



This is Aerospace Medicine

**Presented by the
Aerospace Medical Association**



Overview

Introduction

Flight Environment

Clinical Aerospace Medicine

Operational Aerospace Medicine



Aerospace Medicine vs. Traditional Medicine

Medical Discipline	Physiology	Environment
Traditional Medicine	Abnormal	Normal
Aerospace Medicine	Normal/Abnormal	Abnormal



Brief History of Flight Medicine

- Advent of powered flight presented new physiologic demands such as altitude exposure
- Aviation Medicine driven by WWI high losses of life due to physically unfit pilots
- Development of manned space flight led to evolution of Aviation Medicine into Aerospace Medicine

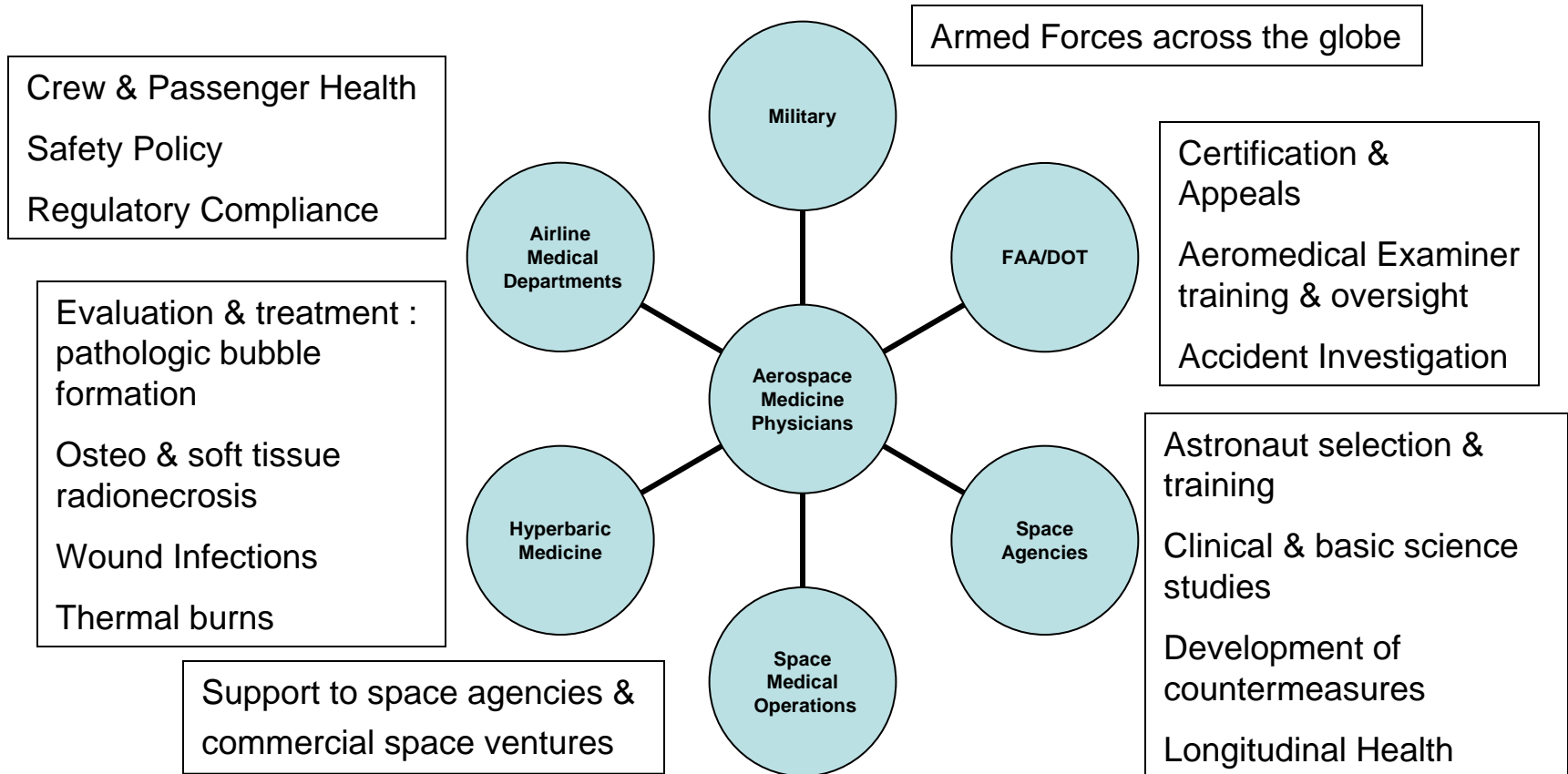


Aerospace Medicine Practitioners

- Address needs of all who work, recreate, and travel in the air, sea, and space
- Trained in medicine, with special knowledge of operating in extreme environments of flight, undersea, and space
- Uniquely equipped to make decisions on selection and retention of aviators, divers, and space mission and space flight participants.



Aerospace Medicine Practitioners





Aerospace Medicine Practitioners

- **Aviation Medical Examiners (AMEs)**
 - Designated, trained, and supervised by the FAA Flight Surgeons
 - Examine/certify civilian pilots
 - Training provides an understanding of aviation related problems, physiology, standards, and administrative processes
 - One week course with mandatory refresher courses
- **International Aviation Medical Examiners**
 - European Aviation Safety Agency (EASA)
 - Training provides an understanding of aviation related problems, physiology, standards, and administrative processes
 - 60 hr basic and 60 hr advanced courses



Aerospace Medicine Practitioners

- Military Flight Surgeons
 - Caring for aviators and their families, manage aerospace medicine and public health programs
 - Special training programs:
 - Residency in Aerospace Medicine (RAM)
 - Non-RAM military courses



Aerospace Medicine Practitioners

- National Aeronautics and Space Administration (NASA) Flight Surgeon Duties
 - Medical care for astronaut corps and their families
 - Astronaut selection and mission training
 - Develops physiologic countermeasures for spaceflight
 - Ensures crew health and safety
 - Research promoting a better understanding of medical issues associated with spaceflight environment
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Advanced Training in Aerospace Medicine

- United States
 - Civilian Residencies
 - University of Texas - Medical Branch
 - Wright State University
 - Civilian Fellowships
 - Mayo Clinic
 - Military Residencies
 - US Navy
 - US Army
 - US Air Force
- United Kingdom
 - Subspecialty of Occupational Medicine
 - Civilian Fellowship: King's College in London
 - Military Fellowship: Royal Air Force (RAF) Centre of Aviation Medicine



Aerospace Medicine Practitioners (Non-Physicians)

- Aerospace Experimental Psychologists
- Aerospace Physiologists
- Bioenvironmental Engineers
- Cognitive Psychologists
- Environmental Health Professionals
- Flight Nurses
- Human Factors Engineers
- Industrial Hygienists
- Radiation Health Professionals
- Systems Engineers



Advanced Training in Aerospace Medicine

- Other countries also have advanced training in aerospace medicine with military and civilian components



The Flight Environment



Theory of Flight

- Atmospheric flight
Bernoulli and Newton described the concept of lift, when air flows over a wing.
- Space Flight
Suborbital and Orbital
Lunar and
Interplanetary



The Atmosphere

Composition

Gases

- Nitrogen 78 %
(at SL 592.8 mmHg)
- Oxygen 21%
(at SL 159.6 mmHg)
- Other 1%
(at SL 76 mmHg)

Additional Components

Solid particles

- Dust
- Sea Salt



The Atmosphere

- Gaseous mass surrounding Earth which is retained by the Earth's gravitational field
- Governed by gas laws



Aerospace Physiology

Respiration

Cardiovascular System

Spatial Orientation

Bioacoustics

Vision

Sleep and Circadian

Rhythms

Acceleration

Gravitational Effects

Vibration

Hypobaria

Hyperbaria

Other Physical Factors

Human Factors



Clinical Aerospace Medicine



Fitness for Duty & Return to Flight Status

- Screen aviators, astronauts, air traffic control personnel for risk of sudden incapacitation or degradation in skills
 - Applies to all areas of medicine
 - Applies to all types of aviators, i.e. military, commercial pilots, private pilots, and flight crew
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Operational Aerospace Medicine



Operational Aerospace Medicine

- Address challenges of operating aerospace vehicles in a physiologically challenging environment
- Conducted in military and civilian setting
- Management and prevention of medical events during operations



Operational Aerospace Medicine

- Issues in civilian operations
 - Commercial air transport flight operations
 - Deep vein thrombosis prophylaxis in susceptible individuals,
 - Circadian rhythm issues
 - Potential for spread of infectious diseases
 - Consideration of radiation exposure
 - Commercial spaceflight operations



Operational Aerospace Medicine

- Military crew members can be required to operate at very high altitudes for the purposes of reconnaissance, combat, or routine training operations
- The unique stresses of extreme altitude operations require special protective equipment and training





Operational Aerospace Medicine

- Aeromedical Transportation encompasses the transport and inflight care of patients of different acuity levels.
- Noise, vibration, communication, pressure changes and combat activities can impact ability to deliver care in these settings.
- These transports include fixed-wing aircraft and rotary wing aircraft.





Operational Aerospace Medicine



- Hyperbaric Medicine Practitioners support a variety of occupational, training, and remote diving activities
 - Oil Industry
 - Astronaut Dive Training for Extravehicular Activities
 - Underwater Search & Rescue Support



Survival, Search & Rescue

- **Crash Worthiness – Primary/Secondary Protection**
 - The aircraft and its systems are a life support system and its thoughtful design may greatly aid in the survivability of a crash
- **Search & Rescue Systems**
 - Beacons
 - Increased use of satellite technology
 - Organized systems in civilian environment and military
 - Importance of survival training





Accident Investigation

- Significant improvements in accident rate and data since the 1960s due to:
 - Improved operational procedures
 - Technological developments
 - Application of lessons learned from accident investigations





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