ASTHMA IN NATO AIRCREW

NATO Aviation Pulmonology Working Group (RTG HFM-299)

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- The HFM 299 mandate includes assessment of pulmonary conditions with potential impact on flying operations
- The burden of asthma in military aircrew is unknown
- HFM 299 initiated a questionnaire study to assess the prevalence of asthma in participating NATO pilot aircrew.

Asthma- Global Prevalence

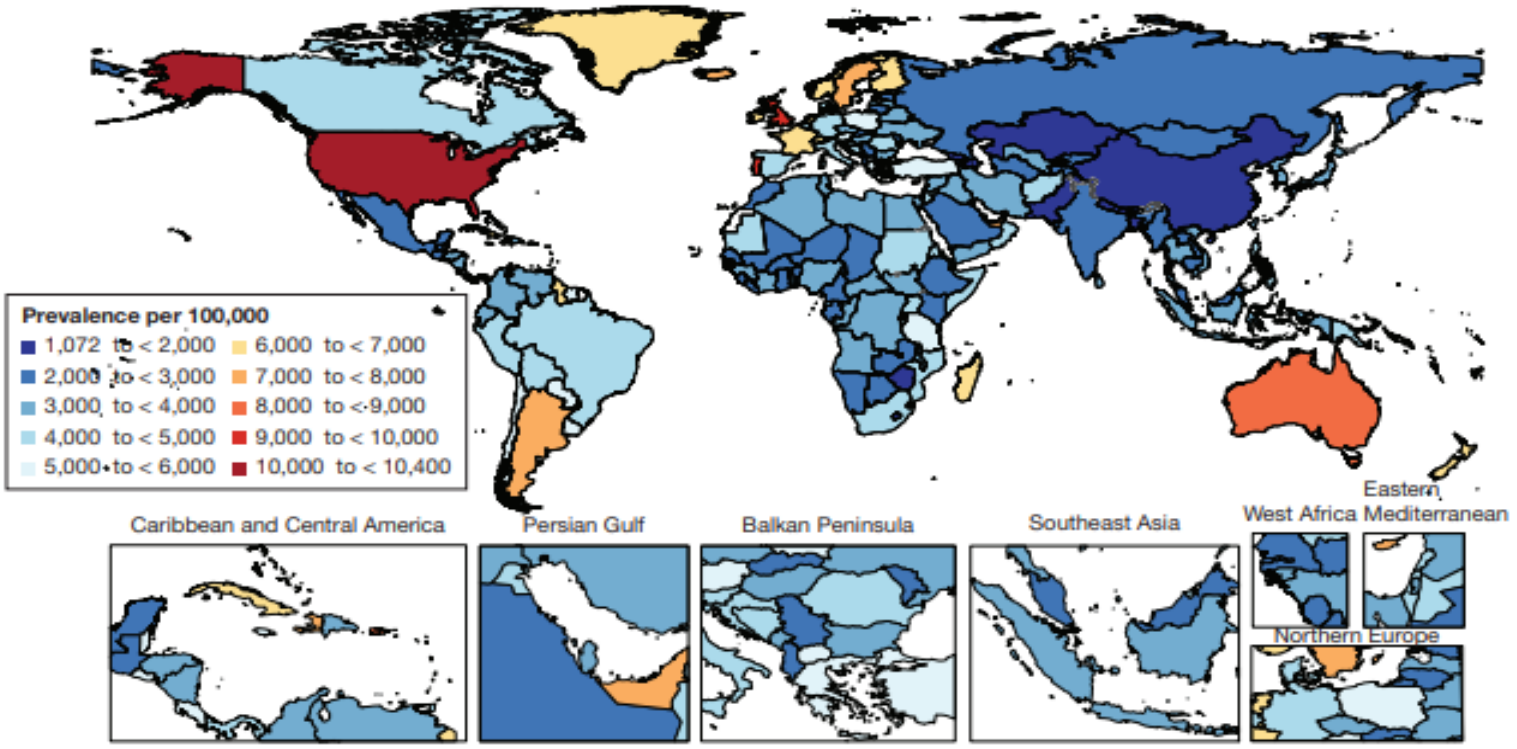


Figure 1 – *Map showing age-standardized point prevalence of asthma per 100,000 population in 2019 by country. (Generated from data available at http://ghdx.healthdata.org/gbd-results-tool.)*

Ref:https://doi.org/10.1016/j.chest.2021.09.042

Asthma- Myths and Facts

Asthma can be cured.

FACT: There is no cure for asthma, but with regular treatment, it can be controlled, allowing patients to live full and productive lives.

You only have asthma when you have trouble breathing.

FACT: Asthma is a chronic condition, meaning it is there all the time. People with asthma have airway inflammation even when no symptoms are present.

Asthma attacks are always sudden and severe.

FACT: Most asthma attacks develop slowly with a gradual increase in symptoms like chest tightening, breathlessness, coughing, and wheezing. Recognizing your symptoms early can help you address the issues before an asthma attack becomes severe.

Asthma medication is only used when a person is having an asthma attack.

FACT: Medications are one of the most important tools for managing asthma symptoms and preventing them from getting worse. These include daily and long-term controller medicines, which are different from the medicines used to deal with an asthma attack. What's important is to take your medicines as prescribed every day even if you don't experience any symptoms.

Children can outgrow asthma.

FACT: Asthma is not a disease you outgrow. Symptoms can improve or resolve during adolescence and adulthood, but the disease never goes away.

Moving to a dry climate can cure asthma.

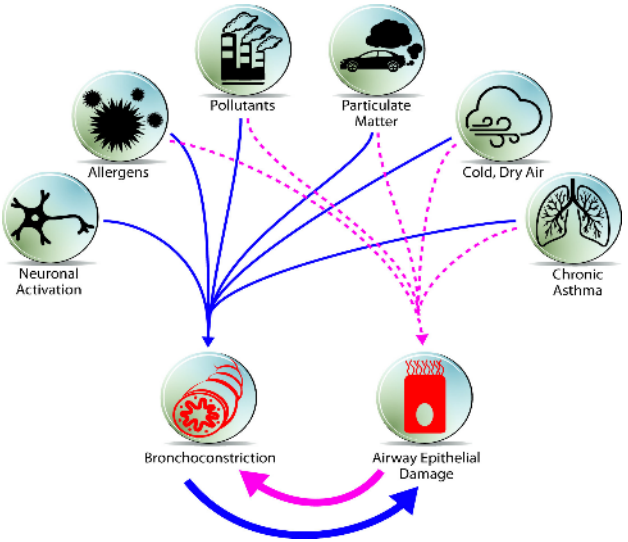
FACT: A change in environment may have a temporary impact on improving asthma symptoms, but it won't cure the disease. Reducing the asthma triggers in your environment may be more helpful than moving to a different climate.

Allergies have nothing to do with asthma.

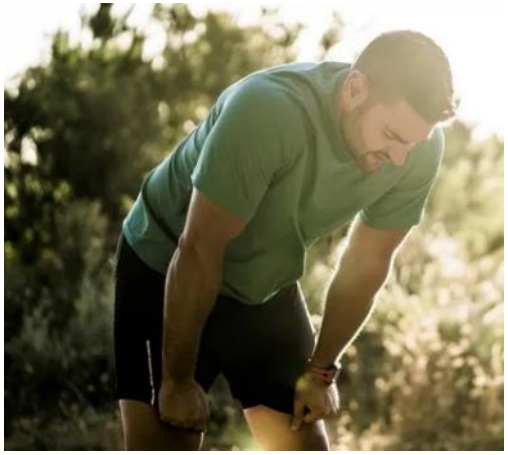
FACT: Roughly 70% of people with asthma also have allergies. Allergies increase lung inflammation and can trigger coughing, wheezing, and shortness of breath. When allergies are effectively treated, asthma symptoms often improve.

People with asthma shouldn't exercise.

FACT: Exercise is a critical element in healthy living, particularly for those with asthma. Regular exercise helps improve lung function. Additionally, weight loss reduces the risk of asthma and helps people with asthma breathe easier.



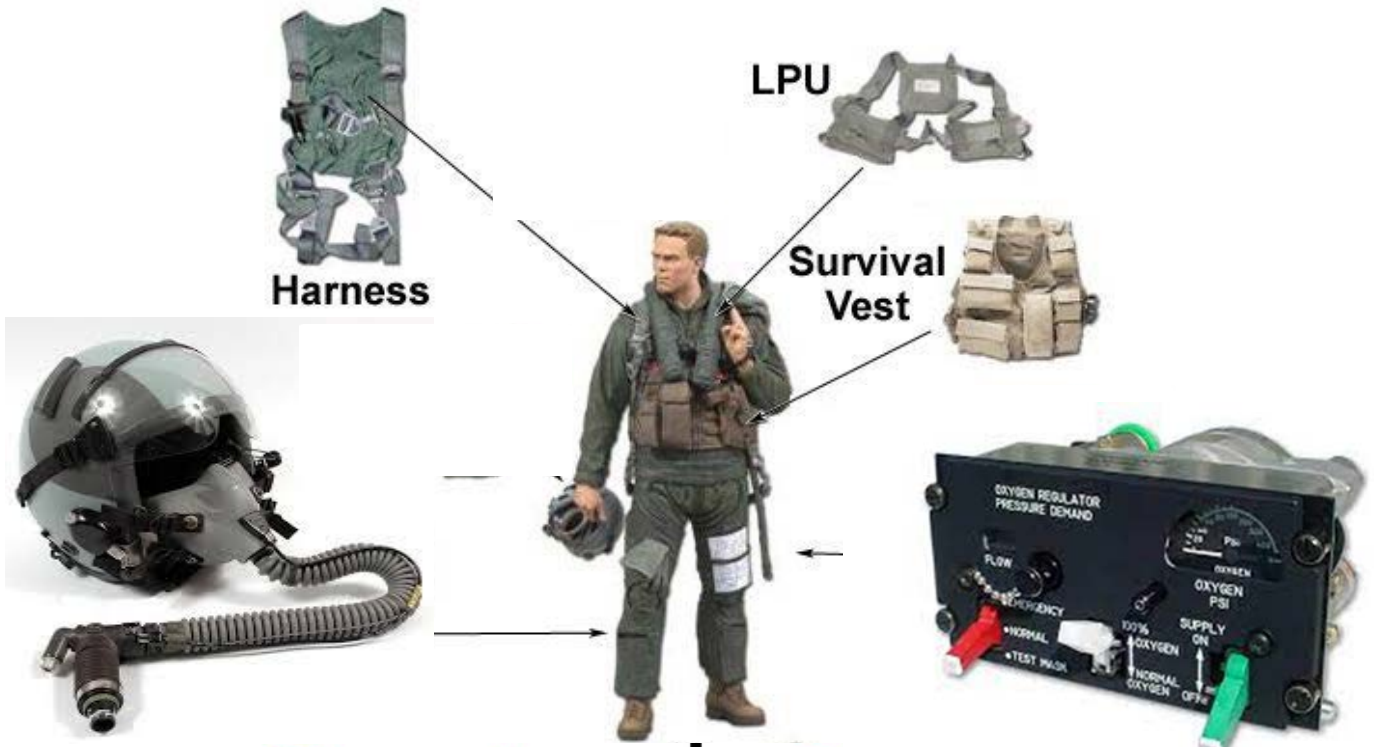
Asthma- Aeromedical Issues

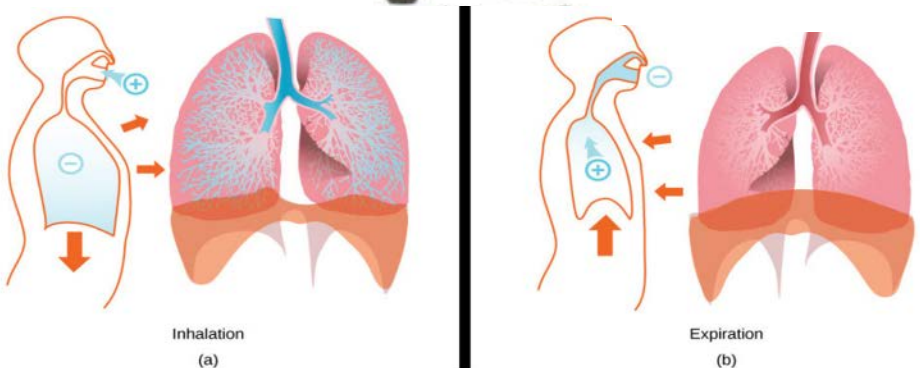


Asthma - Aeromedical Issues

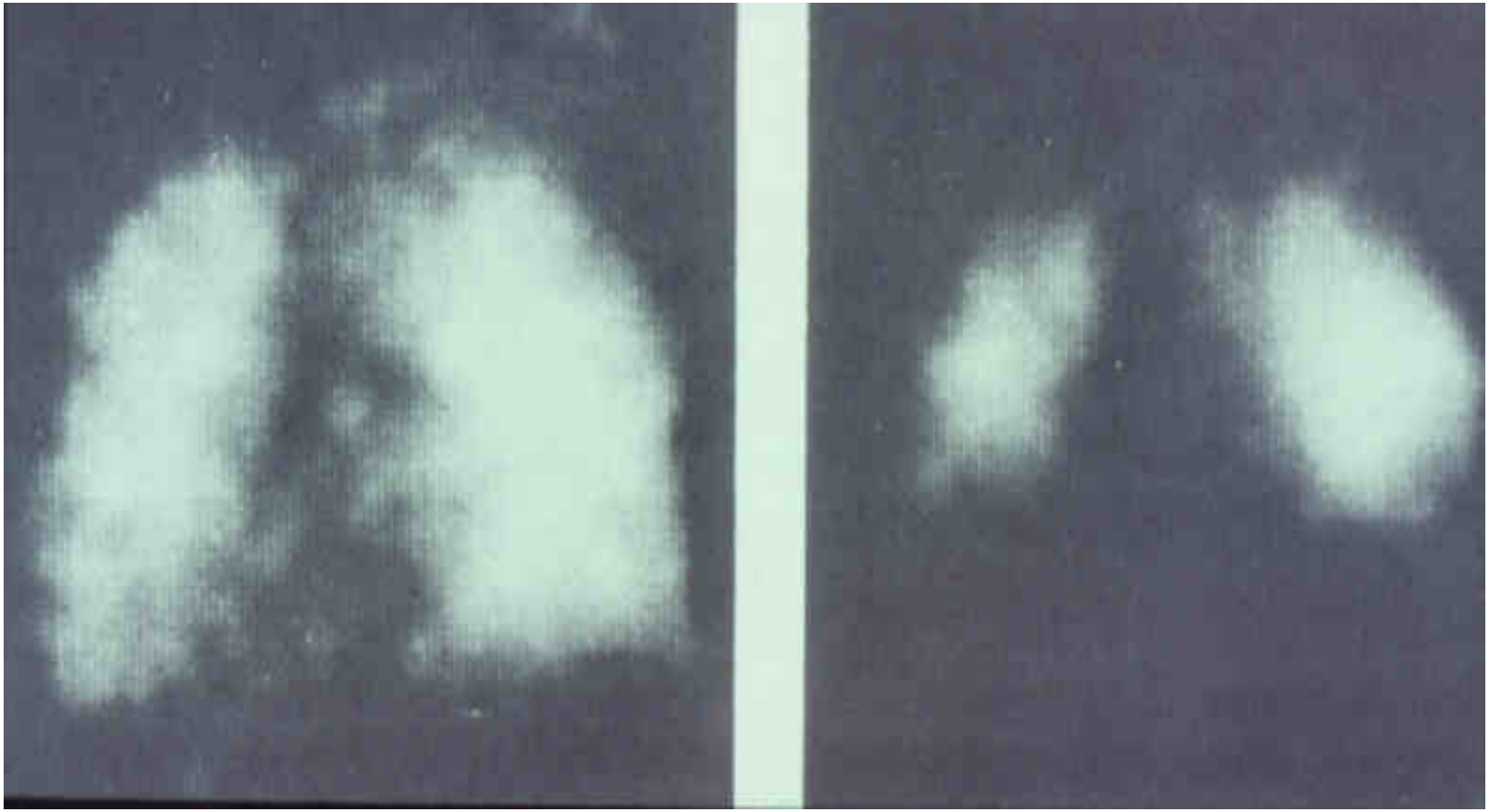
- Incapacitation or performance degradation
- In-flight triggers - cockpit smoke/fumes, exertion, cold dry air, allergens, stress
- Small airways dysfunction causing:
  - Increased ventilation-perfusion mismatch with G, increasing hypoxia
  - Reduced G-tolerance
  - Dynamic Hyperinflation
  - Increased risk of pneumothorax
  - Increased work of breathing
  - All of above may contribute to physiologic events
- Interaction of protective equipment and life support systems
- Aeromedical impact of any required medications

Asthma- Aeromedical Issues
Pilot Flight Equipment





Distribution of Xenon-33 showing the effects of +Gz on the distribution of ventilation



+1Gz

+3Gz

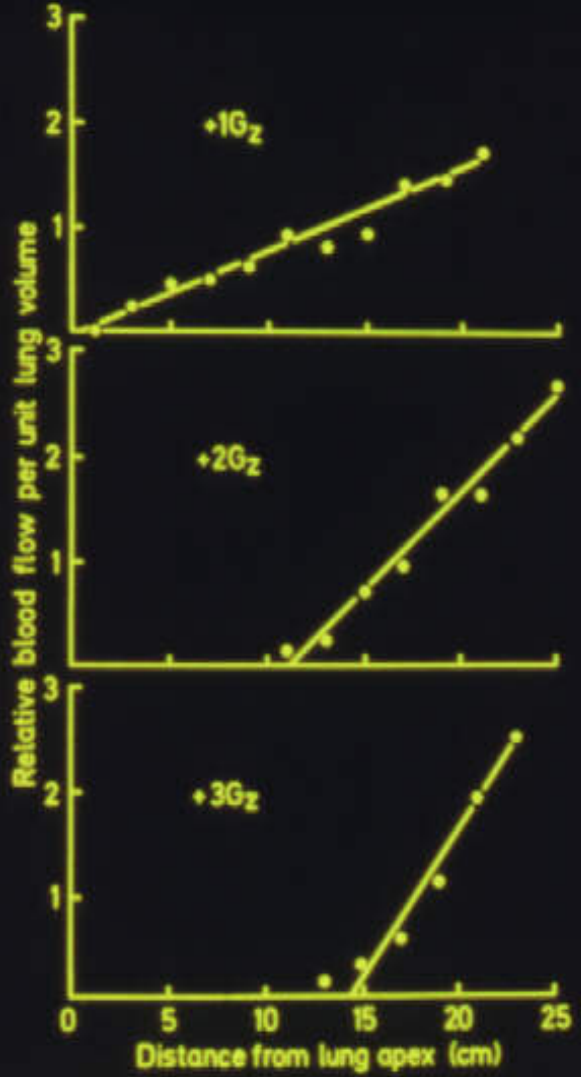
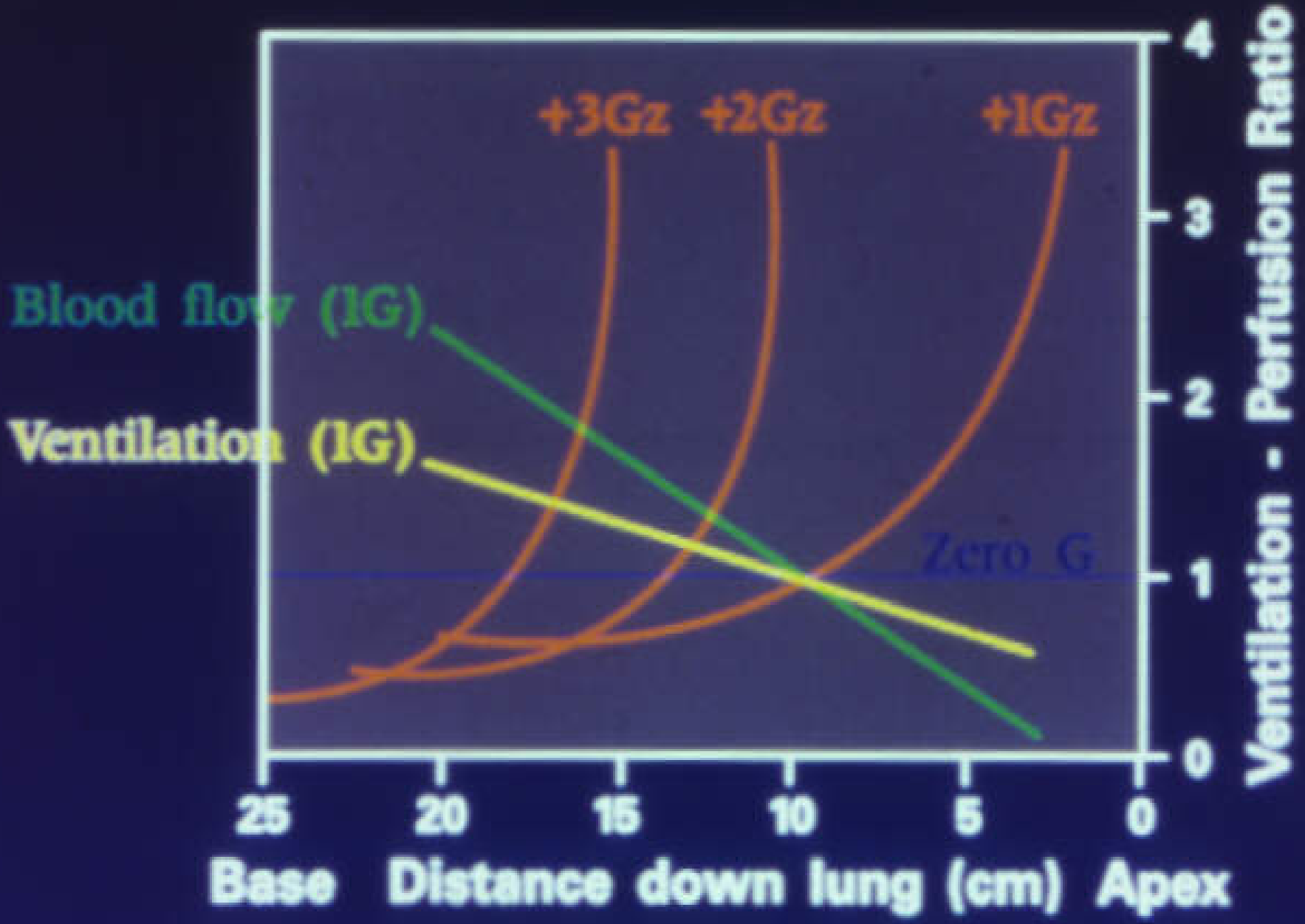
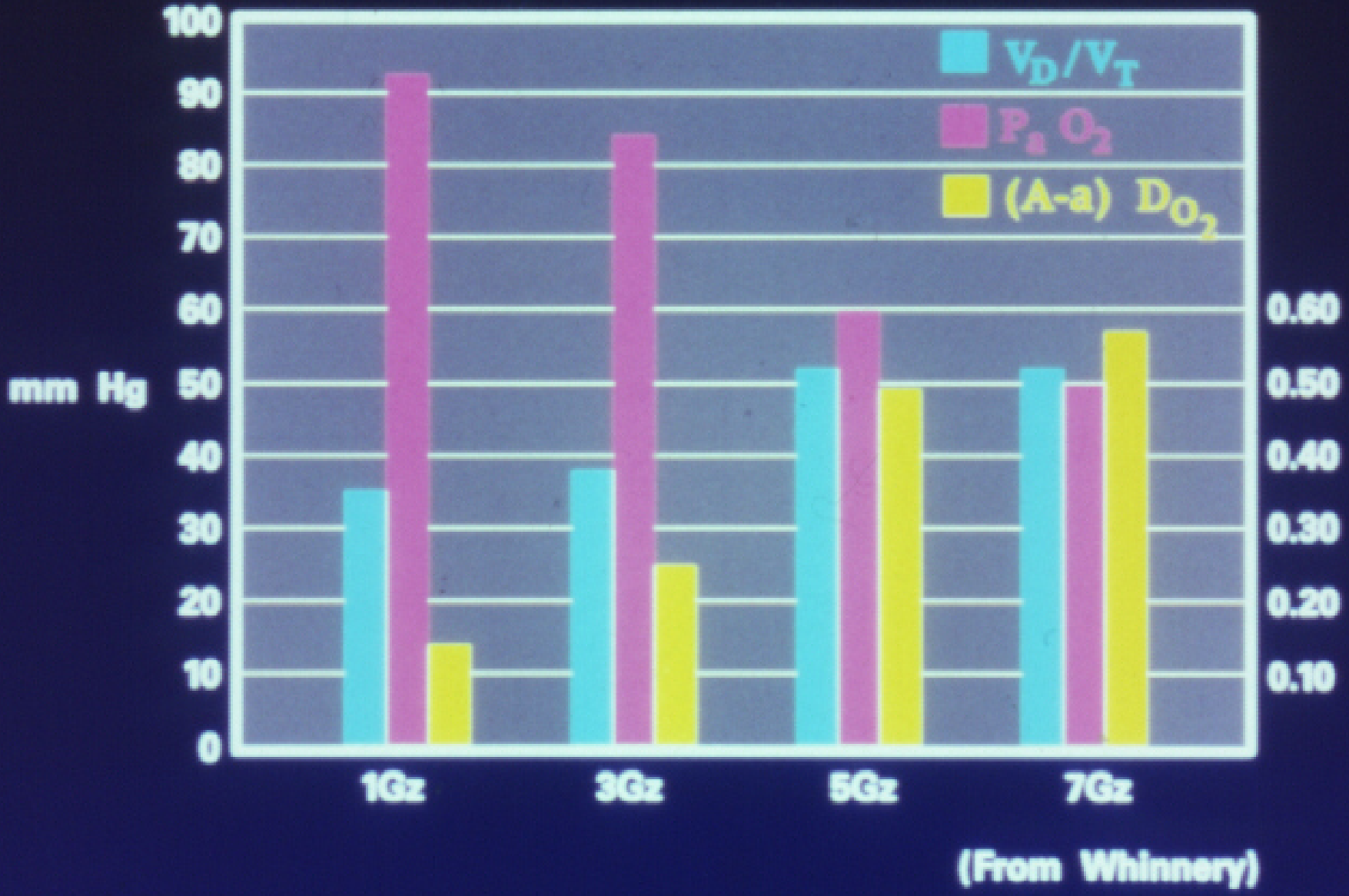


FIG. 8.11 Effect of $+G_z$ acceleration on vertical distribution of perfusion per unit lung volume calculated from scans similar to those of Fig. 8.10.

Ventilation-perfusion ratios with increasing +Gz, showing increased wasted ventilation (high V/Q) toward lung apices, and increased shunt (low V/Q) at lung bases



Wasted ventilation (V_D/V_T), arterial oxygen tension, and alveolar to arterial oxygen gradient with increasing levels of +Gz



NATO Pilot Asthma Survey

- Retrospective review by participating NATO countries which surveyed
  - The incidence of asthma in pilot aircrew
  - The incidence of permanent grounding or operational flying restriction as a result of asthma
  - Selection policies with respect a history of asthma in pilot candidates
  - Allowable medications for pilot duties

HFM RTG 299 RETROSPECTIVE REVIEW OF ASTHMA IN PILOTS

One of the major issues HFM RTG 299 is addressing is asthma. There is a wide discrepancy amongst NATO nations regarding screening procedures for and disposition of asthma in aircrew candidates and trained aircrew. To better assess the magnitude of the issue, RTG 299 is undertaking a retrospective review of the prevalence of asthma in serving aircrew.

For this review, HFM RTG 299 requests that each participating NATO nation take part in a review of the aeromedical disposition of trained pilots who were diagnosed with asthma over a 10 year period. The details of the requested information are as follows

Population: All pilot aircrew who have completed training. All designated pilots whether or not on active flying status should be included (ie include pilots on ground tours or staff positions)

Time period: 10 year period from 1 Jan 2009 to 31 December 2018 (if unable to provide the full 10 year data, please indicate the specific years searched)

Data Requested: Please provide the following information.

Pilots diagnosed with asthma who were returned to active flying status	NUMBER
a. With a flying restriction	
i. Restricted to dual/multicrew	
ii. Restricted from fighters	
a. Returned to unrestricted flying status	
Pilots with a diagnosis of asthma who were permanently grounded	
Approximate annual number of pilots over the 10 year period	(denominator)

NATION/Air Force SELECTION POLICY		
	Yes	No
Candidates with a history of asthma are rejected		
Candidates with a history of asthma may be accepted with further evaluation		
ACCEPTABLE TREATMENTS FOR FLYING DUTIES		
SABAs		
ICS		
LABAs		
Other (please specify)		

NATO Pilot Asthma Survey
Incidence of Asthma in Pilots

Agency	Data Period	Number of pilots	Pilot-years	Aeromedical Disposition				
				Total Dx Asthma	Permanent Grounding	Restricted	Unrestricted	Comments
USAF	10 yrs	18859	188590	13	4	5	4	
UK Aircrew	4 yrs 9m	3004	14269	12	1	4	7	54 other dx no formal board
RNLAF	10 yrs	650	6500	13	0		13	
RCAF	10 yrs	2200	22000	14	1	12	1	
US Army	10 yrs	24568	245680	63	3		60	
GAF	10 yrs	4103	41030	24	4	6	14	
RDAF	10 yrs	230	2300	0	0	0	0	
		53614	520369	139	13	27	99	

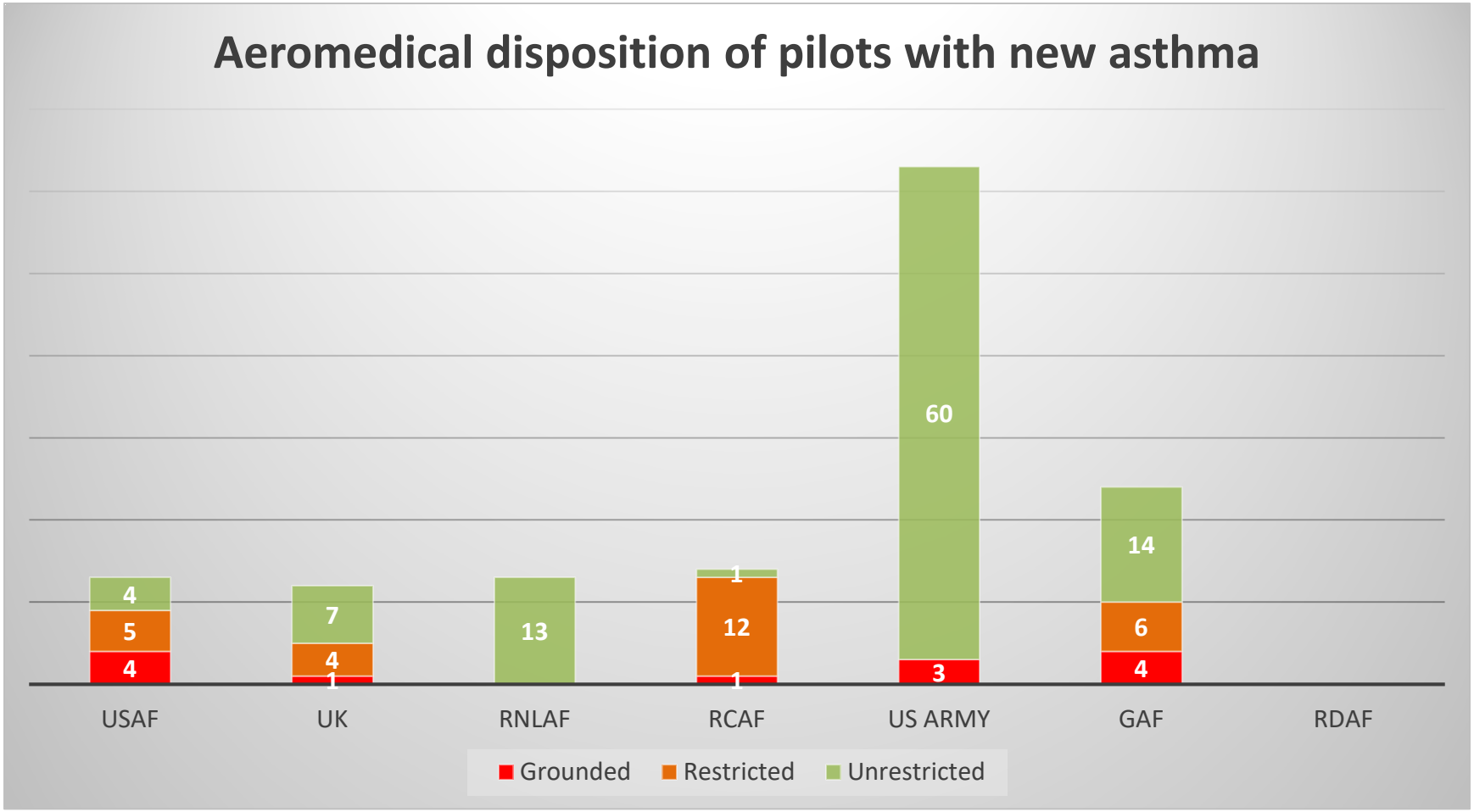
0.26 cases of new asthma every 1000 pilot-years

or

New asthma diagnosed in ~ 0.03% per year of the pilot population

New asthma incidence in general adult population 3-5/1000 person-years

NATO Pilot Asthma Survey
Incidence of Asthma in Pilots



NATO Pilot Asthma Survey
Incidence of Asthma in Pilots
Non-US data

Agency	Time	Number of pilots	Pilot-years	Aeromedical Disposition				
				Total Dx Asthma	Permanent Grounding	Restricted (TTB)	Unrestricted	Comments
UK Aircrew	4 yrs 9m	3004	14269	12	1	4	7	54 other dx no formal board
RNLAF	10 yrs	650	6500	13	0		13	
RCAF	10 yrs	2200	22000	14	1	12	1	
GAF	10 yrs	4103	41030	24	4	6	14	
RDAF	10 years	230	2300	0	0	0	0	
		10187	86099	63	6	22	35	

0.7 cases of newly diagnosed asthma every 1000 pilot-years

Or

New asthma diagnosed in ~ 0.07% per year of the NATO pilot population

New asthma incidence in general adult population 3-5/1000 person years

NATO Pilot Asthma Survey Selection Policies

Agency		
	History of asthma is disqualifying	May be acceptable with evaluation
USAF	Yes	Yes
GAF	No	Yes
UK	Yes	Yes
RNLAF	No	yes
RCAF	No	Yes
US Army	No	Yes
RDAF	After age 10	Before age 10

NATO Pilot Asthma Survey
Acceptable Medications

Agency				
	SABAs	Inhaled corticosteroids	LABAs	Other
USAF	Yes	Yes	>2018	
GAF	Yes	Yes	Yes	
UK	Occasionally	Yes	Occasionally	cromoglycate
RNLAF	Yes	Yes	Yes	
RCAF	No	Yes	Yes	Leukotriene inhibitors
US Army	Yes	Yes	Yes	Leukotriene inhibitors
RDAF	No	No	No	

NATO Pilot Asthma Survey Summary

- The incidence of new-onset asthma is very low in NATO pilots (significantly below age matched population)
- The low incidence reflects selection procedures and policies
  - Asthma after childhood is generally disqualifying
  - Individual candidates with a history of asthma may be considered with detailed pulmonary assessment
  - Universal pulmonary function test screening in aircrew candidates helps identify individuals with an asthmatic diathesis
- Small airways dysfunction in asthmatics may contribute to reduced G-tolerance and UPEs by increasing V/Q imbalance thus aggravating hypoxia

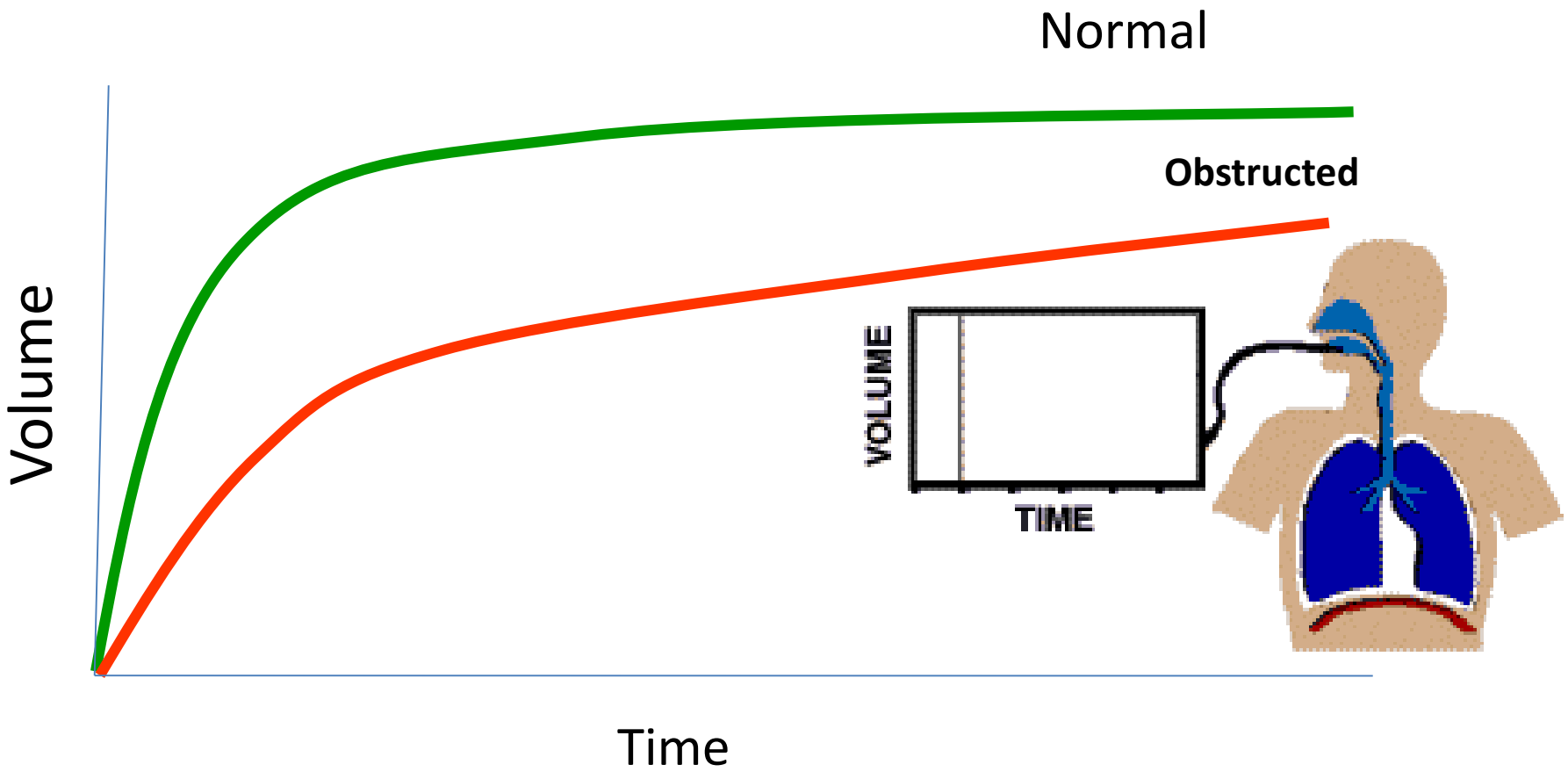
Discussion Points

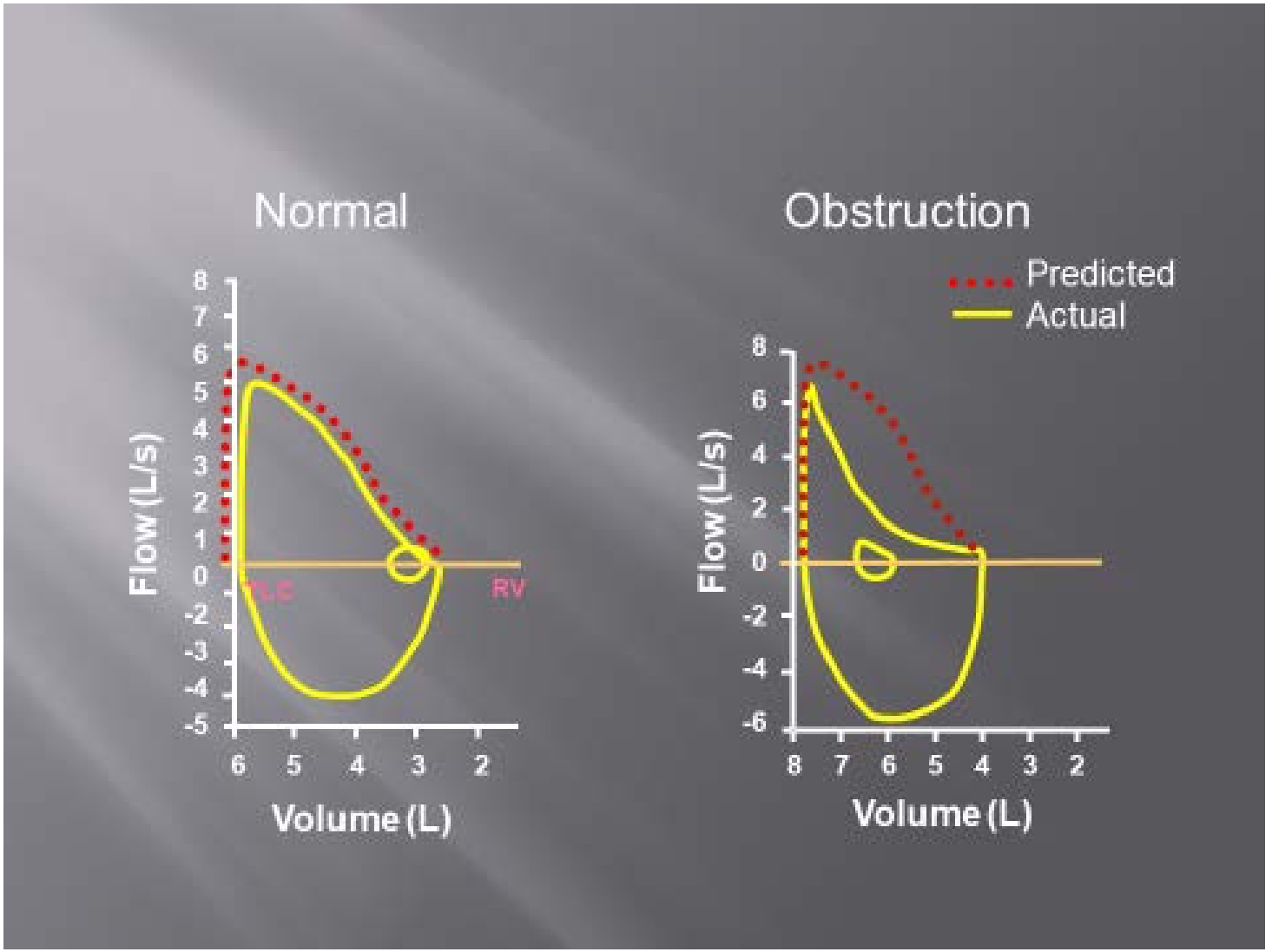
- The need for universal screening of aircrew candidates for asthma
  - Pulmonary function testing of all candidates
  - Enhanced screening for candidates with a history of asthma

- Given the potential for aggravating G-induced impairment of gas exchange, which may contribute to reduced G-tolerance and possibly contribute to UPEs, pilots with a history of asthma should generally not be assigned to fast-jet fighter operations

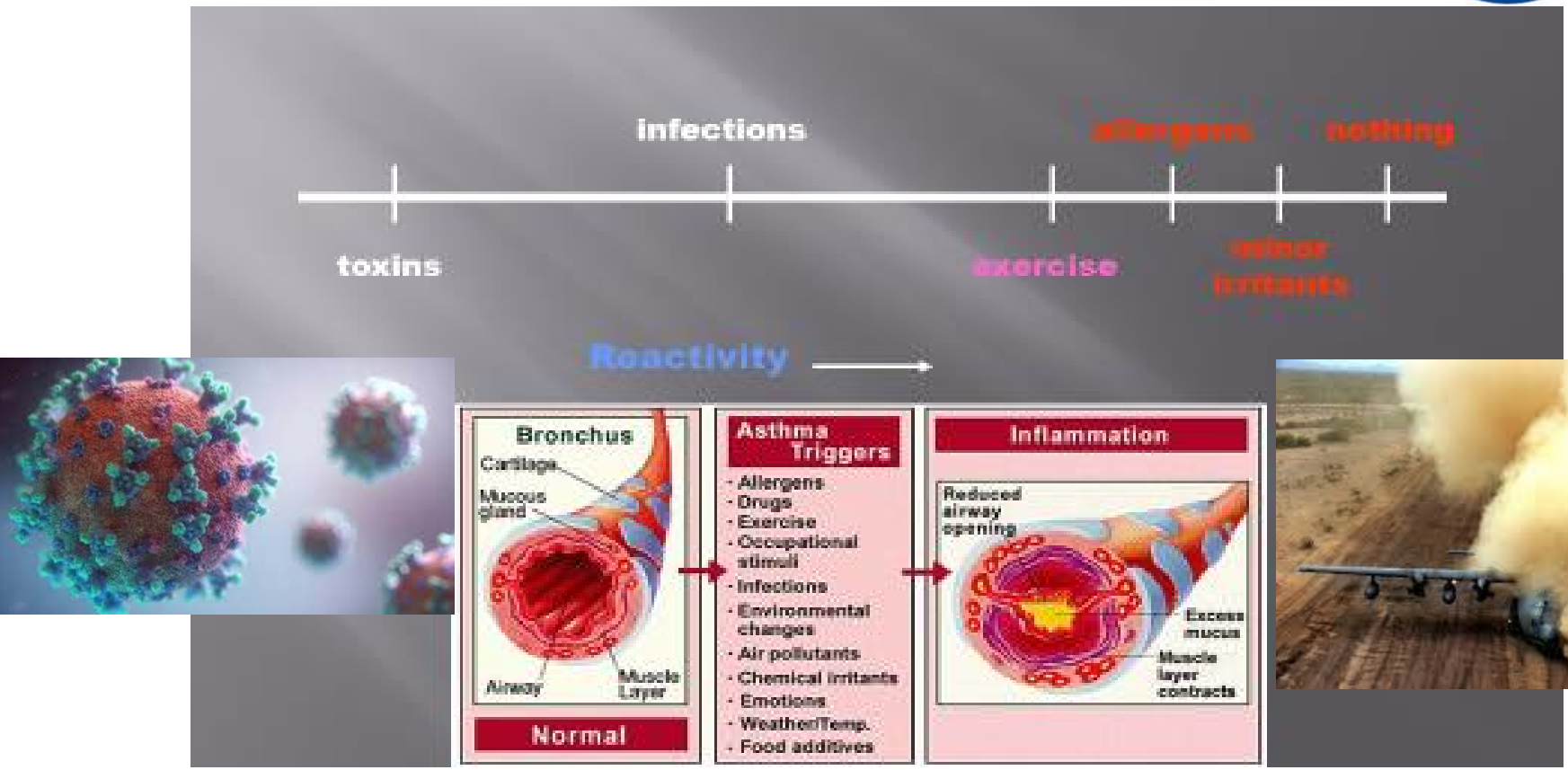
QUESTIONS

Spirometry




Normal
Obstruction
Predicted
Actual
Flow (L/s)
Volume (L)
TLC
RV
8
7
6
5
4
3
2
1
0
-2
-3
-4
-5
6
5
4
3
2

Asthma- Aeromedical Issues Triggers



Asthma- Aeromedical Issues
Dynamic Hyperinflation