



WORKING PAPER

ASSEMBLY — 39TH SESSION

TECHNICAL COMMISSION

Agenda Item 35: Aviation safety and air navigation standardization

**LACK OF INTERNATIONAL HARMONY IN THE APPLICATION OF
AVIATION COLOUR VISION STANDARDS**

(Presented by New Zealand, Australia and Singapore)

EXECUTIVE SUMMARY

Despite similar aviation medical standards globally, the outcome of colour vision deficiency assessments leads to different regulatory interventions and decisions. These vary from the denial of a medical certificate to issuing unrestricted Class 1, 2 and 3 licenses where the applicant is unable to pass any colour assessment. Such variation appears to stem from the different methods and processes used in the interpretation and application of global standards.

These inconsistencies pose barriers to States' harmonisation of colour vision assessment practices and pilot license recognition, potentially undermining the integrity of the regulatory system. Furthermore, the inconsistency in the application of colour vision assessments may encourage license applicants to "shop around" for a favourable outcome. Inconsistent compliance also places unfair financial and professional costs on applicants.

This paper discusses the issue in the context of ICAO standards and recommends that the Assembly encourage ICAO to specify the role of colour recognition in aviation and clarify the application of standards for the assessment for colour vision deficiency.

Action: The Assembly is invited to recommend that ICAO reviews its colour vision deficiency standards in the interests of assisting international harmonisation, including:

- a) identification of the specific role colour recognition plays in the aviation environment
- b) the updating of acceptable testing modalities to reflect current requirements for colour vision in aviation, and
- c) a recommended application of testing results against these standards.

Strategic Objectives:

This working paper relates to the Safety Strategic Objective.

References:

Annex 1 — *Personnel Licensing*
Doc 8984, Manual of Civil Aviation Medicine

1. INTRODUCTION

1.1 At the fifth meeting of the Regional Aviation Safety Group – Asia Pacific Regions (RASG-APAC/5) held in Manila, Philippines from 26 to 27 October 2015, the Group discussed a paper presented by New Zealand and Australia (WP/26) pertaining to the lack of international harmonisation in States' application of colour vision deficiency standards. The Group agreed (Decision RASG-APAC 5/24):

1.1.1 That ICAO clarifies and specifies its Colour Vision Deficiency Standards, including specifically:

a) The role colour vision plays in the aviation environment; and

b) The application of testing against these standards.

1.2 This paper advances that clarification would contribute to outcomes-based standards and international harmonisation in the area of colour vision for applicants' medical certification.

2. COLOUR VISION IN AVIATION

2.1 Colour plays an important role in the transmission of information from the environment to aviation personnel. Color-coded information is found on instruments and displays, radar screens, charts and documents, and throughout the external airborne and terrestrial environment. Over time, aircraft systems and equipment have become increasingly complex. In many cases that complexity includes an increased use of colour-coded information.

2.2 However, there remain questions and uncertainties about the aeromedical significance of needing to recognise specific colours in aviation and how to best test for these.

2.3 The current International Civil Aviation Organization (ICAO) colour vision medical standards require an applicant to have “the ability to perceive readily those colours the perception of which is necessary for the safe performance of duties”.¹ ICAO Standards provide Contracting States with a degree of flexibility in the medical assessment of applicants who fail to meet any of the specific medical Standards.

2.4 A 2014 study published in *Aviation, Space and Environmental Medicine* concluded that there is a high degree of variation between States in the detection and medical assessment of applicants in aviation with colour vision deficiency, and that this variation stems from the application of medical Standards rather than the wording of the Standards themselves.²

2.5 This paper outlines factors contributing to this situation, the problems that potentially result from this and recommends that ICAO take steps to address the issue.

¹ Convention on International Civil Aviation, Annex 1, standard 6.2.4.2. *International Standards and Recommended Practices - Personnel Licensing*, 11th ed. ICAO, Montreal, Canada: 2011.

² Watson DB. “Lack of International Uniformity in Assessing Color Vision Deficiency in Professional Pilots.” *Aviation, Space, and Environmental Medicine*, 85(2), pp. 148-159: February 2014.

• See also: Werfelman L. “Color Vision GAP.” *AeroSafety WORLD*, Flight Safety Foundation, pp. 33 – 36: May 2014.

3. FACTORS CONTRIBUTING TO VARIED OUTCOMES

3.1 The ICAO colour vision Standard, requiring applicants to have “the ability to perceive readily those colours the perception of which is necessary for the safe performance of duties”, is concise and conceptually sound. However, it does not indicate which colours need to be perceived readily by applicants to ensure safe aviation, or the threshold of measurable colour vision deficiency at which an applicant fails to meet the Standard.

3.2 Guidance material for the ICAO medical Standards is provided in the *Manual of Civil Aviation Medicine* (Doc 8984)³. The colour vision sections of this manual provide general information concerning the physiology of colour vision, colour vision and aviation, and the methods often used to detect and evaluate colour vision deficiency. The manual describes colours most often used in aviation and notes the difficulty in establishing criteria for the assessment of applicants with colour vision deficiency. The manual recognises that “precise physical and physiological criteria cannot be given because of the large number of variables in different viewing situations.” The challenge is to “determine exactly where the cut-off between ‘safe’ and ‘unsafe’ should be placed with respect to an initial applicant who chooses aviation as his career or hobby”.

3.3 Furthermore, the apparent cause of the variation in application of the colour vision medical standard is not the standards published by the States. Rather, it is considered to be the result of the methods and processes used in the interpretation and implementation of those standards.

3.4 ICAO’s Universal Safety Oversight Audit Programme (USOAP) includes assessment of states’ medical systems. These audits, however, do not consider the application of the colour perception requirements or the outcomes of that application. Therefore, while these audit processes have encouraged a high degree of consistency in states’ published medical standards they have not served to encourage consistent outcomes in medical assessments.

3.5 The medical Standards in Annex 1 — *Personnel Licensing* are open to a degree of flexibility that allows for the medical certification of certain applicants who likely do not meet the medical Standards. While such flexibility provides benefits in some circumstances, it does not foster uniformity in the interpretation of medical Standards and may compromise safety.

3.6 In addition to the flexible application of colour vision Standards, a range of other factors have been identified as contributing to variations across States:

- medical knowledge and attitudes
- medical demographics
- cultural factors
- legislation
- aircraft accidents
- appeals and reviews
- audit and benchmarking
- commercial factors
- special interest lobby groups driving safety regulators towards a lowest common denominator

4. PROBLEMS RESULTING FROM THE VARIED OUTCOMES

4.1 The inconsistent application of colour vision Standards serves as a barrier to States establishing aviation agreements that include a component of licensing recognition or pilot training and certification, and can undermine existing agreements, when States medical certification outcomes differ

³ ICAO Doc. 8984-AN/895, *Manual of Civil Aviation Medicine*, 3rd ed. Montreal, Canada: 2012.

considerably. Furthermore, individuals can face difficulties when seeking to transfer their qualifications and expertise between States. The lack of consistency exposes States to potentially reduced safety outcomes, for example, where a pilot with colour vision deficiency flies from one State over or into another State which has more stringent colour vision outcomes that the pilot would not satisfy. Because the published medical standards of the State of origin are ICAO compliant, the other State will have no knowledge that a pilot, with what it considers an unacceptable level of colour vision deficiency, is flying in its airspace.

4.2 Industry participants have long known of this inconsistency, with individuals and representative groups seeking to use differences to their advantage. For example, within geographically close-knit regions with shared or similar standards, but different assessment procedures, an applicant has the potential to “shop around” different States to obtain a favourable assessment outcome. This results in aeromedical tourism that can undermine a State’s regulatory standards and potentially affect aviation safety.

4.3 The variation of colour vision assessments also has a range of economic implications in addition to the transfer (or not) of expertise and credentials. In States with a liberal application of colour vision standards, a wider pool of applicants is made available to the aviation industry, possibly to the detriment of safety where some of these applicants are medically certified who perhaps do not meet the intent of the colour vision standards. Similarly, individual applicants face widely varying compliance costs when confronted with different colour vision assessment regimes to which they may need to adhere.

4.4 At its most fundamental level, this inconsistency delivers a mixed message to safety regulators, and to the various individuals and organisations involved in aviation. On the one hand, the Annex 1 colour vision Standard, and associated guidance material, suggests that colour vision is important for safe aviation. On the other hand, the wide range of assessment outcomes, including in some cases no application of colour vision standards whatsoever, and the absence of any remedial effort, can be interpreted as suggesting that the recognition of specific colours is not important for aviation safety.

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