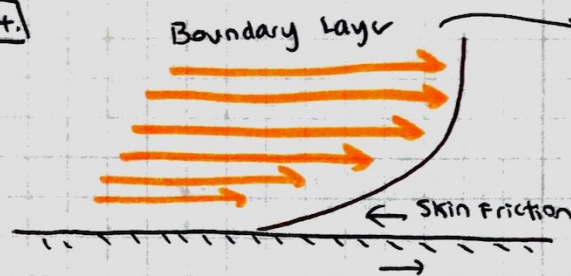


9/11-9/12 : Bibliographic Research (Cont.)

08

Exp. No.	Experiment/Subject	Date		
	Topspin Tennis Trajectory J6	10/14/20		
Name	Joe Gong	Lab Partner	Locker/ Desk No.	Course & Section No.

Cont.



Turbulent when $V \uparrow$

& surface area/length J6

↑ surface roughness ↑

↳ significantly more drag
↳ planes & ships

★ But planes have ridges on their wings

Turbulence mixes up faster high up air down close to surface

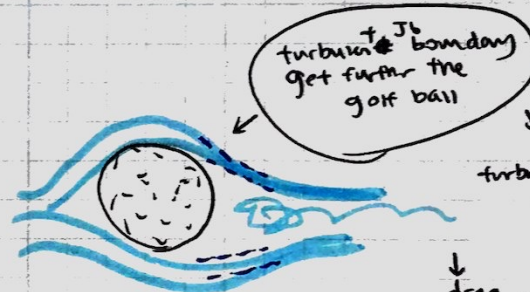
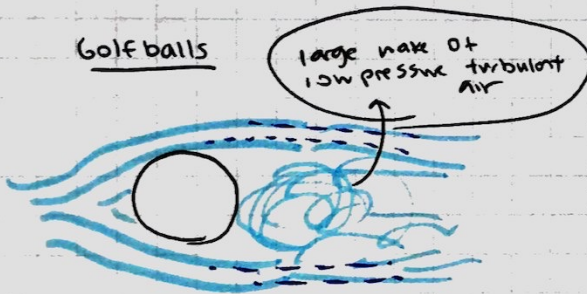
follow surface of the wing & maintain lift J6

↳ purpose: induce turbulence

↳ because air flow can separate @ low speeds or high α s

↓ so leads to stall & low lift

Golf balls



↓ - reduces size of turbulent wake + pressure drag

↓ drag coefficient drops by factor of 2

Scientists are trying to harness the energy they contain

Von Karman Vortex street



PUTTING A DEAD FISH HERE IN THE WAKE OF THE OBJECT

↓ SWIMS UPSTREAM! ★

Signature	Date	Witness/TA	Date
Joe Gong	10/14/2020	JHG	10/14/2020

Exp. No.	Experiment/Subject	Date	
	Ordinal Procedures (Plan) - 11/1/2020	11/1/2020	
Name	Lab Partner	Locker/ Desk No.	Course & Section No.
Jue Gong			

Yellow highlights + red #s: changes entry on 11/13/2020 after conducting (etc)

Ordinal Procedures (Plan) - 11/1/2020 (Planning to go to PATC on 11/4)

- need to find the quantitative measurements of parameters below
- Set up the tennis ball machine as detailed in "setting up" part of the Methodology in the Research Plan as well as the proposal

- ① **OVERALL DIRECTION:** Try multiple combinations of the parameters & determine a few that are easy to test with and collect data
- Ex. ball has to go over the net
ball should land somewhere between service line & baseline on the other side

RATE / SPEED OF BALL - in m/s

Experiment

1. Instead of aligning a digital camera (with tripod) along with the net, align the tripod on the baseline on which the ball machine is placed.
2. make sure that the camera points directly at the ball machine, with the line of sight parallel to the baseline & the face of the phone perpendicular to the ground.
3. Measure the width of the ball machine in meters. Record the value.
4. The other settings (e.g., feed rate, spin) do not have a significant impact on the initial speed, but will all be in general set to the lowest magnitude available.
- ③ ④ 5. Feed direction should be set to an adequate degree that will shoot the ball to adequate height & ~~distance~~ distance.
6. Place a timer (or phone) on the ball machine or in front of the camera where it can be read but not blocking the trajectory of the ball from being filmed. Start the timer. MAKE SURE THAT THE TIMER IS VISIBLE.
7. Set the speed to _____ (whatever is chosen or wanted to be tested)
→ right now the model is unknown so the selections are unknown
8. Turn on the camera & start recording. Start the ball machine.
9. After 6 balls have been launched, stop the tennis machine.
- ② 10. Repeat steps 6-9 with a few other speeds.

SLOW MOTION

Analysis

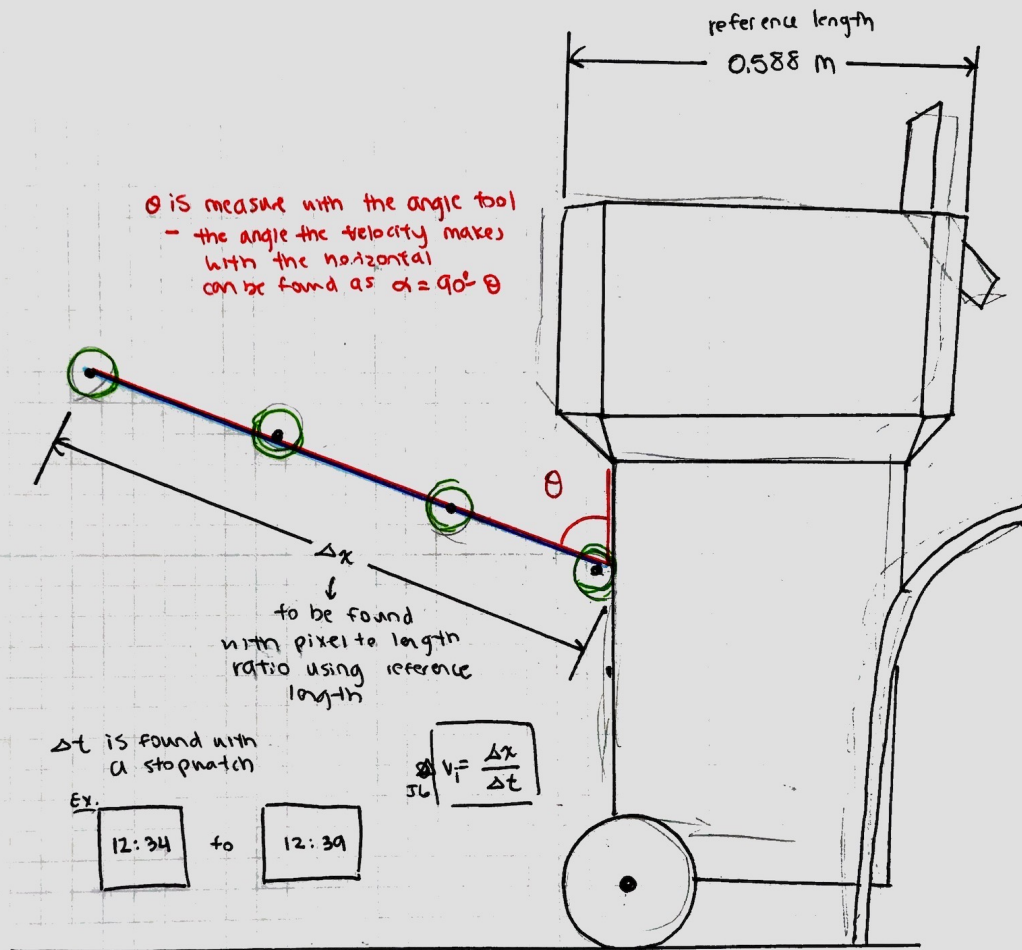
1. Use the phone or send the video (for one trial) to a computer - use slow motion or video editing/viewing software to analyze the videos in frame.
2. Play the video in slow motion. Identify the frame right before the ball becomes visible out of the launching hole. (Define the time shown on the ~~timer~~ timer to be t_i , in seconds)

Signature	Date	Witness/TA	Date
Jue Gong	11/1/2020	Jue Gong	11/1/2020

Exp. No.	Experiment/Subject	Date	Course & Section No.
	Ordinal Procedure Explanation/Sketch: Speed + Angle	11/20/2020	
Name	Lab Partner	Locker/Desk No.	
	Jue Gong		

Ordinal Procedure Explanation/Sketch: Speed + Angle

11/20/2020



Signature	Date	Witness/TA	Date
Jue Gong	11/20/2020	fn	11/24/2020

Exp. No.	Experiment/Subject MAJOR CHANGE, in dependent variables	Date 12/9/2020
Name Jue Gong	Lab Partner	Locker/ Desk No. Course & Section No.

CHANGE : in dependent variable

12/9/2020

From: height of trajectory / projectile (m)

To: horizontal displacement (m)

- measured relative to service line of ball on the other side

WHY?

- when doing the ordinal part of the experiment, I tried to film the height of the ball, but it was difficult in multiple ways

- ① Height location (horizontal location) varies based on the trajectory. It cannot be guaranteed to be right above the ~~tee~~ net.
- ② The ball goes too fast; looks blurry in sides even though slow-motion is used. (The best camera available is my iPhone 7's camera.)
- ③ The courts are placed side by side, so there are nets less than a few feet from the side of the net of our court, so it was impossible to place a camera directly beside the net and also being far enough to capture the net in its entirety as well as leaving some margin above for the ball.

- I noticed that there is significant differences in the horizontal displacement of the ball (a fact I was not too sure of until I was actually able to use the machine; when writing my proposal in 9th grade, I had thought about using horiz. displ. as the dependent variable, but wasn't sure). When the spin levels are change, so I think it is appropriate to change the dependent variable to that.

Signature Jue Gong	Date 12/9/2020	Witness/TA Jhm	Date 12/9/2020
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