CYCLOTRON

Initiation Packet

Oct. 13, 1989

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1.0 THEME

CYCLOTRON Theme and Overview

Cyclotron is a BMX Racing Bike Game using the Hard Drivin' hardware in a scaled down configuration similar to what Stun used. The viewpoint will be first person, not first person removed. The only part of the player which will be visible is the front tire and possibly part of the handlebars. The player controls his forward motion through the game by pedalling bicycle pedals which have computer controlled resistance matching the terrain visible on the monitor. All pedalling will have a power assist factor so that the exertion required to play the game will always be less than actually racing a bicycle. A system of performance sampling and handicapping will allow players of different ages and athletic capabilities to enjoy the same gameplay. Performance may be sampled again between heats to compensate for fatigue. The player can adjust the game for the degree of physical effort with which they are comfortable.

The player will begin in a starting line with 7 other BMX racers. There are 4 tracks to choose from, and each track will have 16 levels of difficulty. Each heat is over when someone wins it -- either the player or a drone. Score is awarded for speed and the skill the player exhibits in each of the course obstacles. The higher the heat number, the better the skills of the drones and the more aggressive they become.

Each race begins with a massed start on a dirt track. Each track has multiple turns. Some are hairpin turns and some are wide sweeping turns which don't require slowing down. Some turns are steeply banked with high dirt banks permitting riders to zip through at high speeds. Between the turns there are a variety of obstacles: jumps, sudden drops, bumps, and mud. These obstacles send bikes flying and test the rider's skills, strategy, and timing. Each track will also have a straight portion for all out racing. Mud can cause the bike to slide out from either the player or drones if they take turns too fast. The drones are able to crash, so quick reactions are required of the player to prevent pile-ups with other fallen riders.

The controls will include pedals, steering, push and pump (like PaperBoy) and both front and rear brakes. The push control is for shifting their body forward, and the pump control is for shifting the body weight back. With these controls the player can perform stunt maneuvers, control the amount of air they get on jumps, and display a wide range of skill at handling the obstacles in a BMX track.

2.0 TRACKS

Four track layouts and their components

Obstacles:

- Hairpin turn
- Wide turn
- Steeply banked turn
- Jumps
- Sudden drops
- Table tops -- Table Tops are obstacles which the player must hop up onto with their bike.
- Bumps -- Several close together are called 'whoop do dos'. If you take them at very high speed, you can skim the ridges, otherwise you'll jolt down into each depression.
- Mud
- Quarterpipes
- Ramps
- Pallet stacks -- These are pallet stacks of lumber. They are high flat platforms of differing heights with large steps between them. The player must be careful to land their rear tire slightly before touching down the front tire.

Other components of a track.

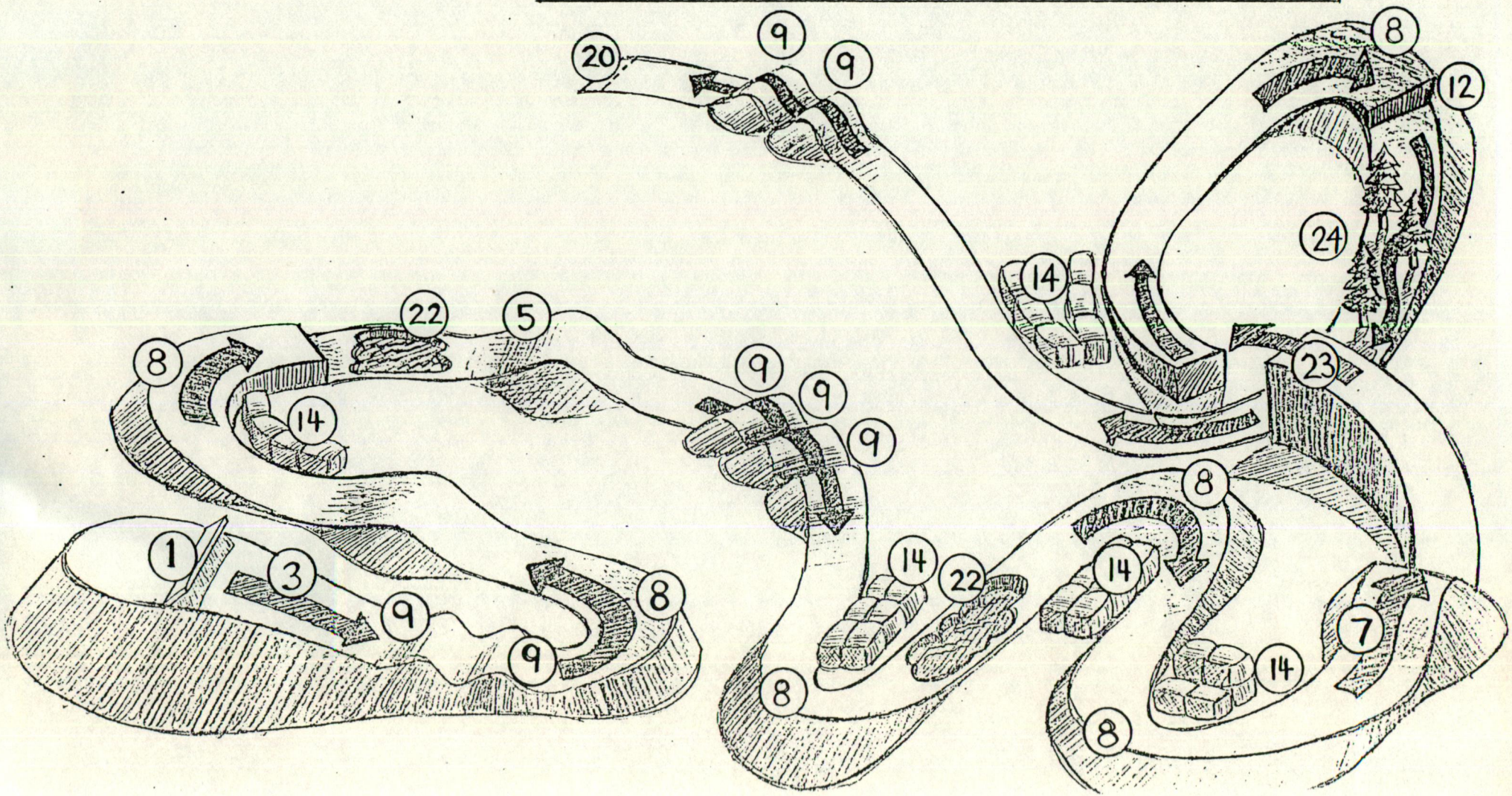
- Starting gate
- Starting light
- Bales of hay
- Flags
- Pylons
- Tires
- Stumps
- Trees
- Flags

(Track #1 is illustrated in Storyboard, Section 5.0)

TRACK 2

LOW - MEDIUM - HIGH DEGREE

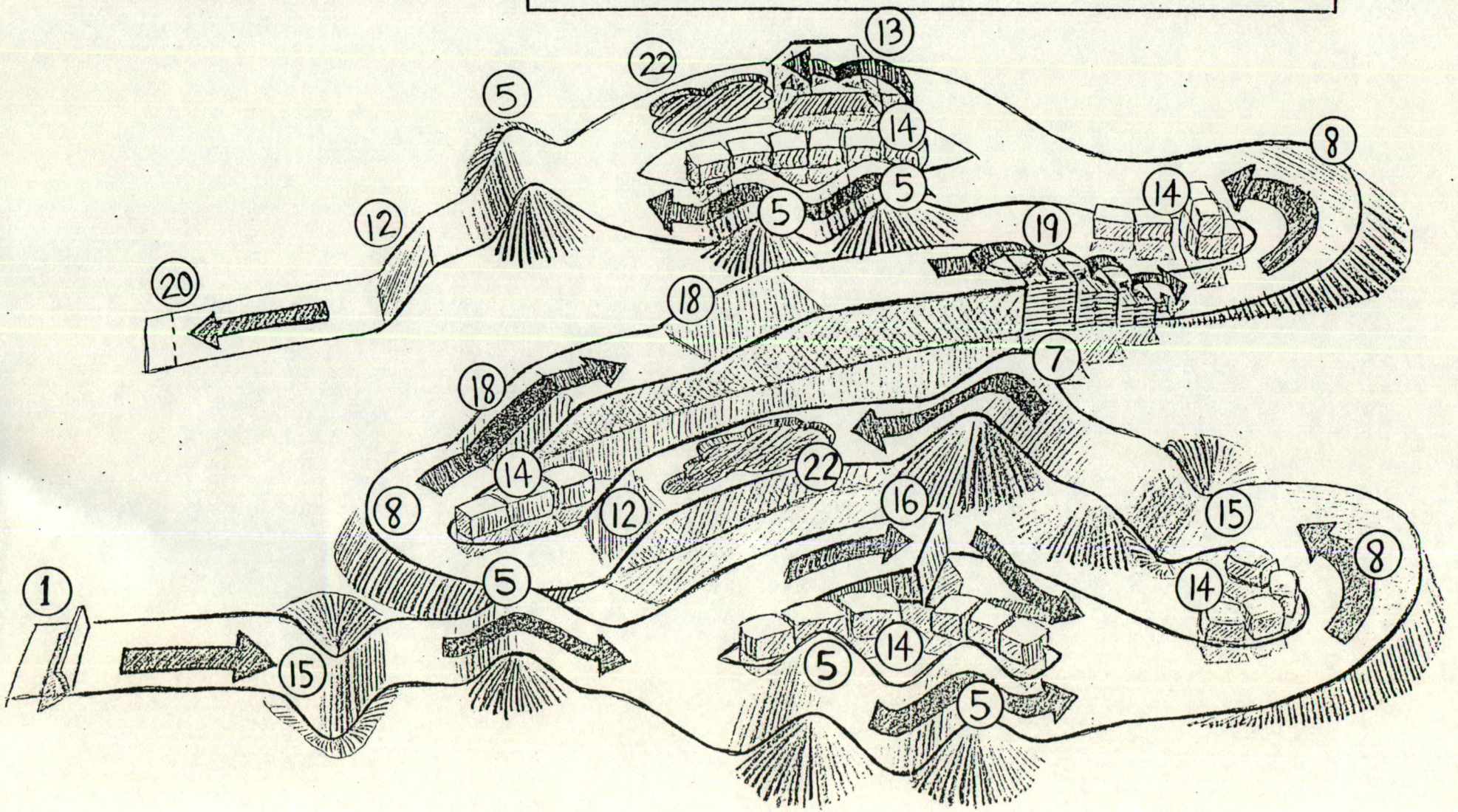
1. STARTING GATE
2. JUMP M
3. DOWNHILL
4. WIDE TURN
5. JUMP H
6. BERMED CURVE M
7. HIGH PEAKED JUMP
8. HAIRPIN BERMED CURVE
9. JUMP L (BUMP)
10. RIDGE
11. SUDDEN DROP L
12. SUDDEN DROP M
13. TABLETOP
14. BALES OF HAY
15. DIP
16. RAMP M
17. RAMP H
18. UPHILL
19. PALLET
20. END
21. QUARTERPIPE
22. MUD
23. OVERPASS
24. TREES



TRACK 3

LOW - MEDIUM - HIGH DEGREE

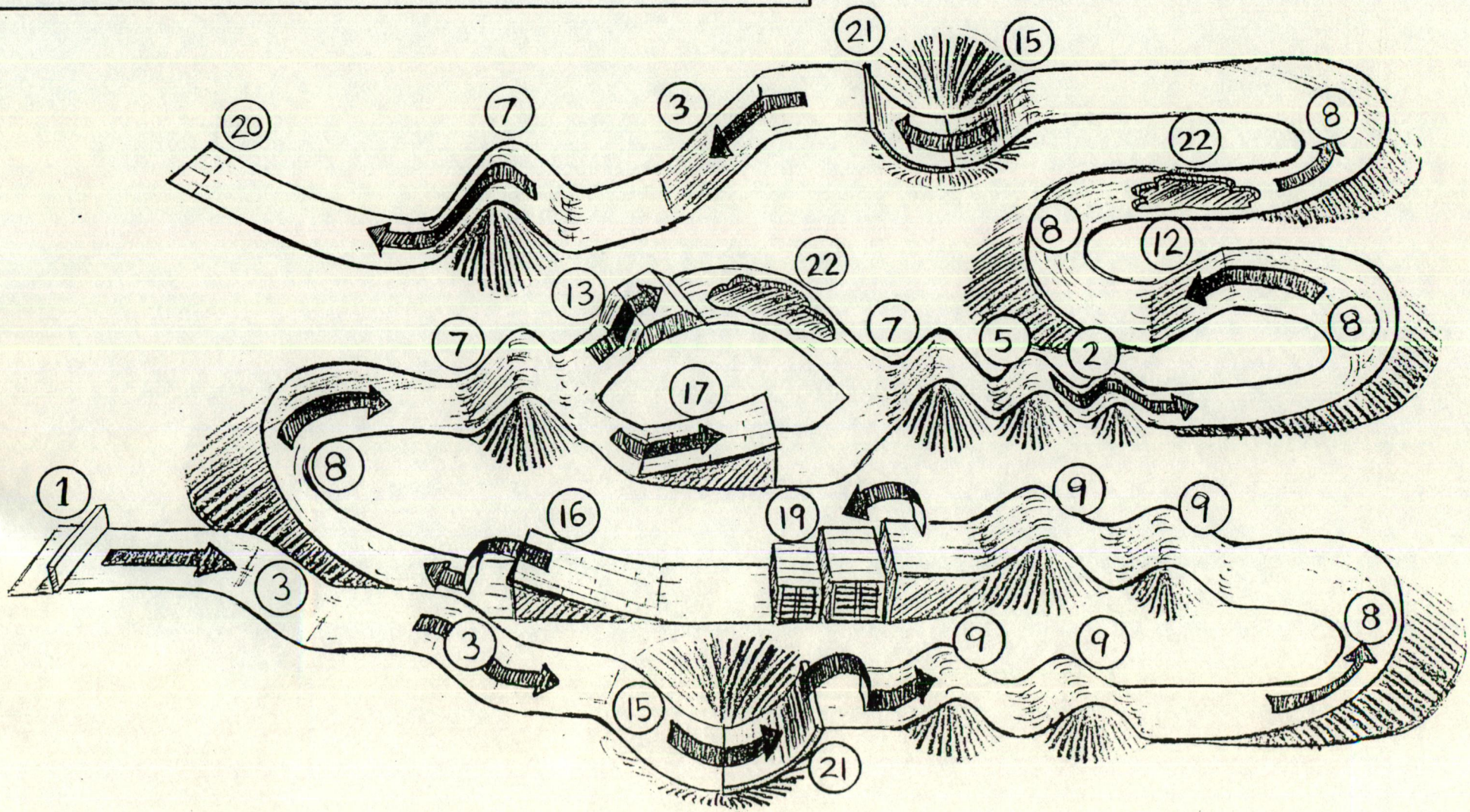
1. STARTING GATE
2. JUMP M
3. DOWNHILL
4. WIDE TURN
5. JUMP H
6. BERMED CURVE M
7. HIGH PEAKED JUMP
8. HAIRPIN BERMED CURVE
9. JUMP L (BUMP)
10. RIDGE
11. SUDDEN DROP L
12. SUDDEN DROP M
13. TABLETOP
14. BALES OF HAY
15. DIP
16. RAMP M
17. RAMP H
18. UPHILL
19. PALLET
20. END
21. QUARTERPIPE
22. MUD
23. OVERPASS
24. TREES
25. STRAIGHTAWAY



LOW - MEDIUM - HIGH DEGREE

1. STARTING GATE
2. JUMP MEDIUM
3. DOWNHILL
4. WIDE TURN
5. JUMP HIGH
6. BERMED CURVE MEDIUM
7. HIGH PEAKED JUMP
8. HAIRPIN BERMED CURVE
9. JUMP LOW (BUMP)
10. RIDGE
11. SUDDEN DROP LOW
12. SUDDEN DROP MEDIUM
13. TABLETOP
14. BALES OF HAY
15. DIP
16. RAMP MEDIUM
17. RAMP HIGH
18. UPHILL
19. PALLET STACKS
20. END
21. QUARTERPIPE
22. MUD
23. OVERPASS
24. TREES
25. STRAIGHTAWAY

TRACK 4



3.0 CONTROLS

The player inputs consist of steer angle, push, pump, front brake, rear brake, and the pedal motion. Push is pushing forward on the handlebars and signifies that the player has moved their weight onto the front tire with the rear tire off of the ground. Pump is pulling back on the handlebars and signifies that the player's weight is on the rear tire with the front tire off of the ground.

Handlebars

The controls will consist of a redesigned Paperboy control, minus the switch pod assembly. In place of the old switch pod would be the addition of hand brake levers using a variable resistor or strain guage.

Pedals

The pedals will incorporate a "eddy current brake" variable resistance system. The main parts involved are:

- a magnet
- an opto coupler
- a large aluminum disc
- a hub and a freewheel
- a chain or v-belt with tensioner
- a frame to position the assembly in the cabinet
- electronic magnet drive circuitry

4.0 GAMEPLAY

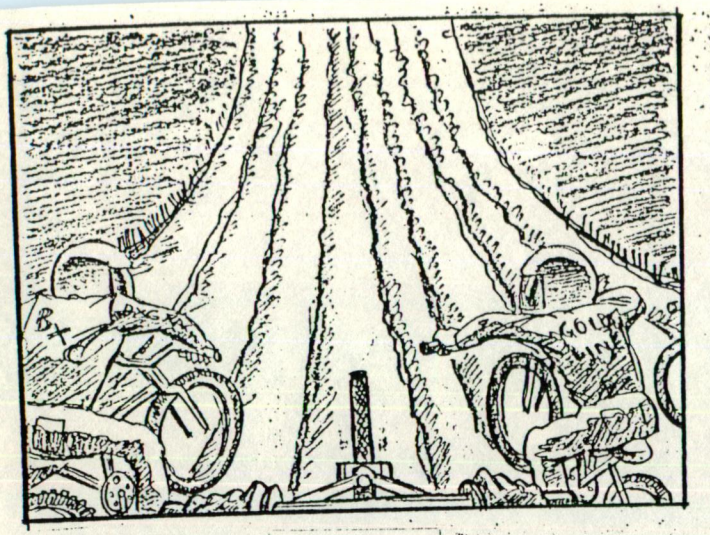
Moment to Moment Gameplay

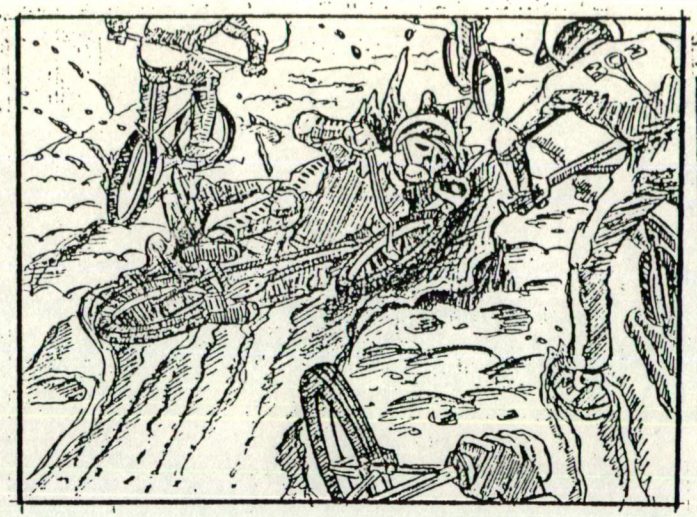
- Starting gate. The riders are lined up side by side at the starting gate at the top of the starter's hill. The starter shouts "Racers ready!", followed by a brief silence. Then the starting gate crashes to the ground, the control light flashes green, and the riders start fighting for the best positions to take the obstacles.
- Hairpin turn. You have to match your speed to the maximum speed at which you can take the curve or you'll wipe out.
- Wide sweeping turn. This is a turn you can keep your speed up on, but you'll wind up leaning far into it at those speeds. The player may be fooled into thinking that they should slow down. If they do they'll lose a speed advantage, which becomes more and more important as the skill level of the other riders increases. As the riders become less and less timid about taking these turns at high speeds, they'll eventually reach the speed at which they wipeout.
- Steeply banked turn. If you are at the top, you can attack to take the lead with the added force of gravity on your side as you descend the berm. If you're not, another rider could do the same to you. If other riders are blocking you at the bottom of the berm, you have to work harder to climb the berm in order to go around them.
- Jumps. Jumps give the player the chance to get airborne provided that you hit the embankment at the right speeds and angles. If not, you can start falling over while still in midair. Your points for this hazard will be a function of how high you can get, but don't let that distract you from your goal of winning the race. "Hot doggers" may score high for spectacular jumps, but they lose precious seconds while they hang in the air. Jumps taken close to the ground get you moving forward again more quickly. Your landing trajectory from a jump may intersect with another rider's for a multiple part crash. You're better off taking jumps out ahead of the pack.
- Sudden drops. An abrupt change of elevation reduces your stability, and while the screen is bouncing, your visibility is reduced. They'll also slow you down.
- Bumps. If you hit bumps at the right angle and speed you can lurch a little into the air. If you hit them at the wrong angle, you can wipeout, or blow out a tire. Your steering control is useless while airborne. So are your brakes. If there are several ridges in a row, a rider at high speed can just skim the tops of the ridges instead of riding through each depression.
- Mud. Mud will be indicated by a different colored track section. Mud reduces your tire's friction and reduces the speed at which you can take a turn. This trains the player to pay attention to the road condition. Mud will slow you

down on a straightway and make you less stable. It takes longer to stop and you'll spin around more while braking.

- Straightway. This is a race section without obstacles. Just pedal full out so you can can breakaway to take the optimal positioning for the next obstacle on the course. It will let the player get some momentum up, have the thrill of the sensation of speed, and have a break from the quick reactions required by obstacles.

- Instant replay on the race completion. In Pole Position, seeing how close you came to completing the race was often a powerful motivator since the player believed that if they just crashed once less often, or if they just didn't skid into the grass, they'd have made it. An instant replay of the race finish would give them the urge to try again.





LOW - MEDIUM - HIGH DEGREE

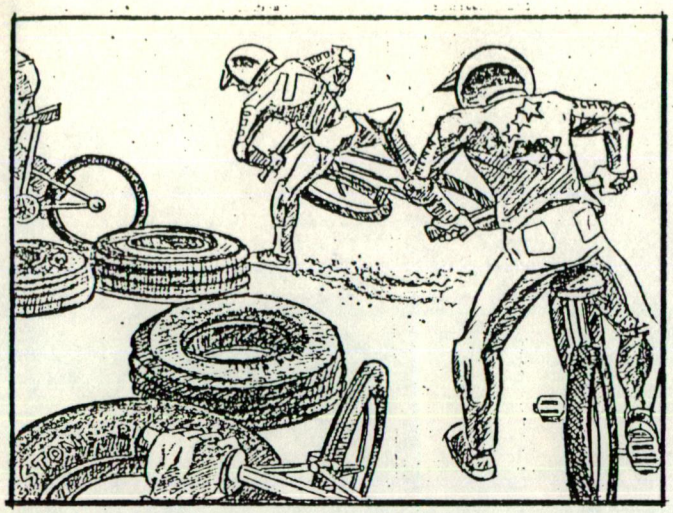
1. STARTING GATE
2. JUMP M
3. DOWNHILL
4. WIDE TURN
5. JUMP H
6. BERMED CURVE M
7. HIGH PEAKED JUMP
8. HAIRPIN BERMED CURVE
9. JUMP L (BUMP)
10. RIDGE
11. SUDDEN DROP L
12. SUDDEN DROP M
13. TABLETOP
14. BALES OF HAY
15. DIP
16. RAMP M
17. RAMP H
18. UPHILL
19. PALLET
20. END
21. QUARTERPIPE
22. MUD
23. OVERPASS
24. TREES
25. STRAIGHTAWAY

TRACK 1

START

MUD

TIRES



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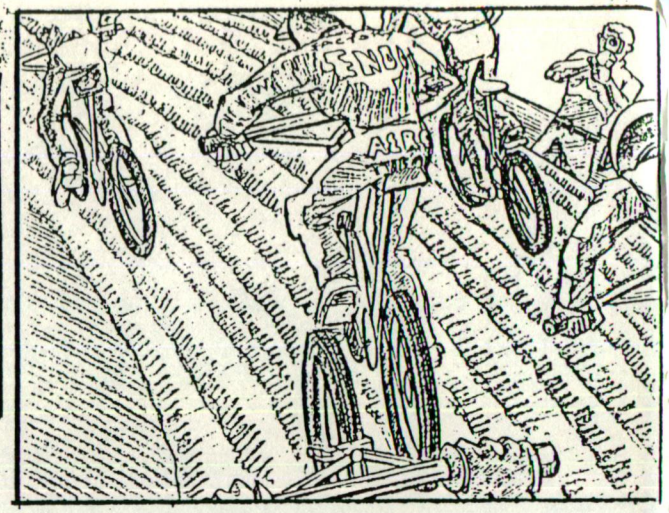

TRACK 1

HAIRPIN TURN

HIGH-BANK BERMED TURN

TIRES

LOW - MEDIUM - HIGH DEGREE

1. STARTING GATE
2. JUMP M
3. DOWNHILL
4. WIDE TURN
5. JUMP H
6. BERMED CURVE M
7. HIGH PEAKED JUMP
8. HAIRPIN BERMED CURVE
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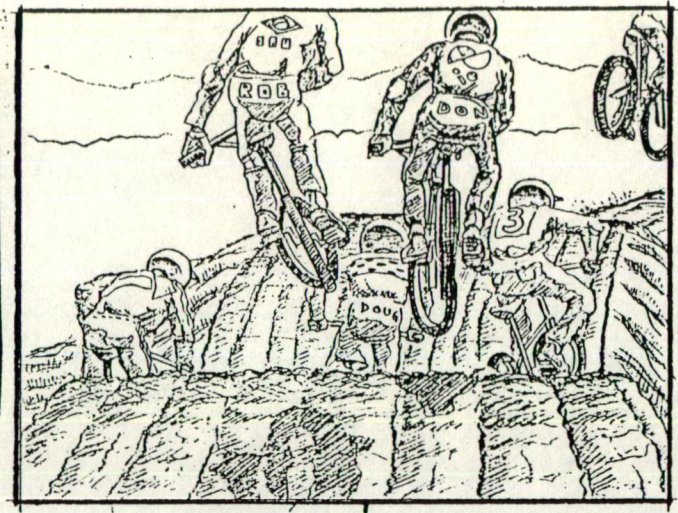
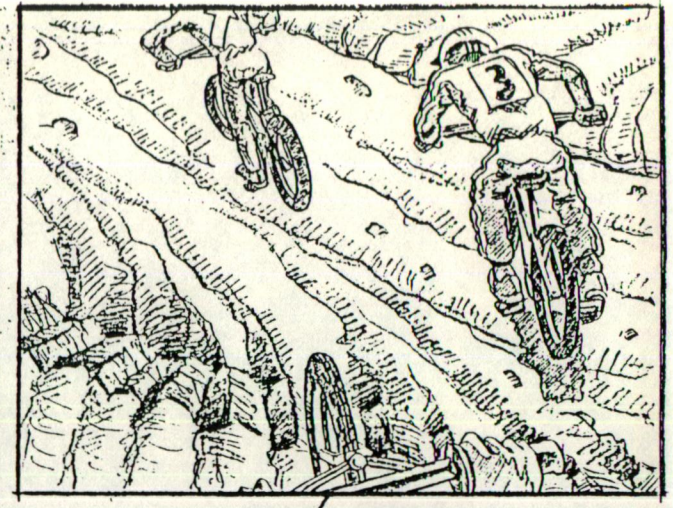


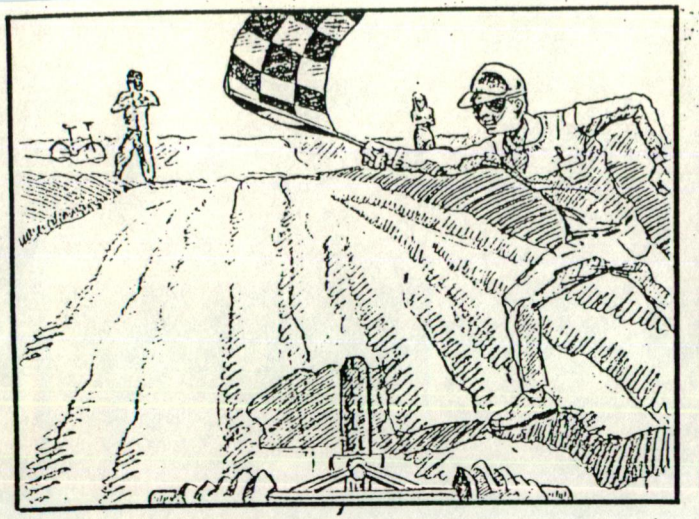


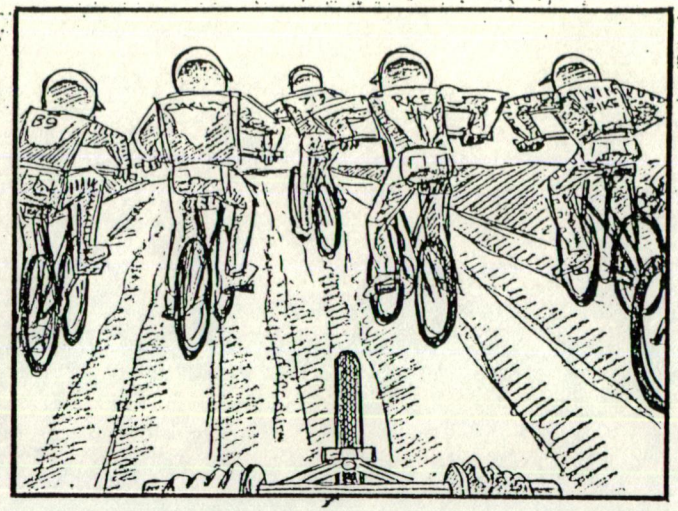
TRACK 1

BUMP

RIDGE

TIRES





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12. SUDDEN DROP M
13. TABLETOP
14. BALES OF HAY
15. DIP
16. RAMP M
17. RAMP H
18. UPHILL
19. PALLET
20. END
21. QUARTERPIPE
22. MUD
23. OVERPASS
24. TREES
25. STRAIGHTAWAY

TRACK 1

FINISH LINE

STRAIGHTAWAY

TIRES

6.0 WAVES

Wave Progression

Performance Sampling

The player will be able to set a level of exertion they are comfortable with. The player will be told to pedal hard for 6 seconds. The RPM which is sampled at that time will be used to scale the power-assist factor through the game such that 15% above the sampled value is the maximum forward speed in the game. If we sample them at a certain RPM we'll cap RPM values at 15% above the sampled RPM. The 15% allows for a kick in the speedway or when pressure from the drones is on. If they sandbag it and don't pedal as hard during the sample as during the game, they'll be in danger of speeding through the stunts and the jumps. Going too fast could cost them just as much as going too slow.

Race selection -- Four tracks:

- Standard BMX -- regulation track
- More Turns -- lots of berms / hairpins -- more speed for radical wipeouts
- More Jumps -- with ramps -- more speed for up and down motion.
- Hell Track -- longest track with ramps, quarter pipes -- The biggest and the baddest!

The player will have a racing class for each of the four tracks. For each track, players start off in the beginner class. If they win a heat from level 5 through 9, they advance to the novice class. If they win a heat from level 10 through 15, they advance to the expert class. If they win heat 16 they turn pro. (Turning pro details are described in Section 10.0 Goals). If a player is racing at an expert class on track 1 and then selects track 2, his racing class will be beginner on that track until he wins heat number 5 or above. The racing class entitles the player to scoring multipliers.

1 2 3 4	5 6 7 8 9	10 11 12 13 14 15	16
Beginner	Novice	Expert	Pro

Players can select waves by track and heat number -- the higher the heat number the greater the skill level of drones. After each heat the player can select another track. The track selection screen will look much like the track selection screen in Pole Position II which has small overview pictures of each track which lights up as you steer to select it. Steering will select a heat number after the track is selected. The player can also elect to do another performance sample after each lap. For linked games, a player may be asked to standby until the heat in progress finishes.

The player advances to new heats as long as they win them. If they lose, the next default heat level isn't advanced. Random elements in the gameplay will keep it from seeming repetitive. The player can override the default wave selection and explicitly select other heats. If they are in the beginner racing class, they can select heats 1 through 9. If they are in the novice racing class, they can select heats 5 through 15. If they are in the expert racing class, they can select heats 10 through 16. They could choose to advance even if they didn't win the last heat. The player will get a fixed number of losses for a credit's worth of coin drop.

Continuation allows the player to preserve their score and racing class setting.

Each track will have a separate high score table. In the track select screen, if they pick a new track to race, and they qualifed for the high score for the track they're leaving, they'll enter their name for that track before going on. The name will be remembered as a default setting until a cycle into attract.

Wave End

The wave is over when someone wins the race -- either the player or a drone. The camera position will shift to the cross view of the finish line for a replay of the race finish in slow motion. Then we'll cut to a summary screen of the race.

7.0 DRONES

Drone's behavior and intelligence

Drone skills overview

The drones will match the optimal speeds of track elements within a range of values. This range will start out large and get closer and closer to the optimal speeds. The drones' reaction time, speed, and steering skills will improve as the player advances through the heats. The starting range is wide enough to allow the drones to to crash and make the sorts of mistakes human players do. The player will need some defensive maneuvers in order to avoid pile-ups with fallen drones. The actual value from the range will be determined by a random number selection. The random elements in the drones' behavior will add variety and realism to the races. At higher levels, the drones will start using team strategy tactics on the player such as blocking you and boxing you in. They'll also get more aggressive and occasionally try to run the player off of the track.

Each drone has a skill level and a personality profile. Skill levels and personalities are described in tables for each of the waves. The tables make the game easily tunable.

Skill Level

The skill level specifies the size of the range of values from which a target value can be selected. At each road section in the course there will be an optimum speed and angle to ride over it. A random number generator will select a value from this range of values for each drone. This range starts out large to make the competing traffic novice class and gets harder, just as it would in an elimination race.

Beginning laps will have the drones targeting the minimal speed it takes to get through the course. By adjusting the speeds of the optimal value, we can adjust the difficulty of the wave. The higher heats will have a lap speed adjustment set as fast as it can be while maintaining control. The following formula will generate the target values which the drones are trying to match:

target = Ideal (with lap speed adjust) + random element

If a drone is slower than its target, it will accelerate.

In addition to speed matching, the drone will do orientation matching. The drone will adjust its orientation as it travels over the track to match the target orientation. The target orientation is the ideal orientation associated with a track section plus a random element.

Each drone has a reaction time delay between re-targeting which gets shorter as the heats progress.

Personality

Some drones will strike rad aerial poses; some like to grandstand and get a lot of air on jumps; some are speed demons who wipe out on the turns. These and other traits are part of a drone's personality profile. There will consistent personalitiew from race to race. Players could identify a hot-dogger drone by his colors.

For all of the turns and straightaway, the drones behavior wil be governed by a equation which targets a speed and orientation plus some random elements. For tabletops, their speeds will be adjusted on the fly so that they make it and can keep going. The remaining drone stunts and maneuvers are described in a drone behavior map which contains entries from the drone personality table.

The personality table associates a behavior characteristic across a range of intensity for each stunt.

DRONE PERSONALITY TABLE

Stunts	Characteristic Intensity 1	2	3	4	5	6	7
Jumps	Likes to hang in air	Likes to hang in air	Gets air on most jumps	Gets air on most jumps	Gets air on most jumps	Gets air on most jumps	Speed jumps Pedals thru
Aerial Pose	Helicopter	Tabletop	CanCan	CanCan	Hip Hanger	Hip Hanger	No Pose
Jump height (1-lo,7-hi)	1	2	3	4	5	6	7
Ramp speed	1	2	3	4	5	6	7
Quarterpipes	Adj speed to make it	Adj speed to make it	Adj speed to make it	Adjust after skill lvl 4	Adjust after skill lvl 6	Adjust after skill lvl 8	target eqn No adjust
Quarter pipe stunt After skill level:	No stunt	Hip Hanger 0	CanCan 4	Tabletop 8	360 Rollover 11	360 Rollover 13	360 Rollover 15
Aggro Behavior After skill level:	Try to run plyr off of track 13	Elbow's plyr 2	Block's plyr 4	Work's with 5 for team blocking of plyr 10		Joins blocking team 4 & 5 13	Elbow's plyr 6
Pallet Stacks pullup After skill level:	Pulls back All	Pulls back 2	Pulls back 4	Pulls back 6	Pulls back 10	Lands flat All	Pushes forward All
Stability on drops	1	2	3	4	5	6	7

DRONE BEHAVIOR MAP for an example WAVE

Stunts	Drones A	B	C	D	E	F	G
Jumps	2	2	6	4	1	7	3
Aerial Pose	6	5	7	1	3	4	2
Jump height (7-hi,1-lo)	3	4	6	1	2	4	5
Ramp speed	2	7	4	1	5	6	2
Quarterpipes	2	4	3	4	7	6	5
Quarter pipe stunt	4	4	5	3	7	7	7
Aggro Behavior	1	2	3	4	5	6	7
Pallet Stacks Pullup	6	5	2	1	2	3	3
Stability on drops	7	2	3	1	2	3	1

8.0 STUNTS

Player and Drone Stunts

Drone's Stunts

- Ramp: 720 or 360 degrees yaw rotations;
- Quarter pipes: 360 pitch rollovers
- Pallet stacks

The following are all drones' poses and maneuvers while airborne during jumps:

- Helicopter -- Rotate the front wheel 360 degrees
- Cancan -- Kick one leg high across the other.
- Hip hanger -- Push bike to one side and push your hips to the other side.
- Aerial Tabletop -- Make one side of the bike and your body parallel to the ground. Lay out flat to one side.

Player's Stunts

- Ramp: 720 or 360 degrees yaw rotations;
- Turnarounds -- On a ramp, come to a stop on the front tire and pivot the back around so that you are facing back down the ramp.
- Quarter pipes: 360 pitch rollovers
- Pallet stacks
- Rear Wheelies: Pedals don't power it while doing this. Slamming on the brakes will result in a face plant!
- Front Wheelies: Ride around kind of like a unicycle
- Endos: This is a stationary rear wheelie.

PLAYER STUNTS

* means set, - means not set, x means don't care

ACTION	Pump Fwd	Pull Back	Front Brake	Rear Brake	Pedal -ling	Steer Left	Steer Right	Track Components
Spin around on front tire till you are pointing back down the ramp	*	-	*	x	x	x	x	Top of a ramp
Riding with front tire off of the ground	-	*	x	-	*	x	x	Anywhere
Pop front tire off of ground and land again into stationary position	-	*	x	*	x	x	x	Anywhere
Riding with rear tire off of ground	*	-	-	x	x	x	x	Anywhere -- coast on front tire
Pop rear tire off of ground and land again into stationary position	*	-	*	x	x	x	x	Anywhere
Pitch forward with a fixed pitch velocity	*	-	x	x	x	x	x	Airborne
Pitch back with a fixed pitch velocity	-	*	x	x	x	x	x	Airborne
Yaw left with a fixed yaw velocity	x	x	x	x	x	*	-	Airborne
Yaw right with a fixed yaw velocity	x	x	x	x	x	-	*	Airborne
Jump up onto tabletop	-	*	-	-	x	x	x	Section before a tabletop
Drop a level onto the rear tire closely followed by the front tire touching down	-	*	x	-	x	x	x	Step edge of a palette stack and step edge of a tabletop
Land on next level down nosing into that level and roll over so that the player lands on his back under the bike	*	x	x	-	x	x	x	Step edge of a pallet stack and step edge of a tabletop
By putting on just the front brake on a fast turn the rear tire keeps moving and whips the player around faster	-	-	*	-	-	x	x	Taking a fast turn or steering side to side on straightaway

PLAYER STUNTS

* means set, - means not set, x means don't care

ACTION	Pump Fwd	Pull Back	Front Brake	Rear Brake	Pedal -ling	Steer Left	Steer Right	Track Components
Putting on just the rear brake generates a light but uniform braking force	-	-	-	*	-	x	x	Going fast
Both brakes give a strong uniform braking force	-	-	*	*	-	x	x	Going fast
Fishtailing to a stop	-	-	*	-	-	-	-	Straightaway
Endo -- player goes onto front tire nosing downward then comes to rest as rear tire sets down	*	-	*	x	x	-	-	Anywhere

9.0 SCORING

The player is constantly adding score with their distance through the track (forward only). The score being added is higher for higher speeds. Additional points are awarded at each obstacle. The closer the player approaches the ideal speed, angle, and maneuvering (pump / push / brakes input), the more points will be awarded.

Obstacle point awards will be multiplied by 2 for novice class racing, and by 4 for expert class racing. (See Section 6.0 for a description of racing class.)

There will be a point award for placing in the top three finishers of a heat.

At certain point breaks, extra races will be awarded. This is equivalent to awarding the player a continuation credit for high scores.

10.0 GOAL

Long Range Objective for Player

Each track has 16 heats. If a player wins the final race of a track, they turn pro. If a player turns pro and has one of the five highest score accumulations during heat #16 of all of the players who have turned pro for that track, they can enter their name and have it appear on one of five bales of hay along the course. After finishing the 16th heat, the status block at the bottom of the screen will accept entry of 10 letters while the camera zooms to the appropriate bale of hay. The pro with the highest score will have their name close to the starting gate, since that is where most other players will see it. The top five scoring pros will have their name on the track until someone else places in the category and bumps them out of their standing. An example of a bale of hay marking is "#1 ABCDEFGHIJ". Both the rank and the name will be displayed.

This is like letting the player carve their name into the track. It will foster rivalry, since the names on the bales are rearranged each time someone else places into the top five. The name will be made up of polygon letters with color cycling. The player who makes the top five will be motivated to play again so that he can see his name on the track and show his friends. He might also try to improve his score to move his name closer to the starting gate.

When a player selects heat 16, before going to the race, a screen labeled "The Pro's" will be displayed which shows rank, name, and the scores to beat so that the player will know how many points they must accumulate during the race to leave their mark on the track or improve their standing. This isn't the same as the high score table. There will be entries in the high score table before anyone at a given location plays to the end of a track. This is an additional award for finishing a track. Each track will have its own pro table and high score table.

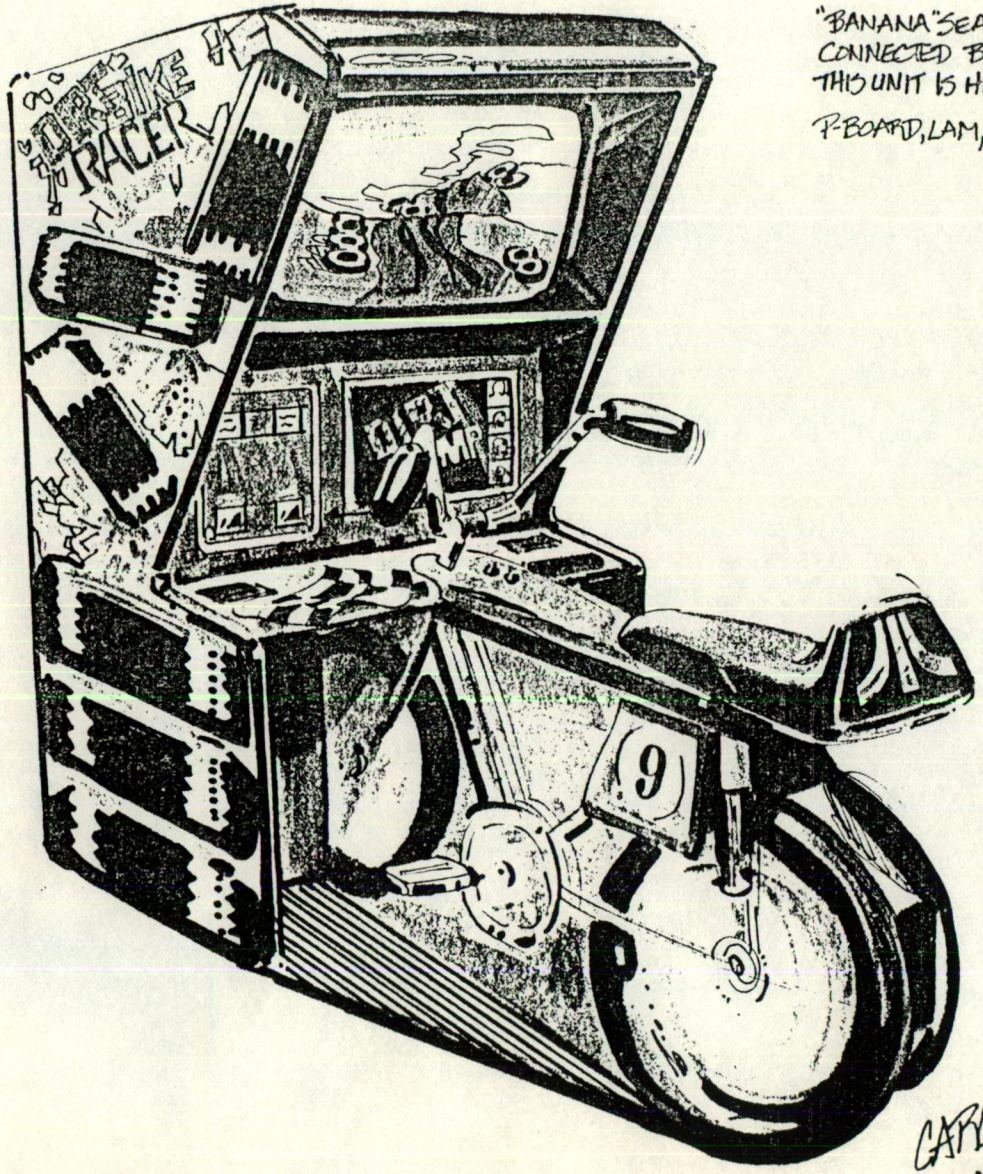
11.0 CABINET

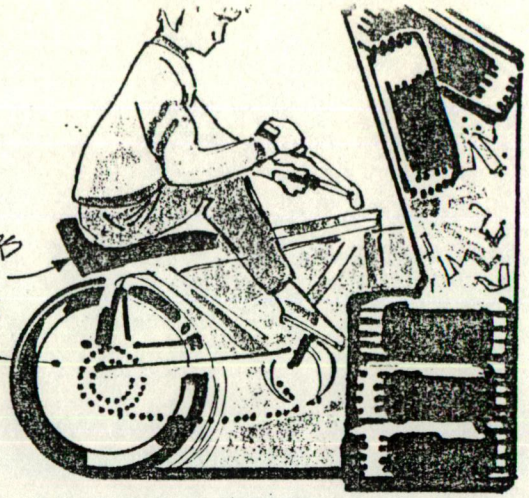
Cabinet Description and Drawings

The cabinet wil be a ride-on style cabinet much lke STUN Runner. The ride-on portion of the cabinet will be taller and thinner to accomodate the rotating disc and a frame system to position it in the wood cabinet.

(The whole ride-on portion could be all formed parts. Those parts would cost about $120 for each side.)

The bike may need a scale for weighing players in order to adjust the force applied to the pedals for different sized people. A hinge at the front of the base with a spring connected to a pot on the rear base should give adequate resolution.





"BANANA" SEAT, HANDLEBARS CONNECTED BY METAL BAR THIS UNIT IS HINGED AT SEAT.

P-BOARD, LAM, SILKSCREEN

DIRT BIKE RACER

MANEUVER YOUR "BIKE" OVER COURSE AVOID OTHER BIKES, RUTS IN TRAIL, MUD HOLES AND STRAY WILD ANIMALS. JUMP THE HILLS BY PULLING UP ON HANDLEBARS (ATTACHED TO THE SEAT). PULLING TO MUCH WILL MAKE YOU FALL BACKWARDS (LOOKING UP AT THE SKY-ON YOUR BACK!) SKILL LEVELS ARE CHOSEN AND AWARDED BY DISPLAYING PLAYER'S PICTURE (GRAPHICALLY) WITH DEGREES OF BEING COVERED WITH MUD.

CAROLE CAMERON
AND BRAD NEMETH 1983

12.0 CINEMATOGRAPHY

We can really move the camera in this game. Let's use it!

Instant replay will occur after the player crashes. When the player is visible, a drone picture is substituted for the player in the player's unit colors. There will be cameras buried in the track and during instant replay, the cameras will switch to the next one along the track to follow the race tp simulate TV sports coverage cinematography. The race will continue in real time leaving the crashed player behind. A 5 second instant replay is the penalty for crashing. As soon as the instant replay is over, the game returns to a player back on his bike and ready to go.

Attract mode will have the camera under the bikes' jumps so we'll have actions shots of bikes flying overhead. We'll use some of the camera placement techniques ESPN uses when covering sports events to play up the excitement of the action.

The wave is over when someone wins the race -- either the player or a drone. The camera position will shift to the cross view of the finish line and we'll show an instant replay of the race finish. Then we'll cut to a summary screen of the race.

13.0 COMMS LINK

Communications linking up to 4 units together

The Multisync board set has communications linking circuitry built in. There will option settings to configure each linked unit from 0 to 3. If there is more than one unit with a given unit number, a self test style error message will appear on the screen.

When you boot up, color tables will be set up based on how many people are linked and which one you are.

- 0 -- RED
- 1 -- BLUE
- 2 -- GREEN
- 3 -- YELLOW

On instant replay, you'll see yourself as the one in your colors. Colors in things like the performance sampling will match your colors so you can recognize yourself in replays. Other linked players are in solid colors corresponding to the table above.

Linked players can use team strategy tactics against the leading drone or to get even with particularly aggressive drones.

We'll have software to synchronize screens so that players could select separate tracks or have time to add coins and race against each other. Players which have the same track and heat selected will automatically be linked. In the score and status area of the screen, there will be an indication about which opponents are humans and which could be linked if they had the same race selected but aren't.

A packet of data will be an integer x,y,z for position and 9 words for unit vectors. There is one spare word for future expansion and status resulting in a packet size of 32 bytes.

Each unit will perform animation processing separately, but the position updates and collision detects will be distributed among the processors. This distribution of game processing saves processing time and compensates for the communication processing overhead. With two linked units, each unit updates their player plus 3 drones. With three linked units, units 0 and 1 update a player and two drones while unit 2 updates a player and one drone. With 4 linked units, each unit updates one player and one drone. Each linked unit transmits what it updates to the other units.

14.0 SOUNDS

Sound Requirements

We'll have sound effects during the race and music for the transitions. The music should be some kind of Rock and Roll. Something that would appeal to daredevils with a rad lifestyle.

One possibility for the audio board is the SAII. The drawbacks are that we can't do simulated sounds on it since the program can't control a sound's frequency and magnitude. However, the sounds of a BMX race are more subtle than sounds in a car race. The doppler effect isn't as applicable for BMX since quite often you'll be in a pack, there's no traffic in the other direction, there's no motor, and you're traveling on dirt rather than concrete. It has the advantages of being inexpensive and fully supported by the audio group.

Two other possibilities for the sound board will be considered later in the project. One is a cost reduced version of the Hard Drivin' audio board and the other is a new board which is being developed by the audio group. The requirements for the board we choose are that it cost the same or less than Stun's audio board complete with ROMs, and that it have the full support of the audio group.

15.0 Marketing

Product Logic

BMX racing is an exciting, fast-paced sport that lends itself well to play as a competitive video game. A multiple-unit linking feature will add even further excitement.

A realistic simulation of BMX would be much too expensive for Atari to build and much too risky for players to play in arcades. A motion simulation of "catching air" and the spectacular falls that are characteristic of the sport are impossible. Cyclotron offers a somewhat limited physical simulation of BMX that would be safe for players of all ages. Using handlebar and pedal controls, combined with the realistic video display and instant replay features, this product can be a safe, fun way to race a BMX course.

Objectives

- Develop a BMX racing game to appeal to our target audience. Participants in this sport are both male and female. The age of participants is similar to our target group for coin-operated games. The appeal of this game may be stretched to include adults who are into mountain biking.
- Capitalize on the success of the Hard Drivin' game hardware. Both the feedback controls and three-dimensional video display of Hard Drivin' have proven to be very attractive to players. Although Cyclotron does not attempt to be a full-fledged simulator, the game does possess many of the features that made Hard Drivin' a success.
- Incorporate physical exercise as an aspect of a fun game. Because of the physical involvement required, this unique element could create a new audience.
- Develop a game that will have a wide-range appeal by providing a unique handicapping system that will allow players of all ages and physical abilities to compete.
- Increase potential sales into the arcade market via a linked game configuration. This product design is primarily limited to the arcade market because of its size and sales price.

Marketing Issues

- Define the BMX market. It will be helpful to know who is involved in BMX and related activities and how to market to these people. Becoming familiar with the jargon of the sport and the lifestyles of the participants would be a big advantage.

- Fairly early in development we should evaluate players' willingness to play a game that requires a good amount of physical involvement.
- Emphasis should be placed on making the drones in a one-player race feel like real opponents. Despite the plans for linking several cabinets, Cyclotron will likely be played as a one-player game at least 75% of the time.
- The link feature, however, is a key for additional sales into the arcade market and should not be ignored.
- Consideration should be given to marketing this product in a two-bike-minimum configuration similar to Final Lap, increasing the inherent competitive aspect of the game.
- Given its unique controls and game theme, Cyclotron has potential for dollar play. Game development should consider alternative pricing methods such as, "Two heats for a quarter or five heats for a dollar."
- Cyclotron also has application as a redemption piece with players awarded tickets or prizes according to their qualification and/or placement in a race.
- A highly competitive race game such as this would be perfect for a contest. We could run another Atari-sponsored t-shirt contest, or at the very least provide locations with a "Moto kit" similar to Cyberball's tournament package.
- Given the physical nature of BMX, product safety may be more of a concern on Cyclotron than on past Atari games.
- The control configuration should be designed for a wide range of player height/size. A short eight-year-old should be able to reach the pedals and handle bars as easily as a tall adult.
- Consideration should also be given to potential future applications of his product outside of the arcade-only market. If the game play is fun and exciting, a scaled-down street market version may be possible.

16.0 SCHEDULES

Schedule and Resources Required

16.1 Animation Estimates

Pixblit Pictures

- Title
- High score table insignias
- 4 Track maps: Small for selecting, Larger for a close-up before the race
- Score and Stats display
- Performance sampling screen
- Lap tally screen -- after a heat, where the score is tallied up.
- Fonts

3 days each x 10 = 30 days

POLYGON PICTURES

- 4 tracks -- all pieces:

  2 months each depending on Mac Super 3D and interchangeable pieces.

- front tire (in lieu of mirror and windshield frame)

POLYGON CYCLISTS MUST BE DONE TWICE TO GET 8 COLOR COMBINATIONS -- THE ONLY DIFFERENCE BEING COLOR ASSIGNMENTS TO POLYGONS

- Popping front wheelie -- Wheelies must have all pedaling positions
- Popping rear wheelie
- Helicopter
- Cancan
- Hip hanger
- Aerial Tabletop

- Crash and getting up again -- all in the self frame. These will not only include pictures but also delta roll, delta yaw, and delta pitch angles for some animations, like the crashes. In crashed pictures, bike and body should stay as one picture, and they should stay close together.
- face plant from front of bike
- falling over forwards
- falling over backwards
- falling to the left side -- Falls should land in different types of positions
- falling to the right side
- left leg out for balance
- right leg out for balance
- bike sliding out from under you to the left
- bike sliding out from under you to the right
- other pileup positions for riders and bikes
- 2 or 3 animations of picking themselves up and re-mounting
- Turnaround

2 days for each x 20 = 40 days

Total estimate = 30 + 8 months + 40 days ~ 11 1/2 months.

16.2 PROGRAMMING

Schedule and Resources Required

Resources Needed

Tool for laying out stunts on the track -- a way of making tables of additional information. Drives forward and backward and highlights a roadsection at a time. This would be an add on to Max's universe cad tool.

A separate standalone for play during development

Game

	Work Days
• Dispatch loops	2
• Model	20
• Tracks -- additional data	5
• Drone personality	15
• Traffic	20
• Integrating Artwork	20
• Customizing the universe cad tool	10
• Laying out and tuning tracks	7
• Laying out and tuning traffic	5
• Collision Detect	5
• Handicapping	14
• Track selection	3
• High score tables	3
• Animation Driver	5
• Attract	5
• Instant Replay	14
• Comms link	40
• Performance sampling	10
• Controls interface	7

Coinmodes..... 5

Focus support 5

Field test support.....10

T-shirt contest..... 3

Redemption options..... 5

Vacation..... 3

Meetings..... 5

TOTAL 246 work days is approximately 12 months

16.3 MILESTONES

This schedule assumes that the preliminary focus marketing will do can be done with the version available today. Any additional work needed will require adjustments to this schedule.

1st Review -- 2 1/2 months

- 1 BMX track
- Adapted univcad
- Jumps / Sliding behavior for drones and player
- Personality and skill tables built
- 68000 integer model built -- This is the software which models the behavior of the bicycle. The plan is to use a simple one for both the player and the drones. In the event that this is not good enough, we may need to add back a processor dedicated to running the model.
- Preliminary animation driver built
- Random behavior for the drones
- Code and tuning
- Performance Sampling as a transition screen
- Sensing exertion, refinements
- Dash with inset showing player's pitch.
- Pixblit Status Display
- Good Mechanical feel.

2nd Review -- 4 1/2 months

- Player Stunts
- Drone Stunts
- Scoring
- Crashes
- Crashes and finishline instant replay
- Cabinet
- ESPN fonts for lap stunts

- LCD font for status display

**** *Focus 5 months*

3rd Review -- 7 1/2 months

- 2nd track
- More stunts for player and drones
- Aggro behavior from drones
- Warping
- Comms Link
- Full synchronization support
- Attract
- Cabinet refinements
- Title Screen

4th Review -- 10 months

- 3rd and 4th track
- Statistics
- 2 linked, fieldtest-ready cabinets with controls built
- Hiscore
- Coins
- Coin options
- Attract Mode
- Camera under jumps
- Pro's screen
- More stunts
- Team tactics from drones
- Initials on Hay Bales

**** *Fieldtest -- 10 1/2 months*

Between Field test and Production

- ROM checksums
- Self Test Support for Production
- Cabinet and controls refinements
- Publications
- Graphic Art
- FBI and Credits Screens

**** FGA -- 12 months*

PRODUCT STATUS

"CYCLOTRON -- the BMX Racing Game"

DATE: 12 October 1989. PROJECT LEADER:. B.Smithson START: 12 Oct 1989
LAB:Omega/Nu EXT: 1716 NUMBER: 521
OMEGA TEAM

EVENT	SCHEDULE or <OCCURENCE>	MISSED DATES
PROJECT INITIATION:	Oct 16 1989	
1st REVIEW:	Jan 8 1990	
< 2 weeks extra for holidays and company shutdown >		
2nd REVIEW:	Mar 05 1990	
FOCUS:	Mar 19 1990	
3rd REVIEW:	May 28 1990	
4th REVIEW:	Aug 06 1990	
FIELD TEST:	Aug 20 1990	
FGA:	Oct 29 1990	

General:
Technical:
Software:

17.0 COSTS

There will be a one time tooling cost for the aluminum disk of $4000. There will also be tooling costs for whatever formed parts we use.

We allocated 2 27512 EPROMs over what Stun used to accomodate our extra usage of animation on polygon objects which will be necessary to accomodate the stunt positions.

Development will proceed as though the MSP will not be needed. After we get the 68000 model running, if the handling isn't good enough, we may need to allocate some more processing power to running a model. If so, a 40 MHz TI34010 and necessary RAM can be added for $55.

	Quantity	Cost	Ext. cost
PCBs			
Multisync (less Timekeeper	1.00	300.74	300.74
VRAM	16.00	6.00	96.00
EPROM (27512-200)	16.00	6.05	96.80
SUB-TOTAL			493.54
ADSP (less ROM,EPROM)	1.00	223.67	223.67
OTPROM (512-250)	6.00	4.10	24.60
SUB-TOTAL			248.27
SA II	1.00	77.79	77.79
EPROM (27512-250?)	1.00	5.80	5.80
OTPROM (512-250?)	4.00	4.10	16.40
SUB-TOTAL			99.99
Multisync/ADSP flat cable	1.00	4.75	4.75
		PCB Total	841.80

19" UPRIGHT cabinet	Quantity	Cost	Ext. cost
PCBs	1.00	841.80	841.80
Magnet drive electronics	1.00	10.00	10.00
Monitor (19" std. res.)	1.00	183.00	183.00
Power Supply (10A?)	1.00	50.00	50.00
Coin handling system	1.00	45.00	45.00
Cabinet (Incl. accessories	1.00	250.00	250.00
Formed Parts	1.00	58.00	58.00
Fluorescent light fixture	1.00	13.00	13.00
Attract plex/decals	1.00	75.00	75.00
Speakers & grills	2.00	8.00	16.00
Glass monitor shield	1.00	5.00	5.00
Monitor Bezel	1.00	4.30	4.30
Monitor shield retainer	1.00	14.00	14.00
Base trim	1.00	3.00	3.00
Control panel w/hinge	1.00	16.00	16.00
Control panel decal	1.00	5.00	5.00
Control panel harness	1.00	7.00	7.00
Hand brakes	2.00	10.00	20.00
Steering with Push / Pump	1.00	70.00	70.00
Pedal Assembly w/Frame	1.00	80.00	80.00
Start Button	1.00	5.00	5.00
Controls harnesses	1.00	10.00	10.00

Main harness	1.00	37.00	37.00	
Power cord	1.00	3.00	3.00	
On/off switch	1.00	3.22	3.22	
Labels and manuals	1.00	6.15	6.15	
Shipping container	1.00	53.00	53.00	
Hardware - nuts, screws	1.00	3.00	3.00	
Reserve: missing parts	1.00	6.00	6.00	
Utility Bracket	1.00	6.00	6.00	
		Material Total		1898.47
Labor				
PCB hours	2.12	8.57	18.17	
Video hours	3.89	5.89	22.91	
		Labor Total		41.08
Overhead ($58/hour)				
Fixed	5.51	42.00	231.42	
Variable	5.51	16.00	88.16	
		Overhead Total		319.58

		Fully burdened cost		2218.05
		Dist cost(40% marg)		3704.14
Overhead ($75/hour)	5.51	75.00	413.25	413.08

		Fully burdened cost		2352.63
		Dist cost (40% marg)		3928.89

18.0 TEAM

Team Leader	John Ray
Project Leader	Bonnie Smithson
Project Coordinator	Carole Cameron
Programming	Bonnie Smithson
Lead Animator	Mark West
Engineer	T.B.A
Technician	Alex Taccir
Marketing	Linda Benzler
Mechanical Design	
Pedals	Rick Moncrief
	Eric Durfey
	Max Behensky
Handlebars	Carole Cameron
	Milt Loper
	Jack Aknin
Software Support	Max Behensky
	Stephanie Mott

19.0 CHANGES

Summary of Changes in direction since the Concept Approval

- Only one type of racing: BMX
- Controls changes: Pump, Push, 2 brakes, Start button, One Gear
- Stunts
- It'll be a game not a simulator
- No fan to simulate drag.