

# Game Idea: Code Bread

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Team *Callstack Overflow<sub>2</sub>*

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## Game Description

In space, no one can hear you complain about climate change.

Code Bread places you along with up to 3 other inexperienced space agents in charge of your own spaceship, that will aid you in fulfilling various tasks for faceless customers. From mining passing asteroids for ore to making pizza, orders will keep coming in via *the telephone*, your ship's only form of external communication. Completing these tasks will require you and your other agents to work together to fulfill these orders in a timely fashion.

Space is dangerous, and keeping your customers happy isn't the only thing you'll need to worry about. Having opted for a "slightly used, good as new" space ship due to budgetary constraints, your team will quickly discover the consequences of this action. Keeping the ship habitable and space-worthy will frequently require your attention. Life support systems were listed as unreliable, so you have instead opted to use plants to maintain a breathable atmosphere - not that having an atmosphere to breathe is always a given either. What is rapid decompression if not an extreme form of climate change? Between caring for your plants, fixing holes to maintain hull integrity and ensuring the microwave and toaster don't start another ship-wide fire, your crew's attention will be in constant demand, even ignoring the customer orders from outside.

These orders are however not to be ignored: Not only are they your only form of income, customers may also get angry if kept waiting for too long and send henchmen after you to roughen your ship up. Your crew needs the money from these orders to be able to afford a more capable spaceship, so time spent fixing avoidable damage means more time not earning money and more time spent at risk of your crew suffocating.

Fortunately you aren't entirely on your own, in addition to being able to distribute tasks between your crew, the ship is equipped with an AI to give helpful advice, motivational support and status updates. Just make sure it doesn't learn about your plans to buy a new ship, or else it might decide to become less cooperative...



### **In more technical terms:**

Code Bread will require you and your team of up to 3 other players to work together to complete tasks that are split between enabling progression and ensuring survival. Each player controls their character from a top-down perspective. Gameplay is set on a 2D plane, however visually our plan is to go 3D.

The setting of the game on a spaceship enables us to feature rapidly changing environmental conditions as a core game element, which is also how this game is associated with the topic of climate change.

The baseline plan is to simulate air pressure, flow and mixing, which will determine which areas players can and can't breathe in. Air flow would also be able to move around lighter physics objects. The ship is able to generate unbreathable air that can be converted into breathable air via plants around the ship. Hull breaches will allow air to leak out into space, with doors between rooms in the ship preventing a single breach from sucking all the air away.

The environmental simulation could then be expanded upon by allowing small objects on the ship to catch fire, and spread this fire to other nearby burnable objects on the ship. Fire would tie into the air mixing simulation by quickly converting oxygen in its vicinity to unbreathable air. If there is not enough oxygen nearby to keep a fire burning, it will naturally get extinguished, though it would be better for players to extinguish the fires manually before that happens.

Another environmental factor is artificial gravity. When enabled, players would have much tighter control over their characters, directly modifying their velocity rather than applying forces to them. Air flow could also tie into this system, with objects being more strongly affected by it in zero gravity.

The ultimate form of the environmental simulation would include power as the final factor. Power could be required to operate most stations, enable artificial gravity and provide the lighting plants on the ship need to grow, converting unbreathable air to Oxygen and generating certain resources in the process. A generator on the ship would generate power, and spread it to the rooms across the ship via individual power lines. All of these elements have the potential to break and require repairs.



The core gameplay consists of two types of actions:

On the one hand players will need to operate various stations, such as ship turrets/the tractor beam, crafting & baking station, generator restarting hamster wheel or telephone. On the other, players will need to carry around equipment for repairing the ship, resources for operating the crafting station or turrets, plants for generating oxygen where needed and completed customer orders to the teleporter room to be delivered. Bumping into one another will cause players to drop the object they were holding (only one object can be carried at a time!). If artificial gravity is offline, this could send objects flying, and in the case of pizza degrade the quality of the object being carried.

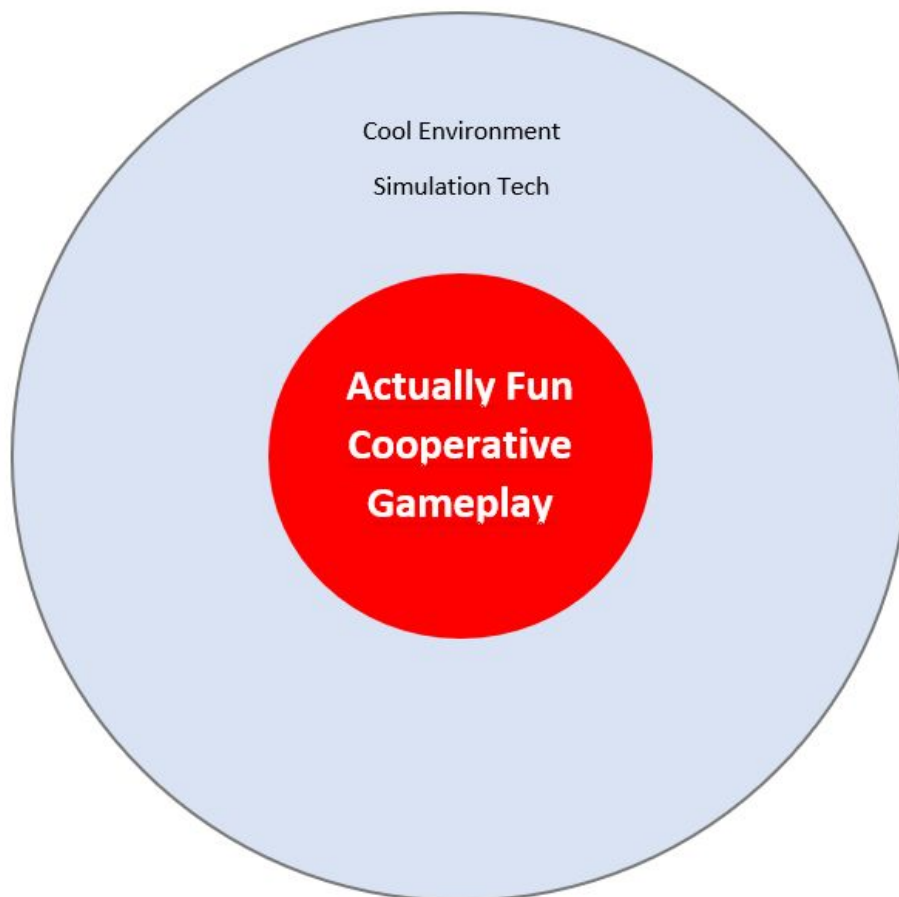
The overall goal of the game is to complete enough customer orders to be able to afford a better spaceship. This could then be presented as a new level with a new room layout, new stations and goals and ultimately new challenges. What is preventing your crew from reaching this goal is the need to keep your spaceship habitable. Characters can only survive in sections of the ship without Oxygen for a short period of time before falling unconscious, requiring other players to revive them in order to continue playing. Air- and object sucking hull breaches and Oxygen consuming fires will need to be taken care of to keep breathable air inside the ship, while plant management will determine the parts of the ship where unbreathable air (if available) is converted to Oxygen.

Overall the goal is to deliver a fun party game where players need to collaborate to balance out pursuing their dreams of becoming rich while keeping changing environmental conditions in check.

## Technical Achievement

- Environment simulation
  - simulate the propagation of air (Split into the categories O2 and CO2) via a sort of fluid simulation
  - interactions between objects (e.g. fire)
  - air flow moving objects around in zero gravity
  - powered systems
  - environmental state based sound mixing
- Online co-op

## "Big Idea" Bullseye



## Development Schedule and Tasks

### Layered Task Breakdown

#### Functional Minimum

- Basic environment simulation (O<sub>2</sub>/CO<sub>2</sub>, air flow)
  - Plants/life system as producers
  - Players as consumers
- Spaceship hull breaches and repair mechanics => air pressure

#### Low Target

- Co-Op of any kind
  - Examples:
    - ammunition needs to be carried to the gunner
    - repair task distribution
    - the players maintain the ship
  - Revive other players when they fall unconscious due to a lack of oxygen
- *The Telephone*
  - Do missions, get paid (e.g. in order to buy a better spaceship)
- Asteroid shooting minigame
- Resource gathering from asteroids and plants
- Crafting
  - ammo
  - repair equipment
  - pizza ingredients
- Oven for baking pizza

#### Desired Target

- Online Co-Op
- Med-bay or cloning room to replace revival system
- Fire, Fire propagation & interaction with the environment, fire suppression mechanics
- Advanced environment simulation: electricity, artificial gravity (that can get disabled)
- Ultimate environment simulation: temperature
- Explaining ship AI (tutorial, ship status updates, story?)

#### High Target

- Captain's chair (advanced ship overview)
- End-game statistics

- Environment based audio mixing (having things sound different when in a pressurized room compared to an unpressurized room).
- Hunger system
- Attacks from other ships if their orders via *the telephone* aren't completed/are completed poorly

#### Extras

- Needy ship AI
  - Enforces players to keep the ship tidy, otherwise it will temporarily disable random systems
  - Comments on the current situation
  - Defend the ship from hacking attacks
  - AI temporarily takes control of the spaceship
- Multiple levels
- balancing for different numbers of players
- trading

## Timeline

See *timeline.pdf* on our Wiki.

## Milestones & Task Distribution

### I. Game idea pitch

Task	Assigned to	Actual hours
Brainstorming	All	5
Project document & presentation	All	6

### II. Game prototype

Basic air simulation completed, character control, level design with basic objects, Asteroid-ship interactions, repairing damage, better level boundary assets

Task	Description	Assigned to	Planned hours	Actual hours
Physical Prototype		All	10	
Project document & presentation		All	6	



### III. Interim report

Task	Description	Assigned to	Planned hours	Actual hours
Basic networking	object/game state synchronization	Max & Felix	20	
Level design	simple space ship layout	Mark	4	
Basic air simulation	real time implementation of eulerian fluid solver	Max	30	
Resource gathering & crafting system	<ul style="list-style-type: none"> <li>- turret minigame</li> <li>- tractor beam</li> <li>- turn resources into ingredients/tools</li> </ul>	Felix	15	
Basic environment interactions & character control	<ul style="list-style-type: none"> <li>- watering plants</li> <li>- player-player collision</li> <li>- carrying objects</li> <li>- cooking</li> <li>- movement</li> <li>- repairing</li> <li>- player death/revival</li> </ul>	Max & Mini	20	
Simple system design	<p>Elements can influence others by, e.g., heat/CO2&amp;O2 production and requirements:</p> <ul style="list-style-type: none"> <li>- fire: O2-&gt;CO2</li> <li>- plants: CO2-&gt;O2</li> <li>- hull breaches</li> </ul>	Felix	15	
Assets	<ul style="list-style-type: none"> <li>- resource gathering</li> <li>- player models</li> <li>- interior design</li> </ul>	Mark	30	
Shaders	<ul style="list-style-type: none"> <li>- O2/CO2 concentration</li> <li>- air flow</li> <li>- fluid visuals</li> <li>- tractor beam</li> </ul>	Mini	30	

	- highlight player interactions			
Project document & presentation		All	8	

#### IV. Alpha release

Task	Description	Assigned to	Planned hours	Planned hours
Player revival system	cloning station (DNA needed) instead of first aid	Mini	3	
Game ending	timer/collecting money	Felix	3	
Temperature simulation	e.g.: <ul style="list-style-type: none"> <li>- fire/oven generates heat</li> <li>- plants require a certain range of temperature</li> <li>- hull breaches reduce temperature</li> </ul>	Max	12	
Gravity/electricity simulation	lose gravity randomly or on hull breaches -> air flow moves objects	Max	15	
Assets	<ul style="list-style-type: none"> <li>- further interior objects</li> <li>- outer objects, such as customers</li> <li>- sound</li> <li>- effects (e.g. fire, O2 from plants)</li> </ul>	Mark & Mini	15	
UI design/menus		Mark	4	
Fire system	<ul style="list-style-type: none"> <li>- random fires appearing</li> </ul>	Felix		

	<ul style="list-style-type: none"> <li>- forgot oven -&gt; fire</li> <li>- fire extinguisher</li> </ul>			
Polished networking	e.g.: <ul style="list-style-type: none"> <li>- custom messages</li> <li>- client-sided interpolation</li> </ul>	Max & Felix	15	
Environment visualization	Space (Background with stars -> shader)	Mini	7	
Mission	pizzas with various ingredients for customers	Mini	10	
Level design	refinements	Mark	5	
Project document & presentation		All	8	

## V. Playtesting

Task	Description	Assigned to	Planned hours	Actual hours
Bug fixing		All	$\infty$	
Evaluation of feedback		All	5	
Make changes based on feedback		All	10	
Captain's chair	overview over the information of the ship	Max	6	
Hunger system	necessary to eat at given times (together)	Mini	5	
End-game statistics	e.g.: <ul style="list-style-type: none"> <li>- scoresystem</li> <li>- number of hull breaches</li> <li>- money earned</li> </ul>	Felix	$2 * \square * r$	

Environment based audio mixing	e.g. different audio when in pressurized room vs unpressurized	Mark	6	
Attacks from other ships	only if the completed orders are either missing or incomplete	Mini	2	
Project document & presentation		All	5	

## VI. Public presentation and conclusion

Task	Description	Assigned to	Planned hours	Actual hours
Bug fixing		All	$\infty$	
Trailer		All	4	
Needy ship AI		All	12	
Project document & presentation		All	10	

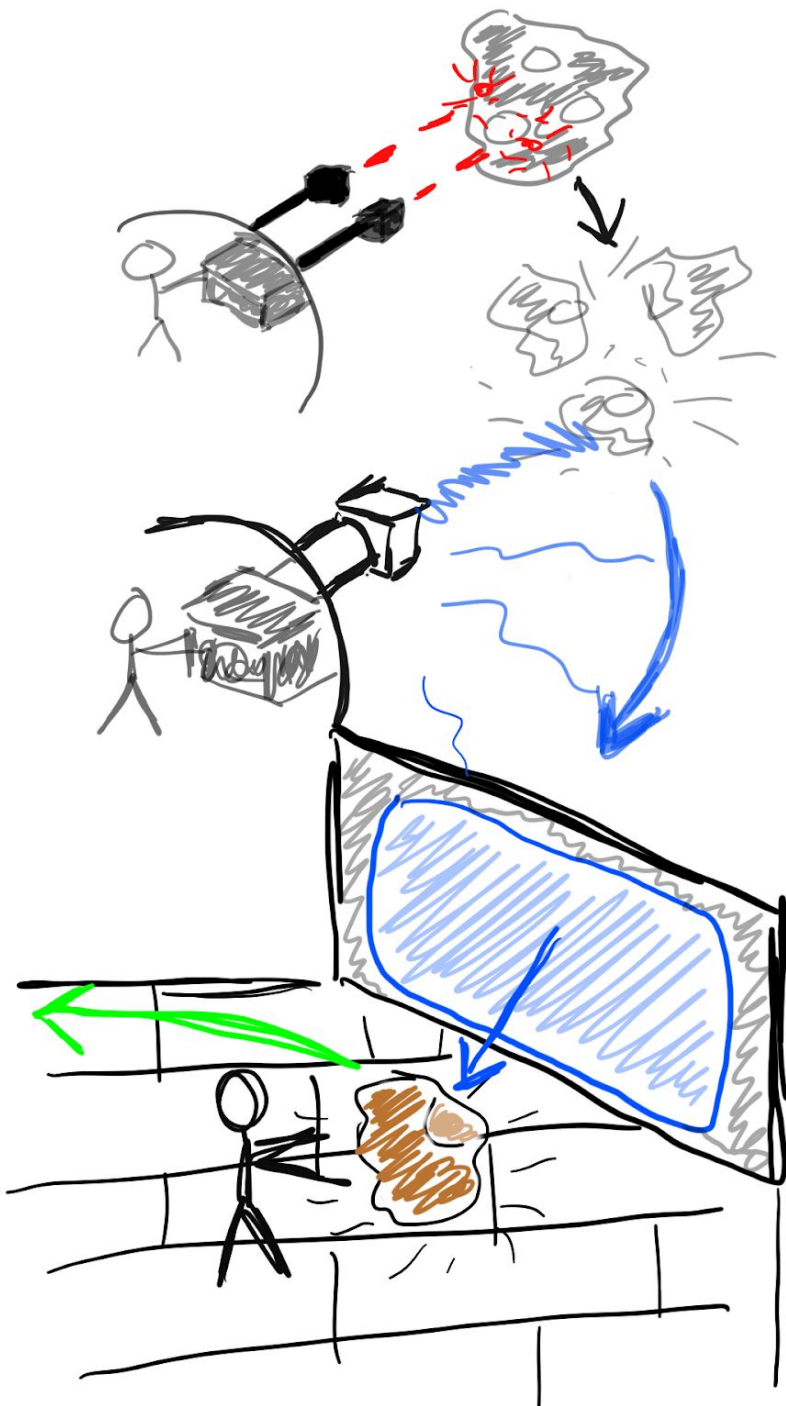
## Assessment

As a party game, the game will need to present players with enough challenges simultaneously to cause some chaos, while simultaneously providing them with all the information they need to tackle these challenges.

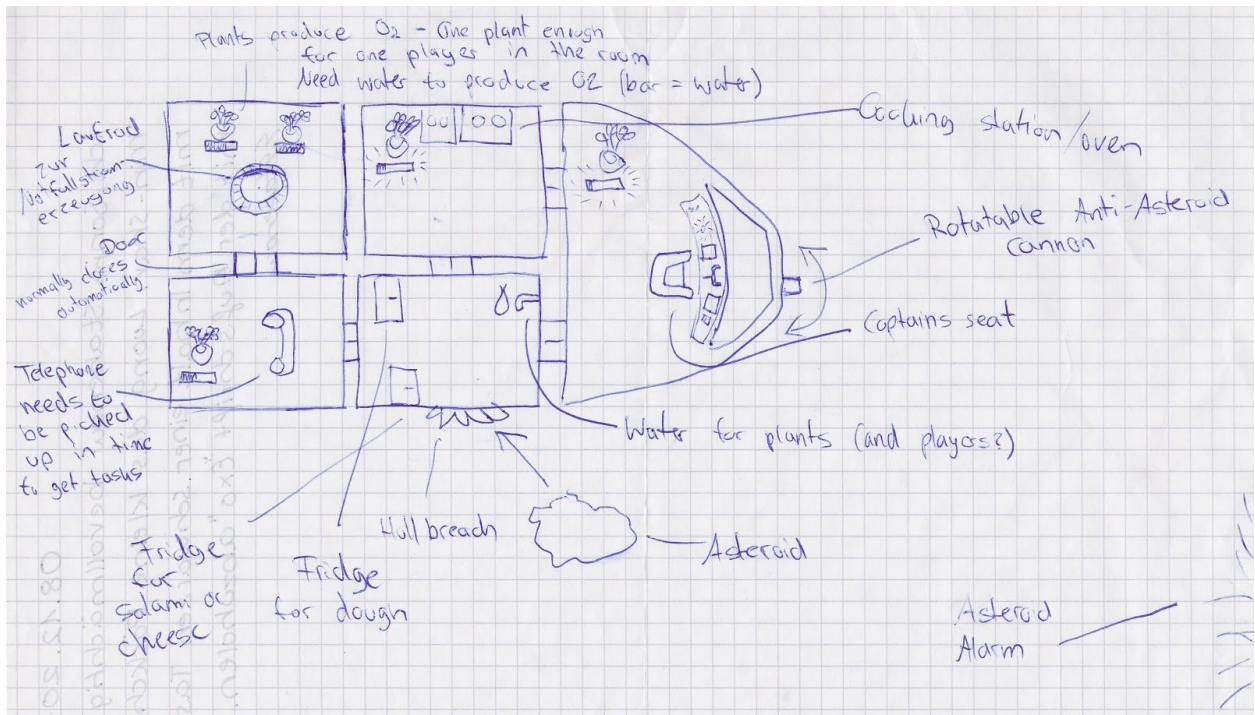
Ideally we want to have a team of players shouting ridiculous orders each other like “Target the cheese asteroids, I’ll go for the hamster wheel!”, “Pick up the phone before another wave of thugs comes after us” or “Put out the toaster and fix the breach so I can get the pizza to the teleporter!”. For this to happen, the game will have to be more than just a tech demo and actually be engaging to play. If players have nothing to do, do not find the world and tasks entertaining or get frustrated by the way systems (like the environment simulation) are presented to them, it will be hard to achieve such an outcome.

## Sketches

Resource gathering:



Rooms with different functions:



Air system and impact on player character:

