## **2D Sailing Race Game — Web App Spec**

### **Purpose**

Create a web-based multiplayer 2D sailing game simulating realistic sailing tactics and dynamics for training, fun, and racing. Target audience includes high school sailors and casual racers.

### **Visual Design**

* **Very simple 2D graphics from birds eye view**
* **Boats**:
  + Shape: Simple triangle with a slight curved hull.
  + Sail: Single animated sail that shifts side-to-side depending on wind direction and tack.
  + Boat has small username under it
* **Course Elements**:
  + **Start Line**: Defined by two square buoys with a dotted line between. Visible on screen.
  + **Marks**: Circular buoys for rounding. Placed at course extremities (top and near-bottom of screen).

### **User Features**

* **Web App Login**
  + Email/password or OAuth (Google) sign-in.
* **Profile Page (not required to play)**
  + Upload a profile picture.
  + Username.
  + Short text bio (max 280 characters).
  + Display: User stats (wins, races completed, average finish).
  + Custom URL input (optional): User can add a personal link.
* **Subscription (placeholder not required for first version)**
  + Stripe integration.
  + Free 4-day trial, then $5/month recurring.
  + Payment wall enforced before gameplay resumes post-trial.

### **Game Dynamics & Environment**

* **Wind**
  + Comes from **top of screen** (0° angle).
  + Wind strength varies per cell (wind cells = circular looking patches of pixels of darker color the stronger the wind strength).
  + Wind direction shifts ±10° at intervals (randomly or on a timer).
  + Visual indicator (arrows/streamlines) for wind direction and strength.
* **Boat speed**
  + Boats move at 5 knots base speed. Speed increases or decreases by 2 knots depending on the strength of the wind in their pixel
* **Current**
  + Optional. Can come from any direction. Max of 3 knots of current
  + Affects boat movement vector.
  + Display with arrow vector
* **Collisions**
  + Boats can bump—small bounce animation so they don't get stuck, no hard collision.
  + No fouling or penalties (MVP).
  + Same for boats colliding with marks

### **Sailing Mechanics**

* **Tacking**
  + Upwind requires tacking at ~30° angles from the wind direction.
  + Boat must alternate tacks (port/starboard) to make progress.
* **Sail Position Logic**
  + **Upwind (< 90° to wind)**:  
    Sail is trimmed to farthest aft corner of boat from the wind.
    - Tacks switch the sail from side to side.
  + **Beam Reach (90°–120°)**:  
    Sail at ~30° to the wind direction.
  + **Downwind (> 120°)**:  
    Sail is perpendicular to the wind (sail out, "wing-on-wing" not needed for MVP).
  + Optional: Basic UI sail trim indicator.
* **Sail turbulence zone**
  + Spans from just below the sail to 4 boat lengths below the sail straight down from wind vector. The wind speed is 1 knot less in this zone

### **Race Rules & Flow**

1. **Starting Sequence**
   * 3-minute countdown timer.
   * Pre-start: Boats can move freely but **cannot cross to the upwind side of the start line before 0:00**.
   * Dotted line (start) turns green at start time.
   * A boat must travel between the start marks from bottom of the screen to the top
2. **Upwind Leg**
   * Boats must sail upwind via tacking.
   * **Top mark** (top of screen) must be rounded **counterclockwise**.
3. **Downwind Leg**
   * After rounding top mark, sail downwind toward **bottom mark**.
   * Bottom mark is placed just above the start line.
   * Must be rounded **counterclockwise**.
4. **Second Upwind Leg**
   * Sail back upwind to the top mark again.
   * Round it again counterclockwise.
5. **Finish**
   * Sail down and **cross the start line between the starting marks. Direction must be from top of screen to bottom of screen**
   * Boats are ranked based on crossing time and displayed at top right of screen
6. **Ranking**
   * Real-time leaderboard at top right of screen
   * Boats ranked based on elapsed time from start to finish.
   * Optional: Split times and leg times.

### **Game controls**

* ENTER - tacks or gybes boat
* LEFT AND RIGHT ARROW KEYS - changes boats direction
* SHIFT - Trims sail to ideal position OR Luffs sail. Luffing sail stops the boat from moving

### **Stretch Features (Later Additions)**

* Rules enforcement (penalties for hitting marks, port/starboard).
* Replays of races or ghost boats.
* Multi-boat lobbies with room codes.
* AI competitors or time trials.
* Coach overlay or analytics mode.