

Scooter X Sport Go Kart Product Analysis

Seat is made from polystyrene and is bucket seat, this will have brackets that will be bolted to the frame



Frame/ chassis (tubular steel) – welding and bolting together suspension to frame, the design is lightweight for a go kart and has the strength to support the weight and hold its shape.

It has a butterfly steering wheel that is made from chrome plated steel as well as having molded finger grooves on edge to grip steering wheel that would be injection moulded using a polymer like rubber/silicon with more of a softer grip for user.



The wheels are fitted by being bolted in place with the axle allowing the wheels to move with the axle.

The Engine is a petrol powered engine that is a pull start on a cord. It produces 6.5hp and is one of the more powerful go kart engines, this allows the kart to reach 45mph.

Bill of Materials

Frame/ chassis (tubular steel)
Steering
Seat
196cc 4 stroke petrol engine
Rear coil over suspension
Centrifugal clutch – automatic clutch
x4 13” offroad tires
Rear hydraulic disk brakes

Steering column bolts the steering wheel together with the front axles at the other end. It also uses a steering hoop which uses a steering hoop which attaches at the top of the steering column these parts are welded to the frame to hold together.



Comparison of the Go-Karts

These two karts have a similar look because of the newer design being based on the original. However it has used many new materials and features to put together a suitable Mars research vehicle that will be able to work on the surface of Mars by adapting some of the features from the original to the new one. The main aim was to make the kart more lightweight enabling transport to Mars to be easy as well as being lighter it will be able to carry itself more up rocky surfaces.

New tyres for driving on mars surface – these are special tyres that were used on the Mars rover because they have a special design to allow them to be more successful when driving on surfaces like Mars.

Boxed in engine and electronics to protect when being driven on mars – These will be boxed in by an aluminium shell that will be able to withstand some of the conditions such as protecting electronics from sand and the engine from getting blocked with sand.



The design kept some main features such as the main frames shape has been kept the same other than adding more places for it to bolt to other components, this means the manufacturing of it will be easier as has already been done just with steel instead of titanium

New titanium frame stronger and more lightweight material
Solar panels on rear to provide power for electric components

Titanium tubing for legs attached to wheels – same process used to manufacture high end bike frames – welding of the tubing

Wheels made from aluminium has cleats on surface for grip as well as using titanium spokes for springy support

Electrical power, 2 lithium ion rechargeable batteries –
solar panels on the back of the aluminium cover used to
charge batteries and power kart during the daylight
Uses plutonium radioactive decay as fuel
Will sit at back under body shell to protect

Bill of Materials

Frame/chassis – tubular titanium – Kroll process

Body panels – Aluminium – CNC extrusion bender

Offroad tyres – Aluminium cleats and titanium spokes

Rear hydraulic brakes

Centrifugal clutch

Rear coil over suspension

196cc 4 stroke petrol engine

Bucket seat – Polystyrene – injection molding

Steering wheel – aluminium and silicon – injection molding

Steering column – aluminium – standard aluminium extrusion

Axles – titanium – Kroll process

Part and Purpose

It is an offroad go kart for teens that want to have a higher quality go kart that is faster than the more basic versions. This is an expensive kart but is a more suitable design for its use on offroad but wouldn't be able to do any extreme offroad which is why the design needs to be modified to allow for it to work on more rough surfaces. This kart is used to moving on flat surfaces and can reach up to 45mph.

Typical Use and Work Environment

The typical use for this kart is on flatter ground such as fields and on tarmac it is used for more easier offroad as it doesn't have the power and quality for the very high end offroad use of a kart. The environment this would be used in is more residential areas and so the kart will never really be put to the test in difficult rocky surfaces, however hills could still be an issue with the kart.

New Work Conditions

The new use of the design will be for use on Mars, this will be a more rough and rocky surface that will need more suitable tyres to be able to grip on the newer surface also will need a better suspension to control the surface as well as a more powered drive for it as it needs to work on ascends on this surface which the original version is less capable of. The costs of the newer design will be more expensive however this is because it wouldn't be used by most people and more of a one off space design that will be used for research on mars, this means that the modifications are able to be expensive newer better quality materials that will be able to cope with surviving use on

Mars. The quote below shows the extreme conditions on Mars and that the last rover to collect research on Mars has disappeared since a dust storm and has not responded, this shows that the kart will need some stability to avoid being pulled about however this could be difficult as the main priority is keeping it lightweight.

(sols 5347 to 5353, Feb. 7, 2019 - Feb. 13, 2019)(<https://mars.nasa.gov/mer/>)

“No response has been received from Opportunity since Sol 5111 (June 10, 2018), amid a planet-encircling dust storm on Mars.”

Design Considerations

The main design to be worked on is making it a more lightweight vehicle as it will need to be transported to Mars as well as will allow it to have more ease at moving on the newer surface as being lightweight it can carry itself uphill easier. Another modification will be adding the equipment needed for a Mars vehicle for it to work on Mars as well as be able to collect research, this equipment will need to be protected and so a strong design to protect this is also required. Another modification for the design could be to find a more sustainable power source for use on Mars, using solar panels could be a good option with the sunlight on Mars. The quote below shows that the materials are going to be a major part of adapting this kart into a space vehicle as it will need to be able to use new materials that will allow it to be able to work more easily on Mars.

“To build a spacecraft, we must begin with materials. Sometimes the material choice is the solution. Other times, the design must accommodate the limitations of materials properties.” (Materials and Manufacturing – Gail Chapline – pg1)

New Part Design

The new part design will have the NASA equipment in the back of the newer fuel system to use radioactive decay of plutonium as well as storing batteries in the back to power the electrics. To protect this an aluminium cover will be used on the back because of it being a lightweight material and has strength to withstand rocks that could hit the back of the vehicle. Another main modification is a newer material being used for the frame, this will be titanium tubing because it is very lightweight and strong this will be important as it will help reduce the weight as well as protect the underbody from the rocky surface on Mars. Being the main frame, the structure will hold in place well when manoeuvring over the rocky surface. Another big change is the newer tyres that are used on the Mars surface these are a stronger and more suitable offroad design, they use aluminium and titanium in them for the tyres to stay durable throughout the usage of the kart, The aluminium cleats are what enables the kart to find grip on the rocks and making it move across the surface as well as titanium spokes that are also durable to withstand the conditions. The design also has solar panels on the back of the aluminium cover facing up this will power the 2 lithium ion batteries inside to source the electrics for the kart.

New Manufacturing Method Employed for Production of the New Part

The manufacturing of the frame will keep the same structure but is just the change of material used, this will mean the designs method of manufacturing will not change and will still be welded together in the same way, also it will have the same bolt joints to the other parts such as steering column. The

back of the design has a newer part and so will have more places to bolt onto the frame the aluminium cover will be bolted from the outside to allow it to easily be taken off for a user with tools if needing to access what's being protected. The aluminium will use a CNC extrusion bender to form the curved shape that the metal will need to cover the rear of the kart. The titanium will use the Kroll process to form the durable and lightweight tubing which will then be used to weld together for the frame.

Suitability and Advantages of New Part and Manufacturing Process

The major advantages of the modifications are the newer lightweight body that allows the kart to work more easily especially with having a more powerful source of fuel with modifications to the engine allow it to drive more easily on the rocky surface. The manufacturing process is also suitable being a design that will only have very few made for the use on Mars this allows more flexibility for the manufacturing as can have more detailed components such as allowing the use of plutonium radioactive decay to fuel the kart. The added complexity to the design means specialist research engineers will be helping manufacture as it would need to meet all quality standards for it to be taken to Mars to be used for research. Another suitability is considering a sustainable power source such that of having the 2 lithium ion batteries that are able to charge when solar panels are active that will be sat above the electronic components on the aluminium body.

Cost Justification

The cost of the kart will be very high priced however as being used for research they are expensive designs as needs the equipment to withstand surviving on Mars. This means the cost will not be a worry when choosing materials such as titanium as all the materials and components used much more durable and required for the conditions. The kart is very unlikely to go on sale to the public and so the cost would not be a worry as it has no target customer, but more for the use in space research which puts high payments into the research and manufacturing of components for this use and so the kart will have a high manufacturing cost.

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