An Analysis of Medical Unfitness among Civil Aviation Aircrew in South Africa

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Evolution of Aviation Medicine

ICAO Requirements

Operational Requirements

Medical Causes of Aircraft Accidents

Acceptable Medical Risk

Application of Safety Management to Medical Requirements

Analysis of common morbidity among civilian crew

Analysis of In-flight Incapacitation, Medical Appeals Enforcement Cases

Conclusion
The field of aviation medicine came into existence during World War I, when it was realized that more pilots died due to reasons of medical incapacity, than as a result of enemy gunfire.
The aircraft environment differs from other occupational environments with respect to the following altitude stressors:

- Hypoxia, noise and vibration
- Low humidity, leading to dehydration
- Fatigue, decompression syndrome, acceleration and spatial disorientation.
- Because of these stressors, the aircrew is required to maintain a high level of physical and mental fitness to operate in that environment.
- Aviation personnel are legally required to assess their fitness to carry out their professional duties.
With the introduction of medical standards for pilot duties, the fatality rate dropped significantly.

This led to the development of ICAO Medical Standards which are found in Annex 1, Chapter 6.
ICAO MEDICAL REQUIREMENTS

- Oversight of medical certification
- Routine collection and analysis of medical findings to identify areas of increased medical risk
- Periodic auditing of the competence of the medical examiner (AME) by the medical assessor
- Application of the ICAO Flexibility Clause and ensure accredited medical conclusion
- Routine collection and analysis of incapacitation in-flight and on active duty
- Enforcement - (Medical Certificate applicants and DAMES)
- Training of Designated Examiners
ICAO MEDICAL REQUIREMENTS - PURPOSE

- Aid in the approach and management of intricate borderline cases (AMEs/CAA)
- Risk of incapacitation - Single pilot vs. Multicrew commercial operations carrying passengers
- Harmonisation of medical standards by Contracting States
- Medical assessment; the relevant operating environment should be borne in mind
- Imposing an operational condition or limitation applied to the licence.
Operational Considerations
OPERATIONAL CONSIDERATIONS

Recreational Pilots

Cabin Crew
What is an acceptable incapacitation risk for different tasks, e.g., ATP vs. Helicopter ATC Environment?
Medical Causes of Accidents

- The incidence of incapacitation of aircrew due to medical conditions or physiological impairment is low - Study West
- Attributed to stringent & established medical certification processes
- Despite stringent medical requirements -
- No medical examination can entirely exclude the possibility of incapacity (Aneurysm)
- Medical Causes of Aircraft Accidents in SA/Africa not known.
- Limited Research & Capacity
<table>
<thead>
<tr>
<th>Year</th>
<th>Aircraft</th>
<th>Medical Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>1982</td>
<td>DC 8</td>
<td>Schizophrenia</td>
</tr>
<tr>
<td>1982</td>
<td>Citation</td>
<td>Alcoholic impairment</td>
</tr>
<tr>
<td>1982</td>
<td>Metro</td>
<td>Vomiting</td>
</tr>
<tr>
<td>1983</td>
<td>Learjet</td>
<td>Use of marijuana</td>
</tr>
<tr>
<td>1988</td>
<td>Metro</td>
<td>Use of cocaine</td>
</tr>
<tr>
<td>1989</td>
<td>FH 227</td>
<td>Alcohol</td>
</tr>
<tr>
<td>1990</td>
<td>Learjet</td>
<td>Slurred speech, Cause?</td>
</tr>
<tr>
<td>1993</td>
<td>Learjet</td>
<td>Alcohol/cocaine</td>
</tr>
<tr>
<td>1994</td>
<td>ATR 42</td>
<td>Suicide</td>
</tr>
</tbody>
</table>
ICAO-Medical Causes of Accidents

- ICAO - physical disease is very rarely a significant factor in two-crew airliner accidents involving younger pilots - West

- Anxiety and Depression are more common in the under-40s age group

- Illicit drug use and alcohol consumption also cause a considerable, increasing disease burden

- It represents a serious potential threat to flight safety.
Medical Causes of Aircraft Accidents in SA

- Forensic Pathologist (Determine cause of death)
- Aviation Psychology
- Toxicology
- Research Limited
- Medical Aspect of Aircraft Investigation
Acceptable Medical Risk - Assessment

- Many diseases not amenable to numerical analysis

- Psychiatric (Acceptable Cut-Off Memory, Concentration, etc) compared to BP Monitoring

- Expert opinion that seems ‘reasonable’, often based on similar precedents, is likely to hold sway

- Expert opinion differs with legal implications to the CAA (Bipolar Mood Disorder)

- Subtle cognitive impairment substance/alcohol abuse
Acceptible Medical Risk- CVS & NS Medical Assessments

• Some common medical conditions (e.g., heart disease)

• Where high quality epidemiological data exist and can be used in assessing the aeromedical risk

• Some conditions are normally found incidentally (Aneurysm)
An Analysis of Medical Unfitness among Civil Aviation Aircrew in South Africa - 2000-2008 UP Univ-Masters Thesis

Medical Status of Aviation Personnel

- Permanent unfit: 2
- Temporarily unfit: 33
- Unfit: 65

Racial Distribution of unfit personnel

- White: 87%
- Black: 12%
- Indian: 1%
An Analysis of Medical Unfitness among Civil Aviation Aircrew in South Africa - 2000-2008 UP Univ-Masters Thesis

Age Distribution of pilots

- 30 or <: 26.88
- 31 to 41: 25.97
- 42 to 54: 25.17
- 55 or >: 21.98

Age Distribution of pilots
An Analysis of Medical Unfitness among Civil Aviation Aircrew in South Africa 2000-2008

Category of licences of aviation crew

![Chart showing the category of licences of aviation crew]
An Analysis of Medical Unfitness among Civil Aviation Aircrew in South Africa - 2000-2008

<table>
<thead>
<tr>
<th>System Affected</th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Central Nervous System</td>
<td>257</td>
<td>29.34</td>
</tr>
<tr>
<td>Cardiovascular System</td>
<td>190</td>
<td>21.69</td>
</tr>
<tr>
<td>Psychiatry</td>
<td>103</td>
<td>11.76</td>
</tr>
</tbody>
</table>
An Analysis of Medical Unfitness among Civil Aviation Aircrew in South Africa - 2000-2008

<table>
<thead>
<tr>
<th>Neurology</th>
<th>Cardiovascular</th>
<th>Psychiatry</th>
</tr>
</thead>
<tbody>
<tr>
<td>Head Injuries</td>
<td>CAD</td>
<td>Depression</td>
</tr>
<tr>
<td>Convulsions</td>
<td>Hypertension</td>
<td>Substance Abuse</td>
</tr>
<tr>
<td>Migraine</td>
<td>AF</td>
<td>Bipolar Mood Disorder</td>
</tr>
<tr>
<td>Syncope</td>
<td>Aortic Valve Disease</td>
<td>Alcohol Abuse</td>
</tr>
<tr>
<td>LOC</td>
<td>Bundle Branch Block</td>
<td>Others</td>
</tr>
<tr>
<td>TIA</td>
<td>Mitral Valve Disease</td>
<td></td>
</tr>
<tr>
<td>Headache</td>
<td>Cardiomyopathies</td>
<td></td>
</tr>
<tr>
<td>Others</td>
<td>Others</td>
<td></td>
</tr>
</tbody>
</table>
Desktop Analysis - Aeromedical Cases: June 2010 to December 2012

- Neurology, 25%
- Psychiatry, 19%
- CVS, 19%
- Surgery, 16%
- Ophthalmology, 4%
- ENT, 3%
- Internal Medicine, 14%
Internal Medicine Cases (83)

Diabetes  | TB       | Asthma   | HIV      | Warfarin Protocol | Dermatomyositis | Cancer | Other

Other lung diseases

Number
Desktop Analysis - Aeromedical Cases: June 2010 to December 2012

Surgery Cases (96)

- Malignant Melanoma
- Other Cancers
- Prostrate Cancer
- DVT
- Other

Number
Desktop Analysis - Aeromedical Cases: June 2010 to December 2012

Psychiatry Cases (112)

- Depression: 40
- Bipolar Mood...: 30
- Substance Abuse: 20
- Alcohol Abuse: 10
- Other: 50

(Number)
Distribution of Substance and Alcohol Abuse across Age groups
Desktop Analysis-Aeromedical Cases: June 2010 to December 2012

Distribution of Alcohol and Substance Abuse across different classes of licence holders:

- CCM, 50%
- PPL, 21%
- ATC, 8%
- COMM, 17%
- ATP, 4%
### An Analysis of In-flight Incapacitation Reported to the CAA

<table>
<thead>
<tr>
<th>Neurology/Psychiatry</th>
<th>Category</th>
<th>Other Conditions</th>
<th>Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>Epilepsy</td>
<td>ATP</td>
<td>Palpitations/Tachycardia</td>
<td>Cabin Crew</td>
</tr>
<tr>
<td>Brain Stem Infarct</td>
<td>ATP</td>
<td>Epistaxis</td>
<td>Cabin Crew</td>
</tr>
<tr>
<td>Anxiety Disorders</td>
<td>PPL</td>
<td>Gastric Ulcers</td>
<td>Cabin Crew</td>
</tr>
<tr>
<td>Seizure Disorder</td>
<td>Cabin Crew</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Syncope</td>
<td>Cabin Crew</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Strange Behaviour</td>
<td>Cabin Crew</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bizarre Behaviour</td>
<td>Cabin Crew</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Seizure</td>
<td>PPL</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
# An Analysis of Medical Appeals & Non-Compliance to Civil Aviation Regulations Aircrew in South Africa – 2010 - 2013

<table>
<thead>
<tr>
<th>Neurology</th>
<th>Medical Certificate Applicants</th>
<th>Designated Aviation Medical Examiners</th>
</tr>
</thead>
<tbody>
<tr>
<td>Seizure/Epilepsy-99.9% Unfit</td>
<td>Substance/Alcohol Abuse</td>
<td>Incomplete Forms</td>
</tr>
<tr>
<td>Head Injury-100%</td>
<td>Non-Disclosure of medical Conditions</td>
<td>Late Submissions of medical records</td>
</tr>
<tr>
<td>Multiple Sclerosis(1) case</td>
<td>Psychiatric-BMD/Substance/Alcohol</td>
<td>Errors on the medical certificates</td>
</tr>
<tr>
<td>academic-Fit</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Substance Abuse-100% Unfit</td>
<td>Neurologic Condition-Epilepsy</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Use of Unacceptable Medication</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Penalty/High Court</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Outcome-Warning Letter</td>
<td></td>
</tr>
</tbody>
</table>
Collection of Data and challenges for In-flight Incapacitation

Challenges In-Flight Medical Reporting

- Obtaining such data
- Fear adverse repercussions
- Paperwork regarding such an event may be onerous
- Confidentiality issues may be a concern
- The initial report will almost always be made by crew members with little or no medical training
- This can hinder subsequent analysis
- A minor event may not be obvious to the passengers or cabin crew and there may be a temptation not to report it if only the flight crew are aware of the event.
Conclusion

CAA Concerns

- Failure to disclose medical information that may impact safety
- Reporting of Non-Compliance & Incapacitation by Industry is encouraged.
- Conflict of interest-CAA/IAM & DAMEs
- Oversight of DAMEs & Medical Tourism
- Delay tactics suspected case of substance abuse & alcohol
- Inconsistent Psychiatric Reports (BMD)

- Threat of litigation - May hinder decision-making.
- Psychological Tests - lack of validation regarding local population.
- Laboratories - limited Chain of Custody
- IT - Address delay in the processes of medical certification
- Research
Conclusion (cont.)

- Operational / Labour Issues / Training vs. Medical Diagnosis
- Psychological Testing
- Limited knowledge of certain operational environments (ATC)
- Cultural-bound syndrome
- Define acceptable medical risk
- Evolving and learning
- Minimize the threat of litigation

- Decisions are taken following close examination and assessment of all the medical facts, their relationship to occupational demands and personal performance.
Thank you

"That's all folks!"