CALIFORNIA STATE SCIENCE FAIR
2002 PROJECT SUMMARY

Name(s)
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Project Number
22074

Project Title
Ancient Polygonum Reveals Secret to Correct Ball's Erratic Flight Path

Abstract

Objectives/Goals
Determine why a ball of given mass, diameter and smoothness does not fly accurately and precisely. Manufacture two experimental ball groups with surface patterns ('Fully Dimpled' group and 'Equatt Dimpled' group) that will increase range, accuracy and precision, and then compare those results with the control group. Success is defined as the pattern which is more accurate, more precise, and yields the most range or distance.

Methods/Materials
Smooth foam balls of 11/16ths-inch diameter are used as the control group and are propelled by precisely controlled air pressure at a target placed exactly 60 feet away with results recorded and measured. The control group ball's surface is then modified with 2 specific geometric patterns of dimples, re-fired and measured against the control group for range, accuracy and precision. Statistical information is used to compare results.

Materials are foam balls, propellant device with air tank, mount and regulators, target, and measuring devices. A butane gas powered soldering iron was used to impress the nearly 2,400 dimples into 60 balls. All tests were performed in an environmentally isolated outdoor area 60 X 150 feet.

Results
The smooth control group exhibited a nearly uniform normal distribution of results in range, accuracy and precision. The two test patterns differed wildly from the control group. The 'Fully Dimpled' pattern, which was expected to be the most successful, was not. The 'Equator Pattern' was unexpectedly highly successful.

Conclusions/Discussion
Owing to a physics principle known as the 'barbell effect', the 'Equator Dimpled' pattern was surprisingly successful in accuracy and precision. The 'Fully Dimpled' group was disappointingly inaccurate and imprecise, although expectedly, yielded the most range. Because each of the 60 balls of the twot experimental groups was handmade, some degree of manufacturing imperfection was responsible for variances in results.

Summary Statement
Unusual geometric dimple patterns applied to the surface of a smooth skinned ball yields surprising effects on accuracy, precision and range.

Help Received
I would like to thank my Father for help with mechanical setups and statistics, Mother because she let me keep the organized mess together without cleaning up until the project was finished, Mr. Kangus for his help with the statistics and Mr Patzold for his overall guidance.