

Retinal Artery Occlusion,  
Ischaemic Optic Neuropathy,  
Amaurosis Fugax and  
Aeromedical Considerations for Certification

**Dr Ryan Anderton**  
Specialty Registrar in Aviation and Space Medicine  
UK CAA Medical Assessor

**Mr John Pitts, UK CAA Medical Assessor and Consultant  
Ophthalmologist**

## **Dr Ryan Anderton MBChB MRCP DAvMed**

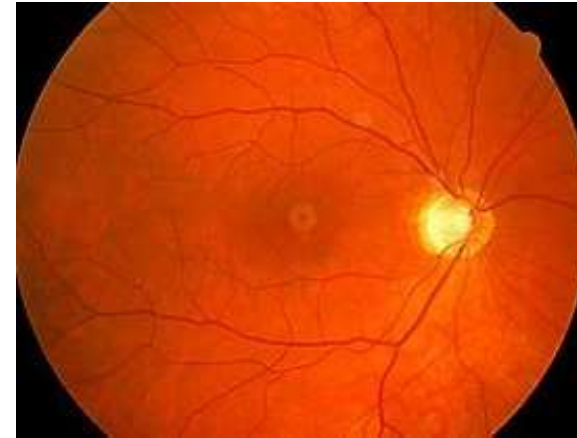
- Specialty Registrar in Aviation and Space Medicine
- UK CAA Medical Assessor
- General Practitioner

## **Mr John Pitts DAvMed FRCOphth**

- UK CAA Medical Assessor
- Moorfields-trained Consultant Ophthalmologist
- Former consultant adviser in ophthalmology to the CAA

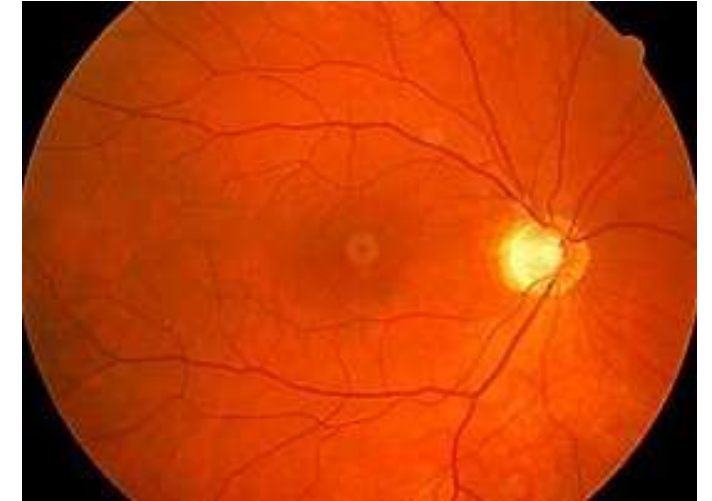
# Aims

- Brief overview of conditions
- Aeromedical concerns
- Current UK guidance
- Case examples
- Summary



# Ocular Ischaemic Conditions

- Central Retinal Artery Occlusion (CRAO)
  - Branch Retinal Artery Occlusion (BRAO)
  - Anterior Ischaemic Optic Neuropathy (AION)
  - Posterior Ischaemic Optic Neuropathy (PION)
  - Amaurosis Fugax as a symptom
- 
- We are not discussing surgical causes/major blood loss, ocular injury etc.
  - We are not discussing arteritic causes (connective tissue disease including giant cell arteritis (GCA))



# Aeromedical Concerns

- Functional ability
- Incapacitation risk

# Non-arteritic Ischaemic Optic Neuropathy (NA-ION)



- Commonest adult optic neuropathy
- Underlying vascular disease
- Mean age onset 57- 65 (ageing pilot population)

# Associated conditions to consider in NA-ION

- Hypertension in up to 50%
- Diabetes in up to 25%
- Hyperlipidaemia in up to 50%

# Associated risks in NA-ION

- Ischaemic stroke
  
- Cardiovascular events

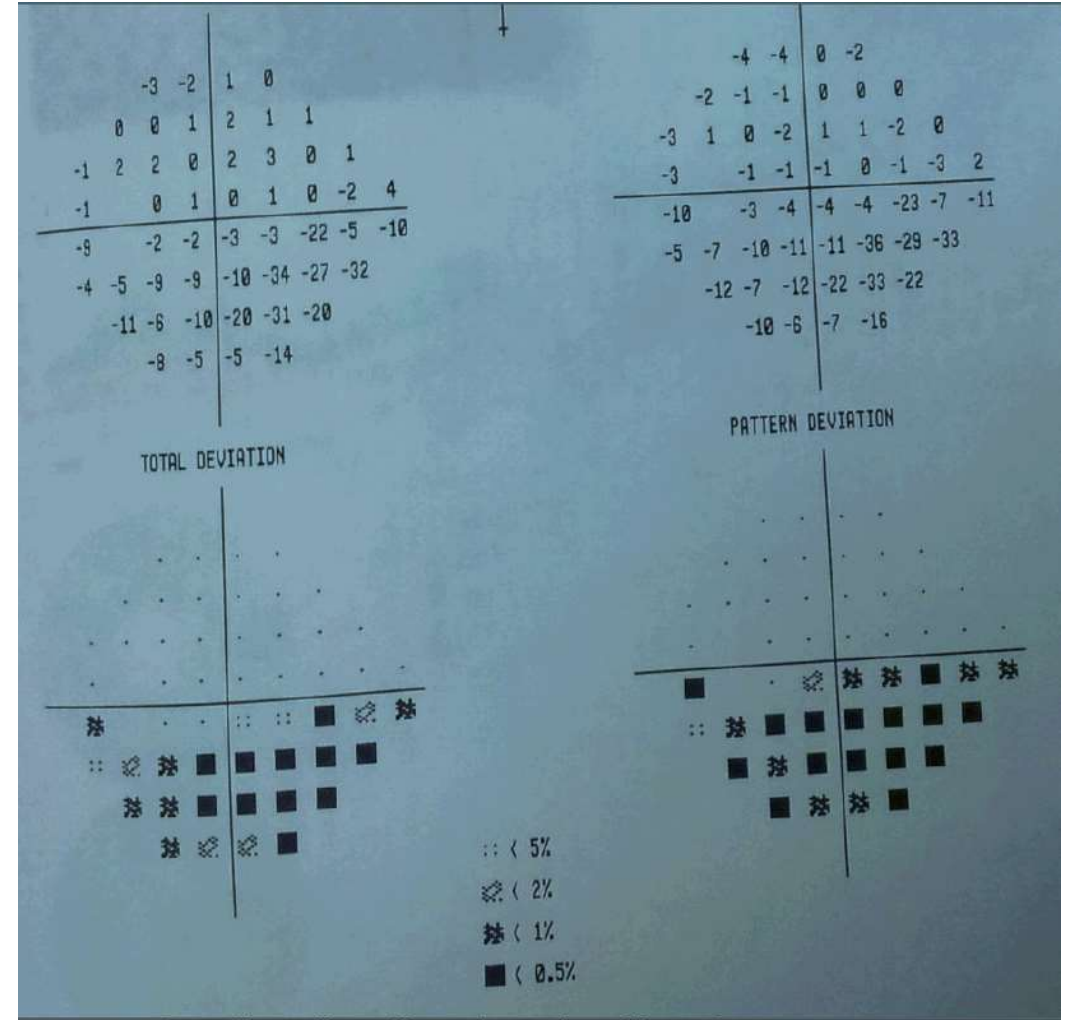


# Clinical features of NA-ION

- Acute painless loss of vision
- Can affect one half of visual field (VF) or the whole field
- Visual acuity normal in 40%
- Relative afferent pupillary defect
- Optic disc – “pale papilloedema”
- Disc can show a variety of appearances including initial hyperaemia so can be confused with other causes of swollen discs (raised intracranial pressure, diabetic papillitis, etc.)

# Visual Fields

- Altitudinal defect due to the anatomy of the blood supply
- Visual field improvement is possible, particularly in the first year



Wide Report

and100781

Age : Ryan Anderton

3D-OCT-2000(Ver.8.00)

Print Date : 19/09/2018



Ethnicity : Caucasian

Technician :

Gender : Male

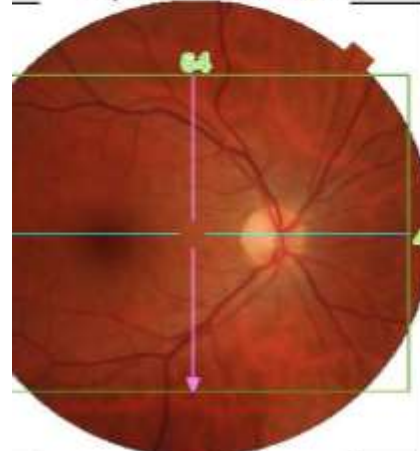
Fixation : OD(R) Wide

DOB : 10/07/1981 Age : 37

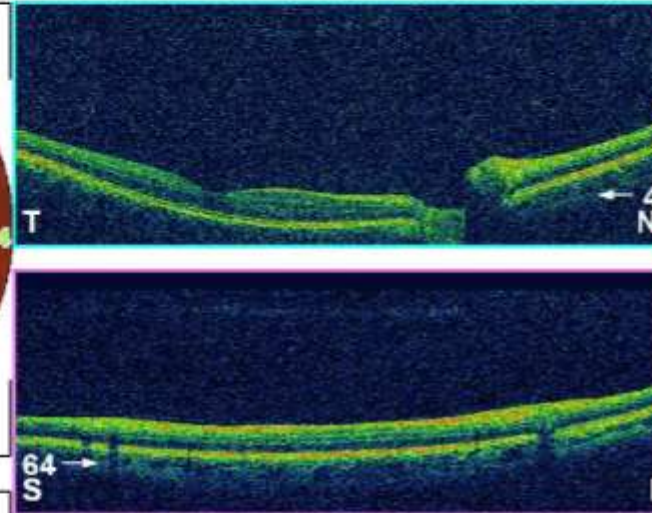
Scan : 3D Wide(12.0 x 9.0mm - 512 x 128)



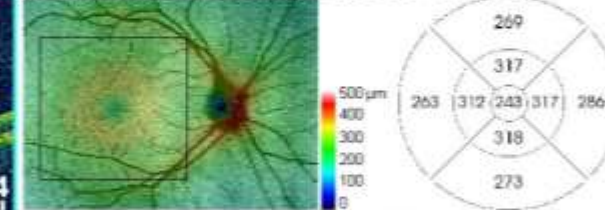
(R) Image Quality : 51 Analysis mode : Fine  
Capture Date : 18/08/2018



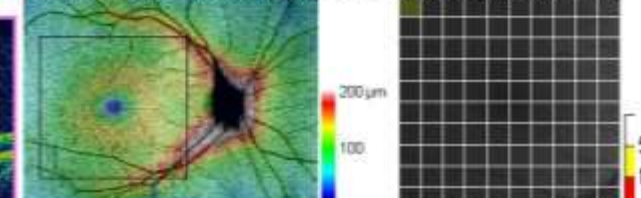
Red-free



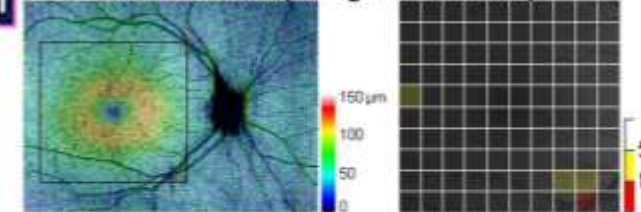
Retina ThicknessMap / ETD RS Grid



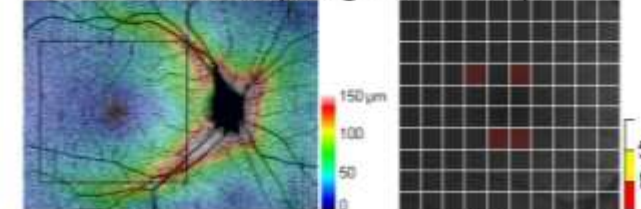
GCL++ ThicknessMap / Significance Map



GCL+ Thickness Map / Significance Map



RNFL ThicknessMap / Significance Map



ILM Surface



RPE Surface

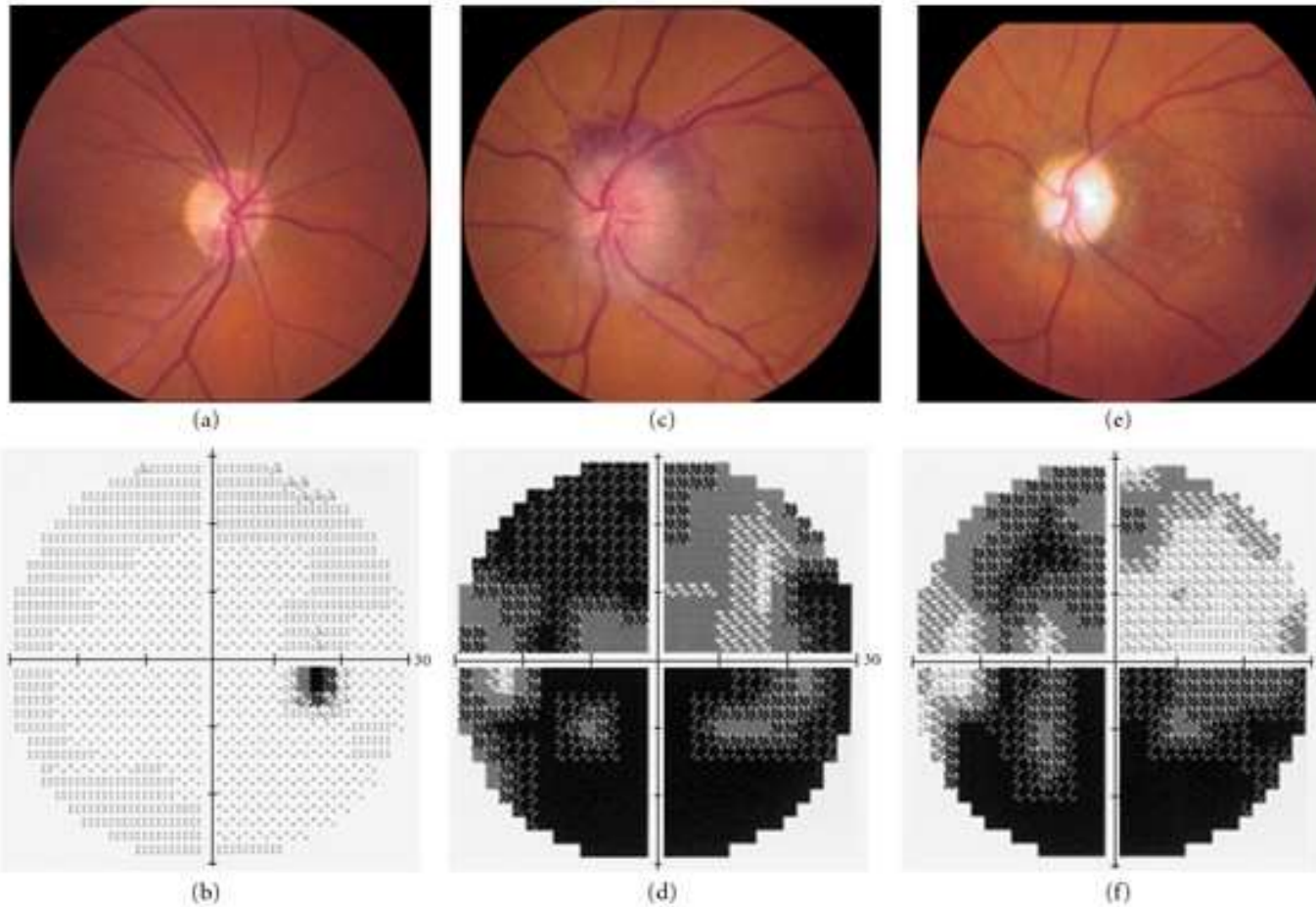


Prints :

Signature

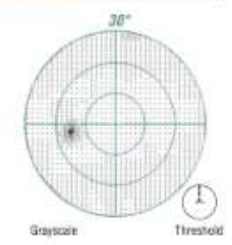
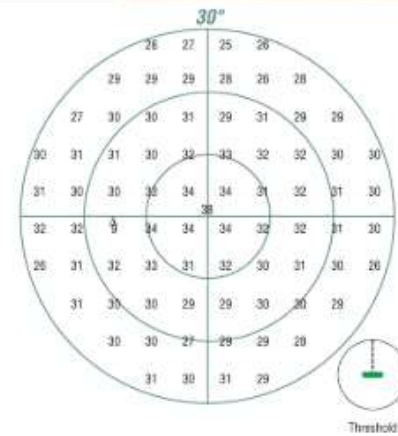
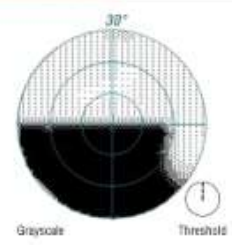
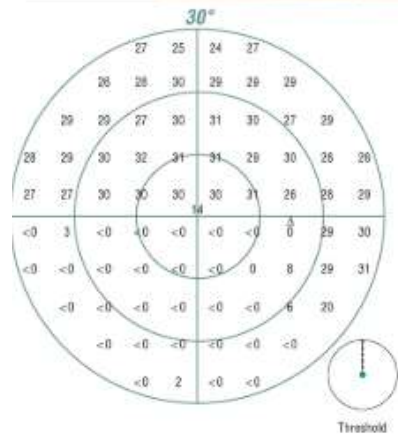
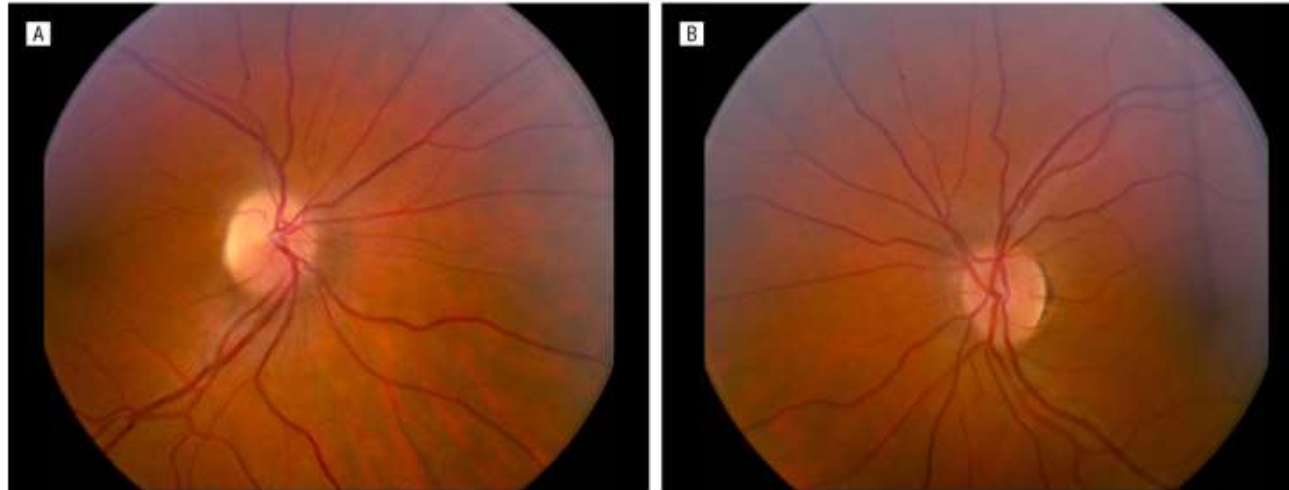
Date :

# AION with involvement of whole disc





# Sectorial AION



# Retinal Artery Occlusion

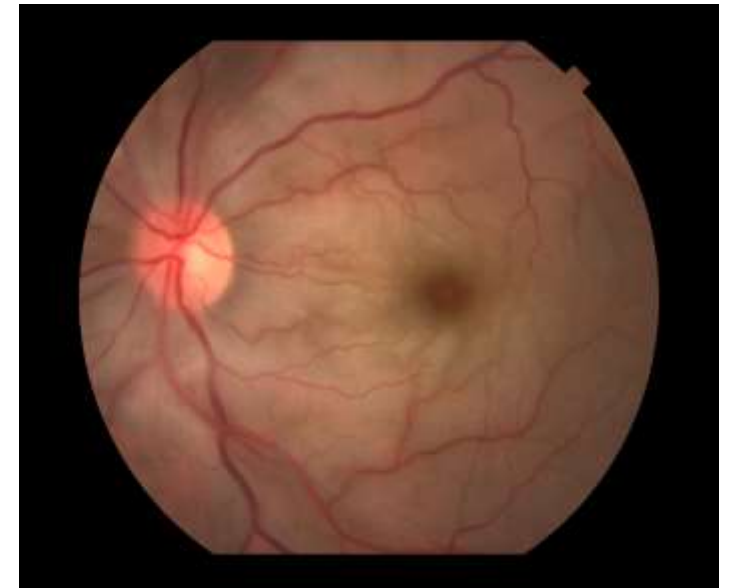
- Most due to atherosclerosis
- Causes include embolism and thrombophilic disorders
- Embolism source can be anywhere between heart and eye; commonly carotid
- Not typically due to GCA

# Presentation

- BRAO - sudden, profound altitudinal or sectorial visual field loss; VA variable

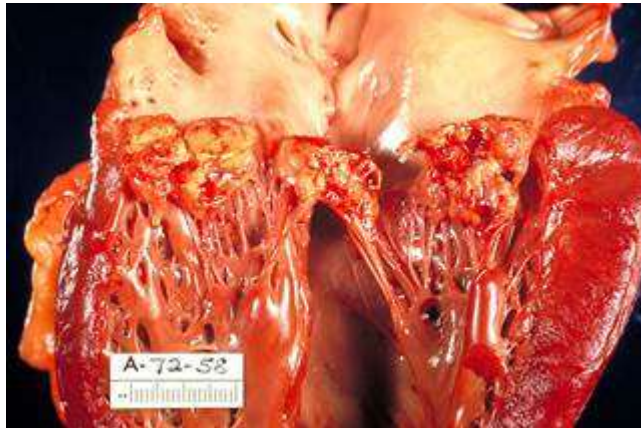


- CRAO - sudden, profound loss of vision; VA severely reduced



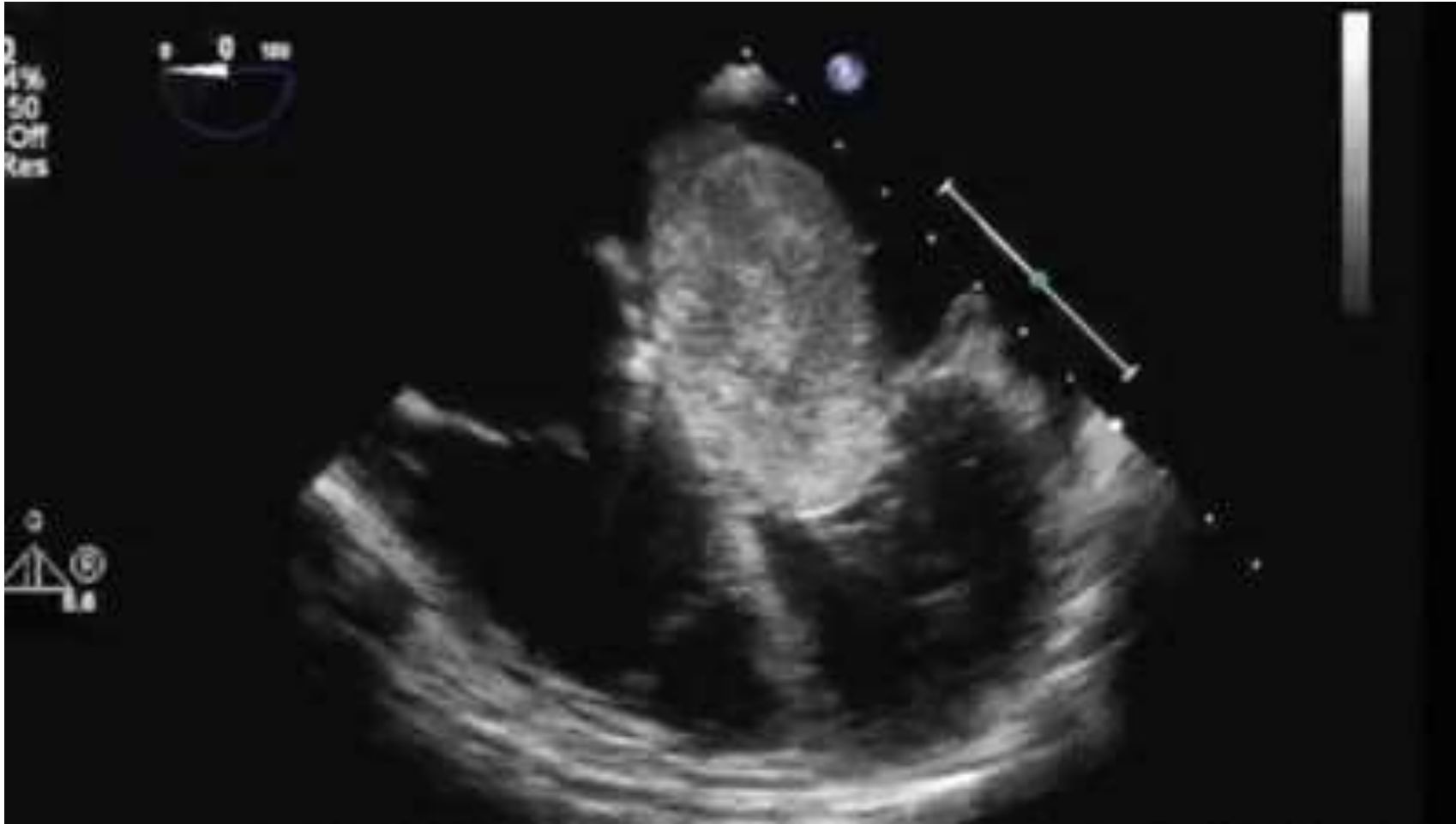
# Investigations

- Pulse
- Blood pressure
- ECG
- Full blood count, ESR
- Carotid evaluation



- Echocardiogram
- MR angiography
- Thrombophilia screen
- Autoantibodies
- Homocysteine





# Amaurosis Fugax

- Transient, painless loss of vision in one eye
- Sudden onset
- Lasts seconds to minutes
- Indicative of transient retinal ischaemia
- Associated with emboli
- ‘Curtain passing across the eye’

# Investigations

- Sudden loss of vision = emergency referral. Consider stroke unit
- Carotid blood flow and lumen diameter assessment
- Blood work up including Full Blood Count, ESR
- ECG including rhythm strip / echocardiogram and Doppler
- Computed tomography angiography (CTA)

**Atrial Fibrillation (AF)**



# UK CAA Regulations

- Pilots with arterial vascular disease affecting the eye should be made unfit.
- The subsequent aeromedical fitness assessment needs to take into account both;
  1. the effect on visual function AND
  2. the cardiovascular incapacitation risk.
  
- Arterial vascular disease affecting the eye reduces visual acuity and field of vision in the affected eye. Although some recovery is possible, particularly in the first year, this is sometimes permanent.

- Infective endocarditis, GCA and thrombophilia must all be excluded, as these conditions have their own treatment protocols and aeromedical implications.
- Arterial vascular disease, including that presenting in the eye, is associated with an increased cardiovascular mortality.
- Cardiovascular risk factors must be identified and managed before re-certification.

# UK Class 1 & 2 Certification



## Assessment of visual function

- A report must be obtained from the treating consultant ophthalmologist, to include;
  - visual acuity in each eye separately
  - visual field in each eye separately and, if either are abnormal, in both eyes together (binocular Esterman)
- If the pilot develops substandard vision in one eye following a vascular event then they can be assessed in accordance with the UK's 'substandard vision in one eye' guidance. (SSVOE)

# Assessment of cardiovascular risk

- Clinical cardiovascular review
- BP investigations
- CV risk score
- Carotid Doppler scan and echocardiogram
- Exercise ECG (Bruce protocol)
- Thrombophilia screen



# Aeromedical Disposal

- If ophthalmic function is satisfactory (including satisfactory Medical Flight Test)

And

- No recurrent cause is found, or
- Recurrent cause is identified and treated,

And

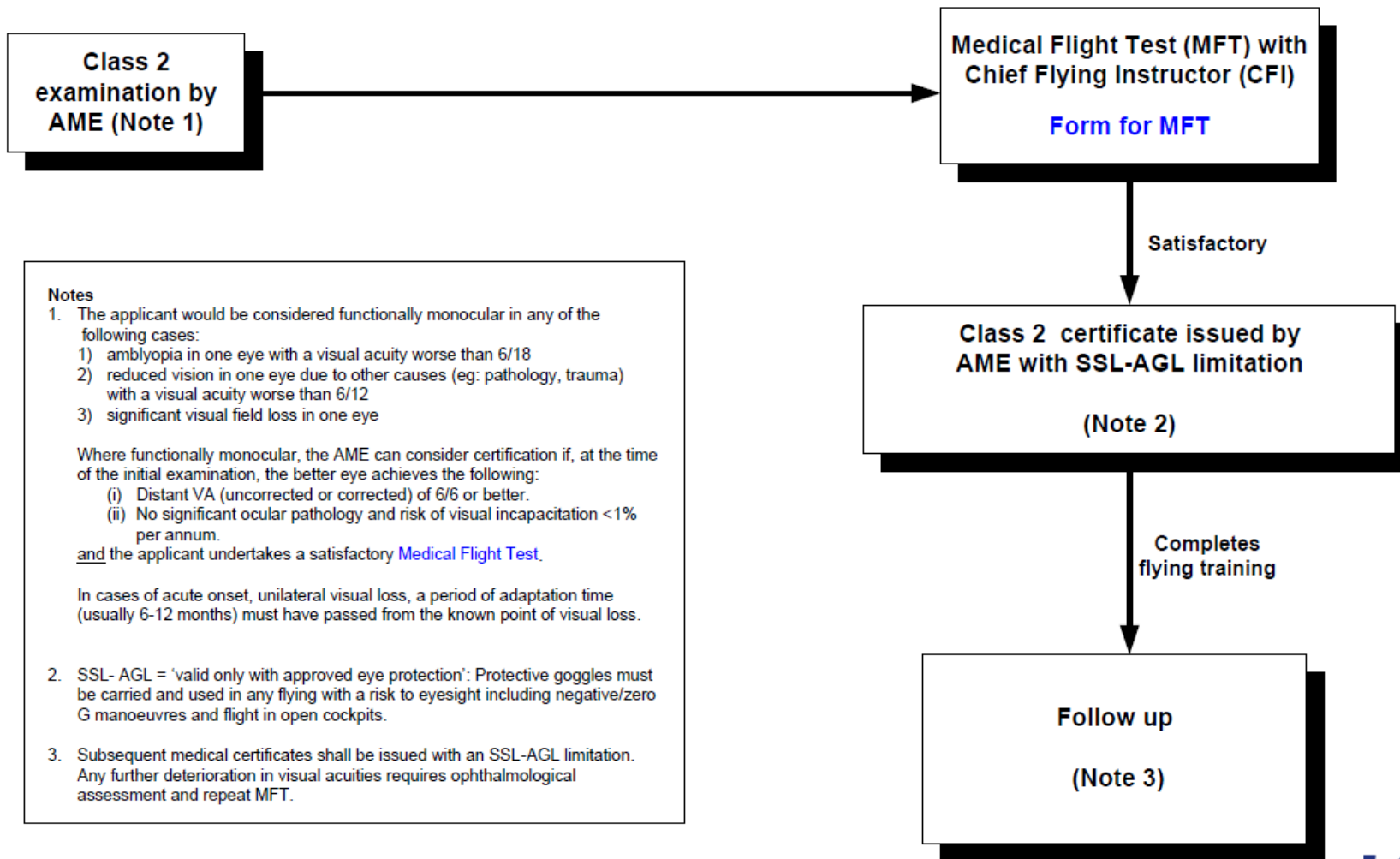
- CV risk is acceptable,

... then fitness can be restored, normally Class 1 OML or Class 2

NB As previously stated, SSVOE policy may be necessary in some cases  
(FLOWCHART)



## Class 2 - Substandard vision in one eye



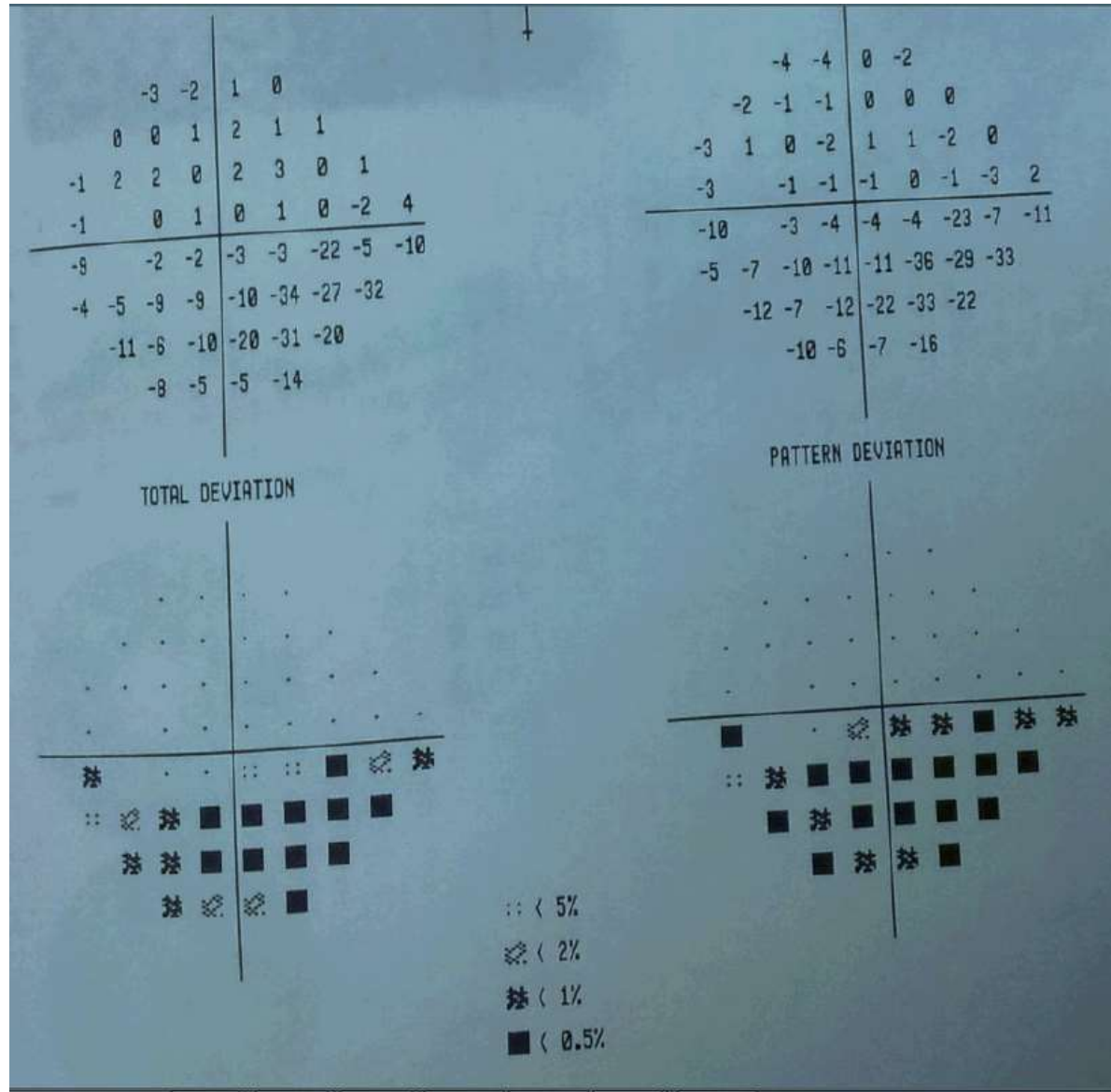
**PLEASE PRINT THIS DOCUMENT AND TAKE TO YOUR SPECIALIST ADVISOR**

# Case Example

- 54 year old male
  - Painless left sided VF loss
  - Left optic disc swelling
  - Altitudinal VF defect inferiorly
- 
- Blood tests, MRI head, ECG, echocardiogram, Trans-oesophageal echocardiogram (TOE), 24-hour ECG, exercise ECG, Q-RISK
  - Cholesterol 6.7, HDL 1.24
  - TOE – PFO detected

# Ophthalmic review

- VA 6/6 corrected right and left
  - N5 right and left
  - Normal colour vision
  - Left relative afferent pupil defect
  - Inferior altitudinal field reduction
  - Mild left optic disc pallor
- 
- Diagnosis NAION



# Decision?

- Patent PFO
  - Possible embolic event
  - Residual visual field defect
- 
- Fit Class 1 with OML
  - Optimise cardiovascular risks

# What about.....?

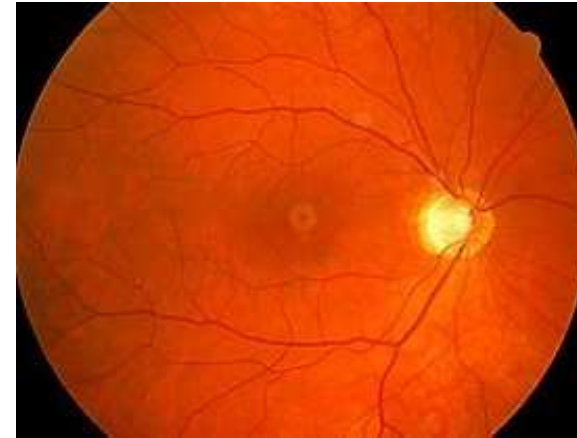
- 57 year old male pilot
- Presented with signs and symptoms of BRAO in left eye
- Left upper VF defect
  
- Antiphospholipid syndrome
- Aortic valve disease with aortic stenosis
- Aortic root dilatation
  
- Cardiovascular risks?
- Cerebrovascular risks?
- Antiphospholipid?

# Summary

- Arterial vascular disease affecting the RETINA and OPTIC NERVES can reduce visual acuity and field of vision, either transiently or permanently, **but has wider implications for aeromedical certification.**
- The aeromedical fitness assessment therefore needs to take into account not only the effect on visual function, but the effects of the underlying pathology in terms of **incapacitation risk to the fellow eye and cardiovascular system as a whole.**

# Aims

- Brief overview of conditions
- Aeromedical concerns
- Current UK guidance
- Case examples
- Summary





# Thank you

## Questions?

Dr Ryan Anderton  
Specialty Registrar in Aviation and Space Medicine  
UK CAA Medical Assessor  
e: [ryan.anderton@caa.co.uk](mailto:ryan.anderton@caa.co.uk)

Mr John Pitts, UK  
CAA Medical Assessor and Consultant Ophthalmologist