Have Flight Surgeons and Aerospace Medicine Improved Aviation Safety?

American Osteopathic College of Occupational and Preventive Medicine
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"Aviation" Medicine

Wright Brothers First Flight - 1903

Army and Navy Surgeon General’s Memorandum from 1912

Army Surgeon General’s Memo
Flight Surgeon

What does that mean?
What do you do... Operate in airplanes?

Flight Surgeon

• He is a doctor who knows flying.
• He was to do nothing whatever, except to be the “doctor for the pilot.”
• Whether military or commercial, the flight surgeon’s desire and duty is to keep a man in the air.

Flying Vistas – I. Jones, 1937
“The art of aviation medicine cannot be described by writing or by word of mouth. It is an abstract something which is inherent in an individual and is almost impossible to acquire. It is intimately associated with personality.”

“Finally, the flight surgeon must have that depth of human understanding which will naturally cause those for whom he is responsible to turn to him for guidance and advice in time of stress or need.”

Principles and Practice of Aviation Medicine

“A good Flight Surgeon, therefore, must be a combination of an outstanding physician, priest and lawyer with a strong leaning toward the psychopathological side of medicine.”

How the Flying Fighters’ Doctor is Made
Reinartz, 1943

British Experience

Fatalities after the first year of WWI
- 2% due to enemy action
- 8% due to aircraft failure
- 90% due to medical deficiency in the pilot (60% due to actual physical defect)

After medical standards implemented
- 20% – 1st year medical deficiency accidents
- 12% – 2nd year medical deficiency accidents

Aviation Medicine during WWI
- Standardized flying medical examination worked
- Rigid medical standards for pilots provided medically sound pilots
- No exemptions to medical standards considered
- Accidents due to pilot medical issues were low

Early Civil Aviation Medicine
- 1926 - Air Commerce Act - Aeronautics Branch within the Commerce Department
- Louis H. Bauer - 1st Medical Director of Aeronautics
  o Commandant of Army School of Aviation Medicine
  o Author of Textbook - “Aviation Medicine”
- Implement new Civil Medical Standards - Same as Army
- 1927 - Appointed first 57 Medical Examiners
- 1930 - 800 Medical Examiners
- Examinations at the rate of 2,000 per month

Studies by Bauer and Cooper - 1930
- General aviation student pilots
  o 16% physical defects (PD)
  o 84% physically normal (PN)
- PD pilots involved in 40% more accidents than PN pilots
- PD pilots involved in 22% of all accidents
- PD pilots in accidents – 67% higher chance of death
- Similar statistics for transport pilot accidents
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U.S. Military & Civil Aviation Physical Examination – 1930's

Civil Aeronautics Act of 1938
Establishes
Civil Aeronautics Authority (CAA)

Aviation Safety
Commercial Airline Accidents
1927 - 1958

Airline Accident Data, 1927-1958

Fatal Accidents Per Million Miles Flown
Commercial Aviation

I-4
Airline Accident Data, 1938-1958

Aviation Safety
General Aviation Accidents
1938 - 2010

General Aviation-Total Accidents, 1938-2010

General Aviation Accident Rate
Aviation Safety in WWII

Military Aerospace Medicine contributed greatly to the safety of pilots during the war, decreasing injuries and medical causes of aircraft accidents

- High Altitude Operations
- High Altitude Bailout
- G-Tolerance
- Oxygen Masks

Upon his Retirement as the 15th President of the Aeromedical Association in 1946 he said...

“We are at present on the threshold of a new world. Not one of us can envision the possibilities of Aviation Medicine in the future. With the progress of Aviation and the complete linkage of medicine with aviation, Aviation cannot progress without the medical man. He is absolutely necessary and as I have said time without number, aviation and medicine are wedded and can never be divorced.

Eugen G. Reinartz

U.S. Astronaut Selection

April 1959

Aerospace Medicine Safety In The U.S. Space Program
Difficult Aerospace Medicine Decisions Early in the Program

Donald K. “Deke” Slayton

Slayton Chronology

- 08/59 - Atrial Fibrillation noted on centrifuge
- 09/59 - Centrifuge to max 9 Gx with normal rhythm, later at 2300 hours - atrial fibrillation recurred
- 09/59 - Evaluation at USAF SAM, atrial fibrillation occurred again
- 08/60 - Periodic episodes of atrial fibrillation
- 03/62 - NASA Administrator removes him from MA-7 2nd orbital flight

Slayton Chronology (cont.)

- 11/63 - Qualified to fly in NASA aircraft with another qualified pilot
- 10/70 - Revealed on no meds except vitamins, no atrial fibrillation, Disp: Observation
- 02/72 - Returned to full flying status
- 01/73 - Stafford, Brand, Slayton announced as ASTP astronaut crew

Difficult Aerospace Medicine Decisions Early in the Program

Alan B. Shepard

Shepard Chronology

- 05/61 - Flew first U.S. manned spaceflight
- 05/63 - Hearing loss and tinnitus left ear, inflamed TM, Rx: Antihistamine and decongestant
- 06/63 - 3 episodes vertigo, nausea, plus hearing loss, and tinnitus, Rx: Viral Labyrinthitis, Disp: Grounded
- 07/63 - Symptoms persist, Dx: Meniere’s Disease (ENG supports Dx), Rx: Diuretic, low salt diet, Niacin, Disp: Remain grounded
Shepard Chronology (cont.)

- **08/63** – Symptoms cleared, Dx: Meniere’s in remission, Disp: Limited flying status
- **01/66** – Dx: Meniere’s in remission, Disp: Continue flying status, no space crew assignment
- **01/67** – Recurrent hearing loss, tinnitus, fullness in left ear, vertigo, nausea, vomiting, and nystagmus, episodes every four months

Shepard Chronology (cont.)

- **05/68** – Endolymphatic Shunt Surgery in Los Angeles, CA
- **01/69** – Vestibular Evaluation, Pensacola – NAMI, same results as 5/68
- **03/69** – Medical Board, Disp: Full flying status, eligible for space crew assignment

Shepard Chronology (cont.)

Jan. 31 – Feb. 9, 1971 – Apollo 14 Mission Commander

Apollo 9 Crew

Aerospace Medical Association - President’s Page

**Courageous Flight Surgeons:**

...The fact that the departure of Apollo 9 was delayed for 48 hours for medical reasons should be noteworthy to members of our Association...

...As an experienced military flight surgeon knows, it takes courage and unwavering faith in one's clinical judgment to go to the boss and recommend to stand down a mission...

...We have witnessed an example of the practice of aerospace medicine in the finest tradition. We salute the wisdom and courage of your President Elect and his strong medical backing in NASA headquarters.

BG John M. Talbot, 4/69
“The truth of the matter is that the space program would be precisely where it is today had medical participation in it been zero or perhaps it would be even a little bit ahead because we could have gone without all the impedimenta and medical claptrap such as blood pressure cuffs, exercise ergometers and urine output measuring devices.”

Carrying the Fire
Apollo 11 Astronaut, Michael Collins

“\thead
The flight surgeons’ judgment and ability to assess the astronaut’s well-being in flight, as well as their confidence in the crew’s readiness to undertake each of the missions were very necessary to achieving success. I do not believe that we could have gotten to the moon without the contributions of the flight surgeons.”

Chris Kraft
Director of Flight Operations – NASA
In Apollo Expeditions to the Moon

“To Chuck Berry,

“The man who, all through the program, was my closest confidant and advisor and without whom we would have been hard pressed indeed to bring the whole program off. Only the years of the future will tell how much you have done for the Space Program.”

Robert L. Gilruth
Director, NASA Manned Spacecraft Center
To Chuck Berry,

“Who was always willing to make the most difficult decisions concerning man in space and who always made the right decisions.”

“Without your advice and your decisions, without your skill and dedication, Apollo would not have succeeded.”

George M. Low
Deputy Administrator – NASA

Aerospace Medicine and Aviation Safety Today

Civil Aviation Accidents
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FAA Aerospace Medical Certification
...Today

Aerospace Medicine Impact on Aviation Safety
Show Me The Data!

“We are all just prisoners here, of our own device”

Prove the Negative!

Why are there fewer medical causes of civil aircraft accidents?
Top Medical Categories of Denials
(Average 2006 to 2016)

Failure to provide – Encompasses numerous medical conditions
2,606 Denials for this in 2016
1. DQ medications
2. Coronary Artery Disease
3. Psychiatric conditions
4. Alcohol problems (Dependence and Abuse)
5. Diabetes on Meds other than Insulin

NTSB Study - 2014
Drug Use Trends in Aviation: Assessing the Risk
of Pilot Impairment

- NTSB Accident Database and FAA Toxicology Database
- 6,597 Accidents with Fatally Injured Pilots
- Fatally Injured in Domestic U.S. Civil Aviation Accident, 1990-2012
- Accidents: 96% General Aviation, 4% Part 135, <1% Part 121

Human Intervention Motivation Study
HIMS

- Started in 1974
- 5,800 pilots successfully through the program
- 85% success rate
- Identification, treatment, long-term monitoring
Medical Findings in Light Sport Aircraft Accidents, 2007-2015

- 23 Fatal Accidents - NTSB cited medical condition as probable cause, or contributing factor
- 6 Fatal Accidents - Medical condition presented significant hazard to safety, no NTSB cause
- 23 Fatal Accidents – Medical findings at autopsy identified significant or serious condition
- 36 Fatal Accidents - Alcohol or drugs identified on toxicology
- 88 Total Accidents - No pilots had valid medical certificates

Aerospace Medicine in the Future

Medical Standards for UAS

14 CFR Part 107 – Small UAS

Medical Standards for Larger UAS

Large UAS

- Evaluate the tasks of the operator.
- What are the potential risks of medical incapacitation?
- What are the risks of possible psychiatric or psychological problems in the operator?
- Can we leverage current medical standards?
Commercial Space Flight

- Civilian pilots, not NASA Astronauts, piloting space vehicles.
- What should the medical standards be?
- Passengers will be on these same space flights.
- Should there be minimum medical standards for passengers?

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YES!