スキージャンプスーツ用生地の通気量と空力特性の関係解明と飛距離最大を目指した高性能スーツの提案

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Elucidation of The Relationship between Aerodynamic Characteristics and Air Permeability of Ski Jumping Suit and Proposal of High-performance Suit to Achieve The Maximum Flight Distance

by

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ABSTRACT

Ski jumping competition is a sport that competes in term of the total point of "Distance Point" that digitizes the flight distance and "Judges Point" that digitizes the beauty of flight attitude and landing, and ski jumpers attempt to fly as far as possible. In competition, there are many regulations to ensure fairness. In the international ski jumping competition rules, suit fabric must show the air permeability of a minimum of 40 liters per m^2/sec under 10 mm water pressure. However, the effect of air permeability of suit fabric on aerodynamic characteristics has not been completely clarified yet. The purpose of this study is to investigate the effect of air permeability of suit fabric on aerodynamic characteristics. Four types of fabric with different air permeability are used and the wind tunnel experiments were carried out using the fabric clothed elliptic cylinder. The drag coefficient decreases with increasing the air permeability. Also, the stall delay occurs for the fabric with high air permeability, and the lift to drag ratio at the high angle of attack can be improved. Furthermore, it was confirmed that the velocity profiles near the surface show the different tendency for

different air permeability fabric. It is presumed that the aerodynamic performance of ski jumpers during a flight can be improved by depending on the air permeability of the ski jumping suits fabric. The flight distance for each fabric was calculated with the aerodynamic force data assuming that the elliptic cylinder flies. Case-2 with increased air permeability have longer flight distances than Case-1（original air permeability）.

要　旨

本研究ではスキージャンプスーツ生地の通気量に注目し，通気量と空力特性の関係を明らかにすることを目的とする．通気量の異なる生地を数種類用意し，これを楕円柱に巻き付けて風洞試験を行った．楕円柱に作用する流体力は３分力天秤を，生地近傍の流れ場は熱線風速計を用いて測定した．楕円柱周りの流れはスモークワイヤ法による可視化を行い評価した．また，取得したデータを考慮し楕円柱がスーツを巻いて飛行すると想定した場合の飛距離を試算した．

流体力測定では，オリジナルの生地よりも通気量を増加させたCase-2において最も失速角が後退した．熱線風速計による測定結果より，Case-2で楕円柱後縁側の生地近傍において他の生地と比較して増速が見られた．また，飛距離計算の結果から現在の空気通気量の規定値以上においても，飛距離が延伸する可能性を示すことができた．