Main points

• The Reason model:
  – is a useful model to assist investigation analysis
  – is only one component of the analysis process
  – can be improved to be more useful
Investigation methodology

- lot of expertise
- few written guidelines, particularly for analysis stage
- variation in approaches
- investigation environment is changing
- ATSB is developing Safety Investigation Guidelines (SIGs) for each stage and each major task of investigation process
Investigation analysis

• converting data to conclusions about:
  – contributing factors
  – safety issues
• few written guidelines
• relies on expert judgement
• involves many components
Components of analysis process

• clear definitions of key terms (e.g. ‘contributing factor’, ‘safety issue’)
• general guidelines on inductive reasoning
• structured process for:
  – reviewing data
  – identifying possible factors
  – testing existence, influence
  – evaluating practicability, suitability
Reason model
Reason model

- model of accident development
- emphasises a system approach
- many different versions, many different uses
- focuses on human factors
- represents some of the dynamics of accident development
- helps identify and organise factors/issues during analysis
Towards an ATSB model

• recognise ‘defences’ now much broader
• distinguish between management processes and management outputs
• modify definitions of components to make classification easier
• include technical failures
• minimise some terminology problems (e.g. ‘failure’ when referring to behaviour)
ATSB draft analysis model

- Organisational conditions
  - Preventative defences
  - Local conditions
  - Operational events
  - Recovery defences
Operational events

• observable actions of people, vehicles, technical components

• when such events increase accident risk, they are termed:
  – ‘unsafe acts’ (if associated with personnel)
  – ‘technical failures’ (if associated with technical components)
Local conditions

• conditions associated with the immediate context or environment in which operational events occur

• if increase accident risk, can be termed ‘local hazards’ or ‘local threats’
Local conditions (for unsafe acts)

- lack of skills, knowledge, experience
- fatigue
- stress, workload
- medical condition
- motivation
- habits, norms
- distractions
- environmental conditions
- task design
- equipment design
Defences

• measures put in place by an organisation to facilitate and assure safe performance of the operational components

• cannot control the existence of many undesirable local conditions and operational events, but can manage their influence

• if increase accident risk, can be termed ‘safety deficiencies’
Defences

• Preventative defences
  – procedures, checklists
  – training, education
  – equipment design/availability
  – work schedules
  – performance monitoring, supervision

• Recovery defences
  – warnings, alarms
  – barriers, crash worthiness design
Organisational conditions

• conditions that establish, maintain or otherwise influence the effectiveness of an organisation’s safety defences

• if increase accident risk, can be termed ‘safety deficiencies’
ASASI 2003

Organisation

Safety Management Processes

Organisational Characteristics

Defences

External Influences
Organisational conditions

• Safety management processes:
  – hazard identification, risk assessment
  – change management
  – training needs analysis
  – personnel management
  – safety statistics analysis

• Organisational characteristics:
  – priorities and goals
  – management commitment
  – organisational structure
  – communication style
Stages / questions for analysis

• Describe sequence of events *(What happened?)*
• Assess operational events *(How did it go wrong?)*
• Assess local conditions *(Why did it go wrong?)*
• Assess defences *(What could the organisation have done to prevent these problems?)*
• Assess organisational conditions *(Why were these measures not in place?)*
• Assess safety issues *(What improvements are left to be made?)*
Case Example

Cessna 310R
VH-HCP
Newman WA
26 January 2001
Background information

- aircraft operated by Air Support Unit, WA police service (aerial work)
- police pilot flew Karratha to Newman
- 3 police officers boarded
- departed Newman (1419), with full fuel
- arrived Kiwirrkurra (1700), added some fuel from already opened drum to auxiliary tanks
- departed Kiwirrkurra (1930)
Background information

- dark night, VFR, storms in area
- arrived Newman circuit 2150
- engine problem downwind, loss of control
- impact 3 km east of aerodrome
- 165 litres useable fuel on board
- not survivable
Operational events

• pre-flight planning and preparation (unsafe act)
• management of fuel tank selections (unsafe act)
• not detecting critical fuel situation (unsafe act)
• engines failed due to fuel starvation (technical failure)
• not maintaining control of the aircraft following engine failure (unsafe act)
Local conditions

- self-imposed pressure
- fuel management practices
- high workload
- dark night conditions
- skills to respond to engine failures without external visual reference
- physiological condition
Operational Events

- Pre-flight planning
- Fuel tank selections
- Monitoring fuel tanks
- Fuel starvation
- Maintaining control

Local Conditions

- Self-imposed pressure
- Fuel management practices
- Workload
- Dark night
- Skills for engine failure at night
Operator defences

- fuel planning procedures, training, supervision (preventative)
- night operations procedures, training and supervision (preventative, recovery)
- chief pilot training and preparation (preventative)
- role of police pilots
- human factors guidance/education
Operator organisational conditions

• ASU safety management program
• WA police guidance on safety management
• WA police processes for identifying safety issues
Defences associated with CASA activities

- regulatory and advisory information on VFR in dark night environments
- chief pilot approval processes
- surveillance
- check and training pilot approval process
- potential conflict of interest issues
- classification of operations for corporate operations
## Defences

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<th>Organisational Conditions</th>
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<td>Fuel planning defences</td>
<td>Safety management program</td>
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<td>Night operations defences</td>
<td>Guidance for safety management</td>
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<td>Chief pilot preparation</td>
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<td>Regs and advice on night VFR</td>
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