AERODYNAMIC CHARACTERISTICS OF A NEW SOCCER BALL

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Introduction

Specifications for soccer balls are determined by the Fédération Internationale de Football Association (FIFA). New soccer balls that meet these specifications are being routinely manufactured and used in competitive and recreational sports around the world. However, the aerodynamic characteristics of these newly manufactured soccer balls have not been clarified. Thus, the purpose of this study is to compare the basic aerodynamic characteristics of a conventional soccer ball with those of a new soccer ball in a wind tunnel. Furthermore, to examine the aerodynamic instability of these balls near the critical Reynolds regime (Re = ~3.0 × 10^5), we used high-speed video images and a smoke-generating agent (Asai *et al.*, 2007).

Methods

We measured the aerodynamic forces acting on the two types of balls in a low-speed wind tunnel with a rectangular cross section of 0.7 × 0.7 m (turbulence level ≤ 1%). Two full-size official FIFA soccer balls were tested: a conventional-type ball (Adidas TEAMGEIST II, 14 panels) and a newly designed ball (Adidas JABULANI, 8 panels). The surface of the conventional soccer ball is relatively flat, whereas the Adidas JABULANI has small ridges.

Results & Discussion

According to the experimental results, the critical Reynolds number for the conventional soccer ball was approximately 2.8 × 10^5, whereas that for the ridge-type ball was approximately 3.2 × 10^5. We noted that the critical Reynolds number of the new ridge-type ball was slightly higher than that of the conventional soccer ball (Fig. 1).

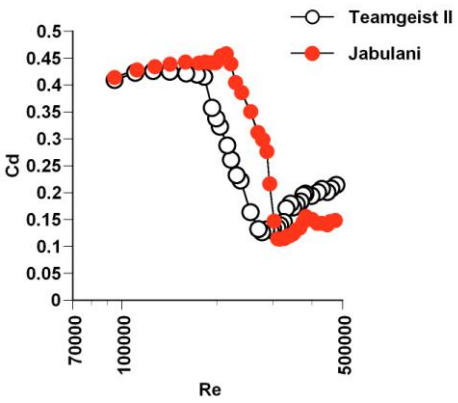

Figure 1. Drag coefficient of conventional (Teamgeist II) and new (Jabulani) soccer balls.

Conclusion

It is concluded that the aerodynamic drag coefficient of the newly designed soccer ball is closer to that of a smooth sphere than the drag coefficient of the conventional ball.

References

1. Asai, T. *et al.* (2007). *Sports Engineering*, 10(2): 101-109.