



Australian Government
Civil Aviation Safety Authority

The Undiscovered Country

ESAM 2017

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PGCAeroRet MRCGP FRACGP DRCOG

ESAM 2017 - Denver



Denver, Colorado, USA





COLUMBINE (11M.Per tower terrace level)

The flat, sharp networked new age pilot



SPEAKERS:

- Michael Drane, MD** – CASA
Presentation: Undiscovered Country
- Martin Hudson, MD** – ESAM Advisory Board
Presentation: Do AMEs need a Wingman?
- Ries Simons, MD** – ESAM Advisory Board
Presentation: Of Flat and Sharp Pilots
- Quay Snyder, MD** – AMAS
Presentation: Props from Pilot Peers - Maintaining Psychological Altitude

CHAIRS:

- Declan Maher, MD** – ESAM
- Anthony Wagstaff**

ESAM



Disclaimer

- Any financial interest in this presentation has escaped my notice
- The views expressed are my own, and do not represent policy or opinions of the Civil Aviation Safety Authority of Australia



*The undiscover'd country, from whose bourn
No traveller returns - puzzles the will,
And makes us rather bear those ills we have
Than fly to others that we know not of...*

William Shakespeare

Hamlet Act III, Scene 1





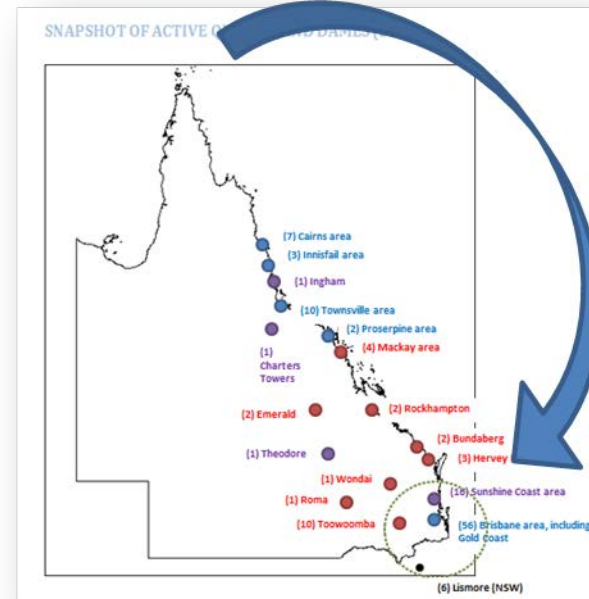
Oz is Different!

THE AUSTRALIAN CONTEXT

Our Examiners

- 729 Designated Aviation Medical Examiners
- 133 Overseas DAME's
- Require Certificate in Aviation Medicine: 2 week course
- Focus on EXAMINATION

2,800 km

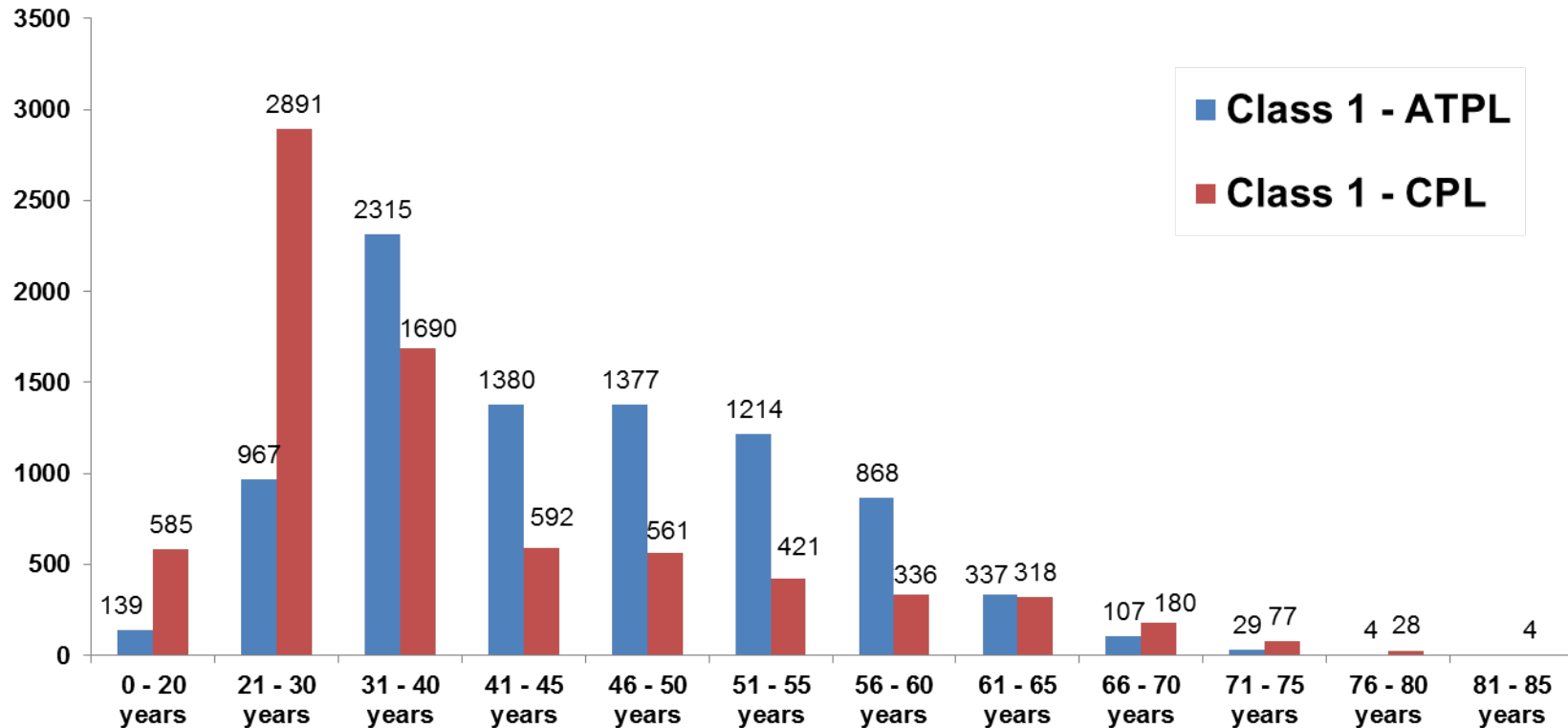


Our Pilots and Controllers (2015 – 16)

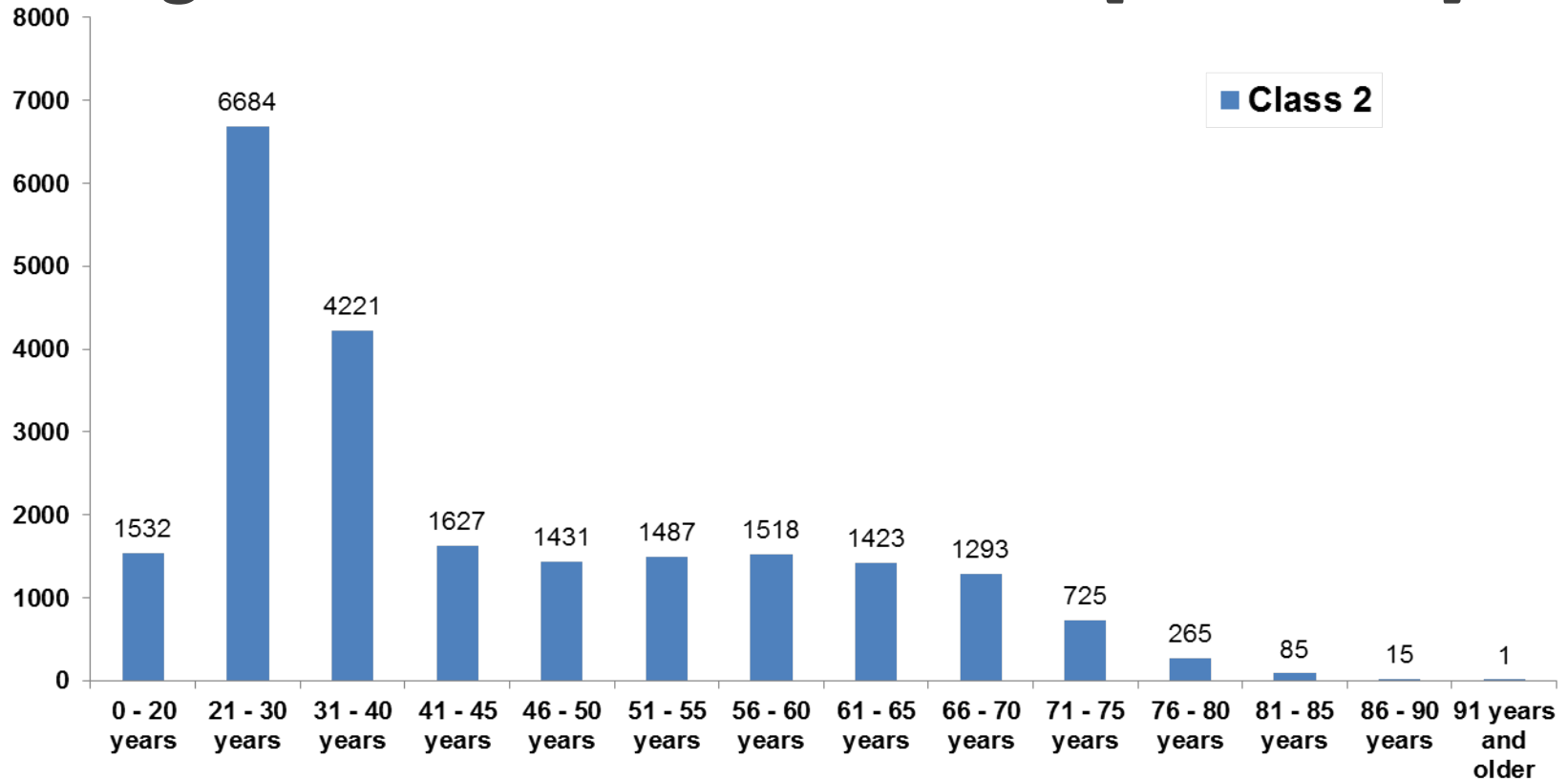
- 30,547 pilot licence holders
- 26,226 medical certificates issued
- 164 medical certificates refused
- Respond to approx 80 phonecalls/day

And there is no discrimination permitted on the basis of age alone.

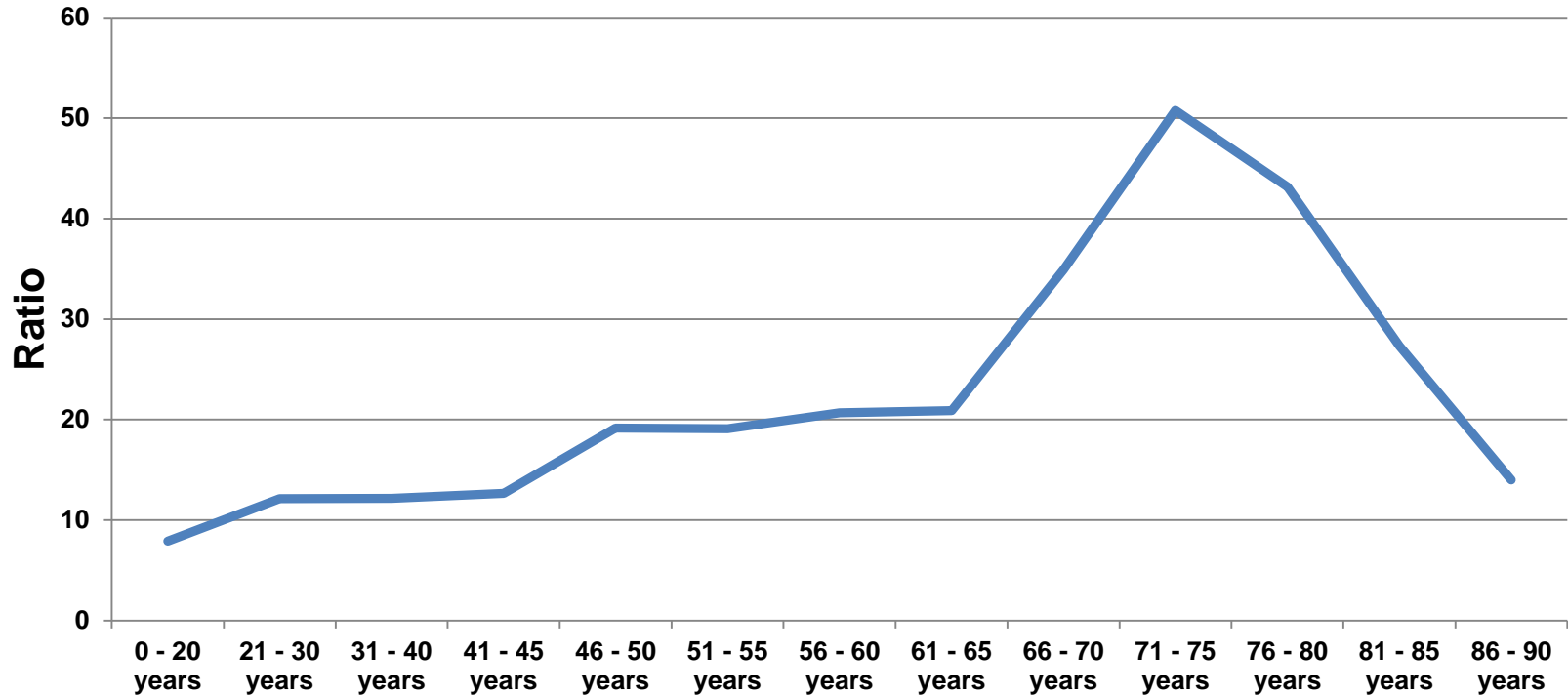
Age Distribution: Class 1 CPL & ATPL [2016 -17]



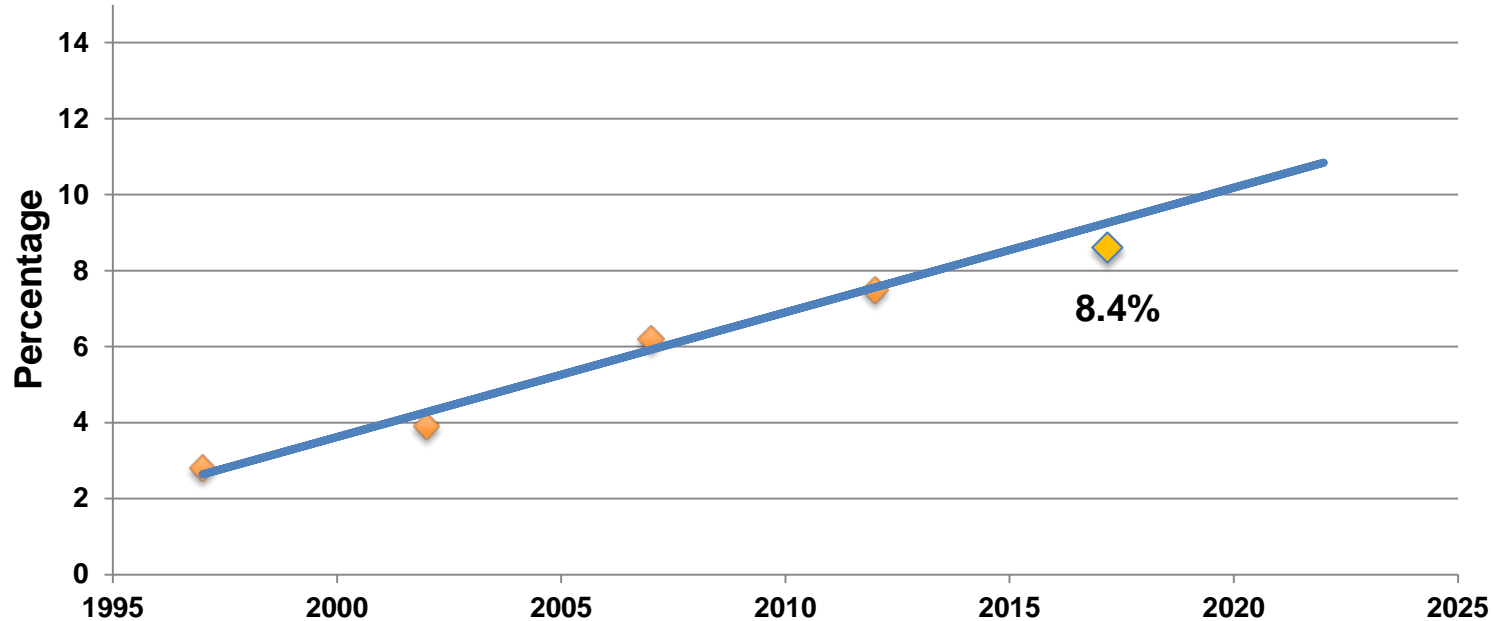
Age Distribution: Class 2 PPL [2016 - 17]



Gender Distribution: Male/Female Ratio [2017]

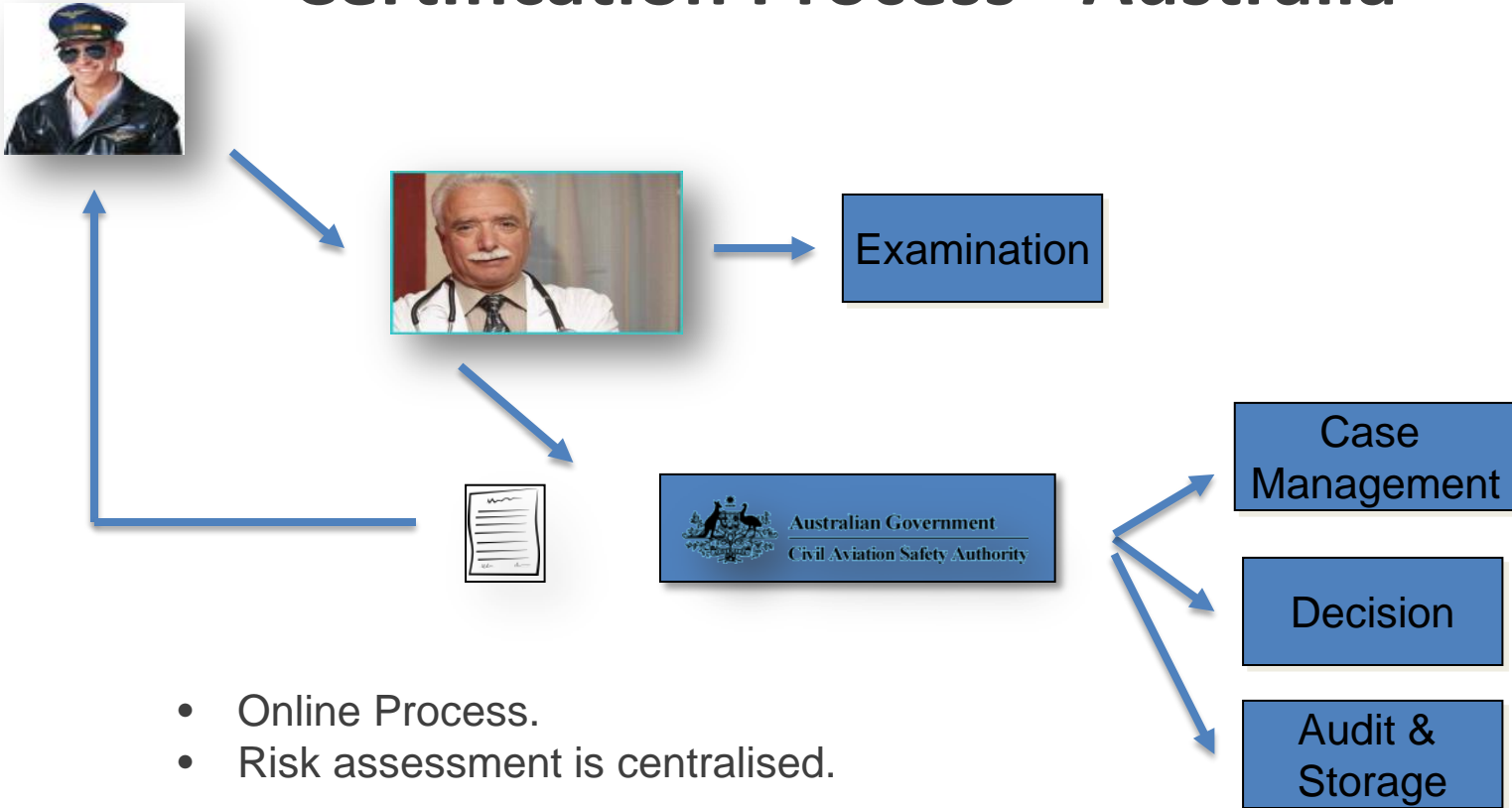


Trends in the Over-60's



From 1 Jul 1997 until 1 Jul 2012 the percentage of Class 1 applicants over 60 has increased from 2.8% to 7.5%.

Certification Process - Australia



- Online Process.
- Risk assessment is centralised.

Periodic Tests

Class 1 and 3

- Cardiac risk @5Y to 60, then annual
- ECG @2Y to 40 then annual
- Eyes @2Y from 60
- Audio @5Y

Class 2

None mandatory

Aviation Medicine Contacts

Av Med Switchboard: (02) 6217 1641

Av Med Email: avmed@casa.gov.au

DAME Liaison

Direct line: (02) 6217 1170

Email: dame.liaison@casa.gov.au

MRS Online Helpline: 0434 076 851
(9am-5pm, 7 days)

CASA (cost of local call)
131 757

CASA medical processing fees

As at 1 May 2011

Processing Fee – Original/renewal	\$75
Provision of a duplicate certificate	\$25
Extension of medical certificate	\$50
Reconsideration of a CASA decision (form 047 required)	\$150

Minimum Class for Licence type

Licence type	Class 1	Class 2	Class 3
SPL - Student Pilot Licence		*	
PPL - Private Pilot Licence		*	
CPL - Commercial Pilot Licence	*		
ATPL - Airline Transport Pilot Licence	*		
FLTENG - Flight Engineer	*		
ATCO - Air Traffic Control Officer			*
FROL - Flight Radio Operator Licence		*	
CPB - Commercial Pilot Balloons		*	
FSO - Flight Service Officer			*
Validity Periods (in Months)			
< 40 yrs old*	12	48	24
>40 yrs old*	12	24	24
>60 yrs old (applies to ATPL only)	6		

Special Reports & Tests

Licence	Age (yrs)	Ser., Lips & Bl. GI	Audio	Eye	ECG	CVD Risk Score*
INITIAL ISSUE						
Class 1	All	*	*	*	*	*
Class 2	No additional tests required unless clinically indicated					
Class 3	All	*	*	*	*	*
RENEWALS						
Class 1 & Class 3	25	*	*		*	*
	30	*	*		*	*
	32				*	
	34				*	
	35	*	*			*
	36				*	
	38				*	
	40	*	*		An ECG is required yearly from age 40 to 80 for Class 1 & every 2 years for class 3	*
	45	*	*			*
	50	*	*			*
	55	*	*			*
	60	To be done each year over 60 years	*	*		Calculate each year over 60
	62			*		
	64			*		
	65		*			
	66			*		
	68			*		
	70		*	*		
	72			*		
	74			*		
	75		*			
	76			*		
	78			*		
	80+	Additional requirements advised individually				
Class 2	No additional tests required unless clinically indicated					

* NOTE - Diabetics/impaired glucose tolerance to have yearly CVD Risk Score

Cardiovascular Assessment

- Framingham based [Anderson 1991]
- Limitations:
 - USA population
 - Polynesian and Asian morbidity different
 - No family history
- Incorporates cardio and cerebrovascular risks
- Functional assessment (angios are poor discriminators of risk)



Coronary Heart Disease Risk Factor Prediction Chart (CRI)

1 Find Points for each Risk Factor

FEMALE		MALE		HDL Cholesterol		Total Cholesterol		Systolic BP		Other			
Age	Pts	Age	Pts	HDL-C	Pts	Total-C	Pts	SBP	Pts	Others	Pts		
30	-12	30	-2	0.65-0.68	7	3.60-3.99	-3	98-104	-2	Cigarettes	4		
31	-11	31	-1	0.69-0.76	6	4.00-4.30	-2	105-112	-1	Diabetic (M)	3		
32	-10	32-33	0	0.77-0.84	5	4.31-4.69	-1	113-120	0	Diabetic (F)	6		
33	-8	34	1	0.85-0.90	4	4.70-5.19	0	121-129	1	ECG-LVH	9		
34	-6	35-36	2	0.91-0.99	3	5.20-5.69	1	130-139	2	(0 points assigned for each negative answer) NOTE: IFG or IGT are counted as diabetes for this calculation			
35	-5	37-38	3	1.00-1.09	2	5.70-6.19	2	140-149	3				
36	-4	39	4	1.10-1.19	1	6.20-6.79	3	150-160	4				
37	-3	40-41	5	1.20-1.30	0	6.80-7.49	4	161-172	5				
38	-2	42-43	6	1.31-1.43	-1	7.50-8.19	5	173-185	6				
39	-1	44-45	7	1.44-1.56	-2	8.20-8.55	6						
40	0	46-47	8	1.57-1.70	-3								
41	1	48-49	9	1.71-1.89	-4								
42-43	2	50-51	10	1.90-2.07	-5								
44	3	52-54	11	2.08-2.25	-6								
45-46	4	55-56	12	2.26-2.49	-7								
47-48	5	57-59	13										
49-50	6	60-61	14										
51-52	7	62-64	15										
53-55	8	65-67	16										
56-60	9	68-70	17										
61-67	10	71-73	18										
68-74	11	74	19										

Use this profile for professional pilots 5 yearly (or private pilots, if clinically indicated) and every year for pilots over 60 years of age

2 Sum Points for all Risk Factors
Age () + HDL-C () + Total-C () + SBP () + Smoker () + Diabetes () + ECG-V/H () = Point Total
NOTE: Minus points subtract from total

3 For Stress ECG if > 14 Pts

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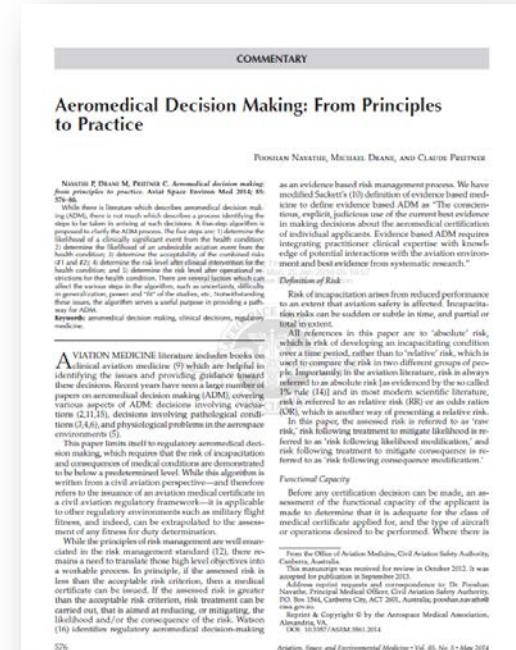
4 If LBBB needs stress Echo or Perfusion Scan

Coronary Heart Disease Risk Factor Prediction Chart
Image 1 of 2

CLOSE X

The “Medical” Evaluates:

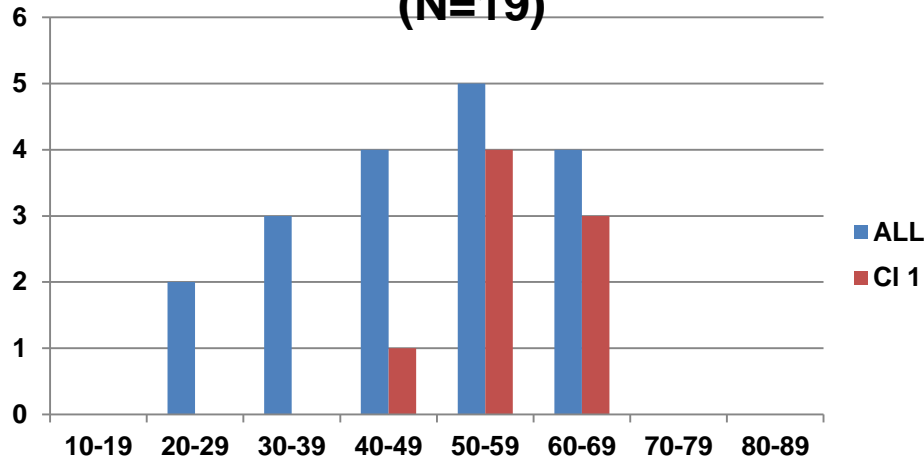
1. Functional ability to conduct aviation tasks
 2. Effect of aviation on condition
i.e. Assessment of conditions which might be aggravated by the work environment
 3. Effect of condition on aviation
i.e. Assess impact of condition on human performance and/or flight safety
 4. Stability of condition
Condition must be stable for the period of the certification
- ## CASR Part 67: Are they “Safety-relevant”?



Navathe P, Drane M, Preitner C. Aeromedical decision making: from principles to practice. *Aviat Space Environ Med*. 2014 May;85(5):576–80.

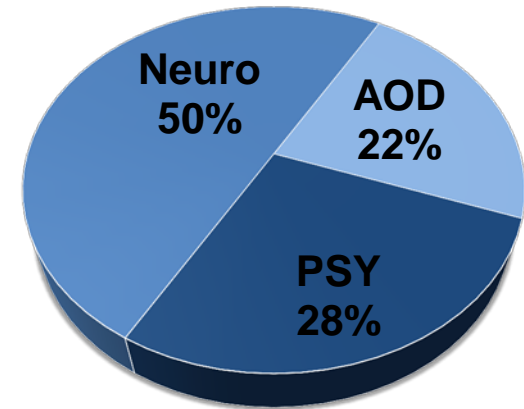
Cancellations (of Valid Certificate)

**Number of Cancellations by Age
(N=19)**



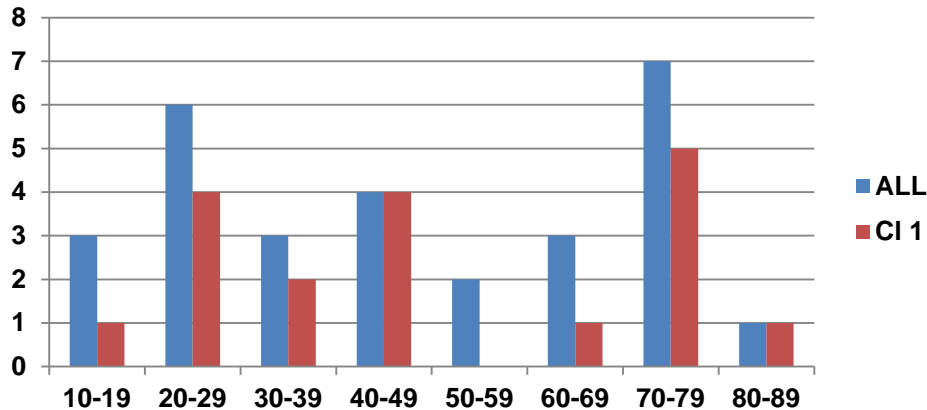
All Class 1 cancellations were for psychiatric or neurological reasons.

Cancellation: Pathology

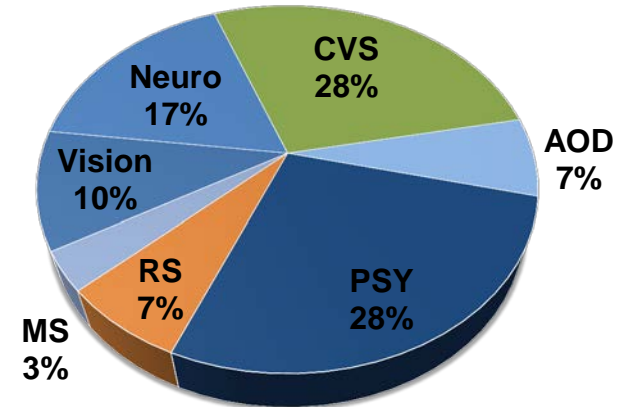


Certificate Refusals (New Application)

Number of Refusals by Age (N=29)



Refusals: Pathology



THE CHALLENGES OF AGEING PILOTS

The Challenges of Ageing Pilots

- Co-morbidities increase
- Polypharmacy increases
- Complications and side-effects increase
- Sensitivity to stressors increases (Reduced resilience)
- Cognitive changes
 - Neuroplasticity
 - Insight
 - Cognitive and executive function
- Experience: “I’ve been teaching this for years..?”



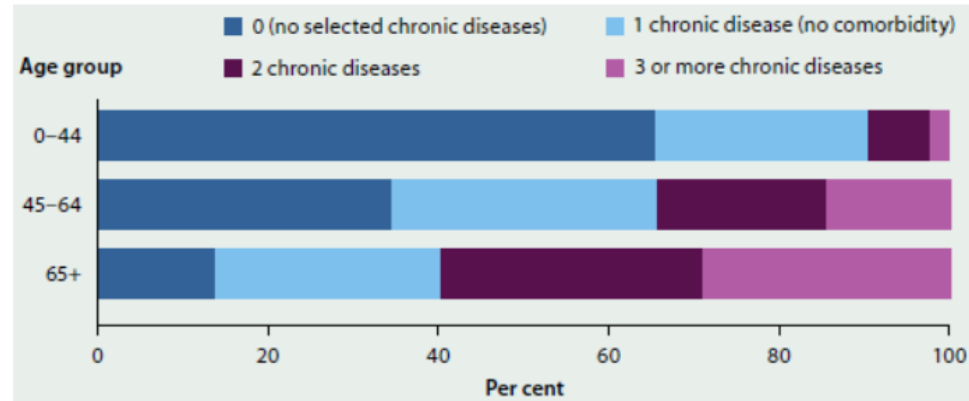
Co-Morbidities

Definition: 2 or more diseases.

In Australia:

- 65+yr: 60% have co-morbid condition. 0–44yr: 9.7%
- Females : Males 25%: 21%
- Low : High SEG 30%: 19%
- Remote : Cities 28%: 21%

Comorbidity of selected chronic diseases, by age, 2014–15



Note: The selected chronic diseases are: arthritis, asthma, back pain and problems, cancer, cardiovascular disease, chronic obstructive pulmonary disease, diabetes, and mental health conditions.

Sources: ABS 2015. National Health Survey: first results 2014–15. ABS cat. no. 4364.0.55.001. Canberra: ABS.

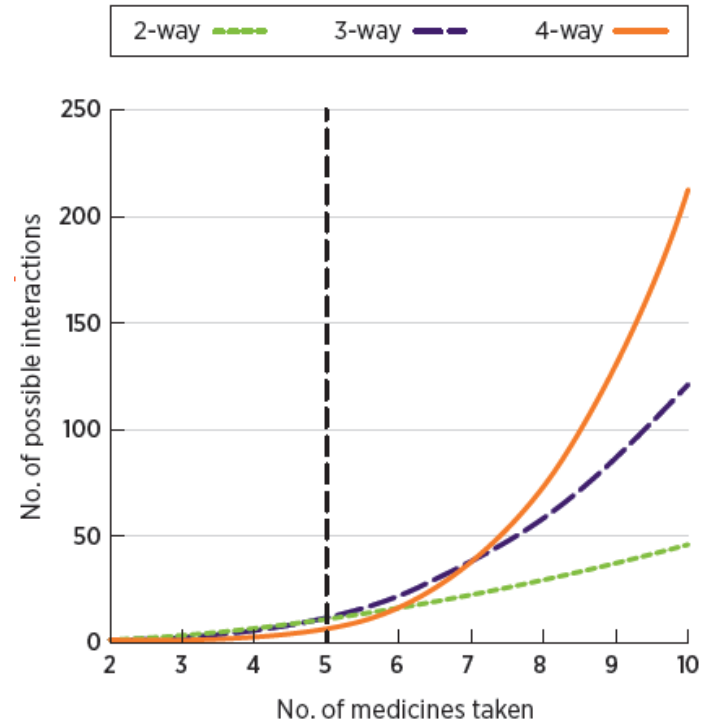
Polypharmacy

Definition: The use of five or more drugs.

Polypharmacy in Australia:

- 65 – 74yr 50%
- Over 75 66%

Leads to an exponential increase in drug interactions



Ferner RE, Aronson JK. Communicating information about drug safety. BMJ. 2006 Jul 15;333(7559):143–5.

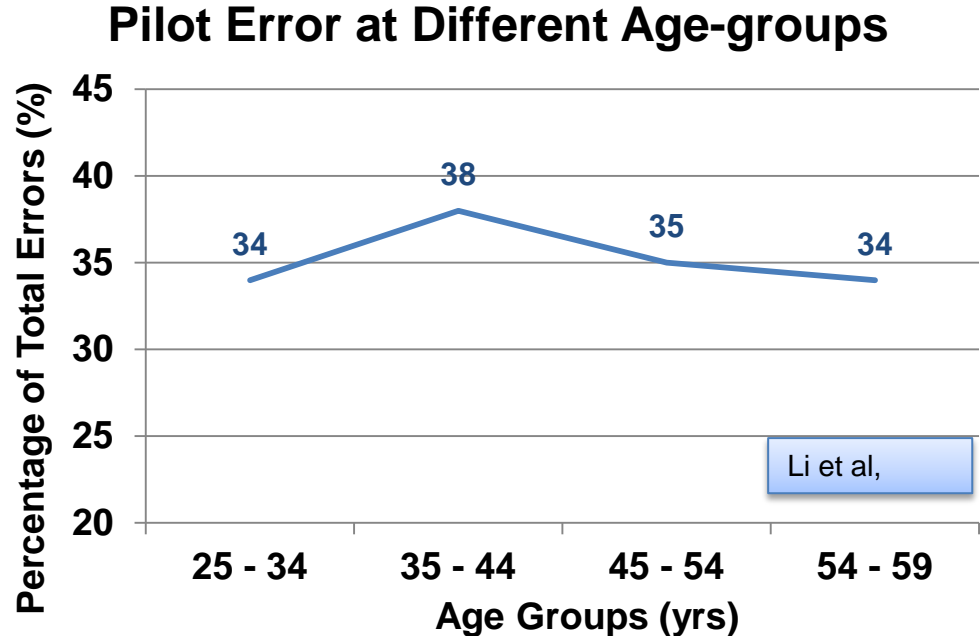
Performance Issues and the “Data Problem”

- Conflicting results not helped by definition of “Aged”!



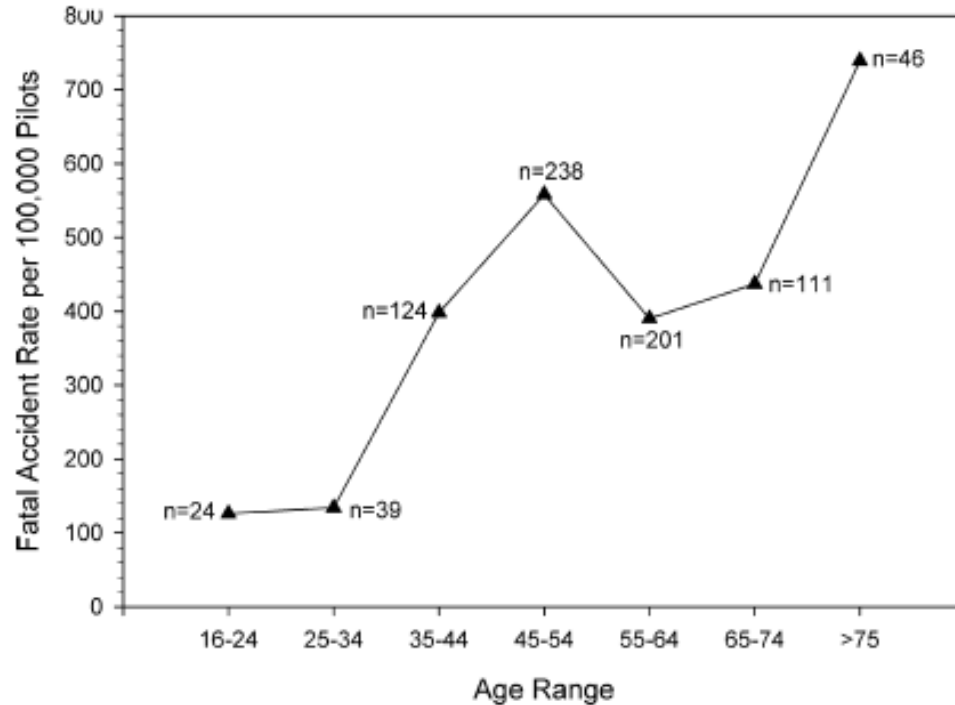
Younger “Aged” Pilots!

- NTSB data
- 25 – 59 years
- Accidents 1983 – 2002
- Proportion with contribution from “Pilot Error”



Li G, Grabowski JG, Baker SP, Rebok GW. Pilot error in air carrier accidents: does age matter? Aviat Space Environ Med. 2006 Jul;77(7):737–41.

Accidents in Light Twins 2002 – 2011



Shao BS, Guindani M, Boyd DD. Causes of fatal accidents for instrument-certified and non-certified private pilots. *Accid Anal Prev*. 2014 Nov;72:370–5.

Performance Issues and the “Data Problem”

- Conflicting results not helped by definition of “Aged”!
- Many clinical trials under-represent older people, and exclude those with co-morbidities. Evidence is a challenge!
- “Sundowner’s Syndrome” Performance varies over the 24 hour period. With elder drivers, there is a disproportionately higher rate of injury due to motor vehicle accidents during the early evening time period compared with younger and middle-aged drivers. [Renner CH et al 2011]

Other Medical Limitations

- Cardiovascular Disease: >60yr Incapacitation exceeds 1% p.a.
- Vision. Glaucoma. Macular degeneration
- Hearing
- Agility: pre-flight aircraft, assist emergency egress



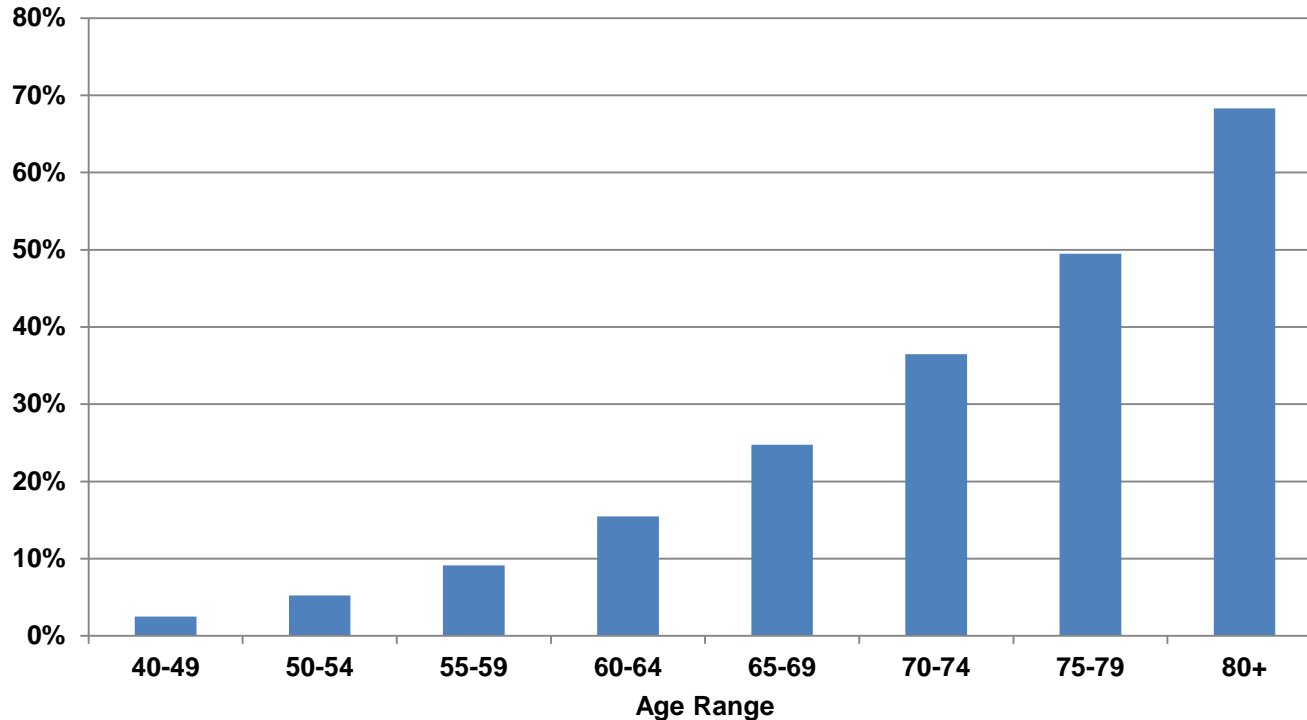
Class 1 Cardiac Risk Assessment and Outcomes – CASA Data

July 2014 – June 2015

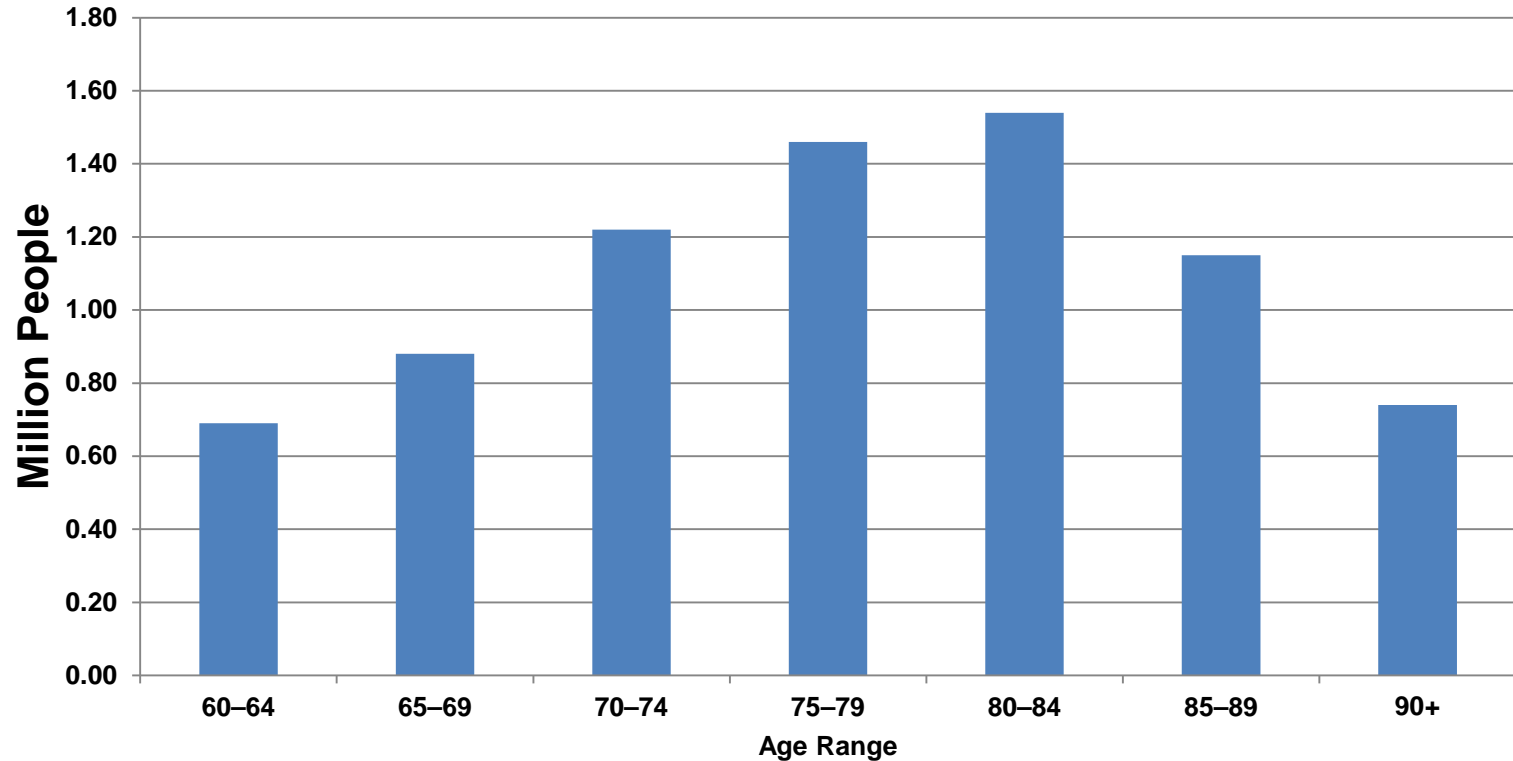
Medical Assessments	Cardiac risk >1% per annum	Refusals & suspensions for cardiovascular disease
17,007	757	5

Suspensions	
#1	Reversible ischaemia – known cardiovascular disease
Refusals	
#1	Myocardial infarction - implantable defibrillator [CRI = 20, ExECG -ve]
#2	Ventricular tachycardia – Ca breast / sarcoidosis / alcohol
#3	Atrial fibrillation & stroke – previously normal stress echo & angio
#4	Atrial fibrillation & stroke

Age-Specific Prevalence Rates for Cataracts [US 2010]



Age-Specific Incidence of Dementia [WHO 2015]




Cognitive Assessment

- Case – by – Case
- Risk Factors:
 - Polypharmacy
 - Co-morbidities e.g. cardiovascular, cancer and depression
- Assessment:
 - Montreal Cognitive Assessment (MOCA). Accept >25/30.
 - Flight review. (Biennial review is mandatory)
 - Psychogeriatrician if concerns

MONTREAL COGNITIVE ASSESSMENT (MOCA)

NAME : _____ Education : _____ Date of birth : _____
Sex : _____ DATE : _____

VISUOSPATIAL / EXECUTIVE


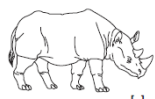

Copy cube  Draw CLOCK (Ten past eleven) (1 point)

End (E) → A → 2
1 → B → 3
D → 4 → C

[] [] [] [] [] [] [] [] [] []

Contour Numbers Hands

NAMING

[] [] []

MEMORY

Read list of words, subject must repeat them. Do 2 trials. Do a recall after 5 minutes.

	FACE	VELVET	CHURCH	DAISY	RED
1st trial					
2nd trial					

No points

ATTENTION

Read list of digits (1 digit/ sec). Subject has to repeat them in the forward order [] 2 1 8 5 4
Subject has to repeat them in the backward order [] 7 4 2

Read list of letters. The subject must tap with his hand at each letter A. No points if ≥ 2 errors
[] F B A C M N A A J K L B A F A K D E A A A J A M O F A A B

Serial 7 subtraction starting at 100 [] 93 [] 86 [] 79 [] 72 [] 65 [] 58

4 or 5 correct subtraction: 3 pts, 2 or 3 correct: 2 pts, 1 correct: 1 pt, 0 correct: 0 pt

LANGUAGE

Repeat : I only know that John is the one to help today. []
The cat always hid under the couch when dogs were in the room. []

Fluency / Name maximum number of words in one minute that begin with the letter F [] (N2: 11 words)

ABSTRACTION

Similarity between e.g. banana - orange - fruit [] train - bicycle [] watch - ruler []

DELAYED RECALL

Now I recall words WITH NO CUE FACE VELVET CHURCH DAISY RED Points for UNRECALLED recall only

Optional Category cue Multiple choice cue

ORIENTATION

[] Date [] Month [] Year [] Day [] Place [] City []

© Z. Nasreddine MD Version November 7, 2004 Normal 2-26 / 30
www.mocatest.org

TOTAL
Add 1 point if ≤ 12 yr edu

<http://www.mocatest.org/>

Opinion Piece: The Declaration

- Is self-declaration a valid approach to aeromedical assessment?
 - Does an applicant have a good knowledge of a driving standard?
 - Does an applicant have any other competing “interests” in obtaining the permission?
 - Is INSIGHT and informed OBJECTIVITY guaranteed?
 - Are there any safety-relevant conditions of note where insight is impaired?
- Am I purely self-interested?

Hazard Awareness - Insight

“while self-assessments of driving ability may be used by drivers to determine the degree to which they restrict their driving, the problem is that drivers have little insight into their own driving ability.”

Horswill MS, Anstey KJ, Hatherly C, Wood JM, Pachana NA. Older drivers' insight into their hazard perception ability. *Accid Anal Prev.* 2011 Nov;43(6):2121–7.



My Opinion

- The Aviation Medical Examiner has an important role
- Comprehensive medical history is essential
- “Education” alone is not the answer
- Age alone is a poor discriminator
- Flight reviews should be tailored to maturer pilot, and not undertaken by the lifelong buddy!
- Type of operation should be considered (Australian law constrains operational “consequence” mitigations)

The Public Opinion



<https://www.arrse.co.uk/community/threads/over-70-year-old-drivers.263897/>

Questions and Comments?



An aerial photograph of a city and surrounding mountains during sunset. The city is nestled in a valley, with a large body of water in the center. The mountains are visible in the background, and the sky is a mix of blue and orange. The text "CASA" is overlaid on the image.

CASA

THANK YOU

Accidents in Light Twins [Boyd 2015]

