Risk Matrices

Not just pretty colors!
Introduction

- Ben Luther, Flight Test Safety Manager, Gulfstream
- Rules of engagement
Objective

- Appreciation
  - Risk Matrix as a tool
  - Complexity

- Tools
  - Better risk assessments
  - Mitigate not administrate
Positives

- Communication
  - Normative
  - Easily documented

- Simple
  - Conceptually (!!) simple
  - Convenient
Issues

• Exposure
... the Math

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$\pm = \pm$$
... the Math

Assumptions to simplify:

\[ R = \sum_{n} (C_i \times P_i \times E_i) \]

\[ R = C \times P \]
Risk Formula

• *Real* risk formula

\[ \text{Risk} = \sum_n (C_i \times P_i \times E_i) \]

- \( C_i \): consequence
- \( P_i \): probability
- \( E_i \): exposure

• But ... assumptions
  - Exposure is constant
  - \( P \) is tiny for all but one

• True for flight test ??
Exposure
Issues

• Exposure

• Ambiguity
  – Negative correlation
Negative Correlation

![Diagram showing positive and negative correlation with axes labeled probability, consequence, possible, and rare. The diagram illustrates how positive correlation moves from minor to major consequences as probability increases, while negative correlation moves from possible to rare as probability decreases.](Image)
Negative Correlation

Possible

Probable

Rare

Consequence

Minor

Major
Negative Correlation

Wildlife Hazard

Possible Rare

Consequence

Major Minor

Probability
Issues

- False resolution
- Iso-risk lines and scales (linear or logarithmic)
- Continuity and consistency

Colors

- Negative correlation

Ambiguity

Exposure
Colors

False resolution

![Matrix](image)
Iso-Risk Lines

Lines of equal risk

LINEAR SCALES

LOG SCALES
Colors

Discontinuous
Colors

- Un-justifiable
  - False resolution
  - Discontinuous

- Log scales are OK
Colors

- Much better
  - Justifiable resolution
  - Continuous function
  - Log scale apparent
Issues

- Exposure

- Ambiguity
  - Negative correlation

- Colors
  - Continuity and consistency
  - Iso-risk lines and scales (linear or logarithmic)
  - False resolution
Real Life

• Resource allocation

• Psychological risk attitude

\[ Q_i = 0 \]

or

\[ Q_i = \text{huge} \]
Conclusions

- Analysis tool
- Communication tool
- Underlying science / mathematics
- GIGO
- The matrix is NOT mitigation
- GIGO
- Communication tool
- Analysis tool

Conclusions
Questions

That concludes my two-hour presentation. Any questions?

Did you intend the presentation to be incomprehensible, or do you have some sort of rare “PowerPoint” disability?

Are there any questions about the content?

There was content.

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References


