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Short note

Tachikawa number: A proposal

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Abstract

This paper describes the studies of windborne debris by Masao Tachikawa and shows that a parameter defined by him, representing the ratio of aerodynamic to gravity forces, is the main non-dimensional parameter determining the trajectories of debris items of all types. A case for naming this parameter as the "Tachikawa Number" is made.

Keywords: Debris; Tachikawa parameter

1. Introduction

Professor Masao Tachikawa (January 14, 1929–March 20, 2001) was a pioneer in the study of windborne debris who studied experimentally and numerically the trajectories of generic debris types, at Kagoshima University in Japan in the 1980s [1,2]. Amongst his significant insights was the recognition of the importance of the non-dimensional ratio of aerodynamic forces to gravity forces to the flights of flat plates, referring to this ratio as a parameter "K" in his 1983 paper "Trajectories of flat plates in uniform flow with applications to wind-generated missiles" [1], published in this journal (this paper was also presented at the Sixth International Conference on Wind Engineering in March 1983).

This paper describes the studies by Masao Tachikawa and shows that the parameter defined by him is the main non-dimensional parameter determining the trajectories of

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debris items of *all* types, and appears irrespective of which form of non-dimensionalisation of the equations of motion is used.

2. The life and career of professor M. Tachikawa

Professor Masao Tachikawa (Fig. 1) received his Bachelor's degree from The University of Tokyo, Japan, in 1952. He was awarded Doctor of Engineering in 1971 from the same university for the dissertation entitled "Fundamental studies on the features of fluctuating wind pressures on buildings".

He first worked for the Nippon Oil Corporation, Japan, as a structural engineer for 7 years from 1952 to 1959. He joined Kagoshima University (KU), Japan, in 1959, and started his study of wind engineering. He said that he started wind engineering simply because Kagoshima was a typical place in Japan subject to typhoon attack. He was a Professor at KU for 19 years from 1975 to 1994, and was a Professor Emeritus later. He served as Dean of the Faculty of Engineering, KU, from 1988 to 1991. After retirement from KU, he was the President of Sendai Polytechnic College from 1994 to 1997.

Masao Tachikawa achieved excellence in the field of wind engineering, and in 1993 he received an Award of the Japan Association for Wind Engineering (JAWE) in recognition of his outstanding and innovative contributions.

His first paper in English was "Wind pressure measurements on bluff bodies in natural winds." This paper appeared in the Proceedings of US-Japan Research Seminar WIND LOADS ON STRUCTURES, October 1970, University of Hawaii. He presented the results of measurements of fluctuating wind pressures on prisms with a square and a rectangular section model mounted on the rooftop of a four-storey building. The wind pressures were measured by six pressure transducers and 20–30 U-tube manometers. The transducers were manufactured by him in 1965, and it was a pioneering work in wind pressure measurements under field conditions. He used intermediate-size models to compensate for various difficulties in full-scale measurements of fluctuating pressures acting on buildings and different features of wind characteristics in wind tunnels.

Fig. 1. Professor Masao Tachikawa (1929–2001).