

Top Level

F1 Transform electrical energy to mechanical energy

C1a DC motor

Sub-Functions (C1a)

sF1 Transfer energy from motor to wheels

- sC1a** Direct drive
- sC1b** Gear box
- sC1c** Belt drive
- sC1d** Chain drive
- sC1e** Friction drive
- sC1f** Fan or propellor

C1b Explosives

sF1 Move explosives behind center of mass

- sC1a** Chute of gunpowder with a servo
- sC1b** Gravity fed tube
- sC1c** Small fan

sF2 Set Off Explosives

- sC2a** Lighter
- sC2b** Primer with pins
- sC2c** Arcing electricity

C1c Jet Engine

sF1 Hold Fuel

- sC1a** Internal gas tank
- sC1b** External gas tank

sF2 Move fuel to engine

- sC2a** Gravity
- sC2b** Injection
- sC2c** Difference in air pressure

sF3 Expel fuel

- sC3a** Fan or propellor
- sC3b** Air compressor

sF4 Light fuel

- sC4a** Pilot light
- sC4b** Arcing electricity

F2 Detect turns

C2a Potentiometer

sF1 Detect resistance changes

- sC1a** Arduino

C2b Accelerometer/gyrometer

sF1 Detect changes in acceleration/gyration

- sC1a** Arduino

C2c Light sensor

sF1 Detect differences in light reflected from track

- sC1a** Arduino

C2d Preset time intervals

sF1 Wait for preset time interval

- sC1a** Arduino

C2e None

sF1 Go slow enough to not need turn detection

F3 Turn relative to ground

C3a Conical wheels

sF1 Adjust speed for each wheel to account for difference in distance travelled

- sC1a** Geometry will account

C3b Flat wheels

sF1 Allow for slip

- sC1a** Use material with low coefficient of friction

C3c Slip differential

F4 Move up steep inclines

C4a High momentum

sF1 Quickly accelerate

- sC1a** Lightweight chassis
- sC1b** Gear ratio

C4b High torque

sF1 Increased amounts of friction

- sC1a** Rubberized wheels
- sC1b** Adhesive

sF2 Sustain torque

- sC2a** Gear ratio
- sC2b** Multiple motors

C4c Sticky arms

sF1 Move along its length

- sC1a** Ratchet
- sC1b** Pulley and motor powered

sF2 Launch arms forward

- sC2a** Crossbow
- sC2b** Pneumatics
- sC2c** Explosives
- sC2d** Slingshot
- sC2e** Catapult

F5 Control speed

C5a Drum brake

sF1 Apply pressure to wheels

- sC1a** Servo
- sC1b** Hydraulics
- sC1c** Pneumatics

C5b Spike

sF1 Force spike into ground

- sC1a** Servo motor
- sC1b** Heavy spike with release latch
- sC1c** Shoot spike into ground
- sC1d** Hydraulics
- sC1e** Pneumatics

C5c Disk brakes

sF1 Apply pressure to wheels

- sC1a** Servo
- sC1b** Hydraulics
- sC1c** Pneumatics
- sC1d** Electromagnets

C5d Drag based brakes

sF1 Increase drag coefficient

- sC1a** Flip panels outward
- sC1b** Parachute

C5e Electric brake system

sF1 Transform kinetic energy of motor to electrical/heat energy

- sC1a** Connect motor to storage battery/capacitor (regen braking)
- sC1b** Connect motor to resistor (dynamic braking)
- sC1c** Connect motor to power source in reverse (plug braking)

F6 Stay aligned with rails

C6a Conical wheels

C6b Wheels with o-rings and flanges

C6c Tank treads

F7 Contain components

C7a Sit in box

C7b Drill to plate

C7c Adhere to plate

C7d Potting

C7e Welding

F8 Connect to cargo carts

C8a Screws

C8b Rope/wire

C8c Links

C8d Pins

C8e Glue