



SPACECRAFT

ASSIGNMENT 1

MCD 4730

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2022

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01| INTRODUCTION

SPACECRAFT



/BACKGROUND

Name: Minerva

This spacecraft is an observatory space craft. It allows people to go on expeditions serves as a research facility in space.

The name Minerva originated from the Roman goddess Minerva which represents wisdom and intellect. Therefore it would be a fitting name for an observatory spacecraft with the purpose of research and gaining new knowledge.

/OBJECT DESIGN

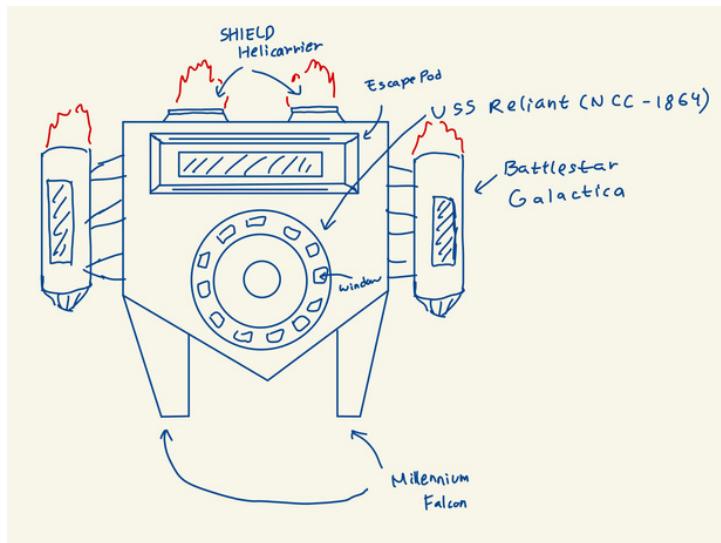
Minerva has a detachable pod for when a small group of people are needed to go on small missions.

Other than a detachable pod, the spacecraft has other facilities to aid people in their research excursions such as observation decks as well as an observation area on the main cockpit dome.



02| SKETCH

TOP VIEW

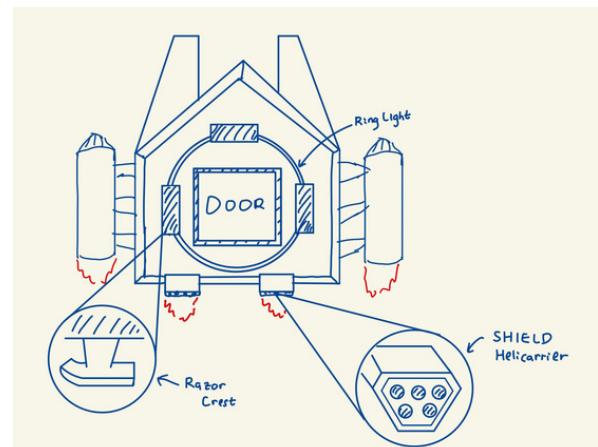


This is the early sketch of the spacecraft's top view. As shown in the picture, there are some changes made.

For instance, the sketch, there were no rings on the side thrusters.

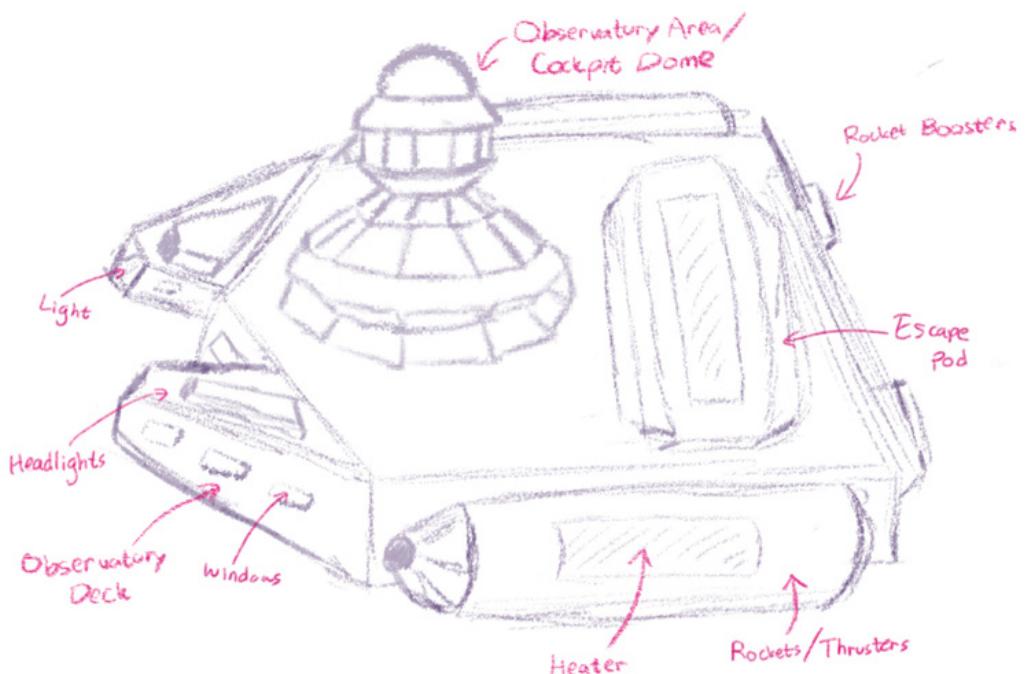
BOTTOM VIEW

In the bottom view sketch, we can also see some differences such as the rocket boosters. In the model, the rocket boosters have been slightly altered so it does not look exactly like the SHIELD Helicarrier in the sketch.



02| SKETCH

3D SIDE VIEW



There are a few subtle differences between the sketch and the 3D model. This is because, some small changes were made throughout the modeling process. The 3D model has more details in comparison to the sketch.

For example, unlike in the sketch, the 3D model has much more engine boosters and lights.

03| REFERENCES

In order to make a unique spacecraft, it was encouraged to do some research about existing spacecraft designs to get inspiration.

This is why some references were used during the process of making the model of this spacecraft.:

1. MILLENIUM FALCON



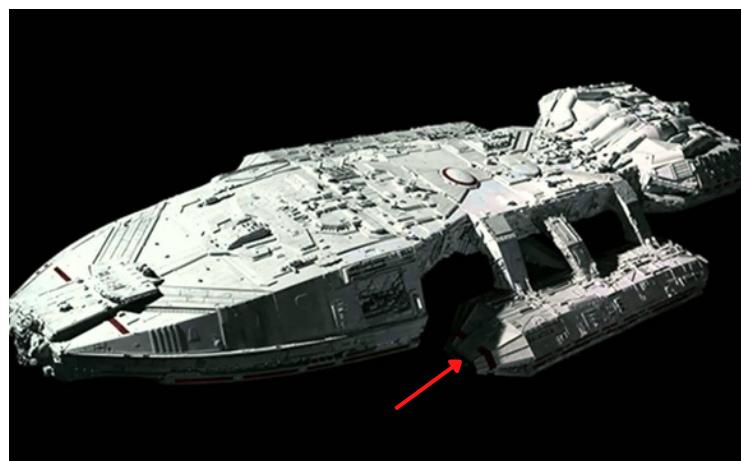
One of the references used was the Millennium Falcon from the Star Wars franchise.

The Minerva made reference to the Millennium Falcon's escape pods' shape and used the reference to make observation decks.

<https://images.app.goo.gl/prBw9DNMESg49stPA>

03| REFERENCES

2. BATTLESTAR GALACTICA



Another reference was from Battlestar Galactica 1978.

The Minerva made reference to Battlestar Galactica's side thrusters.

<https://images.app.goo.gl/jHzkrBz7Y6Gj6rCV6>

3. USS RELIANT NCC-1864



The USS Reliant NCC-1864 from Star Trek 2: The Wrath of Khan is also one of the references used for the Minerva.

The Minerva made a loose reference to the USS Reliant NCC-1864's cockpit dome and used the reference to make the base shape of the observation area on top of the cockpit dome.

<https://images.app.goo.gl/qrDCsCXiNVXNGCh38>

03| REFERENCES

4. SHIELD HELICARRIER



Other than that, the SHIELD Helicarrier from the Avengers MCU franchise is also a reference for the Minerva.

The Minerva made reference to the shape of the SHIELD Helicarrier's rocket boosters.

<https://images.app.goo.gl/R94TsG1aoye1h3z59>

5. RAZOR CREST



The Mandalorian's Razor Crest is another one of Minerva's model references.

The Minerva made reference to the Razor Crest's foot.

<https://images.app.goo.gl/w6q24t9zLNNZ2yZw9>

04| STEP BY STEP

MAYA MODELING PROCEDURE

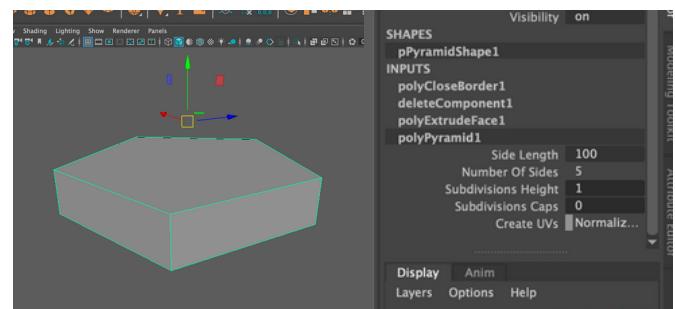
BODY

STEP 1

Create a 5 sided pyramid and select the bottom faces to extrude their thickness. After that,

STEP 2

Select the top faces and delete them. Use the edge tool and bridge the top edges to cover up the newly made hole.



OBSERVATION DECK

STEP 3

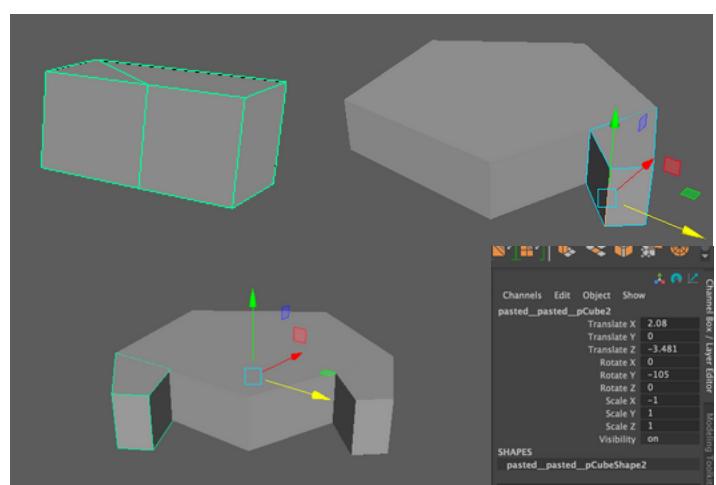
Create a cube.

Width: 60

Height: 30

Depth: 30

Stretch one of the edges and adjust to one of the sides of the body.



STEP 4

Use the Multi-cut tool to cut one of the faces of the cube and delete it. Bevel it and duplicate for the other side.

04| STEP BY STEP

MAYA MODELING PROCEDURE

THRUSTER ENGINES

STEP 5

Create a cylinder with radius 10, height 10 and subdivision axis 12. Rotate it so that it fits the side face of the spacecraft.

STEP 6

Select the 12 faces and scale it. Make sure to set the scale setting to World and use the scale tool to shrink the cap so that the sides of the cylinder slope towards each other.

STEP 7

Duplicate it so that there are 3 of them on each side of the spacecraft.

STEP 8

Create a cylinder.

Radius: 10

Height: 70

Depth: 30

Subdivision Axis: 12

Select the front faces of the cylinder and extrude thickness: 10.

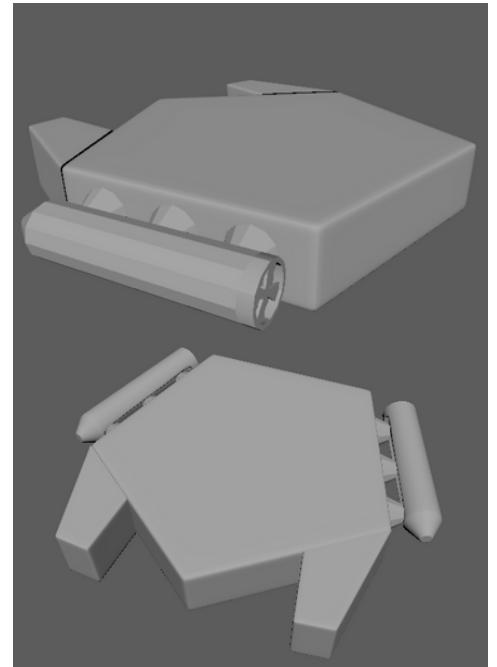
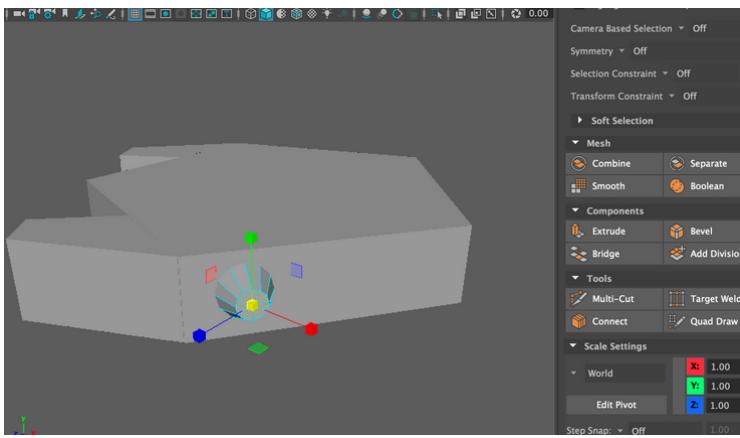
STEP 9

Use the scale tool to shrink the caps towards each other and bevel it.

Select the back face and extrude offset to 1.5. Extrude once more for thickness -5 for the inner parts and bevel the edges.

STEP 10

Now for the propeller, create a cylinder with radius 2, height 3 and subdivision axis 12. Select the face and extrude the thickness to 1. Then, select two of the new side faces and extrude thickness to 7. Bevel the propeller and edges and finally duplicate the thruster engines for the other side.



04| STEP BY STEP

MAYA MODELING PROCEDURE

COCKPIT DOME

STEP 11

Create a cylinder with radius 30, height 10, subdivision axis 12 and subdivision caps 3. Select the middle top faces and use the Move tool to drag it up so that the sides slope towards each other.

STEP 12

Extrude thickness: 5 on the middle caps and use the Move tool to drag it up. Extrude the thickness once more on the outer upper faces by 5.

STEP 13

Create a sphere with a radius of 13. Delete half of the sphere and place it in the middle of the cockpit dome.

STEP 14

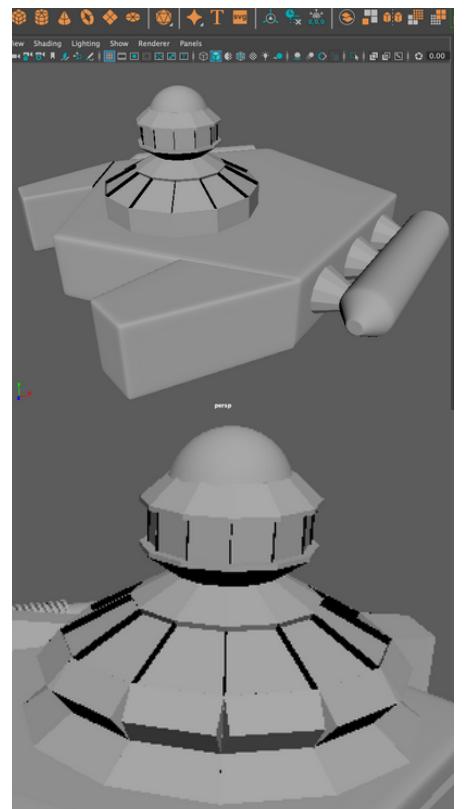
Select the bottom side faces and use the scale tool to widen the base of the cockpit dome. Then select the faces for the upper windows, and extrude the offset to 1. Extrude once more and set thickness to -1.5. Then extrude again to keep the faces together off and thickness to -0.5.

STEP 15

Select the faces for the bottom windows and extrude the offset to 0.15. Extrude again thickness to -1.5 with the keep faces together off.

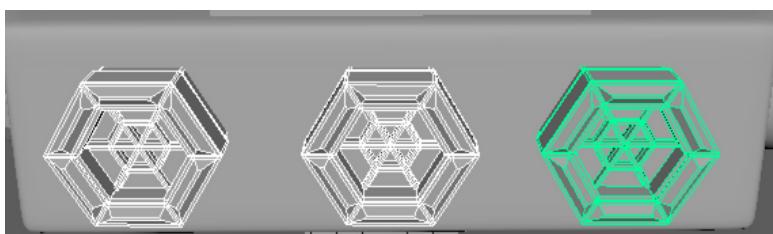
STEP 16

Now select the bottom side faces and scale it so that it will slope towards each other. Then select the bottom faces of the cockpit dome to use the scale tool and stretch it so that it the base becomes wider. Lastly, bevel the cockpit dome.



04| STEP BY STEP

MAYA MODELING PROCEDURE



ROCKET BOOSTERS

STEP 17

Create a 6 sided prism with a length of 5, side length 11 and subdivision caps 3. Select the middle faces and extrude the thickness to -4. Then, bevel it.

STEP 18

Select the outer faces and set offset 1. Extrude again with thickness 3. Next, select the middle parts and set the thickness 0.5. Duplicate it so that there would be a total of three rocket boosters. Place the rocket boosters at the back of the spacecraft.

ESCAPE POD

STEP 19

Create a cube with width 40, height 15, depth 30 and subdivision axis 3. Select the two side middle faces and use to scale tool to make it protrude outwards. After that, select the top face extrude offset to 4. Extrude again this time with thickness 2.

STEP 20

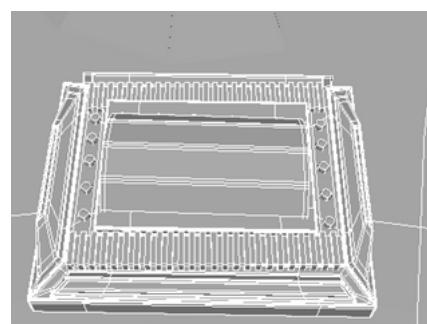
Create a cylinder with a radius 10, height 30 and subdivision axis 12. Delete half the cylinder and put it on top of the pod body. Then, bevel it.

STEP 21

Select the side faces and extrude offset to 0.5. Extrude again thickness to -1. Extrude once more and set offset to 0.5. Use scale tool to stretch it out and bevel it.

STEP 22

Add cubes of width, height and depth 2. Make 5 of these and duplicate to the other side. Next, create a cube with width 4, height 1, depth 39 and subdivision depth 50. Select the faces with 1 interval and add thickness 0.5. Finally duplicate to the other side.



04| STEP BY STEP

MAYA MODELING PROCEDURE

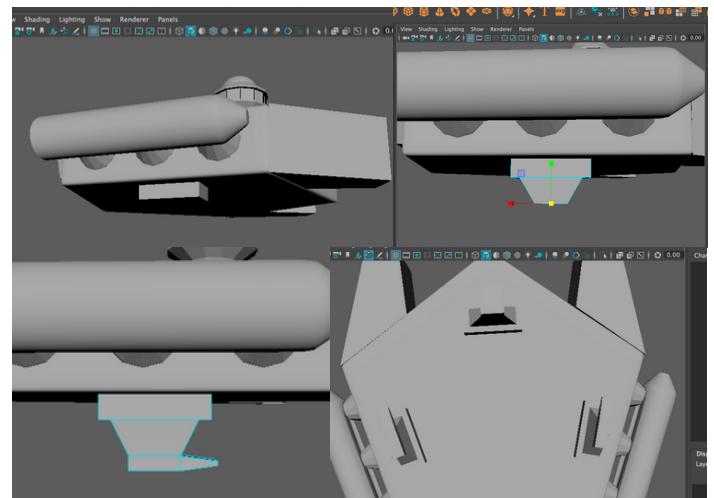
FOOT

STEP 23

Create a cube with a width 30, height 10 and depth 15. Select bottom face and extrude offset to 3. Extrude again thickness to 10. Use the Scale tool to make the side faces slope towards each other.

STEP 24

Select the bottom face and extrude thickness to 4. Then select the side face and extrude thickness to 10. Use the Scale tool and drag the arrow so that the face will slope towards each other. Bevel it 3 times and make 3 of these.



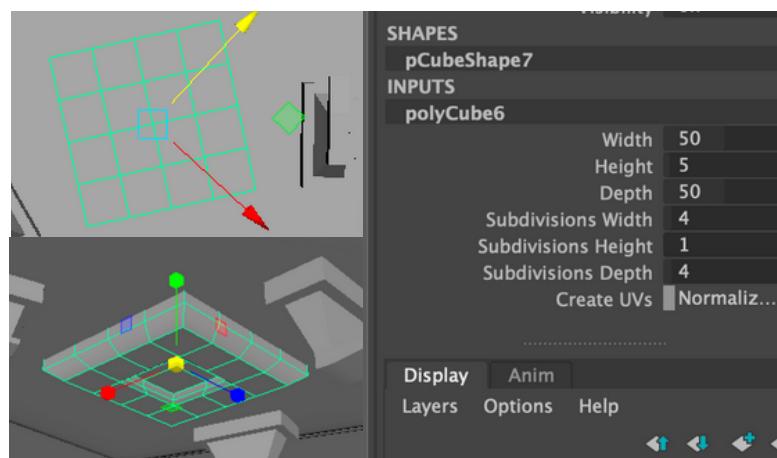
ENTRANCE

STEP 25

Create a cube and select the 4 middle faces and extrude thickness: -2.

STEP 26

Now select the outer faces and extrude thickness to 3. Use the Scale tool to make the outer faces slope towards each other.



04| STEP BY STEP

MAYA MODELING PROCEDURE

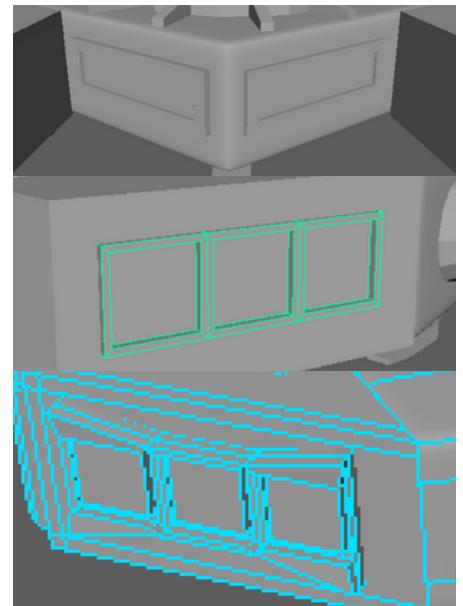
WINDOWS

STEP 27

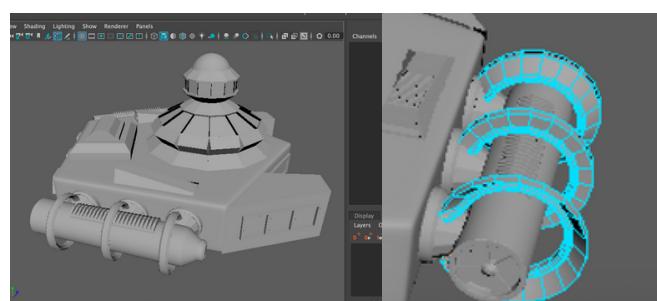
Create a cube with width 45, height 15 and depth 2. Select the top face and extrude offset to 3. Extrude again and set thickness to -1.

STEP 28

Create another cube this time with width 45, height 15, depth 2 and subdivision with 3. Select the 3 faces and extrude offset to 1 and keep the faces together off. Extrude again the thickness to -1.5. Select the edges to stretch it and extrude thickness to 2, extrude again the outer parts with offset of 1. Extrude one more time by setting thickness to 2.



SIDE RINGS



STEP 29

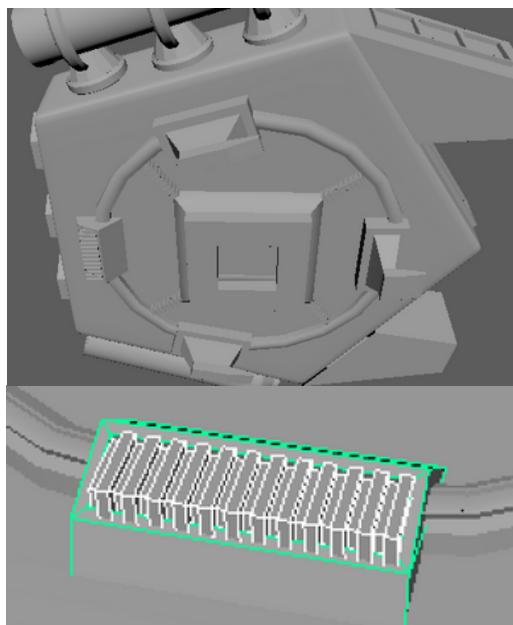
Create a pipe with radius 15, height 5 and thickness 2. Extrude and set the offset to 1 and divisions to 2. Then extrude once more time with the thickness set to 1.

STEP 30

Select the outer faces of the rings and extrude so it become thicker. After that, use the scale tool to make the rings bend away.

04| STEP BY STEP

MAYA MODELING PROCEDURE



BOTTOM ENGINE

STEP 31

Before making the bottom engine, briefly make a ring light by creating a pipe with a radius slightly bigger than the spacecraft entrance.

STEP 32

Now, for the bottom engine create a cube with width 25, height 5 and depth 15. Tweak it and extrude offset to 1. Extrude again the thickness to -3.

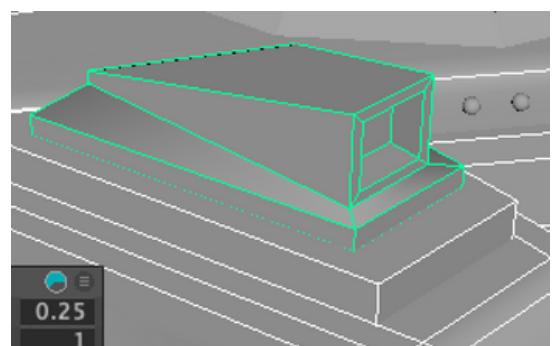
STEP 33

Make a cube with similar measurements but a lot of subdivisions. Select the faces with 1 interval and extrude the thickness to 0.5.

HEADLIGHTS

STEP 34

The platform has a width of 18 and height of 2. Tweak it so it has a similar shape with the body of the observatory deck..



STEP 35

For the headlights make a cube with width 18, height 2 and depth 12. Tweak it and set the offset to 2. Extrude the thickness to 8 and tweak it once more so it goes down

04| STEP BY STEP

MAYA MODELING PROCEDURE

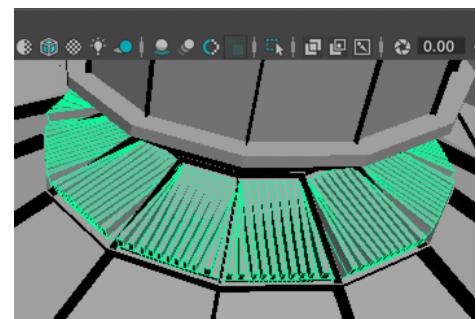
TEXTURES (RIDGED PLATES & WIRES)

STEP 36

Make a cube with width 6, height 3, depth 9 and subdivision width 15.

STEP 37

Tweak it a bit so it would look like the shape under it. Select the faces with 1 interval and extrude the thickness to 1.



CLEANING UP

STEP 38

After adding the extra details and textures, delete the history and start renaming objects on the outliner. Arrange and group them so that it would look much more organized.

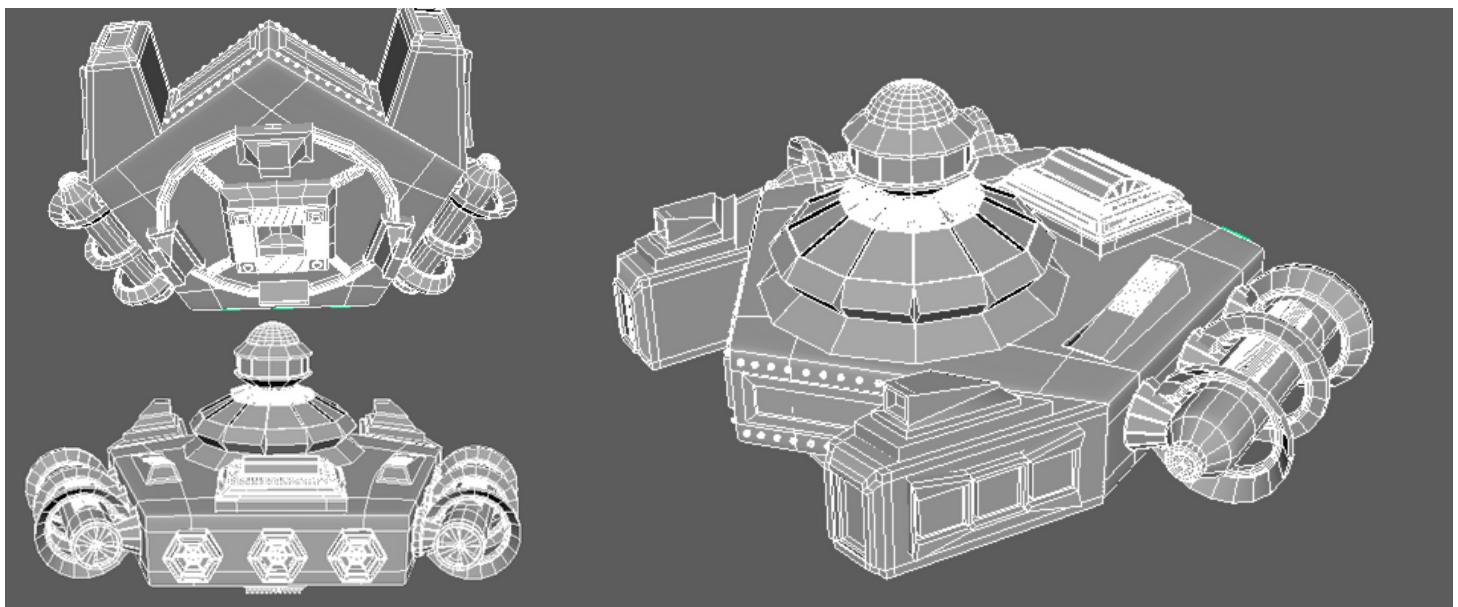
STEP 39

Make sure to combine objects such as the side thrusters and the lights. Finally select the whole spacecraft and group them. Name the group "spacecraft".

04| STEP BY STEP

MAYA MODELING PROCEDURE

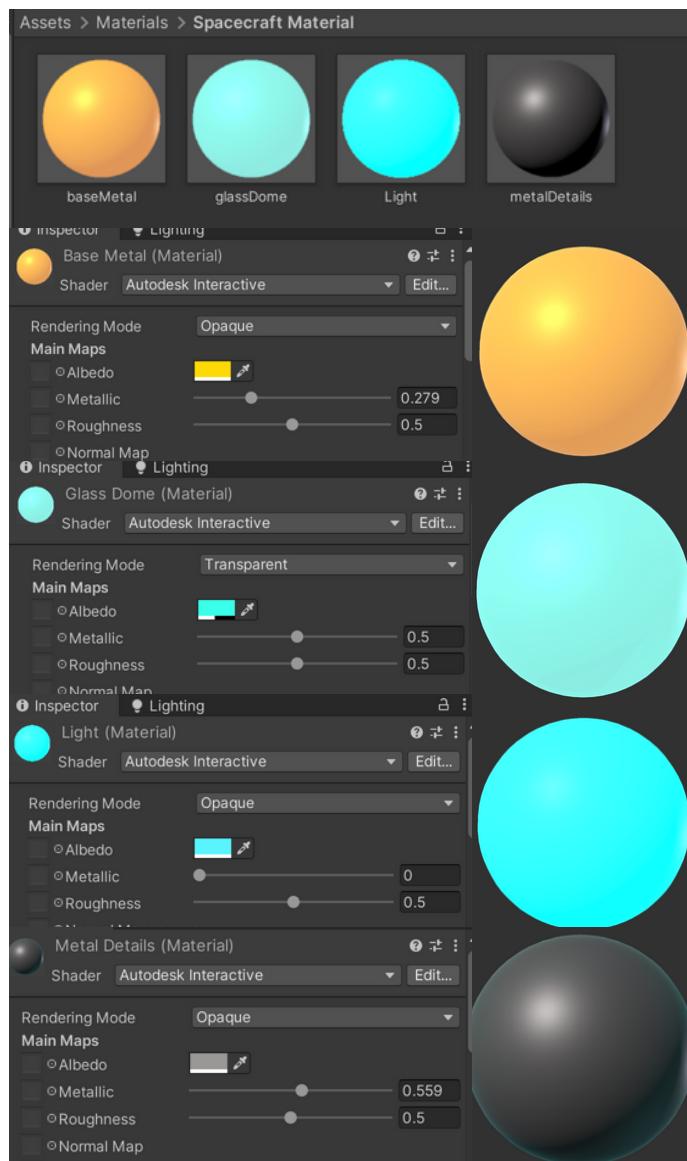
FINAL MODEL



The spacecraft model is finally finished. Now send the model to Unity where the spacecraft would be coloured and given material textures.

06| UNITY PROCEDURE

MATERIALS & COLOURS



The materials used for the spacecraft is a yellow base metal for the main body of the spacecraft with a black metal for further details of the spacecraft.

Transparent glass was also used for the observation area dome located on top of the cockpit.

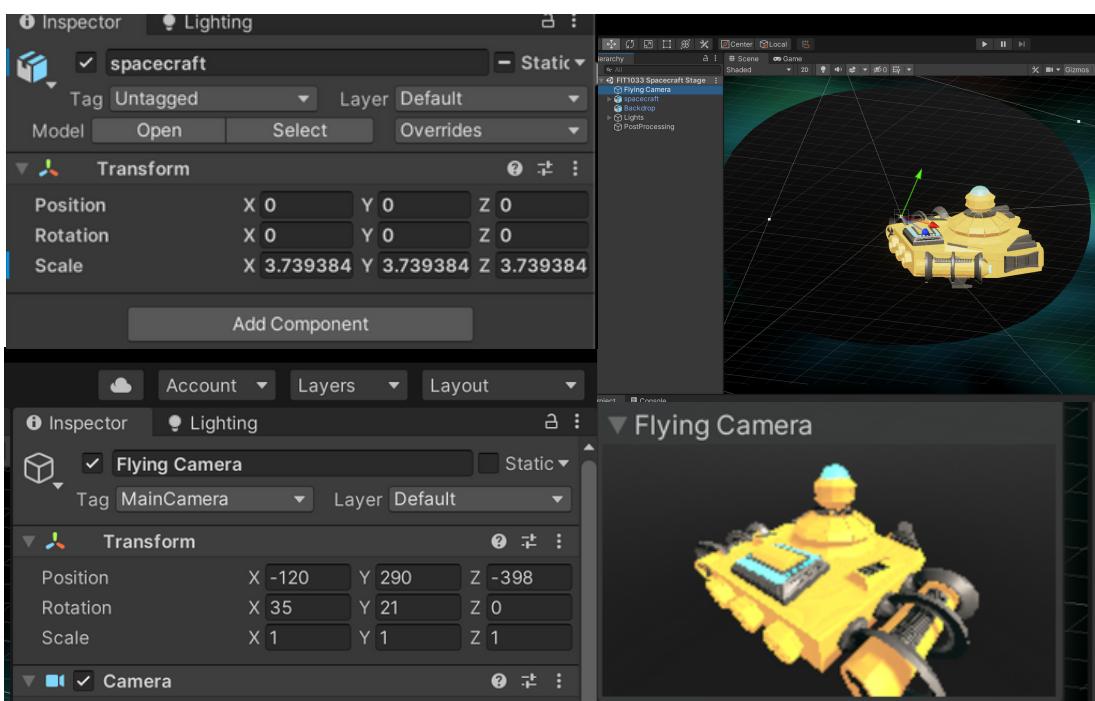
The lights were made by using blue emission to achieve a glow effect.

The colour yellow was chosen for the main body of the spacecraft as yellow often symbolizes intellect and new ideas. Since the Minerva is an observatory spacecraft with the purpose of gaining new knowledge, therefore yellow would fit the design.

Black was used for further details of the spacecraft as black contrasts and match yellow well.

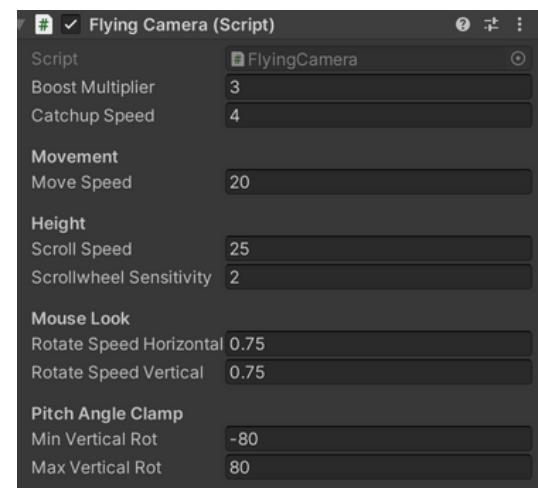
06| UNITY PROCEDURE

FLYING CAMERA



Firstly, make sure to position the spacecraft at 0,0,0. Then set the flying camera to a nice position where the whole spacecraft is visible.

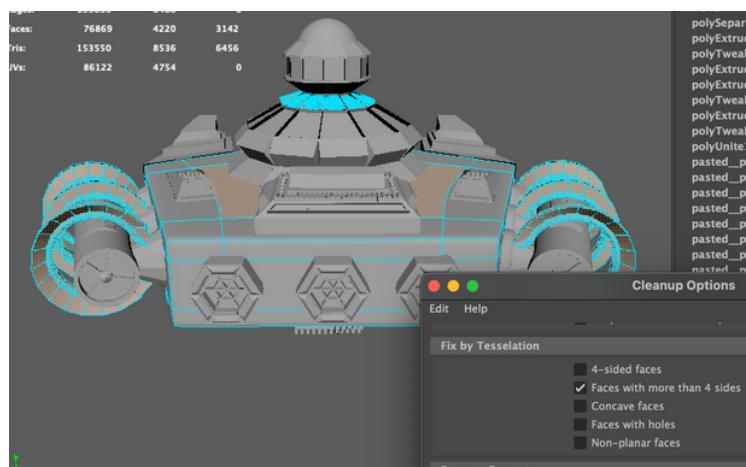
Since the Minerva is a large spacecraft, the flying camera's movement speed is set to 20 so that it would take a longer time to move around.



07| DISCUSSION

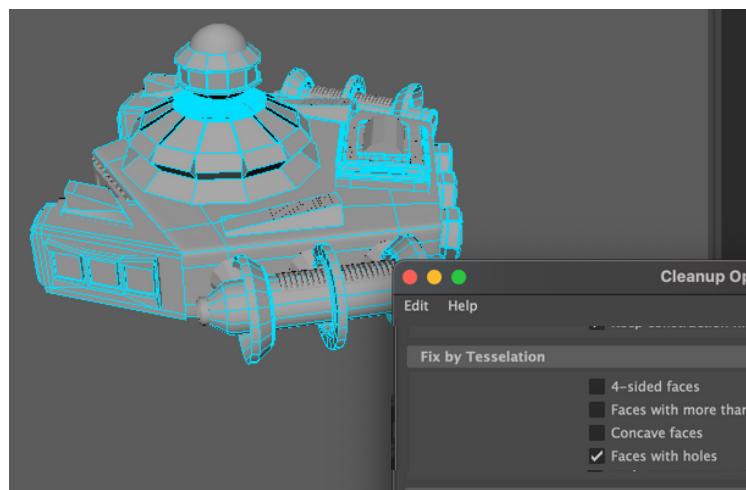
ERRORS

FACES WITH MORE THAN 4 SIDES



There are a few faces with more than 4 sides but we can assume that there is no issue since the body of the spacecraft is a pentagon. So there would most definitely be an n-gon. Furthermore, this doesn't affect anything negatively.

FACES WITH HOLES

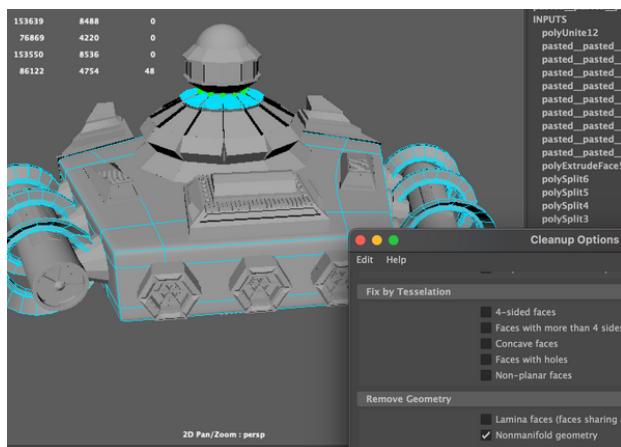


As shown on the picture, there are no faces with holes.

07 | DISCUSSION

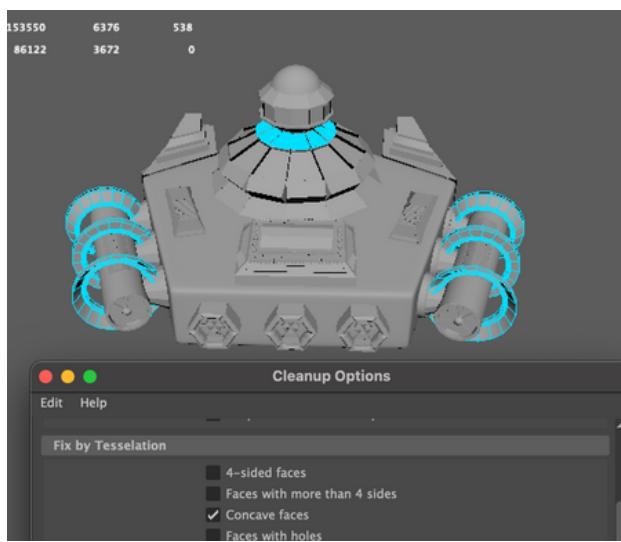
ERRORS

NON MANIFOLD GEOMETRY



There are a few non manifold geometry however it would not affect anything major.

CONCAVE

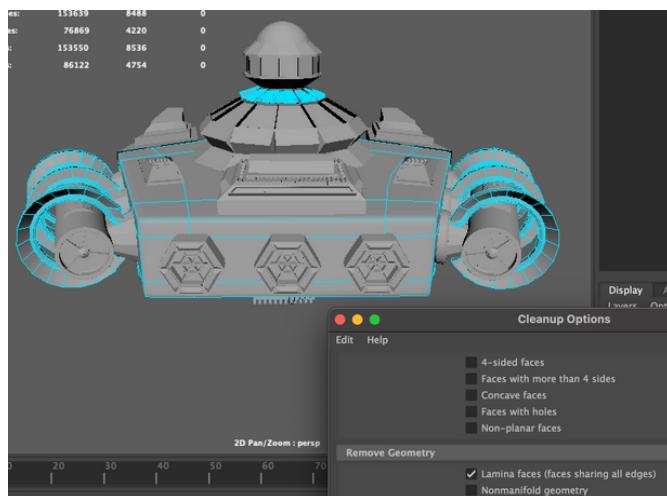


There are no concave faces.

07| DISCUSSION

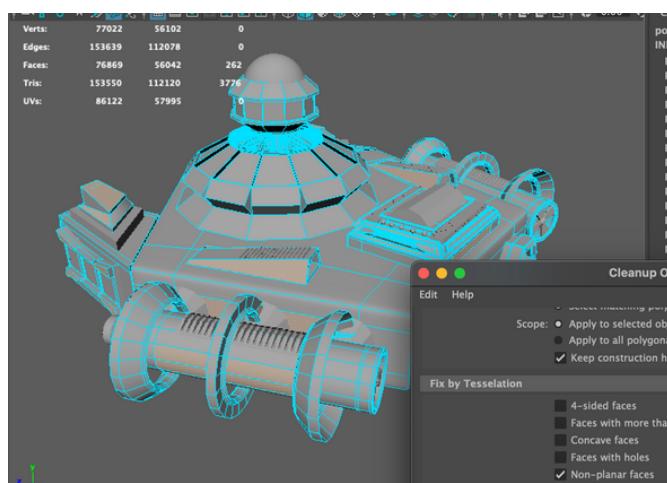
ERRORS

LAMINA FACES



There are no lamina faces present in the spacecraft model.

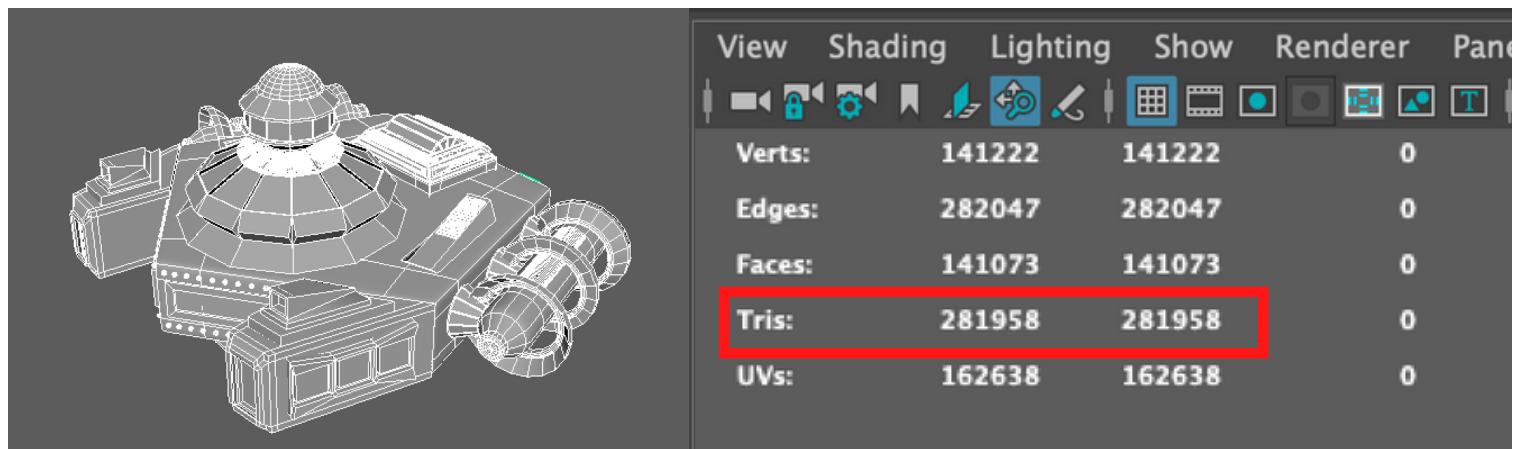
NON PLANAR



Even though maya selected these faces, all the objects were set in one plane therefore we can assume that there are no issues.

07| DISCUSSION

TRIS COUNT



After finishing the model and cleaning it up, select the whole spacecraft and check the tris count in the Poly Count display.

Since the tris count is under 300 000, therefore it is still good.

08| CONCLUSION

Throughout this assignment, I was able to model my own unique spacecraft. I have used the techniques and tools taught during the lecture sessions to complete this assignment. Some tools used are the bridge, bevel, scale and move tool. I also used the multi-cut tool in order to make some of my spacecraft parts.

Although there were a few errors present in the model, it was not significant enough to negatively impact the model. Therefore we can say that the spacecraft assignment is quite a success since I managed to successfully sketch, build and document the entire process of the assignment.

