

**ICAO***International Civil Aviation Organization*

Seventh Meeting of the Aerodromes Operations and Planning Sub-Group (AOP/SG/7)

*Bangkok, Thailand, 3 to 6 July 2023***Agenda Item 4: Provision of AOP in the Asia/Pacific Region****– Planning & Design of Aerodromes****STRENGTH ASSESSMENT AND CLASSIFICATION FOR GRASS RUNWAYS**

(Presented by New Zealand)

**SUMMARY**

This paper presents a review of strength assessments for unpaved (grass) runways in New Zealand and request ICAO to consider developing recommended practices for unpaved runways.

**1. INTRODUCTION**

1.1 In New Zealand, during the recovery from COVID-19, it has been observed that there are an increasing number of small commercial passenger transport operators creating niche domestic routes. It is likely that future generation (electric) aircraft will further increase the value of this market segment.

1.2 These types of operation are able to use smaller, more remote aerodromes, some of which have unpaved (predominantly grass) runways, which may have previously been used exclusively by light or general aviation aircraft. This activity has provided an opportunity for New Zealand to review the current strength assessments used for unpaved surfaces.

**2. DISCUSSION**Background

2.1 In New Zealand, the Aeronautical Information Publication (NZAIP) provides guidance on the surface bearing strength of unpaved surfaces using the Equivalent Single Wheel Load (ESWL) classification.

2.2 The condition of a grass runway is dependent on the prevailing weather conditions, therefore a promulgated ESWL value could be inaccurate, leading to an increased risk of runway excursion or runway damage on landing.

2.3 *NZAIP AD1.11 Operational Data Section 2.3 Strength* provides information on strength classifications for paved and unpaved surfaces. For unpaved surfaces Section 2.3.2 and 2.3.3 provide the following explanation of ESWL:

- a) (2.3.2) The majority of New Zealand aerodromes use the Equivalent Single Wheel Load (ESWL) classification of the surface bearing strength of unpaved manoeuvring areas. Since undercarriage loads in excess of the ESWL value could damage the surface, aircraft weights must be limited to ensure that the ESWL for the aircraft does not exceed that specified for the runway.

- b) (2.3.3) For aircraft with a single wheel per undercarriage leg, ESWL is taken as 45% of the all-up weight. For aircraft with multi-wheeled undercarriage legs the ESWL is lower than this value. Operators should refer to the Civil Aviation Authority when an ESWL for this latter type is critical.

2.4 ICAO Circular 25-AN/22 Runway design methods for multiple wheel landing gears, published in 1952, advised that the ESWL for a dual main wheel configuration could be 30% of the actual weight.

2.5 ICAO Doc 9157 Aerodrome Design Manual – Part 1 – Runways Section 5.1.15 states “A runway should be capable of withstanding the traffic of aeroplanes the runway is intended to serve. For details of pavement design methods refer to the Aerodrome Design Manual, Part 3”.

2.6 ICAO Doc 9157 Aerodrome Design Manual – Part 3 – Pavements Chapter 9 provides detail on Structural Criteria for Natural Ground. Section 9.1.3 states: “The guidance provided in this section is geared toward the physical attributes most commonly left unpaved at an aerodrome. Specifically, these are runway and taxiway shoulders, runway end safety areas (RESAs) and runway strips outside the runway shoulder area. **The guidance does not apply to unpaved runways themselves, since the strength requirements for a runway are much more stringent.**” There is no further specific guidance that refers to unpaved runways in Doc 9157.

#### Current Situation

2.7 There appears to be a lack of standard or recommended practice that refers to unpaved runways or grass runways specifically.

2.8 Based on the weather dependent nature of a grass runway’s strength, promulgating a single strength value generates a risk that the value is incorrect for the prevailing conditions.

2.9 Pilots using these grass surfaces may have an incorrect impression of the strength characteristics of the grass runway given the prevailing conditions leading to an increased risk of runway excursion or aircraft becoming stuck on the runway. In New Zealand, this risk is mitigated at some aerodromes through proactive inspections and NOTAM closures of grass surfaces and AIP notes highlighting soft when wet conditions.

2.10 As the number of small commercial passenger transport operations increases, it is likely that the strength limits of unpaved and grass runways will be more routinely used to assess the suitability of runways for commercial operations, generating a requirement for recommended practices that provide greater assurance over the runway strength.

### **3. ACTION BY THE MEETING**

3.1 The meeting is invited to:

- a) Consider the information contained in this paper; and
- b) Request ICAO to consider the need for the establishment of recommended practices with regard to unpaved runways.