

# Cone Contrast Test for Color Vision Deficiency Screening Among Trained Military Aircrew and Flying Related Vocations

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I have no financial relationships to disclose.

I will not discuss off-label use and/or investigational use in my presentation.

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# Introduction

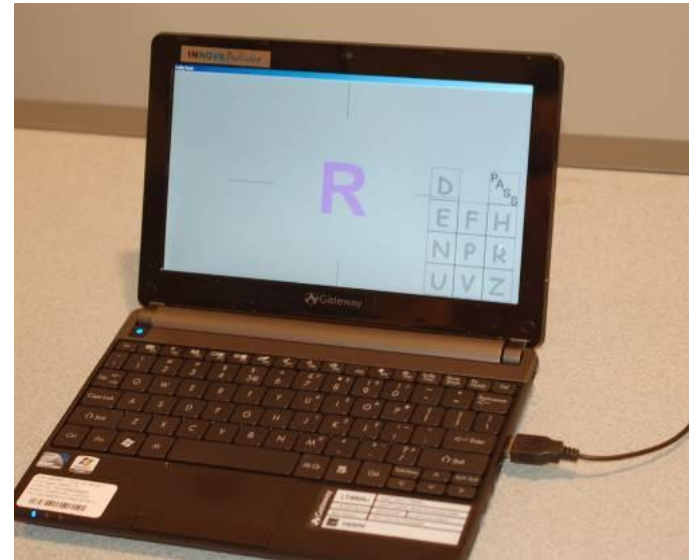
- RSAF reviewed and replaced its color vision testing modality in 2016
- Pre-July 2016: Concept of color safe
  - Primary - Ishihara Pseudo Isochromatic Plates
  - Secondary - Edridge Lantern Test
- Post-July 2016: Computerised Color Vision
  - Cone Contrast Test
    - Led to an increase of applicant attrition from 0.75% to 3%<sup>1</sup>



<sup>1</sup> Isaac Chay, Shawn Lim, Benjamin Tan. Cone Contrast Test for Colour Vision Deficiency Screening Among a Cohort of Military Aircrew Applicants; 2017.

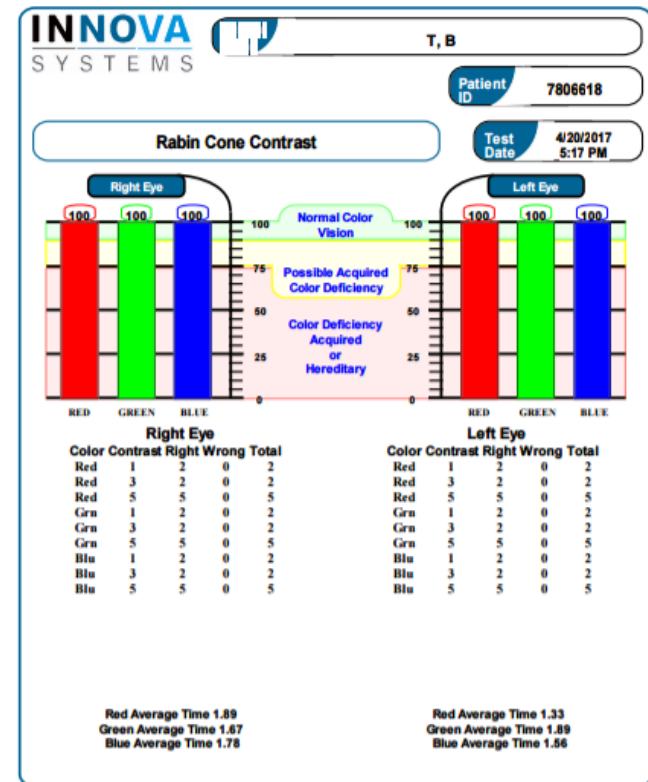
# Cone Contrast Test

Score	Cone Contrast Test			Cone Contrast (%)		
	L Cone	M Cone	S Cone	L, M	S	
10	V Z	N F	E Z	27.5	173	↑ <b>severe</b>
20	F V	Z U	N R	19.1	120	
30	R P	E P	F D	13.2	83	
40	Z E	N F	Z V	9.1	57	Color deficiency
50	H R	E D	R P	6.3	39	
60	D R	H P	Z N	4.4	27	↓ <b>mild</b>
70	N Z	D U	E D	3.0	19	
80	V F	F H	V R	2.1	13	↑ Normal color vision
90	F D	F D	F D	1.4	10	
100	F D	F D	F D	1.0	7	



# Cone Contrast Test

- Score for each cone type (L,M,S)
- The CCT score for each eye is pegged to the cone type with the lowest score
- The lower score of both eyes will be used as the overall score



Version 16.02.0

Tested at 7.00 feet

Last Calibration: 3/31/2017

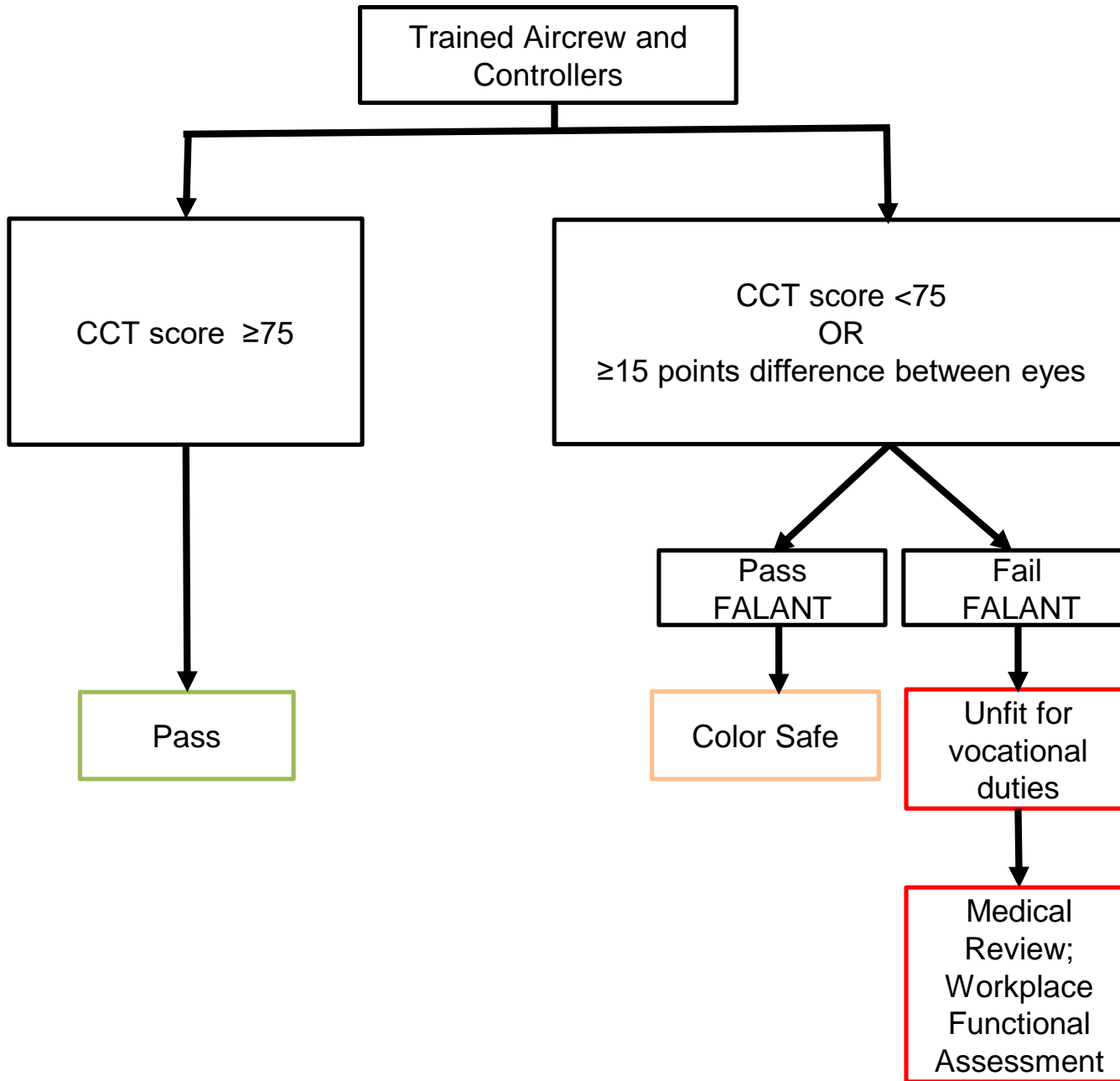


# Methodology

- Retrospective cohort study from Nov 2016 to June 2018
- All trained military aircrew and controllers who underwent CCT as part of their annual medical screening
  - All had best corrected VA of 20/20 or better
  - All had no ocular pathology







# Workplace Functional Assessment



# Results

- 143 trained military aircrew and ground based crew, including UAV operators and air-traffic controllers with abnormal CCT score
- Four personnel underwent ophthalmological review, workplace functional assessment with aviation medical officer and qualified instructor:
  - One unfit
  - Three returned to restricted vocational duties



# Results

- All four who failed FALANT were controllers with PMhx of diminished colour vision
- Reviewed by Ophthalmologist: no ocular pathology
- Three out of Four who passed FALANT
  - **Workplace Assessment:** deemed functionally safe
  - **Aeromedical Board:** restricted control duties to specific platform and yearly FALANT



# Discussion

- CCT is an effective colour vision test in identifying and quantifying colour vision deficiency
  - High sensitivity/specificity
  - Good repeatability and Fast administration
  - Impossible to memorise
- Majority of trained aircrew and controllers who previously passed colour vision testing continued to pass CCT



# Discussion

- Decision matrix for trained aircrew and controllers with abnormal CCT score
  - Maintaining **flight safety**
  - **Retention** of trained personnel
- Waiver management is dependent on the etiology and severity of colour deficiency
  - Workplace functional assessment
  - Aeromedical board for case dependent restrictions





**T H E E N D**