

VEHICLE COLLECTION FOR GURPS Fourth Edition



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GROUND VEHICLES

HORSELESS CARRIAGES

Early automobiles had a variety of strange shapes as inventors struggled to perfect a useful design. Some of them resembled horse-drawn vehicles and even ones which looked very different were often named after the more familiar carriages.

Benz Patent-Motorwagen (Germany, 1886-1893)

One of the first vehicles built to be driven by an internal combustion engine was a three wheeled contraption which looked more like a large bicycle than a modern car. It had a single large seat, a simple handle for steering and no fuel tank; it ran on ether which was stored by soaking it into a basin of fibre.

Morris & Salom Electrobat (USA, 1895-1896)

Powered by heavy lead-acid batteries, this slow but quiet vehicle was used as a taxi in Philadelphia, Boston and New York. The passenger sat in a large open seat at the front covered by a small awning while the driver stood behind on a raised platform.

Nesselsdorfer Wagenbau Präsident (Austria-Hungary, 1897)

Nesselsdorfer Wagenbau was known for making luxury horse carriages and they built their first motor car in the same style. It looks very similar to a cabriolet or cab phaeton, except for the simple handlebar controls and the obvious lack of horses.

Oldsmobile Curved Dash (USA, 1901-1907)

The first mass-produced automobile was a 'runabout'; a popular style for early cars with a simple steering handle, a single bench and no windshield.

Stanley EX Runabout (USA, 1906)

The EX had many features of a modern car, such as a steering wheel, headlights and an engine at the front. However it wasn't an internal combustion engine, but a steam engine, fuelled by burning kerosene heating a high-pressure boiler. There are no records of any Stanley boiler actually bursting, but if such an engine were damaged it could in theory explode quite violently.

DRIVING (AUTOMOBILE)

TL	Vehicle	ST/HP	Hnd/SR	HT	Move	LWt	Load	SM	Occ	DR	Range	Cost	Locations
6	Electrobat	37	-1/3	10	1/8*	0.6	0.2	+2	1+1	4	25	\$25K	O4W
6	Patent-Motorwagen	37	-1/3	9f	1/5*	0.6	0.2	+2	1+1	4	30	\$20K	O3W
6	NW Präsident	53	-1/3	10cf	1/9*	1.5	0.3	+3	1+2	4	100	\$50K	O4W
6	Curved Dash	37	-1/3	10f	1/10*	0.65	0.2	+2	1+1	4	140	\$15K	O4W
6	Stanley EX	37	-1/3	11fx	1/12*	0.9	0.4	+3	1+3	4	300	\$19K	O4W

ECONOMY CARS

Some of the most innovative designs of the twentieth century came from the demand for cheap

but reliable cars. The most successful models sold in vast numbers, transforming society by allowing

ordinary people to travel further for both work and leisure.

I will build a car for the great multitude... it will be so low in price that no man making a good salary will be unable to own one – and enjoy with his family the blessing of hours of pleasure in God's great open spaces.

- Henry Ford

Ford Model T (USA, 1908-1927)

Henry Ford didn't invent the concept of building cars on an assembly line, but he did create one which was far quicker than his competitors. Even the colour of the paint was chosen based on the time it took to dry (leading to Ford's famous quip that it was available in any colour 'so long as it is black'). With more than 15 million sold the Model T was by far the most successful car of its time, outnumbering all its competitors combined.

The 'Tin Lizzie' was a simple and rugged design, capable of running on ethanol, kerosene or gasoline and handling the rough dirt roads which were common in America at the time. It was often used as a working vehicle, with conversion kits to turn it into a tractor selling well. With one wheel removed to drive a belt, it served as a mobile power generator for agricultural machinery. Some were even made into railcars or fitted with tracks and skis.

Volkswagen Type 1 'Beetle' (Germany, 1938-1974)

Initially designed as a family car for Nazi Germany, only a small number of civilian Volkswagens were actually produced before the end of World War II since the factory building them also had to provide military variants such as the Kübelwagen.

After the Nazis were defeated, the factory was handed over to the British who considered dismantling the facility and shipping it to Britain but eventually decided not to after an official report concluded 'to build the car commercially would be a completely uneconomic enterprise'. Instead, the factory was given a contract to produce cars for the British army and eventually started commercial sales.

The Type 1 had an air-cooled engine which was both simple to maintain and capable of producing relatively good power for a small car. This, combined with its distinctive appearance and low cost made it increasingly popular throughout the fifties and sixties when it gained its enduring associations with surf and hippy culture. The Beetle remains one of the most recognisable cars in the world, with numerous nicknames and even a children's game based around spotting them.

Citroën 2CV (France, 1948-1990)

Designed to replace the horse-drawn carts still used by most French farmers in the forties, the Deux Chevaux was a minimalist but practical vehicle. Nicknamed the 'umbrella on wheels' due to its canvas roof, which could be pulled back to accommodate large loads, the 2CV was widely mocked but sold in large numbers. At one point demand was so high that there was a five year waiting list for new vehicles.

Early versions of the 2CV were notoriously slow (reduce Move to 1/20*) but this was soon improved and by the mid seventies versions with vaguely respectable engines (Move 2/35*) were available.

Morris Minor 1000 (UK, 1956-1971)

One of the first British attempts to make a car cheap enough for the working class, the Morris Minor didn't really have the charm of its continental competitors. Nevertheless its low price, fuel economy and acceptable road performance meant that it sold in large numbers.

Sachsenring Trabant 601 (East Germany, 1963-1991)

Like the 2CV, the Trabant had a lengthy waiting list. However, in this case it was less that demand was high and more that there were few alternatives available under Soviet rule. The 601 had a dirty and inefficient two-stroke engine and many parts of it were made of Duroplast (a plastic made from recycled materials which was sometimes compared unfavourably to cardboard).

After the fall of the Berlin Wall, many Trabant owners used their vehicles to move to West Germany and promptly sold them at low prices or simply abandoned them. It remains a symbol of the soviet era and the butt of many German jokes. However, it is popular with a small number of enthusiasts who tune or replace the engines to produce surprisingly fast rally cars.

Renault 5 (France, 1972-1985)

One of the first modern hatchback 'supermini' cars, the Renault 5 (also known as the R5) was

designed by engineer Michel Boué in his spare time. When his superiors saw the plans, they authorised development immediately. Boué died of cancer just months before the car was launched, never knowing how successful it would be.

The low price, fuel economy and space-efficient layout made the R5 a huge hit in Europe, but in America (where it was sold as the Renault Le Car) low fuel costs and a preference for larger vehicles meant it didn't have the same appeal.

The Renault 5 Turbo had a similar name and appearance, but was a very different machine. A bigger engine was mounted in the middle of the car, replacing the back seat and powering the rear wheels rather than the front as in the R5 (ST/HP 50, Move 4/62, LWt. 1.4, Load 0.3, Occ 1+1).

Kia Rio (South Korea, 2011-)

Although it is larger than most cars in it's price range, the Rio has impressive fuel efficiency thanks to it's clean turbo-diesel engine.

DRIVING (AUTOMOBILE)

<i>TL</i>	<i>Vehicle</i>	<i>ST/HP</i>	<i>Hnd/SR</i>	<i>HT</i>	<i>Move</i>	<i>LWt</i>	<i>Load</i>	<i>SM</i>	<i>Occ</i>	<i>DR</i>	<i>Range</i>	<i>Cost</i>	<i>Locations</i>
6	Ford Model T	43	0/4	10f	2/22*	1	0.4	+3	1+3	5	180	\$5K	O4W
6	Volkswagen Type 1	49	0/4	11f	2/36*	1.3	0.4	+3	1+3	4	330	\$10K	G4W
6	Citroën 2CV	43	0/4	11f	1/25*	1.1	0.45	+3	1+3	4	410	\$5K	G4W
7	Morris Minor 1000	48	0/4	10f	1/38*	1.3	0.45	+3	1+3	5	250	\$10K	G4W
7	Trabant 601	41	0/4	11f	2/31*	1	0.45	+3	1+3	3	210	\$7K	G4W
7	Renault 5	46	0/4	11f	2/36*	1.3	0.45	+3	1+3	4	350	\$9K	G4W
8	Kia Rio	54	0/4	10	2/50*	1.8	0.55	+3	1+4	4	600	\$10K	G4W

CITY CARS AND SUBCOMPACTS

In built-up areas there is often great demand for small vehicles suitable for short journeys. These cars are usually agile enough to manoeuvre through heavy traffic and fit into cramped parking spaces.

Austin Seven (UK, 1922-1939)

Herbert Austin had traditionally built large cars but the market for them was drying up, especially since Britain had introduced new taxes based on a vehicle's horsepower. With his company in receivership, he shocked his board of directors by

proposing to make a small, cheap vehicle to 'motorise the common man'. In the end he had to pay much of the development costs himself and the design was drawn up in his billiard room, but the result was a great success. Most other British companies making small cars were wiped out and several foreign firms built copies, including BMW and Nissan.

Fiat 500A 'Topolino' (Italy, 1936-1948)

The 'little mouse' was an exceptionally small car for it's time. Although it had a relatively long hood, the position of the radiator behind the engine allowed it to be sharply angled down to give better visibility. The trunk could be accessed from behind the seats and some owners managed to squeeze several passengers into the space.

The very similar B and C versions were produced until 1955. In America, the 500A was sometimes used as the basis for a 'Hot Rod' conversion with a more powerful engine.

Iso Isetta (Italy, 1953-1956)

The original 'bubble car' was a curious little vehicle powered by a motorcycle engine. It had four wheels, but the back two were very close together. It's most unusual feature however was that the entire front of the car (including the steering wheel) hinged open to allow access. It was made under license by several different countries, with the BMW version being the most successful (and often credited with saving that company at a time when it was near ruin).

Due to the strange door, the Isetta could be entered with a wheelchair. The British National Health Service even provided them for free to disabled people at one point.

BMC Mini Mark 1 (UK, 1959-1967)

Following the 1956 Suez Crisis, Britain suffered a fuel shortage, driving up demand for small, efficient cars. The British Motor Corporation responded by designing an exceptionally compact vehicle. The Mini was hugely popular in Britain, but failed to sell well in America.

Numerous variants of the Mini were produced, including the more powerful Mini Cooper (seen in *The Italian Job*, Move 3/43*) which was intended for rally competition, the Mini Moke all-terrain vehicle (which lacked the ground clearance to perform well off-road, Move 3/32*, Loc O4W) and even a pick-up truck. Vehicles based on the original design were produced by a variety of companies until 2000 with a total of over five million sold worldwide.

Smart Fortwo W450 (Germany, 1998-2007)

Just over eight feet long, this tiny car is actually shorter than the width of some other road vehicles, meaning that two of them can be packed sideways into a normal parking space. It features swappable body panels allowing for a quick change in appearance, a concept which came from the Swatch watch makers who partnered with Daimler-Benz to design the smart car.

DRIVING (AUTOMOBILE)

<i>TL</i>	<i>Vehicle</i>	<i>ST/HP</i>	<i>Hnd/SR</i>	<i>HT</i>	<i>Move</i>	<i>LWt</i>	<i>Load</i>	<i>SM</i>	<i>Occ</i>	<i>DR</i>	<i>Range</i>	<i>Cost</i>	<i>Locations</i>
6	Austin Seven	38	0/4	10f	1/22*	0.85	0.4	+3	1+3	4	250	\$8K	G4W
6	Fiat 500 'Topolino'	43	0/4	10f	1/26*	1	0.3	+3	1+1	4	230	\$9K	G4W
7	Iso Isetta	36	0/3	11f	1/23*	0.6	0.2	+2	1+1	4	170	\$7K	G4W
7	Mini Mark 1	44	0/4	11f	2/36*	1.1	0.4	+3	1+3	4	260	\$9K	G4W
8	Smart Fortwo W450	46	0/4	11f	2/45*	1.0	0.2	+2	1+1	4	310	\$11K	G4W

SCOOTERS

Many people are unable to afford a car, but still need some form of transport. Scooters offer a low-

cost, convenient method of getting one or two people from place to place. Unlike many larger motorcycles they need little maintenance and allow the rider to keep their clothes clean with their enclosed engines and lightweight fairings.

Piaggio Vespa 150 GS (Italy, 1955-1961)

Piaggio created the first successful scooter in 1946, naming it the Vespa ('Wasp') because of its narrow waist. Over the years dozens of Vespa variants have been sold, most of them fairly similar. The 150 GS was one of the more popular, thanks to coming onto the market at the start of the 'mod' scene in Britain where Italian scooters were seen as

an essential fashion accessory.

Honda Super Cub 110 (Japan, 2009-)

Since its introduction in 1958 the Super Cub line has become so popular that it is now the most common motor vehicle in the world. Used as both a personal transport and a commercial delivery vehicle by millions of people, its efficiency and reliability are legendary. In some places it is so popular as a motorcycle taxi that 'Honda' has become a generic term for such vehicles. The 110 has a cleaner engine than previous versions, but is still essentially the same machine.

DRIVING (MOTORCYCLE)

<i>TL</i>	<i>Vehicle</i>	<i>ST/HP</i>	<i>Hnd/SR</i>	<i>HT</i>	<i>Move</i>	<i>LWt</i>	<i>Load</i>	<i>SM</i>	<i>Occ</i>	<i>DR</i>	<i>Range</i>	<i>Cost</i>	<i>Locations</i>
7	Vespa 150 GS	23	+1/2	10f	3/32*	0.2	0.1	0	1	3	140	\$2K	E2W
8	Super Cub 110	23	+1/2	12f	3/23*	0.2	0.1	0	1	3	150	\$2.4K	E2W

OFF-ROAD BIKES

These lightweight motorcycles are made to handle rough terrain. They usually have tires with heavy tread to grip in soft ground and strong suspensions to handle bumpy rides. In rural areas they fill much the same role that scooters do in cities; a cheap, convenient form of transport that is just fast enough to be fun.

Yamaha AG100 (Japan, 1973-)

First marketed as a farm bike in Australia, the AG100 sold well in many parts of the developing

world thanks to its low cost, fuel economy and reliability. Its simple two-stroke engine is easy to repair and its enclosed drive chain is well protected from dirt.

BMW R1200GS Adventure (Germany, 2005-)

A powerful 'dual sport' bike, capable of high speeds both off and on roads. Actors Charlie Boorman and Ewan McGregor rode these from Scotland to South Africa.

DRIVING (MOTORCYCLE)

<i>TL</i>	<i>Vehicle</i>	<i>ST/HP</i>	<i>Hnd/SR</i>	<i>HT</i>	<i>Move</i>	<i>LWt</i>	<i>Load</i>	<i>SM</i>	<i>Occ</i>	<i>DR</i>	<i>Range</i>	<i>Cost</i>	<i>Locations</i>
7	Yamaha AG100	24	+1/2	11f	3/26	0.22	0.1	0	1	4	300	\$2.8K	E2W
8	BMW R1200GS	32	+1/2	11f	9/65	0.37	0.1	0	1	4	360	\$13K	E2W

SPORT BIKES

If you want an agile, exciting and, above-all, fast ride then these 'crotch rockets' are pretty much the best thing on wheels. They are ideally suited to high-speed chases... so long as you are able to stick to

good roads and don't value your life.

Honda CB750 (Japan, 1969-2003)

The first 'superbike' had a powerful engine, good

brakes, comfortable suspension and reasonable price. It sold over 400,000 copies and inspired many imitators, which came to be collectively known as 'Universal Japanese Motorcycles'.

...essentials of the motorcycle consists in the speed and the thrill...

Soichiro Honda

Moto Guzzi Le Mans 850 (Italy, 1976-1983)

A factory-made 'café racer' in the style of the custom bikes used by European 'Rockers', the Le Mans had a big engine packed neatly into a small

frame, a tiny fairing and controls laid out for the rider to hunch over for maximum control and minimum drag.

Kawazaki GPZ900R Ninja (Japan, 1984-2003)

The Ninja had a revolutionary design; using it's cutting-edge, liquid-cooled, 16 valve engine as part of the frame to save weight it was the fastest production bike in the world at the time of it's release. In the 1983 Isle of Man TT race both first and second place were taken by Ninja riders.

The Ninja was so popular that the name became a generic term for similar sports bikes with aerodynamic fairings. Tom Cruise rides one in *Top Gun*.

DRIVING (MOTORCYCLE)

<i>TL</i>	<i>Vehicle</i>	<i>ST/HP</i>	<i>Hnd/SR</i>	<i>HT</i>	<i>Move</i>	<i>LWt</i>	<i>Load</i>	<i>SM</i>	<i>Occ</i>	<i>DR</i>	<i>Range</i>	<i>Cost</i>	<i>Locations</i>
7	Honda CB750	31	+1/2	11f	8/60*	0.36	0.2	0	1+1	4	170	\$8K	E2W
7	Moto Guzzi Le Mans	31	+2/2	11f	8/62*	0.35	0.1	0	1	4	230	\$12K	E2W
8	GPZ900R Ninja	32	+2/2	11f	10/75*	0.38	0.1	0	1	4	180	\$9K	E2W

CRUISING AND TOURING MOTORCYCLES

These bikes are general purpose road transport. They aren't especially fast, don't cope well in rough terrain and give little protection from the elements. On the other hand, they are usually more affordable and manoeuvrable than a car while offering better power than a scooter and they look cool.

Harley-Davidson FXST Softail Standard (USA, 1984-)

Like most recent Harley-Davidson machines, this heavy bike has a deliberately old-fashioned appearance. But concealed under it's seat is a

modern suspension system which gives a far more comfortable ride than the classic bikes it mimics.

Honda Gold Wing GL1500 (Japan, 1987-2000)

A shamelessly luxurious tourer, the Gold Wing is a huge bike with a rear-seat backrest, a big fairing to protect the riders from the wind and integrated storage (almost 5 cubic feet total) in the form of hard panniers and a trunk. Options include a sound system and foot heaters.

DRIVING (MOTORCYCLE)

<i>TL</i>	<i>Vehicle</i>	<i>ST/HP</i>	<i>Hnd/SR</i>	<i>HT</i>	<i>Move</i>	<i>LWt</i>	<i>Load</i>	<i>SM</i>	<i>Occ</i>	<i>DR</i>	<i>Range</i>	<i>Cost</i>	<i>Locations</i>
8	FXST Softail	34	+1/2	11f	5/54*	0.53	0.2	0	1+1	4	220	\$15K	E2W
8	Gold Wing GL1500	37	+1/2	11f	6/48*	0.67	0.25	0	1+1	4	190	\$17K	E2W

MILITARY MOTORCYCLES

Motorcycles are easy to transport, fast and generally able to deal with rough terrain. In the first half of the twentieth century, many military forces used them for scouting and to carry vital messages. Many early civilian bikes were also used by the military and most military bikes were available in civilian versions, often only distinguished by the paint job.

Triumph Model H (UK, 1915-1923)

The British Army bought thousands of these bikes to replace horses for their despatch riders. The troops nicknamed it the 'Trusty' and generally considered it to be a good, reliable machine – at least once they had reinforced the weak front suspension springs with leather belts.

Birmingham Small Arms M20 (UK, 1937-1955)

The most common motorcycle used by the

British Army in the second world war was criticised for being heavy, slow and fuel-thirsty. However it was at least moderately reliable and very easy to repair, so the military used it extensively and ended up buying around 126,000 of them.

After the war, many surplus M20s were purchased by the Automobile Association who attached distinctive yellow sidecars and used them as transports for their mechanics.

BMW R75 (Germany, 1941-1946)

A motorcycle-sidecar combination with a powered wheel on the permanently attached sidecar. The R75 could tow a trailer or light artillery piece, as well as having numerous racks and brackets for carrying equipment on the vehicle. The most notable feature however was the *Rheinmetall MG34* machine gun (High-Tech, p.132) which was usually mounted on the front of the sidecar.

DRIVING (MOTORCYCLE)

TL	Vehicle	ST/HP	Hnd/SR	HT	Move	LWt	Load	SM	Occ	DR	Range	Cost	Locations
6	Triumph Model H	23	+1/2	11f	3/24	0.2	0.1	0	1	4	300	\$5K	E2W
6	BSA M20	29	+1/2	11f	3/25	0.3	0.1	0	1	4	150	\$5K	E2W
6	BMW R75	39	0/3	11f	2/28	0.8	0.3	+2	1+2	4	210	\$10K	EO3WX

TRIKES

Half-way between a bike and a car, these awkward machines are often seen as offering the worst features of both. Many of them are custom builds made by combining two existing vehicles, but a few companies have mass produced them with some success.

Harley-Davidson Servi-Car (USA, 1932-1973)

The Servi-Car was built for the car service industry as a vehicle for deliveries. It could be towed behind a car which was being driven to the customer, then unhitched and ridden back to the garage. It also proved popular with small businesses

who used it to make deliveries (a box at the rear could hold about 3 cubic feet of cargo) and police departments who found it ideal for collecting cash from parking meters and issuing tickets.

Honda Gyro UP (Japan, 1985-2008)

This tiny cargo transporter looks like a cross between a scooter and a pick-up truck. The driver steers with handlebars while sitting in an open-sided cab and the cargo rests in a box at the back (which holds about 5 cubic feet and is sized to fit standard Japanese 20-bottle beer crates).

DRIVING (AUTOMOBILE)

<i>TL</i>	<i>Vehicle</i>	<i>ST/HP</i>	<i>Hnd/SR</i>	<i>HT</i>	<i>Move</i>	<i>LWt</i>	<i>Load</i>	<i>SM</i>	<i>Occ</i>	<i>DR</i>	<i>Range</i>	<i>Cost</i>	<i>Locations</i>
6	Servi-Car	34	0/3	10f	2/25*	0.48	0.15	+1	1	4	280	\$6K	E3W
8	Honda Gyro UP	25	+1/3	11f	2/15*	0.3	0.2	+1	1	4	220	\$1K	O3W

FAMILY CARS

These mid-sized cars have enough space to carry children, pets and large quantities of shopping. They usually compromise between affordability, comfort and performance to give an average, safe vehicle.

AMC Rambler Six (USA, 1956-1960)

The first of the American 'compact cars' (which were still large compared to most European ones) the Rambler spawned many imitators. It's advertising emphasised the safety of it's welded unit body, offering a personal injury insurance policy at no extra cost to demonstrate the manufacturer's confidence in their product.

Toyota Corolla E30 (Japan, 1974-1981)

Like many best-sellers the Corolla name has been used for a variety of different cars over the years

with over 40 million sales between them. The E30 was one of the most popular, dominating the market in the late seventies as fuel prices made larger cars less desirable.

Volvo 245 (Sweden, 1974-1993)

The 200 series was Volvo's most successful line and this slab-sided station wagon is probably the most iconic model. With over 40 cubic feet of cargo space and a reputation for solid build quality, it was seen as a practical car for well-off families.

Ford Focus Mk 1 (USA, 1998-2004)

One of the few Ford models sold successfully in both America and Europe, the Focus is a typical modern compact car. Some versions have dual fuel engines which can run on either gasoline or ethanol.

DRIVING (AUTOMOBILE)

<i>TL</i>	<i>Vehicle</i>	<i>ST/HP</i>	<i>Hnd/SR</i>	<i>HT</i>	<i>Move</i>	<i>LWt</i>	<i>Load</i>	<i>SM</i>	<i>Occ</i>	<i>DR</i>	<i>Range</i>	<i>Cost</i>	<i>Locations</i>
7	AMC Rambler Six	57	0/4	11f	2/48*	2.1	0.6	+4	1+4	5	320	\$16K	G4W
7	Toyota Corolla E30	49	0/4	11f	2/43*	1.6	0.6	+3	1+4	4	380	\$10K	G4W
7	Volvo 245	57	0/4	11f	2/50*	2.4	0.9	+4	1+4	6	300	\$20K	G4W
8	Ford Focus Mk 1	53	0/4	11f	2/53*	1.7	0.5	+3	1+4	4	530	\$16K	G4W

FLEET CARS

These cars are rarely owned by private citizens, being better suited to the needs of businesses or government agencies. They often have spacious back seats, dividers between the driver and passengers and are more sturdy than other road vehicles.

Hindustan Ambassador (India, 1958-2014)

India's 'national car' is based on a British vehicle, the Morris Oxford. When first introduced it was

beyond the means of most Indians was mainly used by politicians and other dignitaries. As the Indian automotive industry grew and the market opened to foreign imports the 'Amby' faced stiff competition, but still managed to stay in production with only minor changes for several decades. It remained popular with politicians, who didn't want to be seen in a foreign car even if it was a more high-status vehicle and was also commonly used as a taxi.

DRIVING (AUTOMOBILE)

<i>TL</i>	<i>Vehicle</i>	<i>ST/HP</i>	<i>Hnd/SR</i>	<i>HT</i>	<i>Move</i>	<i>LWt</i>	<i>Load</i>	<i>SM</i>	<i>Occ</i>	<i>DR</i>	<i>Range</i>	<i>Cost</i>	<i>Locations</i>
7	Ambassador	53	0/4	11f	2/36*	1.8	0.6	+4	1+4	4	300	\$9K	G4W

MUSCLE CARS

Unlike most sports cars, these heavyweight machines put little emphasis on steering. They are built to go fast in a straight line without elegance or subtlety.

Oldsmobile 'Rocket' 88 (USA, 1949-1953)

The first muscle car (and the inspiration for the first rock and roll record) put a big luxury car engine in a smaller, lighter body to produce one of the fastest vehicles on the road at the time.

Dodge Charger (B-Body) (USA, 1966-1978)

The first Dodge car to bear the Charger name had

a big square hood and a sharp 'fastback' wedge at the rear. It was available in an array of eye-watering colours with names like 'Panther Pink' and 'Top Banana'.

The most famous Charger (actually several hundred of them, as they were regularly destroyed during filming) was probably the 'General Lee' driven by the title characters in *The Dukes of Hazard*. Decorated with a confederate battle flag on the roof, the 'General' had its doors welded shut to strengthen the body for the numerous stunts in the show.

DRIVING (AUTOMOBILE)

<i>TL</i>	<i>Vehicle</i>	<i>ST/HP</i>	<i>Hnd/SR</i>	<i>HT</i>	<i>Move</i>	<i>LWt</i>	<i>Load</i>	<i>SM</i>	<i>Occ</i>	<i>DR</i>	<i>Range</i>	<i>Cost</i>	<i>Locations</i>
7	Oldsmobile 88	62	0/4	11f	3/47*	2.6	0.6	+4	1+4	4	240	\$20K	G4W
7	Dodge Charger	63	0/4	11f	5/70*	2.5	0.5	+4	1+3	4	200	\$18K	G4W

EXECUTIVE AND LUXURY CARS

These high-status vehicles have spacious, comfortable interiors and good performance, but at a high price. For many manufacturers these are their 'flagship' products, bringing positive associations to the entire brand by their reputation.

Citroën Traction-Avant 11 Légère (France, 1934-1957)

The novel combination of a drivetrain which was entirely forward of the cabin, advanced suspension and unitary body construction gave the Traction Avant a distinctly low-slung style. Although sales were good, the stress of getting the factory ready for it in time was blamed for killing André Citroën and driving his company into bankruptcy.

Cadillac Eldorado Biarritz (USA, 1959-1960)

Possibly the most iconic car of the fifties, the third generation of the Eldorado featured the same huge fins and bullet tail lights as other Cadillacs of the time as well as plenty of chrome and stylish curves. Elvis Presley famously owned a pink one, which was the subject of several songs.

The Eldorado Seville (Loc G4W) was the same car with a hardtop.

Mercedes-Benz S-Class 450SEL 6.9 (Germany, 1975-1981)

The Mercedes-Benz S-Class (*Sonderklasse* or 'Special Class') is one of the world's most popular

luxury car lines, notable for the emphasis on passenger safety (it was one of the first cars to feature airbags and comes with a built-in first aid kit) and engines optimised for high-speed cruising.

The 450SEL 6.9 was the most powerful version (a more typical S-Class of the time would have Move 3/60*). It closely resembled the other S-Class models, with the interior detail being rather restrained and lacking in features compared to other

cars in its price range. What it did offer was impressive speed, with performance more like a sports car than a large sedan. It features prominently in *Lost Highway* and *Ronin*.

BMW E36 (Germany, 1990-1998)

The third generation of BMW's popular 3 Series is relatively small for a luxury car, but fast and well suited for commuting into busy cities.

DRIVING (AUTOMOBILE)

TL	Vehicle	ST/HP	Hnd/SR	HT	Move	LWt	Load	SM	Occ	DR	Range	Cost	Locations
6	Traction-Avant 11L	53	0/4	10f	2/33*	1.7	0.5	+3	1+3	4	280	\$17K	G4W
7	Cadillac Eldorado	69	0/4	11f	3/61*	3.4	0.8	+4	1+5	5	210	\$50K	O4W
7	S-Class 450SEL 6.9	65	0/4	11f	4/70*	2.9	0.7	+4	1+4	5	260	\$115K	G4W
8	BMW E36	56	0/4	11f	4/73*	2.0	0.5	+3	1+4	4	440	\$37K	G4W

LIGHT TRUCKS AND SPORT UTILITY VEHICLES

With the ability to handle large amounts of cargo and off-road capability, these sturdy vehicles were originally intended for agricultural work. However, they soon became popular as lifestyle accessories; a light truck can imply that you are wealthy enough to own a country retreat, or that you are an adventurous, outdoor person. This image, combined with favourable regulations for trucks compared to cars made these vehicles massively popular in the United States and elsewhere.

Toyota Hilux N50 (Japan, 1983-1988)

This famously tough pick-up has been described as the truck equivalent of the Kalashnikov rifle thanks to its widespread use by African and Middle-Eastern militia. Numerous versions of the Hilux

have been built since its introduction in 1968, with the N50 being a fairly typical and widespread example.

Land Rover Defender 110 (UK, 1990-)

The truck of choice for British farmers, these crudely built workhorses can transport cargo or labourers through muddy fields and navigate narrow country roads. The usual seating arrangement has the driver and one passenger in conventional forward-facing seats and two benches or rows of folding seats facing sideways in the back.

The Defender is also used by the British Army, where it is known as the Land Rover Wolf or Truck, Utility, Medium (TUM).

DRIVING (AUTOMOBILE)

TL	Vehicle	ST/HP	Hnd/SR	HT	Move	LWt	Load	SM	Occ	DR	Range	Cost	Locations
8	Toyota Hilux N50	56	0/4	12	2/45	2.3	0.9	+4	1+1	6	400	\$20K	G4W
8	Land Rover Defender	60	0/4	11	2/38	2.9	1.2	+4	1+7	5	380	\$25K	G4W

LIGHT COMMERCIAL VEHICLES

These modest cargo haulers move all kinds of goods along busy roads, providing essential transport for millions of businesses. Many of them are available with a variety of different body types, such as flatbeds, panel vans and box trucks.

They also serve as the base for several specialist vehicles: ambulances, police riot vans, small buses, garbage trucks and food vendor vehicles are often built on the same medium truck frames.

Citroën Type H (France, 1947-1981)

The 'H Van' or Nez de Cochon ('Pig Nose') was small and ugly, but remarkably advanced for its time. It was the first mass produced commercial vehicle built using the unibody structure and had front wheel drive, a low floor and side loading doors long before they became standard features for vehicles of this type.

The body panels were made of corrugated metal in order to provide strength without adding weight inspired by the Junkers aircraft which used the same technique. This combined with the boxy shape of the van gave it a distinctly shed-like appearance.

Ford Transit Mark 1 (USA, 1965-1978)

In many ways the 'Tranny Van' is the iconic European panel van. Although owned by an American company, the first transit was designed and built in England (with help from Ford's German engineering department) and never marketed in America. Plain white Transit vans soon became a common sight throughout Europe as it found favour with tradesmen of all kinds. The Transit was also popular with criminals, thanks to good handling characteristics and the ability to blend in on city streets.

DRIVING (AUTOMOBILE)

TL	Vehicle	ST/HP	Hnd/SR	HT	Move	LWt	Load	SM	Occ	DR	Range	Cost	Locations
7	Citroën Type H	57	-1/4	11f	1/24*	2.6	1.1	+3	1+1	4	300	\$17K	G4W
7	Ford Transit Mk. 1	64	0/4	11f	1/28*	3.8	1.8	+4	1+1	4	400	\$9K	G4W

MILITARY TRUCKS

A modern army needs a huge fleet of logistics vehicles and most of them are simple trucks.

Mercedes-Benz Unimog 404 (Germany, 1955-1980)

This incarnation of the Universal-Motor-Gerät is an off-road transporter which was used by the armed forces of many countries as a logistics vehicle. They are popular civilian vehicles too, especially with foresters or others who need to travel into rough terrain.

Like many military trucks Unimogs usually have power take-off connections, allowing them to be used as a power source for machinery (often connected to a heavy duty winch). Many of them also have an air compressor which usually powers their auxiliary brake system but which can be used to inflate tyres or power other devices.

GAZ-66B (Russia, 1966-1999)

Russian airborne forces somehow manage to cram an entire platoon under the flimsy canvas roof of this little truck. It is nicknamed the *Shishiga* (a

type of nature spirit from Russian folklore) and still a common sight in Ex-Soviet countries.

Variants with closed cabs (Occ 1+1) have a range of options to mount on the rear of the vehicle. The military often fit them with standardised sealed shelters called KUNG, while civilian versions are sometimes converted into buses (Occ 1+20). Tyre inflation systems and winches are standard for most military models and many have a power take-off unit for agricultural use.

Ural 4320 (Russia, 1977-)

Developed as a more fuel-efficient alternative to older Soviet trucks, the 4320 otherwise conforms to most stereotypes about Russian engineering; it's crude, heavy, slow and uncomfortable to ride in, but reliable and simple to repair.

Like most other trucks, there are a wide variety of variants. The military have the standard KUNG shelter version of course, but there are also buses, ambulances, fire engines, dump trucks, fuel tankers (with 1,700 gallons capacity) and specialised logging vehicles. One version even mounts the BM-21 multiple rocket system, turning it into a self-propelled artillery piece.

M1078 LMTV (USA, 1996-)

The Light Medium Tactical Vehicle is part of the Family of Medium Tactical Vehicles (FMTV), a

group of trucks which share many common elements. Unusually for American military trucks, the FMTV uses a cab-over-engine layout. This combined with it's relatively soft lines make them look more like civilian vehicles with unusually high ground clearance.

It's three-seat cab has good visibility and plenty of room to stow equipment behind the seats. The folding seats in the open bed are considerably less comfortable, although a canvas roof can be fitted to provide basic shelter. Standard equipment includes a winch (with 100 yard cable), central tire inflation system and a small ladder to make climbing into it easier.

The cab can be replaced with a more angular version which can be fitted a weapon mount in the roof and armour plates (600 lbs. for a typical kit, changing Loc. to g4WX and giving DR 20 to the vehicle's vitals, driver and two passengers).

The M1079 (Load 2.4, Loc. G4W) is simply the same vehicle with a box shelter instead of an open cargo bed. Larger versions are known as Medium Tactical Vehicles (ST/HP 108, LWt. 15.3, Load 5.4, Occ. 1+16, Range 300, Loc. GO6W) and can be fitted with various equipment, including a two-ton crane for handling heavy cargo and a 1,500 lbs. dump truck unit.

DRIVING (AUTOMOBILE)

<i>TL</i>	<i>Vehicle</i>	<i>ST/HP</i>	<i>Hnd/SR</i>	<i>HT</i>	<i>Move</i>	<i>LWt</i>	<i>Load</i>	<i>SM</i>	<i>Occ</i>	<i>DR</i>	<i>Range</i>	<i>Cost</i>	<i>Locations</i>
7	Unimog 404	74	-1/4	11f	1/30	4.9	1.6	+4	1+1	6	200	\$30K	G4W

DRIVING (HEAVY WHEELED)

<i>TL</i>	<i>Vehicle</i>	<i>ST/HP</i>	<i>Hnd/SR</i>	<i>HT</i>	<i>Move</i>	<i>LWt</i>	<i>Load</i>	<i>SM</i>	<i>Occ</i>	<i>DR</i>	<i>Range</i>	<i>Cost</i>	<i>Locations</i>
7	GAZ-66B	78	-1/4	11f	2/29	6	2.2	+4	1+22	4	200	\$25K	O4W
7	Ural 4320	108	-1/4	11	1/26	16.9	6.9	+5	1+26	6	600	\$50K	gO6W
8	M1078 LMTV	103	-1/4	12	2/29	11.5	2.9	+5	1+14	6	400	\$150K	GO4W

HEAVY TRUCKS

Being responsible for a vehicle this big is serious business, usually the job of a professional truck

driver who needs a special licence. Despite the extra cost of paying someone qualified to handle such a

machine, the sheer tonnage they transport makes it economical.

BelAZ 75710 (Belarus, 2013-)

An ultra-class haul truck looks a lot like a regular dump truck, only bigger. Much bigger. Lesser trucks, buses and probably houses could be crushed beneath it's wheels.

The cab of this monstrous mining vehicle is accessed with either a ladder or the stairs running across the front of it's hood. A CTIS and Fire-Suppression System (High-Tech, p. 229) keep it running when the going gets tough and it's massive bucket can tip up (taking 26 seconds) to drop a small hill in one go.

DRIVING (HEAVY WHEELED)

TL	Vehicle	ST/HP	Hnd/SR	HT	Move	LWt	Load	SM	Occ	DR	Range	Cost	Locations
8	BelAZ 75710	370	-3/5	11	1/20	891	495	+8	1+1	10	270	\$5M	g4W

PROTECTED PATROL VEHICLES

Military forces use a lot of trucks, but trucks tend to do poorly when attacked with explosives and firearms. So military trucks often get upgraded with armour in an effort to increase their survivability. Many such vehicles are improvised by soldiers in the field adding sandbags and scavenged metal plates to their trucks, but factory-made upgrade kits and purpose-built machines tend to work better. Unfortunately it is difficult to make them as tough as armoured fighting vehicles without affecting their performance as trucks, so these vehicles tend to be a

compromise between protection and mobility.

Truck, Utility, Medium with VPK (UK, 1992-)

A military version of the Land Rover Defender upgraded with an improved suspension and chassis to handle the weight of the Vehicle Protection Kit armour. More commonly known by it's nickname of 'Snatch' after it's use by 'snatch squads' in Northern Ireland, who would arrest protesters and carry them away in their Land Rovers.

DRIVING (AUTOMOBILE)

TL	Vehicle	ST/HP	Hnd/SR	HT	Move	LWt	Load	SM	Occ	DR	Range	Cost	Locations
8	TUM with VPK	75	-1/4	10	2/33	4.5	1.2	+4	1+7	20	320	\$115K	G4W

BUSES AND MOTOR-COACHES

The modern 'omnibus' concept was pioneered in the early nineteenth century with large horse-drawn carriages. They soon became an important form of mass transit for the Victorian working class.

internal combustion engines. Specialist vehicles developed for long-distance travel, carrying school children and even military use. Bus stops became a common feature of modern cities (and a common plot element in fiction which required scenes of people waiting or meeting strangers).

As transport technology developed, buses were designed to use steam, electric and eventually

Children's Song

Buses have also proven popular with private citizens who spend a lot of time on the road: bands use tour buses to travel between venues and politicians seeking election work from campaign buses fitted out as mobile offices.

AEC Routemaster (UK, 1954-1968)

The bright red double-decker bus is an iconic part of modern London and the Routemaster was the most famous and successful of them. It was the first bus to have power steering, an automatic gearbox and hydraulic braking. It's bodywork was also cutting-edge, making extensive use of aluminum and construction techniques developed for aircraft to save weight.

The Routemaster had an open platform at the back, which allowed passengers to board it more quickly. However this design had two flaws: it required a conductor to collect fares and passengers occasionally fell off the bus while it was moving!

Neoplan Skyliner (Germany, 1964-)

A large double-deck luxury coach intended for long journeys. The Skyliner has a toilet, galley and sleeping area on it's lower deck and a large luggage compartment (over 270 cubic feet).

*He screams and he cusses,
He rams other buses,
Hail to the bus driver!*

- Traditional American

General Motors New Look 5303 (USA, 1968-1971)

The New Look was one of the most popular North American city buses with over 44,000 being produced in various models from 1959 to 1986. They were notable for the excellent visibility offered by their rounded windshields, earning them the nickname of 'fishbowl'.

The 5303 model (featured prominently in the movie *Speed*) was a typical example. It was available with a powerful V8 engine (in table) or a somewhat less impressive V6 (Move 1/28*).

Plaxton Pointer (UK, 1988-2006)

The Pointer was a small bus (sometimes called 'midibus') built on the popular Dennis Dart frame. Extremely similar buses were manufactured under a variety of names: Plaxton sold theirs as 'Super Pointer Darts' and 'Mini Pointer Darts' and the same chassis and engine were used for the Alexander Dash, Northern Counties Paladin, East Lancs Spryte, Wright Crusader and several others. Plaxton eventually merged with Dennis when both were bought out by the Mayflower group (who also owned Alexander) forming the short-lived TransBus International.

As can be seen from the sheer number of companies assembling them these were popular vehicles, especially among British bus companies. More than 11,000 Dart variants were built.

DRIVING (HEAVY WHEELED)

<i>TL</i>	<i>Vehicle</i>	<i>ST/HP</i>	<i>Hnd/SR</i>	<i>HT</i>	<i>Move</i>	<i>LWt</i>	<i>Load</i>	<i>SM</i>	<i>Occ</i>	<i>DR</i>	<i>Range</i>	<i>Cost</i>	<i>Locations</i>
7	AEC Routemaster	101	-1/3	10f	1/24*	14.7	6.5	+5	1+64	4	230	\$110K	G4W
7	Neoplan Skyliner	116	-2/4	10f	1/28*	28.6	15	+6	1+78	4	430	\$170K	G4W
7	GM New Look 5303	105	-2/4	10f	2/31*	15	5.4	+6	1+53	4	700	\$120K	G4W
8	Plaxton Pointer	100	-1/4	10f	1/26*	11.6	2.7	+5	1+26	4	400	\$55K	G4W

CROSSOVERS AND LIGHT UTILITY VEHICLES

Essentially a light-truck or SUV reduced to the size of a medium car and popular with the same people for similar reasons as their larger cousins.

In many areas they are simply known as 'Jeeps' after the American military trucks (High-Tech, p. 236).

Volkswagen Type 82 Kübelwagen (Germany, 1940-1945)

The military version of the Volkswagen Beetle, the 'Bucket Car' had a more angular appearance than its civilian counterpart and only a folding canvas roof. Despite being a two-wheel drive vehicle with a relatively weak engine, its light weight and smooth underside allowed it to handle soft surfaces

surprisingly well (terrain is never considered worse than Bad due to mud, snow or sand).

UAZ487 (Russia, 1971-)

This soviet army vehicle has a detachable canvas roof which does little to protect its passengers from harsh weather. Civilian and police version are also available with a metal or fibreglass roof which makes it slightly more bearable.

AvtoVAZ 2121 (Russia, 1977-)

Described by its designers as 'a Renault 5 on a Land Rover chassis' this off-road car had a lukewarm reception from Soviet customers but proved popular in Europe. Its design anticipated many later trends in compact SUVs.

DRIVING (AUTOMOBILE)

TL	Vehicle	ST/HP	Hnd/SR	HT	Move	LWt	Load	SM	Occ	DR	Range	Cost	Locations
6	Kubelwagen	46	0/4	11f	2/24*	1.3	0.5	+3	1+3	4	270	\$13K	O4W
7	UAZ487	59	0/4	11f	2/30	2.5	0.8	+3	1+4	4	350	\$8K	G4W
7	AvtoVAZ 2121	53	0/4	11f	3/39	1.7	0.5	+3	1+3	4	240	\$10K	G4W

ALL-TERRAIN VEHICLES

'All-Terrain Vehicle' is often used as a term for anything that can travel off-road, but here it describes vehicles even smaller than LUVs, just big enough to transport two or three people or haul a small trailer.

SdKtz 2 Kettenkrad (Germany, 1938-1948)

This strange vehicle is essentially a half-track motorcycle. When its handlebars were turned slightly only the front wheel moved, but as they were rotated further the track brakes were engaged allowing sharp turns.

Chenoweth Racing Products Desert Patrol Vehicle (USA, 1991-)

Dune Buggies are often made from stripped down Volkswagen Beetles, fitted with open framework bodies and wide tires and raced across sandy terrain. This armed version was built to military specification for special forces. It features in the Chuck Norris movie *Delta Force*.

The front passenger operates a pair of light or medium machine guns (usually the *Saco M60*, High-Tech pp. 134, 137) while the gunner at the rear of the vehicle uses a heavy machine gun (*Browning M2HB*, High-Tech pp. 133, 137), automatic grenade launcher (*Saco MK 19 MOD 3*, High-Tech pp. 143,

145) or guided missile (*BGM-70F TOW 2B*, High-Tech p. 151). Weight and price does not include weapons or ammunition.

Grizzly is typical of the 'quad bikes' used for farm work and recreational riding. The British Army also uses it as a light logistics vehicle and casualty transport.

Yamaha Grizzly 450 (Japan, 2008-)

Resembling a four-wheeled motorcycle, the

DRIVING (AUTOMOBILE)

TL	Vehicle	ST/HP	Hnd/SR	HT	Move	LWt	Load	SM	Occ	DR	Range	Cost	Locations
8	Desert Patrol Vehicle	41	+1/2	11f	4/30	1.3	0.7	+3	3	4	200	\$15K	O4W
8	Yamaha Grizzly 450	34	+1/2	11f	2/21	0.5	0.2	+1	1	4	80	\$6K	E4W

DRIVING (HALFTRACK)

TL	Vehicle	ST/HP	Hnd/SR	HT	Move	LWt	Load	SM	Occ	DR	Range	Cost	Locations
6	SdKfz 2 Kettenrad	55	+1/3	10f	2/22	1.6	0.3	+2	1+2	4	160	\$11K	E2CW

TRACTORS

These powerful machines can drag a plough through hard earth or haul massive loads across muddy fields. Farmers and soldiers alike use them to replace the draught horses which did their work at the start of the twentieth century.

Fordson Model F (USA, 1917-1928)

Henry Ford produced this small agricultural vehicle with the same philosophy that created his Model T, building them quickly and selling them cheaply. It has a similar appearance to most modern farm tractors with two big wheels at the back and two smaller ones in front. The main difference is that it doesn't have tires.

Caterpillar Holt 75 (USA, 1913-1924)

The Holt 75 was little more than a sturdy chassis, a large engine, two tracks and a wheel, with all its working parts exposed to view. The driver sat on the right of the machine where he could turn it either with the front 'tiller wheel' or by disengaging one of the tracks. A flimsy canvas awning provided minimal protection from bad weather.

The Model F had a bad habit of flipping over if whatever it was dragging got caught. With no cab to protect the driver when this happened, this was frequently fatal.

Originally intended as an agricultural machine, the Holt 75 proved popular as an artillery tractor in the first world war. Altogether well over 4,000 of them were built, with around half being used for military service.

John Deere 4020 (USA, 1963-1972)

An extremely popular farm tractor, the 4020 was usually fitted with a spacious cab which included a roll-over protection system to protect the driver. Like most modern tractors, it has a power take-off connector to drive attached machinery.

DRIVING (CONSTRUCTION EQUIPMENT)

TL	Vehicle	ST/HP	Hnd/SR	HT	Move	LWt	Load	SM	Occ	DR	Range	Cost	Locations
6	Fordson Model F	56	-1/3	10f	1/3	1.5	0.1	+2	1	4	50	\$6K	O4W
6	Caterpillar Holt 75	114	-3/4	11f	1/8	11.5	0.1	+5	1	6	100	\$80K	O2CW
7	John Deere 4020	81	-1/4	11f	1/9	4.5	0.1	+3	1	5	90	\$48K	G4W

BULLDOZERS AND DIGGERS

Some earthmoving machines are just tractors with a blade or bucket attached while others are purpose built for the task. Either way they tend to be heavy, slow and powerful.

Bulldozers are made to shove rubble out of the way and have a flat blade at the front, excavators have a powerful arm with a shovel for digging into the ground, loaders have a big bucket for picking up heaps of soil or rock and backhoe loaders combine the bucket of a loader at one end with an excavator's digging arm at the other.

Caterpillar D9G (USA, 1961-1974)

A fairly typical heavy bulldozer, the D9G resembled an agricultural tractor cab and engine compartment with two wide tracks instead of wheels. The front blade can be raised slightly when not in use and shields both tracks and about half the body from the front (giving an additional DR 30). At the rear of the vehicle a device called a 'ripper' is fitted. When lowered this tears into the ground behind the bulldozer, breaking up the surface.

The D9G was used by the US Army during the Vietnam war to clear large areas of jungle. One also features as the villain in the 1974 film Killdozer!

There have been many other models of D9 bulldozer built since the first in 1954, most of them very similar to the D9G. One notable variant is the armoured bulldozers used by the Israeli Defence Forces (ST/HP 200, LWt. 62, DR 50) which have spaced armour (High-Tech, p.229).

DRIVING (CONSTRUCTION EQUIPMENT)

TL	Vehicle	ST/HP	Hnd/SR	HT	Move	LWt	Load	SM	Occ	DR	Range	Cost	Locations
7	Caterpillar D9G	190	-3/5	11	1/4	54	0.1	+5	1	10	70	\$900K	2CG
7	Bobcat 440	59	+1/4	11	1/4	1.8	0.1	+2	1	6	100	\$10K	G4W
7	Case 580 CK	94	0/4	11	1/12	6.7	0.1	+4	1	6	200	\$100K	AG4W
8	JCB HMEE	130	0/4	11	1/26	17.5	0.1	+4	1+1	25	350	\$325K	Ag4W
8	Komatsu PC200-8H	140	-3/5	11	1/2	22	0.1	+4	1	6	100	\$120K	A2CG

Bobcat 440 (USA, 1962-)

This small front loader uses a 'skid steer' system where the wheels are fixed in position and driven at different speed in order to turn, like a tracked vehicle.

Case 580 CK (USA, 1966-)

The 'Construction King' series of backhoes are among the most popular digging machines in the world. Options include an extending excavator arm with a seven yard reach and a '4-in-1' bucket which can transform into a dozer blade or hinge open and closed like a giant jaw in order to grab objects.

JCB HMEE (UK, 2005-)

A purpose-build military digger, the High Mobility Engineer Excavator is unusually fast for a backhoe loader, especially an armoured one!

The HMEE can run on diesel or aviation fuel, has run-flat tires and a tyre inflation system. The loader bucket can be replaced with a sandbag filling device, a snowplough or a forklift (able to carry 4,500 lbs.) while the excavator shovel can be swapped for rock breaking equipment. A 50' hose supplies power to hydraulic tools.

Komatsu 200-8 Hybrid (Japan, 2008-)

The latest version of Komatsu's popular line of excavators is notable for being a fuel-efficient hybrid vehicle. Less environmentally friendly but otherwise similar machines have been common on construction sites for decades.

ARMoured PERSONNEL CARRIERS

These 'battle taxis' aren't built for serious combat, but they give the troops inside protection from bullets and shrapnel while they get to the front lines.

Hanomag Sd.Kfz 251 (Germany, 1939-1945)

One of the first APCs, the Hanomag (as it was usually called) was a half-track with a long hood, sharply sloped armour and an open top. Small windows and firing slits allowed troops to shoot from it without exposing themselves but the lack of roof made it a death trap if anyone got close enough to throw a grenade.

The driver and one passenger sat in forward facing seats under a small roof, while the rest of the troops had benches running along the sides of the open section at the rear (which could be covered by a simple canvas cover). The only door was at the rear of the vehicle.

The Hanomag had two machine gun mounts, typically armed with either M34 (High-Tech, p. 132) or MG 42 (High-Tech, p. 134) machine guns with 2,100 rounds between them. The rear gun mount was able to function as an anti-air weapon, but had to be crewed by one of the passengers as the vehicle only had one gunner.

Many variants were built. Anti-aircraft (Occ 4) versions had either a KwK38 (a variant of the KwK30, High-Tech Pulp Guns, Vol. 2, p. 27) or three Mauser MG151 autocannons (High-Tech, p. 133) on a rotating mount (5 seconds to change facing) protected by a gun shield (DR 25, front and sides only). Fire support vehicles used a similar set-up but with a Rheinmetall 3.7cm PaK (High-Tech, p. 140) or KwK40 (High-Tech, p. 141).

When equipped with a Koebe flamethrower system the vehicle was designated Sd. Kfz 251/16. The Sd.Kfz 251/20 Uhu (Owl) had a large infra-red searchlight (800 yards range) to assist Panther tanks

equipped with night-vision devices. The standard troop carrier could be easily transformed into a mobile artillery piece by attaching Wurfrahmen 40 rocket frames to the sides of the hull.

M3 Personnel Carrier (USA, 1941-1943)

The American equivalent to the Hanomag was fairly similar in layout, the main difference being that the sides of the troop compartment were flat instead of angled and had lower sides which improved visibility but meant the passenger's heads were exposed. The front of the M3 had distinctive slats across the radiator which could be closed for protection or opened to cool the engine and a small roller which helped when climbing out of trenches. A winch was often fitted instead of the roller.

The open-topped cab had three seats, while the rest of the passengers sat in the troop compartment facing sideways. Doors were fitted at the sides of the cab and the rear of the troop compartment. The cab had a steel visor and folding panels on top of the doors which could be opened for better visibility or closed for protection. In bad weather a canvas roof could be fitted, covering both the troop compartment and the cab.

A pillar mount at the front of the troop compartment held a Browning M1919A4 (High-Tech, p. 132) or M2HB (High-Tech, p. 133) machine gun (the M2HB was usually mounted on platoon leader's vehicles). This mounting was criticised as unsafe, since it had the barrel very close to the passengers heads, so in the M3A1 version it was replaced with a ring mount above the right-hand cab seat for a M2HB and three mounting points at the sides and rear for a M1919A4 (only one was meant to be carried, but squads who could scrounge extra weapons often added more). Standard ammunition load was 7,750 rounds for the M1919A4 and 700 rounds for the M2HB. A case in the cab held 22

grenades of various kinds and the M3A1 added racks on the outside of the troop compartment to hold up to 26 M1 anti-tank mines (or whatever the squad could cram into them).

There were several minor variants which had extremely similar performance, like the M5 export version (LWt. 10.5) which used thicker plates of softer steel for its armour. The M2 (Occ 2+8) was used for towing artillery, reconnaissance and transporting machine gun teams. It used the same basic design as the M3, but was shorter, had no back door and used a different seating layout with three passengers on each side and one facing backwards. Two large stowage bins could be accessed from either inside or outside the vehicle. It used a rail mount which ran all the way around the troop compartment to mount a M2HB and M1919A4 but this system proved to be inconvenient so the M2A1 was fitted with mountings similar to the M3A1. Racks for 14 mines were also added.

The M3 GMC (Occ 5) mounted a Schneider Mle 1897 cannon (High-Tech, p. 138) in an open mount with a DR 20 gun shield and 59 rounds. The T48 57mm GMC was similar but used a 57mm Gun M1 (an American version of the British 6 Pounder) with a DR 40 gun shield and 99 rounds while the T19 HMC (Occ 6) had a RIA M2A1 howitzer (High-Tech, p. 141) with a DR 20 gun shield and eight rounds plus a M2HB (with 300 rounds) at the rear.

The M4 MMC (Occ 1+5) was a mortar-carrier

for the Watervliet M1 (High-Tech, p. 145) based on the M2, carrying 96 mortar rounds. The M2's rail was retained (usually mounting a single M1919A4) and a rear door was added. The mortar wasn't originally meant to be fired from the vehicle, but crews did it so often that the M4A1 was built with reinforced floors to handle the recoil. It was replaced by the M21 which used the larger M3 hull in order to give the mortar more room to turn and added a M2HB (with 400 rounds) at the rear.

The M13 MGMC (Occ 4, Loc. 2CgOt2W) was an anti-aircraft vehicle with a turret armed with two M2HB machine guns (with 5,000 rounds in 200 round boxes) and equipped with a reflex sight (+1 Gunner). The turret was open at the back and sat inside the rear compartment (the sides could be folded down to allow it to fire at ground targets). The gunner sat in the turret while two loaders stood behind it (or rode in the cab when not needed). An electrical generator provided power to the turret rotation mechanism (one second to change facing) even when the vehicle wasn't running. The M16 was similar, but with four guns. They were sometimes used against infantry, which earned them the nicknames of 'meat chopper' and 'krautmower'. An even more powerful anti-aircraft variant was the M15 (Occ 5+2, Loc. 2CgOT2W) which replaced the entire rear compartment with a large turret (DR 20, open at the top and rear, 30 seconds to change facing) armed with two M2HBs (with 1,200 rounds) and a M1A2 37mm gun (with 200 rounds).

DRIVING (HALFTRACK)

TL	Vehicle	ST/HP	Hnd/SR	HT	Move	LWt	Load	SM	Occ	DR	Range	Cost	Locations
6	Sd.Kfz 251	103	-3/5	10f	1/16	10.1	1.5	+4	2+10	40/25	200	\$120K	2CgO2W2X
6	M3	102	-3/5	11f	1/22	10.3	1.8	+4	2+11	40/20	200	\$140K	2CgO2WX

LIGHT TANKS

Although lacking in armor and firepower, these nimble fighting machines are generally able to move quickly enough to exploit weak points in enemy defences and avoid more powerful vehicles. For many forces they are the only tanks available, either because they lack the capacity to transport anything

heavier or simply can't afford better.

Panzer II Ausf. C (Germany, 1937-1940)

The most common tank in German service at the start of the second world war, these weakly armoured vehicles were just about good enough to

fight against contemporary opponents under favourable circumstances. Fortunately for the Nazis, their Blitzkrieg tactics meant that they were usually fighting on their terms and the Panzer II managed to perform well by engaging only when they had a decisive advantage.

The tank is armed with a 2cm KwK 30 Autocannon (High-Tech Pulp Guns, Vol. 2, p. 27) and a Rheinmetall MG34 (High-Tech, p. 132). It carries 180 2cm rounds (mostly SAPHE) and 2,250 machine gun rounds. The Panzer II's turret holds the commander and gunner, who operates both weapons and the manual turret rotation mechanism, which takes 12 seconds to change facing.

The higher DR in the table applies to the front of the body and turret. The tracks, underside and top of the body and turret are all DR 30.

Later models, such as the Ausf. F had improved front armour (LWt. 10.5, DR 100/40) and sometimes mounted the 2cm KwK 38 (a variant of the KwK 30 with RoF 8!). The Panzer II Ausf. L, also known as the Luchs (Lynx), was an improved scout tank (ST/HP 118, Move 1/18, LWt. 13.6, DR 90/45) armed with the KwK 38 and 330 rounds for it.

One unusual variant was the 'Flamingo' flame tank (ST/HP 118, LWt. 13.5, Load 0.4, DR 80/50, Loc 2CT2t) which only had a machine gun in it's main turret but added two small flamethrower turrets (Dam. 3d burn, Range 20/30, Shots 80×2s) with 180° rotation. The flamethrowers were controlled by the commander from the turret while the driver and radio operator sit in the hull with the flamethrower fuel tanks. Nitrogen cannisters (DR 10) to supply pressure to the flamethrowers were fitted outside the hull, above the tracks.

M-24 'Chafee' (USA, 1944-1945)

With a relatively powerful main gun and good

off-road capabilities, the Chafee (named after an American general, but only by the British) was considered to be a great improvement over other light tanks of the time. It didn't see much action in WWII, but was widely exported. American M-24s fought in the Korean War, the South Vietnamese used them during the Vietnam War and Pakistani forces used them in combat in the Indo-Pakistani War of 1971.

The M24 is armed with a M6 75mm cannon (a lightened version of the Schneider Mle 1897, High-Tech p. 138), a Watervliet M3 smoke mortar (High-Tech, p. 146) in a fixed mount in front of the commander's seat, one Browning M2HB machine gun (High-Tech, p.133) on a pintle mount at the commander's hatch and two Browning M1919A4 machine guns (High-Tech, p. 132), one co-axial with the main gun and the other in a hull mount. It carries 48 cannon shells, 14 51mm smoke rounds, 440 .50 machine gun rounds and 3,750 rounds of .30-06. The driver and radio operator (who operates the bow machine gun) sit in the hull, while the gunner, loader and commander man the turret, which has a hydraulic rotation mechanism that can change facing in three seconds (one minute without power).

The higher DR in the table applies to the front of the body and turret. The tracks, underside, rear of the body and top of the body and turret are all DR 35.

The M19 (Occ. 6, Loc 2CTO) was an anti-aircraft vehicle which replaced the Chafee's turret with an open-topped one mounting two Bofors 40mm guns (with 352 rounds).

The M37 (ST/HP 140, Move 1/15, LWt. 25.4, Load 3.4, Occ 7, Range 100, Loc. 2COX) was a self-propelled artillery piece based on the M-24 hull. It was armed with a M4 105mm howitzer (High-Tech, p. 141) with 126 shells and a M2HB machine-gun (with 550 rounds) in a tall 'pulpit' open mount.

DRIVING (TRACKED)

<i>TL</i>	<i>Vehicle</i>	<i>ST/HP</i>	<i>Hnd/SR</i>	<i>HT</i>	<i>Move</i>	<i>LWt</i>	<i>Load</i>	<i>SM</i>	<i>Occ</i>	<i>DR</i>	<i>Range</i>	<i>Cost</i>	<i>Locations</i>
6	Panzer II Ausf. C	105	-3/5	10f	1/16	9.8	0.5	+3	3	50/40	240	\$250K	2CT
7	M-24 Chafee	133	-2/5	10f	1/17	20	1.4	+4	5	165/85	270	\$400K	2CTX

MEDIUM TANKS

These tanks generally aren't the fastest, the toughest or the best armed, but the best of them manage to strike a balance which makes them excellent all-purpose fighting machines. The most successful tanks of the second world war (including the Sherman and Panzer IV, High-Tech, pp. 238-239) were all mediums.

Nuffield A15 Crusader II (UK, 1940-1942)

Also known as the Tank, Cruiser, Mark VIA. The British split their tanks into slow moving 'infantry' tanks and 'cruiser' tanks which were intended to be highly mobile, able to strike deep into the rear of enemy forces to cut their lines of communication and supply.

Crusaders had two turrets. The main one had a hydraulic traverse (allowing it to change facing in three seconds, or 24 seconds without power) and held the commander, loader and main gunner, armed with a Vickers QF 2-Pounder and a coaxial Besa 7.92mm Machine Gun. Although the main gun wasn't stabilised, it rested on the gunner's shoulder making it possible to fire on the move. The second turret was mounted on the front of the vehicle (it could change facing in six seconds, although it could only face forwards or left) and was crewed by the secondary gunner with another Besa gun. The second turret was so cramped and contributed so little to the tank's combat effectiveness that it was often left unmanned or removed altogether.

The higher DR in the table applies to the front of the body and the front and sides of the turret. The tracks, underside and the top of the body and turret are all DR 25.

The Crusader I had thinner armour (DR 110/80). The Crusader III replaced the main gun with a Woolwich QF 6-Pounder (with 73 shells) and upgraded the gunner's optics to 3× magnification (+1 Acc) but could only fit two men in the turret (the commander had to load the gun). Close Support variants of the Crusader I and II had an Ordnance

QF 3 inch howitzer with 65 rounds. Command and artillery spotter tanks had their guns removed and replaced with dummies and were issued large radios.

Once it had become clear that the Crusader was obsolete, many of them were converted into anti-aircraft vehicles. The Crusader III AA Mark I had a Bofors 40mm gun in an open mount instead of a turret, protected only by a (DR 15) gun shield. The Mark II and III had a full turret with two Oerlikon Typ SS guns (High-Tech, p. 132). Others were converted to open-topped artillery tractors (Load 6.5, Occ. 1, Loc. 2CO).

T-34 (Russia, 1940-1944)

Probably the most significant tank ever built, the T-34 had an impressive combination of armour, mobility and weaponry. Although poorly trained crews, outdated tactics and questionable production standards limited their effectiveness at first, they still presented a formidable challenge to German tanks.

The turret (which could change facing in two seconds with the electric mechanism or 20 seconds without it) held the commander, who also acted as the gunner for F-34 cannon and its co-axial ZiD DT machine gun (High-Tech, p. 132) and a loader. In the hull sat the driver and a radio operator who had another DT machine gun in a ball mount. A standard ammunition load was 77 shells for the main gun and 50 drums for the machine guns (3,150 rounds).

The higher DR in the table applies to the front of the body and turret. The tracks, underside and the top of the body and turret are all DR 45. Additional fuel tanks could be mounted on the side or rear of the hull, usually three 24 gallon barrels of gasoline (DR 4, 170 lbs. +40 range each) and one of oil.

There were numerous variants of the T-34, as the design was constantly updated. The earliest version had a slightly different gun, a single large hatch for both the commander and loader and only fitted radios to command tanks. Other vehicles had to make do with signal flags and carried extra machine

gun ammunition. Later tanks had a larger hexagonal turret which could hold an extra 23 shells and had thicker armour (+100 DR on the front turret). The OT-34 (Occ 3) was a flame tank, replacing the radio operator and his machine gun with an ATO-42 flamethrower (the radio was moved to the turret).

The T-34/85 was a significant upgrade (ST/HP 160, LWt. 35.5, Load 2, Occ 5, Range 150). It mounted the more powerful ZiS-S-53 cannon (with 56 shells) to threaten the latest German tanks in a bigger turret which now had room for an extra crewman to fire the gun, freeing the commander to look around and use his new radio which had been moved from the hull. The OT-34-85 (Occ 4) was a flame tank variant with the same arrangement as the OT-34.

The T-44 was a further advanced design (ST/HP 160, LWt. 35, Load 2, Range 200, DR 480/200) with a three-man turret armed with the same ZiS-S-53 as the T-34/85 (with 58 shells). Stand-off plates effectively gave it spaced armour on the body sides.

Panzer V Panther Ausf. A (Germany, 1943-1944)

The Germans were impressed by the T-34 and resolved to make a similar tank to counter it. With the usual Nazi approach they took a simple, efficient design and transformed it into an over-complicated, unreliable, heavy vehicle. Despite these issues, the Panther was an excellent fighting machine.

Behind the sharply angled armour of the front hull sat the driver and the radio operator (with a medium radio), who also acted as the gunner for a Rheinmetall MG34 machine gun (High-Tech, p. 132). The turret had a hydraulic rotation mechanism (three seconds to change facing or one minute without power) and held the gunner (who fired the KwK 42 cannon and a coaxial MG34 with a 2.5-5× variable-power telescopic sight) plus the loader and commander (who could mount another MG34 on his cupola). Ammunition usually consisted of 79 shells for the main gun (although it was possible to cram in up to 120 with some effort) and 34 bags for the machine guns (5,100 rounds total, although in

practise up to twice this amount might have been carried).

Panthers were initially equipped with smoke dischargers but their habit of catching on fire and choking the crew meant they were soon replaced with improved *Nahverteidigungswaffe* devices as used on the Tiger (Pyramid 67, p. 24).

The higher DR in the table applies to the front of the body and turret. The tracks, underside and the top of the body and turret are all DR 45. Most Panthers were fitted with (DR 15) skirts to protect the upper tracks and some of the hull (3-in-6 chance of affecting a hit from the side) giving them the benefit of spaced armour. These were sometimes modified and moved to the upper surfaces to protect against artillery and air attack. Similar plates could be added to the turret sides and crews often improvised similar protection by attaching spare road wheels and track segments to the turret.

The earlier Ausf. D Panthers were notoriously unreliable (HT 9fx), sometimes spontaneously catching fire as their engines overheated. They also has fixed 2.5× magnification main gun sights (Acc +1), no machine gun mount on the commander's cupola and a slower turret traverse mechanism (ten second to change facing).

The later Ausf. G variant (1944-945) had numerous minor changes including better armour on the roof, tracks and underside (DR 60) and swapping two bags of machine gun ammunition for three more main gun shells (late versions also used MG42 machine guns instead of MG 34s). Command tanks had large radios, but reduced their ammunition racks to 64 main gun rounds and removed the coaxial machine gun to make room for them. An artillery spotting variant was also produced with a large radio and additional rangefinding equipment but no main gun (a wooden dummy gun was mounted to confuse enemy observers). Infra-red spotlights and early night-vision devices (Night Vision 4, 200 yards range) could be mounted, although they were rare and usually only issued to command tanks.

The Bergepanther (Load 4, Occ 2+10, Loc.

2CO2X) was an armoured recovery vehicle which swapped the Panther's turret for an open passenger compartment built up at the top with wooden planks (DR 3), a crane and a heavy winch (with 155 yard cable). Two open mounts for machine guns were installed, but usually not used. They were sometimes retro-fitted with the turret of a Panzer IV (High-Tech, p. 238) or mounted a 2cm KwK 38 (a RoF 8! variant of the KwK 30, High-Tech Pulp Guns, Vol. 2, p. 27).

The Jagdpanther (Range 100, Loc. 2C) was a tank destroyer made by extending the Panther's hull and fitting a PaK 43 cannon (with 57 rounds) in a casemate mount.

Some Panther turrets were used to make fortifications. The turret was mounted on a metal box which was buried in earth or concrete (total DR 300). The tops of these turrets were reinforced to resist artillery fire (DR 110).

DRIVING (TRACKED)

TL	Vehicle	ST/HP	Hnd/SR	HT	Move	LWt	Load	SM	Occ	DR	Range	Cost	Locations
6	Crusader II	137	-3/5	9fx	1/13	21.3	0.9	+4	5	140/80	200	\$450K	2CTt
7	T-34	150	-3/5	9fx	1/16	29.2	1.5	+4	4	250/150	250	\$350K	2CT
7	Panther Ausf. A	180	-3/5	9fx	1/14	50.1	2.1	+5	5	400/140	120	\$660K	2CTX

HEAVY TANKS

In the early days of tank design, heavy tanks were seen as infantry support vehicles or mobile bunkers. These well-armoured but slow-moving war machines would shrug off bullets and shells while smashing open bunkers with their guns.

While the realities of the battlefield didn't quite line up with the assumptions they were designed around, the heavy tanks' strong armour did prove to be an asset and there was soon demand for even bigger ones with thicker armour and better guns to defeat the enemy's tanks.

Mark IV Tank, Male (UK, 1917-1918)

The Mark IV had the same basic form as all the British heavy tanks of the first world war. Two huge tracks enclosed a long hull, with gun sponsons sticking out from the middle of each track. It didn't have a turret in order to keep it's centre of mass low and avoid tipping over when climbing steep obstacles. It was a very complex machine to drive requiring four of the crew to steer it (the commander worked the brakes while the driver and two 'gearsman' controlled the gears), all of them coordinating their work through hand signals.

The 'male' version had a Hotchkiss 6-pdr 7-cwt

Q.F. Mk II cannon (High-Tech Pulp Guns, vol 2, p. 28) and a Lewis Mk 1 machine gun (High-Tech, p. 131) in each sponson, plus another Lewis gun firing from the front hull. The 'female' version (LWt. 30.3) had no cannons but an extra Lewis gun on each sponson (a few 'hermaphrodite' tanks had a female sponson on one side and a male one on the other). Ammunition carried was 332 cannon shells (a mixture of AP, HE and Cannister; Dam 4d pi+, Range 60/600, RoF 1x80, Rcl 1) and around 6,000 machine gun rounds (the female version carried over 30,000 rounds). A spare Lewis gun was also carried in the fighting compartment in case one was knocked out of action.

The higher DR in the table applies to the front of the body only.

Char B1 (bis) (France, 1937-1940)

When the project to develop a new *Char de Bataille* first started the plan was to make two similar vehicles, one with a howitzer for destroying fortifications and the other with an anti-tank gun. By the time that the five companies cooperating on the design actually produced a workable tank over a decade later it had grown to more than twice it's original design weight and mounted both guns.

Despite its old-fashioned design and numerous flaws it was one of the best armoured tanks in the world at the start of the second world war and devastated the lighter German tanks when they fought.

The B1's main weapon was the 75mm SA-35 howitzer in its right hull, which was aimed and fired by the driver (who had to traverse the entire vehicle to point the gun towards its target) who also had a hull-mounted MAC Modele 31 machine gun. A gyroscopic compass was provided to keep him orientated (+1 Navigation). A radio operator (who had a code only radio until 1940 when a TL 7 medium radio was fitted) sat behind the driver while the loader was positioned behind the howitzer. The over-worked commander had a turret with another Mle 31 machine gun and a 47mm SA-35 anti-tank gun. A powered rotation mechanism allowed him to change facing in five seconds (25 seconds if he had to hand-crank it). One major flaw was that the commander didn't have a top hatch to look out of, so his view was limited to peering through the vision slits in the turret cupola or opening the access hatch at the back of the turret and climbing out. Total ammunition load was 74 howitzer shells (usually 67 HE and 7 APEX), 50 shells for the 47mm gun (30 SAPHE, 20 HE, stored in the hull next to the radio operator) and 34 drums for the machine guns (5,100 rounds total).

The higher DR in the table applies to the front of the body and turret. The tracks, underside and the top of the body and turret are all DR 70.

The Germans used captured B1s as the *PzKpfw B-2 740 (f)*. These vehicles were usually fitted with proper turret top hatches and sometimes modified to serve as flame tanks (replacing the hull gun with a flamethrower, Dam 3d burn, Range 35/50, Shots 200×2s) or self-propelled artillery (replacing the turret with a superstructure mounting a 10.5 cm leFH 18 howitzer and removing the hull gun).

Any attempts by a single Tiger to fight a 'Stalin' one-on-one can only result in

the loss of a priceless war machine.

Generaloberst Heinz Guderian

IS-2 (Russia, 1943-1945)

The capture of a German Tiger tank (detailed in *Tigerphobia*, Pyramid 67) prompted the Soviets to develop a new heavy tank capable of defeating it. Chief designer Josef Kotin had named his previous heavy tanks after his father in law Kliment Voroshilov, but he had fallen out of political favour. Kotin named the new machine after the only person he could be sure wouldn't get on Stalin's bad side: the dictator himself!

The *Iosef Stalin* tanks combined thick sloped armour, powerful engines and big guns making them more than a match for any other tank of the time. They were assigned to elite Guards units and used to spearhead breakthroughs against the toughest defences. The only serious flaws in the design were the rate at which it consumed fuel and the slow reload of the main gun.

The driver sat in the front hull, while the commander (who also acted as the radio operator), gunner (who had a 4× magnifying sight, +2 Acc) and loader were in the turret, which turned with an electrical mechanism (five seconds to change facing, or five minutes without power). The main weapon was a D-25T cannon. The commander had a KPZ DshK-38 machine gun (High-Tech, p. 133) in a high-elevation pintle mount with a collimating sight (+1 skill) for air defence and three ZiD DT machine guns (High-Tech, p. 132) were also carried, one coaxial to the main gun, one in the hull (on a fixed mount which was difficult to aim and was therefore removed on later models) for the driver and one in a ball mount at the back of the turret where it could be fired by either the commander or loader. All the machine guns could be dismounted and the rear gun was fitted for a telescopic sight (+1 Acc). Ammunition consisted of 28 shells for the main gun (although crews were reported to squeeze

in more), 40 drums for the DT machine guns (2,520 rounds in total) and a 250 round belt for the DshK. A fire suppression system was fitted, but the Halon it used could poison the crew so they had to wear gas masks.

The higher DR in the table applies to the front of the body and turret. The tracks, underside and the top of the body and turret are all DR 60. Additional fuel tanks could be carried on the sides of the hull, usually three 24 gallon barrels of gasoline (DR 4, 170 lbs. +25 range each) and one of oil.

Early production models used an A19 122mm gun and lacked the DshK machine gun mount. The IS-3 used improved armour casting to give better protection (DR 500 for the turret sides and rear, DR 600 for the hull front) without increasing weight

(although range dropped to just 90 miles and the rear machine gun was removed). It was developed too late to fight the Nazis, but was used by the Egyptians in the Six Day War. A cold-war era upgrade, the IS-2M, added night-vision gear, smoke dischargers, a non-toxic fire suppression system and room for seven more shells in the magazine as well as connection points for two more external fuel tanks at the rear of the hull.

The final member of the IS family (no longer named after Stalin since he died before it was built) was the T-10 (ST/HP 190, Move 1/13, LWt. 57.3, Load 2.7, SM+5, Occ 4S, DR 700/250) which had a stabilised main gun and used a ZiD KPVT (High-Tech, p. 134) as it's coaxial weapon. It's rounded turret had no rear machine gun but used the higher DR for it's side and rear facings as well as the front.

DRIVING (TRACKED)

TL	Vehicle	ST/HP	Hnd/SR	HT	Move	LWt	Load	SM	Occ	DR	Range	Cost	Locations
6	Mark IV Tank	155	-5/6	9fx	1/2	32.5	2.6	+5	8	35/20	35	\$300K	2C
6	Char B1 (bis)	160	-3/5	9fx	1/9	35.2	1.5	+4	4	250/150	100	\$1M	2Ct
7	IS-2	180	-3/5	10fx	1/11	50	1.5	+4	4	500/250	150	\$900K	2CTX

SELF PROPELLED GUNS

These are armoured fighting vehicles which lack some of the features of a proper tank. Most of them don't have a turret or much armour, but they do generally mount large weapons. They usually fulfil a different role to tanks too, although exactly what depends on the vehicle. Some of them are intended for infantry support (usually called 'assault guns'), others are built to defend against armoured assaults or hunt enemy vehicles ('tank destroyers') and some are artillery pieces. In the chaos of war SPGs intended for one role are often called upon to perform another.

Sd. Kfz. 124 Wespe (Germany, 1943-1944)

A self-propelled artillery piece consisting of a Panzer II hull modified to accommodate a 10.5 cm leFH 18 howitzer. The fighting compartment is open at the top and rear and only lightly armoured elsewhere, with only the driver being fully protected

in the hull. The other crew consisted of a commander, a gunner and two loaders (one of who also operated the radio).

In addition to the howitzer, a Rheinmetall MG34 machine gun (High-Tech, p. 132) was fitted in an open mount at the back of the vehicle. Ammunition carried was 32 howitzer shells and 600 rounds for the machine gun. Several SMGs were also carried for defence.

The higher DR in the table applies to the front of the body only. The superstructure has no armour on the back or top.

An unarmed munitions carrier variant (Load 2.3, Occ. 3) held 90 shells. Similar vehicles based on the Panzer II chassis were the Marder II tank destroyer (DR 70/35), which was armed with a 7.5cm PaK 40 gun (essentially the same as the KwK 40, High-

Tech, p. 141) with 37 rounds and the Sturmpanzer II Bison assault gun (ST/HP 125, LWt. 17.6, Load 0.9, Occ 4, Range 70, Loc. 2COX) which carried the 150mm sIG 33 howitzer (and ten shells for it).

ISU-152 (Russia, 1943-1945)

After having some success mounting big guns on older tank hulls the Russians decided to make an assault gun based on their latest tank, the IS-2. The heavy tank's drivetrain and hull could support a lot of weight, so the vehicle was fitted with thick armour as well as a monstrous gun. It's firepower meant that it was usually used to spearhead assaults against the biggest enemy vehicles and heaviest fortifications. Since the toughest German vehicles (the Elephant, Panther and Tiger) were named after animals, the Russians nicknamed it *Zveroboy* ('Beast Killer')

The main gun was the ML-20S howitzer, in a casemate mount with a 24° arc. There was also a pintle mount for a DshK machine gun, although it seems that many vehicles didn't actually carry one. The crew (commander, driver, gunner and one or

two loaders) all worked inside a single compartment at the front of the hull.

Ammunition consisted of just 18 shells for the howitzer. Standard equipment included two PPSH-41 SMGs (High-Tech, p. 124) with 21 drums of ammunition and 20 hand grenades for defence against infantry. In practice, the ISU-152 was usually well defended by the infantry who rode into battle hanging from its hand rails.

The higher DR in the table applies to the front of the body. The tracks, underside and top are all DR 60.

Since the ML-20S gun was in short supply, some vehicles (designated ISU-122) were fitted with D-25S guns (with thirty shells) instead. The SU-152 was an earlier design which was based on the KV-1 hull but had a very similar layout and performance to the ISU-152, albeit with weaker armour (DR 200/150). In the 1950s existing ISU-152s were upgraded with night vision equipment, larger ammunition racks (able to hold 30 shells), bigger fuel tanks (Range 400) and DshKM machine guns.

DRIVING (TRACKED)

<i>TL</i>	<i>Vehicle</i>	<i>ST/HP</i>	<i>Hnd/SR</i>	<i>HT</i>	<i>Move</i>	<i>LWt</i>	<i>Load</i>	<i>SM</i>	<i>Occ</i>	<i>DR</i>	<i>Range</i>	<i>Cost</i>	<i>Locations</i>
6	Wespe	110	-3/5	10fx	1/12	12.1	1.3	+4	5	70/30	140	\$200K	2CSX
7	ISU-152	180	-3/5	10fx	1/11	50	1.5	+4	5	350/250	100	\$800K	2CX

TRAINS

TGV Réseau (France, 1992-1996)

These high-speed electric trains can be powered by three different voltages, making them able to operate on Belgian, Dutch, French and Italian rails.

The passenger carriages are semi-permanently connected to the power cars at each end of the train. They are atmospherically sealed in order to avoid passenger discomfort from sudden pressure changes when entering tunnels at high speed.

DRIVING (LOCOMOTIVE)

<i>TL</i>	<i>Vehicle</i>	<i>ST/HP</i>	<i>Hnd/SR</i>	<i>HT</i>	<i>Move</i>	<i>LWt</i>	<i>Load</i>	<i>SM</i>	<i>Occ</i>	<i>DR</i>	<i>Range</i>	<i>Cost</i>	<i>Locations</i>
8	TGV Atlantique	378	-2/6	11	1/97‡	460	38	+13	1+361S	6	-	\$4M	g56W

AMPHIBIOUS VEHICLES

AMPHIBIOUS AUTOMOBILES

Cars that turn into boats seem like they should only be found in cinematic spy stories, but many people have actually tried to make them. Some of them even managed to produce functional vehicles.

Volkswagen Type 166 Schwimmwagen (Germany, 1942-1944)

An amphibious version of the Kübelwagen with a screw propeller which could be deployed from a hatch in the rear and a proper four-wheel drive to give it serious off-road capabilities. The vehicle's wheels act as rudders when floating so steering is done with the same controls as on land. For fine manoeuvring (the wheels didn't make especially good rudders and the motor could only go forward) a wooden paddle was provided in the equipment rack.

Amphicar Model 770 (Germany, 1961-1968)

The first mass-produced amphibious car to be sold to the public was designed and built in Germany, but marketed to Americans. It looked mostly like a typical American convertible of the time, except for it's high ground clearance, smooth underside and two small propellers under the rear

bumper.

One of the cars was owned by president Lyndon Johnson, who liked to alarm passengers unfamiliar with the vehicle by screaming that the brakes had failed and driving into a lake!

*We like to think of it as the
fastest car on the water
and fastest boat on the
road.*

**- John Hein,
Amphicar Owner**

Watercar Panther (USA, 2013-)

This modern car-boat uses a water jet and semi-retractable wheels to achieve high speeds on water. Switching from land to water modes takes fifteen seconds as the vehicle tucks it's wheels into the hull.

On land, it resembles a Jeep, but with a single rear passenger seat in a central position.

BOATING (MOTORBOAT)

TL	Vehicle	ST/HP	Hnd/SR	HT	Move	LWt	Load	SM	Occ	DR	Range	Cost	Locations
7	Schwimmwagen	50	-2/2	10f	1/3	1.5	0.5	+3	1+3	4	45	\$13K	O4W
7	Amphicar 770	52	-2/2	10f	1/4	1.7	0.5	+3	1+4	4	45	\$19K	O4W
8	Watercar Panther	57	-1/3	10f	1/22	1.8	0.3	+3	1+2	4	90	\$120K	O4W

DRIVING (AUTOMOBILE)

TL	Vehicle	ST/HP	Hnd/SR	HT	Move	LWt	Load	SM	Occ	DR	Range	Cost	Locations
----	---------	-------	--------	----	------	-----	------	----	-----	----	-------	------	-----------

7	Schwimmwagen	50	0/4	10f	2/25	1.5	0.5	+3	1+3	4	400	\$13K	O4W
7	Amphicar 770	52	-1/4	10f	2/35*	1.7	0.5	+3	1+4	4	450	\$19K	O4W
8	Watercar Panther	57	0/4	10f	1/40	1.8	0.3	+3	1+2	4	160	\$120K	O4W

HOVERCRAFT

These vehicles float on a cushion of high-pressure air contained inside a flexible skirt, effectively flying just above the surface. This means that they can move over land or water, exerting relatively gentle pressure on the area below them.

Saunders-Roe Nautical 4 Mountbatten Class Mk. III (UK, 1978-1979)

These massive passenger craft ferried cars and people across the English Channel in as little as 22 minutes. The two Mk. III hovercraft were conversions of the earlier Mk. I vessels (first built a decade earlier) to enlarge their carrying capacity and were the largest hovercraft in the world at the time. The last of the Mountbatten hovercraft was withdrawn from service in 2000.

They had a large central bay which could hold up

to 60 cars, accessed by ramps at the front and rear of the vessel, and two long passenger cabins running along the sides. Four engines each powered one large propeller on the top of the vehicle and one fan to maintain pressure in the cushion. A cockpit in a small superstructure at the front held a flight crew of three; the captain who steered the craft, a first officer who was responsible for navigation and a flight engineer. A further fifteen crew worked as stewards and managed the loading of the vehicle bay.

Hov Pod SPX (UK, 2005-)

A small hovercraft suitable for private owners who want a flexible personal transport. The driver controls it with a pair of handlebars from the front of the vehicle. The propulsion system is a ducted fan with some sound reducing properties, making it a little quieter than most ACVs.

DRIVING (HOVERCRAFT)

<i>TL</i>	<i>Vehicle</i>	<i>ST/HP</i>	<i>Hnd/SR</i>	<i>HT</i>	<i>Move</i>	<i>LWt</i>	<i>Load</i>	<i>SM</i>	<i>Occ</i>	<i>DR</i>	<i>Range</i>	<i>Cost</i>	<i>Locations</i>
7	SRN4 Mountbatten	287	-3/5	11f	1/38	325	112	+10	3+439	4	440	\$57M	gs
8	Hov Pod SPX	38	0/3	11f	2/20	0.8	0.35	+3	1+2	4	50	\$20K	O

WATERCRAFT

WATER SCOOTERS

The aquatic equivalent to a motorcycle, these are mostly used for recreation or sports but can sometimes be seen carrying a lifeguard or fisherman.

Kawasaki Jet Ski JS440 (Japan, 1977-1993)

This was one of the first successful water scooters and did so well that the name 'Jet Ski' is

often used to describe any similar vehicle. It is a 'stand-up' design with no seat.

Sea-Doo GTX 4-Tec (Canada, 2001-)

A relatively large personal watercraft with motorcycle style seats and a waterproof compartment (seven cubic feet) to store equipment.

BOATING (MOTORBOAT)

TL	Vehicle	ST/HP	Hnd/SR	HT	Move	LWt	Load	SM	Occ	DR	Range	Cost	Locations
7	Jet Ski JS440	25	0/2	10f	5/14	0.22	0.1	0	1	4	100	\$5K	E
8	Sea-Doo GTX 4-Tec	37	+1/2	11f	8/19	0.75	0.35	+1	1+2	4	100	\$10K	E

CARGO SHIPS

Shipping can carry far more weight than other forms of transport, which means it is often the most efficient method of delivering goods even when faster options are available.

EFC Design 1022 (USA, 1918-1921)

The Emergency Fleet Corporation was formed to build enough shipping for America to conduct operations in the first world war. The war ended before they could actually achieve anything, but the assembly yard of Hog Island still assembled dozens of vessels and many of them were still in service during the second world war (where almost half of them were sunk). This was the first time that ships had been mass-produced from prefabricated parts.

The 'Hog Islanders' were squat ships with little to distinguish one end from the other (which sometimes made it difficult to judge which direction they were going in, a distinct advantage when under attack from submarines). Most people considered them ugly, but they were fast and well built. One

ship, *SS Liberty Glo* had her entire front end blown off by a mine but remained afloat and went on to serve for another thirty years after repairs.

In times of war the ships were armed, usually with two to five dual-purpose guns and six to eight machine guns or autocannons.

Figures given are approximate as ships varied from the basic design and were often modified. A Design 1022 ship has a draft of 25 feet.

EC2-S-C1 'Liberty Ship' (USA, 1941-1945)

These ships were designed to be built as quickly as possible, taking an average of only six weeks with some yards managing less than half that time. Unfortunately the low grade steel used for the hulls combined with the fact they were welded rather than riveted made them prone to cracking.

The United States built hundred of them, using them to ship supplies of all kinds to their European allies. Many were sunk by mines, submarines,

warships, bombers or from colliding with each other in the convoys they used to defend themselves from all the other dangers.

They were armed with a variety of weapons, usually two dual purpose guns and a handful of autocannons and machine guns.

Figures given are approximate as ships varied from the basic design and were often modified. A Liberty Ship has a draft of 27 feet.

Type C7 Lancer Class (USA, 1968-1983)

The first purpose-built container ships, these were part of the revolution in shipping which saw standardised containers become the most common method of delivering manufactured goods. The containers greatly simplified loading and unloading of ships, meaning they could spend less time in port and keep tighter schedules. They could hold approximately one thousand standard 40 foot shipping containers.

Those built after 1975 also had a rear ramp which could be used for roll-on/roll-off cargo and some of them were acquired by the US Navy as transport vessels.

A Type C7 Lancer class ship has a draft of 32 feet.

Batillus Class Supertanker (France, 1976-1979)

The largest ships ever built were made to transport oil from the Persian Gulf to Northern Europe. Due to the difficult market conditions for petroleum, they struggled to turn a profit and most of them were scrapped in the mid '80s.

Due to their size, the Batillus class ships couldn't

pass through the Suez canal and usually had to unload a significant fraction of their cargo at offshore terminals before they could fit into the few European ports which could handle them.

A Batillus class supertanker has a draft of 94 feet.

SA-15 Norilsk Class (Finland, 1982-1987)

These ships were made to operate in the freezing seas North of Russia without assistance from icebreakers. Their thick hulls and strong engines allow them to crush through sheets of ice up to four feet thick.

The Norilsk Class have ramps for roll-on/roll-off cargo and flexible cargo handling equipment for use in the small undeveloped ports they often served (the largest crane is capable of lifting 80 tons). The cargo holds have space for 236 standard 40 foot shipping containers and the front hold is designed to carry hazardous materials such as explosives.

Several of the SA-15 ships were eventually refitted for work in warmer water, increasing their cargo capacity by 7,000 tons.

A SA-15 ships has a draft of 30 feet (37 feet when refitted for warm water).

Maersk E Series (Denmark, 2006-2008)

At the time they were built, these were the largest container ships in the world, able to transport over 7,000 standard 40 foot shipping containers. Running costs are reduced by using heavy automation to keep crew to a minimum and highly efficient engines which recover heat from the exhaust for additional power.

A Maersk E Series ship has a draft of 53 feet.

SHIPHANDLING (SHIP)

<i>TL</i>	<i>Vehicle</i>	<i>ST/HP</i>	<i>Hnd/SR</i>	<i>HT</i>	<i>Move</i>	<i>LWt</i>	<i>Load</i>	<i>SM</i>	<i>Occ</i>	<i>DR</i>	<i>Range</i>	<i>Cost</i>	<i>Locations</i>
6	EFC 1022	810	-3/6	12f	0.01/6	12.5K	7.5K	+11	50+200A	40	25,000	\$30M	g2s
6	EC2-S-C1	670	-3/6	9f	0.01/6	14K	10K	+11	50+50A	30	23,000	\$25M	g2s
7	Type C7	1,280	-4/6	11f	0.01/11	37.3K	16.5K	+13	9+22A	40	20,000	\$70M	gs
7	Batillus Class	2,220	-5/7	11f	0.005/9	696K	610K	+14	30+20A	70	19,000	\$300M	gs
8	SA-15	1,160	-4/6	11f	0.04/8	30.4K	11.6K	+12	32+10A	100	18,000	\$90M	gS

OCEAN LINERS

Steam-powered ships allowed passenger services to cross the Atlantic ocean on a regular schedule and with minimal risk, unlike sailing ships which could be easily delayed by poor winds. Reliable service meant that travelling between Europe and America was now far more convenient and many more people made the journey. It was only when passenger jets made it possible to cross oceans in hours rather than days that ocean liners disappeared.

Olympic Class (UK, 1910-1914)

Built for the White Star line, these three huge vessels were the largest ships in the world at the time. They were intended to take passengers across the Atlantic in style and comfort with gymnasiums, restaurants, turkish baths and other luxuries. They could carry up to 64 wooden lifeboats, although only 20 were actually carried at first.

SHIPHANDLING (SHIP)

TL	Vehicle	ST/HP	Hnd/SR	HT	Move	LWt	Load	SM	Occ	DR	Range	Cost	Locations
6	Olympic Class	1,760	-5/5	10	0.04/13	58.6K	1.9K	+13	390+	50	5,500	\$155M	gS 3,800A

The most famous of the Olympic class liners was the *Titanic*, which sank on it's maiden voyage in 1912 after striking an iceberg. It's sister ship *Britannic* sank in 1916 when it hit a naval mine while acting as a hospital ship. The final vessel, the *Olympic*, served in the first world war as a troop carrier and later returned to service as a commercial liner before being decommissioned in 1935.

At any given time around one hundred crew would be working to keep the ship running, most of them moving coal from the bunkers to the furnaces for the steam engines. The crew numbers listed on the table only cover the essential functions of the vessel. Several hundred more people were employed to serve the passengers, with professions ranging from bath attendants to butchers.

An Olympic Class liner has a draft of 35 feet.

LIFEBOATS AND LIFERAFTS

When a ship is damaged it's passengers and crew often have no choice but to abandon it and take to the sea in small boats. Unless they are fortunate enough to have been wrecked close to land or are within range of another vessel the odds of survival can be slim, but at least they are better than being on a sinking ship!

Carley Float No 20 (USA, 1903-1946)

A Carley Float consists of a thick copper tube in an oval shape covered in cork and canvas. The inside of the oval supports a floor of planks held in place by netting. It is almost impossible to sink, even if punctured by bullets. Unfortunately it offers almost no protection from the water, so anyone aboard will

be soaked and soon suffer from exposure.

A Carley Float has a draft of one foot.

Harland & Wolff 30' Lifeboat (UK, 1910-1914)

Most of the lifeboats on the Olympic class liners were of this type. They had clinker-built wooden hulls reinforced with steel beams and copper buoyancy tanks, making them very resistant to sinking. In theory they were capable of carrying 65 people, although there was only enough seating for 40. Standard equipment (often not stored in the boat itself) was ten oars, a mast and sail, 50 yards of rope, a sea anchor, two buckets for bailing, two boat hooks, a compass, a lantern and provisions for about

70 meals (including 12 gallons of water).

Similar craft were used on many ships from the early nineteenth century until at least the middle of the twentieth. In the British Merchant Navy they were sometimes known as 'Board of Trade boats' after the body which issued rules for their construction and equipment.

A lifeboat of this type has a draft of two feet.

SOLAS '74 Standard 6 Person Liferaft (International, 1974-)

The 1974 International Convention for the Safety of Life at Sea set out new standards for 'life-saving appliances'. Liferrafts built to meet their requirements

were made by numerous companies. Similar craft were widely available for at least a decade before the convention.

These liferafts are usually stored inside a rigid plastic cannister until they are needed (110 lbs. total). When activated it automatically inflates (taking about one minute to fully deploy) into a roughly circular shape with a domed roof to provide shelter and water bags hanging below to provide stability. Inside the raft are sealed containers holding two paddles, a large open ocean survival kit and enough provisions for twenty meals.

A SOLAS liferaft has a draft of one foot.

BOATING (UNPOWERED)

<i>TL</i>	<i>Vehicle</i>	<i>ST/HP</i>	<i>Hnd/SR</i>	<i>HT</i>	<i>Move</i>	<i>LWt</i>	<i>Load</i>	<i>SM</i>	<i>Occ</i>	<i>DR</i>	<i>Range</i>	<i>Cost</i>	<i>Locations</i>
6	Carley Float No 20	29	-1/4	12c	0.02/1	2.2	2	+2	2+18	5	F	\$600	O
6	Harland & Wolff 30'	82	0/3	12c	0.4/2	11	6.5	+5	10+30	4	F	\$12K	MO
7	SOLAS 6 Person	18	-1/4	10c	0.1/1	0.65	0.6	+2	2+4	1	F	\$1.1K	O

SUBMARINES AND SUBMERSIBLES

With most watercraft it's a bad sign if they sink beneath the surface, but some are designed to dive into the depths.

Type VIIc U Boat (Germany, 1940-1945)

The most common of the second world war *Unterseeboote* (and the most produced submarine class in history) were conservative designs not much different to the ones used in the previous war.

The crew of four officers and 48 enlisted men had only one cabin (for the commander) and 24 bunks between them. An active sonar system was installed for underwater detection, although most targets were still spotted with the periscope. Weapons consisted of five torpedo tubes (four facing forwards and one to the rear, although a few boats had only two forward tubes or no rear one) with 14 53.3cm torpedoes, an 8.8cm SK C/35 deck gun (with

200 rounds) and various anti-aircraft weapons (typically one M42 flak gun and two FLAK 38 guns; a RoF 8! variant of the FLAK 30, High-Tech Pulp Guns, Vol. 2, p. 27).

Statistics given are for surface performance with the diesel engines (Move 0.05/4, Range 90 when running on batteries underwater). Late-war submarines were fitted with snorkels to allow them to run their diesel engines while submerged, although these devices limited top speed (to 3 yards per second), only worked just below the surface, could still be spotted by eye or radar and caused the engines to suck air from the crew compartment (causing rapid decompression) if the intake was flooded.

A type VIIc U Boat has a draft of 16 feet (32 feet for complete submergence) and a safe test depth of 750 feet.

Pisces Class DSV (Canada, 1971-1976)

These Deep Submergence Vehicles are designed for conducting scientific research and exploration of the ocean floor. The crew sit inside a spherical pressure hull at the front of the craft where they can observe their surroundings through small portholes or via the cameras mounted above them. Two robotic arms are mounted below the nose, one with a strong gripper and the other with more delicate manipulators for precision work. The vehicle is

moved by two rotating ducted propellers on the sides of the hull. Although the batteries only have enough energy to operate at full power for about eight hours the carbon dioxide scrubbers give about six days of breathable air in case of emergency.

The higher DR in the table only applies to the spherical pressure hull holding the crew. A Pisces Class DSV has a draft of 9 feet and a safe test depth of 6,500 feet.

SUBMARINE (LARGE SUB)

<i>TL</i>	<i>Vehicle</i>	<i>ST/HP</i>	<i>Hnd/SR</i>	<i>HT</i>	<i>Move</i>	<i>LWt</i>	<i>Load</i>	<i>SM</i>	<i>Occ</i>	<i>DR</i>	<i>Range</i>	<i>Cost</i>	<i>Locations</i>
6	Type VIIc U Boat	440	-2/5	10	0.2/10	848	70	+10	52APS	100	9,000	\$23M	s

SUBMARINE (MINI-SUB)

<i>TL</i>	<i>Vehicle</i>	<i>ST/HP</i>	<i>Hnd/SR</i>	<i>HT</i>	<i>Move</i>	<i>LWt</i>	<i>Load</i>	<i>SM</i>	<i>Occ</i>	<i>DR</i>	<i>Range</i>	<i>Cost</i>	<i>Locations</i>
7	Pisces Class	120	0/4	11	0.07/2	14.3	0.3	+4	1+2PS	130/10	30	\$19M	2Ag2Rs

AIRCRAFT

SMALL PASSENGER PLANES

These planes allow airlines to provide service on routes with small numbers of passengers or give large businesses and wealthy individuals the fastest possible personal transport.

Blériot-SPAD S.33 (France, 1920-1921)

One of the world's first successful passenger planes, the S.33 was a biplane with a small enclosed cabin in the fuselage, forward of the open cockpit. It had four passenger seats in the cabin and another next to the pilot. It could be seen throughout the 1920s serving the London-Paris and Paris-Bucharest routes.

A S.33 requires a 150 yard runway, can reach an altitude of 12,000 feet and has a stall speed of 18 yards per second.

Antonov An-2 (Russia, 1948-1971)

Despite its dated looks, this single-motor biplane is an efficient, easy to maintain aircraft that played an important role in bringing civilization to the most remote corners of Russia. More than 17,000 were built. While it was discontinued in USSR in 1971, Poland kept producing them until 2002 and China makes them even today. Russians call them *Annushka* or *Kukuruznik* ('Cropduster').

One of the main design goals was to make controls as easy and forgiving as possible. It is almost impossible to stall (with a moderate headwind it can hover or even fly backwards) or put it into uncontrollable spin and it is intended to work from unprepared airfields (it carries its own fuel pump). Unfortunately, it is also notorious for causing motion sickness in even the toughest of passengers.

The An-2 has been used in numerous roles in addition to simply carrying passengers. It is

commonly used as a crop duster, for dropping water to stop forest fires, for scientific surveys and as an air ambulance. The wheels can be replaced with skis during winter and floatplane versions (known as the An-2N or An-4, Load 1.2, Loc. G2R2Wi) are available. It was even used as a combat aircraft for attacking observation balloons, for which it was fitted with a small turret armed with either two heavy machine guns or an autocannon (the Gsh-23L from Pyramid issue 57, p. 19).

An An-2 requires a 235 yard runway, can reach an altitude of 14,000 feet and has a stall speed of 18 yards per second.

Beechcraft Baron B55 (USA, 1964-1982)

One of the larger light aircraft using piston-driven propellers, the B55 is a popular small passenger plane which is also used as a military trainer and utility aircraft, often with several seats removed to save weight.

A Baron requires an 800 yard runway, can reach an altitude of 19,000 feet and has a stall speed of 41 yards per second.

Learjet Model 35A (USA, 1976-1993)

A popular medium business jet with distinctive wingtip fuel pods, the 35A is usually used to ferry corporate executives between cities. That is far from the only duty it serves though; during the Falklands War the Argentine military even used unmodified civilian ones as reconnaissance and decoy planes.

A variant actually intended for military use is the C21-A which is used for pilot training, casualty evacuation and submarine hunting as well as transport. The model 36A is an almost identical plane with reduced seating to make room for

additional fuel tanks (Load 0.8, Occ 2+6, Range 3,200).

A Model 35A requires a 1,700 yard runway, can reach an altitude of 45,000 feet and has a stall speed of 54 yards per second.

Cessna Citation Mustang Model 510 (USA 2005-)

A small personal jet with about as much space

inside as a limousine. It has a two-man cockpit, four passenger seats in the rear and an emergency toilet between them. Baggage is stored in unpressurised compartments in the nose and tail.

A Mustang requires a 1,000 yard runway, can reach an altitude of 41,000 feet and has a stall speed of 41 yards per second.

PILOTING (LIGHT AIRPLANE)

TL	Vehicle	ST/HP	Hnd/SR	HT	Move	LWt	Load	SM	Occ	DR	Range	Cost	Locations
6	Blériot-SPAD S.33	53	0/3	10f	1/56	2.3	0.9	+5	1+5	4	670	\$90K	Og3W2Wi
7	Antonov An-2	78	0/4	12f	2/143	5.8	1.4	+5	2+12	4	1,200	\$100K	g3W2Wi
7	Beechcraft Baron	59	0/3	11f	3/118	2.5	0.7	+5	1+5	4	1,100	\$370K	G3WrWi
7	Learjet Model 35A	84	0/3	11f	4/265	9.1	1	+6	2+8PS	5	2,700	\$3.9M	g3WrWi
8	Cessna Mustang 510	70	0/3	11f	3/240	4.3	0.6	+5	1+5PS	5	1,300	\$2.8M	G3WrWi

LARGE PASSENGER PLANES

Douglas DC-3A (USA, 1936-1942)

The first airliner cheap enough to operate at a profit without government assistance, the DC3 was built in dozens of versions. The most popular was the C-47 'Skytrain' used by the American military who used it to transport troops and supplies in World War II. After the war surplus 'Goony Birds' were converted into civilian planes and used by most major airlines.

A DC-3A requires a 300 yard runway, can reach an altitude of 23,000 feet and has a stall speed of 34 yards per second.

Aérospatiale-BAC Concorde (UK & France, 1975-1979)

This dart-shaped jet was one of the few passenger planes capable of supersonic flight, allowing long distance journeys to be completed in less than half the time taken by other airliners. Only twenty were built and six of those were development craft which were never used for commercial flights.

Concorde requires a 4,000 yard runway, can reach an altitude of 60,000 feet and has a stall speed of 71 yards per second.

Airbus A320-200 (France, 1987-)

One of the most popular mid-range narrow-body airliners, the A320 pioneered the use of fly-by-wire controls for commercial planes.

An Airbus A320-200 requires a 2,300 yard runway, can reach an altitude of 39,000 feet and has a stall speed of 63 yards per second.

Boeing 747-400 (USA, 1989-2009)

The 'Jumbo Jet' is a large, wide-bodied plane with four turbofan engines. It has two decks, with the shorter upper deck giving it a distinctive hump-backed appearance.

A 747-400 requires a 3,500 yard runway, can reach an altitude of 45,000 feet and has a stall speed of 55 yards per second.

PILOTING (HEAVY AIRPLANE)

TL	Vehicle	ST/HP	Hnd/SR	HT	Move	LWt	Load	SM	Occ	DR	Range	Cost	Locations
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6	Douglas DC-3A	103	-2/3	12f	2/115	12.6	2.3	+7	2+21	4	1,700	\$1.1M	g3WrWi
8	Airbus A320-200	181	-3/3	11f	3/265	86	20	+8	2+150PS	8	3,600	\$75M	g3WrWi

PILOTING (HIGH-PERFORMANCE AIRPLANE)

TL	Vehicle	ST/HP	Hnd/SR	HT	Move	LWt	Load	SM	Occ	DR	Range	Cost	Locations
7	Concorde	223	-3/3	10f	4/662	206	13.8	+9	3+92PS	10	4,500	\$130M	g3WrWi
8	Boeing 747-400	293	-3/3	11f	3/300	438	54.3	+10	2+416PS	8	8,300	\$250M	g4WrWi

HEAVY BOMBERS

Combining long range and a big bomb load, these planes are meant to wreck enemy infrastructure far behind the front lines.

Gotha G.IV (Germany, 1917)

These plywood biplanes were small compared to later bombers and carried only a modest payload, but they caused widespread alarm when they attacked English cities from their bases in Belgium.

The two wing-mounted engine units included the fuel tanks (which had a nasty tendency to spill over the hot engine if damaged) and had propellers

mounted on the rear. The three crew consisted of a bombardier in the nose armed with a LMG14 Parabellum (High-Tech Pulp Guns, Vol. 2, p. 16) in the nose, the pilot sitting behind him and a rear gunner with another LMG14. The body of the plane had a hole allowing the rear gunner to shoot down through it to defend against attacks from below as well as above. Racks below the fuselage could carry up to 1,100 lbs. of ordnance.

A Gotha G.IV requires a 360 yard runway, can reach an altitude of 16,000 feet and has a stall speed of 30 yards per second.

PILOTING (LIGHT AIRPLANE)

TL	Vehicle	ST/HP	Hnd/SR	HT	Move	LWt	Load	SM	Occ	DR	Range	Cost	Locations
6	Gotha G.IV	70	-1/3	9cfx	1/41	4	0.9	+7	3	3	430	\$500K	O2W2Wi2X

FIGHTER PLANES

These small, fast planes are designed to hunt other aircraft. They are often called upon to act as scouts or attack ground targets too, but they are defined by their ability to knock other fliers out of the sky.

Sopwith F.1 'Camel' (UK, 1917-1918)

The first British aircraft to have guns synchronised to fire through it's propeller, the 'Camel' got it's nickname from the hump where it's weapons joined the fuselage, intended to stop them freezing at high altitude. Like many biplanes of the time, it was mostly made from wood and cloth.

It had a reputation for being agile but difficult to handle. It wasn't as fast as other fighters and the torque from it's engine was so strong that the plane had difficulty turning left. Many pilots simply turned 270° to the right rather than 90° to the left!

A F.1 is armed with two Vickers Mk II Machine Guns (High-Tech, p. 131) each with 250 rounds of ammunition. It requires a 150 yard runway, can reach an altitude of 19,000 feet and has a stall speed of 24 yards per second.

Messerschmitt Bf 109E-3 (Germany, 1939-1940)

The Bf 109 was a light, agile fighter intended as a fast interceptor. The original design didn't include wing-mounted weapons and adding them to later models proved difficult, resulting in a lack of firepower compared to other fighters of the time. Nevertheless, it performed well and many of the top aces of the second world war were 109 pilots.

The 109E-3 was armed with two synchronised MG17 machine guns (High-Tech, p. 133) in the nose and a MG-FF autocannon (High-Tech Pulp Guns, Vol. 2, p. 27) in each wing. Ammunition consisted of 1,000 rounds for each machine gun and 60 for each autocannon. Other equipment included a reflex sight (+1 Gunner skill), large radio, IFF and navigation instruments.

A Bf 109E-3 requires a 150 yard runway, can reach an altitude of 34,000 feet and has a stall speed of 36 yards per second.

There were numerous other models of the Bf 109. Early versions like the B-1 which was used in the Spanish Civil War had only the two machine-guns

and lacked the reflex sight. The E-1 had machine guns in the wings instead of autocannon. The E-4 added armour to the cockpit (DR 25 for occupant hits from the front or rear) which became standard for all future versions and was retrofitted to many existing planes. The E-1/B and E-4/B could carry 550 lbs. of ordnance in an external rack and the E-7 could carry either bombs or drop tanks (double Range). The E-7/Z used a Nitrous Oxide injection system to boost engine performance for a short time (Move +2/+20).

The F series and later had better engines and streamlining (Move 5/180, Range 1,000). The F-1 was armed with twin nose machine guns and a MG-FF which fired through the hub of it's propeller. The F-4 had a MG151/20 autocannon instead. The F-4/R1 added two more MG151/20 in pods under the wings (these became a standard option for all later variants). The F-4/Z had a Nitrous Oxide injection system like the E-7/Z. The G-1 (Occ 1S) had the same weapons as the F-4 and a pressurised cockpit. The G-3 was very similar but upgraded the radio (to a TL7 large radio).

PILOTING (LIGHT AIRPLANE)

<i>TL</i>	<i>Vehicle</i>	<i>ST/HP</i>	<i>Hnd/SR</i>	<i>HT</i>	<i>Move</i>	<i>LWt</i>	<i>Load</i>	<i>SM</i>	<i>Occ</i>	<i>DR</i>	<i>Range</i>	<i>Cost</i>	<i>Locations</i>
6	Sopwith F.1 'Camel'	39	+2/2	9cf	2/55	0.73	0.12	+4	1	2	300	\$130K	O3W2Wi
6	Bf 109	67	+2/3	10fx	5/170	2.9	0.2	+5	1	5	400	\$400K	g3WrWi

ATTACK PLANES

These planes are intended to carry out airstrikes with greater precision than conventional bombers. Flying low, they can hit small targets or deliver close air support with less risk to friendly troops in the area.

Ilyushin Il-2 M3 Sturmovik (Russia, 1942-1945)

This formidable plane was built to make direct attacks against enemy tanks, with guns easily able to punch through inch-thick steel plating. It was also made to survive anti-aircraft fire at low altitudes, with the underside being made of relatively thick

steel which provided both protection and great structural strength. Soviet soldiers called the Il-2 'the flying tank' due to it's toughness and firepower.

The Il2 M3 had two VYa-23 autocannons with 250 rounds for each and two ShKAS machine guns (High-Tech Pulp Guns, Vol. 2, p. 27) with 750 rounds each in it's wings. The gunner was armed with a rear-facing UBT machine gun with around 300 rounds. It could also carry an additional 1,400 lbs. of ordnance in it's two bomb bays or attached to wing hardpoints.

The higher DR in the table applies to attacks to

the body from below and the pilot (but not the gunner) has an additional DR 50/25. An Il2 M3 requires a 280 yard runway, can reach an altitude of 18,000 feet and has a stall speed of 40 yards per second.

Our Red Army now needs Il-2 aircraft like the air it breathes, like the bread it eats... I demand that you manufacture more. This is my final warning.

Stalin

Douglas AD-6 Skyraider (USA, 1953-1957)

The first versions of the Skyraider came into service with the US Navy shortly after the second world war. They were single propeller monoplanes with folding wings to allow them to operate from aircraft carriers.

The popular AD-6 variant (later renamed A-1H) was introduced near the end of the Korean War. It had a better engine, could carry larger bombs and added additional armour to protect the cockpit and important systems (the higher DR only applies to the pilot and vitals and doesn't protect against attacks from above). They were widely exported and used by both the Americans and the South Vietnamese during the Vietnam War. In combat against the more advanced MiG-17 they still managed to claim several kills.

The AD-6 had four M3 autocannons with 200 rounds for each in it's wings and numerous hardpoints allowing it to carry up to three tons of ordnance, fuel tanks (500 miles added to range for

every half-ton droppable tank) or specialist equipment. A radar detector and IFF transponder were standard equipment but radar was only available if carried in an external pod.

Early versions of the Skyraider had less armour (DR 20/5, higher DR only applies to the pilot), could only carry half as much ordnance and only had two guns. The AD-4 had four guns and could carry as much as the AD-6. The AD-5 added an extra seat, plus enough internal space to carry passengers (four seats or two litters for casualties) or cargo.

A Skyraider requires a 290 yard runway, can reach an altitude of 23,000 feet and has a stall speed 44 yards per second.

Fairchild Republic A-10 Thunderbolt II (USA, 1977-1984)

Although officially called the Thunderbolt II, the A-10 is better known by it's nickname, the Warthog. It has been described as a plane built around a gun and the 30mm Avenger cannon is certainly a major element of it's design; the weapon is placed so that it's recoil is precisely aligned with the centre line of the plane to avoid the powerful kick from knocking the aircraft to the side.

Like many attack planes, the A-10 is built to survive fire from the ground, with the pilot sitting in a tub of titanium armour and the twin turbofan engines mounted high up to reduce their chances of being hit from below.

An A-10 is armed with a single GAU-8/A cannon (with 1,174 rounds) and around six tons of ordnance on external hardpoints. The higher DR in the table only applies to the pilot. It requires a 650 yard runway, can reach an altitude of 45,000 feet and has a stall speed of 68 yards per second.

PILOTING (HEAVY AIRPLANE)

TL	Vehicle	ST/HP	Hnd/SR	HT	Move	LWt	Load	SM	Occ	DR	Range	Cost	Locations
7	A-10 Thunderbolt II	121	0/3	11f	4/215	25	7	+6	1S	60/6	470	\$15M	g3WrWi

PILOTING (LIGHT AIRPLANE)

TL	Vehicle	ST/HP	Hnd/SR	HT	Move	LWt	Load	SM	Occ	DR	Range	Cost	Locations
6	Il-2 M3 Sturmovik	78	+1/3	12f	3/128	7	1.1	+6	2	25/10	450	\$700K	g3WrWi

HELICOPTER GUNSHIPS

Helicopters are generally better than planes at flying low and (relatively) slow, so they make ideal platforms for close air support.

Bell AH-1G Cobra (USA, 1967-1973)

Although helicopters had been armed and used as attack vehicles before, the Cobra was the first true, purpose-built helicopter gunship. Based on the UH-1 Iroquois (SEALs in Vietnam, p. 39), it often flew alongside the 'Hueys' during the Vietnam war.

The two crew sit in a tandem-arrangement with the gunner in front controlling the nose turret which has 220° rotation and can change facing in one second. The turret mounts two weapons, usually a M134 Minigun (High-Tech, p. 135) with 4,000 rounds and a M129 Grenade Launcher with 300 rounds. Later versions replaced the two weapon mounts with a single M197 Vulcan cannon (High-Tech, p. 135) and added a telescopic sight (+3 Acc) and laser rangefinder (+3 Acc).

Additional weapons can be carried on four hardpoints mounted under the stub wings. Typically around half a ton of ordnance is carried, but twice this can be managed if the fuel tank is left half-empty to save weight.

The higher value for DR in the table only applies to the crew (and not if shot through the window from above or the side) and rotors. An AH-1G Cobra can reach an altitude of 11,000 feet.

Boeing AH-64D Apache Longbow (USA, 1995-)

Following the collapse of the AH-56 Cheyenne's development, the U.S. Army started the Advanced Attack Helicopter program to create a replacement

for the AH-1 Cobra. The final result was the Apache, a well-protected, heavily-armed attack aircraft packed with (at the time) cutting-edge electronics. During Operation Desert Storm they devastated Iraqi air defences and armoured units, although by the time of Operation Iraqi Freedom the Iraqi tank crews has learned to fight back, shooting down one Apache and damaging dozens more in a single engagement.

The 64D Longbow upgrade improved on the original design in many areas, including more powerful motors (Apaches built before 1990 would have Move 2/85) and the addition of the Longbow radar system (a low-probability intercept tactical radar with 5-mile range which can 'lock-on' to 16 targets at once and gives 360° coverage) mounted above the main rotor. The pilot has a thermal-imaging sensor with 180° vision, while the gunner has his own thermal-imaging sensor as well as an optical camera (×127 zoom), telescopic sight (×16 magnification, +4 Acc) and a laser rangefinder (which also functions as a target designator, 12-mile range) all with 240° vision.

Weaponry consists of a M230 chain gun in a turret under the Apache's nose with 1,200 rounds and additional ordnance attached to the stub wings (typically about one ton of weaponry, often four Hellfire missiles or 19 Hydra rockets on each of it's four hardpoints). The Apache can also carry extra fuel tanks on it's hardpoints (1,600 lbs. +180 Range per tank) or in it's magazine (reduces the chain gun to 100 rounds, +100 Range).

Apaches have the Redundant Systems construction option. The higher value for DR in the table only applies to the crew, vitals and rotor. An Apache can reach an altitude of 20,000 feet.

PILOTING (HELICOPTER)

TL	Vehicle	ST/HP	Hnd/SR	HT	Move	LWt	Load	SM	Occ	DR	Range	Cost	Locations
7	AH-1G Cobra	72	+1/2	10fx	3/84	4.7	1.1	+6	2	20/5	360	\$15K	gH2RtWi
8	AH-64D Apache	90	+1/2	11f	3/89	8.9	1.9	+6	2	30/15	300	\$30K	gHt3WWi

HEAVY HELICOPTERS

When you need to lift something big into (or out of) a place without roads or airfields, a heavy helicopter is often the only way to do it. Most of them are built for the military, but they have also proven useful for disaster relief, forestry work and construction.

Sikorsky S-64 Skycrane (USA, 1962-)

The Skycrane (called the CH-64 Tarhe in the American military) looks like someone cut out the belly of a large helicopter, leaving only the rotor, tail and cab. This skeletal design allows the S-64 to tuck slung loads close to its centre of mass, reducing drag and avoiding instability caused by heavy loads swinging on long lines.

A S-64 can reach an altitude of 18,000 feet.

Boeing CH-47C Chinook (USA, 1968-)

Instantly recognisable due to its twin-rotor layout, the Chinook is a big, ugly machine that is capable of a surprising turn of speed. When first introduced in 1965, it was able to outpace attack and scout helicopters. During the Vietnam War, American forces used Chinooks to carry artillery pieces into mountainous terrain, deliver supplies to units which couldn't be reached by road, evacuate mass casualties and even recover entire aircraft which had been shot down.

The helicopter is controlled by two pilots in the cockpit. It usually also needs a crew chief to

supervise the cargo bay and has mounting points for up to three machine guns (at the rear and both sides, although usually only the side positions actually had guns, most commonly M60s).

The early CH-47A had weaker engines (Move 2/73, LWt. 18, Load 4.2) while more modern versions like the CH-47F are significantly more powerful (Move 2/96, LWt. 25, Load 7.1, Occ 2+45, Range 450).

The higher DR in the table only applies to the rotors. A CH-47C can reach an altitude of 10,000 feet.

Mil Mi-23 (Russia, 1980-)

The largest mass-produced helicopter in the world, the Mi-23 has a single huge main rotor with eight 50' long blades. Its 4,000 cubic foot cargo bay can hold several trucks or even armoured vehicles. When the U.S. Army stranded a Chinook on a mountainside in Afghanistan a Mi-23 was used to lift the other helicopter and carry it back to base!

Crew consists of two pilots, a navigator and two technicians. Several variants of the Mi-23 exist, including a fuel tanker (capable of holding 3,700 gallons) and an air ambulance (which has its own operating theatre and lab).

The higher DR in the table only applies to the rotors. A Mi-23 can reach an altitude of 15,000 feet.

PILOTING (HELICOPTER)

TL	Vehicle	ST/HP	Hnd/SR	HT	Move	LWt	Load	SM	Occ	DR	Range	Cost	Locations
7	Sikorsky Skycrane	108	-1/2	11f	2/73	23.5	10.5	+7	3+2	5	230	\$30M	gH3W
7	CH-47C Chinook	111	-1/3	11f	2/87	19.2	5.3	+7	2+34	20/5	225	\$33M	gH4W
8	Mil Mi-23	158	0/2	11f	2/90	61.7	21.1	+8	5+85	20/5	400	\$22M	gH3W

AIRSHIPS

Although the principles of lighter-than-air flight had been understood for some time, it wasn't until

the dawn of the twentieth century that they became good enough to serve as a serious means of

transport. For while they competed with aeroplanes but it soon became clear that the winged machines had an advantage in speed which made airships redundant for most purposes.

Zeppelin P Class (Germany, 1915)

These were the infamous Zeppelins which carried out the first bombing of London, causing significant panic despite the rather limited damage they were able to inflict. Flying higher than most fighters of the time could reach and moving silently, they were able to attack with little risk at first. However air defences were soon improved and within a few years bombing by airship was no longer practical.

The P Class had two enclosed gondolas hung beneath a streamlined hull which held the 16 gasbags (filled with hydrogen and very prone to burning). The forward gondola held the control room, a radio room, a 'rest area' and one engine

driving a single propeller. The rear gondola had three engines each driving a propeller. Each gondola had two Maxim MG08 or LMG14 Parabellum machine guns (High-Tech, p. 130) with another in the tail and two or three more in a position on top of the hull. Up to 4,400 lbs. of bombs were hung from the keel girders between the gondolas.

A P Class Zeppelin can reach an altitude of 11,000 feet.

Goodyear GZ-20 (USA, 1968-2006)

The famous 'Goodyear Blimps' are used to promote the Goodyear Tire and Rubber Company. The 'Z' stands for Zeppelin, a tribute to Goodyear's historical partnership with that company despite them being out of business for over twenty years when the GZ-20 first flew. It has a single gondola with two engines hung beneath a non-rigid gasbag.

A GZ-20 can reach an altitude of 7,500 feet.

PILOTING (LIGHTER-THAN-AIR)

<i>TL Vehicle</i>	<i>ST/HP</i>	<i>Hnd/SR</i>	<i>HT</i>	<i>Move</i>	<i>LWt</i>	<i>Load</i>	<i>SM</i>	<i>Occ</i>	<i>DR</i>	<i>Range</i>	<i>Cost</i>	<i>Locations</i>
7 Goodyear GZ-20	84	-4/3	11	1/24	6.4	0.7	+9	1+6	1	900	\$5M	S

SHIPHANDLING (AIRSHIP)

<i>TL Vehicle</i>	<i>ST/HP</i>	<i>Hnd/SR</i>	<i>HT</i>	<i>Move</i>	<i>LWt</i>	<i>Load</i>	<i>SM</i>	<i>Occ</i>	<i>DR</i>	<i>Range</i>	<i>Cost</i>	<i>Locations</i>
6 Zeppelin P Class	114	-4/3	10cf	1/28	17.9	4.5	+12	19	2	2,700	\$6M	S

EQUIPMENT

VEHICLE COMPONENTS

Aircraft Transponder

From 1960 most civilian aircraft are required to carry radar transponders (transmitter-responders) which make them easy to identify by air-traffic controllers. These are essentially civilian versions of military IFF systems (High-Tech, p. 229).

Buoyancy Tanks

A vehicle with buoyancy tanks is 'unsinkable' in that it will always float so long as the tanks are intact, regardless of whether the rest of the vessel is flooded. It can still capsize, spilling passengers and cargo into the water, but it doesn't sink. Impaling or Piercing damage doing more than HP/3 injury to the vehicle will render the tanks useless.

Fire Extinguishers

Early vehicle fire extinguishers often used toxic chemicals such as Carbon Tetrachloride (Halon 104) because they were more effective than water and could be used on electrical fires. A blast of Halon 104 will put out a fire on the roll of 9 or less on 3d but exposure to high concentrations causes liver and nerve damage.

Contact agent, one week delay, HT+2 roll to resist. -1 HT permanently on a failure, -1 DX and HT on a critical failure.

When heated, Carbon Tetrachloride can turn into Phosgene. This often happened when it was sprayed onto a fire! Phosgene gas is heavier than air, colourless and hard to detect by smell. When inhaled it causes damage to the tissue of the lungs.

Respiratory agent, 24 hour delay, HT roll to resist. Inflicts one point of toxic damage on a failure and one hour of coughing on anything except a

critical success, repeating at hourly intervals for 48 cycles.

Power Take-Off

Early motor vehicles were often used to power other machines by simply removing a wheel and running a belt from the axle. A more convenient method is the Power Take-Off connection, which fits a separate drive shaft to the vehicle specifically for powering attached equipment. This allows the devices to be used while the vehicle is in motion and saves the effort of removing wheels!

Radio and Telegraph

Wireless Telegraphy allows communication between military ships from around 1900, but it didn't become standard equipment for civilian vessels until a decade later. By the 1920s civilian ships and some military air and land vehicles had compact radios which were capable of transmitting speech and by 1930 they were common in civilian aircraft too.

Civilian land vehicles rarely have two-way radios, but from the 1930s they were often fitted with simple receivers so that people could listen to radio broadcasts while driving. Early radios were expensive enough that they were usually considered an optional extra until the 1960s.

Redundant Systems

By using multiple versions of important components, carefully isolated from each other a vehicle can be made to keep operating despite damage which would usually stop it. A vehicle with this option treats damage to the Vitals hit location as having only a $\times 2$ wounding modifier rather than $\times 3$.

Sea Anchor

Essentially, this is just a waterproof bag attached to a length of rope. Trailed in the water from the

stern of a boat, it provides stability in rough seas. A sea anchor gives -1 Handling, +2 SR and halves Move when in use. A typical sea anchor for a 30' boat is 40 lbs. (half weight at TL 7+).

STANDARD EQUIPMENT

Vehicles often come with accessories and equipment attached. These standard lists provide a general guide to what you might expect to find in a typical vehicle of the type.

Armoured Fighting Vehicle

Binoculars (High-Tech, p. 47). Camouflage Net (High-Tech, p. 77). Crowbar. Felling Axe (High Tech, p. 24). Fire Extinguisher (High-Tech, p. 26). First-Aid Kit (High-Tech, p. 221). Flashlight (High-Tech, p. 52). Hydraulic Jack (High-Tech, p. 25). Manuals for the vehicle and all it's equipment. Pick-

Mattock (treat as a poorly balanced warhammer, -3 skill). Portable Tools Kits (High-Tech, p. 24) for Armourer (Heavy Weapons) and Mechanic (Vehicle Type). Provisions sufficient for all crew and passengers for at least one day, including water (often in 5 gallon cans). Radio (usually a medium radio, with an added encryption system from mid TL 7). Sandbags. Saw (High-Tech, p. 25). Shovel (High-Tech, p.25). Sledgehammer (High-Tech, p. 25). Spare Wheel or Track Segments. Tow Cable. Wire Cutters (High-Tech, p. 25).

WEAPONS

AUTOCANNON AND MACHINE GUNS

*MAC Mitrailleuse Modele 31, 7.5×54mm
MAS (France, 1931-1940)*

This weapon was originally designed for the fortifications of the Maginot Line, where it was usually fitted in pairs on the *JM Reibel* embrasure mount. It was soon adapted to use in armoured fighting vehicles. The Germans used captured ones as the Kpfw MG 331(f).

The Mle 31 had an extra-heavy barrel (High-Tech, p. 86) but it couldn't be easily removed if it overheated. Instead the weapon was sprayed or dunked in a bucket of water to cool it down! In addition to the large drum-pan magazines, it could be loaded with 35-round box magazines (3.6 lbs.) which were usually used by infantry when the gun was mounted on a tripod (often the 44 lbs. one used with the Browning M2HB). As well as the usual 'Balle C' ball ammunition it was often loaded with AP-I (Dam. 5D(2) pi- inc).

It was derived from the standard French light machine gun, the FM Mle 1924 M29 (Wt. 22.3/2.3, RoF 8, Shots 25(3), ST 11B) which had the same issue with changing the barrel (and didn't even have an extra-heavy barrel). Early versions fired a slightly different round (7.5×57mm MAS) and had a bad reputation for exploding (Malf. 16) especially if accidentally loaded with 7.92×57mm Mauser ammunition which had very similar dimensions. The Mle 24's box magazine could be used with the Mle 31 if it was fitted with an adapter.

The Mle 34 was a variant for aircraft (EWt. 23.5, RoF 24!) which could be loaded with 100, 300 or

500 round magazines (13.5, 40 or 70 lbs. respectively) or disintegrating belts (6.6 lbs. per 100 rounds).

Bofors 40mm L/60, 40×311mmR (Sweden, 1933-1947)

One of the most popular anti-aircraft weapons of the early twentieth century, the Bofors gun was used by many nations in many roles.

It was loaded with aluminium clips which held four shells each. The loading mechanism held two clips and it took a team of two loaders to keep the gun full as it fired (three ready manoeuvres to load four rounds; one for the first loader to pick up the clip, one for both loaders to pass the clip between them and one for the second loader to load it into the weapon while the first loader picks up the first clip).

Various mountings were used, a typical one was the American M2 gun carriage which weighed 4,650 lbs. It had four wheels and could be towed behind a truck such as the CCKW-353 (High-Tech, p.239).

As well as the HE round in the table, it was sometimes issued with AP ammunition (Dam 5d×5(2) pi++) for use against ground targets.

Hispano-Suiza HS.404, 20×110mm Hispano (France, 1938-1940)

After a falling-out with Oerlikon over the rights to their autocannon (High-Tech, p. 132) Hispano-Suiza developed their own weapon. It used a gas-operated mechanism, allowing it to be lighter and shoot faster than the Oerlikon gun. Licensed versions were manufactured in Britain and America,

who continued to produce them after Hispano-Suiza had been shut down by the German invasion of 1940.

The American versions (known as the M1, M2, M3 and M24) used belted ammunition and were prone to stoppages (Malf. 16). Later models fitted in aircraft had electric cocking mechanisms to clear them if they misfired. A lighter variant with a slightly different round (20×110mm USN) was made by Colt as the Mk 12 cannon (EWt. 101 lbs. RoF 13!).

In addition to SAPHE (in table) the HS.404 and its derivatives were often loaded with APHC-T (6d×3(2) Pi++ inc).

Browning M1A2 AA Gun, 37×223SR (USA, 1939-1943)

Designed by the famous John Browning, this was the main air defence autocannon for American forces at the start of the second world war.

Ammunition was loaded in ten round clips which could be fed into the mechanism as the previous one was emptied, allowing sustained fire.

It was commonly mounted on a four-wheeled carriage which could be converted into a firing platform. Two M2HB machine guns (feeding from 200 round boxes) were fitted as coaxial weapons and the gunner could fire either or both weapon types with his foot pedals. Seats were provided for the gunner and two gun layers (who can change facing in seven seconds). The entire carriage (including weapons) weighed 5,600 lbs.

Available ammunition includes HE-SD-T (in table, self-destruct at 4,000 yards) and AP-T (Dam 6d×3(2) pi++ inc).

Besa 7.92mm Machine Gun, Mk II, 7.92×57mm (UK, 1940-1943)

Based on a Czechoslovakian weapon, the Besa used different ammunition to most British small arms, but since it was only used by the Royal Armoured Corps who had a separate supply chain this wasn't a major problem. A fire rate selector allowed the user to switch between steady or rapid

fire as required.

The original ZB-53 which the design was based on was almost identical. The Mk III and III* variants were simplified designs for rapid manufacture, resulting in them being slightly heavier (EWt. 47) and having a fixed rate of fire (13! for the Mk III and 8! for the Mk III*).

Berezen UB, 12.7×108mm (Russia, 1941-1945)

This aircraft machine gun was designed to be quick to manufacture but not especially durable (treat it as having a light barrel for sustained fire). It was available in three versions, the UBS (synchronised to fire through propellers), UBK (for wing mounts) and the UBT (for turrets). This last version required the gunner to charge it by pulling a cable, which took considerable force (an additional ready action for every point of ST below 12).

***In contrast to the ShKAS,
the Berezen was
deliberately expendable...***

US Intelligence Report

Volkov-Yartsev Vya-23, 23×152mmB (Russia, 1941-1945)

The main gun for the Il-2 Sturmovik was essentially an enlarged version of the Berezen UB. Its powerful recoil and abrupt reloading action caused significant wear when fired, leading to frequent jams (Malf. 16).

In addition to the SAPHE rounds in the table, APHCI rounds were available (7d×3(2) Pi++ inc).

3.7cm Flak M42, 37×263mmB (Germany, 1943-1945)

This anti-aircraft gun was used for defence on both surface ships and submarines. It could be fitted singly or in pairs on open mounts (both weighing about a ton and taking five seconds to change facing).

It was based on the Flak 18, which was used on

land with a 3,600 lbs. platform which could be transported on a two-ton wheeled mount. Later versions reduced the weight to a 2,500 lbs. platform and a 1,700 lbs. transport unit.

Ammunition was AP-T (in table) and HE (Dam 7d×4(0.5) pi++ with a 3d [2d] cr ex follow-up). Flak 18 guns fitted to Stuka dive-bombers used APHC (Dam 7d×4(2) pi++) for tank-hunting.

RSAF ADEN, 30×113mm (UK, 1954-)

A fast-firing revolver-feed cannon the ADEN (named for the Armament Development Establishment who designed it and the borough of Enfield where it was built) was the standard weapon for most British fighter planes of the twentieth century.

The ADEN is often mounted in a gun pod with 150 rounds of ammunition (800 lbs. total). It can fire API (in table) or SAPHEC (Dam 6d×3 pi++ with a 4d cr ex follow-up).

The Mk 5 Straden is an improved version with

RoF 28! The French DEFA 552 is almost identical in performance to the basic ADEN, while the DEFA 554 has RoF 20!/30! The GIAT 30M 781 (EWt. 260, RoF 13) is similar but uses an electric feed.

Hughes M230 Chain Gun, 30×113mm (USA, 1975-)

This electrically-powered automatic cannon is the nose gun for the AH-64 Apache. The M230 is usually loaded with HEDP (in table) but can also accept the ammunition used in other 30×113mm guns (Dam 6d×2(2) pi++ inc using API). However, the M230's HEDP ammunition is not safe to use in other weapons.

General Electric GAU-8/A Avenger, 30×173mm (USA, 1977-)

This huge seven-barrelled Gatling style cannon is the famous main gun for the A-10 Thunderbolt II. It is usually loaded with APDU but can also fire SAPHE (Dam 6d×5 pi++ with a 3d+1 [1d+2] cr ex follow-up).

GUNNER (MACHINE GUN)

<i>TL</i>	<i>Weapon</i>	<i>Damage</i>	<i>Acc</i>	<i>Range</i>	<i>EWt</i>	<i>RoF</i>	<i>Shots</i>	<i>ST</i>	<i>Bulk</i>	<i>Rcl</i>	<i>Cost</i>
6	MAC Mle 31	7d pi	5	1,000/4,000	26/17	13!	150(5)	12M	-7	2	\$5K
6	Bofors 40mm	6d×6(0.5) pi++	5	3,000/11,000	1,150/38	2	8(6)	40M	-11	2	\$100K
	<i>follow-up</i>	4d+2 [2d] cr ex									
6	HS.404	6d×3 pi++	5	1,700/6,400	131/56	12!	60(5)	25M	-10	3	\$25K
	<i>follow-up</i>	3d [1d] cr ex									
6	M1A2	5d×5(0.5) pi++	5	1,000/9,000	365/30	2	10(3)	30M	-10	2	\$35K
	<i>follow-up</i>	4d+1 [2d-1] cr ex									
6	Besa Mk II	7d pi	5	1,100/4,400	48/13.5	8!/13!	225(5)	18M	-7	2	\$5K
6	Berezin UB	7d×2 pi+	5	1,800/7,700	47.4/16.9	17!	50(5)	20M	-7	2	\$8K
6	Vya-23	7d×3 pi++	5	1,800/7,700	150/250	10!	250(5)	30M	-10	3	\$25K
	<i>follow-up</i>	3d [1d+1] cr ex									
7	Flak M42	6d×3(2) pi++ inc	5	1,100/7,000	240/28	4	8(3)	30M	-10	2	\$40K
7	ADEN	6d×2(2) pi++ inc	5	1,000/4,900	192/180	20!	150(10)	25M	-10	2	\$150K
7	Hughes M230	4d(10) cr ex	5	1,000/4,900	120/1,200	10!	1,200(10)	25M	-10	2	\$120K
	<i>linked</i>	3d+1 [1d+2] cr ex									
8	GAU-8/A	6d×6(2) pi++ inc	6	3,000/10,000	618/1,784	65!	1,174(10)	35M	-12	2	\$600K

CANNON

Mark 10 Dual-Purpose Gun, 3"/50 Caliber, 76.2×584mm (USA, 1915-1945)

These guns were meant to serve as both anti-ship and anti-aircraft weapons, although they would have been unable to harm most battleships. They were typically fixed to a four ton mount which allowed them to be aimed in any direction, including upwards, with a manual traverse mechanism (12 seconds to change facing). A team of two could load a shell in three seconds.

In addition to the usual HE-AB rounds they could also be loaded with APEX (Dam 8d×5(2) pi++ with a 6d+1 [4d-1] cr ex follow-up).

Mark 12 Dual-Purpose Gun, 5"/38 Caliber, 127×679mm (USA, 1934-1948)

These guns served as anti-aircraft weapons for large American ships, but also as the main deck gun on smaller vessels. When not mounted in an anti-aircraft turret, they were usually fixed to a fifteen ton pedestal mount which had limited elevation. A team of nine could load a shell in three seconds.

In addition to the HE-AB round in the table it could fire APEX (Dam 6d×9(2) pi++ with a 6d×3 [6d+1] cr ex follow-up).

Barrikady A-19, M1931, 122×785mmR (Russia, 1935-1946)

This big field gun was intended to provide indirect fire as a corps-level artillery piece, but the Russians sometimes used it as a direct-fire weapon to deal with heavily armoured vehicles.

It was mounted on a five-ton carriage which could be attached to an artillery tractor by a 1,800 lbs. limber. It was usually operated by a crew of nine. In 1937 the carriage was redesigned with numerous small improvements, like pneumatic tires, and the weapon was renamed the M1931/37.

In addition to the usual HE shells, the A-19 could fire 'anti-concrete' SAPHE (Dam 6d×20 pi++ with a 5d×5 [6d] cr ex follow-up) for use against buildings

or APEX-T (Dam 6d×14(2) pi++ with a 7d [6d] cr ex follow-up) for use against tanks.

The D-25T was a tank gun version only suitable for direct-fire (Range 4,700/12,000). The D-25S was basically the same weapon but for tank-destroyers.

Rheinmetall leFH 18, 10.5cm (Germany, 1935-1945)

The *leicht FeldHaubitze* (light field howitzer) was the standard divisional artillery piece used by the Wehrmacht in the second world war. When not mounted on a vehicle, it used a one-ton two-wheeled carriage and was operated by five crew. A later improved carriage was shared with the PaK 40 gun (the original version of the KwK 40, High-Tech, p.141).

ABS SA 35 Howitzer, L/17, 75×241mmR (France, 1935-1940)

The main gun of the Char B1 was a short but powerful weapon, designed to demolish fortifications. Fitted in the hull mount of its tank it had 40° of vertical traverse, but could barely be moved horizontally. Instead it was aimed by the driver (through his magnifying binocular sights) by turning the tank.

As well as the HE round in the table an APEX shell was available (Dam 6d×4(2) pi++ with a 5d [4d-1] cr ex follow up) although only seven were usually carried in each tank.

Vickers QF 2-Pounder, Mk. IX, 40×304mmR (UK, 1936-1944)

Although it had comparable performance to the anti-tank guns of other nations when it was first introduced, the 2-pounder was kept in service longer than others due to the fact that the British were forced to rebuild their forces following their retreat from France and these light guns were much easier to build than more powerful weapons.

It could be mounted on a 1,500 lbs. wheeled

carriage which unfolded into a tripod arrangement which could rotate 360° and protected the gunner with a (DR 15) shield.

As well as the AP rounds listed in the table they could fire APEX (Dam 6d×4 (2) pi++ with a 2d+2 [2d] cr ex follow-up). When fitted with a 'Littlejohn' squeeze bore adaptor they could fire Armour Piercing Composite Non-Rigid rounds (Dam 6d×6(2) pi++).

Rheinmetall sIG 33, 15cm (Germany, 1936-1945)

This Heavy Infantry Gun (*Schweres Infanterie Geschütz*) was very heavy indeed for an infantry support weapon. German soldiers struggled to push it around on its 1,200 lbs. two-wheeled carriage, although they did appreciate the impact of its massive shells on enemy fortifications and tanks. In order to enjoy the benefits without the struggle, the Germans mounted in on various obsolete tank hulls to produce powerful assault guns.

ML-20 Howitzer-Gun M1937, 152×547mmR (Russia, 1937-1947)

With a barrel length between that of a typical short howitzer and a full-size artillery gun, this was one of the more successful Soviet artillery pieces of the second world war.

It was usually mounted on a five ton carriage which could be attached to a truck with a 1,500 lbs. limber and had a crew of nine. The ML-20S (Range 6,600/10,000) variant was designed for use in self-propelled guns.

In addition to the HE shells in the table it could fire 'anti-concrete' SAPHEC (Dam 6d×19 pi++ with an 8d×5 cr ex follow-up) and APEX-T (Dam 8d×10(2) pi++ with a 7d×2 [7d+2] cr ex follow-up).

APX Canon de Antichar Modele 1937, 47×380mm (France, 1937-1940)

Developed as a replacement for the Schneider Mle 1897 (High-Tech, p. 138) the new gun was easier to conceal and transport. It was easily able to penetrate German tank armour, but wasn't produced in great enough quantities to really make a

difference. It was usually mounted on a 1,700 lbs. wheeled carriage with a (DR 20) gun shield. Ammunition was carried in limbers like the ones used for the Mle 1897, which could hold 96 shells.

The Germans captured many of these guns and immediately started using them to knock out the Char B1 tanks which their own weapons were struggling to penetrate. They even manufactured their own APCR ammunition for it (Dam 7d×5(2) pi++).

The SA 35 was a slightly earlier design with the same mechanism but using a weaker round, the 47×193mm (Dam 7d×3(2) with AP or 7d×4(0.5) with a 7d-1 [2d+1] cr ex follow up with HE). It was used as a tank gun.

SK C/35, 8.8cm L/45 (Germany, 1938-1942)

This deck gun was carried by U-Boats to threaten merchant ships which didn't merit a torpedo. As the cargo vessels started carrying weapons and threatening them with an unshielded deck gun got more hazardous it soon became obsolete and many were transferred to minesweepers and sub chasers as defensive weapons.

It was usually fitted on a 3,600 lbs. open mount which was rotated by hand (taking 15 seconds to change facing). It could fire AP (in table) or HE (Dam 6d×12(0.5) with a 6d×5 [4d+1] cr ex follow up).

52-K Air-Defence Gun M1939, 85×629mmR (Russia, 1939-1945)

Like many anti-aircraft guns of its time the 52-K was also used as an anti-tank weapon. In the anti-aircraft role, it was usually mounted on a 6,500 lbs. four-wheeled trailer. Modified versions for tanks and tank-destroyers were designated D-5T and ZiS-S-53.

In addition to the HE shells in the table, APEX-T (Dam 5d×11(2) with a 9d [4d+1] cr ex follow-up) and APCR-T (Dam 6d×13(2) pi++ inc) were used.

F-34 M1940, 76.2×385mmR (Russia, 1941-1944)

The designers of this gun believed it was superior

to the Kirov L-11 that had been selected as the main armament for the T-34 tank, but the bureaucrats were afraid of angering Marshal Kulik, the notorious political patron of the Kirov factory, and refused to approve it. In a conspiracy between the factory managers it was manufactured and fitted to the tanks without approval. Kulik denounced the conspirators, but the tank crewmen loved the new weapon and their letters persuaded the State Defence Committee to retroactively approve the decision.

As well as the APEX-T round in the table, it could fire HE (Dam 7d×8(0.5) pi++ with an 8d×2 [4d-1] cr ex follow-up), HEAT (Dam 6d(10) cr ex with 8d×2 cr ex linked), 'anti-concrete' SAPHEC-T (Dam 7d×8 pi++ with an 8d×2 cr ex follow-up) and a rare APCR-T (Dam 7d×8(2) pi++ inc) which was only used when major tank combat was expected.

The similar but less powerful L-11 (Dam 7d×5(2) pi++ with an 8d [4d-1] cr ex follow-up using APEX) was used on early T-34 tanks.

Woolwich Arsenal QF 6-Pounder, L/43 Mk. III, 57×441mmR (UK, 1941-1945)

When the British realised their existing 2-pounder guns wouldn't be powerful enough to combat the latest generation of tanks, they chose to upgrade to a 57mm weapon because they already had factories set up to produce barrels for Hotchkiss 6-pounder naval guns (High-Tech Pulp Guns, Vol 2, p. 28).

In addition to the AP round in the table there were HE (Dam 5d×10(0.5) pi++ with a 6d [3d] cr ex follow-up), APCR (Dam 5d×10(2) pi++) and APDS (Dam 5d×13(2) pi++) shells available.

The Mk. II was a field-gun, usually mounted on a 1,760 lbs. wheeled carriage with a (DR 15) gun shield. The Mk. IV and V were variants with longer barrels (Dam. 5d×11(2) pi++ with APCR, EWt. 727) for gun carriages and tanks respectively. The 57mm Gun M1 was an American version which closely resembled the Mk. IV.

Molins Guns were autoloading versions for ships

GUNNER (CANNON)

and planes. The naval version (3,850 lbs. including it's mount) had a six-shot feed mechanism and space for another 12 shells to be stored on the mount. It used a special low-velocity flashless shell (Dam 8d×4(0.5) with a 7d [3d] cr ex follow-up). The air version weighed 1,400 lbs. and held 23 rounds in it's autoloader racks.

The Royal Ordnance QF 75mm was 6-pounder modified to fire the 75×350mmR shell. It had performance almost identical to the Schneider Mle 1897 (High-Tech, p.138).

Royal Ordnance QF 3" Howitzer L/25, 76.2×134mmR (UK, 1941-1945)

This low-velocity gun was designed to fit into the same space as the Vickers 2-pounder, giving British tanks a bigger explosive shell than their anti-tank guns could offer.

It also fired smoke rounds (20 yard radius, 2 minutes duration).

Krupp 8.8cm Pak 43 L/70, 88×822mmR (Germany, 1943-1945)

The longest and most powerful of the famous German 'eighty eights' could punch through any contemporary tank from several miles away. When mounted on it's three-ton wheeled carriage it was nicknamed the 'barn door' because of it's unwieldiness and the large (DR 20) gun shield.

As well as the usual APEX rounds, it could be loaded with HE (Dam 6d×18(0.5) pi++ with a 6d×3 [4d+1] cr ex follow-up) as well as the rare APCR (Dam 6d×18(2) pi++) and HEAT (Dam 5d×2(10) with Dam 6d×4 cr ex linked).

Rheinmetall 7.5cm KwK 42 L/70, 75×640mmR (Germany, 1943-1945)

With it's long barrel, variable magnification scope and electric firing mechanism, the KwK 42 was one of the most precise weapons of it's day.

In addition to the usual APEX, it could fire HE (Dam 6d×14(0.5) pi++ with a 7d×3 [4d-1] cr ex follow-up) and APCR (Dam 6d×14(2) pi++).

<i>TL</i>	<i>Weapon</i>	<i>Damage</i>	<i>Acc</i>	<i>Range</i>	<i>EWt</i>	<i>RoF</i>	<i>Shots</i>	<i>ST</i>	<i>Bulk</i>	<i>Rcl</i>	<i>Cost</i>
6	Mk 10 3"/50 <i>follow-up</i>	6d×10(0.5) pi++ 11d [4d-1] cr ex	5	2,600/10,000	1,760/24	1	1(5)	70M	-15	5	\$100K
6	Mk 12 5"/38 <i>follow-up</i>	6d×13(0.5) pi++ 6d×6 [6d+1] cr ex	5	4,000/13,000	4,000/82	1	1(15)	110M	-16	10	\$150K
6	A-19 <i>follow-up</i>	6d×20(0.5) pi++ 7d×5 [6d] cr ex	6	4,700/22,000	5,730/90	1	1(15)	130M	-16	10	\$200K
6	leFH 18 <i>follow-up</i>	6d×10(0.5) pi++ 7d×3 [5d+1] cr ex	5	5,400/12,000	2,250/45	1	1(10)	80M	-14	5	\$120K
6	ABS SA 35 <i>follow-up</i>	7d×5(0.5) pi++ 5d×3 [4d-1] cr ex	5+2	900/4,500	800/15	1	1(3)	50M	-14	5	\$80K
6	QF 2-pounder	5d×5(2) pi++	5	1,600/7,000	290/4.5	1	1(3)	30M	-10	4	\$50K
6	sIG 33 <i>follow-up</i>	8d×5(0.5) pi++ 5d×10 [7d+2] cr ex	5	1,100/5,100	2,800/93	1	1(8)	90M	-14	5	\$120K
6	ML-20 <i>follow-up</i>	6d×19(0.5) pi++ 5d×9 [7d+2] cr ex	5	6,600/19,000	5,500/130	1	1(20)	130M	-16	10	\$200K
6	APX Mle 1937	5d×5(2) pi++	5+2	1,000/5,000	660/7	1	1(3)	45M	-14	5	\$80K
6	SK C/35	5d×10(2) pi++	6	2,000/13,000	1,700/33	1	1(5)	70M	-15	5	\$100K
6	52-K <i>follow-up</i>	6d×13(0.5) 8d×2 [4d+1] cr ex	6+1	3,300/10,000	3,400/35	1	1(5)	100M	-15	6	\$100K
6	F-34 <i>follow-up</i>	5d×8(2) pi++ 8d [4d-1] cr ex	6+1	2,800/9,100	2,550/19	1	1(6)	85M	-15	6	\$90K
6	QF 6-pounder	7d×5(2) pi++	5	1,300/5,600	760/13	1	1(3)	45M	-14	5	\$80K
6	QF 3" L/25 <i>follow-up</i>	6d×4(0.5) pi++ 8d×2 [4d-1] cr ex	3	330/2,500	260/17	1	1(3)	30M	-12	5	\$50K
7	Pak 43 <i>follow-up</i>	6d×12(2) pi++ 5d-1 [4d+1] cr ex	6+2	3,500/17,000	5,000/50	1	1(10)	120M	-16	6	\$130K
7	KwK 42 <i>follow-up</i>	6d×10(2) pi++ 3d [4d-1] cr ex	6+2	3,000/11,000	2,200/32	1	1(6)	80M	-16	6	\$80K

FLAMETHROWERS

ATO-42 (Russia, 1942-1943)

This flamethrower was mounted in OT-34 tanks, replacing the T-34 radio operator's seat and hull machine gun. It used compressed air and gunpowder charges to spray the fuel which was ignited by a gas torch. An additional 10 bursts could be provided by tapping the tank's fuel supply (reducing Range by 40 miles).

The ATO-41 (Range 60/100, Malf. 15) was an earlier, unreliable version. The later ATO-43 (Shots 15×2s) used exhaust fumes rather than carrying compressed air tanks.

Koebe Flamethrower System (Germany, 1943-1944)

The Flammanlage Bauart Koebe was a complex arrangement fitted to Sd. Kfz 251/16. It consisted of

two large flamethrowers mounted on the sides of the vehicles, each with a (DR 20) shield and a smaller hand-held unit with an 11 yard hose (plus an optional 11 yard extension hose) which could be used while dismounted (Range 20/30, ST 7†).

The weapons all drew fuel from the same tanks (the shots listed in the table are the total supply for

all three weapons) and were supplied with pressure by a motor (reduce range by 20% for each additional weapon firing at the same time). The hand-held unit was ignited by cartridges (25 per magazine) while the larger ones had electrical ignition. A redesign in 1944 removed the hand-held unit and changed the mounted flamethrowers to cartridge ignition.

LIQUID PROJECTOR (FLAMETHROWER)

<i>TL Weapon</i>	<i>Damage</i>	<i>Range</i>	<i>Weight</i>	<i>RoF</i>	<i>Shots</i>	<i>ST</i>	<i>Bulk</i>	<i>Cost</i>
7 ATO-42	3d burn	90/140	330	Jet	10×2s	25M	-8	\$3K
7 Koebe Flamethrower System	3d burn	40/60	1,870	Jet	80×1s	50M	-8	\$10K

GRENADE LAUNCHERS

Philco-Ford M129, 40×53mmSR (USA, 1967-1973)

One of the options for the AH-1 Cobra's nose turret, this automatic grenade launcher had the unusual feature that it could fire both high-velocity

40×53mm grenades and low-velocity 40×46mm ones (Acc 1, Range 15/400). The first number under Range is minimum range.

An earlier design, the M75 (RoF 3, Rcl 3) could only use high-velocity grenades.

GUNNER (MACHINE GUN)

<i>TL Weapon</i>	<i>Damage</i>	<i>Acc</i>	<i>Range</i>	<i>EWt</i>	<i>RoF</i>	<i>Shots</i>	<i>ST</i>	<i>Bulk</i>	<i>Rcl</i>	<i>Cost</i>
7 M129	4d-1 [2d] cr ex	2	35/2,200	43/412	7	300(5)	15M	-8	2	\$7K

GUIDED AND HOMING MISSILES

The first number listed under *Range* for these weapons is their speed.

AGM-114A Hellfire (USA, 1984-)

The Helicopter Launched Fire and Forget Missile was originally intended to give helicopter gunships a serious anti-armour weapon, but has been used on a wide variety of aircraft against a wide variety of targets. It is the weapon of choice for American targeted killings, where it is often delivered by drone. It has even been used (once) to shoot down another aircraft.

The improved AGM-114K Hellfire II has a

tandem warhead to defeat reactive armour: Acc 6, Dmg 6d×3(10) cr ex with a 7d×10(10) cr ex follow-up and a linked 6d5 cr ex. The 108 lbs. AGM-114L has the same warhead but is radar rather than laser guided. The AGM-114M is a 106 lbs. missile with a HE warhead: Dmg 6d×6 [3d×3] cr ex. The 105 lbs. AGM-114N has a thermobaric warhead: Dmg 4d×11 cr ex and damage is divided by 2× distance in yards from the blast centre.

The Hellfire is usually launched from a 145 lbs. launch rail system which holds four missiles. A 96 lbs. system which only holds two missiles is also available. One missile is \$50,000. Backblast is 6d×2

burn.

ARTILLERY (GUIDED MISSILE)

<i>TL</i>	<i>Weapon</i>	<i>Damage</i>	<i>Acc</i>	<i>Range</i>	<i>EWt</i>	<i>RoF</i>	<i>Shots</i>	<i>ST</i>	<i>Bulk</i>	<i>Rcl</i>	<i>Cost</i>
8	Hellfire <i>linked</i>	6d×14(10) cr ex 6d×8 cr ex	5	500/8,800	145/100	1	4(5i)	25M	-10	1	\$20K

ROCKETS

The first number given under *Range* for these weapons is the minimum range.

Wurfrahmen 40, 28cm Wurfkörper Spreng (Germany, 1940-1945)

German artillery rockets were often launched from frames mounted on the side of vehicles such as the SdKfz 251. The 66 lbs. wooden frame (most of which was actually the rocket's packing crate) could fire the 28cm Wurfkörper Spreng high-explosive rocket (in table), the 32cm Wurfkörper Flamm incendiary (8 yard radius area effect, treat as napalm, see High-Tech p. 188 but the fire can be extinguished by normal means) or the 275 lbs. long-range Wurfkörper 42 (Dam 6d×22 [15d] cr ex, Range 500/5,000).

A 44 lbs. metal frame was also used. Alternatively, the rockets could be fitted to a Wurfgerät launch frame and fired from the ground.

Four rockets could fit onto either an 114 lbs. wooden frame or a 242 lbs. metal one. A rocket is \$4,000.

M21, 122mm Grad (Russia, 1963-)

A modern version of the Katyusha (High-Tech, p. 150) the Grad ('Hail') is a rectangular block of launch tubes mounted on a pivot which attaches to the back of a truck. Rifling and fins make the rockets a little more accurate than it's predecessor, but it is still a messy area bombardment weapon.

Improved rockets (Range 1,540/41,000) are available at TL8, weighing 150 lbs. A HE rocket is \$5,000.

M261, 70mm Hydra (USA, 1979-)

A large pod for 70mm rockets, usually mounted on helicopter gunships. It has the same options for ammunition as the M260 (High-Tech, p. 150).

GUNNER (ROCKETS)

<i>TL</i>	<i>Weapon</i>	<i>Damage</i>	<i>Acc</i>	<i>Range</i>	<i>EWt</i>	<i>RoF</i>	<i>Shots</i>	<i>ST</i>	<i>Bulk</i>	<i>Rcl</i>	<i>Cost</i>
6	Wurfrahmen 40	6d×23 cr ex	1	300/2,400	66/180	1	1(15)	30M	-10	1	\$100
7	M21 Grad	6d×6 [6d] cr ex	2	1,640/16,400	5,700/125	2	40(5i)	50M	-13	1	\$30K
7	M261	7d×3 [3d+2] cr ex	2	70/10,500	87/23	19	19(5i)	25M	-10	1	\$10K

TORPEDOES

The first number listed under *Range* for these weapons is their speed.

G7a T1 'Ato' 53.3cm (Germany, 1938-1945)

This was the standard-issue German torpedo during the second world war. It was powered by a small steam engine (which was rather loud and left a

visible trail in the water) and kept on course with a gyroscopic guidance system. Speed could be adjusted for different range (Range 17/15,300 with the low speed setting).

In early models the guidance system tended to keep the torpedo too low to directly hit the target (-1 skill when using impact detonation) and the

magnetic pistol (the mechanism which detects nearby ships and triggers the torpedo's warhead) was distinctly unreliable (Malf 14). Later versions fixed

these flaws and added a programmable course mechanism.

Each torpedo is \$100,000.

ARTILLERY (TORPEDOES)

<i>TL</i>	<i>Weapon</i>	<i>Damage</i>	<i>Acc</i>	<i>Range</i>	<i>EWt</i>	<i>RoF</i>	<i>Shots</i>	<i>ST</i>	<i>Bulk</i>	<i>Rcl</i>	<i>Cost</i>
6	G7a T1 'Ato' 53.3cm	6d×52 cr ex	0	23/8,800	7,000/3,370	1	1(15)	60M	-15	1	\$300K