Acceptable Aeromedical Risk for Pilots

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Plan

- Acceptable medical risk to flight safety
- Professional (public transport) pilots
- “1% rule”
- Conclusions

Medical standards

- What is an acceptable incapacitation risk for different tasks?

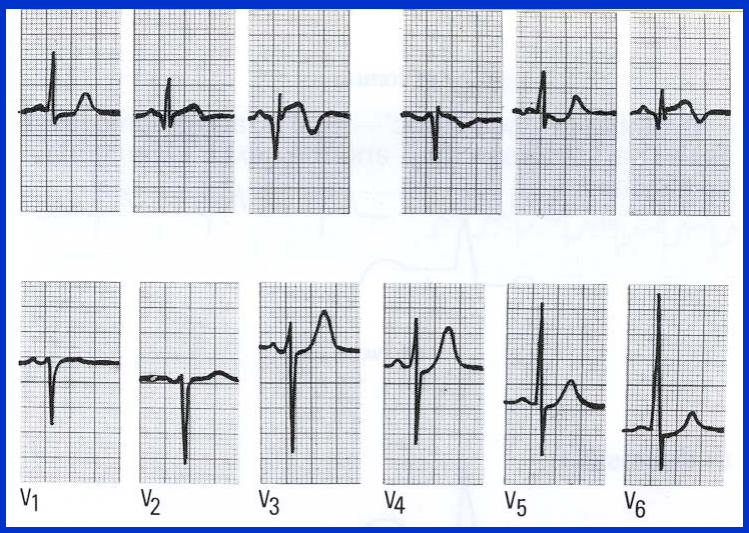
Acceptable operational risk

- What is it?

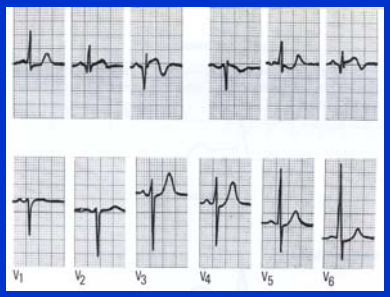
‘Flying does not have to be safe - Just safe enough’

John Chaplin
Past director
UK CAA Safety Regulation Group

Inferior MI



Assessment



- Investigations
- Acceptable Risk?
  - No certificate
  - ?Professional
  - ?Single pilot/multi-pilot
  - ?Private

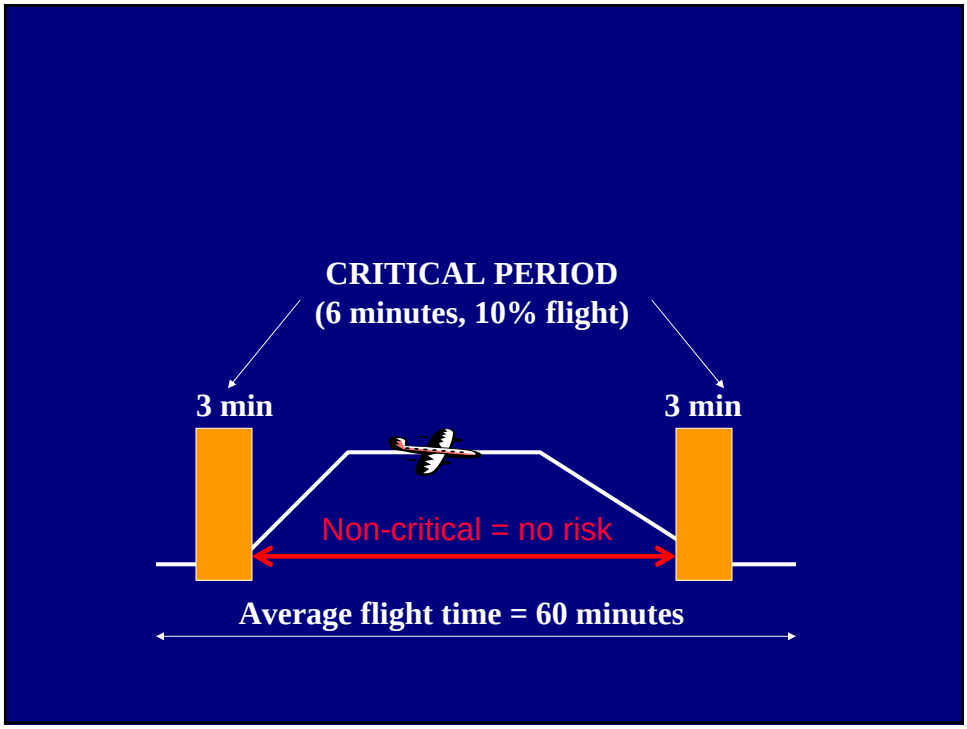
What is an acceptable in-flight incapacitation risk?

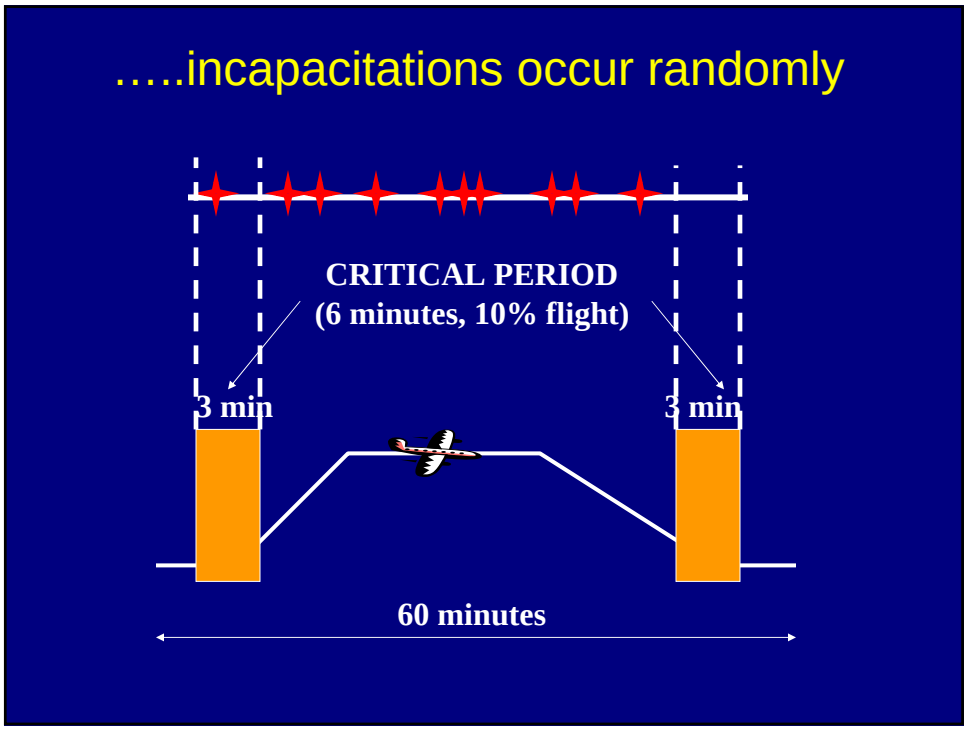
- Assessment procedure developed for cardiac disease
- Early 1980s
- Applies to any potentially suddenly incapacitating illness
- Called “1% Rule”

Assumptions

Further assumptions…..

- Only flight close to the ground ("critical period") poses any safety risk
- Incapacitation outside critical period poses no safety risk


CRITICAL PERIOD
(6 minutes, 10% flight)
3 min
3 min
Non-critical = no risk
Average flight time = 60 minutes


…..incapacitations occur randomly
CRITICAL PERIOD
(6 minutes, 10% flight)
3 min
3 min
60 minutes

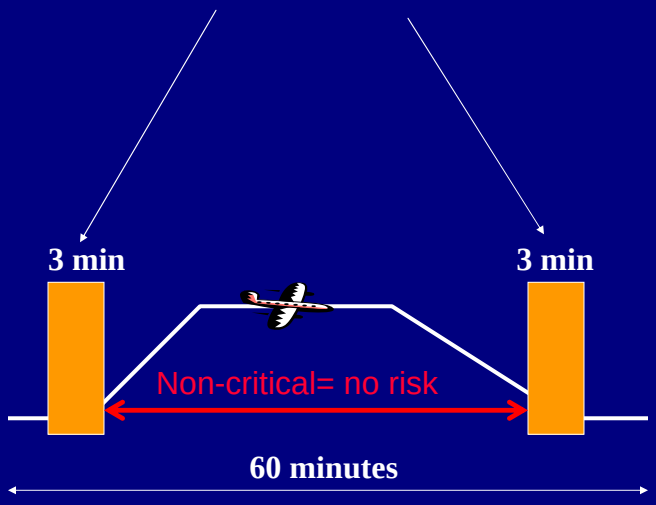
Risk during “critical period”

- How often will the second pilot fail to take over safely?

Simulator incapacitation study
(Chapman 1984)

- 1 in 400 incapacitations in critical period -> ‘crash’
- ‘Real world’ risk is greater - assume risk of 1 in 100

1 in every 100 incapacitations in the critical period causes a crash
and
1 in every 1000 in-flight incapacitations result in a crash



So, on average …..

- 1 in 10 in-flight incapacitations pose a safety risk (9/10 pose no risk)
- 1 in 100 ‘critical period’ incapacitations cause a crash
- Second pilot reduces risk to
  1/10 X 1/100 = 1/1000
  of single pilot risk

Putting it another way…

- In a two pilot aircraft, expect, on average:
  - 1,000 in-flight incapacitations before a crash (fatal accident) occurs

What do the figures mean?

$10 = 10^1$

$1{,}000 = 10^3$

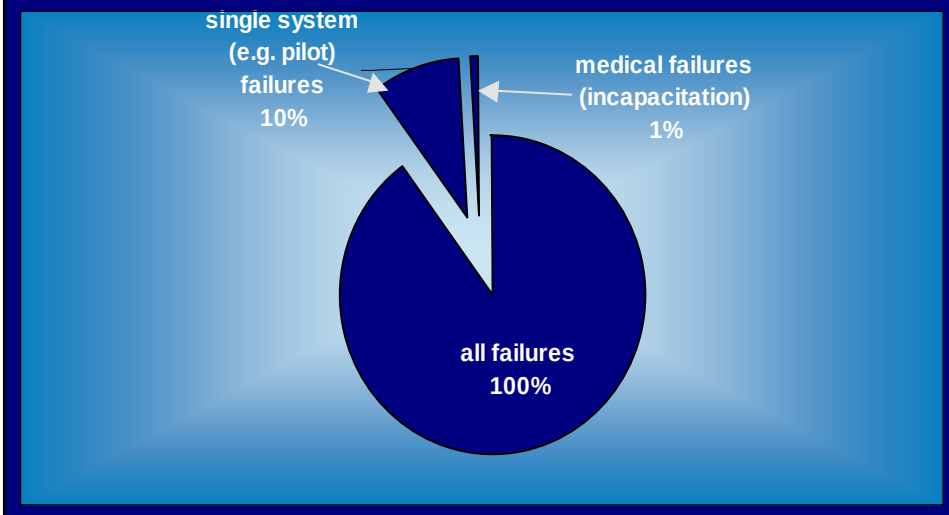
$1{,}000{,}000 = 10^6$

$1{,}000{,}000{,}000 = 10^9$

Acceptable risk per year

- What is the acceptable incapacitation risk per year for a professional pilot?
- Compare aeromedical risk with other flight safety risks

Target acceptable risks



What is an acceptable target medical cause fatal accident rate?

- Target *all cause* fatal accident rate = 1 in 10^7 flying hours (not greater than)
- Target *single system* (weather, engine, hydraulics, pilots etc.) contribution to risk = 1 FA in 10^8 flying hours
  - Most pilot related risk due to error
- Target *medical* contribution to risk = 1 FA in 10^9 flying hours

For 2-pilot operations

- Target medical cause fatal accident rate = 1 in 10^9 (1,000 m) hours
- Acceptable in-flight incapacitation rate for an individual pilot is 1,000X greater than 1 in 10^9 hours
- = 1 in 10^6 hours

Acceptable in-flight incapacitation rate = 1 in 10^6 hours

- 1 in 10^6 hours = 1 in 1,000,000
- = 100% in 1,000,000 hours
- = 1% in 10,000 hours
- = approx 1% in 1 year (8,760 hours per year)
- = 1% in 1 year = 1% 'Rule'

The "1% Rule"

"If a professional pilot has an in-flight incapacitation risk greater than 1% per annum he is unfit for professional flying"

Advantages of objective risk target

- Reduces influence of ‘eminent opinion’
- Enables doctors not familiar with aviation risks to assist in medical assessment
- Improves consistency of decision-making
  - Within and across specialities, over time
- Accepted by unions

Disadvantages

- Many diseases not amenable to numerical analysis
  - Especially psychiatry
- Judgement still necessary in many cases

Conclusions

- Objective decision-making is desirable
- Despite its limitations the “1% Rule” has been found to be a useful aid to objective aeromedical decision-making

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