A critical incident in the cockpit: Analysis of a critical incident interview using the Leximancer™ tool

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Perceptual Cycle Model and Human Error
- The Perceptual Cycle Model (PCM) presents the view that human thought is closely coupled with a person's interaction in the world;
- A reciprocal, cyclical relationship between person and environment is presented;
- Knowledge (SCHEMA) leads to the anticipation of information;
- This directs behaviour (ACTION) to seek certain types of information and allows information to be interpreted;
- Environmental experience (WORLD) can modify and update cognitive schema.

Method
- Single case study design
- Critical Decision Method (CDM): knowledge elicitation tool uses cognitive probes to understand expert decision making in non-routine situations
- Leximancer™: Software tool for performing rapid conceptual analysis of qualitative textual data

Critical incident: During a SAR winching exercise, all 4 display screens went blank when a waypoint was entered into the nav.system. Fault diagnosis involved looking for popped circuit breakers, checking the flight reference cards and assessing whether the electrical power and generators were functioning. Decision made to return to base.

Results: Manual Analysis
- Data transcribed and coded into the categories of the PCM
- Schema: “…can pretty much guarantee one on most flights… the expectation is that there will be some sort of glitch”
- Action: “…entered destination into the navigation system”
- World: “…the screens went blank…”
- Inter-rater reliability calculated for 32 segments of text, 86% agreement between two coders and criterion coder

Results: Leximancer™ Analysis
- Concepts:
  - Collection of words that ‘travel together’ throughout the text
  - Weighted according to their frequency, assigned a percentage relevance value
  - 22 concepts generated (top 10 shown below)

- Themes:
  - Groupings of concepts, increase analysis from individual items to broader, highly connected clusters
  - Assigned a percentage relevance value
  - 10 key themes

Results: Leximancer™ vs. traditional analysis
- Manual analysis: 22 concepts generated (top 10 shown below)
- Leximancer analysis: 22 concepts generated (top 10 shown below)

Conclusions
- In the manual analysis all data were coded against the PCM
- CDM appears to elicit information that can be analysed in terms of the PCM and Schema Theory
- Schema appear to be influential during decision making in critical incidents in the cockpit
- Many overlaps between manual and Leximancer analysis, suggesting schema are utilised when making decisions in the cockpit and CDM is a suitable approach to analyse CDM data
- Further data collection required to validate claims made here