



Iara Lima nº 12307

Fábio Fernandes nº 15322

Pedro Almeida nº 17564

Game Design Document

# Space Clean-Up VR

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## INTRODUCTION

This document specifies the design for the gameplay, graphics, sound, and story of the game Space Clean-up VR, it is based on design made by IPCA students Iara Lima, Fábio Fernandes and Pedro Almeida.

The following is a proposal for a first-person VR game developed in Unity, Playable on cardboard VR compatible android phones. Various Story related documents have been attached to this document, available in the folder "Story".

## GAME OVERVIEW

Space Clean up takes place in high orbit in space, the main character is part of a space clean-up company whose job is to clean up the orbit of trash. The player is tasked by the company to retrieve an old mysterious satellite in high orbit and clean up the debris surrounding it, all before an incoming satellite comes crashing against the old one.

Using free-range movement, the player can float around in space, catch, or even collide with the various debris spread around a satellite, all while trying to dodge incoming high-speed debris that orbit the earth.

The game is developed for Cardboard VR, and uses a very limited input, with single input for movement and long input for interactions. Poly count and texture size are kept low to minimize hardware impact.

The game will feature a Storyline with various objectives, dialog during gameplay as well as 2 cutscenes, one before gameplay, and another one after which changes depending on the player's actions.

## STORY

The year is 2043, due to the number of satellites in space, the orbit has become cluttered with small debris from collisions and decommissioned machines. Our protagonist, the cleaner, works for a certain space clean-up company and is tasked with retrieving an old satellite for dismantling and recycling.

But when our protagonist arrives at the scene, he is informed that another incoming satellite is on collision course to the old, and so he must act quickly. Little do they know that this is but a plot to cover up the true nature of the satellite.

While exploring the scene, the cleaner finds a black box belonging to the old satellite and decides to investigate it. When analysing the black box on the ship's computer, the cleaner finds information regarding several locations and 3 "rods", one of which seems to have been used.

When the cleaner asks their company's handler about the black box, they deny answering any question, which prompts them to contact a friend, who can further investigate the data. Said friend analyses the black box and tells the cleaner that there is an openable hatch on the lower part of the satellite and asks the cleaner to go open and look at what's inside.

When the cleaner opens the hatch, what he finds inside are 2 Rods, used for kinetic bombardment. He installs the thrusters on the satellite so that it can be moved back to the ship, and reports back to their friend, but while talking to them, the connection is cut in by the handler, who angrily tells them to stop meddling and complete the job.

In the end, the satellite is attached to the ship, and put on auto pilot by the handler. In the aftermath of the event, the information about the satellite is spread on the media, causing an uproar between various countries. As for the cleaner, his ultimate fate was to be fired by their superiors for leaking sensitive information to the outside and not following orders.

## GAMEPLAY

With full range movement freedom, the player can move around in space, their objective being to place thrusters on the satellite and clean up as many floating debris as possible.

Due to the limited number of controls available in Cardboard VR, we must make the most use out of one single button.

By doing a single press, the player will start moving in the direction they are looking, while moving, the player can look around without changing direction, then, by once again doing a single click, the player will stop where they are. In terms of movement mechanics, the player will start slowly gaining speed before reach max, and then when they want to stop, they will also slowly lose speed before coming to a full stop, keeping the movement realistic to how it works in real life for astronauts.

The player can also interact with various objects by doing a long 1 second press, looking at what they want to interact with and releasing the button. There is an interaction distance limit of 8 units.

The Main objective of the game is to retrieve a satellite by moving it back to the ship. To do this, the player must install thruster on it, and then clean up the path between it and the ship and finally activate the thrusters to move the satellite. As a Secondary objective, the player must also clean up as many debris as they can before finishing the mission. Another optional objective also exists and can be found by discovering and analysing the satellite's black box, unlocking the hidden secondary quest that leads to a different ending.

While doing their objectives, the player must keep track of their health, oxygen, and backpack space. Oxygen depletes over time and must be refuelled at the oxygen station in the ship. Backpack space fills up by picking up debris and must be placed in the ship's storage, which nets the player with money to buy upgrades. Health can be lost by being hit by stray flying debris that passes the space where the game occurs.

Debris are scattered around the area and cannot only be picked up but also be bumped against, when the player bumps against a debris, the debris will be sent flying, and will not stop until the player collects it. These moving debris can also bump against other debris, causing those to also move. They can also collide with the ship or the satellite, but those are static objects.

Debris are collected by interacting with them, then they will go to the backpack where they will occupy space, each debris having different sizes. The player then needs to go back to the spaceship to dump their backpack in the storage.

## RESOURCES:

- Health – if it reaches 0, Player dies and its game over. Can be healed at upgrade station at a price.
- Oxygen – used over time, Refiled at the oxygen station. If it reaches 0, player will start gradually losing health. Can be upgraded to have more oxygen.
- Backpack Space – gets filled up by debris, must be emptied at the ship's cargo bay. Can be upgraded to hold more debris.
- Money – money can be gained by placing debris on the cargo bay, each debris gives 10 dollars per size unit.

## UPGRADES:

Upgrades can be done at the upgrade station that exists inside the ship, Both Oxygen and backpack Space can be upgraded, but they cost money that must be acquired from debris. Health can also be recovered at this station, but the player must also pay for it. There is a maximum of 5 levels of upgrade on both upgrades.

- Back Space
- Oxygen amount

## DANGERS AND CHALLENGES

The main danger that stops the player are the debris that pass by the area, if they hit the player, they lose health. Another danger is the limited amount of oxygen which the player must manage.

Because the game is supposed to be played on a mobile device, we decided to also add a playing time limit of 30 limits in the form of an incoming satellite that is on route to collide with the old satellite.

## GAME SPACE

The game's space centres around the satellite that must be retrieved. When the game starts, the player will be close to their ship and must make way to the satellite that exists surrounded by debris.

From here, the player can also see at a distance the incoming satellite as well as the earth, the moon, and the sun.

## OBJECTS:

- Player Ship
- Satellite
- Incoming Satellite
- Debris

## HUD

The Hud show the player's health, oxygen, current backpack space, max backpack space and current objectives.

Objective are shown in the Hud as they are activated as "active objectives".

The Hud also features a pointing reticule, that changes when the player is looking at an interactable object. When the object the player is looking at is a debris, it will also show the debris' size.

On the lower half there are 2 warning that can be shown, one is that the player is outside the mission area, and the other is that the oxygen levels are low. These warning are only shown when these events happen.

Dialog will be shown on the lower part of the screen, just below the warnings.

## SOUND

The Spacesuit has its own voice function that tells the player when various things are happening:

- Backpack Full
- Backpack half full
- Backpack is emptied
- Collecting Debris
- Incoming transmission
- Oxygen Levels half full
- Oxygen Levels, Low
- Oxygen Replenished
- Suit Repaired
- Not enough Space for debris

Other Player generated sounds include:

- Gas released when moving
- Hurt sounds
- Sound of player colliding with something

## MUSIC

The game will feature an atmosphere track to give the player a feeling of being adrift in space.



## CUTSCENES

The game feature 2 cutscenes, one before the gameplay starts, named “The Debriefing”, and one after it ends, named “the Conclusion”.

## DEBRIEFING

The Debriefing starts with a narrator introducing the player to the space debris problem, showing various real-life pictures of what the narrator is talking about. This narration will be voiced by a text-to-speech.

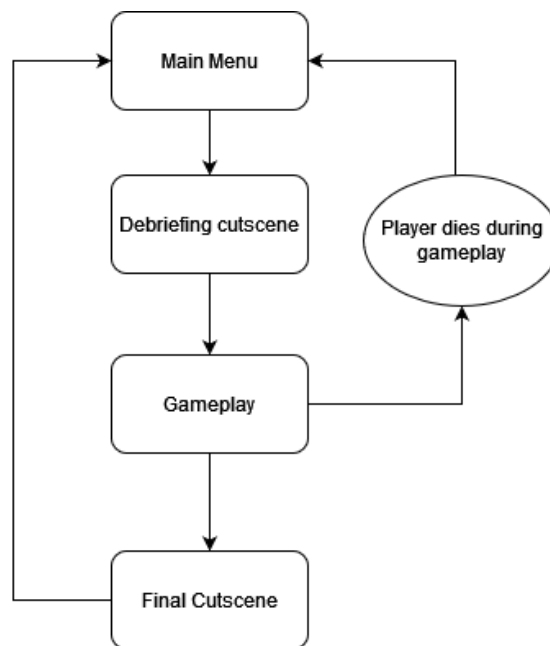
After that, 3 shadowy figures will appear and talk to the player about their assignment.

## CONCLUSION

During the conclusion, the same 3 shadowy figures from the prologue will appear to talk to the player once again, and depending on the player’s actions, what they say will change. After that, the narrator will tell the player humanity’s fate based on how many debris they cleaned.

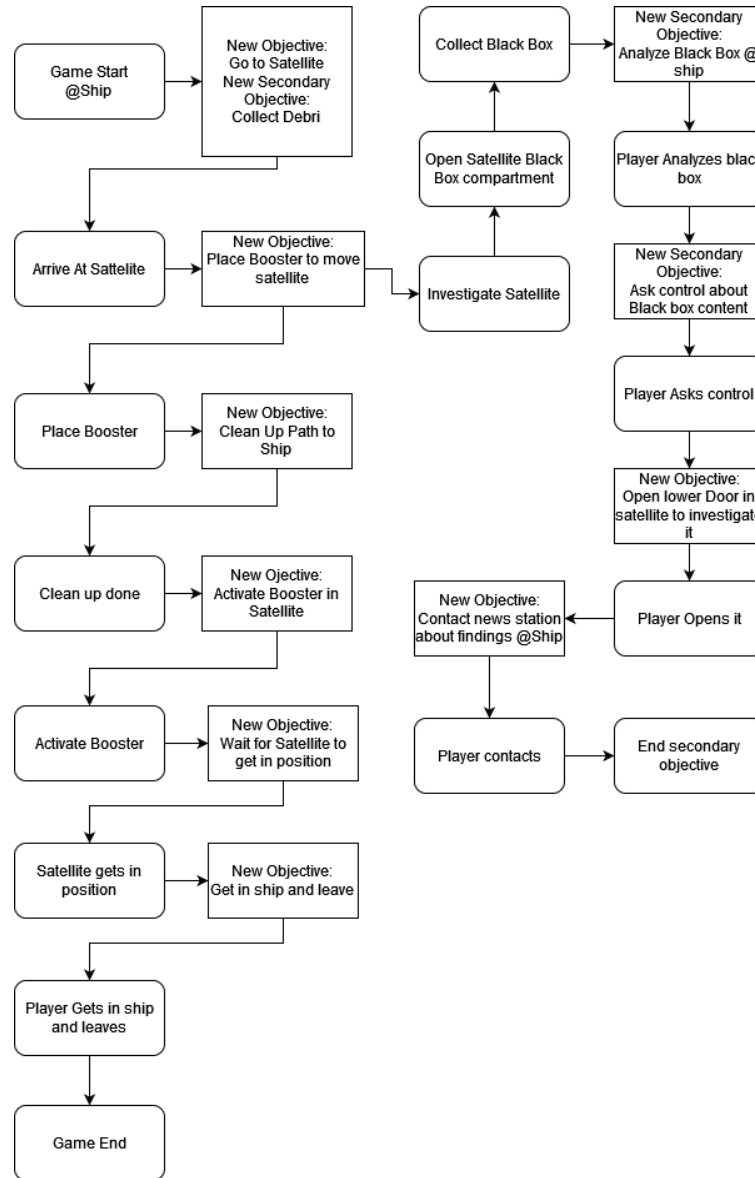
## GAME FLOWCHART

The following is the game’s flow chart.



## OBJECTIVE FLOWCHART

The following is the objective’s flowchart, note that the Blackbox is a hidden object that the player must find in order to initiate the “black box questline”.



## ENDING SCENE FLOWCHART

Depending on what the player does during the game, the ending will be different, the following is the flowchart for the ending scene.

