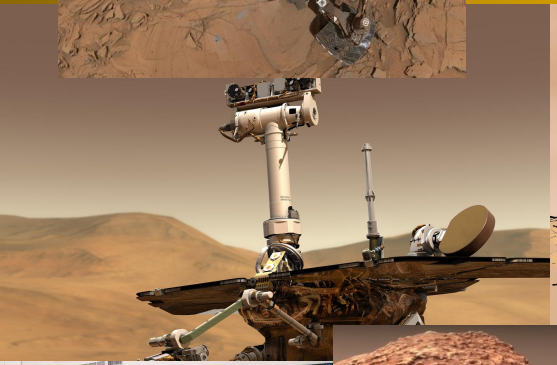
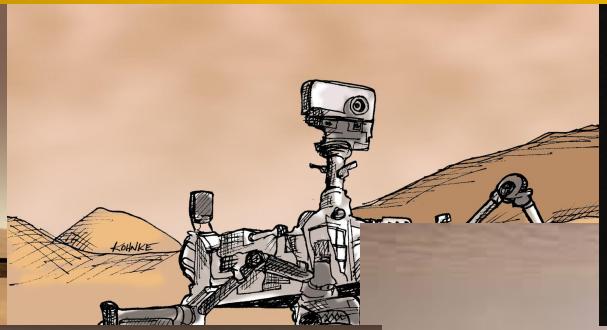
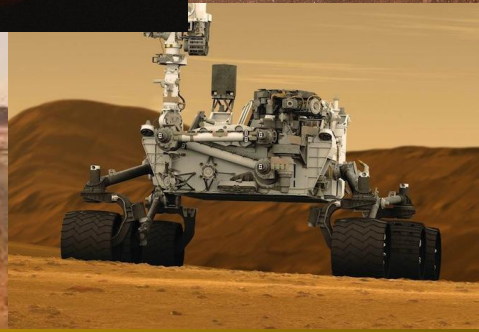
# Team 10

Chris, Cody, Coline, Dan, Daniel, Anthony

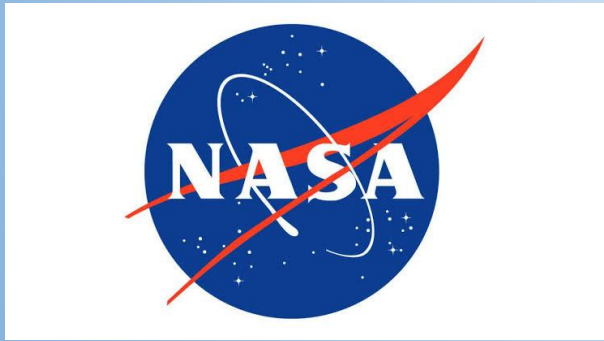






# Importance of the Concept Generation Stage

- Explore a large range of ideas that suits the customer's needs and specifications or has a large number of design variables.
- Evaluation: final design chosen based on relevance and importance.
- The majority of the design costs are decided during this stage.




# Morph Chart

A matrix in which the leftmost column is a list of all of the principal functions that our design must perform and also some of the key features it must have

| Functions | Option 1 | Option 2 | Option 3 | Option 4 | Option 5 |
|---|---|---|---|---|---|
| **Regolith Collection Toolsnipp** | Caterpillar belt over wheels | Vacuum Hose (Suction) | Scoop | Claw | Horizontal sweeping roller |
| **Method of Movement** | Tracks | Simple base with 4 wheels and axles. | Flying drone | Hovercraft | Multiple small wheels |
| **Controlling Method (communication)** | Bluetooth | Radio Control | Wired Connection | Wifi Connection | Autonomous |
| **Dispatching System** | Tipping system | Slanted container with opening door | Caterpillar belt over wheels | Gravity fed and hatch release | |
| **Storage System** | Structure contains regolith in box | Plastic bag | Magnetic levitation | No storage system - keep in scoop | Ferris wheel scoop |
| **Power Source** | Batteries | Hand powered | Solar Panels | Internal combustion engine | Steam engine |
| **Materials** | Ply-wood | Aluminium | Fiberglass | 3d Printed plastic | Carbon fibre |

Chosen Feature

Backup Feature

# Regolith Collection Tool (Anthony)

| | | | | |
|---|---|---|---|---|
| Caterpillar belt over wheels | Vacuum hose (suction) | Scoop | Claw | Horizontal sweeping roller |

**Scoop**

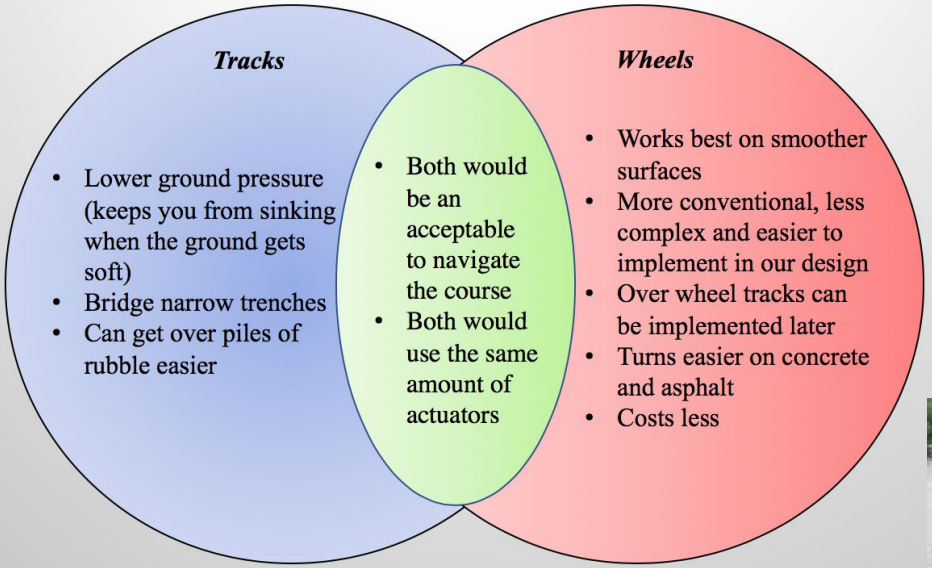
- Simple, effective, more conventional.
- Cost efficient, can be used with any material.
- Proven to be effective by previous rovers.

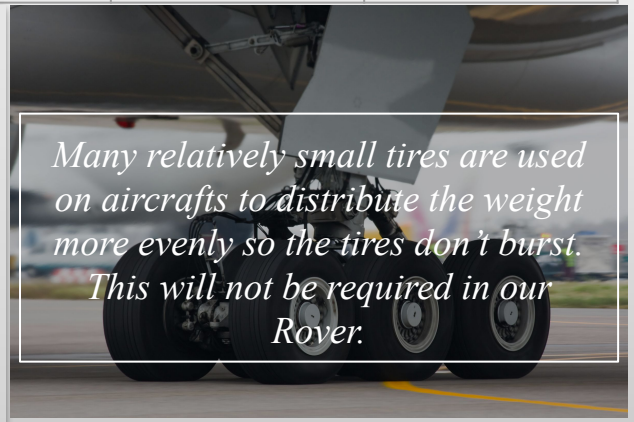
**Caterpillar Belt Over Wheels (Continuous Tracks)**

- Interesting design which could have a faster rate of collection.
- Too many uncertainties to consider as a first option.
- Difficult to implement.

# Method of Movement (Daniel)

| **Method of Movement** | Tracks | Simple Base With 4 Wheels | Flying Drone | Hovercraft | Multiple Small wheels |
|---|---|---|---|---|---|





# Controlling Method (Communication & Control)

| **Controlling Method (communication)** | Bluetooth | Radio Control 2.4 Gh | Wired Connection | Wifi Connection | Autonomous | Dan |
|---|---|---|---|---|---|---|

All methods of communication considered were viable except Autonomous.

Autonomy is too complex and would require too much development time.

Pros and Cons of Radio Control (2.4Gh):

Pros - System already available and designed for remote control of vehicles.

Cons - Extra level of complexity as need to program Arduino to read PWM signals.

Wired connection would have been simpler but still need to develop a custom controller.

Wi-Fi / Bluetooth - easy to implement with Arduino but still need to develop control interface.

Microprocessor (brain) - really only one option - Arduino because it has a huge library and is by far the most well documented and supported MP. Chose the Mega as a large number of inputs and outputs and big  sketch memory.

# Dispatching System (Cody)

| Dispatching System | Tipping system | Slanted container with opening door | Caterpillar belt over wheels | Gravity fed and hatch release | |
|---|---|---|---|---|---|

**Gravity Fed Hatch Release**

- Would be slanted downwards, with a hatch at the back that would be controlled by an electromagnet
- Advantages:
  - Simple to design and implement
  - Uses little extra power
- Disadvantages
  - Regolith may get stuck in the container

**Tipping System**

- Would use a linear actuator to tilt the regolith box upwards
- Advantages:
  - Reliable Dumping
- Disadvantages:
  - Extra Complications
  - More Power consumption


# Storage System (Cody)

| Storage System | Structure contains regolith in box | Plastic bag | Magnetic levitation | No storage system - keep in scoop | Ferris wheel scoop |
|---|---|---|---|---|---|

**Structure Contains Regolith in Box**

- The regolith will be placed within an open container
- Advantages:
  - Easy access for scooping into
  - Simple and space saving
- Disadvantages
  - Regolith not contained
  - Not very innovative

**No Storage System - Keep in Scoop**

- Just keeping in the single scoop that the vehicle has
- Advantages:
  - A good backup if the container fails
- Disadvantages:
  - Cannot hold much regolith
  - Would be big and heavy

# Power Source (Coline)

| **Power Source** | Lipo Batteries | Hand powered | Solar Panels | Internal combustion engine | Steam engine | Coline |
|---|---|---|---|---|---|---|

Li-Po (Lithium Polymer) Batteries

Pros - High energy density, Lightweight, Small - expensive but already had available.

Cons - Can be dangerous if mishandled, Need care and expensive chargers.

Most other options had huge disadvantages

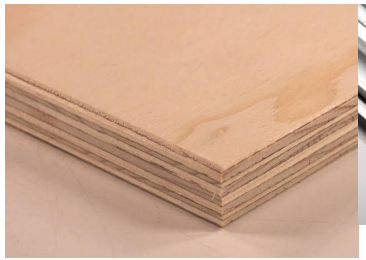
Solar - not enough surface area/ power to do anything useful

Steam Engine/ Internal combustion  - too complex/ emissions (Don't want to pollute Mars)

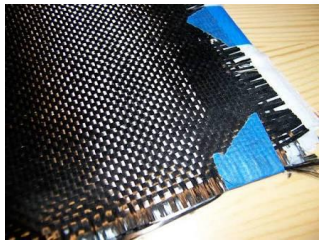
Hand Power - boring

# Materials (Chris)

| Materials | Ply-wood | Aluminium | Fiberglass | 3d Printed plastic | Carbon fibre |
|---|---|---|---|---|---|



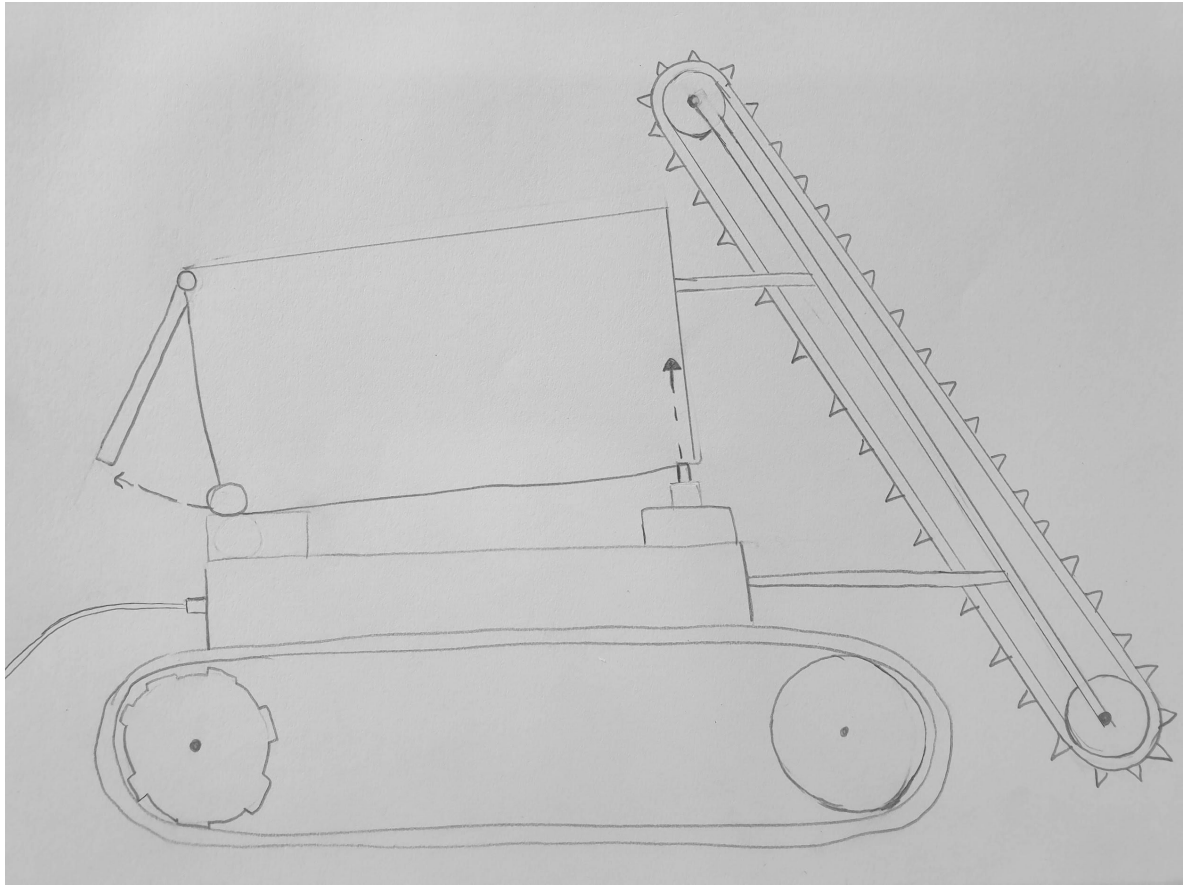




Differentiating factors -
How easy to cut and price

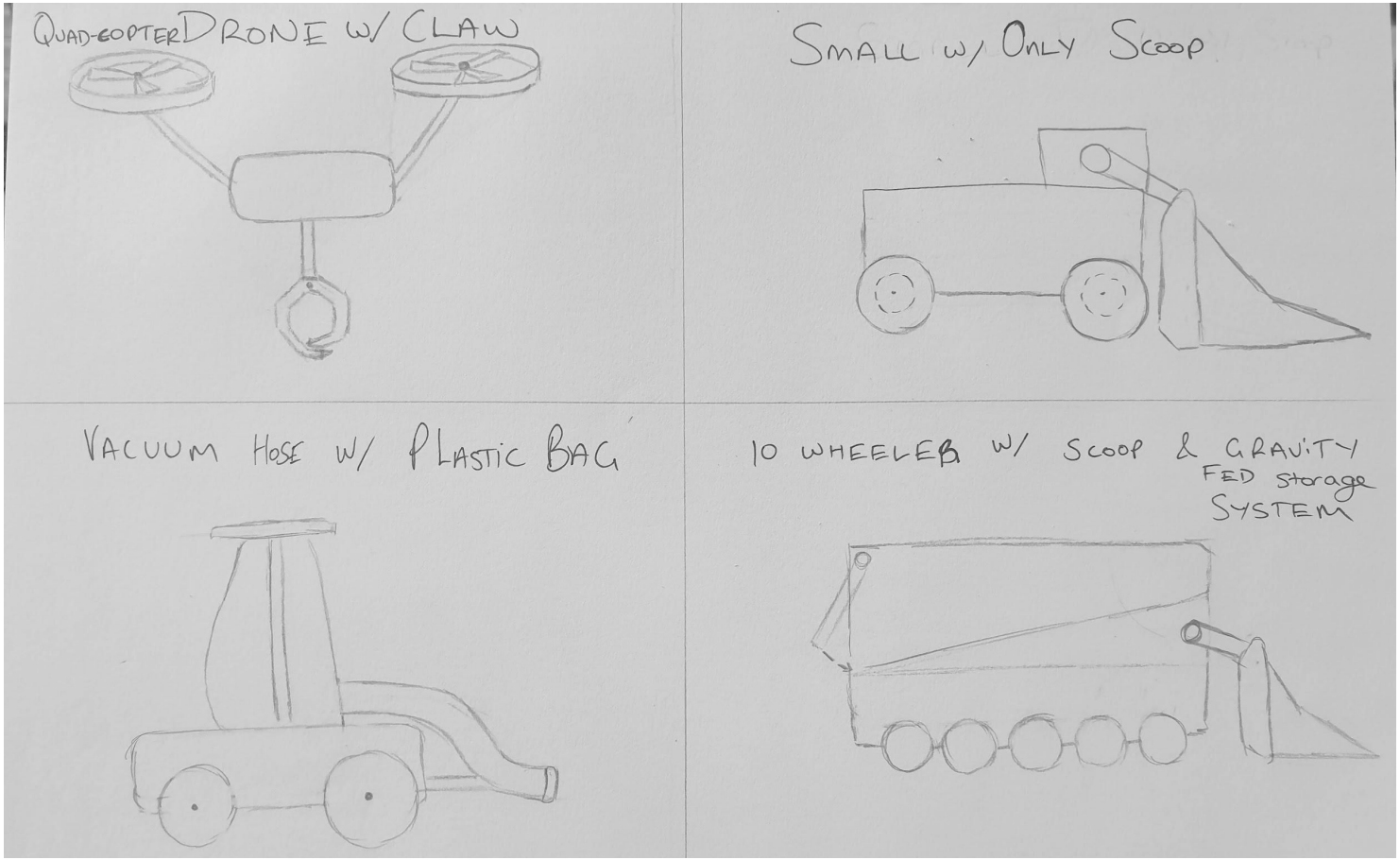
Less Important factors - Weight and strength,

# Backup Concepts Congregated



- Caterpillar belt over wheels
- Tracks
- Wired Connection
- Tipping System
- Container
- Lipo Batteries
- Aluminium Construction

# Other Conceptual Designs



# Project update - March 19th

Prototype features decided on

Prototype designed in CAD

Main body laser cut and assembled

Scoop cut and ready to be assembled

Arduino and drive system arrived.

Scoop and Dispatch system testing next week...

# From Vectors to Prototype...

*CAD Render*

*Assembled Body*