriate when facing firearms.

All of the measures below are possible at TL0.

Natural Obstacles

A good commander will incorporate the terrain into his battle plan. Any defense that Mother Nature has provided is one the troops don't have to prepare! Examples include natural watercourses; marshlands; cliffs and large rock formations; and trees, hedges, and thickets.

Ditch

This is the most common defensive structure used to slow the enemy's advance. A shallow ditch can blunt a cavalry charge; a deeper one might stop progress completely. The rubble from the ditch is often used to construct an adjacent *rampart* (see *Ditch and Rampart,* p. 27). Use *Digging* (pp. B350-351) to determine the time required.

Stakes/Pickets

These are sharp wooden poles driven into the ground and angled toward the enemy. When they line the bottom of a ditch, they're sometimes called *cusletts.* It takes about half an hour for one man to cut, sharpen, and plant each stake. This workload is often divided among several men. Roman legionaries carried their own prepared stakes ready for immediate planting each time they made camp (see *Roman Field Camp,* below). Even one stake per yard of front will interfere with a cavalry charge; infantry calls for at least two per yard.

Trench

Troops crouch in trenches to get protection from incoming projectiles while gaining a stable platform from which to launch their own weapons. A trench's sides are usually more vertical than those of a ditch, and built up using the excavated earth. Sandbags can further strengthen such defenses. If the soil is particularly loose, or if the trench is more than 5' deep, the walls will need timber reinforcement. See *Digging* (pp. B350-351) for construction and *Cover* (pp. B407-408) for benefits.

A *foxhole* is a trench that's circular in shape rather than linear. It uses the same rules.

Roman Field Camp

The Romans were famous for building a fortified camp every time they stopped for the day. Surveyors would scout out a suitable position and mark out the rectangular perimeter, along with other features such as roads and gates. Then a portion of the troops would form a defensive cordon while the rest of them prepared the camp. Some men were assigned to dig the ditch (*fosse*) and rampart (*agger*) around the perimeter; others unloaded baggage, erected tents, cooked dinner, tended horses, etc. When the earthworks were finished, wooden stakes – carried with the baggage – were planted atop the rampart to create a palisade (*vallum*). If manpower allowed, the palisade would be reinforced with piled turf (p. 28).

More permanent camps had *two* walls (around 10' high) of piled turf, with rubble from the ditch filling the space in between. Wooden posts were erected to form corner towers and gatehouses. A second rampart was constructed on the outside of the ditch; this was reinforced with timber, where plentiful. Timber was also used to construct a catwalk atop the first rampart. Inside, wooden buildings were raised instead of tents. In the Center of a permanent camp was a small building called the *sacellum,* which housed the treasury and regimental standards; this was made of stone, if possible. In a camp intended to remain for more than a single season, stone would replace the timber structures as well.

City Defenses

The circumvallation of large cities began around 5500 B.C. This coincides with the emergence of organized warfare. Uruk, in Sumer, is one of the oldest known examples of a walled city.

A wall around a city was a symbol of its inhabitants' prosperity and independence. One of the worst indignities that could befall a conquered city was to have its wall completely dismantled. The conqueror would require the population to prove its loyalty over a period of time before granting permission to rebuild it.

Note on DR: Below, cover DR is given *per inch of thickness*. See ***GURPS Low-Tech Companion 3*** for details.

You're in the army now;
You're not behind a plow.
You'll never get rich
A-digging a ditch;
You're in the army now!
– Traditional marching cadence

Ditch and Rampart (TL0)

The first evidence for walled settlements dates to the Neolithic. The earliest fortifications consisted of a simple ditch-and-rampart construction: the material from the ditch was used to create a mound, or *rampart,* adjacent to it on the defender's side. The ditch's depth was usually about the same as the rampart's height. Since a typical rampart was 4'-6' tall, attackers at the bottom of the ditch faced an 8'-12' obstacle!

The higher the rampart, the thicker its base must be. In general, thickness increases at the same rate as height. For example, a 10'-tall rampart would be 10' thick at its base.

A rampart gives DR 0.8/inch. Within a couple of years, the earth will settle, becoming equivalent to hard earth (see below). This reduces its height but increases its protection to DR 1/inch.

Dry Stone (TL0)

The earliest stone walls were *dry stone* or rubble constructions, built by simply piling loose stones on top of each other without mortar to cement them together. The height of such a wall cannot exceed its width; historically, this was rarely greater than 10'. A dry stone wall has DR 10/inch.

At TL1, larger stones were cut so that they interlocked with each other, a construction called *ashlar.* The strong, tight fit enabled much higher fortifications. The walls of the Inca often used this technique, and attained heights of up to 30'. Mycenaean "Cyclopean" walls stood up to 40' tall. Ashlar walls have DR 13/inch.

Hard Earth (TL0)

In China, early walls were made of compressed earth. Wooden forms were built and filled with earth, which was laboriously tamped with heavy rams to compress it. Another set of forms was constructed above the first and the process repeated until the desired height was achieved. Parts of the Great Wall of China were made this way! To achieve the best results, the mix of earth, clay, and aggregate had to be carefully measured; less-permanent walls could be made with any soil (except sand) and a little water, however.

Mud bricks also count as hard earth. These are unfired bricks made from mud or clay mixed with a binding agent such as straw or rice husks. The earliest examples, from the upper Tigris and southeast Anatolia, date to the middle of the eighth millennium B.C.

Such constructions are most durable in drier climates. Rain increases deterioration. Height ranges from 6' up to 30'.

Hard earth walls have DR 1/inch.

Hedge (TL0)

Plants can serve as a defensive barrier if strategically planted and trimmed to shape. A thick hedge of thorny thickets would dissuade all but the most determined attacker. The barrier's height depends on the maximum height of the plant used, and on whether it has had time to grow that tall. Anyone attempting to climb or force his way through a thorny hedge is likely to get snagged or injured; see *Spikes/Thorns* in ***GURPS Low-Tech.***

A hedge has DR 0.2/inch, and is Fragile (Combustible).

Wooden Palisade (TL0)

A *palisade* is series of wooden posts driven vertically into the ground with little space between them, often with their tips sharpened. In wooded areas, this is a quick means of constructing a defensive wall. Palisades may be used in conjunction with other defenses; e.g., atop an earthen rampart. If the stakes are planted horizontally in a rampart, pointing toward the enemy, the resulting barrier is called a *fraise.* A palisade was often used as a temporary measure until more permanent fortifications could be built.

Theoretically, if lifting equipment were available, the only limit on maximum height would be the height of the trees used. In practice, though, a typical palisade stood 8'-12' tall.

A palisade has DR 0.5/inch, and is Fragile (Combustible).

Brick (TL1)

Fired bricks first appeared in the third millennium B.C. These were similar to mud bricks (see *Hard Earth,* above), except that they were baked in a kiln to create a ceramic. They were then laid in much the same way as stone – either with or without mortar – to construct walls about as tall as comparable stone ones.

A brick wall has DR 8/inch.

Cribwork (TL1)

This is a means of reinforcing one material with another. One example is stone walls with integral courses of brick tying them together; another is earthen walls with log ties. The Romans encountered cribworked earthen and stone walls around Celtic settlements: large logs ran transversely through the wall and protruded from the face. They named the construction *Murus Gallicus* ("Gallic wall").

Cribwork is an option for any earthen, brick, or stone wall that's at least 2' thick. It improves resiliency, giving +1 to the wall's HT. Most walls start at HT 12; see ***GURPS Low-Tech Companion 3*** for details.

Mortared Stone (TL1)

This is similar to dry stone (p. 27), except that the stones are cemented together with some sort of binding agent. In some ancient cities, such as Babylon, bitumen was used as a mortar. However, most masonry was held together with lime or plaster, which was first developed in the Neolithic.

Mortared stone was the most common method of constructing medieval fortresses. The largest wall of Constantinople is 16' thick and 40' high, while its towers are up to 70' tall. The keep at Pembroke Castle has walls 19' thick and 75' high. Rochester Castle is even more impressive, with walls up to 13' thick and 113' tall!

Mortared stone has DR 12/inch.

Piled Turf (TL1)

When Roman legionaries were on the march in hostile territory, they would fortify their camp each evening; see *Roman Field Camp* (p. 26). They often constructed the defensive wall by digging out slabs of turf or sod and piling them on one another until the desired height was reached. This was normally used to reinforce a wooden palisade – but if there were enough men, two turf walls were constructed and rubble from the defensive ditch was used to fill the space between them. This was a quick and simple way to build an effective fortification with nothing but digging tools.

Piled turf has DR 0.8/inch.

Concrete (TL2)

The Romans were the first to use concrete in large structures. Roman concrete was a mixture of wet lime, *pozzolana* (volcanic ash), and gravel combined in specific ratios to suit the engineer's purpose. The mix was far drier than that used today, and was shoveled into wooden forms and then packed tightly with rams in a similar manner to rammed earth (see *Hard Earth,* p. 27). The results were more durable than the majority of Portland concrete used today. The Coliseum was made of concrete and is still standing . . . without the steel reinforcing that's so necessary for most modern concrete! It was about 150' tall when built.

Roman-style concrete has DR 9/inch.

> *Something there is that doesn't love a wall,*
> *That wants it down.*
> – *Robert Frost, "Mending Wall"*

Embossing (TL2)

Similar to *Murus Gallicus* (see *Cribwork,* above), except that instead of wooden logs protruding from the face, large stones protrude at regular intervals. These spread the impact of siege weapons. Embossed walls must be made of stone or brick, and be at least 1' thick. Embossing increases DR by 5% vs. crushing damage.

Fortresses

A *fortress* is a permanent strongpoint built to defend a population center, control a strategic location, and/or house troops. Such fortifications have existed since the first settlements began to surround people with walls.

Causewayed Enclosure (TL0)

This Neolithic European complex of earthworks consisted of one to four concentric ditches surrounding a hilltop site. Access to the center was via causeways that segmented the ditches. Some such fortresses were manned for defense; others were infrequently occupied.

Hill Fort (TL1)

The successor to the causewayed enclosure, hill forts were common throughout much of Europe. Most consisted of a raised central location surrounded by one or more ditch-and-rampart defenses. Not all were circular; many followed the contours of the land. The ramparts of larger forts were sometimes replaced with stone walls. The buildings within could be of timber or of stone.

Like the causewayed enclosure, the hill fort wasn't always permanently manned. In some cases, a community would flee to the local hill fort when attacked, but leave it to stand empty during peacetime. Other forts were large enough to act as permanent settlements, protecting full-time inhabitants.

Terramara (TL1)

This kind of "lake dwelling on land" was common in northern Italy during the Bronze Age. The settlement was trapezoidal in shape and built atop piles, but on dry land rather than in water. Protection consisted of a ditch (sometimes water-filled) and rampart.

Motte and Bailey (TL2)

This construction is synonymous with the Norman invasion of England, but similar fortresses were built in Ireland and France. The French term *motte* described a raised mound upon which a wooden or stone keep stood. The *bailey* was a courtyard enclosed by a rampart and/or a wooden palisade, adjacent to and overlooked by the motte. The bailey typically had two gates: a heavily fortified main entrance at the front, and a rear exit leading up to the motte. This was an effective fortification – an attacker had to breach the outer wall, fight all the way through the bailey to the rear gate, and then up the steep incline toward the keep atop the motte, which was often surrounded by another wall.

Castles (TL2)

The word "castle" is derived from the Latin *castellum.* It's a general term used to describe any large fortress, which might be made of wood, stone, brick, or concrete. The motte and bailey (above) could be classified as a castle, for instance. Details on building castles and other structures appear ***GURPS Low-Tech Companion 3.***

A short glossary of some distinguishing features of TL2-3 castles:

arrow loops: Long slits or cross-shaped openings in stone walls, enabling archers to attack the enemy. These were later made rounded to accommodate firearms. A defender who wants to launch a projectile through an arrow loop has -1 to hit and can only target enemies in front. An attacker who wishes to retaliate has *-4* to hit.

bailey: An enclosed courtyard surrounded by fortified walls and towers. The *keep* (q.v.) was often located here; if not, its entrance was accessed from here. In a castle with multiple lines of defenses, the *donjon* was the central fortified building – usually a tower.

crenellations: Usually rectangular notches along the top edge of the defensive wall. Defenders could shoot from the spaces (*crenels* or *embrasures*) and duck behind the adjacent projections (*merlons*) for full cover. These features are common from the Bronze Age on; the Great Wall of China has many thousands of crenellations! The merlons could be of many shapes; rounded ones can be found in African and Middle Eastern castles. By the Middle Ages, merlons were large enough to incorporate *arrow loops* (q.v.). The development of heavy siege cannon saw the demise of the merlon. A defender protected by crenellations is attacked at -2 with ranged weapons, as only his top half is exposed; see *Cover* (pp. B407-408).

gatehouse: Gates were a weak point in any castle, and the gatehouse was designed to prevent them from being breached. It incorporated various defenses, including towers, movable bridges, multiple doors, and/or *portcullises* (q.v.). Elongated gatehouses enabled defenders to trap the enemy between portcullises and attack them in a confined space.

hoardings: A temporary wooden construction assembled on the outside of the wall during a siege. It granted defenders a wider angle of fire, including straight down to the base of the wall. *Machicolations* were similar, but permanent and made of stone; these were sometimes called *murder holes.*

keep: The primary redoubt, located in the middle of the defenses and solidly constructed. It was the final place to which defenders fell back when under attack.

moat: A ditch, often water-filled, surrounding the castle. The castle could only be accessed by means of a moveable bridge, such as a *drawbridge.* A large drawbridge could take up to 45 seconds to raise or lower (from vertical to horizontal at 2° per second).

portcullis: A latticed grill made of wood and/or metal. Set into vertical grooves, it could be raised and lowered on a rope or a chain by means of a winch. Heavier gates would utilize counterweights to assist with this. A *gatehouse* (q.v.) often contained two portcullises. In times of strife, the outer one would be opened first to allow entry; the inner one wouldn't be raised until the outer one was lowered again. For statistics, see *Grate* in ***GURPS Low Tech.***

Guards and Watchers

Unmanned fortifications will only slow interlopers temporarily. Traps have no manpower requirement, but may endanger allies and then fail to trigger against enemies, and are *still* essentially short-term obstacles. But even a single alert pair of eyes watching for signs of trouble can thwart would-be intruders. This may be a human guard – perhaps equipped with a spyglass (see ***GURPS Low-Tech***) – or an animal.

Dogs make the most effective guard animals; man has used them this way for 10,000 years. Their senses of hearing and smell can make them more effective than human guards – and in combination with a handler, guard dogs are one of the most reliable security measures. To sneak past a dog, an intruder must *win* a Quick Contest of Stealth vs. the animal's Hearing; use 14 for a trained beast. If the trespasser is upwind, Stealth is irrelevant; simply roll against the animal's Smell of 16-18 (depends on the breed). With training, the dog also gets a Smell roll to track; see *Tracking* (p. B226). A fully trained dog costs at least $200; see *Dogs* (p. B457).

Other guard animals include geese, which have served in this role since first domesticated during the Bronze Age. Livy wrote that the noise from the geese in the temple of Juno saved Rome from a Gallic night attack in 390 B.C. Geese are *very* alert (roll vs. Hearing 13 to detect intruders), and strangers cannot calm them. A related bird, the screamer (family *Anhimidae*), was used to guard herds in South America; the ostrich filled a similar role in Africa. In Uzbekistan, golden eagles – known to attack and kill wolves – were allegedly used to protect sheep.

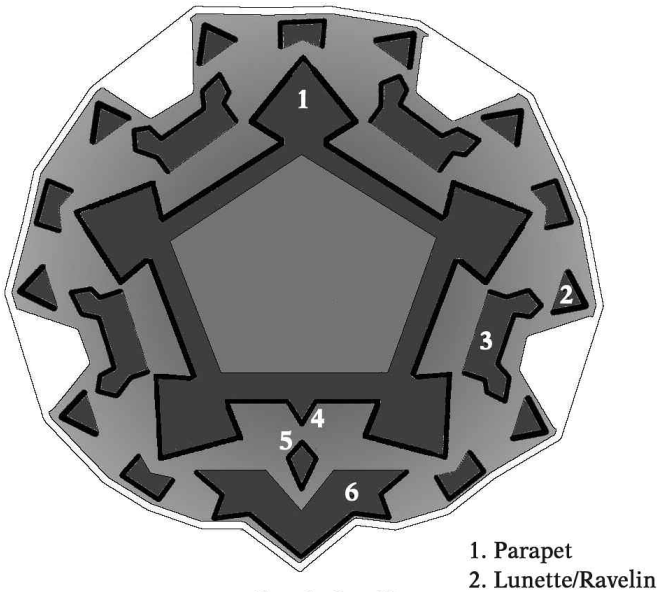
Dangerous reptiles – pythons, cobras, crocodiles, etc. – might not warn that intruders are present, but will act as a strong deterrent! The same goes for large felines, such as lions.

tower: Towers were the tallest part of the castle. They were installed on defensive walls and allowed an uninterrupted view of the surrounding area. Towers extended past the line of the wall so that sentries could keep watch along the base of it – and to allow defenders to shoot at any enemy on the wall! The corners of square towers proved vulnerable to mining and battering rams, so rounded towers became common by the 13th century.

Star Fort (TL4)

Beginning as early as the 15th century in Europe, gunpowder caused fortifications to evolve into much lower structures. As purely physical defenses, the high walls and tall towers of the Middle Ages were extremely vulnerable to cannon fire. Moreover, the relatively narrow parapets were unsuitable platforms for cannon. The guns' carriages needed room, and additional space was required for recoil – a firing cannon could push itself off of a narrow wall! Requirements for parapets grew so great that they had to extend beyond the thickness of the wall itself. In some cases, rooms were built within the curtain wall with roofs up to the wall's height, and then the roofs paved over to extend the parapet's width. The exterior faces of walls were surrounded with thick, sloping earthworks that could more effectively absorb and deflect cannon fire.

Map of a Star Fort



Gunpowder-era forts also took on a "spiky," or star-shaped, plan. Instead of looking almost entirely outward, like earlier castles, the long, angled walls created overlapping fields of fire for the defenders. Attackers assaulting a wall would take fire from not just the position they were attacking, but also the adjacent "arm" of the star. Instead of high and usually round towers, the corners of walls were reinforced with angular bastions, which might be no taller than the adjacent wall but provided still more angles of fire.

The quest to create more angles from which to shoot at attackers led to a number of new features. *Counter-guards, lunettes,* and *ravelins* were low, angular fortifications – often triangular – in front of the main curtain wall. In addition to providing supporting fire to adjacent parts of the fortress, they were completely open to the parapets and bastions behind them; attackers who managed to capture them would have no shelter from defenders farther back. *Crownworks, hornworks,* and *priest's caps* were similar but larger structures, often with more complex shapes and incorporating bastions at the corners. A *redan* was a triangular bastion, the inner anchor of the bridge used to enter the fort, and typically heavily defended. *Redoubts* were bastions outside the main fortress – semi-detached (possibly communicating with the fort's main body by bridges) or completely freestanding – that provided strong points from which defenders could fire on attackers assaulting the main fortress.

All of these structures were raised defensive platforms standing out from a network of ditches and low ground. Attackers entering these networks could be caught in a crossfire from the inner (*scarp*) and outer (*counterscarp*) sides of the ditch. The counterscarp side rarely had raised defensive walls, so attackers capturing an outer position could still be fired on from positions farther in, yet the height of such a position usually afforded the defenders reasonably good protection against attackers in the ditches they overlooked. Not only could fire come from the tops of the raised platforms, it might come from *casemates:* large and notoriously dark rooms under the level of the parapets, protected by scarp/counterscarp walls. Casemates could be shielded by several yards of earth and rock, so loopholes were often deep enough for people to lie down full-length and sleep in.

By the 18th century, forts could have extremely complex ground plans, with a many-pointed citadel surrounded by a network of angular, plateau-like outlying fortifications. Such extensive defenses were, of course, expensive – feasible for city-states and national armies, perhaps, but rarely for individual noblemen.

You see, if put on a stone wall, a mass of this sort smashes whatever it finds underneath because of its violent recoil, not its weight.

– Ammianus Marcellinus, ***The History***

Huge Guns

Early gunsmiths occasionally made incredibly huge bombards or cannon. These were typically one-of-a-kind projects (with some exceptions, like the great Turkish bombards described below). Rulers seem to have commissioned such pieces primarily to impress their rivals with their wealth and power; such guns often went unfired for years. But for the GM who wants to send adventurers to sabotage the enemy's most terrifying weapon – or let them fire one of their own! – here's historical information and statistics on some notable examples.

Unless otherwise stated, these are wrought-iron muzzleloaders. All are considered TL3, despite the late date of manufacture in some cases, because they have static mounts rather than carriage or pintle mounts (see *Aiming Fixed-Mount Weapons* in ***GURPS Low-Tech***). Due to the massive heat release from their powder charges, these guns can't be fired more than a few times a day. If discharged after less than an hour of cooling, apply -2 to Malf.

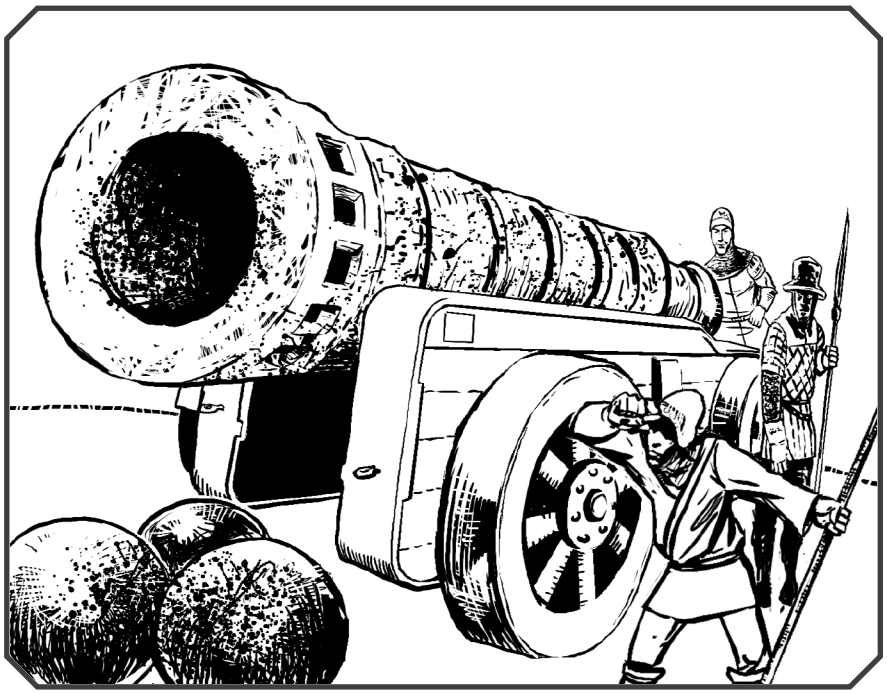
Dhul Dani (1628). Cast from bronze in Agra for the Mughal ruler Shah Jahan (also famous for building the Taj Mahal).

Dulle Griet (15th century). Made for the Duke of Burgundy about the same time as Mons Meg (below) and installed in Ghent in 1578. The name means "Mad Margaret," and refers to a character in Flemish folklore who leads an army of women to pillage Hell (depicted in a 1562 painting by Bruegel).

Great Turkish Bombards (1453). Mehmet II had several really huge guns made for the siege of Constantinople in 1453, and 42 more to guard the Dardanelles. Muzzles and receivers were cast separately from bronze, but unlike most smaller bombards, these guns were muzzle-loaded. Moving them was a heroic project; it took 200 men and 60 oxen to transport the largest Turkish guns. The recoil of these weapons was too great for a wooden frame to endure; instead, they were suspended in cradles of heavy ropes that let them swing in larger wooden frames, absorbing the recoil.

Mons Meg (1449). Made by Jehan Cambier for the Duke of Burgundy, and sent as a gift to James II of Scotland; the name was only adopted in the 17th century. It may have been installed by James IV on a warship, the *Great Michael*. It's now kept at Edinburgh Castle.

Murshidabad Guns. The Bengali city of Murshidabad has two huge breechloaders: the *Bachawali Tope* (before 1400) and the *Jahan Kosha* (1637). The statistics on the table describe the Bachawali Tope.



Raja Gopala (16th century). Made for one of Tanjore's Mughal rulers, this may be the largest bombard ever made. According to legend, the gunners were terrified of firing it – it was fired only once, with a powder train 2 miles long!

Tsar Pushka (1586). This gun was made by Andrei Chokhov for Tsar Feodor. Its outer surface is elaborately sculpted, showing the tsar on a horse, among other images. It's kept within the walls of the Kremlin.

Huge Guns Table

Terms and notation are as defined on pp. B268-271. For costs, "K" means thousands and "M" means millions.

TL	Weapon	Damage	Acc	Range	Weight	RoF	Shots	ST	Bulk	Rcl	Cost
ARTILLERY (CANNON) (IQ-5)											
3	Dhul Dani	6d×50 pi++	2	1,400/8,000	60,000/1,320	1	1(1,800)	164M†	-19	10	$814K
3	Dulle Griet	6d×45 pi++	2	1,250/7,000	36,000/900	1	1(1,800)	144M†	-19	10	$489K
3	Great Turkish Bombard	6d×11 pi++	1	300/1,700	40,000/1,500	1	1(10,800)	140M†	-19	8	$544K
3	Mons Meg	6d×35 pi++	2	1,100/6,000	15,400/400	1	1(1,800)	117M†	-17	10	$210K
3	Murshidabad Gun	6d×30 pi++	2	1,000/6,000	13,400/320	1	1(1,800)	113M†	-17	10	$183K
3	Raja Gopala	6d×45 pi++	2	1,300/7,000	88,000/880	1	1(1,800)	180M†	-20	10	$1.20M
3	Tsar Pushka	6d×60 pi++	2	1,700/9,500	84,000/2,500	1	1(1,800)	178M†	-20	10	$1.14M

Chapter Four
Mobility

The larger a war's scale, the more soldiers and materiel it grinds up, and the farther these must travel to reach the action. Thus, as warfare escalated from squabbles between bands to clashes of empires, a new consideration appeared alongside equipping troops, erecting defenses, and plotting strategies: transporting armies. Canny commanders soon exploited mounts and vehicles for this purpose, inventing a whole new area of military superiority. Accordingly, mobile forces were outfitted for defense and offense, to better fill their role in this struggle. Navies in particular developed rapidly from logistical arms into fighting ones.

Military Transportation

There's an old saying about war: "Amateurs talk tactics, professionals talk logistics." An army must get to the enemy before it can fight them . . . and to *keep* fighting, it needs food and fodder, ammunition, medical supplies, and fuel for cooking, heating, light, and metalworking. All of this relies on transportation. From TL1 to TL4, the scale of warfare and the size of empires increase – and one of the main reasons for this is that higher-TL empires have better transportation.

Foot

Through the end of TL4, soldiers travel mainly on foot. This was true of prehistoric tribal war bands at TL0, and it remained true of most soldiers in organized armies later on. Riding on a mount or in a vehicle was for the elite who could afford it.

A soldier's basic ration in low-tech societies is usually grain or starchy roots. This is heavier than the traveler's rations on p. B288: 1 lb. per meal, or 3 lbs./day. In dry areas, the warrior must also carry water: at least 2 quarts per day, or 4 lbs./day. For each day, then, he needs a minimum of 3 lbs. of provisions in wet climates or 7 lbs. in dry ones. In realistic low-tech economies, the basic ration costs $2/lb., or $6/day. Meat, dried fruit, and the local form of alcohol are extra.

An average soldier has ST 10, making his Basic Lift 20 lbs. He'll typically be asked to carry Medium encumbrance: 3×BL, or 60 lbs. With Basic Move 5, this lets him march 30 miles in a day on a good road. Seven days' food in wet climates, or three days' food and water in dry ones, weighs 21 lbs., leaving him with just under 40 lbs. of combat gear – enough for light armor, a small shield, and a weapon or two. Assuming the same weight of rations, a ST 11 warrior can manage over 50 lbs. of gear; a ST 12 one, over 65 lbs.

A fairly typical low-tech army has one noncombatant for every three soldiers. Many of these will be women. Assuming ST 9, they can carry about 25 lbs. over and above their own clothing and rations; none of this will be weapons or armor. That gives each unit of 12 soldiers an extra 100 lbs. of gear.

Realistic Foot Travel

The hiking rules on p. B351 are optimistic: they assume a 16 hour/day forced march under ideal conditions. At low TLs, travel conditions are seldom ideal. For a more realistic and detailed treatment of foot travel, use the following rules.

Assume that speed in miles per hour equals Move/2. Adjust this as usual for terrain, weather, and roads; see p. B351. Apply the FP costs for an hour of hiking on p. B426. Extra effort (p. B357) works as usual. Each foraging attempt (p. B427 or ***GURPS Low-Tech Companion 3***) takes an hour, during which no progress is made.

These rules can also be applied to mounted forces and to wheeled vehicles drawn by animals.

Example: A soldier is carrying 3×BL. He loses 3 FP/hour while marching. If he has a fairly average 10-11 FP, he must rest after two hours or lose half his Move. One hour of rest will restore his lost 6 FP. With Basic Move 5, he's at Move 3 for Medium encumbrance, and can travel 1.5 miles in an hour's walk – or 1.8 miles if his unit's Hiking roll succeeds. Thus, he averages 3.6 miles in 3 hours, or 1.2 mph.

Mounted

A cavalryman can bring along whatever supplies and gear his horse can lug. But his mount must also carry him! An average cavalry horse (p. B459) has ST 22 and Basic Lift 97 lbs. Allowing for rider (200 lbs., armed and armored) and horse furniture (bridle and bit, horseshoes, saddlebags, stirrups, and war saddle, totaling 45 lbs.) – and once again assuming Medium encumbrance – the horse can carry another 46 lbs., slightly over the 40-lb. capacity of saddlebags.

A horse doing hard work needs 10 lbs. of grain and 8 gallons (64 lbs.) of water per day. In wet climates, it can carry food for itself and its rider for three days, at 13 lbs./day; in dry ones, it can't even carry enough water for one day, and must reach a spring, lake, or well after each day's journey.

Thus, cavalry can't keep going for as long as infantry; the extra supplies the horses need more than cancel out their heavier loads. However, they move somewhat faster; at Medium encumbrance, on average terrain, optimal daily travel is 48 miles, compared to 30 miles for foot soldiers. This doesn't include the effect of Enhanced Move, which requires straight-line movement over good terrain (hard-packed desert, level plains, or good roads).

Heavy cavalry, such as knights, face even worse problems. The rider is likely to be bigger and stronger, and clad in heavier armor – and his horse will likely be armored, too. Knights commonly have multiple horses: a heavy warhorse to ride in combat, a riding horse for travel to the battlefield, and another riding horse for a squire who looks after the spare horses while his master fights.

Gamers seeking a more realistic treatment of mounted travel should apply *Realistic Foot Travel* (p. 32) to the speed of mounts. With the FP costs included in those rules, there's a *big* advantage to having several mounts per cavalryman and switching off between them, in the style of the Mongol armies.

An alternative use for horses is as pack animals. The relatively lightly equipped Macedonians allowed one pack animal per 50 men; the Roman legions had one per seven men. A large mule (p. B460) can carry the same total load as a cavalry horse; as a rule of thumb, allow 250 lbs. of useful capacity. In a wet climate, it needs 70 lbs. of grain for a week's travel, leaving 180 lbs. for gear such as tents, construction tools, and parts for siege engines. In a dry climate, food and water for three days (at 74 lbs./day) will leave a mere 28 lbs. of useful capacity. Alexander had good reason to restrict the use of pack animals in his Near Eastern expeditions!

Camels (p. B459), too, have ST 22 and Basic Lift 97 lbs., and require comparable amounts of food, but they have one big advantage: their bodies use water extremely efficiently. A camel can go for up to four days without drinking – although after doing so, it needs 20 gallons (160 lbs.) of water to restore itself. This lets it travel through dry country as easily as wet, provided that there's a water supply at the far end.

Realistically, large troop movements happen at the pace of an army's slowest units: foot soldiers, heavy weapons, or baggage trains. The speed of mounted forces is mainly important in *tactical* maneuvering.

Carts and Wagons

Oxcarts enter use at TL1. Oxen can work for only five hours a day, however, and move at 2 mph – a comparatively slow pace. A general in a hurry might order the destruction of all his army's carts to avoid the delays they caused!

At TL3, the horse-drawn wagon comes into use. The example on p. B464 and in ***GURPS Low-Tech*** weighs 680 lbs. and can transport 1,000 lbs. of cargo, with two draft horses pulling it at Move 8 (80 miles/day) over flat, level surfaces. Off road, speed is halved. Some armies use bigger wagons to transport heavier loads, but this can lower speed substantially.

The appearance of field carriages at TL4 turns the TL3 bombard into the TL4 cannon (see ***GURPS Low-Tech***). The cannon itself has wheels. For movement to a new position, it's attached to a *limber,* which is harnessed to a horse team. The usual team is three pairs of horses, taking up a space 60' long. Field cannon have Move 2 at a walk or Move 5 at a trot. Mounting cannon on carriages means that they recoil 6-12 feet when fired; gunners must allow for this when placing them, and reposition them after each shot.

Ships

Starting at TL1, ships play a vital role in military transport. Powerful states can afford enough vessels to send armies to distant lands – from Bronze Age Egyptians in Palestine to Age of Sail conquistadors in Mexico and Peru. This export of military might is what sets great powers apart from lesser ones.

In the ancient world, galleys on long journeys relied mainly on their sails, attaining a speed of about 5-7 mph with favorable winds or 2-3 mph with unfavorable ones. Fleets were much slower – partly because they had to keep together and partly because galleys needed sailing ships to carry supplies. A fleet could make 2.5-3.5 mph with favorable winds or about 1.5 mph with unfavorable ones. In an emergency, a trireme could sustain a pace of 10 mph for a full day under oars; a penteconter, 8 mph. This meant extremely hard labor for the oarsmen, however. Normally, they would row in shifts, with 1/3 of the rowers being enough to achieve 2/3 of the speed.

Speed didn't increase significantly in the Age of Sail; the larger sail area served instead to propel bigger, heavier ships. For example, sailing ships crossing the Atlantic in the 19th century averaged 3.25 mph eastbound and 2.25 mph westbound. But while galleys seldom spent the night on the open sea, Age of Sail vessels did so routinely, sailing around the clock.

The burden a ship can carry varies widely. As a rough rule, 100 men (be they crew or passengers) weigh 10 tons and need 18 tons of provisions per month. Any extra capacity can be used for ammunition, other military supplies, or trade goods.

> *The Antelope sloop was a sickening sight.*
>
> ***How I wish I was in Sherbrooke now!***
>
> *She'd a list to the port and her sail in rags*
>
> *And the cook in the scuppers with the staggers and jags.*
>
> *– Stan Rogers, "Barrett's Privateers"*

Horse Transport

From TL1 through TL4, military transport has to move horses as well as men. The ancient Athenian *hippagogos* illustrates the issues involved. Developed in 430 B.C., this was a converted trireme used to carry horses. The lower two rows of oarsmen and their benches were removed, leaving room for 29 horses in place of 108 men. The last oarsmen in the upper row were taken out, too, so that one more horse could be carried aft. The end result was 60 rowers transporting 30 horses. The speed was comparable to that of a penteconter (see *War Galley,* p. 38).

Naval Combat

Ordinary merchant ships can be used to transport troops for land combat, if necessary, with the same men serving as oarsmen on the voyage and as soldiers during the battle. This style of warfare goes back to TL0 war canoes (see ***GURPS Low-Tech***), and remains common up through the Vikings of TL3. Its earliest form – raids on coastal communities – shades into outright piracy.

Real warships have a different function, though: fighting at sea with other ships. To accomplish this, they need a different sort of design. From ancient Greece through the Vikings to the Age of Sail, transports had rounded lines, and were designed to hold as much cargo as possible, at the expense of speed. Warships, by contrast, had sleeker lines, and were built for speed and maneuverability, at the expense of cargo space.

The first targets for warships were transports. An organized navy might attack a rival power's troop transports; a pirate ship would raid merchant vessels. But when both sides had warships, defeating the enemy's warships was more urgent than attacking their transports; once the warships were beaten, the transports were easy prey. This led to the design of ships to attack other warships, and to naval arms races during which ships got bigger and better armed. Other specialized warships could patrol the seas, suppressing piracy, or escort merchant fleets to deter pirates from attacking them.

Don John pounding from the slaughter-painted poop,
Purpling all the ocean like a bloody pirate's sloop,
Scarlet running over on the silvers and the golds,
Breaking of the hatches up and bursting of the holds . . .
– G. K. Chesterton, "Lepanto"

Historical Development

At TL0-1, boats and general-purpose ships were sometimes adapted to military use, but there were no specialized vessels for naval combat. Battles on water involved missile fire and boarding parties, using the same personal weapons as land battles, and targeting the enemy crew, not their ship. Naval historians divide the history of true warships into four eras: the Age of Galleys (TL2-3), the Age of Sail (TL4-5), the Age of Steam (TL5-6), and the Modern Age (TL6-8).

The Age of Galleys

The first specialized warships were *galleys:* long, narrow vessels propelled by rowers. A galley normally had a sail, too, but the wind was unreliable – it might die down at a crucial moment, or blow the wrong direction. A shipload of oarsmen could always get the ship moving. Travel at top speed would tire them out quickly, but they only needed to keep going for 10 or 20 minutes. Wars between galleys involved swift encounters at close range.

Specialized war galleys emerged at TL2, with the development of the Phoenician *bireme.* They remained in use throughout TL3. The last major battle involving galleys was Lepanto, fought in 1571 between 225 Turkish ships and 210 European ships under the command of Don John of Austria. While this was after the start date for TL4, it can be considered the final naval battle with TL3 technology.

The first weapon specifically designed for attacking other ships was the ram (see *Ramming,* pp. 35-36). This put a premium on speed, as a faster ship had a better chance of hitting an enemy vessel, inflicted greater damage when it struck, and could more easily avoid enemy ramming attempts. Having more oarsmen aboard gave a ship more power and therefore more speed. The Phoenician bireme, developed around 775 B.C., added a second row of oarsmen; these were initially on a superstructure deck, but before long they were placed lower down, with their oars protruding through small ports. The Corinthian *trireme,* developed around 725 B.C., added a third row. The fully developed Athenian trireme was about 120' long and carried 170 oarsmen, rather than the 50 of a penteconter of the same length; this was the ship that defeated the Persian fleet at Salamis in 480 B.C., with 300 Greek vessels driving off 800 Persian ones.

In 399 B.C., the tyrant Dionysius of Syracuse began building even larger galleys, starting with *quadriremes.* This led to an arms race that added more oarsmen, going from the trireme's three rows to five, six, or seven rows – with a few even bigger ships, the largest of which was a "forty." These huge vessels don't seem to have sported any more oars than a trireme; instead, they had two or more men per oar. This allowed the use of less-skilled oarsmen; only one man on each oar needed to be fully trained, while the rest just had to follow his lead on when to pull. After Octavian defeated Marc Antony at Actium in 31 B.C., the Roman navy stopped using these massive ships and went back to triremes and smaller vessels called *liburnians,* with only two rows of oarsmen, plus a handful of ships with four to six rows.

At TL3, the Byzantines continued to operate fleets of galleys, with ships called *dromons* in three standard sizes: the *ousiakos* carrying 108 men, the *pamphylos* carrying 150, and the *chelandion* carrying 300. These vessels were more cheaply built and couldn't withstand the shock of ramming. Rather, they carried catapults and/or fire-siphons. *Greek fire* (see ***GURPS Low-Tech***) was a Byzantine specialty, dreaded for its ability to burn while floating on the water.

After 1250, the Venetians carried on the tradition, with ships that placed three oarsmen on a single bench, each with his own oar – a design called *alla sensile.* In the 1500s, they shifted to the *a scalaccio* system, with three to seven men on a single oar; as with the larger galleys of the ancient world, this allowed use of less-skilled oarsmen, with only one skilled rower per oar. Late war galleys often carried a single huge bombard at the prow, pointing forward; this was sometimes flanked by a few smaller guns to either side. These were the weapons used at Lepanto, the last great battle of the Age of Galleys.

The Age of Sail

The move from bombards in fixed mounts at the prow to cannon on carriages at the sides – enabled by the invention of the gun port in 1501 – proved to be the pivotal shift in naval warfare in this period. Galleys were too narrow for stability under the recoil of massed cannon fire to port or starboard, so warships grew wider to accommodate both cannon and additional fighting men. Too few oarsmen could fit along the sides of such a craft to attain a good speed, though, so ships came to rely almost entirely on sails. Large vessels had two, three, or more masts, letting them carry a huge sail area. To get the most from the chancy winds, mariners developed the full-rigged ship, which combined square sails suited to running before the wind with fore-and-aft sails that helped them beat upwind efficiently.

With these technologies, a sea battle became a long, almost formal affair, with enemy captains trying to outmaneuver each other to achieve a good firing position. Two hostile fleets would form parallel lines, and the ships in each line would maneuver as a unit with the aid of signal flags (see ***GURPS Low-Tech***). The first major battle between fleets of sailing ships was the Spanish Armada's attack on England in 1588, just a few years after Lepanto (1571).

The biggest warships were called *ships of the line*. Command of such a vessel became every young naval officer's dream. With no need for large numbers of oarsmen, ships of the line instead carried far more sailors than they required. In battle, the extra men could be assigned to damage control or boarding parties. Afterward, they could replace combat losses – or crew a captured enemy ship and take it to port as a prize! Larger warships also carried *marines,* who served as shock troops in boarding actions or during raids on land-based enemies, and whose presence helped deter mutinies.

Early Paddlewheels

Paddlewheel ships are usually associated with the Age of Steam. The paddlewheel itself – powered not by steam engines but by human or animal muscles – is much older, however. A late fourth-century Roman military treatise, *De Rebus Bellicis,* described vessels with paddlewheels driven by pairs of oxen turning capstans, although it's unclear whether such craft were ever constructed.

In 784 A.D., the Chinese actually began to build paddlewheel ships powered by men on treadmills. These were used in the navies of the later Song Dynasty (1132-1279). Typical designs had four men per wheel, but larger numbers were recorded for some vessels. The Mongols used captured paddlewheel ships in warfare, but apparently built none of their own.

How fast these ships were is unknown. Ancient writers certainly found their speed impressive – one class was known as "flying tiger ships." Paddlewheel ships used against the British in the Opium Wars could achieve about 4 mph (Move 2) with one wheel on each side; ancient ships often had multiple wheels, and could conceivably have been twice as fast.

Naval Weapons

Fighting at sea is akin to siege warfare on land. A ship is a large structure with solid walls; capturing it is rather like capturing a fortress. Ships are *mobile* fortresses, though, able to approach one other – much as if two siege towers could maneuver to attack each other, but faster.

Small Missile Weapons

The first shipboard armaments were personal missile weapons, usually pointed ones: spears, bows, and eventually crossbows. A ship's crew would try to pick off members of the opposing vessel's crew – especially the other side's officers! This kind of combat continued into the Age of Sail, with small firearms replacing muscle-powered weapons.

Such weapons are normally used at a considerable distance from the adversary, which makes targeting individual foes difficult. Missiles are therefore often shot at the enemy vessel as a whole, in which case its Size Modifier helps to counteract the range penalty (p. B550). Attacking from a moving vehicle imposes additional penalties – although ships have a high SR, allowing a good offset from aiming and bracing (p. B469).

The GM may opt to treat such weapons fire as occurring in *volleys.* Handle all shots the crewmen take at the enemy ship as a *single* attack, resolved using the rules in *Rapid Fire* (pp. B373-374). Assume Rcl 1 for this massed fire, since shooting one crossbow or musket doesn't actually push the one next to it out of line, much less rock the ship.

Boarding

Battling ships sometimes maneuvered close enough to permit crewmen to board the enemy vessel and fight the rival crew hand-to-hand. This usually involved pulling the two ships together, whether with polearms or using grapnels and ropes. The crossing was done at deck level or, if the ships had elaborate sails and masts, in the rigging.

At TL2, ships of the Roman Republic employed another boarding method. The *corvus* – meaning "raven," so named for its protruding beak – was a boarding plank 36' long by 4' wide with a spike at the end, mounted on a galley's prow. When a galley armed with a corvus had closed on the enemy, the plank was swiveled into position and dropped. The spike stuck in the opponent's deck, locking the two ships together. Marines then crossed the plank two abreast, resting their shields on the side rails for protection.

Corvus (TL2): This accessory gives the attacking captain +2 on all Shiphandling rolls he makes for boarding. However, it *also* renders his ship top-heavy, meaning that turning requires a Shiphandling roll at -1 (possibly explaining why the corvus didn't remain in use for long!). It has DR 3, HP 80. $2,750, 1,070 lbs.

Ramming

Yet another ship-to-ship combat option was *ramming:* deliberately running a vessel's prow into another ship. This relied heavily on speed, leading the Phoenicians to develop the *bireme,* with a second row of oarsmen. The Greek *trireme* added a third row. Ramming was a tactic for galleys. Two sailing ships – both dependent on the wind – had a hard time building up sufficient relative speed.

Ramming inflicts collision damage (p. B430). A large craft may overrun a smaller one for additional damage (p. B432). Damage to the side of an oared ship's body can injure oarsmen on that side; use *Occupants and Vehicle Damage* (p. B555), treating damage as *crushing* rather than cutting. At TL2, Phoenician and Greek vessels were built with a ram at the prow. A ram gives +1 *per die* to the damage inflicted on the target, and -1 *per die* to the damage the attacker suffers.

Instead of ramming an enemy's hull, a ship may run along its side, attempting to shear off its oars. Treat this as an attack on a propulsion system – locations 6-7, 13-14 on the *Vehicle Hit Location Table* (p. B554) – with the usual -2 to hit. A miss by 1 turns into a body hit for both vehicles. Damage over HP/(2 × number of oars on vehicle) cripples an oar, with effects similar to those for a character with the same number of legs losing one leg (pp. B54-55); multiples of this amount of damage shear off *several* oars on that side. Loss of all oars on one side makes the ship unable to maneuver except by sailing.

If a ship suffers a shearing attack, the flailing motion of the oars inside inflicts damage on the rowers on that side, as noted above. However, the oarsmen may attempt to avoid the attack by pulling their oars back into the ship – or, on a vessel with one man per oar and one row of oarsmen, raising the oars above the attacking ship. This counts as a parry at (average Oarsman skill/2) + 3; if there are two or more men per oar, use the average skill of the lead oarsmen. Success means the ship's oars take no damage.

Catapults

Not long after catapults were developed, Greek and Roman warships began to carry them. Ships commonly mounted bolt-throwers called *scorpions* (see ***GURPS Low-Tech***); the 36" size was standard. Some craft might carry a small *ballista* hurling 15-lb. stones or other missiles. Shipboard catapults remained in use until gunpowder appeared on the scene.

Roman ships also used bolt-throwers to shoot grappling lines at enemy vessels. The line was attached to a metal missile, the *harpago*. This gives the catapult *half* its usual range. If any damage penetrates the target's DR, the harpago is embedded. An attached harpago grants the attacking captain +4 on all Shiphandling rolls he makes for boarding. It's destroyed if its metal grapnel suffers 25 points of injury or if a specific section of the connecting rope takes 10 points of cutting damage.

Incendiaries

Another use for shipboard stone-throwers was to lob pots of flaming oil at enemy ships. On a hit, these inflict 1d-1 burning damage per second in a one-yard radius for 3d seconds. Treat most ships as being made mainly of seasoned wood, which requires 10 points of damage to set afire; see *Making Things Burn* (p. B433).

In the Middle Ages, the Byzantines developed a deadlier incendiary: *Greek fire*. See ***GURPS Low-Tech*** for details. Depending on their size, Byzantine warships carried one to three fire-siphons for dispensing this mixture.

The Age of Sail saw the use of an even larger-scale incendiary weapon: the *fireship*. This was a warship filled with combustibles, sailed into the opposing fleet by a skeleton crew and set on fire. On the open sea, fireships seldom did much harm, although they could restrict the movement of the enemy fleet. Ships in harbor were far more vulnerable to them, however.

> *The basic tactic was for the two fleets to come together in parallel lines only a few hundred yards apart and simply blast away with broadsides.*
>
> *– James L. George,* ***History of Warships***

A nastier variant was the *bomb ship*. A warship with 20 tons of powder in the hold could deliver 6d×250 cr ex damage – enough to inflict perceptible harm out to a radius of a mile. On the other hand, 20 tons of black powder would cost $800,000!

Gunnery

Guns entered use aboard ships in the Middle Ages – as early as 1337 – although not in large numbers. A typical Venetian war galley had one huge gun at the prow, pointed forward, flanked by two smaller guns to either side. These were fixed-mount weapons; the only way to aim them was to turn the vessel. Later galleys sometimes added small swivel guns at the sides, but these served mainly as antipersonnel weapons. At Lepanto, the last battle of the Age of Galleys, most of the ship-to-ship combat was by boarding parties.

After 1500, several changes made guns more useful. Carriages made them movable separately from the ship, allowing gunners to adjust their aim. A carriage-mounted gun recoiled into the ship's body when fired, so the ship didn't have to withstand the full force of the recoil; after recoiling, it could be cleaned and reloaded by the muzzle, which was faster and allowed stronger guns. Muzzleloaders were standard after 1520. Ships themselves became broader and more stable in the water, able to mount rows of guns along both sides and use them to fire volleys. The gun port, invented in 1501, let a ship have separate gun decks lower in its body, which could hold heavier guns without unbalancing the vessel.

Massed fire became the main form of combat, and a ship's power was measured by the weight of ammunition it could unleash in a single volley. Treat such attacks using *Rapid Fire* (pp. B373-374), as explained for volleys under *Small Missile Weapons* (p. 35). Speed of fire was also important here, and many captains drilled their gun crews to reload and fire as quickly as possible.

Navies developed specialized ammunition for use against ships. A load of *grapeshot* could clear the decks of an enemy vessel. *Chain shot,* made from two small cannonballs chained together, could sever a ship's mast and bring down its sails. Most dangerous to use, red-hot shot could set fire to a ship, or even touch off its magazine and blow it up – still another form of incendiary attack. For stats, see *Alternate Cannon Ammunition* in ***GURPS Low-Tech.***

Warcraft

GURPS Low-Tech describes small warcraft on a scale suited to adventurers; e.g., chariots and war canoes. Heroes who go to war may encounter far larger vehicles!

*The **Helepolis** is the ultimate example of a siege tower.*

Ground Vehicles

Most low-tech ground vehicles were comparatively small, holding at most a dozen men, and often only two or three. But armies sometimes came up with much larger contrivances for special purposes.

Siege Towers (TL2)

Siege towers were first developed by the Assyrian Empire for use in taking cities. The Greeks, the Roman Empire, and medieval rulers continued to build them, until gunpowder rendered them obsolete. A particularly famous example was the *Helepolis,* built by Hellenistic general Demetrios Poliorketes (see *The **Helepolis** of Demetrios Poliorketes,* below) during the siege of Rhodes. Demetrios had previously constructed a somewhat smaller tower for his siege of Salamis, but the one he used to attack Rhodes exceeded it in magnitude.

The construction of siege towers isn't standardized. Each tower is built adjacent to the city it's intended to attack, and sized to the city walls it must defeat. Some materials may be shipped in, but the tower itself is far too big to transport. It's shifted by men or animals positioned inside the base to protect them from enemy attack; they may push or pull at its structure, or turn capstans that drive its wheels. In any case, siege towers move *extremely* slowly – as little as a few yards per day. They require level ground to move at all; if the defenders can find a way to create uneven or muddy terrain, they may be able to immobilize a tower.

A siege tower's structure is made of heavy wood, able to withstand massive impacts; it's effectively a mobile fortress. An expensive siege tower, such as the *Helepolis,* may be armored with metal plates. A more common covering is the untanned hides of oxen or donkeys, intended to resist incendiary attacks from the city's defenders. Towers often have multiple platforms that can be use to shoot at the enemy; big ones may even carry catapults. When the tower reaches the city wall, one or more gangplanks are lowered to let shock troops cross over and assault the wall's defenders.

Given its size and slowness, a siege tower is better described as a (barely mobile) building than as a vehicle. In addition to the usual statistics for a building (see *HP and DR of Structures,* p. B558), it has a movement speed in yards/hour. It cannot be accelerated above this speed.

Example: A small siege tower, suitable for attacking a provincial town, stands 30' tall on a base 15' square. Its front and sides are armored with thick hides with DR 4. Its wooden walls are 4" thick and have DR 4, for total DR 8. It has HT 12 and HP 165. A crew of 10 men can shove it forward on its wheeled base at 6 yards/hour. $26,400, 8,800 lbs.

The base price and weight don't include weapons. See ***GURPS Low-Tech*** for suitably heavy fixed-mount weapons.

The *Helepolis* of Demetrios Poliorketes

The *Helepolis* (Greek for "city-taker" or "destroyer of cities") is perhaps the ultimate example of a siege tower. It's built on a grille of timber 72' square, and has a total height of 144'. It has nine floors within, and occupants move between these via two internal staircases. The bottom level covers 4,225 square feet; the topmost level, 900 square feet. Its wide base for its height makes it very stable.

The entire front and both sides are covered with iron plates, probably about 1/4" thick. It has DR 24 on those facings and DR 12 elsewhere, and HP 600. The 222-ton tower has eight iron wheels, each 15' in diameter, and room for almost 1,200 men to push simultaneously; 3,400 men operate in shifts to move it. It can make at most 1 yard/hour, traveling only the length of its own base per day! Construction cost is $3.4 million – $3 million of that for the iron plates.

The tower contains 16 ballistae and four scorpions. Each has its own firing port, with leather-and-wool padded shutters that open and close mechanically. The bottom floor houses two 180-lb. ballistae and a 60-lb. one. The second floor has three 60-lb. ballistae. Each of the next five floors sports two 30-lb. ballistae. The four 72" scorpions are placed two apiece on the top two floors. With tripods, these engines collectively add *another* $3.5 million to cost and 70 tons to weight.

During the siege of Rhodes, the *Helepolis* drove the defenders from the battlements, and its catapults stripped the crenellations off the city walls. One tower and a section of curtain wall were brought down as well. Repeated attacks by the defenders managed to damage sections of the iron armor, forcing Demetrios to withdraw the tower. According to one account, the Rhodians managed to mire it in a swamp of sewage, dislodged some of its protective iron plating, and shot flaming arrows at it. In any case, the siege was ended by a negotiated peace and the *Helepolis* was abandoned. Legend has it that the sale of the *Helepolis'* iron plates was sufficient to finance the construction of the Colossus of Rhodes.

Armed, armored, and (slowly) mobile, the *Helepolis* is an early troop-carrying war machine . . . or perhaps a primitive, manned Ogre!

Warships

Ships can be made large much more easily than can land vehicles. Watercraft with crews of 50 or more go back to the Bronze Age (TL1), while the largest Iron Age (TL2) ships might have several *hundred* crewmen. The vessels below are of intermediate size – too big for a party of adventurers to man on their own, but smaller than massive capital ships, and likely to be assigned to independent action.

War Galley (TL1)

A classic example of the war galley is the *penteconter,* the Greek warship of the heroic age (TL1). The ship the Argonauts used on Jason's quest for the Golden Fleece was a penteconter; so were most of the vessels the Greeks took to Troy. A penteconter is primarily a transport for foot soldiers, carrying 50 rowers who disembark to fight on land; it has room for a captain, perhaps a few passengers, and a modest amount of cargo. If it must fight at sea, it does so by having the crewmen shoot small missile weapons, or by grappling and boarding. The oarsmen form two rows of 25 men, one down each side. A single mast bears a square sail, best suited to running before the wind. Construction is based on planks joined edge to edge, in a tongue-and-groove arrangement held together with wooden pegs.

Many other cultures used roughly similar galleys in comparable combat roles. Viking longships (TL3) are a good example. Like a penteconter, a longship had a single square sail; however, it had two men per oar, not one. Viking ships were clinker-built, with the sides of adjacent planks overlapping and fastened mainly by cords rather than pegs. The result was a vessel sturdy enough to survive the Atlantic's rough waters. The *snekke* on the *Warships Table* (below) is a relatively small vessel, capable of being beached (making it useful for raiding) or even physically carried over a portage by its crew; performance statistics come from a reconstructed snekke, the *Helge Ask*.

Trireme (TL2)

An advanced variant on the war galley, the trireme was the best-known warship of ancient Greece and Rome. The Athenian Empire's power came from a fleet of roughly 200 triremes; the Roman Empire moved back from larger warships to a mainly trireme-based fleet, which served to keep the Mediterranean largely free of piracy. In the 20th century, the British-based Trireme Trust constructed a working trireme, the *Olympias,* based on indirect evidence of how triremes were built; working trials achieved performance roughly comparable to ancient historical descriptions.

The trireme is specialized for a single purpose: attacking other ships. Its main weapon is a bronze-and-iron ram at the prow (see *Ramming,* pp. 35-36). To enable it to strike with the greatest possible force, and to enhance its maneuverability, it carries three rows of oarsmen on each side, for a total of 170 men. To accommodate the top row and upper bodies of the middle row, it has a superstructure on each side of the hull, extending out to a width of 18'. It also carries nine officers, 10 sailors, and a variable number of marines – 18 were standard in Athens. It has barely enough room to fit them all in, no cargo space, and no quarters; standard practice is to spend nights ashore. A mainmast to the aft and a smaller foremast hold sails, but these are taken down at the start of a battle.

Turtle Ship (TL3)

The Korean turtle ship, or *geobukseon,* was yet another variation on the war galley, but with an unusual feature: it was completely enclosed, giving its crew much more protection in battle. Historical accounts sometimes describe turtle ships as "iron-clad." Actually, the sides and roof were made of thick pine, like the hull; iron was used only in spikes protruding through the roof, which functioned like caltrops (see ***GURPS Low-Tech***). Even so, this gave the turtle ship substantial protection against enemy vessels, and made boarding it nearly impossible.

Warships Table

Terms and notation are as defined in *Vehicle Statistics* (pp. B462-463).

TL	Vehicle	ST/HP	Hnd/SR	HT	Move	LWt.	Load	SM	Occ.	DR	Range	Cost	Locations	Draft	Notes
SHIPHANDLING/TL (SHIP)															
1	Penteconter, 120'	86†	-4/3	11c	1/4	12.5	7.5	+8	55	3	F	$84K	MO	6	[1, 2]
2	Trireme, 120'	194†	-2/3	12c	1/5	77.7	20.7	+8	207	3	F	$1.2M	2M2S	4	[1, 3]
3	Snekke, 60'	73†	-3/2	12c	0.8/3	7.5	4.5	+6	30	4	F	$28K	MO	2	[2]
3	Turtle Ship, 112'	161†	-4/4	12c	0.4/2	50	17.5	+9	125	6	F	$300K	2MS	5	[4]
4	Caravel, 100'	165†	-3/4	12c	0.1/6	100	65	+9	24	4	–	$325K	2MS	7	[5]
4	Frigate, 100'	268†	-5/5	12c	0.2/5	500	350	+9	198	6	–	$1.4M	2MS	14	[5]
4	Sloop of War, 60'	165†	-3/3	12c	0.15/4	100	65	+7	70	4	–	$325K	MS	8	[5]

Notes

[1] Has a metal ram that improves collision damage (see *Ramming,* pp. 35-36).

[2] Using oars. Under sail, Range is "–" and Move is 1/4 in a favorable wind.

[3] Using oars. Under sail, Range is "–" and Move is 1/6 in a favorable wind.

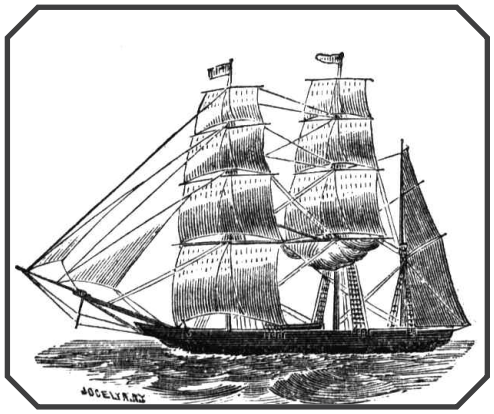
[4] Using oars. Under sail, Range is "–" and Move is 0.4/2 in a favorable wind.

[5] Under sail.

Harder to save the warships once they're up in flames.

– Homer, ***The Iliad***

Turtle ships were heavy and slow, but hard to stop – rather like seagoing tanks. Their flat-bottomed construction let them maneuver easily in shallow water. Propulsion came mainly from oarsmen on the lower deck (eight oars on each side, with five men per oar), but there were also two masts with junk-style sails. The upper decks carried cannon of various sizes, usually firing long shafts like huge crossbow bolts rather than cannonballs: two at the prow, alongside the dragon-shaped figurehead, and six more along each side.



Full-Rigged Ship (TL4)

The first step toward the full-rigged ship took place at late TL3, with the development of the *carrack,* a modified cog (see ***GURPS Low-Tech Companion 3***) with two masts (1350-1425) – or, later, three (beginning in 1416). The three-masted form was standard after 1450. These vessels had high superstructures, called *castles,* fore and aft. Columbus' largest ship, the *Santa Maria,* was a carrack.

His other two ships were *caravels,* a Mediterranean design with a long, narrow shape. Two masts carried fore-and-aft sails. These were speedy craft, widely used in exploration, and for patrol and convoy duty.

The next version of the large ship was the *galleon,* a warship specifically designed to carry guns. Such craft no longer included a high forecastle, but came to be built with three decks, including a separate, relatively low gun deck for better stability. Galleons were long and narrow, rather like caravels, but full-rigged. The first *frigate,* a two-decker analog of the galleon, was built in 1646, and smaller vessels of this type become the most common warships of their time. The larger warships came to be known as *ships of the line.* Adding to the range of options, navies also included *sloops* and *brigs,* small ships with one or two masts.

Smaller ships with modest-sized crews, in which a party of adventurers might play a significant role, include:

Caravel: A ship modeled on the Iberian caravels of around 1500, with a narrow hull (beam ratio about 5:1).

Frigate: An early version of the frigate, as built around 1700. It carries 20-24 cannon, typically 6-lb. In the British navy of its day, it would be categorized as a sixth-rate ship.

Sloop of War: A small sailing ship from around 1700, with a single mast bearing a fore-and-aft sail. A large bowsprit adds to the sail area. When outfitted with perhaps a dozen small cannon, this is a favorite of pirates for its speed and maneuverability. In the British navy, this would be an unrated ship, commanded by a "master and commander," not a captain. This isn't the same as the much smaller "sloop" in ***GURPS Low-Tech.***

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