Medical Aspects of Safety Critical Work
AFOEM Trainee Meeting – Auckland 5th May 2019
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The usual disclosure

None the views expressed are those of, or likely to be supported by, the organisations I work for currently, or in the past.
What is our usual approach?

1) Safety critical work is identified following critical risk assessment by the organization or regulator specific to your industry or workplace.

2) Medical/health assessment at entry into the workplace/industry, and a periodic basis usually involving various combinations of the following:
   - Questionnaire;
   - Biometric measures – BP, height, weight, BMI;
   - Special senses - Vision testing, audiology;
   - Spirometry;
   - Skin check;
   - Musculoskeletal assessment;
   - Shiftwork assessment;
   - Mental health assessment;
   - AOD testing.
What is our usual approach?

3) Health risk assessment for fitness for role with any relevant recommended restrictions or accommodations using medical standards;

4) Fitness for work certification or notification.
Safety Critical Worker

• is one whose job function is directly related in some way to the safety of others, or who could seriously impact the safety of others by not performing the job correctly.

• is one where sudden or subtle incapacitation of that individual may compromise their ability to undertake a task defined as essential to safety, thereby posing a significant risk to the health and safety of themselves and others

How about Decision Critical Workers?

- Those workers whose occupational performance depends upon the ability to consistently exercise judgement and insight.

- Where impaired performance leads to adverse workplace consequences may arise from low grade impairment as well as a single event, or error, with serious consequences that may not be immediately apparent.

- What is their “orbit of harm”?

“Trump’s like an alcoholic who fires his doctor and starts getting medical advice from his bartender.”

Seth Meyers
How safe is safe?

Aviation operational acceptable risk for fatal aircraft accident:
- 1 in 10-5 flying hours in private recreational flying
- 1 in 10-7 flying hours in commercial operations
- 1 in 10-9 flying hours for multi-engined aircraft airline operations.

Link to medical standards via the 1% “Rule”
- 1 in 10-10 flying hours an acceptable risk of an acute medical incapacitation event leading to a fatal aircraft accident
- Presence of a Co-pilot reduces risk of fatal event by 10-4
- Thus an acceptable level of risk is 1% per year
- About the CVS risk of an average Caucasian male 60-65 yrs old

What are the operational risks of medical conditions?

Reviews of inflight medical incapacitation and impairment of airline pilots reveals that the leading causes are:

- acute gastroenteritis
- myocardial infarctions,
- cardiac arrhythmias
- epileptic seizures
- loss of consciousness

BUT........................


But do these medical events contribute to or cause fatal accidents?
## Medical cause fatal accidents 1980-2000
### Global, 2-pilot aircraft, over 5700 kg

<table>
<thead>
<tr>
<th>Year</th>
<th>Aircraft</th>
<th>Medical problem</th>
<th>Confidence</th>
</tr>
</thead>
<tbody>
<tr>
<td>1982</td>
<td>DC 8</td>
<td>Schizophrenia *</td>
<td>High</td>
</tr>
<tr>
<td>1982</td>
<td>Citation</td>
<td>Alcoholic impairment *</td>
<td>High</td>
</tr>
<tr>
<td>1982</td>
<td>Metro</td>
<td>Vomiting (P2)</td>
<td>High</td>
</tr>
<tr>
<td>1983</td>
<td>Learjet</td>
<td>Use of marijuana (P1 &amp; P2)*</td>
<td>High</td>
</tr>
<tr>
<td>1988</td>
<td>Metro</td>
<td>Use of cocaine</td>
<td>High</td>
</tr>
<tr>
<td>1989</td>
<td>FH 227</td>
<td>Alcohol (P2)</td>
<td>High</td>
</tr>
<tr>
<td>1990</td>
<td>Learjet</td>
<td>Slurred speech, ? cause *</td>
<td>Medium</td>
</tr>
<tr>
<td>1993</td>
<td>Learjet</td>
<td>Alcohol/cocaine (P1)</td>
<td>High (private)</td>
</tr>
<tr>
<td>1994</td>
<td>ATR 42</td>
<td>Suicide *</td>
<td>Low</td>
</tr>
<tr>
<td>1999</td>
<td>An 26</td>
<td>Alcohol (P1 &amp; P2) *</td>
<td>Medium</td>
</tr>
</tbody>
</table>

* Primary Cause
(Excluding hypoxia, fumes, fatigue)
Other incidents/accident

- 2001: Galaxy Air Cargo, DC3 – [Fatalities x 2] Night VFR collision with volcanic mountain. Capt – cocaine, FO two antidepressant drugs
- 2012: JetBlue, A320 – Captain “things just don’t matter”, “we’re not going to Vegas”, began “a sermon”. FO locked the captain our of the flight deck and diverted safely into Amarillo
- 2015: Condor, A320 – Diverted safely to Faro. Copilot subsequently “exhibited behaviour ...that raised psychiatric concerns”
FAA 2018...2013 -2016 study
What jumps out?

- In the last 35 years of airline passenger and cargo operations there have been twelve psychological/mental health/AOD related incapacitation events leading to a fatal accident or a diversion.
- This pattern is consistent with the 2018 FAA report.
- Very few accidents have arisen from physical incapacitation.
- In airline operations mental/AOD related incapacitation pose greater risks to flight safety than physical incapacitation.
- For these events a second pilot of the flight deck does not prevent fatal accidents, especially for pilot intended crashes.
What does this evidence show?

How appropriate are our medical assessments?

Are our routine health assessments focusing on the critical risks?
Can our current systems detect the variable, the hidden, and the currently unpredictable?
Are we focusing on things we are familiar with but don’t have a significant impact on the critical risks?

Now for the truly depressing…..
How effective is our current system?

This report compared the known GA FAA pilot medical certification records of pilots in fatal aircraft accidents with medications found in post mortem specimens.

The study involved toxicological evaluations on 4143 pilots between 1 Jan 1993 to 31 Dec 2003.
What did this study find?

<table>
<thead>
<tr>
<th>Medical Condition</th>
<th>Pilots With Medications</th>
<th>Medical Conditions Reported by Pilots</th>
<th>Medications Reported by Pilots</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cardiovascular</td>
<td>149</td>
<td>69</td>
<td>29</td>
</tr>
<tr>
<td>Neurologic</td>
<td>15</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Psychological</td>
<td>223</td>
<td>14</td>
<td>1</td>
</tr>
<tr>
<td>Total</td>
<td>387</td>
<td>84</td>
<td>30</td>
</tr>
</tbody>
</table>

Note: Table reflects specific medications and conditions of interest from 4143 individual samples.
How effective is our current system?

Most significant pilot health conditions occurred between normal routine CAA medical renewals.
Guess what?

Unintended consequences...
Employees lie to us......

Our conundrum....

“Reports that say that something hasn't happened are always interesting to me, because as we know, there are known knowns; there are things we know we know. We also know there are known unknowns; that is to say we know there are some things we do not know.”
How do we influence safety?

- FAA has a Limits of Agreement (LOA) that the expected pilot fatality rate is 1 pilot per 2000 medicals.

- 3.5% (254) of AMEs had high fatality rates and 1.6% (120) had low fatality rates relative to the 95% of AMEs whose rates were within the LOA.

- 1 AME had 25 fatalities.

- The 3.5% of AMEs with the higher fatality rates had three times as many fatalities as the 95% of AMEs within the agreed LOA and 7 times the fatality rate as the low rate AME group.

- This small group of AMEs accounted for 37.7% (1077 fatalities). The expected LOA fatality rate would have been 387 fatalities over the 10 year period.

- But there was no direct correlation between the number of fatalities and the number of examinations performed by AMEs.
Emerging challenges
Insulin treated diabetes...
Emerging challenges

Biotechnology
So what is our role going to be?

Still need for health risk assessment
- Awareness of limitations of current systems
- Should be more targeted? eg risk and age specific
- Meeting the challenges of mental health, AOD, lifestyle, life events and human factors of employees
- Support cultures that foster disclosure

Need to expand our role
- Integrated into safety management systems
- Human factors, FRMS, AOD, Mental health awareness
- Connected into peer network systems
- Part of multilayered defenses in our SMS