

# Sail

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# 1 Game Overview

## 1.1 Philosophy

### 1.1.1 Freedom of Choice

The player should feel like they are free to pursue whatever actions they choose. This freedom is a central theme of this game's design.

### 1.1.2 Connection to Story

The player should feel that the actions they choose have an impact on the game world. The game world's changes, helped along by the player, should be fed back to the player in story form to impress upon them the dynamic nature of the world.

### **1.1.3 Immersiveness**

The player should feel that the game world is a plausible environment. Suspension of disbelief should be achieved by having no unexplained impossibilities.

### **1.1.4 Emotional Investment in Game Characters**

The player should feel connected to the game's characters. This is achieved by giving characters unique appearance, skills, and personalities that can never be exactly replaced.

## **1.2 Common Questions**

### **1.2.1 What is the game?**

The game is a 3D sailing and naval combat game. The player character is the captain of the ship and plays from the first person perspective. Realism is used to increase immersiveness. The game is set in the Caribbean in the 1600s, the golden age of piracy. The game is open ended and non-linear: the player is able to choose their allegiances to the various governments and are free to pursue roles as a cargo shippers, pirate hunters, privateers, pirates, and more. The setting is somewhat realistic in terms of the countries involved, but in the background wars and alliances will play out in various ways to increase replayability and to make the player feel like they're making a difference.

### **1.2.2 What are the goals of the game?**

- To create a fairly realistic sailing simulation that can be played by anyone regardless of sailing knowledge
- To create an open-ended game world with a story that evolves from dynamically generated changes
- To create dynamically generated characters to which players can emotionally relate

### **1.2.3 Why create this game?**

The swashbuckling life of a privateer is a relatively common cultural fantasy, yet few games have attempted to replicate this fantasy in an immersive way. Most sailing games set in the 1600s are from a detached perspective from a floating camera set far away from the ship. The first-person perspective as a sailing ship captain allows for first-person immersiveness and realism. The accessibility of the game is retained, as the first officer and crew see to the details, allowing

the player to make higher level decisions that require no specific expertise. The many options available to a ship captain in the time and place the game is set allow for maximum freedom of choice by the player. In addition, turbulent political scene encompassing many nations sets the stage for a believably dynamic game world.

#### **1.2.4 Where does the game take place?**

The game is set in the islands of the Caribbean during the 1600s.

#### **1.2.5 What do I control?**

The player directly controls, from the first person perspective, their avatar. The player is the captain of a sailing vessel. Indirectly, the player is in charge of everyone on their ship.

#### **1.2.6 What is the main focus?**

The player is able to choose their own goals, but in general these are expected to center around fame, power, and wealth.

#### **1.2.7 What's different?**

The first person perspective allows for immersion not yet seen in sailing games. The game's story is generated dynamically and presented to the player via news and gossip, connecting the player to the world in a way that surpasses other open-ended games.

## **2 Feature Set**

### **2.1 General Features**

- Huge 1000km by 1000km game world
- First-person, 3D graphics
- Immersive 17th century setting

## 2.2 Gameplay

- Open-ended: the player sets their own goals
- Connected: the player's actions affect the game world, and vice versa
- Accessible: the player is the captain, and makes the high level decisions
- Varied: because the player controls their experience, the gameplay ranges from fast paced naval combat to ferrying cargo
- Customizable: the player can customize their ship, and even capture or buy new ships

## 2.3 Multiplayer Features

- Up to 5 players
- Play can be cooperative or competitive
- Game world is persistent across sessions on the same server

## 2.4 Editor

- Built-in terrain editor
- Built-in ship editor
- Tweak engine parameters in-game

# 3 The Game World

## 3.1 Overview

The game is set in the 17th century Caribbean. Portugese and Spanish ships began claiming territories at the beginning of the century. These colonies brought in gold and attracted other European powers, most significantly England, the Dutch Netherlands, and France. Colonial rivalries made the Caribbean a venue for European wars for the rest of the century. Because the regular navies of these governments had a weak presence, privateers were contracted to carry out attacks against enemy cargo ships. This era is known as the “Golden Age of Piracy” in the Caribbean.



Figure 1: Houses at Port Royale

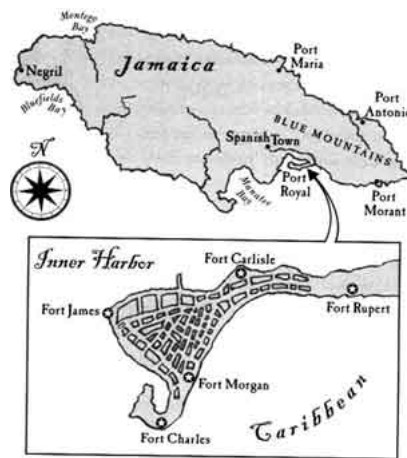


Figure 2: Map of Port Royale

### 3.2 Key Locations

The various island ports are key locations for the player to repair, take on new crew, buy and sell goods, buy ship upgrades, and catch up on news. The following ports are in the game:

#### 3.2.1 St. Martin

#### 3.2.2 St. Eustatius

#### 3.2.3 Curacao

#### 3.2.4 Port Royale

Jamaica. Known as a center for pirates. “Richest and wickedest” city in the Americas.





Figure 3: This fort was built in Havana in 1589 to protect the city from pirates

### **3.2.5 Rio de La Hacha**

### **3.2.6 Gibraltar**

### **3.2.7 Barbados**

### **3.2.8 New Providence**

### **3.2.9 Havana**

This was one of Spain's first major ports. Spain's Silver Fleet (which collected silver) sailed through different parts of Venezuela and Mexico and landed in Havana. Pirates were known to set themselves up in the islands of the Florida Keys and wait for a chance to attack the Silver Fleet.

### **3.2.10 Tortuga**

Divided into French and English territory. Formerly Spanish. Main base for buccaneers. Due to constant abandonment and changes in power, it became a major spot for English, French, and Dutch pirates. In 1645 the French governor

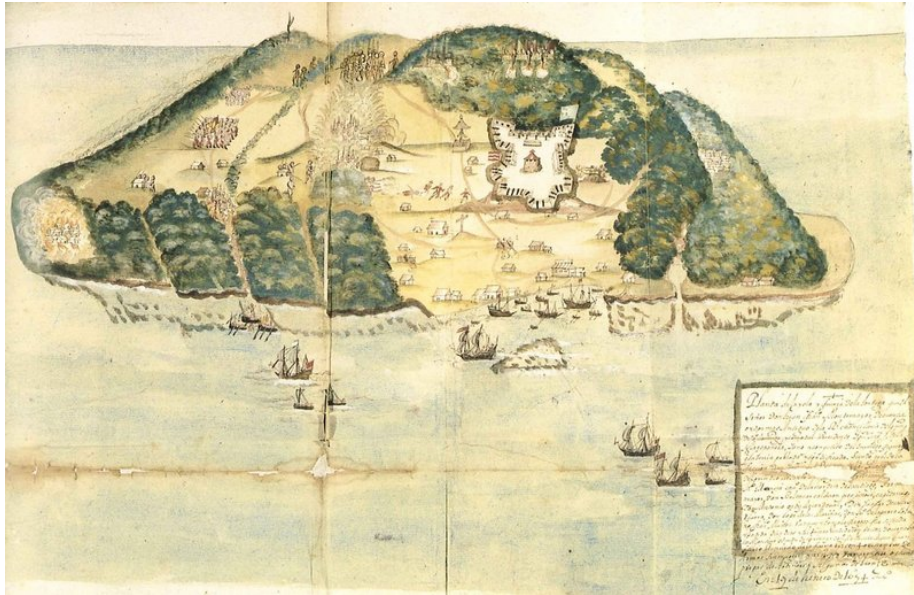


Figure 4: Map of Tortuga

imported 1,450 prostitutes in an attempt to calm the pirates down and regain control. Tortuga was heavily fortified.

### 3.3 Travel

Travel is accomplished via the player's ship. The player, in first person perspective, orders their crew to sail out of port. Once en route, the player can choose to retire to their cabin and will be woken by the crew when the destination is reached or some other event has occurred.

### 3.4 Ships

Ships are constructed from a hull and one or more masts. These attributes cannot be changed once a ship is constructed. The attributes that can change include the number and types of cannon. The derived attributes include weight.

#### 3.4.1 Hull types

The game contains the following hull types, in general order of size:

- Pinnace

- Sloop
- Fluyt
- Brig
- Merchantman
- Galleon
- Frigate
- Ship of the line

### **3.4.2 Mast types**

Each hull type has one or more masts, which can be the following types:

- Square rigged
- Fore-and-aft rigged

## **3.5 Weapons**

### **3.5.1 Naval Cannon**

The cannons in the game are defined by the weight of the shot they fire:

- 6-pounders
- 8-pounders
- 9-pounders
- 12-pounders
- 18-pounders
- 24-pounders
- 32-pounders

## **3.6 Supplies**

### **3.7 Scale**

The scale is realistic, and covers much of the Caribbean.

### **3.8 Weather**

A full range of weather can be expected in the Caribbean. High winds can damage a ship. Rough seas can slow the voyage. Rain and fog affect visibility. Little or no wind brings the journey to a stop.

### **3.9 Day and Night**

A full day/night cycle is supported and darkness reduces visibility depending on cloud cover.

### **3.10 Time**

Time runs at a realistic speed when in the first person perspective. When the player wishes to accelerate time, they have their player character go to their cabin and use the bed. Before this, the player can tell their crew what conditions they wish to be woken for: a certain time, a certain date, or for any events such as encountering bad weather, another ship, or when arriving at the destination. When the player character is awoken, many game-time weeks could have passed, but to the player it happens in an instant.

## **4 Game Engine**

### **4.1 Rendering System**

The rendering system goal is photo-realism. The engine uses the OpenGL API for 3D graphics, along with GLSL for programmable shader effects (no license is required to use OpenGL or GLSL). Water and land rendering are handled with level-of-detail reducing algorithms to ensure speedy performance. Characters are rendered using skeletal animation with the Cal3D library (GNU LGPL license).

### **4.2 Camera**

The camera is entirely first person. The camera is attached to the eyes of the player character model and will bounce slightly when the player character's walk animation is played. The player will be able to see their character's body if they look down.

### **4.3 Sound**

The sound engine is implemented on top of the SDL sound API (GNU LGPL licence). Sound mixing and effects are software based but highly optimized for speedy performance. The sound processing is run in a separate thread to increase performance on multiple-core computers. Sound engine features include support for WAVE and OGG formats (libvorbis is used for OGG playback, which has a BSD-like license), gain falloff over distance, 3D stereo panning, and high quality pitch shifting.

### **4.4 Physics**

The physics engine utilizes the Open Dynamics Engine (BSD license). The physics engine features advanced joint types and integrated collision detection with friction.

### **4.5 Artificial Intelligence**

Artificial intelligence is implemented with a hierarchical finite state machine. AI behaviors are arranged into a ranked hierarchy and at each level the behaviors are checked in order their ranking to see if the behavior is appropriate. If it is, the behavior is run.

### **4.6 Other**

The engine's unit testing framework is QuickTest by Tyler Streeter (GNU LGPL license).

## **5 The World Layout**

### **5.1 Overview**

The layout of the islands and ports world is based on the real Caribbean in the 17th century.

## **6 Game Characters**

### **6.1 Overview**

Though the individual characters are randomly generated, there are several general classes of characters the player encounters.

## 6.2 Random Generation

The game generates characters randomly. This is done by starting with a character class. The appearance of the character is based on randomization of the following elements, appropriate to the character class:

- Facial shape
- Age
- Skin color
- Markings (such as tattoos or scars)
- Height
- Weight
- Injuries (such as a limp, missing limb, or eye patch)
- Clothing
- Accessories (such as jewelry)

The skill set of the character is generated randomly from the following characteristics:

- Gunnery
- Sail-work skill
- Running speed
- Stamina
- Health points
- Combat skill
- Medical skill

The personality of the character is generated randomly from the following characteristics:

- Enthusiasm
- Bravery
- Temperment
- Education

### 6.3 Player Character Generation

The player character generation allows the player to choose their appearance:

- Facial shape
- Skin color
- Markings (such as tattoos or scars)
- Height
- Weight
- Injuries (such as a limp, missing limb, or eye patch)
- Clothing
- Accessories (such as jewelry)

## 7 User Interface

### 7.1 Overview

The game is controlled primarily through the first person perspective. In this perspective, the user interface is the standard FPS interface: directional movement keys on the keyboard, directional look via mouse movement, and actions via mouse clicks.

When detailed interaction with objects is required, the interface is a standard mouse point and click interface.

### 7.2 Giving Orders

The orders interface starts out as a small overlay at the bottom of the screen showing each officer (Figure 5). Number keys are bound to officers. Only officers that are within earshot are shown. After the player presses the number key associated with an officer, the interface expands to show order categories for that officer as well as their current activity (Figure 6). Pressing zero will order them to stop their current activity. Selecting a category will again grow the interface and show the orders available (Figure 7).

Pressing the tilde key at any time will go back to the previous level of the order interface. If no officer is selected, tilde toggles the officer order interface on and off.



Figure 5: No officer selected

Multiple offices can be served by the same person. They will show up more than once on the order menu, but can obviously only be doing one thing at a time.

Some orders will be greyed out if they are not applicable. In this case, the player can press the button anyway to get an explanation of why the order isn't applicable.

### 7.2.1 List of Orders

#### 1. First Officer

- (a) Fetch officer... Order the first officer to fetch another officer from below decks and bring him to you.
  - i. Quartermaster
  - ii. Boatswain
  - iii. Gunner
  - iv. Master at arms
  - v. Carpenter
  - vi. Surgeon





Figure 6: Selecting an order category



Figure 7: Selecting an order

- (b) Report. The first officer gives a brief overview of the status of the boat. If this is the first time you've asked for a report after coming on deck, the first officer will also relate to you anything important that happened while you were away.
- (c) Command captured ship... Order the first officer to go onto a captured ship and command it.
  - i. Ship 1
  - ii. Ship 2
- (d) Move ship to... Order the first officer to move the ship. The first officer will then issue further orders as necessary to change speed or course until the ship has been moved as you ordered.
  - i. Follow ship... Follow the selected ship at a distance of 200 meters.
    - A. Ship 1
    - B. Ship 2
  - ii. Destination. Sail all the way to the active destination. If no destination is selected the first officer will hold fast until a course has been plotted.
  - iii. Into port / Out of port.
  - iv. Turn to starboard.
  - v. Turn to port.
- (e) Fetch me if... Set the parameters under which the first officer should fetch the player. These will take effect anytime the player is below decks.
- (f) Determine exact speed. Orders the first officer to measure the ship's current speed in knots.
- (g) Determine exact depth. Orders the first officer to measure the depth of the water in fathoms.

## 2. Quatermaster

- (a) Transfer supplies from... Order the quatermaster to transfer supplies from one ship to another.
  - i. Ship 1
  - ii. Ship 2
- (b) Monetary status
- (c) Supply status
  - i. Cannon
  - ii. Heavy ammunition
  - iii. Wood
  - iv. Cloth

- v. Firearms
- vi. Small arms ammunition
- vii. Food
- viii. Water

3. Boatswain (pronounced “boh-z-uhn”)

- (a) Raise anchor / Lower anchor.
- (b) Full sail. This choice is greyed out if all sails are already full up.
- (c) Raise sails. This choice is greyed out if all sails are already full up.
- (d) Lower sails. This choice is greyed out if all sails are already down.
- (e) Douse all sails. This choice is greyed out if all sails are already down.

4. Gunner

- (a) Battle stations / Stand down
- (b) Roll out the cannon / Roll in the cannon. This will open the cannon ports and ready the cannon to fire. This option is not displayed until the gunnery crew is ordered to battle stations.
  - i. Starboard
  - ii. Port
  - iii. Front
- (c) Fire. Order the roll out cannon to fire.
- (d) Fire at will / Hold fire. The rolled out cannon will continue to fire automatically if there is a target until told to hold fire.
- (e) Aim for...
  - i. Waterline
  - ii. Mast
  - iii. Crew
  - iv. Sails
  - v. Guns
- (f) Load ammo...
  - i. Ball
  - ii. Knippel
  - iii. Grape

5. Master-at-arms

- (a) Beat to arms / Stand down. Order the master-at-arms to deploy troops to the deck in preparation for close quarters combat.

- (b) Attack / Defend. Once troops are on deck they will defend the ship by default. If given the attack order they will attempt to board an enemy ship if given the opportunity.

#### 6. Carpenter

- (a) Damage report.
- (b) Repair... Items will only be shown for repair if they are damaged and supplies exist.
  - i. Hull
  - ii. Mast
  - iii. Sails

#### 7. Surgeon

- (a) Casualty report.
- (b) Attend to... Officers will only be shown for healing if they are injured.
  - i. First mate
  - ii. Quartermaster
  - iii. Boatswain
  - iv. Gunner
  - v. Master-at-arms
  - vi. Carpenter
  - vii. Surgeon

### 7.3 In Port

When in port, the view changes to a stationary camera which shows the port as well as the services available at that port (Figure 8). The possible services are:

- Shipwright. Here the player can repair ships as well as buy and sell ships.
- Market. Here the player can buy and sell supplies and cargo.
- Inn. Here the player can accelerate time.
- Tavern. Here the player can hire new crewmembers. Jobs are also sometimes to be found at the tavern.
- Weaponsmith. Here the player can buy and sell firearms, artillery, and ammunition.
- Town Hall. Here the player can catch up on news and look for jobs.



Figure 8: In Port Interface

## **8 Graphics**

### **8.1 Overview**

### **8.2 Characters**

### **8.3 Ships**

The ship graphics are a combination of hull, masts, sails, rigging, and cannons. These graphical elements are drawn from a pool of pre-modelled elements and their placement is controlled by the attributes of the ship to be rendered.

### **8.4 Water**

### **8.5 Land**

## **9 Music**

### **9.1 Overview**

Music is orchestral and, to an extent, the cueing is dynamic. Various themes will fade between each other depending on the situation.

## **10 Sound Effects**

### **10.1 Overview**

## **11 Single Player Game**

### **11.1 Overview**

The single player game is open-ended, allowing the player to choose their own goals. Various missions, of varying degrees of specificity, are presented to the player. The player can pass through various paths of advancement, which generally mean more fame, more wealth, and more power.

### **11.2 Story**

The player starts in port with a small fortune with which to buy their initial ship and crew.

### **11.3 Missions**

There are various missions the player can undertake for governments or organizations. The player also has the option of playing without a mission and being completely self-directed.

### **11.4 Crew Positions**

There are several key crew positions that must be filled, although one crewmember can serve multiple posts on a small ship.

#### **11.4.1 First Mate**

The first mate is on duty whenever the captain is on duty. As the Captain's right hand man, it's the first mate's responsibility to carry out the Captain's orders. The first mate also stands watch and is in command when the Captain isn't on deck.

#### **11.4.2 Boatswain**

The Boatswain is in charge of all deck activities, including weighing and dropping anchor, and the handling of the sails.

#### **11.4.3 Master-at-arms**

The master-at-arms is responsible for coordinating close combat.

#### **11.4.4 Gunner**

The gunner is the leader of the ship's artillery. The gunner oversees the four to six men crews required to take the gun through the steps of loading, aiming, firing, resetting, and swabbing for the next load. The gunner also helps to coordinate the timing and accuracy of the individual crews.

#### **11.4.5 Quatermaster**

The quartermaster is responsible for handling supplies such as food, clothing, and other ship-board supplies.

#### **11.4.6 Carpenter**

The carpenter is responsible for the maintenance and repair of the hull, masts and yards. The carpenter is also responsible for plugging leaks.



#### **11.4.7 Surgeon**

The surgeon performs medical treatment to return wounded crew members back to health.

### **11.5 Sailing**

Although in real life sailing can be quite complicated, the game makes it accessible. As the captain, you give the general orders to your first officer, who takes care of orchestrating all of the individual tasks that must be accomplished.

### **11.6 Combat**

The game features ship-to-ship cannon battles as well as hand-to-hand battles associated with boarding another ship or being boarded.

### **11.7 Mortality**

A non-player character crewmember can be knocked unconscious as a result of combat or other situations (such as rough seas or an accident). If the character isn't swept into the ocean or their body completely destroyed, the player can decide to spend precious medical supplies to heal the character. The proficiency of the ship's surgeon determines how many medical supplies are consumed. Depending on the severity of the injury the character may end up with amputated limbs, a limp, or simply a scar. There will also be a certain amount of recovery time during which the character is unable to perform their duties. This ability to heal hurt characters comes in handy since characters gain experience through serving on your ship, and replacing a dead sailor with a new one will impact your ship's operation to a degree depending on the importance of their position.

A player character can also be knocked unconscious as a result of combat or other situations. As long as the player character remains on their ship, they will be revived at the end of the battle by their surgeon. If the player character is knocked off of the ship, they will be rescued or captured depending on the presence of other friendly or enemy ships. If the player character is on another ship, they will be rescued or captured depending on whether or not the other ship is friendly or an enemy. If captured, the player loses their ship and is taken to an enemy port. The player can then buy a small ship to return to a friendly port and buy their way back to being captain on their original ship. If rescued, the player loses their ship and is taken to a friendly port, where they can buy their way back to being captain on their original ship. The fee for buying their way back to captain depends on how long the senior crewmember of the ship has served with the player (if they have served for a long time, the player can be captain again for free).

If the player's ship is destroyed, they will be knocked into the water to be rescued or captured. The player can buy a new ship at port. If other crewmembers survived, they will be available to serve on the new ship at a reduced fee corresponding to how long they have served with the player (if they have served for a long time, they will serve with the player again for free).

## **11.8 Hours of Gameplay**

Because the gameplay is open-ended, the only limit on the game time is to ensure the player's lifespan doesn't exceed 60 years of age.

# **12 Multi-player Game**

## **12.1 Overview**

## **12.2 Max Players**

## **12.3 Servers**

## **12.4 Customization**

## **12.5 Persistence**

## **12.6 Saving and Loading**

# **13 World Editing**

## **13.1 Overview**

# **14 Appendix**