

# GOLF BALL AERODYNAMICS

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# Abstract

In this project we work on golf balls and stuff.

# Declaration

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# Chapter 1

## Introduction

Stuff here about the project and aims and such.

### 1.1 A small history of golf

The origins of the game of golf are difficult to trace, with suggestions that the game originated in either Scotland, France, the Netherlands, China, or even going back as far as the Romans. Golf in its more modern incarnation however, is agreed to have originated in 15 th century Scotland, where the first written records of the game are (somewhat humorously) related to King James II of Scotland banning the game in 1457 for fear of a decrease in archery practice in its favor.

From the 18 th century onwards golf began to take form fully in Scotland, with the founding of both The Royal and Ancient Golf Club in St Andrews and The Royal Burgess Golfing Society in Edinburgh. The oldest surviving rules of golf also date from this time, and these have been in a state of constant revision until the modern day.

In the 19 th century the popularity of golf vastly increased, seeing larger numbers of people knowing and playing the game, and the start of the first major tournaments. Additionally, the game spread out along to much of the British empire, to the United States and eventually to Japan, making golf into a global sport with a large industry to match.

In the modern day, golf is potentially one of the largest sports on earth, with golf tournaments, golf manufacturing and related industries accounting for hundreds of

billions of pounds of economic activity. With such large stakes riding on the game, having a consistent and fair rule set is of paramount importance and this is dealt with jointly by The R&A (The Royal and Ancient) in most of the world and the USGA (United States Golf Association) in the Americas.

## 1.2 A slightly larger history of the golf ball

Golf ball technology has advanced greatly since the advent of the game. Initially, hard wooden balls were used for playing, however these were soon replaced with featherie balls which are leather pouches stuffed with feathers and then painted white.

The next major innovation in the design of golf balls came in 1848, when the gutta-percha ball was invented. This is the first ball to use a rubbery substance as continues to this day, and was easier to make into a proper sphere, unlike the previous types of ball. It was around this time that it was discovered that abrasions to the surface of the ball would improve the aerodynamic properties of the ball, making it easier to control the flight of the ball and increasing the distance at which the game could be played. This would start a series of innovations that would lead to todays dimpled balls, which we will discuss later.



(a) “Featherie” balls



(b) Pro V1 ball

Figure 1.1: In 1.1a are “Featherie” golf balls, taken from [https://en.wikipedia.org/wiki/File:Featherie\\_golf\\_ball.JPG](https://en.wikipedia.org/wiki/File:Featherie_golf_ball.JPG), and in 1.1b is a modern style ball, namely the Titleist Pro V1 ball.

After this, the golf ball once again changed form with the advent of using wrapped rubber thread to help the ball to bounce better. This was coupled with the first time that a plastic cover was added to the ball, in order to protect the rubber inside the ball on impact with the club. This cover also persists to this day, although the inside of the ball has seen significant development.

The modern golf ball has changed significantly from old designs. The interior of the ball is now usually a 3 piece rubber composite, with different properties in each rubber to maximize the controllability of the ball during play. The exterior is a polyurethane cover (normally white but some are in other colours) with usually between 300 to 400 dimples (though these can go as low as 200 dimples, and beyond 600 in some cases). The properties of the ball are stipulated to be within certain ranges, as set by The R&A and USGA in the rules of golf. The weight of a ball must not be greater than 45.93g, the diameter no less than 42.67mm and the ball must be spherically symmetric.

## **1.3 Aims of the project**

The aim of this project is to categorize

# Chapter 2

## Preliminary results

There are some useful results we need which we'll probably write about here [Robinson](#) and [Robinson \(2013\)](#)

# Bibliography

G. Robinson and I. Robinson. The motion of an arbitrarily rotating spherical projectile and its application to ball games. *Physica Scripta*, 88(1):018101, 2013. URL <http://stacks.iop.org/1402-4896/88/i=1/a=018101>.