VEHICLE CONSTRUCTION KIT

For *Dungeons & Dragons* 5th Edition

Version 3.2

Table Of Contents

Version 3.2

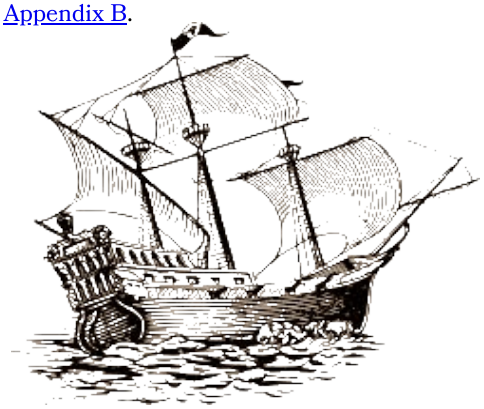
Author. Duncan Timiney (Marasmusine)

Images. All images are public domain or CC0 (creative commons no-attribution).

Format. http://homebrewery.naturalcrit.com/

Vehicle Construction Kit

Elemental airships. Armored wagons. Steam-powered exoskeletons. This sourcebook allows you to create medieval fantasy vehicles – land, air or seafaring – ranging from small wagons to massive sailing ships. To aid you with the VCK system, there are some step-by-step examples in Appendix B.



Creating a vehicle is a five-step process:

1. **Body.** Choose a body mass, which determines how much components cost.
2. **Components.** Select components such as a helm or cargo holds.
3. **Lightweight Components.** Select components such as propellers or wheels.
4. **Options.** Add options such as magic augmentations.
5. **Statistics.** Finalize and fudge statistics.

1. Body

Pick a mass category on the Body table. The mass category is denoted by a Roman numeral, and is used to determine the cost and statistics of the vehicle's components.

The mass you choose gives a laden weight for the vehicle, which includes the weight of the vehicle itself, along with all its cargo, crew and passengers.

Body

Mass	*i*	*ii*	*iii*	*iv*	*v*	*vi*	*vii*	*viii*	*ix*	*x*	*xi*	*xii*
Laden Weight (tons)	2	3	6	10	20	30	60	100	200	300	600	1,000
Damage Threshold	5	5	5	5	10	10	10	15	15	15	20	25
Hit Points	30	35	45	55	70	80	100	115	145	165	210	250
Dexterity	11	10	10	9	9	8	8	7	7	6	6	5

Suggested Size

Mass	*i*	*ii*	*iii*	*iv*	*v*	*vi*	*vii*	*viii*	*ix*	*x*	*xi*	*xii*
Size	L	L	H	H	H	G	G	G	G	G	G	G
Length (ft.)	10	15	20	20	30	40	50	60	80	100	125	180
Beam (ft.)	5	5	5	10	10	10	15	20	20	25	30	35
Decks	0	0	0	0	1	1	1	2	2	2	3	3

Damage Threshold. Larger vehicles have a certain immunity to damage, as described in the *Dungeon Master's Guide* (p. 119).

Hit Points. The vehicle's base hit points. This may be increased when you add structure components.

Dexterity. A vehicle's Dexterity score is a measure of its ability to maneuver. The pilot of a vehicle may be asked to make a maneuver check using the vehicle's Dexterity score to swerve out of the way, or turn beyond the vehicle's limits.

Size. The size of a vehicle is based on its mass category: L (Large), H (Huge) or G (Gargantuan). The specific dimensions can vary greatly. As an example, the size table gives dimensions of a seafaring vessel.

A caravel is a *viii* vehicle (60 ft. by 20 ft., 3 decks), while galleon is an *xi* vehicle (125 ft. by 30 ft., 5 decks)

Facing

Choose if the vehicle uses facing (*Dungeon Master's Guide* p. 252) or not. A vehicle with facing has three body sections: front, center and rear.

Other Statistics

Armor Class Unless structure components are added, a vehicle's AC is 11.

Resistances Vehicles are objects, so are immune to poison and psychic damage.

Speed The speed of a vehicle is determined as you add components and finalized in step 4.

2. Components

A vehicle comprises of twenty component slots. Each slot makes up one-twentieth the mass of the laden vehicle.

As you choose components, select which numbered component slot it goes in.

Facing. If the vehicle has facing, slots are designated as being in the front, center or rear section as follows:

Slot	Section
1–6	Front
7–14	Center
15–20	Rear

Cost. Each component has a cost given in gold coins, depending on the vehicle's mass category. In component tables "K" denotes a multiple of 1,000 gp and "M" denotes a multiple of 1,000,000 gp

Exposed Components. Sails, oars and gasbags are exposed components. When targeted by an attack, they have an AC of 11 regardless of the vehicle's structure components. They can always be targeted regardless of facing.

Power Points. Some components generate Power Points that are allocated to other components that require power. Power Points are scaled to the mass of the vehicle.

Lift Points. Lift Points are generated by some components and vehicle options, as a measure of how quickly the vehicle can ascend. This is described further in Section 4: Statistics.

Workspace

The tables for some components have a "workspace" row. This shows how many crew can work within the component performing maintenance or operating machinery. A component with workspace includes the tools required to repair it.

For motive and power components, crew are engineers or technicians. Magical components require acolytes or wizards. Quarters require stewards or botswains.

If the vehicle has multiple identical components with workspace, a workspace value of a higher mass category is used for those components collectively. Use the Undersized Components table below to determine the number of steps to the right. For example, a vehicle with 5 mass *iv* quarters components uses the workspace value for mass *vii* (3 steps to the right): All 5 components together have 1 workspace.

Alternative Component Sizes

In most cases, one slot contains one component. However, it is possible for one large component to occupy several slots ("oversized"), or for one slot to contain several smaller components ("undersized").

Oversized Components

Not every component is available for the mass category of your vehicle. However, you can use a larger category of component by having it occupy more than one slot, as shown in this table.

Steps	Slots
1	2
2	3
3	5
4	10

For example, a mass *ii* vehicle can take a mass *iv* quarters component by having it take up 3 slots (since this is 2 steps to the right).

Undersized Components

Not every component can be undersized. The description will inform you if it is possible.

Some components indicate they take up a fraction of a slot. The following table shows the undersized steps: for example a component that takes up 1/3 of a slot is 2-step undersized.

Steps	Components	Penalty
1	2	2
2	3	3
3	5	5
4	10	10

The penalty applies to structure and helm components. As structure becomes proportionally lighter, it provides less reinforcement; as a helm becomes lighter, it devotes less weight to control surfaces and mechanisms.

Oversized and Undersized Power Points

The Power Point requirement of an oversized component is multiplied by the "Slots" value in the Oversized Components table.

The Power Points requirement of an undersized component is divided by the "Components" value in the Undersized Components table.

Components that generate Power Points are similarly adjusted if they are oversized or undersized.

Required Components

When planning which components to add to the vehicle, take note of the following requirements.

Helm

Any design that isn't stationary or pulled along requires a helm.

Structure

Some designs require you to add enough structure components to meet a minimum number Structure Points.

Speed. A vehicle's maximum speed cannot exceed 5 mph per 1 Structure Point.

For example, a vehicle of any size with 2 wooden structure components has 12 Structure Points. It cannot travel faster than 60 mph. As streamlining reduces Structure points, the vehicle cannot exceed 50 mph (with good streamlining), 42 mph (sleek), 33 mph (superior), etc.

Ballast

A water vehicle designed to traverse open ocean must have one cargo hold to act as ballast. If it is not laden with actual cargo, it is filled with rocks. From the industrial-era onwards, a vehicle can use a ballast tank instead.

A vehicle that relies on lifting gas gasbags for lift must also have one cargo hold (such as sandbags) or ballast tank for ballast. A hot air gasbag does not require ballast if it uses a burner to control its buoyancy; nor does a vacuum gasbag if it is perfectly sealed.

Flying Speed

There are two methods to achieve flight: "true flight" and Lift points.

True flight can be achieved with ornithopter wings or the cloud keel magical augmentation.

Lift points are derived from any upwards force. This might be from gasbags, fixed wings, soarwood, a rotory wing or the levitating body magic augmentation. Some designs may also rely on updraft or ground effect. You need more than 3 Lift points to rise: you also need forward motive power from a propeller or rotary wing.

Water Speed

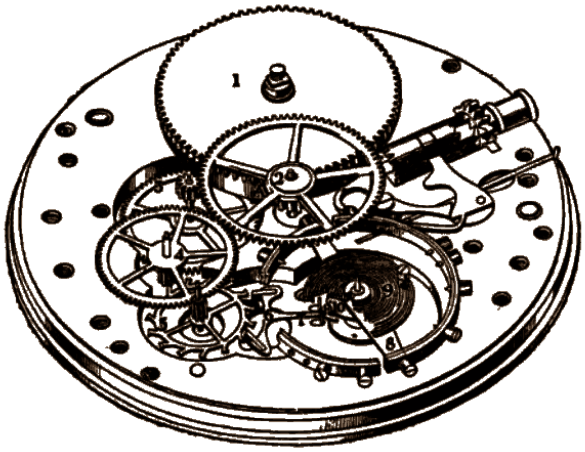
To achieve a speed on water, you need a sail, paddlewheel or screw propeller.

Underwater Speed

To achieve an underwater speed, you need a ballast tank, screw propeller, and the vehicle must be sealed.

Occupancy

For long voyages (lasting longer than one day) each crewperson and passenger requires occupancy in a quarters component. For short voyages, each requires occupancy at a set of controls in a helm component, or in a seating component (even if they are not literally seated: utilitarian seating can merely represent a place to stand).



Component Technology

The assumption is that your campaign has the equivalent of medieval technologies. Some components have the "Renaissance", "Industrial", "Early Modern", "Modern" or "Futuristic" tag. The DM should determine which components are available based on their campaign.

The DM may allow anachronistic technology be available at an increased cost. Each level of technology that diverges from the campaign's normal level doubles the cost of the component. For example, if a modern-era rotary wing is available in a medieval setting, that component has ×8 the normal cost (since there is a difference of 4 levels of technology).

Such anachronistic technology might represent masterwork craftmanship, a magical creation, or technology fallen through time. Whatever the reason, the cost of anachronistic technology contributes towards the vehicle's rarity.

Arm

An multi-jointed arm with a simple gripper that can lift a load. It can be operated from a set of helm controls using a piloting maneuver. A mass *vi* or larger arm can be operated from controls stationed at the component itself. The controls might be a joystick, a wearable "master" arm that drives the larger "slave" arm, or it might be programmable in order to perform repetitive tasks.

Each arm has its own Strength score and Dexterity score. The latter is used when operator needs to make a Dexterity check with the arm: the lower of the operator's and arm's Dexterity is used.

An arm requires a small amount of power, provided by an auxiliary generator included in the component (which might be of any nature, from clockwork to magic.)

All arms share the same cost, lift multiplier and crew requirements, as shown in the following table.

Mass	*i*	*ii*	*iii*	*iv*	*v*	*vi*	*vii*	*viii*	*ix*	*x*	*xi*	*xii*
Cost	300	500	1,000	1,500	3,000	5,000	3,000	5,000	10K	15K	30K	50K
Lift Multiplier	×2	×2	×3	×4	×5	×6	×8	×10	×12	×16	×20	×24
Workspace	0	0	0	0	0	1	1	1	1	1	1	2

Lift Multiplier. An arm can lift 5 lbs × its Strength score × its lift multiplier. A vehicle's carrying capacity is equal to the capacity of its empty cargo holds.

Alternative Sizes. An arm can be undersized or oversized.

Heavy Arm (Modern)

The role of a heavy arm is to lift loads. Use the Body table to determine the arm's Dexterity score: for example, a mass *vi* arm has Strength 17 and Dexterity 8.

Mass	*i*	*ii*	*iii*	*iv*	*v*	*vi*	*vii*	*viii*	*ix*	*x*	*xi*	*xii*
Strength	5	7	10	12	20	25	30	30	30	30	30	30
Reach (ft.)	5	5	5	10	10	10	15	15	15	20	20	20
Epic Lift	–	–	–	–	–	–	–	×1.5	×2.5	×3	×5	×7

Epic Lift. This is an additional multiplier that is applied when calculating the arm's lift.

Precision Arm (Modern)

A precision arm has fine-control actuators and a longer reach. It might have an effector other than a gripper, such as a tool or a facsimilie of a humanoid hand.

A precision arm's Dexterity is always 16 regardless of size.

Mass	*i*	*ii*	*iii*	*iv*	*v*	*vi*	*vii*	*viii*	*ix*	*x*	*xi*	*xii*
Strength	2	3	4	5	8	10	15	20	30	30	30	30
Reach (ft.)	10	10	10	20	20	20	30	30	30	40	40	40
Epic Lift	–	–	–	–	–	–	–	–	–	×1.25	×2	×2.5

Epic Lift. This is an additional multiplier that is applied when calculating the arm's lift.

Simple Arm (Renaissance)

A simple arm uses the statistics for a heavy arm or precision arm, except it has:

- one-tenth the cost
- a -4 penalty to Dexterity
- one-third the Strength score (rounded down)

Superior Arm (Futuristic)

A superior arm uses the statistics for a heavy arm or precision arm. It performs as well as an arm of a living creature, and can be used to climb, catch or throw objects, wield a weapon or hold a shield.

A superior arm has ×10 the normal cost.

Arms as Weapons

An arm's melee attack deals average damage equal to half that indicated for a melee weapon of the same mass. The attack bonus can be determined using the arm's Strength score, or the lower of its Dexterity and the operator's Dexterity scores. The arm can only make one attack per round.

The large gripper of a heavy arm grants it the *grappling* option.

A simple arm is considered to be an improvised weapon.

Atrium

Each atrium provides an area of enclosed open space, representing auditoriums, gardens, pools or promenades.

Mass	*i*	*ii*	*iii*	*iv*	*v*	*vi*	*vii*	*viii*	*ix*	*x*	*xi*	*xii*
Cost	–	–	–	–	–	–	–	450	600	750	1,000	1,500
Capacity	–	–	–	–	–	–	–	45	60	75	100	150
Workspace	–	–	–	–	–	–	–	1	1	1	1	2

Capacity shows the number of people that can congregate in the atrium.

Ballast Tank (Industrial)

A floodable tank with a system of pumps. A ship requires a ballast tank to travel across the open ocean if it does not have a fully-laden cargo hold.

If the vehicle is also sealed, it can dive underwater. If it also has a screw propeller, it can move underwater.

Using only the ballast, the vehicle can dive and rise at 10 feet per round. If it is also moving through the water with a screw propeller, it can dive and rise at 20 feet per round. With a well-trained crew, the vehicle can "crash dive" at 40 feet per round.

Mass	*i*	*ii*	*iii*	*iv*	*v*	*vi*	*vii*	*viii*	*ix*	*x*	*xi*	*xii*
Cost	60	100	200	300	600	1,000	2,000	3,000	6,000	10,000	20,000	30,000

Berth

An area where smaller vehicles can be stored, launched and recovered. It includes assistive machinery such as davits, basic maintenance equipment, and other services for loading and unloading passengers and cargo. The given cost does not include the cost of the stored vehicles.

It takes 1 minute to launch a vehicle from a berth. While a vehicle can be stored in a cargo hold instead, it can take 10 minutes or longer to launch.

Mass	*i*	*ii*	*iii*	*iv*	*v*	*vi*	*vii*	*viii*	*ix*	*x*	*xi*	*xii*
Cost	–	–	–	–	–	30	60	100	200	300	600	1,000
Capacity (tons)	–	–	–	–	–	1	2	3	6	10	20	30
Workspace	–	–	–	–	–	1	1	1	1	1	1	2

Capacity shows the combined mass of vehicles the berth can hold. It is simplest to use their laden mass: for example, a mass *x* berth can hold one mass *iv* vehicle, or two mass *iii* vehicles, or three mass *ii* vehicles, or five mass *i* vehicles.

Alternate Sizes. A berth can be undersized.

Cargo Hold

This represents the vehicle's "carrying capacity". It might represent an actual internal cargo hold, or merely what the vehicle is capable of dragging on chains, drawing in trailers, or carrying in arms. Each hold is rated for its carrying capacity. Cost is negligible, subsumed into the cost of other components.

To carry livestock or other goods that require a special environment, the vehicle must use steerage cargo space in a quarters or seating component (for long or short journeys respectively), rather than a cargo hold.

Mass	*i*	*ii*	*iii*	*iv*	*v*	*vi*	*vii*	*viii*	*ix*	*x*	*xi*	*xii*
Capacity	200 lb	300 lb	600 lb	0.5 ton	1 ton	1.5 tons	3 tons	5 tons	10 tons	15 tons	30 tons	50 tons

Alternative Sizes. A cargo hold can be undersized.

Gasbag (Renaissance)

A gasbag provides lift by creating an envelope of gas with less density that the surrounding air. Each gasbag component provides Lift Points.

Exposed. A gasbag is an exposed component. Furthermore, a gasbag can be targeted without incurring disadvantage on the attack roll.

Speed. If the vehicle has no other means of propulsion, the vehicle will drift with a fair wind at about 0.4 mph per gasbag component. This may be adjusted by wind speed.

Mass	*i*	*ii*	*iii*	*iv*	*v*	*vi*	*vii*	*viii*	*ix*	*x*	*xi*	*xii*
Cost (Hot Air)	50	70	100	150	200	300	500	700	1,000	1,500	2,000	3K
Cost (Lifting Gas)	150	200	300	500	700	1,000	1,500	2,000	3,000	5,000	7,000	10K
Cost (Vacuum)	1,500	2,000	3,000	5,000	7,000	10K	15K	20K	30K	50K	70K	100K
Workspace (Lifting Gas)	0	0	0	0	0	1	1	1	1	1	1	2

There are three kinds of gasbag: hot air, lifting gas and vacuum.

Hot Air (Renaissance). Three hot air gasbags provides 1 point of Lift. The component includes a burner and fuel source. A typical burner lasts for 1 hour then must be refuelled, at 10-percent the cost of the gasbag components.

Lifting Gas (Industrial). Each lifting gas gasbag provides 1 point of Lift. Lifting gas is flammable, so these components are volatile. These gasbags require crew to check for leaks and release ballast. The vehicle must have one cargo hold allocated for ballast. A lifting gas gasbag lasts for 10 days then must be topped-up, at 10-percent the cost of the gasbag components.

Vacuum. Each gasbag of vacuum provides 2 points of Lift. This component is a rigid sphere of thin adamantine with the air pumped out of it (or annihilated with magic). It has an AC of 23 if targeted.

Helm

Any vehicle that is self-propelled or uses sails needs this component. It represents a pilot's seat or wheelhouse; along with transmission and control surfaces (wheel, rudder, flaps, steering, etc). On a large ship it includes navigation equipment or a maproom. A helm comes with one control mechanism that might represent, for example, a ship's wheel, or set of levers. A character must be stationed at a set of controls to perform piloting maneuvers.

A drawn vehicle does not require a helm, but does need a harness.

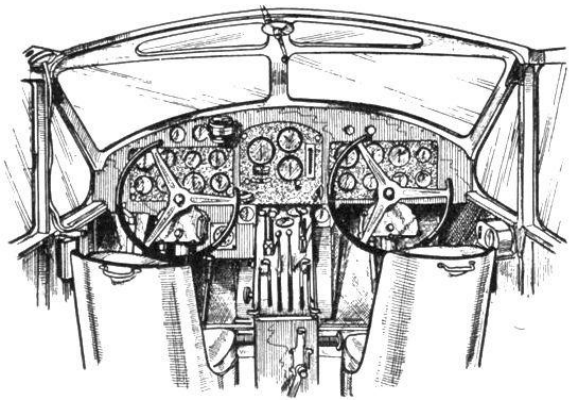
Rudimentary Helm. A helm can be given simpler mechanisms. A character at a rudimentary helm can only make *one* piloting maneuver on their turn (instead of two). This halves the cost of the component.

Small Helms. A mass *ii* or smaller helm must have an adjacent seating component with a workspace for the pilot.

Mass	*i*	*ii*	*iii*	*iv*	*v*	*vi*	*vii*	*viii*	*ix*	*x*	*xi*	*xii*
Cost	40	60	120	200	400	600	1,200	2,000	4,000	6,000	12K	20K
Extra Controls	—	—	—	—	—	—	+1	+1	+2	+2	+3	+3
Workspace	0	0	0	0	0	1	1	1	1	1	1	2

Extra Controls. You can optionally include additional controls to allow for co-pilots. The maximum number of extra controls are shown on the table. Extra controls cost 500 gp (standard) or 250 gp (rudimentary). Extra controls can also be placed in a seating component.

Alternative Sizes. A vehicle can have an undersized helm, subject to undersized penalties.



Leg

Legs give the vehicle a walking speed, allowing it to step over obstacles and move up inclines that would stop a wheeled vehicle.

Dash. Unlike other motive drivetrains, legs allow a pilot to perform a dash piloting maneuver.

Bipedal or Quadruped. Irrespective of the number of leg components, choose if it is a biped or quadruped.

Dexterity. The vehicle's Dexterity on land increases by 3 if it is a biped or by 1 if it is a quadruped.

Mass	*i*	*ii*	*iii*	*iv*	*v*	*vi*	*vii*	*viii*	*ix*	*x*	*xi*	*xii*
Cost	300	500	1,000	1,500	3,000	5,000	10K	15K	30K	50K	100K	150K
Workspace	0	0	0	0	0	1	1	1	1	1	1	2

Each table below shows the following for the indicated number of Power Points allocated to the legs.

Speed in feet.

Components. The number of leg components required. A fraction denotes an undersized component.

Legs (Modern)

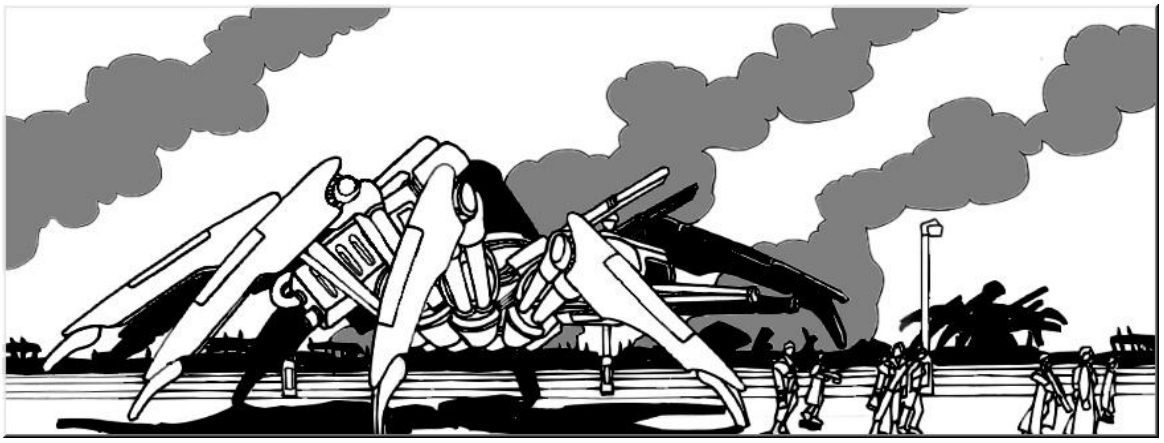
Power Points	1/2	1	2	3	4	6	8
Speed (ft.), biped	5	5	10	10	15	20	20
Speed (ft.), quadruped	5	10	15	20	25	30	35
Components mass *v* or higher	1/2	1	2	2	3	4	5
Components mass *iv*	1	1	2	2	3	4	5
Components mass *iii*	1	1	2	2	3	4	5
Components mass *ii*	2	2	3	3	4	5	6
Components mass *i*	2	3	3	4	4	5	6

Legs (Futuristic)

Power Points	1	2	3	4	6	8	9	10	12	14	16
Speed (ft.), biped	5	10	10	15	20	20	25	25	30	30	35
Speed (ft.), quadruped	10	15	20	25	30	35	35	40	45	45	50
Components mass *v* or higher	1/2	1	1	1	2	2	3	3	3	4	4
Components mass *iv*	1/2	1	1	2	2	3	3	3	4	4	5
Components mass *iii*	1	1	1	2	2	3	3	3	4	4	5
Components mass *ii*	1	1	2	2	2	3	3	3	4	4	5
Components mass *i*	2	2	2	2	3	3	4	4	4	5	5

Superior Legs

All of the vehicle's legs components can be made into superior legs for ×10 the normal cost. Superior legs have ×10 the indicated speed.



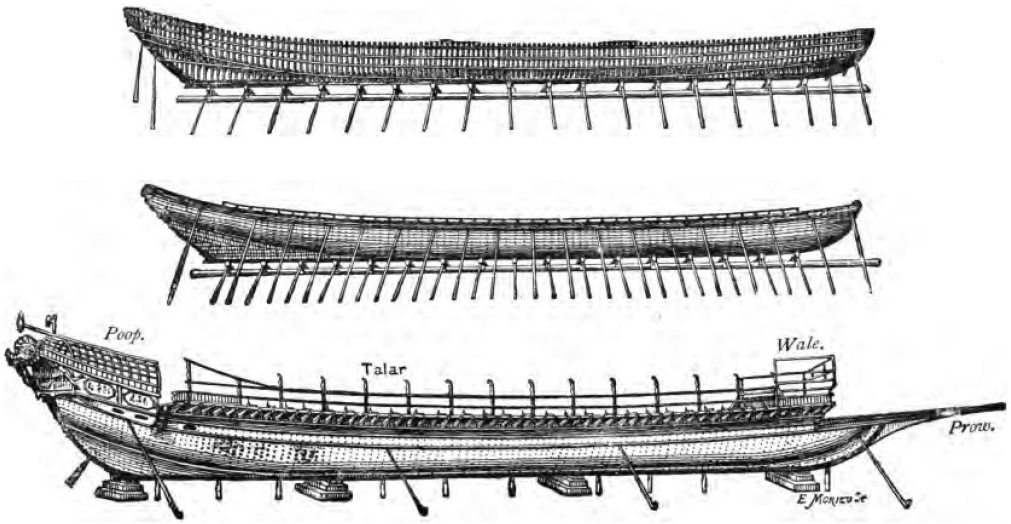
Maneuvering System

This component represents a aerodynamic, hydrodynamic or suspension mechanism. It includes mechanisms such as improved suspension, roll stabilizers, or high-agility ailerons.

Each maneuvering system increases the vehicles Dexterity by 1 in one type of environment (air, water or ground).

Component Limit. A vehicle can have 1 or 2 maneuvering systems.

Mass	*i*	*ii*	*iii*	*iv*	*v*	*vi*	*vii*	*viii*	*ix*	*x*	*xi*	*xii*
Cost	100	150	300	500	1,000	1,500	3,000	5,000	10K	15K	30K	50K
Workspace	0	0	0	0	0	1	1	1	1	1	1	2



Oars

Oars are rowed by the crew to push the vehicle across the surface of water.

Every oar component must be accompanied by a seating component, placed in an adjacent slot. Rowers typically use utilitarian seats, such that you need one seating component for every two oar components.

If the oars are used for steering instead of a rudder or tiller, use the no helm option.

Exposed. Oars are an exposed component.

Mass Limit. Oars become increasingly less effective as a ship becomes more massive. Longer oars are required, which are inefficient, and more rowers are required for each, increasing the ships beam and therefore drag. For each mass category greater than *ix*, one oar component does not contribute towards calculating speed and Dexterity.

Mass	*i*	*ii*	*iii*	*iv*	*v*	*vi*	*vii*	*viii*	*ix*	*x*	*xi*	*xii*
Cost	–	10	20	30	60	100	200	300	600	1,000	2,000	10,000
Crew	–	1	2	3	6	10	20	30	60	100	200	300

Crew. The number of rowers required. In addition, a vehicle with 8 or more rowers also requires 1 superintendant or coxswain for every 100 rowers (or part thereof).

Speed

The following table shows the following values for a given number of oar components.

Speed. The vehicle's base water speed in mph. This may further be adjusted by the vehicle's size, streamlining and drag (see Statistics).

Components	1/3	1/2	1	2	3	4	5	6	7	8
Speed	0.6	1	1.2	1.8	2.2	2.5	2.8	3.1	3.3	3.6

Paddlewheel

Literally a wheel of paddles, this component can push a vehicle across the surface of water. The vehicle might be a "sternwheeler", with the components located in the rear section; or a "sidewheeler", with the components located in the center section.

Sidewheeler or Sternwheeler. Decide if the paddlewheels are in a sidewheel or sternwheel arrangement. Sidewheelers can turn faster by varying the speed of the paddles on each side, or even counter-rotating them. However, sternwheelers have a greater maximum speed.

Dexterity. A sidewheeler's Dexterity in water increases by 2.

Mass	*i*	*ii*	*iii*	*iv*	*v*	*vi*	*vii*	*viii*	*ix*	*x*	*xi*	*xii*
Cost (Simple)	100	150	300	500	1,000	1,500	3,000	5,000	10K	15K	30K	50K
Cost (Feathered)	200	300	600	1,000	2,000	3,000	6,000	10K	20K	30K	60K	100K
Workspace	0	0	0	0	0	1	1	1	1	1	1	2

The following tables show the speed in mph for the indicated allocated Power Points. This is further adjusted by drag, streamlining and size (see Statistics.

Simple Paddlewheel

A simple paddlewheel has fixed paddles.

Power Points	1/5	1/3	1/2	1	2
Speed, Sidewheeler	3.4	4	4.6	5.8	7.3
Speed, Sternwheeler	3.8	4.5	5.1	6.5	8.2

Feathered Paddlewheel (Industrial)

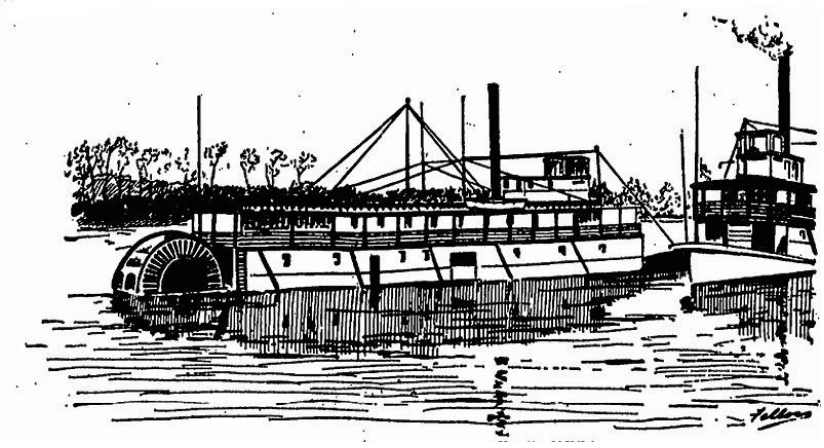
A feathered paddlewheel adjusts the angle of each paddle as it travels through the water to increases its efficiency.

Power Points	1/5	1/3	1/2	1	2
Speed, Sidewheeler	3.7	4.4	5	6.4	8.1
Speed, Sternwheeler	4.1	4.9	5.6	7.1	9

Components Required

Both types of paddlewheel require the same number of paddlewheel components. The number of components required depends on the allocated Power Points and the mass category of the paddlewheel components.

Power Points	1/5	1/3	1/2	1	2
Components mass *vi* or higher	1/2	1	1	2	4
Components mass *v*	1	1	1	2	4
Components mass *iv*	1	1	2	2	4
Components mass *iii*	2	2	2	3	4
Components mass *ii*	2	3	3	4	5
Components mass *i*	2	3	4	4	6



Power, Magical

While the form of a magical power sources varies greatly depending on the campaign, two archetypial engines are presented below: the magic engine, and the elemental engine. Magical power components do not function in an *antimagic* field.

Magic Engine

A magic engine draws on arcane crystals, divine relics, or other forms of ambient magic.

Power. A magic engine generates 4 magic Power Points for the listed cost; 2 magic Power Point for one-third the cost; or 8 magic Power Points for ×4 cost.

Mass	*i*	*ii*	*iii*	*iv*	*v*	*vi*	*vii*	*viii*	*ix*	*x*	*xi*	*xii*
Cost	100	150	300	500	1,000	1,500	3,000	5,000	10K	15K	30K	50K
Workspace	0	0	0	0	0	1	1	1	1	1	1	2

Elemental Engine

This power source uses the energy given out by one or more trapped elementals. The component requires elemental creatures with a combined CR of at least the value shown in the table. At the DMs discretion, the kind of elemental might need to match the vehicle's locomotion: an air or fire elemental for an airship; earth for a land vehicle; water for a water vessel.

If the engine is *disabled*, each elemental can make a DC 15 Strength check to escape. If the engine is *destroyed*, the elementals escape. An escaped elemental will invariably be hostile towards the crew.

Power. An elemental engine powered by a creature summoned by a *conjure elemental* or *conjure minor elementals* spell provides 12 magical Power Points. The engine operates for the duration of the spell. An engine powered by an elemental caught "live" provides 24 magical Power Points and lasts indefinitely.

Mass	*i*	*ii*	*iii*	*iv*	*v*	*vi*	*vii*	*viii*	*ix*	*x*	*xi*	*xii*
Cost	600	1,000	2,000	3,000	6,000	10K	20K	30K	60K	100K	200K	300K
CR	1/8	1/4	1/2	1	2	3	6	10	20	30	60	100
Workspace	0	0	0	0	0	1	1	1	1	1	1	2

CR. The combined CR of elementals required for an elemental engine.

Power, Muscle Engine

Muscle engines provide power for as long as creatures continuously exert themselves with the mechanism. It might be a treadwheel, hand crank or set of peddles. Later-era muscle engines have greater efficiency through chains, gears and flywheels.

Effort. A muscle engine is rated for the maximum effort that can be applied to it. Creatures can use an action to contribute their Strength score towards this effort. For each size category above Medium, double the creature's effort. For a Tiny creature, halve its effort.

Furthermore, if all the creatures in the muscle engine team exert themselves, the effort is doubled. Each creature doing so gains 1 level of exhaustion at the start of each hour.

Workspace. The creatures need space to operate, using seating components with workspaces. In addition, each creature at a helm control can use one of their piloting maneuvers to contribute towards the muscle engine.

Mass	*i*	*ii*	*iii*	*iv*	*v*	*vi*	*vii*	*viii*	*ix*	*x*	*xi*	*xii*
Cost	200	300	600	1,000	2,000	3,000	6,000	10K	20K	30K	60K	100K
Max Effort	100	150	300	500	1,000	1,500	3,000	5,000	10K	15K	30K	50K
Max Effort (Industrial)	200	300	600	1,000	2,000	3,000	6,000	10K	20K	30K	60K	100K
Max Effort (Early Modern)	600	800	1,200	2,000	4,000	6,000	12K	20K	40K	60K	120K	200K
Max Effort (Modern)	1,000	1,500	3,000	5,000	10K	15K	30K	50K	100K	150K	300K	500K

Power

Muscle Engine	Power Points at Maximum Effort
Standard	1/5
Industrial	1/3
Early Modern	1
Modern	1 1/2

Alternate Sizes. An early modern or modern muscle engine may be undersized by two steps, providing 1/3 PP (early modern) or 1/2 PP (modern).

Power, Steam Engine

Steam engines burn coal or wood to heat water in a boiler, the resultant steam drives a set of pistons or rotates a turbine. It requires air to function, and the boiler must be routinely topped up with water.

See the *Revolutionary Vehicles* supplement for a greater variety of steam engines.

Stokers. If a steam engine component consumes fuel from a cargo hold, it requires stokers. The table shows the number of stokers per 1 Power Point generated by the steam engine (so a 1/5th Power Point requires 1/5th the number of stokers).

Start Time. From a cold start, a steam engine takes time to build up the required heat in its firebox. The stokers must attend the firebox for the duration indicated in the tables below before it generates power. The indicated start time is per 1 Power Point (so a 1/5th Power Point requires 1/5th the start time).

Atmospheric Engine (Renaissance)

A low-pressure single-cylinder steam engine with a reciprocating piston.

Mass	*i*	*ii*	*iii*	*iv*	*v*	*vi*	*vii*	*viii*	*ix*	*x*	*xi*	*xii*
Cost	10	15	30	50	100	150	300	500	1,000	1,500	3,000	5,000
Start Time per 1 PP	5 mins	5 mins	5 mins	5 mins	10 mins	15 mins	30 mins	1 hr	2 hrs	4 hrs	6 hrs	10 hrs
Stokers per 1 PP	1*	1*	1*	1*	1*	1	1	2	4	6	12	20

* The stoker requires a workspace in a seating component.

Power

An atmospheric engine generates 1/5th of a Power Point. To generate this power, multiple atmospheric engine components must be added to the vehicle, as shown below. For example, a mass *i* vehicle requires 3 atmospheric engine components to generate a 1/5th Power Point (therefore 15 components to generate 1 Power Point).

If the vehicle has fewer than the indicated number of components, the engine does not generate useable power.

Mass	*i*	*ii*	*iii*	*iv*	*v*	*vi*	*vii*	*viii*	*ix*	*x*	*xi*	*xii*
Components Required for 1/5 PP	3	3	3	3	2	2	2	2	2	2	2	2

Endurance

For every 1/5th Power Point to be generated, the atmospheric engine consumes an amount of coal or wood.

Endurance (Coal). The firebox holds enough fuel for 2 hours. One cargo hold of coal consumed genreates power for 20 hours.

Endurance (Wood). The firebox holds enough fuel for 40 minutes. One cargo hold of wood consumed generates power for 6 hours.

Power, Storage

Power storage components provide Power Points for a set duration of time, then must be recharged. Power storage is self-contained and does not require air or fuel. One type of power storage, clockwork, is presented below.

Clockwork (Renaissance)

A system of mainsprings or other torsion springs.

Power and Endurance. All the clockwork components in the vehicle are either low-gear or high-gear. One low-gear clockwork component provides a 1/5th Power Point for 5 minutes. One high-gear component provides 1 Power Point for 1 minute. Each additional component increases endurance by the base duration.

Mass	*i*	*ii*	*iii*	*iv*	*v*	*vi*	*vii*	*viii*	*ix*	*x*	*xi*	*xii*
Cost	1,000	1,500	3,000	5,000	10K	15K	30K	50K	100K	150K	300K	500K
Workspace	0	0	0	0	0	1	1	1	1	1	1	2
Winding Effort	10	15	30	50	100	150	300	500	1,000	1,500	3,000	5,000

Winding Effort. The combined Strength score required to wind one clockwork mechanism in 1 hour. The mechanism can be wound in 10 minutes if six times this effort is put in.

Alternatively, a dedicated engine can wind the mechanism. This takes 2 minutes per Power Point. This can be an external engine, or a vehicle component.

Propellers (Industrial)

Propellers provide thrust in the air, granting a fly speed. The component may represent a single propeller or multiple propellers.

To achieve a flying speed, the vehicle must have fixed wings, or have 3 or more Lift points (for example from gasbags or lifting rotors).

Cost

Mass	*i*	*ii*	*iii*	*iv*	*v*	*vi*	*vii*	*viii*	*ix*	*x*	*xi*	*xii*
Cost	300	500	1,000	1,500	3K	5K	10K	15K	30K	50K	100K	150K
Cost (Modern)	1,000	1,500	3,000	5,000	10K	15K	30K	50K	100K	150K	300K	500K

Flying Speed (MPH)

The vehicle's base speed depends on the number of Power Points allocated to the propellers, as shown in the table below. This speed may be modified by the vehicle's streamlining and drag (see Statistics). In particular, most aircraft have either fixed wings or gasbags, both of which reduce flying speed through drag.

This speed can also be used as land speed if the vehicle also has wheels. For the purpose of drag, these wheels are considered non-motive. For this reason, an aircraft will usually have small wheels to taxi on the runway.

Propellers are fast – but note the structural requirement of 1 Structure Point per 5 mph.

Power Points	1/3	1/2	1	2	3	4	6	8	10	12	16	20	24	28	32	36	40	44	48
Industrial	35	43	60	86	106	123	150	174	194	213	246	275	300	325	347	370	390	408	426
Early Modern	38	47	67	95	116	134	165	190	213	233	269	300	330	356	380	404	426	447	466
Modern	45	50	72	102	126	145	178	205	230	252	290	325	356	385	410	436	460	482	504

Required Components

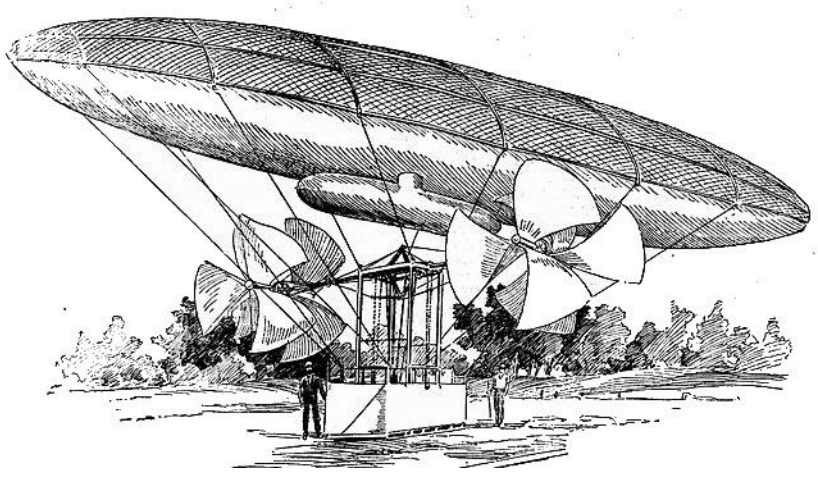
The number of component slots required by the propellers depends on the vehicle's mass category and the Power Points allocated to them. A fraction denotes an undersized component. An asterisk denotes that the propeller can be taken as a lightweight component at ×0.2 the normal propeller cost.

Industrial Propellers

Power Points	1	2	3	4	6	8	10	12	16 –24	28	32+
Components mass *iii* or more	*	*	*	*	1/3	1/2	1/2	1/2	1	1	2
Components mass *ii*	*	*	1/3	1/3	1/3	1/2	1/2	1	1	2	2
Components mass *i*	*	1/3	1/3	1/3	1/2	1/2	1	1	1	2	2

Early Modern and Modern Propellers

Power Points	4	6	8	10	12	16	20–40	44+
Components mass *iii* or more	*	*	1/3	1/3	1/3	1/2	1	2
Components mass *i* or *ii*	*	1/3	1/3	1/2	1/2	1/2	1	2



Quarters

A quarters component represents anywhere that the crew and passengers can occupy for long term voyages. It includes areas for sleeping, preparing and eating meals.

Without quarters, the crew must sleep, eat, work and store consumables on the top deck, empty cargo space, the helm, or anywhere else there is room.

The figures given assume that all the crew and passengers are Small or Medium size.

Mass	*i*	*ii*	*iii*	*iv*	*v*	*vi*	*vii*	*viii*	*ix*	*x*	*xi*	*xii*
Cost	–	–	–	100	200	300	600	1,000	2,000	3,000	6,000	10,000
Occupancy	–	–	–	1	2	3	6	10	20	30	60	100
Workspace	–	–	–	0	0	1	1	1	1	1	1	2

Occupancy

The Quarters table shows the occupancy of the component. Each of the following living areas takes up occupancy as shown in parenthesis.

Hammock or Bunk (1). Cramped sleeping space for one person.

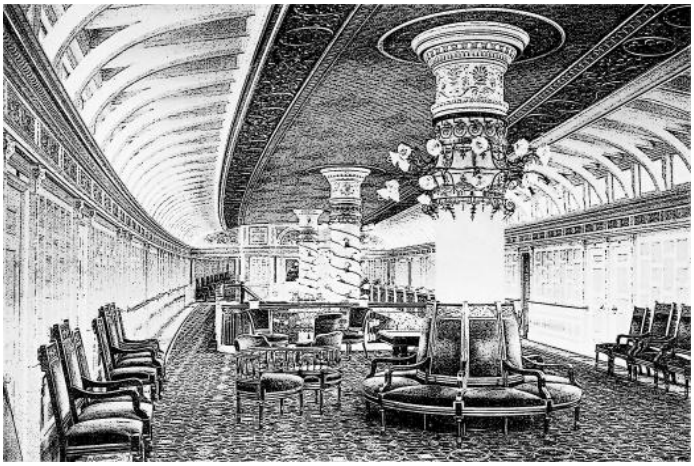
Cabin (5). A private cabin for one or two people (as described in the *Dungeon Master's Guide* p. 119). Each type of private cabin uses up more passenger slots, as shown in the parenthesis.

A cabin may have a private dining area, or many cabins may have a shared dining hall.

Luxury Cabin (10). A comfortable cabin for one or two people, suitable for a captain or important passenger, with private dining area.

Opulent Cabin (20). A superb cabin for one or two people, suitable for nobility, with private dining area.

Medium Cage (1). A secure cage, cell or stable that can hold one Small or Medium creature or prisoner; or four Tiny creatures. The capacity can be increased to a Large cage (3), Huge cage (10) and Gargantuan cage (30)



Other Rooms

A variety of other working and living areas might be added to a large vessel.

Steerage Cargo (2). Capacity: 1 ton (2,000 lbs). While normally used for cargo, this space can be used to transport two passengers. On a long journey, living conditions can be terrible: there is little room to move, food is miserable, disease is common. Such accomodations might be used to transport slaves, refugees, or desparate travellers paying 1 cp per day.

Workshop (20). Workspace, tools and supplies for one of the following professions: alchemy, brewing, carpenter, cobbler, cooking, glassblowing, leatherworking, masonry, potter, smith, woodcarver. Each workshop requires one or two artisans.

Light Workshop (10). Workspace, tools and supplies for one of the following professions: calligraphy, cartographer, jewelry, painting, tinkering, sewing, weaver. Each workshop requires one or two artisans.

Galley (10). Note that quarters already include a galley area. A separate galley can be used for vehicles that do not have cabins or bunkrooms (for example, a dining car on a train). It includes kitchen furnishings, food storage and dining table for 8 people.

Chamber (5). A catch-all room with an occupancy of 5 people. It could represent a saloon, meeting hall, or hot tub.

Sails

A sail component catches the wind and gives the vehicle a speed on water. The component inculdes masts, rigging and capstans. Multiple sail components represent one large sail or many smaller sails.

Exposed. Sails are exposed components.

Crew. The table below shows the minimum number of sailors required to operate the rigging for the indicated number of sail components. A ship usually carries multiple sailing teams: see Preparing the Journey.

Moving. A ship will automatically move (or acclerate / decelerate) if the sail components are crewed. A character at a helm cannot take a piloting maneuver to move the ship (or accelerate / decelerate) via sails. For this reason, many sailing vessels will use a rudimentary helm for turning maneuvers only.

Mass	*i*	*ii*	*iii*	*iv*	*v*	*vi*	*vii*	*viii*	*ix*	*x*	*xi*	*xii*
Cost (Square Rig)	10	15	30	50	100	150	300	500	1,000	1,500	3,000	5,000
Cost (Lateen Rig)	10	15	30	50	100	150	300	500	1,000	1,500	3,000	5,000
Cost (Full Rig)	20	30	60	100	200	300	600	1,000	2,000	3,000	6,000	10,000
Crew (1 Sail)	1	1	1	1	1	2	3	3	5	6	8	10
Crew (2 Sails)	1	1	1	1	2	3	4	5	7	8	12	15
Crew (3 Sails)	1	1	1	2	3	3	4	6	8	10	14	20

Choose a type of rigging for all the sails: square, lateen or a full rig. Each table below shows the following information.

Components. The Speed and Dexterity tables show the vehicle's speed for a given number of sail components.

Speed, maximum. The ship's base speed in mph in a fair wind coming 45-degrees from behind ("close-hauled"). Sail speed may further be adjusted by the vehicle's size bonus and wind speed (see Statistics).

Speed, reaching. The speed of the ship when the wind is coming in 90-degrees to the side.

Speed, beating downward. This is the ship's overall travel speed when moving into the wind. A ship cannot sail directly into the wind, but it can "beat downward" by tacking along a zig-zag path.

Square Rig

A simple sail set perpendicular (square) to the ship's keel.

Crew. Square rigs are easier to handle than lateen or full rigs. Use the crew requirements for the mass category 2 steps lighter than normal.

Components	1	2	3
Speed, maximum	5.3	6.7	7.7
Speed, reaching	2.6	3.3	3.8
Speed, beating windward	0.5	0.6	0.7
Dexterity	+0	+1	+1

Full Rig (Rennaissance)

A full rig combines many square, triangular and outrigger sails.

Components	1	2	3
Speed, maximum	5.7	7.2	8.3
Speed, reaching	4.6	5.8	6.6
Speed, beating windward	1.1	1.4	1.6
Dexterity	+1	+2	+3

Lateen Rig

Lateen sails are triangular and mounted at an angle so that the vehicle can tack against the wind. They form maneuverable rigs such as the fore-and-aft rig.

Speed, Following. Lateen sails are less effective when the wind is directly behind. In such a case, use the "following" speed.

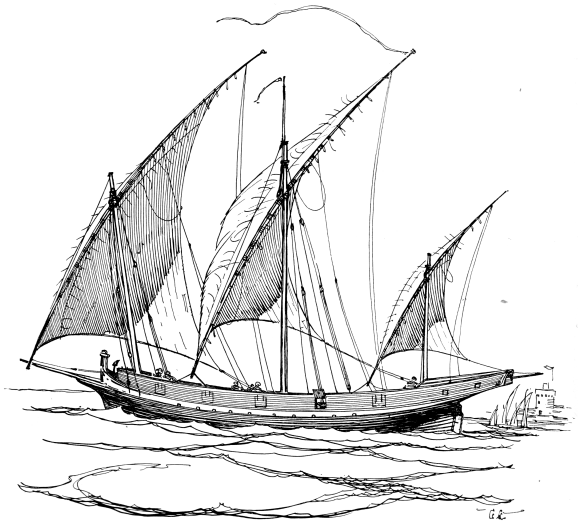
Components	1	2	3
Speed, maximum	5.3	6.7	7.7
Speed, following	4.2	5.3	6.1
Speed, reaching	4.8	6	6.9
Speed, beating windward	1.6	2	2.3
Dexterity	+1	+2	+3

Sky Rig

Any of the above rigs can be configured into a sky rig. If the vehicle has more than 3 Lift points, this grants the vehicle a flying speed.

Sky rigs are less effective on water, granting half the normal water speed.

Cost: ×2



Screw Propeller

A screw propeller pushes a vehicle through water. If the vehicle has facing, screw propellers must be located in the rear section. Compared to a paddlewheel, screw propellers require a greater draft, fare better in rough seas, and allow a vehicle to move underwater if it is sealed.

Mass	*i*	*ii*	*iii*	*iv*	*v*	*vi*	*vii*	*viii*	*ix*	*x*	*xi*	*xii*
Cost	600	1,000	2,000	3,000	6,000	10K	20K	30K	60K	100K	200K	300K
Workspace	0	0	0	0	0	1	1	1	1	1	1	2

Crew. This shows how many engineers need to work within the component to operate the machinery and provide maintenance.

Each table below shows the following values for the indicated number of Power Points allocated to the screw propellers.

Speed. The vehicle's water speed. This value is adjusted by the vehicle's size, streamling and drag (see Statistics).

Components. The number of screw propeller components required for the indicated mass category. A fraction denotes an undersized component. An asterisk denotes that the screw propeller can be taken as a lightweight component at ×0.2 the normal screw propeller cost.

Screw Propeller (Industrial)

A screw propeller advances the spiral oar by improving the hydronamics and rudder placement, and casting the blades in bronze or iron.

Power Points	1/5	1/3	1/2	1	2	3	4	5	6
Speed (mph)	4.5	5.5	6.5	8	10	11	12	13	14
Components mass *v* or higher	1/3	1/3	1/2	1	2	2	3	4	4
Components mass *iv*	1/3	1/2	1	1	2	2	3	4	4
Components mass *iii*	1/2	1	1	1	2	3	3	4	4
Components mass *ii*	1	1	1	2	2	3	4	4	–
Components mass *i*	1	1	2	2	3	3	4	–	–

Screw Propeller (Early Modern)

An early modern screw propeller represents further improvements in materials and hydrodynamics.

Power Points	1/5	1/3	1/2	1	2	3	4	5	6	7	8	10	12
Speed (mph)	5.5	6.5	7	9	11	13	14	15	16	17	18	20	21
Components mass *vi* or higher	*	*	1/3	1/2	1	1	2	2	2	3	3	4	4
Components mass *iii*, *iv* or *v*	*	1/3	1/3	1/2	1	1	2	2	2	3	3	4	4
Components mass *ii*	1/3	1/2	1/2	1	1	2	2	2	3	3	3	4	4
Components mass *i*	1/3	1	1	1	1	2	2	2	3	3	3	4	–

Screw Propeller (Modern)

An modern screw propeller uses lightweight alloys and benefits from computer-aided design.

Power Points	3	6	12	15	18	21	24	27	30	36	42	48	54	60
Speed (mph)	12	15	19	21	22	23	24	25	26	28	29	30	32	33
Components any mass	*	1/2	1	1	2	2	2	2	2	3	3	3	4	4

Structure

A structure component provides two benefits: it grants the vehicle an Armor Class higher than the base 11; and it provides extra hit points. These extra hit points can be used to meet a vehicle's structural requirements.

Choose a structure material for the component: wood, stone, iron, steel, mithral or adamantine.

Wood is a cheap, abundant material and is easy to work. However, wood is combustable and the DM may adjudicate that the vehicle continues to burn after taking fire damage.

Stone is also abundant, but harder to work with: stone is not malleable and cracks easily under tensile strain. Stone structure takes the form of ashlar blocks (for walls) or concrete (for moulded hulls).

Iron and **steel** are malleable and strong but only available to those able to mine and smelt iron on an large scale.

Mithral and **adamantine** are near-impenetrable magical alloys, available only in limited amounts. They are usually used in thin sheets to reduce cost (see Undersized Structure Options, below).

Rarity. The cost of adamantine, darkwood, glassteel, mithral or soarwood structure contributes towards the vehicle's rarity.

Armor Class and Structure Points

Each structure component gives the slot it is in an Armor Class. See the Armor Class in the Statistics chapter to calculate the vehicle's overall AC.

Each structure component also grants Structure Points. These are used to fulfil various structural requirements.

Structure	AC	Structure Points
Wood	15	6
Stone	17	3
Iron	19	18
Steel	19	30
Mithral	21	60
Adamantine	23	90

Structure Cost

Mass	*i*	*ii*	*iii*	*iv*	*v*	*vi*	*vii*	*viii*	*ix*	*x*	*xi*	*xii*
Wood	6	10	20	30	60	100	200	300	600	1,000	2,000	3,000
Stone	10	15	30	50	100	150	300	500	1,000	1,500	3,000	5,000
Iron	40	60	120	200	400	600	1,200	2,000	4,000	6,000	12K	20K
Steel	600	1,000	2,000	3,000	6,000	10K	20K	30K	60K	100K	200K	300K
Mithral	2,000	3,000	6,000	10K	20K	30K	60K	100K	200K	300K	600K	1M
Adamantine	6,000	10K	20K	30K	60K	100K	200K	300K	600K	1M	2M	3M

Extra Hit Points

Structure components increase the vehicle's hit points. Total the vehicle's Structure Points and multiply the result by the value indicated in the table below. Round the result to the nearest 5 hp and add the result to the vehicle's base hit points.

Mass	*i*	*ii*	*iii*	*iv*	*v*	*vi*	*vii*	*viii*	*ix*	*x*	*xi*	*xii*
Multiplier	×3	×3.5	×4.5	×5.5	×7	×8	×10	×11.5	×14.5	×16.5	×21	×25

For example, a mass *viii* vehicle with one iron and two wooden structure components has 36 Structure Points. Therefore it has 95 extra hit points (calculated 36 × 11.5).

Undersized Structure Options

A structure component can be undersized, reducing its extra hit points and the slot's AC.

AC. A slot's AC is the average AC of the structure components within it, rounded down. Use the vehicle's base AC for each non-structure component.

For example, a slot containing a single 2-step undersized mithril structure has an AC of (19 + 11 + 11) ÷ 3 = 14

Structure Points are divided by the component's undersized penalty (rounded down). For example, the two-step undersized mithril structure grants 60 ÷ 3 = 20 Structure Points.

Armor Plating. Optionally, you can have a slot retain a full AC. Choose an undersized structure component within the slot. The slot has that structure's full AC. The component's Structure Points are again divided by its undersized penalty, rounded down.

For example, a slot with 2-step undersized mithril structure plating has an AC of 21, and the component grants 6 Structure Points (instead of 20).

You cannot use this option if it would reduce the component's Structure Points to 0.

Structure Variants

Adamantine: Hardened Adamantine. A critical hit against the vehicle is treated as a normal hit if it strikes the vehicle in a facing that contains hardened adamantine structure. *Cost*: ×2

Composite Structure can be created by averaging the cost, AC and extra hit points of different materials. For example, iron-reinforced wood (two parts wood, one part iron) would have an AC of 16 and grant 10 Structure Points, costing 18 gp at mass *i*.

Steel: Glassteel. This material is magically transformed glass. It has the strength of steel but the transparency of glass. *Cost*: ×2

Wood: Darkwood is a magical material as strong as wood at half the weight. Each darkwood component grants 12 Structure Points (instead of 6). *Cost*: ×2

Wood: Soarwood is a rare but highly bouyant magical material. Each soarwood component provides 1 point of Lift. The Lift of undersized soarwood is divided by its undersized penalty. *Cost*: ×10

Structure, Unusual

The following materials are not as cost-effective as the "standard" structure materials, but are chosen for their availability or prestige value.

Mass	*i*	*ii*	*iii*	*iv*	*v*	*vi*	*vii*	*viii*	*ix*	*x*	*xi*	*xii*
Copper Alloy	120	200	400	600	1,200	2,000	4,000	6,000	12K	20K	30K	60K
Gold	10K	15K	30K	50K	100K	150K	300K	500K	1,000K	1,500K	3M	5M
Lead	40	60	120	200	400	600	1,200	2,000	4,000	6,000	12K	20K
Platinum	100K	150K	300K	500K	1,000K	1,500K	3M	5M	10M	15M	30M	50M
Silver	1,000	1,500	3,000	5,000	10K	15K	30K	50K	100K	150K	300K	500K

Armor Class and Structure Points

Structure	AC	Structure Points
Copper Alloy	18	24
Gold	16	12
Lead	14	3
Platinum	17	15
Silver	16	15

Copper Alloy. Copper easier to smelt than iron, but its alloys – bronze and brass – are dependent on the availability uncommon metals (tin or zinc).

Gold, platinum and silver are often used in prestige vessels simply for the sake of their expense and decorative value. Gold, platinum or silver structure components grant acid resistance to the body section they are located in.

Lead is sometimes used in sheets to protect wooden vehicles from fire, where iron is not available. Lead can also be used to shield the contents of a vehicle from some divination effects such as *detect magic* or a *ring of x-ray vision*.

Seating

Seating provides occupancy for crew or passengers not already given space in another component. You do not need seating for people already occupying quarters, workspaces, sails or helms. If the vehicle does not have quarters, you do need workspace seating for crew in artillery weapon, siege weapon, oar, muscle power components, and for stokers in small steam engines.

Unlike quarters, seating does not include sleeping or galley facilities. However, it might include a small wash area or latrine. Journeys longer than 1 day are possible but uncomfortable, and open to the environment (think of Viking longships). Supplies must be stored in a cargo hold.

Mass	*i*	*ii*	*iii*	*iv*	*v*	*vi*	*vii*	*viii*	*ix*	*x*	*xi*	*xii*
Cost	–	10	20	30	60	100	200	300	600	1,000	2,000	3,000
Occupancy	–	1	2	3	6	10	20	30	60	100	200	300

You can mix different qualities of seating within the component. A seat's occupancy is shown in parenthesis, as follows:

Utilitarian (1). An uncomfortable, cramped space. This might be a simple bench for crew working oars or a deck for soldiers to stand on.

Workspace (1). A workspace for crew for muscle-powered engines, stokers of a small steam engine, artillery weapons and siege weapons. A component of workspaces may be called a "crew deck", "gun deck" or suchlike.

Standard (2). A comfortable seat suitable for paying passengers.

Bed (4). Pallet, stretcher or cot for one person.

Luxury Seat (4). Luxury seating is especially roomy and comfortable, suitable for VIPs or captains.

Opulent Seating (8). Opulent seating, suitable for a noble or commander.

Steerage Cargo (8). Capacity of 1 ton, which can be used to carry livestock.

Extra Controls (1). A set of extra controls costs an additional 500 gp (standard) or 250 gp (rudimentary), per the helm component.

Vault

A vault, like a cargo hold, has a cargo capacity. Its contents are protected by thick walls and locked doors. Use the AC and Hit Points table and Extra Hit Points table for the structure component to determine the vault's properties. A vault has one-third the cost of an structure component: examples are given below.

The cost of one or more locks is added to the cost of the vault. Locks cost 10 gp, 100 gp or 1,000 gp (for a lockpicking DC of 15, 20 or 25 respectfully).

If a vault has an AC equal to or greater than the AC of the vehicle section it is in, none of its contents are lost if the component is *disabled*. If the component is destroyed, half the cargo is lost.

As a magic augmentation, an individual vault and its contents can be protected with *nondetection* (augmentation cost ×0.5).

Mass	*i*	*ii*	*iii*	*iv*	*v*	*vi*	*vii*	*viii*	*ix*	*x*	*xi*	*xii*
Capacity	100 lb	150 lb	300 lb	500 lb	0.5 tons	0.75 tons	1.5 tons	2.5 tons	5 tons	7.5 tons	15 tons	25 tons
Cost (Wood)	2	3	6	10	20	30	60	100	200	300	600	1,000
Cost (Stone)	3	5	10	15	30	50	100	150	300	500	1,000	1,500
Cost (Iron)	12	20	40	60	120	200	400	600	1,200	2,000	4,000	6,000
Cost (Steel)	200	300	600	1,000	2,000	3,000	6,000	10K	20K	30K	60K	100K
Cost (Adamantine)	2,000	3,000	6,000	10K	20K	30K	60K	100K	200K	300K	600K	1M

Alternative Sizes. A vault can be undersized.

Weapons, Artillery

A battery of artillery weapons. A weapon component may hold one category of weapon: Medium, Large or Huge. The component can entirely face one arc, or split its weapons between two arcs (for example, cannons along the left and right broadsides of a ship).

The component also includes storage space for 60 pieces of ammunition per weapon.

The statistics for each weapon can be found in the *Dungeon Master's Guide*. Additional types of siege engine can be found in Appendix A. For more detailed rules, see *VCK Supplement 4: Artillery*.

Ballista

Mass	*i*	*ii*	*iii*	*iv*	*v*	*vi*	*vii*	*viii*	*ix*	*x*	*xi*	*xii*
Cost	–	–	–	–	–	1,250	2,500	3,750	7,500	12,500	25,000	37,500
Crew	–	–	–	–	–	2	4	6	12	20	40	60
Ballistae	–	–	–	–	–	1	2	3	6	10	20	30

Mangonel

Mass	*i*	*ii*	*iii*	*iv*	*v*	*vi*	*vii*	*viii*	*ix*	*x*	*xi*	*xii*
Cost	–	–	–	–	–	–	2,000	2,000	6,000	10K	20K	30K
Crew	–	–	–	–	–	–	3	3	8	15	30	40
Mangonels	–	–	–	–	–	–	1	1*	3	5	10	15

Cannon

Mass	*i*	*ii*	*iii*	*iv*	*v*	*vi*	*vii*	*viii*	*ix*	*x*	*xi*	*xii*
Cost	–	–	–	–	–	–	–	2,250	4,500	7,500	15K	22.5K
Crew	–	–	–	–	–	–	–	10	20	30	60	100
Cannons	–	–	–	–	–	–	–	1	2	3	6	10

Trebuchet

Mass	*i*	*ii*	*iii*	*iv*	*v*	*vi*	*vii*	*viii*	*ix*	*x*	*xi*	*xii*
Cost	–	–	–	–	–	–	–	–	–	–	10K	10K
Crew	–	–	–	–	–	–	–	–	–	–	35	35
Trebuchets	–	–	–	–	–	–	–	–	–	–	1	1*

Crew shows the crew required to operate the weapons. If the vehicle does not already provide occupancy for the crew, add a seating component with enough workspaces.

Alternative Sizes. An artillery weapon component can be undersized. It can be oversized for the purpose of mounting a weapon of a size not normally available.

Rate of Fire

The number of rounds it takes to prepare, load, aim and fire all the weapons in the component varies depending on the type of weapon:

- **Ballista.** 6 rounds
- **Mangonel.** 10 rounds (or 1 minute)
- **Cannon.** 10 rounds (or 1 minute)
- **Trebuchet.** 35 rounds (or 4 minutes)

Note that that this is an intentional deviation from the rates of fire implied in the *Dungeon Master's Guide*.

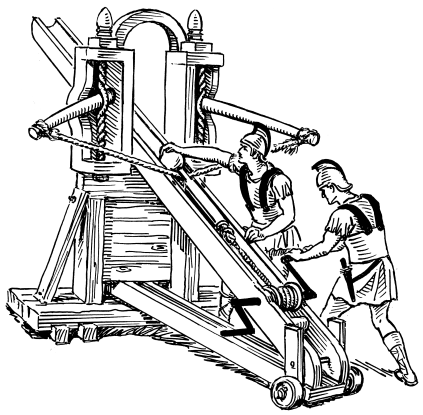
Initiative

Once all the weapons in the component are aimed, they attack on the initiative count of the component's weapon master (included in the component's crew requirement).

Ammunition

The component holds a maximum number of pieces of ammunition per weapon as follows: 20 (cannon), 60 (ballista), 200 (mangonel), 350 (trebuchet).

Where a weapon quantity entry in the artillery table shows "1*", the component's ammunition maximum is increased by 50-percent.



Weapon, Melee

This component represents one or more mechanical melee weapon. It might take the form of an oversized martial weapon swung or thrust on a boom; or it might resemble an animal's bite, pincer or lashing tail. There are two kinds of melee weapon: siege weapon and power weapon.

Unless otherwise speficied, a melee weapon can make only one attack per round, and is fixed to only attack target in one arc.

Siege Weapon

A siege weapon must be prepared and directed by crew: a battering ram, for example.

Attack Bonus. The weapon's attack bonus is +4. If it can only attack objects, its attack bonus is +8.

Mass	*i*	*ii*	*iii*	*iv*	*v*	*vi*	*vii*	*viii*	*ix*	*x*	*xi*	*xii*
Cost	40	60	120	200	400	600	1,200	2K	4K	6K	12K	20K
Crew	1	1	2	4	8	12	24	40	80	120	240	400

Crew. The number of crew required to prepare and attack with the weapon. If the vehicle does not already provide occupancy for the weapon crew, make a "weapon deck" by adding seating component with the appropriate number of workspaces.

Power Weapon (Modern)

A power weapon is driven by auxillary power included in the component. If you are at a set of controls, you can use a piloting maneuver *activate* the power weapon and make an attack with it.

Attack Bonus. The weapon's attack bonus is +5. If it can only attack objects, its attack bonus is +10. A power weapon activated from an undersized helm has an attack penalty equal to the helm's undersized penalty.

Mass	*i*	*ii*	*iii*	*iv*	*v*	*vi*	*vii*	*viii*	*ix*	*x*	*xi*	*xii*
Cost (Powered)	400	600	1,200	2K	4K	6K	12K	20K	40K	60K	120K	200K
Workspace	0	0	0	0	0	1	1	1	1	1	1	2

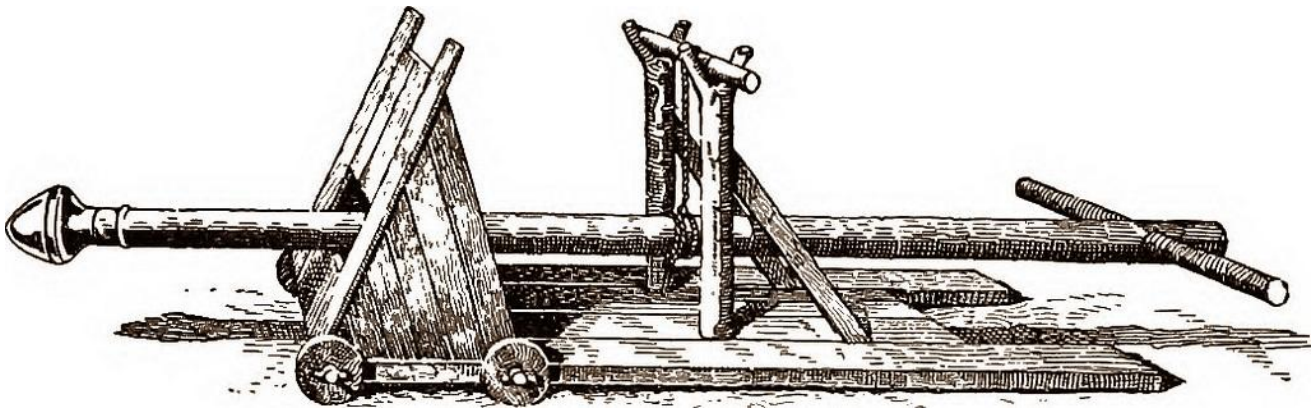
Damage and Range

The following table shows the maximum average damage dealt by the weapon, and its reach.

Use the maximum average damage to determine the damage notation of the weapon. For example, a mass *iii* weapon could represent a large axe that deals 2d12 damage (13 average damage). Choose the damage type for the weapon: bludgeoning, piercing or slashing.

Mass	*i*	*ii*	*iii*	*iv*	*v*	*vi*	*vii*	*viii*	*ix*	*x*	*xi*	*xii*
Damage	10	12	15	17	22	25	31	37	47	54	67	80
Reach	5 ft	5 ft	5 ft	10 ft	10 ft	10 ft	15 ft	15 ft	15 ft	20 ft	20 ft	20 ft

Alternative Sizes. A melee weapon can be undersized or oversized.



Melee Weapon Options

A melee weapon can have any number of the following options. Each option added decreases the melee weapon's damage by 2 columns to the left on the Damage and Range table.

Each option can only be taken once.

Accurate. The weapon's attack bonus is increased by 1.

Flexible. The weapon must have Long Reach. It can attack targets in any arc.

Grappling. A target hit by the weapon is also grappled. The maximum size of target that can be grappled is shown in table below. The escape DC is 12, or 15 for a power weapon. While the weapon is grappling a target, it cannot make further attacks.

At your option, a grappling weapon can be non-lethal, dealing no damage. A non-lethal weapon has half the normal cost.

Knockdown. A target hit by the weapon must make a Strength check or be knocked prone. The DC is 12, or 15 for a power weapon.

Long Reach. The weapon's reach is increased, as shown in the table below.

Restraining. If the weapon also has the *grappling* option (see above), it also restrains a target it grapples.

Silvered. The weapon can be silvered per *Player's Handbook* (p. 148).

Swallowing. If the target of a swallowing weapon is hit, they must make a Dexterity saving throw. The DC is 12, or 15 for a power weapon. On a failed save the target is swallowed by the vehicle and transferred to a cage. The maximum size of target that can be swallowed is shown in table below.

At your option, a swallowing weapon can be non-lethal, dealing no damage. A non-lethal weapon has half the normal cost.

Power Weapon Options

The following options can only be taken by a power weapon.

Demolishing. The weapon deals double damage against objects.

Electrical. Choose any amount of the weapon's average damage to be average lightning damage instead.

Rapid. You can use a second piloting maneuver to attack with the weapon again.

Thermal. Choose any amount of the weapon's average damage to be average fire damage instead.

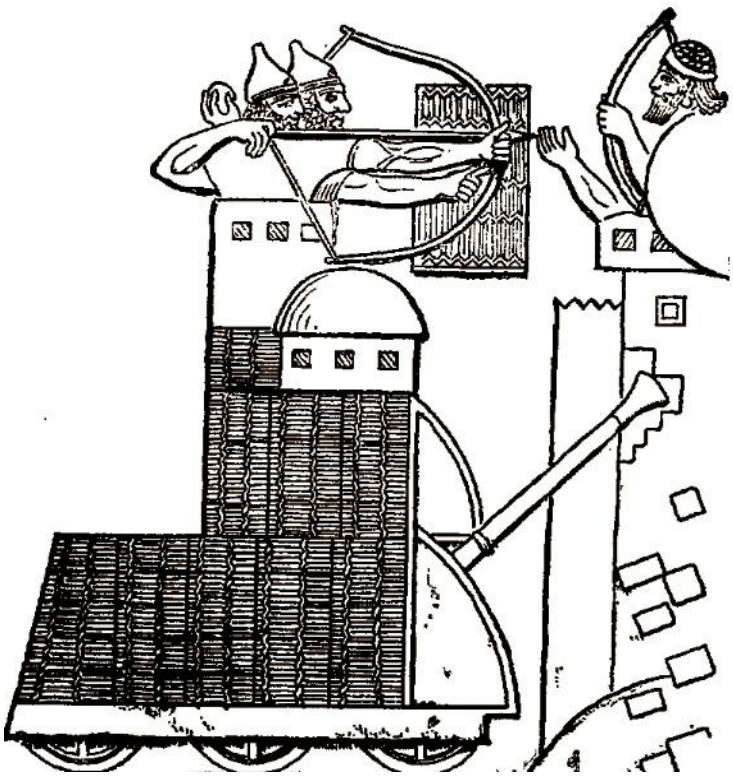
Weapon Options

Mass	*i*	*ii*	*iii*	*iv*	*v*	*vi*	*vii*	*viii*	*ix*	*x*	*xi*	*xii*
Long Reach	10 ft	10 ft	10 ft	20 ft	20 ft	20 ft	30 ft	30 ft	30 ft	40 ft	40 ft	40 ft
Grapple/Swallow Size	S	S	S	M	M	M	L	L	L	H	H	H

Smaller Damage

The damage values from *VCK: Tiny and Titanic* are included here in the case of a weapon option shifting the damage to a category lower than mass *i*.

Mass	*Si*	*Sii*	*Siii*	*Siv*
Damage	4.5	5.5	6.5	8



Wheels

Wheels allow the vehicle to move on flat ground. They might be unpowered, or driven by a wheel drivetrain.

Mass	*i*	*ii*	*iii*	*iv*	*v*	*vi*	*vii*	*viii*	*ix*	*x*	*xi*	*xii*
Cost (Standard)	6	10	20	30	60	100	200	300	600	1,000	2,000	3,000
Cost (Dreadnaught)	10	15	30	50	100	150	300	500	1,000	1,500	3,000	5,000
Cost (Rail)	20	30	60	100	200	300	600	1,000	2,000	3,000	6,000	10,000
Cost (Off-Road)	20	30	60	100	200	300	600	1,000	2,000	3,000	6,000	10,000

Standard Wheels

Use one wheel component to represent a full set of standard wheels. These may resemble cart wheels: a wooden spoked wheel with metal or leather bands around the rim; or more crudely a solid horizontal slice of a tree trunk. Towards the end of the industrial era onwards, standard wheels use metal structures and pneumatic rubber tyres.

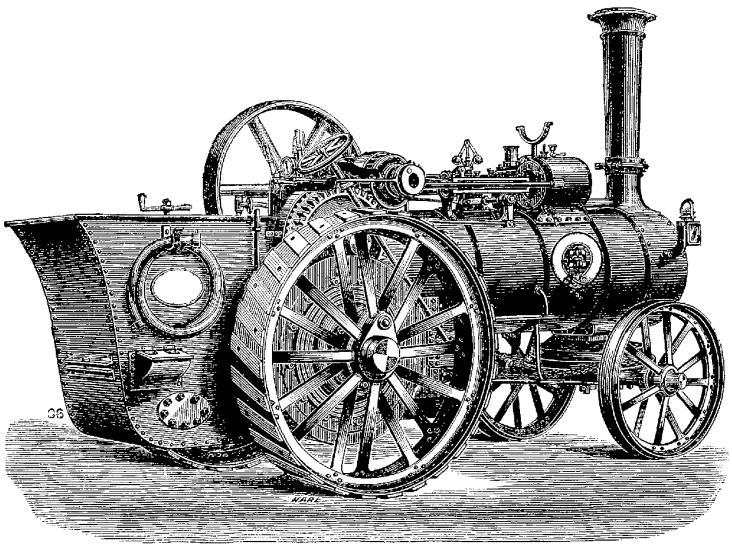
Off-road speed. A vehicle with standard wheels moves at 1/5 its normal speed off-road. It will become stuck in difficult terrain caused by mud, snow or sand.

Dexterity. The vehicle's Dexterity on land increases by 1 if it also has a wheel drivetrain.

Dreadnaught Wheels (Industrial)

A vehicle with dreadnaught wheels has especially large wheels fitted with articulated rails or broad boards to reduce ground pressure.

Road and off-road speed. With dreadnaught wheels, the vehicle's road speed and off-road speed is 1/2 its normal speed. If the vehicle has 2 dreadnaught wheel components and a low-gear drivetrain, it ignores difficult terrain caused by mud, snow or sand.



Rail Wheels (Industrial)

A vehicle must have rail wheels to move on rail.

Rail wheels increase traction with the rail through their weight. The component might take the form of large-circumference wheels, like those on early locomotives, or an arrangement of smaller wheels like a modern bogie.

Rail speed. If the vehicle has 2 rail wheel components driven by at least one wheel drivetrain, it has ×2 the normal speed while on rails.

Off-rail movement. If the vehicle somehow moves on road, the pilot must make a DC 15 maneuver check or become out-of-control. The vehicle crashes it it moves off-road.

Towing. If the vehicle has 2 rail wheel components, it can safely tow twice the normal number of loads. If the vehicle has a low-gear drivetrain, it can safely tow four times the normal number of loads. Towed vehicles must have the same number of rail wheel components as the lead vehicle.

Off-Road Wheels (Early modern)

Off-road wheels have large rubber tyres with improved grip pads.

Dexterity. The vehicle's Dexterity on land increases by 1 if it also has a wheel drivetrain.

Off-road speed. The vehicle's off-road speed improves depending on the number of off-road wheel components it has: 1/4 speed (1 component); 1/3 speed (2 components); 1/2 speed (4 components); full speed (8 components).

If the vehicle has a low-gear drivetrain, it ignores difficult terrain caused by mud, snow or sand.

Wheel Drivetrain (Renaissance)

The transmission and steering mechanism for a set of wheels. The vehicle must also have one or more wheel components or small wheels.

Component Limit. A vehicle can have one or two drivetrains.

Road or Rail. The vehicle must be on a road or rail to acheive its speed. Off-road, the vehicle has one-fifth this speed, and treats difficult terrain as an obstacle.

Mass	*i*	*ii*	*iii*	*iv*	*v*	*vi*	*vii*	*viii*	*ix*	*x*	*xi*	*xii*
Cost	100	150	300	500	1,000	1,500	3,000	5,000	10K	15K	30K	50K
Cost (Early Modern)	200	300	600	1,000	2,000	3,000	6,000	10K	20K	30K	60K	100K
Workspace	0	0	0	0	0	1	1	1	1	1	1	2

Each table below shows the following valuies for a given number of allocated Power Points:

Speed. The vehicle's maximum speed.

Components. The number of wheel drivetrain components required. An asterisk denotes that a lightweight component can be taken at ×0.2 the normal wheel drivetrain cost.

Wheel Drivetrain (Renaissance)

An early drivetrains uses simple axels and gears. The lack of suspension makes for a bumpy ride.

Power Points	1/5	1/3	1/2	1	2	3	4
Speed (mph)	9	11	14	20	28	34	40
Components mass *vi* or higher	1/3	1/2	1	1	2	3	4
Components mass *v*	1/2	1/2	1	2	3	4	5
Components mass *iii* or *iv*	1	1	1	2	3	4	5
Components mass *ii*	1	2	2	2	3	4	5
Components mass *i*	1	2	2	3	4	5	6

Wheel Drivetrain (Industrial)

The introduction of differentials and flywheels, with improvements in materials, produces a more efficient drivetrain.

Power Points	1/5	1/3	1/2	1	2	3	4	5	6	7	8
Speed (mph)	13	17	20	30	42	52	60	67	73	80	85
Components mass *v* or higher	*	1/3	1/3	1	1	2	2	3	3	4	4
Components mass *iv*	1/3	1/3	1/2	1	2	2	3	3	4	4	5
Components mass *iii*	1/2	1/2	1	1	2	2	3	3	4	4	5
Components mass *ii*	1	1	1	1	2	2	3	3	4	4	5
Components mass *i*	1/2	1	1	2	2	3	3	4	4	5	5

Wheel Drivetrain (Early Modern)

A wheel drivetrain that improves on materials and transmission to achieve great land speeds.

Power Points	1/5	1/3	1/2	1	2	3	4	5	6	7	8	10	12	14	16
Speed (mph)	17	23	28	40	56	70	80	90	97	105	113	126	138	150	160
Components mass *iv* or higher	*	*	1/3	1/3	1	1	1	2	2	2	2	3	3	4	4
Components mass *iii*	*	1/3	1/3	1/2	1	1	2	2	2	2	3	3	4	4	5
Components mass *ii*	1/3	1/2	1/2	1	1	1	2	2	2	2	3	3	4	4	5
Components mass *i*	1/3	1/2	1	1	1	2	2	2	2	3	3	3	4	4	5

Wing, Rotary (Industrial)

Rotating set of blade-like wings that creates a downward force, and can be tilted to provide motion in any direction.

Mass	*i*	*ii*	*iii*	*iv*	*v*	*vi*	*vii*	*viii*	*ix*	*x*	*xi*	*xii*
Cost	1,000	1,500	3,000	5,000	10K	15K	30K	50K	100K	150K	300K	500K
Workspace	0	0	0	0	0	1	1	1	1	1	1	2

Each table below shows the following values:

Lift. Rotary wings generate a number of Lift Points that depends on the total Power Points allocated to them, as shown in the tables below.

Speed. If the vehicle has 3 or more Lift Points, it has a fly (hover) speed. The total number of allocated Power Points determines the vehicle's base flying speed, as shown in the tables below. This value is adjusted by the vehicle's size, and possibly drag from other components (see Statistics).

Components. This is the number of rotary wing components required. An asterisk denotes that a lightweight component can be taken at ×0.2 the normal rotary wing cost.

Lifting Rotor (Industrial)

A lifting rotor lacks the articulated swashplate of true rotary wings, so only provides lift. However, the components may represent a quadcopter arrangement, with four rotors arranged in an "X". This allows a pilot to fly by adjusting the power to each rotor. This is greater work for the pilot: two piloting maneuvers must be used to take the *ascend*, *descend*, *turn* or *accelerate/decelerate* maneuvers.

Power Points	4	6	8	10	12	14	16
Lift	1	2	2.5	3	4	4.5	5
Flying Speed (mph)	15	18	21	23	25	27	28
Components mass *iv* or higher	1	1	1	2	2	2	2
Components mass *ii* or *iii*	1	1	2	2	2	2	3
Components mass *i*	1	2	2	2	2	3	3

Rotary Wing (Early Modern)

Dexterity. A vehicle with an early modern rotary wing increases its Dexterity in air by 1.

Power Points	4	6	8	10	12	14	16	18	20	24	28	32
Lift	1	2	2.5	3	4	4.5	5	6	6.5	7.5	9	10
Flying Speed (mph)	50	60	70	77	84	90	96	100	106	115	122	130
Components mass *iii* or higher	1/3	1/2	1	1	1	1	1	2	2	2	2	2
Components mass *ii*	1/2	1	1	1	1	1	2	2	2	2	2	3
Components mass *i*	1/2	1	1	1	1	2	2	2	2	2	3	3

Rotary Wing (Modern)

Dexterity. A vehicle with an modern rotary wing increases its Dexterity in air by 2.

Power Points	4	8	12	16	20	24	28	32	36	40	44	48	52	56	60	64
Lift	1	2.5	4	5	6	7	9	10	11	13	14	15	17	18	19	21
Flying Speed (mph)	50	70	85	98	108	118	126	134	141	148	154	160	166	171	176	181
Components mass *iii* or higher	*	1/2	1/2	1	1	1	1	2	2	2	2	2	2	3	3	3
Components mass *i* or *ii*	1/3	1/2	1	1	1	1	2	2	2	2	2	2	2	3	3	3

Wing, Ornithopter

A set of mechanical wings that flap like a bird or insect. While an ornithopter cannot hover like a vehicle with rotary wings, it is quite agile in the air and capable of true flight.

Dexterity. The vehicle's Dexterity in the air increases by 3.

Stall Speed. A vehicle with ornithopter wings must move at a minimum speed to be able to takeoff and fly (see Stall Speed).

Mass	*i*	*ii*	*iii*	*iv*	*v*	*vi*	*vii*	*viii*	*ix*	*x*	*xi*	*xii*
Cost	6K	10K	20K	30K	60K	100K	200K	300K	600K	1M	2M	3M
Workspace	0	0	0	0	0	1	1	1	1	1	1	2

The following table shows the following values:

Speed. The vehicle's base flying speed, given in mph. This value may further be adjusted by drag, streamlining and size (see Statistics.

Lift. The Lift Points generated by all the ornithopter wings. This can help reduce the vehicle's stall speed. A vehicle with 3 or more Lift Points can hover.

Components. The number of required ornithopter wing components.

Ornithopter Wing (Modern)

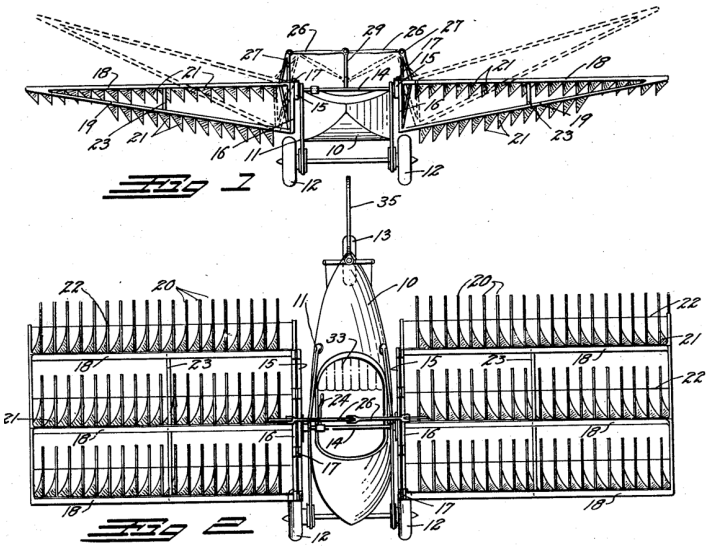
Dexterity. A vehicle with a modern ornithopter wing increases its Dexterity in air by 3.

Power Points	2	4	6	8	10	12	14	16	18	20
Lift	0.2	0.5	0.8	0.1	1.3	1.5	1.8	2	2.3	2.5
Flying Speed	39	53	64	72	79	85	91	96	100	105
Components	1/2	1	2	2	2	3	3	3	4	4

Ornithopter Wing (Futuristic)

Dexterity. A vehicle with a futuristic ornithopter wing increases its Dexterity in air by 4.

Power Points	4	6	8	10	12	14	16	20	24	28	32	36	40
Lift	0.5	1	1.3	1.6	2	2.3	2.6	3.2	4	4.6	5.2	6	6.5
Flying Speed	55	66	76	83	90	97	102	112	120	130	136	142	148
Components	1/2	1	1	1	2	2	2	2	3	3	3	4	4



Rotor Diamater and Wingspan

It is sometimes important to know the diameter of a helicopter's rotary wing, or the wingspan of an ornithopter: for example if you need to land in a forest clearing or fly through a gap.

The following table shows the approximate rotor diameter or wingspan (from wingtip to wingtip) of such vehicles based on their size.

Vehicle Size	Rotor Diamater / Wingspan
Medium	10 ft.
Large	25 ft.
Huge	50 ft.
Gargantuan	100 ft. or longer

3. Lightweight Components

A vehicle can have up to 5 lightweight components. Each lightweight component is placed in a slot in addition to other normal components. If the slot is *disabled* or *destroyed*, the lightweight component is also *disabled* or *destroyed*.

You shouldn't need more than 5 lightweight components, but if you do, you can fill one slot with a "distributed lightweight components" component which grants an additional 5 lightweight components.

Cost

Unless otherwise speficied, a lightweight component has the following gp cost.

Mass	*i*	*ii*	*iii*	*iv*	*v*	*vi*
Cost	10	15	30	50	100	150

Mass	*vii*	*viii*	*ix*	*x*	*xi*	*xii*
Cost	300	500	1,000	1,500	3,000	5,000

Fixed Wings

Choose a wing arrangement: **monoplane**, **biplane** or **triplane**. If the vehicle has propellers, it can fly.

Slots. Fixed wings take up 2 lightweight components slots, one for the each of the left and right set of wings. They must be placed in the center body section. A *disabled* wing continues to function as normal. A *destroyed* wing causes the vehicle to crash.

Drag. Each type of wing arrangement decreases the speed granted by the propellers (see Drag).

Stall Speed. A vehicle with fixed wings must move at a minimum speed to be able to takeoff and fly (see Stall Speed)

Dexterity. The vehicle's Dexterity in air increases by 1 (monoplane), 2 (biplane) or 3 (triplane).

Cost. For any number of wings, pay the normal lightweight component cost once.

Flexible Cover

A vehicle's frame can be covered with a layer of leather, hide, canvas or other flexible material. A flexible cover grants an AC of 12 to the body section it is in, as though it were a structure component.

Slots. Flexible cover can be placed in any slot, but only one per body section.

Cost. Each flexible structure has one-third the normal lightweight component cost.

Harness

A vehicle that is drawn rather than self-propelled requires tack: reins, bit, bridle, collar and so forth.

Slots. The harness must be placed in the front body section, usually with a seating component for the driver.

Dexterity. The vehicle's Dexterity is the lower of the value indicated in the Body Table and the draft animal's Dexterity.

Cost. A harness has the normal lightweight component cost.

Ram

A vehicle with a ram takes half the normal damage from a collision on its front facing, and any damage the vehicle takes is applied to the structure component with the ram.

Slots. The ram must be placed with a structure component in the front body section. It must be a full structure component, not undersized.

Cost. A ram costs half of the structure component's cost.

Spur

A spur is a ram with a shape (such as an upward-pointed beak) designed to break oars. If a ship with a spur collides head-on with the side of a vehicle with an oar component, the pilot can choose to hit the oars instead of rolling for a random location. Damage dealt to the oars by a spur is doubled; however it is halved against other types of component.

A spur can be adapted for other vehicle against other types of exposed component: for example, an airship spur designed to pierce gasbags.

Small Wheels

Small wheels allow the vehicle to move along a road. The vehicle will crash if it tries to move on anything other than flat, smooth ground. An aircraft uses small wheels to taxi and takeoff from a runway.

You cannot have both small wheels and a wheel component.

Slots. Small wheels occupy one slot in the center body section.

Cost. A set of small wheels uses the normal lightweight component cost.

Undersized Components

This option is useful if you have undersized components and do not wish to break up a normal component slot.

A 3-step undersized component or smaller can be treated as a lightweight component.

Slots. An lightweight undersized component can be placed in any slot.

Cost. Use the cost of the undersized component.

4. Vehicle Options

The following vehicle options do not have any mass and do not occupy a slot.

Magic Augmentations

The vehicle's body might have one or more magical items integrated into it. You can use a piloting maneuver to *activate* or *deactivate* the effects of a magic augmentation.

Cost. A magic augmentation increases the cost of the vehicle, as noted in the table below. Furthermore, an augmentation may have a cost multiplier. If the cost of an augmentation exceeds 50,000 gp, you must apply the *powered augment* until it costs 50,000 gp or less.

Powered Augment. The cost of a magic augmentation can be reduced by having it require magic Power Points. Every 4 magical Power Points allocated to the item halves its cost multiplier.

This option cannot be applied items that generate Power Points, such as a lightning turbine.

Mass	*i*	*ii*	*iii*	*iv*	*v*	*vi*
Cost	200	300	600	1,000	2,000	3,000

Mass	*vii*	*viii*	*ix*	*x*	*xi*	*xii*
Cost	6K	10K	20K	30K	60K	100K

Air Recycler. If the vehicle is sealed (see below), it has an unlimited supply of fresh air. *Cost:* ×0.5

Bridle of Burden-Bearing. If the vehicle is drawn or mounted on the back of a creature, that creature's carrying capacity is doubled. *Cost:*×2

Chameleon Hull. The vehicle can project an illusion which allows it to resemble an object or creature of the same size, with the same restrictions as the *major image* spell. *Cost:* ×100

Cloud Keel. The vehicle has a base fly speed of 60 feet. *Cost:* ×3

Fharlanghn's Lines. Each set of these animated ropes halves the crew requirements for one sail component. *Cost:* ×½

Hull of Energy Protection. Choose acid, cold, fire, lightning, or thunder. The vehicle has resistance against that damage tpye. *Cost:* ×3

Hull of Nondetection. The vehicle can't be targeted by any divination magic or perceived through magical scrying sensors. *Cost:* ×3

Levitating Body. The vehicle gains 5 Lift points. *Cost:* ×2

Lightning Turbine. During lightning storms (nonmagical, except through a *control weather* spell), the vehicle gains 4 magical Power Points. The vehicle can include up to three lightning turbines.

Magic Armor. Each structure component can have one application of this augmentation, increasing its AC by 1. *Cost:* ×0.5

Nondimensional Trunks. Each cargo hold component can have one application of this augmentation. The cargo hold can carry ten times the normal cargo capacity without affecting the vehicle's laden weight.*Cost:* ×10

Sand Keel. The vehicle can move through sand as though it were water. *Cost:* ×0.5

Self-Mending Hull. When repairing the vehicle, the material and labor costs are halved, and twice the normal hit points are repaired each day. *Cost:* ×0.5

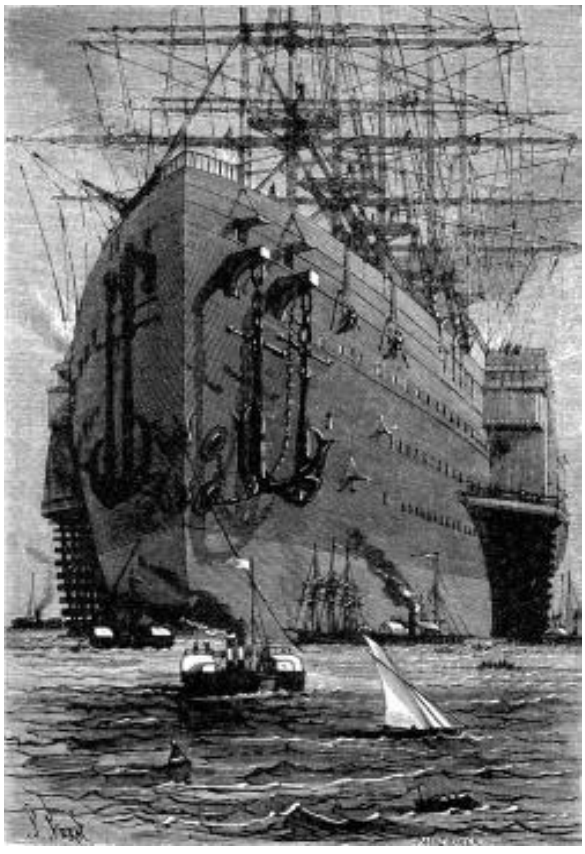
Spider Legs. If the vehicle has a legs component, it gains a climb speed equal to its land speed. It can move along walls and across ceilings. *Cost:*×2

Speedy Wheels. If the vehicle has a wheel drivetrain component, its road or rail speed increases by 10-percent (minimum 1 mph). *Cost:* ×0.5

Skyrider's Platform. The vehicle can be drawn through the air by flying creatures. The vehicle's laden weight is doubled for the purpose of calculating how many flying draft creatures are required. *Cost:* ×10

Stoneskin Hull. The vehicle has resistance to nonmagical bludgeoning, piercing, and slashing damage. *Cost:* ×10

Wind-Favored Sails. If the vehicle has at least one sail component, it is always considered to be in strong favorable winds. In addition the ship's Dexterity in water increases by 2. *Cost:* ×20



Low-Gear Drivetrain

A wheel drivetrain or screw propeller may be a low-gear variant. A low-gear drivetrain improves power at low speeds at the expense of a reduced maximum speed.

- Divide maximum speed by 2.
- Multiply the vehicle's acceleration by 2.
- If used in conjunction with dreadnaught wheels or off-road wheels, the vehicle may ignore difficult terrain caused by mud, snow or sand.
- The vehicle can safely tow twice the normal number of loads.
- Use the original speed for the purpose of determining required Structure Points.

No Helm

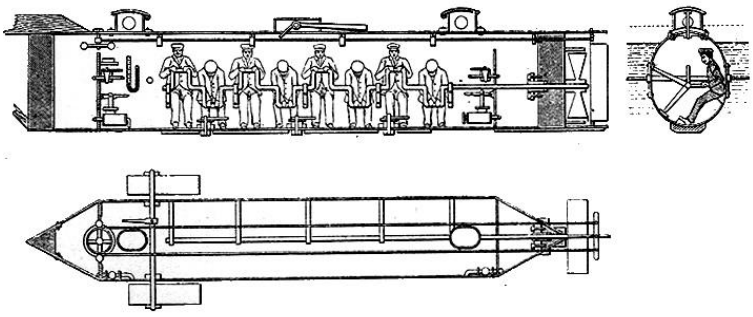
In most cases a vehicle that moves also requires a helm component so that a pilot can issue orders for moving the vehicle.

A vehicle can function without a helm if it has a crewed motive component. For example:

- A rowing boat without a rudder can use an oar component for steering.
- A leg, paddlewheel, rotary wing, ornithopter wing, screw propeller, or wheel drivetrain component with at least one workspace.
- A muscle power component

If component is acting as a helm, the vehicle has the following penalties:

- The vehicle's Dexterity is reduced by 4
- Only one piloting maneuver can be performed, by one character in that component
- Only the *accelerate/decelerate*, *turn* or *ascend/descend* maneuvers can be performed.



Retractable Components (Modern)

Some vehicle components can be designed to fold away, using auxiliary power included in the component.

A character can use a piloting maneuver to retract or extend the component. While retracted, the component does not function but cannot be specifically targeted. It can still be damaged through normal hit location determination.

Crew that work in the component must be provided with seating or quarters occupancy if they are to remain on the vehicle while the component is retracted.

Components. Components that can be made retractable include: arm, leg, oars, sails, seating, screw propeller, melee weapon, wheel drivetrain, rotary wing, ornithopter wing.

Sails or oars are not considered to be exposed components when retracted. Note that this is not just furling the sail, but also folding away all the masts and rigging.

Seating, when retracted, allows that component to be used as a cargo hold. Each seating occupancy allows storage for 200 lbs of cargo.

Drag. Retracted components do not generate drag.

Cost. The component's cost has ×2 the normal value.

Sealed

If the vehicle needs to travel through non-breathable mediums (such as underwater), it needs to be sealed with its own an air supply. The vehicle must have at least one structure component.

Occupants. In a sealed vehicle, quarters and seating components have half the normal occupancy. The vehicle's occupants have of 1 hour of air.

If the campaign's level of technology allows it, air can be compressed into tanks using a steam engine or magic. This provides 8 hours of air (instead of 1).

Maximum Depth. Add together the AC of all the structure components. Multiply the total by the value shown in the table to determine the maximum safe underwater depth.

Total AC	Multiplier	Layer
10–100	×1 ft.	Sunlight Zone
101–150	×5 ft.	Twlight Zone
151 or more	×10 ft.	Midnight Zone

Streamlining (Industrial)

Vehicles are assumed to have a basic aerodynamic or hydrodynamic shape. From the industrial era onwards, vehicles can be given improved streamlining which reduces drag and therefore increases speed.

Streamlining comes in five levels: *good, sleek, superior, excellent* or *extreme*. Each level of streamlining increases the vehicle's speed but reduces the Structure Points granted by structure components. As a result, the vehicle will have fewer hit points.

Note that if the vehicle has structural requirements, this Structure Point reduction may cause the requirements to be no longer met (in which case better structure is needed or a reduction in streamlining).

Land vehicles. A land vehicle only benefits from streamlining if it has a speed of 50 mph or greater.

Streamlining Levels

Streamlining	Speed Multiplier	Structure Points Divisor
Good	×1.2	÷1.2
Sleek	×1.4	÷1.4
Superior	×1.8	÷1.8
Excellent	×2.1	÷2.1
Extreme	×2.4	÷2.4

Streamlining Limits

Component	Limit
Sails	No streamlining
Land vehicle	Good
Rotary wing	Good
Fixed wings (before modern era)	Sleek
Biplane or triplane	Good
Gasbag	Sleek
Any other component that causes drag (see Statistics)	Good

Vertical Design

A vehicle with a vertical design has three body sections – upper, middle and lower – with the component slots distributed in a similar way to a vehicle with facing. Use this option for tall vehicles (e.g. humanoid or tower-shaped), or for buildings.

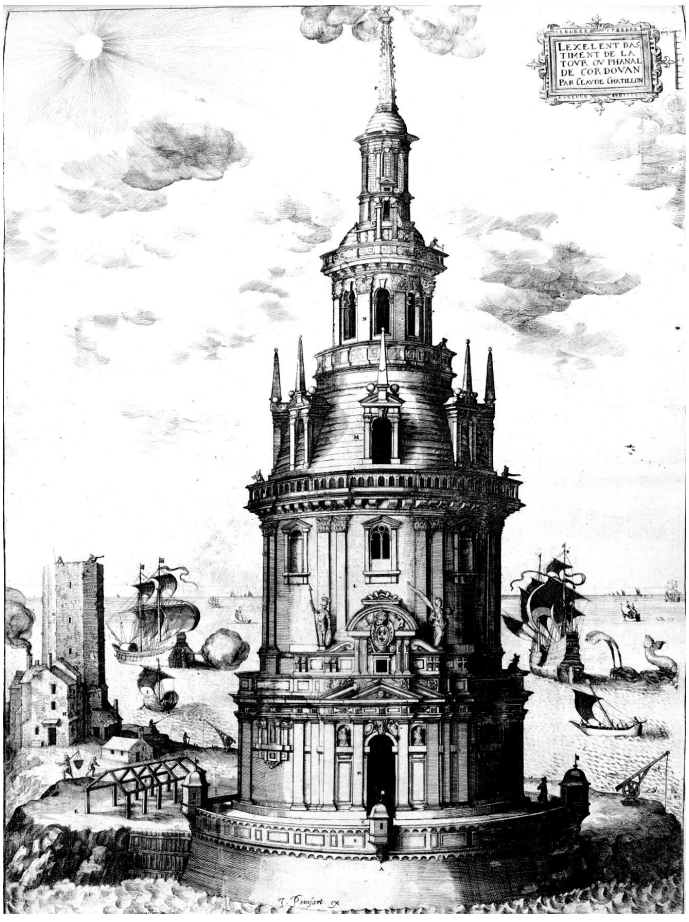
The slots are divided into upper, middle and lower sections:

Slot	Section
1–6	Upper
7–14	Middle
15–20	Lower

Vertical designs can be used with or without facing, as the AC for each section is the same regardless of orientation. If facing is used, fixed artillery weapons must be designated an arc. In addition, when an attack is made against the vehicle the attacker can target any body section.

Buildings. A vertical vehicle without any locomotive components can be a building. Buildings do not have a speed or Dexterity score, but of course cannot be forced to move.

You can designate any number of components in the lower section to be underground. Underground components cannot be targeted (except by a burrowing creature or vehicle), and if hit, the closest above-ground component is hit instead. Only the following components can be underground: structure, atrium, cargo hold, quarters, power (any), or seating. Each underground component costs an additional 10 gp per laden tonnage of the building.



5. Statistics

Size, damage threshold and hit points have already been determined by the vehicle's mass in step 1. You will also need to calculate the vehicle's other statistics such as speed and AC.

Speed

The vehicle might have components that grant the vehicle a speed; otherwise the vehicle is drawn (like a wagon, or mounted on the back of a great beast), or immobile (like a building).

Speed may be further adjusted by:

- Drag
- Size
- Streamlining
- Towing

Drawn Vehicle. If the vehicle can be drawn by creatures, use the laden weight of the vehicle and the carrying capacity of the draft creatures to determine how many creatures are needed. If the vehicle has wheels (travelling on a road), or is waterborne, halve the effective weight of the vehicle.

Maximum Speed. The vehicle's maximum speed is given in mph. Multiply this by 8.8 to determine its speed in feet (round to the nearest 5 ft.)

Travel Speed. A ground vehicle does not normally continuously move at its maximum speed for routine travel: it is slowed by turns, inclines and uneven terrain. A powered vehicle may also travel at a reduced speed for safety and economy. For the purpose of overland travel, a ground vehicle's travel speed is ×0.5 its maximum speed. If the vehicle consumes fuel, it does so at half its normal rate.

Cruise Speed. Airborne or waterborne vehicles that consume fuel may travel at cruise speed. This is ×0.75 the vehicle's maximum speed. Traveling at cruise speed consumes fuel at half the normal rate. A ground vehicle may use cruise speed if its path is entirely on a smooth, straight, flat road; or on rails.

Underwater Speed. A vehicle moving underwater experiences more drag: see the Drag table opposite. If the vehicle can move both on water and underwater, note both speeds.

Stall Speed. Some air vehicles have a minimum speed they must move at to fly: see Stall Speed.

Drag

Drag applies to land vehicles a maximum speed of 10 mph or more, and to all air and water vehicles.

Unless the vehicle is moving in a vacuum, certain components will reduce its maximum speed due to drag. Furthermore, gasbags reduce a vehicle's speed due to their buoyancy.

Add up all the Drag Points for the vehicles components listed in the table below. The total determines a multiplier applied to the vehicle's maximum speed.

"Non-motive" means that the component causes drag if it is not being used to generate speed for the vehicle. For example, an amphibious vehicle with two screw propellers and four wheels has 4 Drag on land and 2 Drag on water.

Component	Drag Points
Monoplane	3
Biplane	5
Triplane	6
Wheels, except small wheels	2
Each gasbag	2
Each arm or melee weapon	1
Each non-motive dreadnought wheel, leg, oar or screw propeller	2
Each non-motive paddlewheel, sail, rotary wing or ornithopter wing	4
Non-motive propeller	2
Underwater	3

Undersized components produce less drag: divide that component's Drag Points by its undersized penalty.

Components do not cause drag if they are retracted.

Speed Multiplier

Drag	1	2	3	4	5	6
Speed	×0.875	0.8	×0.73	×0.65	×0.6	×0.53

Drag	7	8	9	10	11	12	13
Speed	×0.48	×0.43	×0.4	×0.35	×0.3	×0.28	×0.25

Drag	14	15	16	17	18	19	20
Speed	×0.23	×0.2	×0.18	×0.16	×0.15	×0.13	×0.12

For example, an airship with 4 lifting gas gasbag components has 8 Drag points, so has a ×0.43 modifier to its flying speed.

Size Bonus to Speed

Large aircraft and watercraft have a proportionally lower surface area compared to movive power, so the effect of viscous drag is reduced. A multiplier is applied to the vehicle's flying speed or water speed, based on its mass category.

Mass	*i*	*ii*	*iii*	*iv*	*v*	*vi*	*vii*	*viii*	*ix*	*x*	*xi*	*xii*
Multiplier (Air)	×1	×1.1	×1.2	×1.3	×1.5	×1.6	×1.8	×1.9	×2.2	×2.3	×2.6	×2.8
Multiplier (Water)	×1	×1	×1.1	×1.2	×1.3	×1.4	×1.5	×1.5	×1.7	×1.7	×1.9	×2

Stall Speed

Vehicles that use fixed wings or ornithopter wings have a minimum speed for takeoff and flight – the stall speed.

The following table shows the vehicle's stall speed in mph for each mass category and type of streamlining.

Biplane. For a biplane, divide the stall speed by 1.9

Triplane. For a triplane, divide the stall speed by 2.4

Lift. Each 1 Lift Point the vehicle has decreases the stall speed by one-third. For example, a mass *iv* vehicle with no streamlining has a stall speed of 120 mph. One-third of this is 40 mph, so each 1 Lift Point reduces the stall speed by 40 mph.

Hover. If the vehicle's stall speed is reduced to 0 or less (i.e. by having 3 or more Lift points), it can hover.

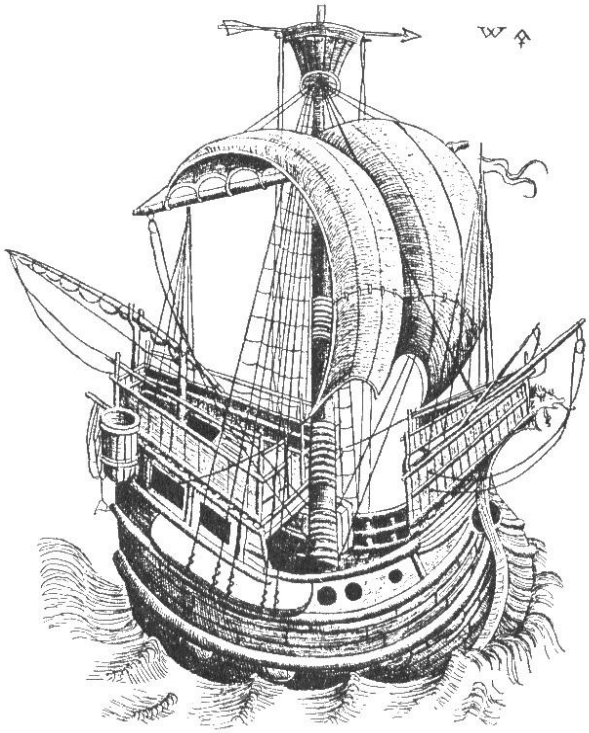
Mass	*i*	*ii*	*iii*	*iv*	*v*	*vi*	*vii*	*viii*	*ix*	*x*	*xi*	*xii*
Stall Speed	70	80	100	120	150	170	215	255	320	370	460	550
Good Streamlining	70	85	105	125	155	180	225	270	340	390	490	580
Sleek Streamlining	75	85	110	130	165	190	235	280	355	405	510	600
Superior Streamlining	80	90	115	135	170	200	250	300	370	420	530	630
Excellent Streamlining	85	95	120	140	180	205	260	305	380	440	560	660
Extreme Streamlining	90	100	130	155	200	220	280	330	420	480	600	720

Sails and Wind

The speeds given for sails assume a fair wind.

In a strong wind, increase sail speed by 20-percent. Strong winds require hourly ability checks by sail and helm crew team leaders to organize the sails and pilot the vehicle. One check per sail component is recommended. Failures may *disable* sail components.

In a light wind, divide sail speed 2.



Maximum Speeds

- A vehicle cannot exceed 600 mph using propellers.
- A land vehicle cannot exceed 600 mph.
- A vehicle cannot exceed 250 mph using rotorary wings or ornithopter wings.
- A vehicle cannot exceed 90 mph if it has gasbags.

Towing

Some vehicles can pull extra loads.

Loads. For the purpose of these rules, 1 load has a mass equal to the mass of the vehicle. On land, the loads must have wheels. An air vehicle can only carry extra loads if it can hover (by lifting it on a skyhook).

- A land or air vehicle can safely tow a one-half load.
- A vehicle with 2 rail wheel components can safely tow one load.
- A water vehicle with a screw propeller can safely tow one load.
- Double the load for a low-gear wheel drivetrain or low-gear screw propeller.

Unsafe loads. If a vehicle tows mass in excess of its safe limit, the pilot must make a maneuver check when the vehicle accelerates, decelerates or turns. The DC is 5 per load. On a failure, the vehicle crashes (for example, the wheels slip, the hitch breaks, or the load collides with the vehicle).

Reduced Speed. The vehicle's maximum speed is determined by dividing its motive Power Points by 1 + number of loads (rounded down)

For example, if a wheeled vehicle with 8 Power Points tows a one-half load, its speed is determined as though it had 5 Power Points (calculated 8 / 1.5). With one load, use 4 Power Points (calculated 8 / 2).

Bonus Lift Points

If a vehicle has fewer than 3 Lift Points, its environment may provide bonus Lift that may allow it to fly.

Updraft. Ridges, mountains or coastlines may provide lift from thermals. A vehicle with wings, a gasbag or a sail has 1 bonus Lift Point from such an environment.

Ground Effect. A vehicle with fixed wings, rotary wings or ornithopter wings has 1 bonus Lift Point within 10 feet of flat ground. This may allow a vehicle with 2 Lift to fly to a maximum altitude of 10 feet as long as it remains over flat ground.

Rate of Climb

A vehicle's rate of climb is the altitude the vehicle gains when the pilot takes the *ascend* piloting maneuver. Similarly, rate of descent is the altitude lost when the pilot takes the *descend* piloting maneuver.

Ascent

Wings. A vehicle with fixed wings or ornithopter wings has a rate of climb of 5 feet per 5 mph of flying speed.

Lift Points. A vehicle with Lift points has a rate of climb of 15 feet per Lift Point. If the vehicle does not have a helm or has a rudimentary helm, the rate of climb is 10 feet per Lift Point.

For ornithopter wings, add together the rate of climb from wings and Lift Points.

Magic Flight. A vehicle that has a fly speed that does not rely on wings or Lift points (such as a cloud keel) has a rate of climb equal to its flying speed.

Descent

Controlled Descent. A powered flying vehicle can safely descend 200 feet. An unpowered flying vehicle (gasbags, sails) can safely descend 60 feet.

Falling Descent. A flying vehicle can simply fall at a rate of 500 feet. If it does so the pilot must make a DC 10 maneuver check, becoming out of control on a failure. This kind of descent cannot be used with gasbags or sails (without crashing).

Diving Descent. A powered flying vehicle can make a steep dive or vertical dive. A steep dive is a rate of descent of 500 feet plus the vehicle's speed in feet. A vertical dive is a rate of 1000 feet plus the vehicle's speed in feet. At the end of a dive, the pilot must make a DC 15 maneuver check, becoming out of control on a failure.

Low-Lift Vehicles

These rules apply to vehicles with 3 or fewer Lift Points.

Level Flight. If a vehicle has exactly 3 Lift Points, it can maintain a level altitude.

Gliding Descent. If the vehicle has fewer than 3 Lift Points, it must descend at a rate of 100 feet (2 Lift Points) or 200 feet (1 Lift Point) each turn.

Armor Class

The vehicle's armor class can be calculated in one of two ways: overall AC or facing AC.

Note that a vehicle's AC may change if one of its structure components is *destroyed*.

Overall AC

Use this option if the vehicle does not have facing, or if you decide the structure components represent protection that is spread out evenly.

The vehicle's AC is the average of its three best slots, rounded down. Use the vehicle's base AC in the absence of a slot with AC.

For example, a vehicle with 2 iron structure components has an average AC of (19 + 19 + 11) ÷3 = 16.

Facing AC

Use this option if the vehicle has facing. The vehicle has sections corresponding to its arcs – front (front arc), center (left and right arcs) and rear (rear arc) – and thus will have three corresponding AC values.

A section's AC is equal to the the highest AC of its slots.

For example, an iron structure component in slot 10 gives the vehicle an AC of 18 in its center section.

Dexterity

The vehicle's Dexterity score is determined by its mass category, adjusted for by an undersized helm, maneuvering systems, magic augmentations, and some motive components.

If the vehicle is drawn, the Dexterity of the vehicle cannot exceed that of the creatures drawing it.

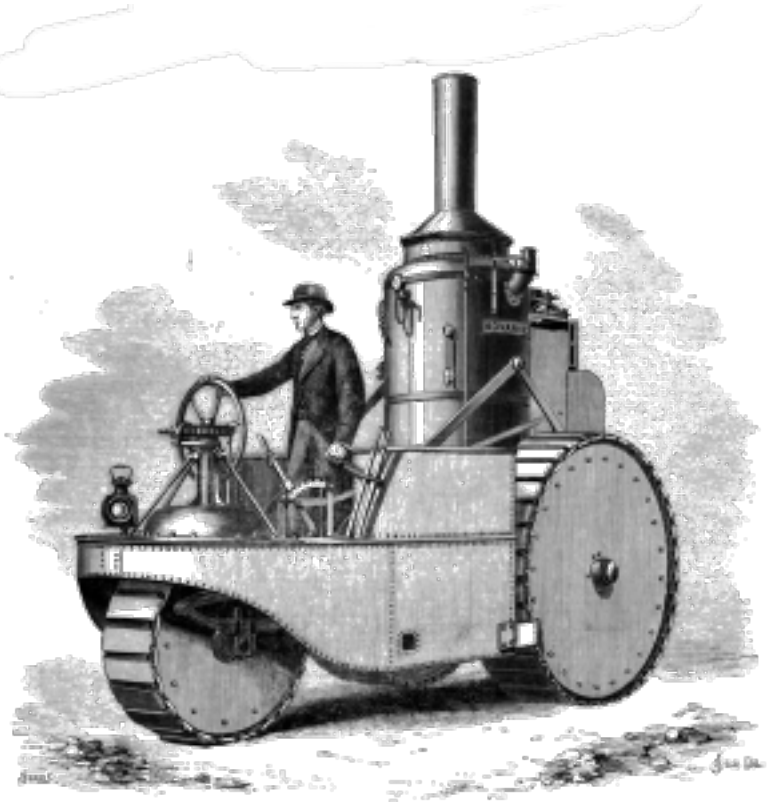
Dexterity is primarily used for making maneuver checks and to determine how quickly the vehicle can turn.

Dexterity in Water

A vehicle's Dexterity in water is decreased by 2.

Dexterity on Rails

A vehicle's Dexterity on rails is decreased by 2. A rail vehicle cannot *turn* or swerve.



Crew and Supplies

See "Preparing the Journey" and note what crew are typically found on the vehicle. This can be as general as simply stating how many crew are required, or you can detail the different roles.

Cost and Rarity

The purchase cost of the vehicle is simply the total cost of its components and options.

If the vehicle has magical properties, it also has a rarity. Total the cost of the following components and refer to the Magic Item Rarity table (*Dungeon Master's Guide* p. 135) to determine the vehicle's rarity.

- Mithral, adamantine, glassteel, darkwood or soarwood structure component
- Magical power component
- Magic augmentations
- At your option, any anachronistic technology (cannon artillery, steam engines, etc)

Vehicle Combat

A broadside from a warship, colliding racing cars, or an airship battling a dragon: While DMs are free to adjudicate vehicle combat as they see fit, the following optional rules utilize the systems described above.

Movement

A vehicle moves at the end of the pilot's turn. If there is more than one pilot, it moves on at the end of the turn of pilot with the highest initiative. If there is no pilot, the vehicle moves on initiative 0.

Maneuver Checks

Sometimes the pilot of a vehicle will be required to make a maneuver check. This is a Dexterity check, made by the vehicle's pilot, using the ship's Dexterity. The pilot adds their proficiency bonus if they have the appropriate vehicle proficiency.

The DM might call for a maneuver check to for the pilot swerve out of the way of an obstacle, out-maneuver an enemy aircraft in a dogfight, or to turn the vehicle sharply.

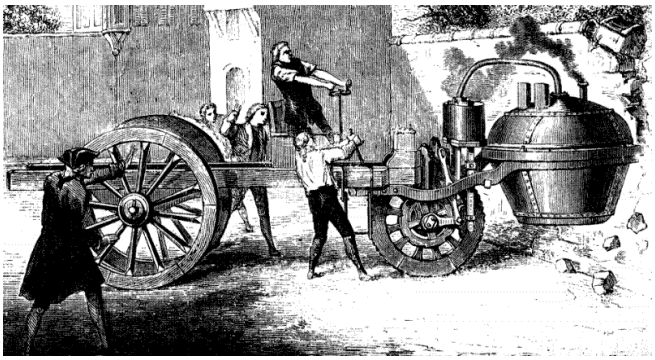
Out-Of-Control

A vehicle might be out-of-control for a number of reasons: it might have no working helm, no conscious pilots, or it might have failed a maneuver check after a collision.

If a vehicle is out-of-control, a pilot cannot take any piloting maneuver other than Regain Control. If it is still out-of-control when it moves, it moves directly forward at its current speed and turns one step left or right (determined randomly).

Swerving

When a vehicle moves, it does so in a straight line. If there are objects or creature in its path that the pilot wishes to avoid, a maneuver check can be made to swerve around them. The DC is determined by the DM based on the size and quantity of obstacles. On a failed save, the vehicle collides with one of the objects or creatures.



Turning

If the vehicle has facing and has a Dexterity score of 10 or more, a pilot moving the vehicle can turn it to face any direction at the start or end of its move. While some vehicles can turn on the spot, others may have to perform three-point-turns, but this is abstracted into its movement.

If the vehicle has a Dexterity score of 9 or less, the vehicle turns slowly and requires the pilot to use a piloting maneuver. The following table shows how many steps the vehicle can turn. On squares, each step is 45 degrees. On hexes, each step is one hex facing.

Dexterity	Squares	Hexes
9–8	3	2
7–6	2	2
5–4	1	1

A vehicle with a Dexterity of 2 to 3 takes 1 minute to turn one step. With a Dexterity of 1, the vehicle takes 10 minutes to turn one step.

Sharp Turn

When you use a piloting maneuver to turn, you may use another piloting maneuver to turn again. If you do so, you must make a DC 15 maneuver check. On a failure, the vehicle does not turn and becomes out-of-control.

Collisions

When you move a vehicle within 5 feet of another creature or object you can deliberately ram it. Other collisions might occur due to a failed maneuver check, or the uncontrolled movement of a vehicle with a destroyed helm or unconscious pilot.

The base damage a vehicle takes in a collision depends on the size of the other creature or object: 1d6 (Medium), 3d6 (Large), 5d6 (Huge), or 8d6 (Gargantuan) bludgeoning damage. The damage is applied to a random component (see Hitting, below). If one vehicle is smaller than the other, it is shoved 10 feet in the direction the larger vehicle was moving.

A vehicle that takes any damage in a collision must subsequently make a DC 10 maneuver check to avoid losing control.

High Speed Collision. Increase the damage by the base amount for every full 10 mph (90 ft.) of collision speed.

Ram. A vehicle with a ram takes half damage if it rams another object.

Armor. A vehicle takes half damage from a collision if its AC is higher than the other object.

Characters

Note which component each character is in. Components with a crew requirement or passenger capacity can be occupied by that many characters. A helm can also be occupied by one or more character at controls.

Each character takes a turn on their initiative as normal. If the vehicle has a pilot, it moves on their initiative; otherwise it moves last in the initiative order.

Piloting Maneuvers

If you are at a set of controls you can use an action on your turn to perform two of the following piloting maneuvers. A maneuver cannot be chosen more than once within a round.

Accelerate / Decelerate. The vehicle's current speed increases or decreases by 1/4 its maximum speed (minimum 5 feet).

Move. A vehicle with legs can move its walking speed without needing to accelerate.

Dash. A vehicle with legs can dash, gaining extra speed this turn equal to its walking speed.

Turn. Turn, if the vehicle if it has a Dexterity of 9 or less. You can choose this maneuver a second time to perform a sharp turn.

Ascend / Descend. Increase or decrease the vehicle's altitude or depth.

Attack. Make an attack with a melee weapon component.

Operate. Use an arm component.

Activate / Deactivate. Activate or deactivate a magical augmentation.

Regain Control. Regain control of an out-of-control vehicle.

Power Actions

If you are in a workspace in a power-generating component, or in an adjacent workspace, you can use an action to perform one of the following tasks.

Allocate Power. Reallocate the component's Power Points from one component to another. This can also be performed by a pilot in the helm.

Increase Power. The character makes a DC 15 Intelligence check, adding their proficiency bonus if they have the appropriate vehicle proficiency. On a success, the component generates twice the normal Power Points for 1 minute. When the duration ends, roll a d20. On a 9 or less, the power component becomes *disabled*.

Repair Actions

A character in the same body section as a disabled component can use an action to attempt a jury rig.

Jury Rig. If the character has the appropriate set of tools, they can use their action to make a DC 15 Intelligence check. On a success, the component is temporarily treated as functional.

It takes 1 success per mass category of the vehicle to finish a jury rig. Multiple characters can work on the same jury rig.

Whenever a jury-rigged component is stressed (as adjudicated by the DM: for example, when used in combat, or when the vehicle swerves or collides), roll a d20. If the result is less than 10, the jury rig ends.

Improve Maneuverability Actions

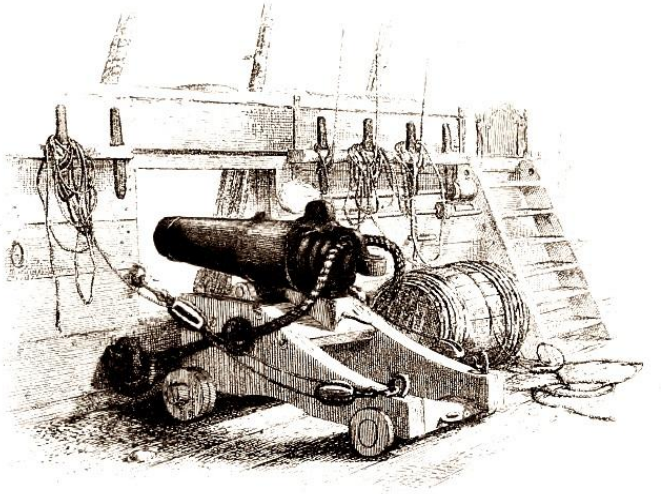
A character one of the following components, or in a workspace adjacent to one, can use their action to improve the vehicle's maneuverability: legs, maneuvering system, oars (or seating for oars), wheel drivetrain, wings (rotary or ornithoper)

Improve Maneuverability. The character makes a DC 15 Intelligence check, adding their proficiency bonus if they have the appropriate vehicle proficiency. On a success, the vehicle has advantage on the next Dexterity check made for it before the start of the character's next turn.

Other Activity

Other typical tasks include:

- Contributing towards the operation of siege engines, or co-ordinating their attacks.
- Rescue creatures trapped by wreckage in destroyed components by making a Strength check (see below).
- Leap onto an adjacent vehicle.
- Launch a vehicle from a berth.
- Operating bilge pumps during stormy weather.



A Brig of War's 12-Pounder Carronade.

Attacking

Targeting

These considerations apply to any attack made against a vehicle.

Targeting Specific Components. An attack with a melee weapon, or a ranged weapon within Normal range, can target a specific component, incurring disadvantage on the attack roll. If using facing, the component must be in the body section which faces the attacker. Exposed components can always be targeted regardless of facing, and have an AC of 11.

Targeting Crew. Creatures on a vehicle may have cover as adjudicated by the DM. In general, creatures in a vehicle body section with no structure components have no cover. Creatures in an exposed component (such as sails or exposed seating) can always be targeted by other creatures (but not vehicle weapons).

Hitting

On a successful hit, you determine which component is hit.

If the target vehicle does not have facing, roll 1d20. The component in the corresponding slot is hit.

If the target vehicle has facing, the slot is determined with a 1d8 plus a modifier that depends on the arc that the attacker is in.

Arc	Slot Hit
Front	1d8
Left, Right	1d8 + 6
Rear	1d8 + 12

Damage

After determining the component hit, make the damage roll for the weapon.

Hit Points. The vehicle's hit points are reduced as normal, taking into account damage threshold and resistances.

Disabled Components. If the damage was taken was at least 10-percent of the vehicle's maximum hit points, the component is *disabled*.

Massive Damage. If the damage taken was at least half the vehicle's maximum hit points, the component is *destroyed*. In addition, the component in an adjacent slot is *destroyed*.

Repeated *Disable*. If a component that is already *disabled* is *disabled* again (for any reason), it is *destroyed* instead.

Repeated *Destroyed*. If a component that is already *destroyed* is *destroyed* again, a different undestroyed component is *destroyed* instead. Choose a slot closest to the target slot.

Undersized and Oversized Components. If a component slot holds undersized components, all the components in that slot are *disabled* or *destroyed*. An oversized component is not *disabled* or *destroyed* until half or more of the component slots it comprises of are *disabled* or *destroyed*.

Disabled and Destroyed Components

Destroyed and *disabled* components no longer function, and do not provide any of the associated benefits, with the following special cases.

Structure. *Disabled* structure continues to provide its normal AC. *Destroyed* armor does not contribute its AC, and its extra hit points can no longer be used for requirements (the vehicle's total hit points are not adjusted). If need be, do not halt the flow of a battle to recalculate average AC &ndash or maximum speed.; work it out later.

Berth. Vehicles in the component may be damaged (see below). *Disabled:* Vehicles in the berth are unable to launch.

Cargo Hold. *Disabled* Half the cargo is lost (either destroyed, or spilled out of the vehicle). *Destroyed:* All the cargo is lost.

Helm. *Disabled:* Half the control sets (rounded up) no longer function. In addition, the vehicle has disadvantage on maneuver checks.

Weapons, Artillery. Siege engines in the component may be damaged (see below). *Disabled:* Half of the siege engines (rounded up) are unable to make attacks.

Wheel. If a wheel component is *disabled*, and the vehicle now has more *disabled* or *destroyed* wheel components than undamaged wheel components, the pilot must make a DC 15 Maneuver check. The vehicle becomes out-of-control on a failure. If all the wheels components are *destroyed*, the vehicle crashes.

Volatile Components

Some components do not react well to being hit:

- An artillery weapon component that includes gunpowder weapons, hit by fire or lightning
- A gasbag component filled with lifting gas, hit by fire or lightning
- Cargo holds that hold volatile cargo, hit by fire or lightning

In such cases, the vehicle is considered to be vulnerable to the damage from that attack.

Creatures in Disabled and Destroyed Components

Even if a projectile or melee strike does not directly strike a creature within a hit component, they are still at risk from splintering or collapsing structures.

Each creature in a component when it is *disabled* takes 5 (1d10) bludgeoning damage.

Each creature in a component when it is *destroyed* takes 11 (2d10) bludgeoning damage. In addition, each creature either falls out of the vehicle or is restrained by the wreckage. A restrained creature can use an action to free itself from the wreckage with a Strength check, with a DC determined by the DM.

Integrity Saving Throw (Optional)

If a Player Character is on a vehicle that drops to 0 hit points, at the start of each round the DM makes an integrity saving throw. You do not need to make integrity saving throws for enemy vehicles: assume they are outright destroyed.

The purpose of this saving throw is to give the Player Characters chance to escape a collapsing vehicle or building; or to cast a spell that can restore some integrity.

Roll a d20. If the roll is 10 or higher, the save succeeds and vehicle continues to function with whatever working components it has left. Otherwise, the save fails and the vehicle begins to fall apart.

When a vehicle fails three integrity saving throws, it is destroyed. All remaining components become *destroyed*: the ship has sunk, the fort has collapsed to rubble, the airship is falling debris.

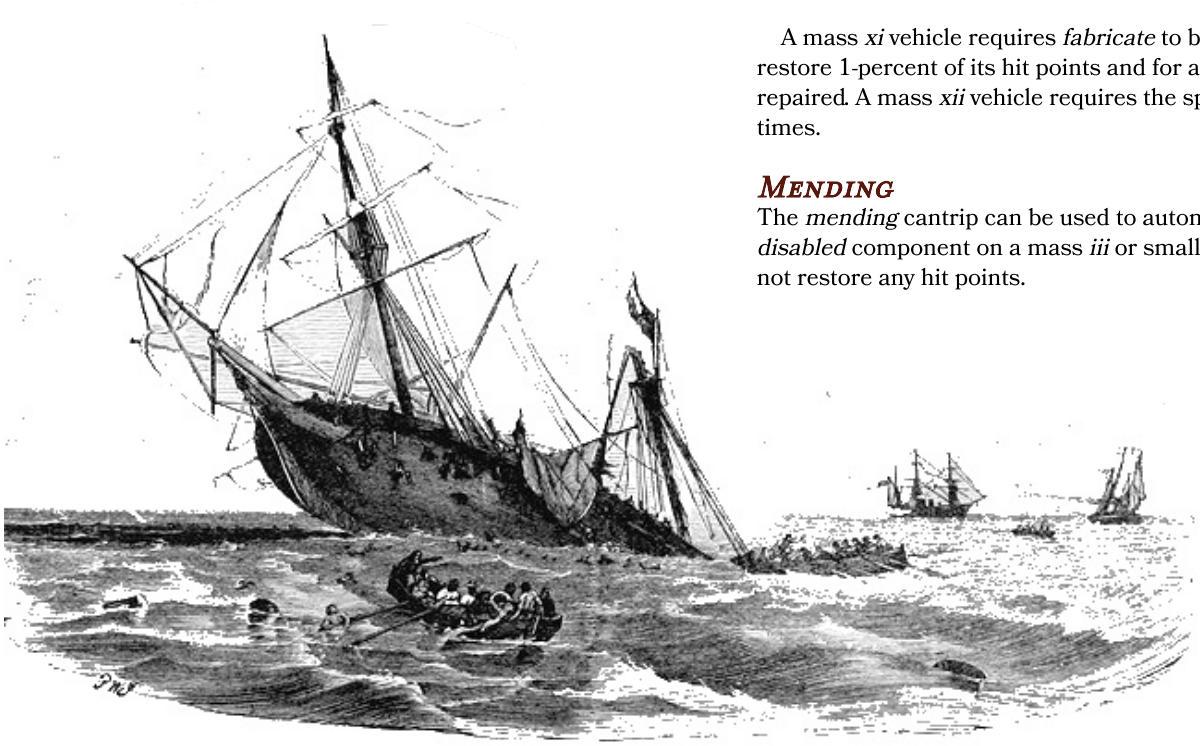
Unlike a death saving throw, the vehicle does not stabilize if a number of successes are scored. Keep rolling until the vehicle is destroyed or it regains any hit points.

Siege engines and Vehicles in Disabled and Destroyed Components (Optional)

Optionally you can keep track of the hit points of vehicles and siege engines held in berths and artillery components.

When a berth or artillery component is *disabled* or *destroyed*, also apply the damage taken to one of the vehicles or siege engines in the component. If this reduces it to 0 hit points, the excess is applied to the next vehicle or siege engine in the component until all the damage is allocated.

In addition, if the component is *destroyed*, roll a d20 for each undestroyed vehicle or siege engine in the component. On a 1–10, the object is trapped in the wreckage. On a 11–20, the object is knocked out of the vehicle.



Spells and Vehicle Damage

Disintegrate

The *disintegration* spell and similar magic can destroy a 10-foot cube of a Huge or larger object. As different components of a vehicle take up different amounts of space, this should be handled with DM adjudication. For example, an engine component might be quite compact, while a quarters component with the same mass is larger, as it includes a lot of empty space.

As a guide, when a vehicle is subject to a *disintegration* spell, use the following table to determine how many components are destroyed. For each destroyed component, the vehicle loses hit points equal to 10-percent of its maximum.

Mass	*ii* or less	*iii*	*iv*	*v*	*vi*	*vii*	*viii*	*ix* or greater
Destroyed Components	All	10	6	3	2	1	1*	0

* One component is disabled (not destroyed) on a mass *viii* vehicle.

Fabricate

The *fabricate* spell can be used to restore hit points to a vehicle, assuming that the broken parts of vehicle are still on board, or raw materials are available.

The spellcaster must be within range of a disabled or destroyed nonmagical component. As mentioned in the spell description, the spellcaster may also need to be proficient with the appropriate artisan's tools.

Once the spell is cast, the component is repaired and the vehicle recovers a percentage of its maximum hit points.

Mass	*ii* or less	*iii*	*iv*	*v*	*vi*	*vii*	*viii*	*ix*	*x*
Hit Points Restored (%)	100	50	30	15	10	5	3	2	1

A mass *xi* vehicle requires *fabricate* to be cast twice to restore 1-percent of its hit points and for a component to be repaired. A mass *xii* vehicle requires the spell to be cast three times.

Mending

The *mending* cantrip can be used to automatically jury rig a *disabled* component on a mass *iii* or smaller vehicle. It does not restore any hit points.

Preparing the Journey

Crew

A vehicle is nothing without the people to operate it.

Minimum Crew. A helm requires a pilot, and each component shows how many crew are required to operate it.

Workspace Crew. A fully crewed vehicle will have one crewperson for each workspace.

Watchkeeping. Multiply all crew requirements by the number of watches (2, 3 or 4) if the vehicle is making a long voyage over water and will not be stopping at night along the coast: watches must oversee the vessel around the clock.

Extra Crew. Optionally multiply all crew requirements by 2 or more if the vehicle is intended for battle (such as warships), or for very long voyages (such as exploratory expeditions). In such roles, crew losses are expected. Warships that expect to capture enemy vessels might double this number again!

Optional Crew. Larger vehicles usually have a captain. Consider also:

- Soldiers
- Officers such as midshipmen or navigators
- Cargo or livestock handlers
- Artisans for workshops
- Purser, for paying the crew
- Cleric, doctor or barber-surgeon
- Nobles, in training to be captains; and pages (often children) in training to be crew

Repairs

Repairing a vehicle is described in the *Dungeon Master's Guide* (p. 119). In addition, for every 5-percent of the vehicle's base hit points restored, one *disabled* component is repaired. When the vehicle is restored to its maximum hit points, all *disabled* components are repaired.

Destroyed components must be replaced. If the replacement is crafted rather than purchased, salvaged parts from the old component provide one-quarter of its value in material costs.

Consumables

Supplies

A vehicle with a quarters component includes storage for 30 days-worth of food and water for each of its occupants. Replenishing this costs 20 gp per occupant.

Otherwise, food and drink for long voyages must be stored in cargo holds or steerage cargo. 300 person-days of rations and water uses 1 ton of cargo space, and costs 150 gp. Make a note of how many days voyage each ton of supplies will support, given a full crew with normal rations.

Ammunition

Replenishing ammunition has the following costs.

Ammunition	Cost per Shot
Ball and Powder, Cannon	216 gp
Bolt, Ballista	3 gp 5 sp
Stone, Mangonel	2 sp
Stone, Trebuchet	1 gp

Fuel

The fuel consumed by steam engines have the following costs.

Fuel	Cost per ton	Cost per lb
Wood	10 gp	0.005 gp
Coal	40 gp per ton	0.02 gp

Cargo

Like creatures, a vehicle has a carrying capacity. This is equal to the vehicle's total cargo capacity from cargo hold components, and from steerage cargo in quarters and seating components.

Overencumbered. If the vehicle is carrying more than its carrying capacity, use the rules for towing to determine safe limits and how speed is affected.

Luggage. Each occupancy in quarters and seating components allows for approximately 200 lbs.: enough for a typical person and a small amount of luggage.

Appendix A: Weapons

Presented here is a small selection of siege engines taken from *Vehicle Construction Kit Supplement 4: Artillery* and *Vehicle Construction Kit Supplement 5: Catapults*.

Traction Trebuchet

Large object

- **Armor Class:** 15
- **Hit Points:** 50
- **Damage Immunities:** poison, psychic

A traction trebuchet is a beam sling powered by a large team of people pulling on ropes. It launches a 12-lb stone on a high arc, so can hit targets behind cover.

It takes 3 rounds to load, aim and fire a traction trebuchet.

Trebuchet Stone. *Ranged Weapon Attack:* +5 to hit, range 50/200 ft. (can't hit targetrs within 30 feet of it), one target. *Hit:* 33 (6d10) bludgeoning damage.

Mass	*i*	*ii*	*iii*	*iv*	*v*	*vi*	*vii*	*viii*	*ix*	*x*	*xi*	*xii*
Cost	–	*	*	*	*	500	1,000	1,500	3,000	5,000	10,000	15,000
Weapons	–	*	*	*	*	1	2	3	6	10	20	30
Crew	–	*	*	*	*	60	120	180	360	600	1,200	1,800

Crew. The pulling team takes up a lot of space: 8 seating components are required for the workspace! If half the crew are used, the trebuchet can launch the stone with half the normal and long range; alternatively a 6-lb rock can be used instead, dealing 22 (4d10) bludgeoning damage.

Furthermore, each Large creature on the pulling team counts as 2 crew, each Huge creature counts as 4 crew, and each creature with a Strength score of 20 or more counts for double.

Ammunition. The component can hold a maximum of 60 stones per weapon. Stones can be found in the environment or purchased for 3 sp each.

Bombardelle, 20-pounder

Medium object

- **Armor Class:** 19
- **Hit Points:** 30
- **Damage Immunities:** poison, psychic

A bombardelle is an early form of breech-loading cannon that fires a stone ball with a charge of serpentine powder.

It takes 2 rounds to load, aim and fire a 20-lb bombardelle.

Bombardelle Shot. *Ranged Weapon Attack:* +5 to hit, range 250/1,000 ft., one target. *Hit:* 26 (4d12) bludgeoning damage.

Mass	*i*	*ii*	*iii*	*iv*	*v*	*vi*	*vii*	*viii*	*ix*	*x*	*xi*	*xii*
Cost	–	*	*	150	300	500	1,000	1,500	3,000	5,000	10,000	15,000
Weapons	*	*	*	1	2	3	6	10	20	30	60	100
Crew	*	*	*	2	4	6	12	20	30	60	120	200

Ammunition. The component can hold a maximum of 15 stone balls per weapon. Each ball and powder charge costs 24 gp.

Appendix B: Examples

Let's Build an Airship

We'll make an airship that uses gasbags for lift and sails for propulsion. It will have hull that looks like a traditional sailing ship, with a lattice of sails extending to each side like wings, and a single round gasbag.

1. Body

We want the airship to be large enough to carry passengers and cargo on long voyages, but not so expensive that PCs cannot purchase one. We'll choose a mass *vii* body (60 laden tons). This gives us a damage threshold of 10, 100 base hit points, and a base Dexterity of 8. We'll use the recommended sizes: a Gargantuan object, 50 feet long with a 15-foot beam and 1 deck.

2. Components

We need the following components.

Gasbag We need more than 3 Lift points for takeoff. Our gasbag is filled with lifting gas, so we need at least four components. We'll take five, so that we'll have a reasonable rate of ascent. 1 crew is required.

Sails The airship may be used for exploring rather than trading, so we'll choose the more maneuverable lateen rig as a sky rig, two components. 4 crew are required. This gives us a base maximum speed of 6.7 mph and +2 Dexterity.

Helm We only need a rudimentary helm for steering. Ascent and movement are controlled by the gasbag and sail crew respectfully. 1 crew is required in addition to the helmsperson.

Quarters We need occupancy for the crew. As the vehicle will remain aloft around the clock, we need to use watchkeeping. With 3 watches, this is 21 occupancy (in hammocks). We'll also take 2 cabins and a chamber (a small saloon) for a total occupancy of 36. Therefore we need 6 quarters components.

This also provides 1 workspace, so we'll add 3 crew to run the quarters deck. We need another 3 bunks, so we'll add another component of hammocks.

Structure The airship has two wooden structure components. Most ocean-going vessels have three, but we need a lighter hull to accomodate the gasbags.

Cargo hold We need at least one cargo hold to hold ballast. Any remaining slots can be used for cargo.

3. Lightweight Components

The airship does not need any lightweight components.

Slot	Component	Cost (gp)
1	Wood structure	200
2	Helm (rudimentary)	600
3–5	Quarters (18 hammocks)	3 × 600
6	Cargo hold (3 tons)	0
7–11	Gasbag (lifting gas)	5 × 1,400
12–13	Sails (lateen air rig)	2 × 600
14–17	Quarters (6 hammocks, 2 cabins, saloon for 5)	4 × 600
18	Cargo hold (ballast)	0
19	Cargo hold (3 tons)	0
20	Wood structure	200

The table above shows the components we've selected arranged into the 20 slots.

4. Statistics

Hit Points The air ship has 120 extra hit points from the wood structure, calculated (6 + 6) × 10. The total is 220 hit points.

Speed.

- *Drag.* With five gasbags, the airship has 10 Drag Points, giving a ×0.35 speed multiplier.
- *Size.* As an aircraft, the vehicle has a size bonus to speed of × 1.5.

This gives the following speeds: *Maximum:* 3.5 mph (30 ft.); *Following:* 2.5 mph (20 ft.); *Reaching:* 3 mph (25 ft.); *Beating windward:* 1 mph

Rate of Climb. The airship's rate of climb is 75 feet per round (5 Lift points × 15).

Armor Class. Overall AC is 13, calculated (15 + 15 + 11) ÷ 3. Each gasbag is an exposed component with an AC of 11.

Dexterity. The airship has a Dexterity of 10, allowing the pilot to *turn* it to face any direction when it moves.

Crew and Supplies. The airship can carry 24 crew in hammocks and up to 4 people in cabins. It carries 30 days supplies, costing 600 gp.

Cost. 13,400 gp.

Let's Build a Steam Wagon

This example introduces Power Points.

This steam wagon is a three-wheeled design with the boiler and piston mounted over the front wheel, similar to Nicolas-Joseph Cugnot's *fardier à vapeur*. We will restrict outselves to Renaissance-era components.

1. Body

The *fardier à vapeur* weighed about 2.5 tons unladen. If we account for the weight of the driver and some cargo, we can use a mass *ii* body (3 laden tons).

This gives the steam wagon damage threshold of 5, 30 base hit points, and a Dexterity of 11. The steam wagon is Large, 10 feet long and 5 feet wide.

2. Components

We need the following components.

Helm. The wagon needs to be controlled. At mass *ii*, this is a small helm.

Seating. A small helm requires a seating component for the driver. A mass *ii* seating component provides 1 utilitarian seat.

Steam Engine. At mass *ii* we must take at least 4 atmospheric engine components to generate power. We will take 8 components, generating 0.5 Power Points. Using only the coal firebox, the power lasts for 1 hour and no stoker is required.

Wheels. We take standard wheels. Only one component is required.

Wheel Drivetrain We have 0.5 Power Points to allocated to a drivetrain. A renaissance-era drivetrain gives us a speed of 14 mph. At mass *ii* we need to take 2 drivetrain components. Because we want the steam wagon to pull a load, we will use a low-gear drivetrain, reducing speed to 7 mph.

Structure We need at least 1 Structure Point because of the maximum speed. The wagon is open-topped but has a wooden frame protecting the drivetrain. We will take two wooden structure components.

Cargo hold Remaining slots can be used for cargo.

3. Lightweight Components

The steam wagon does not have any lightweight components.

Slot	Component	Cost (gp)
1–8	Atmospheric engine	8 × 15
9–10	Wheel drivetrain	2 × 200
11	Helm	60
12	Seating (1 utilitarian for driver)	10
13	Wheels, Standard	10
14–15	Wood structure	2 × 10
16–20	Cargo (1,500 lbs)	0

The table above shows the components we've selected arranged into the 20 slots.

4. Statistics

Hit Points The wagon has 40 extra hit points from the wood structure, calculated (6 + 6) × 3.5. The total is 70 hit points.

Speed. *Maximum:* 7 mph (60 ft.); *Travel:* 3.5 mph.

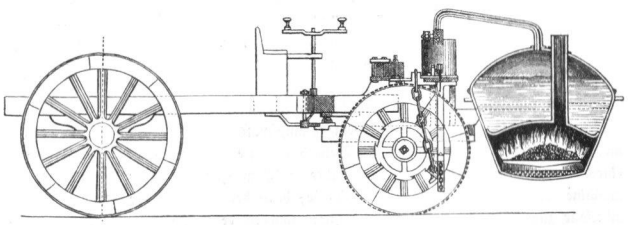
Towing. The steam wagon can safely tow one load (3 tons). If it does so, its speed is reduced to 5 mph (45 ft.) because the drivetrain's effective Power Points are divided by 2 (to 0.25 PP).

Armor Class. Overall AC is 13, calculated (15 + 15 + 11) ÷ 3.

Dexterity. With the bonus from the standard wheels, the steam wagon has a Dexterity of 11.

Crew. 1 driver.

Cost. 620 gp.



The following statblocks show how slots, components and statistics can be presented.

Damage Immunity. All the example vehicles have damage immunity to poison and psychic damage.

Lightweight components are shown in italics and occupy the last numbered slot if a range of slots is given (for exmaple, the steam wagon's rear cart wheels occupy slots 19 and 20).

Heavy Covered Wagon

A heavy wagon with a hide bonnet, wooden panelling, and a simple bench for passengers. A teamster drives the draft horses, walking alongside the wagon. This basic example uses a mass *i* body and does not use facing. Note that each seat must be oversized, as the minimum size for a seating component is mass *ii*.

The vehicle is drawn by draft horses. The carrying capacity of a draft horse is about a quarter of a ton (18 [Strength] × 2 [Large] × 15 = 540 lbs). The wagon has wheels, so its effective laden mass is halved (to 1 ton): therefore 4 draft horses are required.

Large Covered Wagon

Large object
Armor Class: 14
Hit Points: 65
Damage Threshold: 5
Speed: Drawn (Four draft horses, 40 ft.)
Dexterity: 9 (-1)
Cargo: 1 ton
Crew and Passengers: 1 teamster, 2 passengers
Cost: 90 gp

Slot	Components
1	**Wooden structure**
2	**Wooden structure**
3–4	**Seating** (utilitarian for teamster) *Harness*
5–6	**Seating** (utilitarian for 1 passenger)
7–8	**Seating** (utilitarian for 1 passenger)
9	**Cargo hold** (200 lbs, trunk under seats)
10	**Wheels, Standard**
11–20	**Cargo hold** (1 ton) *Flexible structure* (canvas)

Gnomish Submarine

This long iron-hulled vessel allows a team of gnomes to travel 3 miles quietly under the ocean's surface. It must come up for air after 1 hour.

Because the vehicle is sealed, the seating components have half their normal occupancy. A team of 12 operators with at least Strength 10 can generate 0.25 Power Points if they exert themselves with extra effort.

Design Notes. Mass category *iii* (6 tons laden). Sealed. Underwater speed is calculated 5 (base) × 0.73 (from 3 Drag) ×1.1 (from size).

Gnomish Submarine

Huge object (industrial)
Armor Class: 18
Hit Points: 300
Damage Threshold: 5
Speed: *Underwater* 4 mph (35 ft.)
Maximum Depth: 55 ft.
Dexterity: 8 (-1)
Cargo: 600 lbs.
Crew and Passengers: 1 pilot, 12 operators
Cost: 3,520 gp

Slot	Components
1	**Iron structure** (front)
2	**Helm**
3	**Cargo hold** (600 lbs)
4–9	**Seating** (6 workspaces)
10	**Iron structure** (center)
11	**Submarine ballast**
12–17	**Seating** (6 workspaces)
18	**Muscle engine** (+0.25 PP)
19	**Screw propeller** (-0.25)
20	**Iron structure** (rear)

Gun Tower

A two-storey defensive tower with three bombardelles. It has a small guardroom in the ground floor, and off-duty soldiers rest in a separate cabin. Fully stocking the stone shot and serpentine powder costs 1,800 gp.

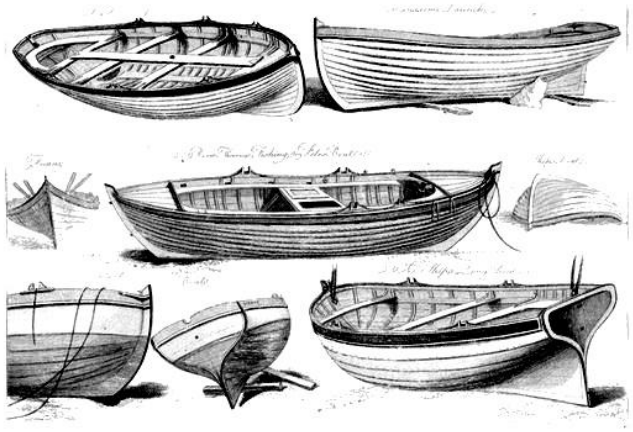
Design notes. Mass *iii* (6 tons laden). Vertical design.

Gun Tower

Large object

Armor Class: 17
Hit Points: 100
Damage Threshold: 5
Crew: 6 gunners
Cost: 920 gp

Slot	Components
1–2	**Stone structure** (upper)
3–8	**3 × Bombardelle, 20-pounder** (15 ammo each)
9	**Cargo hold** (storeroom for 30 ammo)
10–11	**Stone structure** (centre)
12–17	**Guardroom** (standard seating for 6)
18	**Magazine** (75 powder charges)
19–20	**Stone structure** (lower)



Jolly Boat

A jolly boat is a small clinker-built boat for transporting people and goods from shore to ship. Two rowers each operate a set of oars.

Design notes. Mass *i* (2 tons laden). No facing. No helm. Dexterity is calculated 11 - 4 (no helm) -2 (water vehicle).

Jolly Boat

Large object

Armor Class: 13
Hit Points: 65
Damage Threshold: 5
Speed: *Maximum* 2.5 mph (20 ft.)
Dexterity: 5 (-3)
Cargo: 200 lbs
Crew and Passengers: 2 rowers, 4 passengers
Cost: 92 gp

Slot	Components
1–2	**Wood structure**
5–8	**Oars** (requires 2 crew)
9–11	**Seating** (utilitarian for 2 rowers)
12–19	**Seating** (utilitarian for 4 passengers)
20	**Cargo hold** (200 lbs)

Merchant Ship

A sailing ship for carrying cargo. It uses a square sail to follow trade winds.

Slot 2 demonstrates undersized components. To hold the ship's rowboat (1 ton laden) and jolly boat (2 tons laden), the ship has an undersized mass *viii* berth at the stern. A slot can contain two components of this size, so we can include a 5-ton cargo hold.

The ship has enough crew to cover three shifts. In addition, the crew includes a sailmaker, an acolyte (ship's "doctor") and an officer.

Design notes. Mass *ix* body (200 tons laden). Maximum speed is calculated 5.3 (sail base) ×1.7 (size bonus).

Merchant Ship

Gargantuan object

Armor Class: 15
Hit Points: 400
Damage Threshold: 15
Speed: *Maximum* 8.8 mph (75 ft.); *Reaching* 4.4 mph (35 ft.); *Beating windward* 0.8 mph.
Dexterity: 5 (-3)
Cargo: 115 tons
Crew: 1 captain, 9 riggers, 3 helmspersons, 3 helm crew, 3 quarters crew, 1 sailmaker, 1 acolyte
Passengers: 2 to 4 passengers in cabins, 6 passengers in bunks.
Cost: 12,210 gp (plus 140 gp for jolly boat and rowboat)

Slot	Components
1	**Wood structure** (front)
2	i. **Berth** (3 tons) ii. **Cargo Hold** (5 tons)
3	**Quarters** (10 bunks, sewer's workshop)
4–6	**Cargo Hold** (30 tons)
7	**Wood structure** (center)
8	**Sail** (square)
9–13	**Cargo Hold** (50 tons)
14	**Quarters** (2 passenger cabins, 10 bunks)
15	**Wood structure** (rear)
16–18	**Cargo Hold** (30 tons)
19	**Helm**
20	**Quarters** (3 cabins, 5 bunks)

Golden Condor

A huge legendary ornithopter, resembling a condor, made from gold and powered by sunlight. This example demonstrates streamlining and stall speed.

Design notes. Mass *iv* body (10 tons laden). Sleek streamlining.

Speed is calculated 102 mph (base) ×1.3 (size) × 1.4 (streamlining).

Stall speed is calculated 130 mph (base), minus (130/3)×2.6 (for 2.6 Lift from the ornithopter wings).

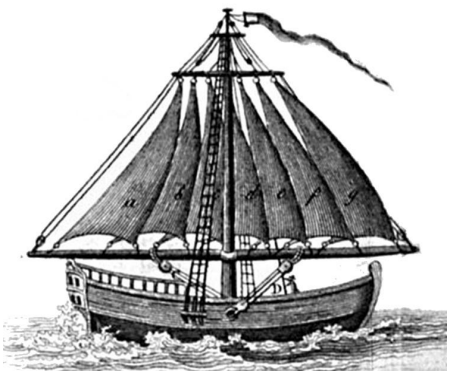
20 Structure Points are required for maximum speed, so if the condor is made of gold, at least 2 gold structure components must be used.

Golden Condor

Legendary huge object

Armor Class: 16
Hit Points: 320
Damage Threshold: 5
Speed: *Maximum:* 185 mph; *stall:* 18 mph; *rate of climb:* 75 ft.
Dexterity: 14 (+2)
Cargo: 2 tons
Crew and Passengers: 1 pilot, 3 passengers
Cost: 262,820 gp

Slot	Components
1	**Gold structure** (front, 12 SP)
2	**Helm**
3–6	**Seating** (3 luxury)
7–10	**Magic Engine** (+16 PP)
11–12	**Gold structure** (center, 12 SP each)
13–14	**Ornithopter Wings** (-16 PP)
15	**Maneuvering System**
16– 19	**Cargo hold** (2 tons)
20	**Gold structure** (rear, 12 SP)



Elemental Locomotive

This rail-bound locomotive is powered by conjured elementals, usually one magma mephit or two steam mephits. The elemental furnace is contained within an iron cylinder to the front of the vehicle, behind which is the driver's station. To the rear is a cab for two wizards to travel in comfort. Their role is to conjure fresh elementals and defend the train.

Design notes. Mass *iii* body (6 tons laden).

Elemental Locomotive

Uncommon huge object

Armor Class: 18 (front), 15 (center, rear)
Hit Points: 180
Damage Threshold: 5
Speed: 85 mph (750 ft.) on rail
Dexterity: 8 (-2)
Cargo: 1.2 tons (2,400 lbs)
Crew and Passengers: 1 driver, 2 wizards
Cost: 3,980 gp

Slot	Components
1	**Iron structure** (18 SP)
2	**Elemental engine** (+12 PP, conjured elemental)
3–7	**Wheel drivetrain** (-8 PP, low-gear)
8	**Wheels, Rail**
9	**Helm**
10	**Wood structure** (18 SP)
11–14	**Seating** (2 luxury)
15	**Wheels, Rail**
16–19	**Cargo hold** (1.2 tons)
20	**Wood structure** (6 SP)

Rolling Stock

The elemental locomotive can safely tow 4 loads. Each car presented below is a one-half load, so the locomotive can safely pull 8 cars.

The train's maximum speed is reduced to 60 mph (2 cars), 52 mph (3 cars), 42 mph (4 to 6 cars), 30 mph (7 or 8 cars).

Design notes. All cars use a mass *ii* body (3 tons laden) and have no facing.

A car's maximum safe speed is 60 mph, since it has 12 Structure Points.

Coach. A coach carries eight passengers in comfort, and includes a latrine. This is an economy class coach. A first class coach has the same cost and carries 4 passengers in luxury seats, while a royal coach carries 1 passenger in an opulent seat.

Coach

Large object

Armor Class: 13
Hit Points: 75
Damage Threshold: 5
Crew and Passengers: 8 passengers
Cost: 340 gp

Slot	Components
1	**Wood structure** (6 SP)
2	**Wheel, Rail**
3–18	**Seating** (8 standard)
19	**Wheel, Rail**
20	**Wood structure** (6 SP)

Covered Goods Wagon. Also known as a boxcar, a covered goods wagon simply carries freight protected by walls and a roof.

Covered Goods Wagon

Large object

Armor Class: 13
Hit Points: 75
Damage Threshold: 5
Cargo: 2.4 tons
Cost: 50 gp

Slot	Components
1	**Wood structure** (6 SP)
2	**Wheel, Rail**
3–18	**Cargo** (2.4 tons)
19	**Wheel, Rail**
20	**Wood structure** (6 SP)