Tools for Safety Management: Considerations for the Design of Occurrence Data

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ACCIDENT INVESTIGATION

Traditional Approach
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- Attached blame for failure to assess risks
- Accident reports depicted:
  - WHAT?
  - WHEN?
  - WHO?
  - WHY?
  - HOW?
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- Attached blame for failure to assess risks
- Accident reports depicted:
  - WHAT?
  - WHEN?
  - WHO?

- Accident reports seldom depicted:
  - WHY?
  - HOW?
ACCIDENT INVESTIGATION

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- Attached blame for failure to assess risks
- Accident reports depicted:

  WHAT?  WHEN?  WHO?

- Accident reports seldom depicted:

  WHY?  HOW?

Applied to data collection as well
TSB APPROACH

- Advance Safety through the identification and validation of Safety Deficiencies that are found through the investigation process
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- Focus is on Why and How
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  - the transportation industry
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Changes to database
Why Collect?

Macro Analysis

Occurrence Assessment
Why Collect?

- Macro Analysis
- Occurrence Assessment
Why Collect?

Macro Analysis

Occurrence Assessment
Source of Data

Macro Analysis

By Regulation

Occurrence Assessment
Source of Data

- Macro Analysis
- By Regulation
- Occurrence Assessment
Source of Data

Macro Analysis

By Regulation

Occurrence Assessment

Investigation
Source of Data

Macro Analysis

By Regulation

Occurrence Assessment

Investigation
Source of Data

- Macro Analysis
- By Regulation
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Investigation
Why Collect?
Why Collect?

- data are required to assess problem size and characteristics, to establish trends, and to decide between and evaluate risk control options.
Why Collect?

- data are required to assess problem size and characteristics, to establish trends, and to decide between and evaluate risk control options.
- a reporting system can provide a bank of data sufficient to establish broad accident categories and provide detailed information on accident causation.
Why Collect?
Why Collect?

- Occurrence most often have happened before
Why Collect?

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- Occurrence most often have happened before
  - Herald of Free Enterprise
Why Collect?

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  - L1011 O-Rings - 11 in past 2 years
Why Collect?

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  - Herald of Free Enterprise
  - L1011 O-Rings - 11 in past 2 years
  - Three Mile Island
What to Collect
What to Collect

“... Data held for any purpose or purposes shall be adequate, relevant and not excessive in relation to that purpose or those purposes.”

Data Protection Act, United Kingdom
VOLTAIRE
VOLTAIRE

“There are no such things as accidents.”
“There are no such things as accidents. What we call by that name is the effect of some cause which we do not see.”
Definitions
Definitions

- Restrictive definitions of reportable occurrences have a profound impact on our work.
Definitions

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- All definitions are of necessity restrictive:
  - simple expediency
  - expressions of limited professional interest
Accident causation is layered like an onion:

- Individual performance
- Crew performance
- Design & Operating Standards
- Supervision and training
- Company safety management
- Regulatory compliance
Accident causation is layered like an onion……..

Each layer represents a set of safety conditions.

- Individual performance
- Crew performance
- Design & Operating Standards
- Supervision and training
- Company safety management
- Regulatory compliance
Occurrence
Initial Assessment
Data Collection

Investigation Methodology

Investigate

Inadequate Defence
Unsafe Act
Preconditions
L.M Deficiencies
Fallible Decisions

Occurrence
Investigation Methodology

Occurrence

Initial Assessment

Data Collection

Occurrence Events

Events & Factors Analysis

Integrated Investigation Process

Investigate

DC = Decision Criteria

Unsafe Condition

Unintentional Action

Intentional Action

Adaptation

Basic Error Types

Slip

Lapse

Mistake

Rule-based & Knowledge-based Mistakes

Knowledge-based Adaptations Routine & Exceptional

Bias

Heuristics

Inattention Overattention

Misapplication of Good Rules Application of Bad Rules

Skill-based Attention & Memory Failures

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DC = Decision Criteria
Integrated Investigation Process

Unsafe Condition -> Unsafe Condition Analysis

- Basic Error Types
  - Slip
  - Lapse
  - Mistake
  - Adaptation

- Skill-based Attention & Memory Failures
- Rule-based & Knowledge-based Mistakes
- Knowledge-based Adaptations Routine & Exceptional
- Biases Heuristics
- Inattention Overattention
- Misapplication of Good Rules Application of Bad Rules

Unsafe Act/Decision

- Unintentional Action
- Intentional Action

Event

DC = Decision Criteria
Integrated Investigation Process

Event -> DC

Unsafe Condition

Unsafe Condition Analysis

Basic Error Types

- Slip
- Lapse
- Mistake

Intentional Action

Unintentional Action

Mistake & Knowledge-based Mistakes

Rule-based & Knowledge-based Mistakes

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DC = Decision Criteria
Integrated Investigation Process

- Event
- Unsafe Condition
- Unsafe Condition Analysis
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  - Mistake
  - Adaptation
- Skill-based Attention & Memory Failures
- Rule-based & Knowledge-based Mistakes
- Misapplication of Good Rules Application of Bad Rules
- Inattention Overattention
- Biases Heuristics
- Unsafe Conditions/Underlying Factors
- DC = Decision Criteria
Integrated Investigation Process

Event -> DC

Unsafe Condition

Unsafe Act/Decision

Intentional Action

Unintentional Action

Basic Error Types

Slip -> Skill-based Attention & Memory Failures

Lapse

Mistake -> Rule-based & Knowledge-based Mistakes

Mistake

Adaptation

Knowledge-based Adaptations Routine & Exceptional

Knowledge-based Adapations

Biases

Heuristics

DC = Decision Criteria

Unsafe Conditions/Underlying Factors

Inattention Overattention

Misapplication of Good Rules Application of Bad Rules
Need for Taxonomy
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- Should be founded in science - have construct validity, not just face validity
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- Should be able to give insight into accident causation
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- Need for taxonomies for error and underlying factors
Accident Prevention Process

Identify Unsafe Cond’ns

Monitor Progress

Take Action

Risk Communication

Assess Risk

Control Options
Accident Prevention Process

1. Identify Unsafe Conditions
2. Monitor Progress
3. Take Action
4. Assess Risk
5. Control Options
6. Risk Communication
Results?

Maybe?
Results?

Our commitment to improving aviation safety data through human factors initiatives will pay a safety dividend?
“... it is impossible, while designing a database, to anticipate every type of data analysis that might be required in the future, (therefore) it is to be anticipated that any database will be lacking with respect to its ability to support macro analysis projects. The implication of this is that for most macro analysis projects, it should be anticipated that some data collection will be required.”
- data quality issues
- currency of data
- etc., etc., ....
“Out of this nettle, danger, we pluck this flower, safety.”

William Shakespeare