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.

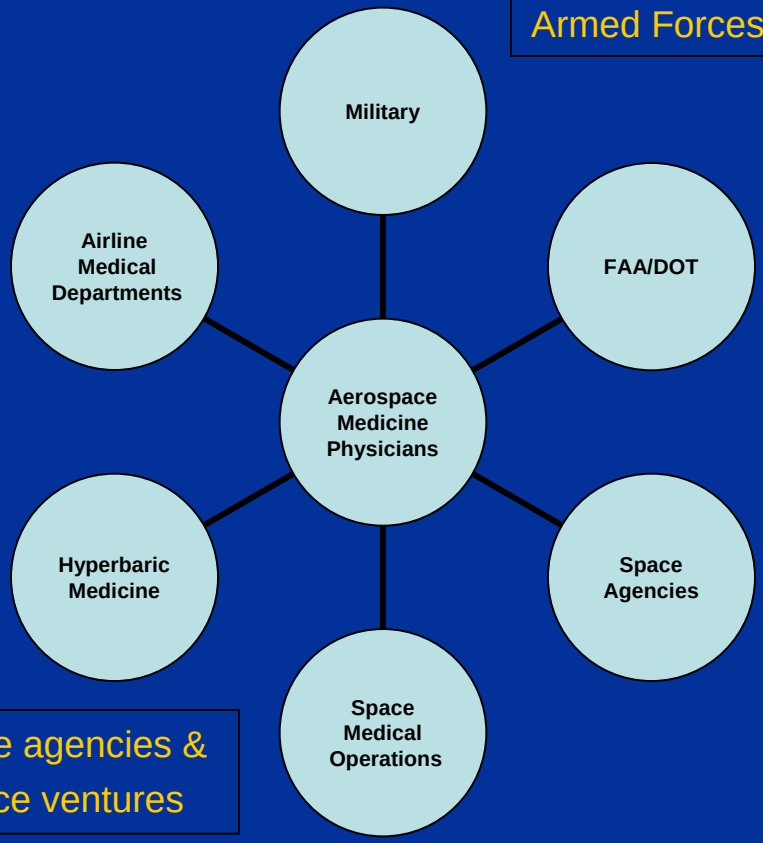
Aerospace Medicine Practitioners

Armed Forces across the globe

Crew & Passenger Health

Safety Policy

Regulatory Compliance



Certification & Appeals

Aeromedical Examiner training & oversight

Accident Investigation

Evaluation & treatment : pathologic bubble formation

Osteo & soft tissue radionecrosis

Wound Infections

Thermal burns

Astronaut selection & training

Clinical & basic science studies

Development of countermeasures

Longitudinal Health

Support to space agencies & commercial space ventures

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

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

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

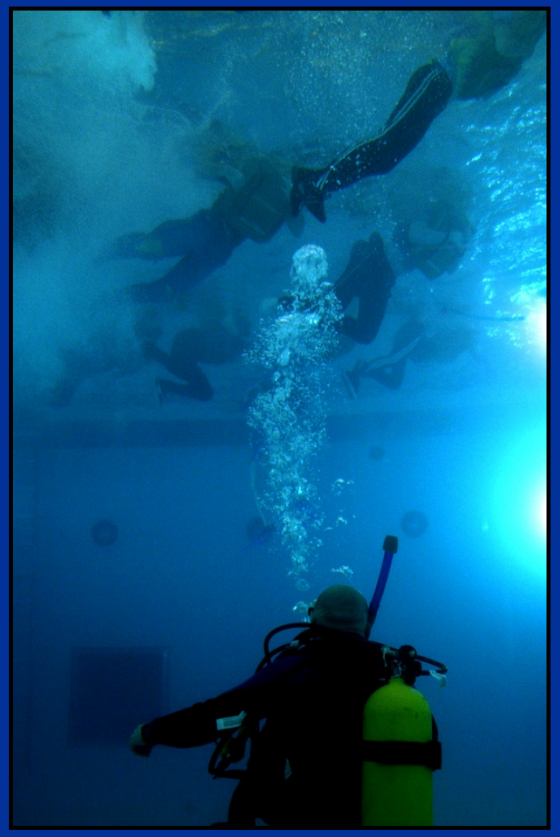
Photographs courtesy of the Federal Aviation Administration

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.

Photographs courtesy of the Federal Aviation Administration

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

Photograph courtesy of the Federal Aviation Administration

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

Photograph courtesy of the Federal Aviation Administration

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

Photograph courtesy of the Federal Aviation Administration

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