Reasoning with the Reason Model

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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

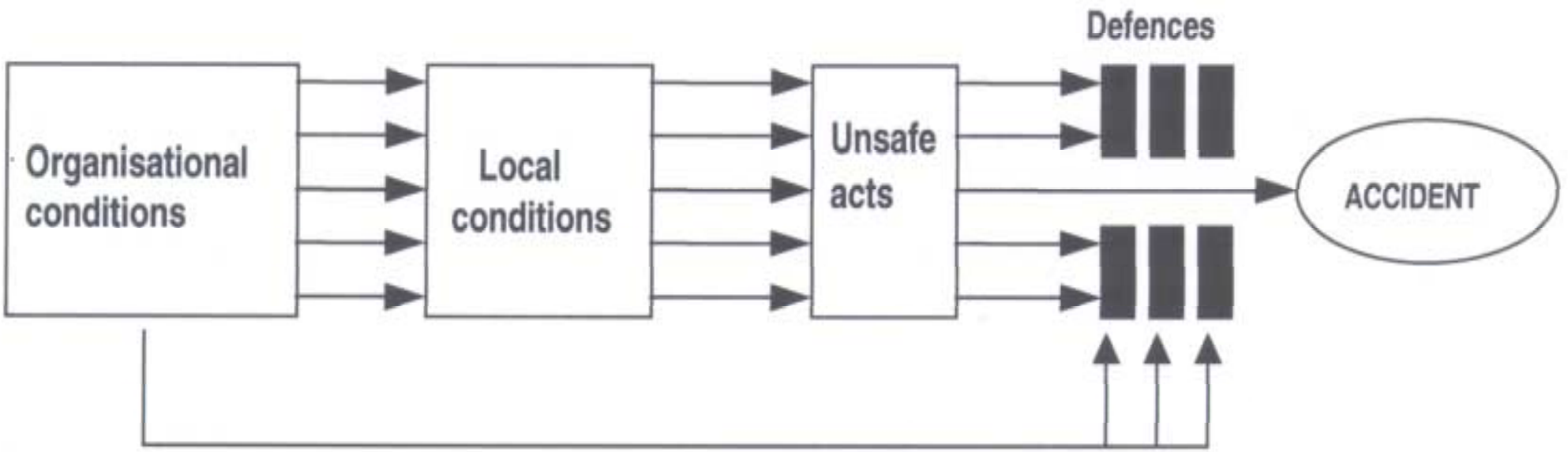
Investigation analysis

- 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



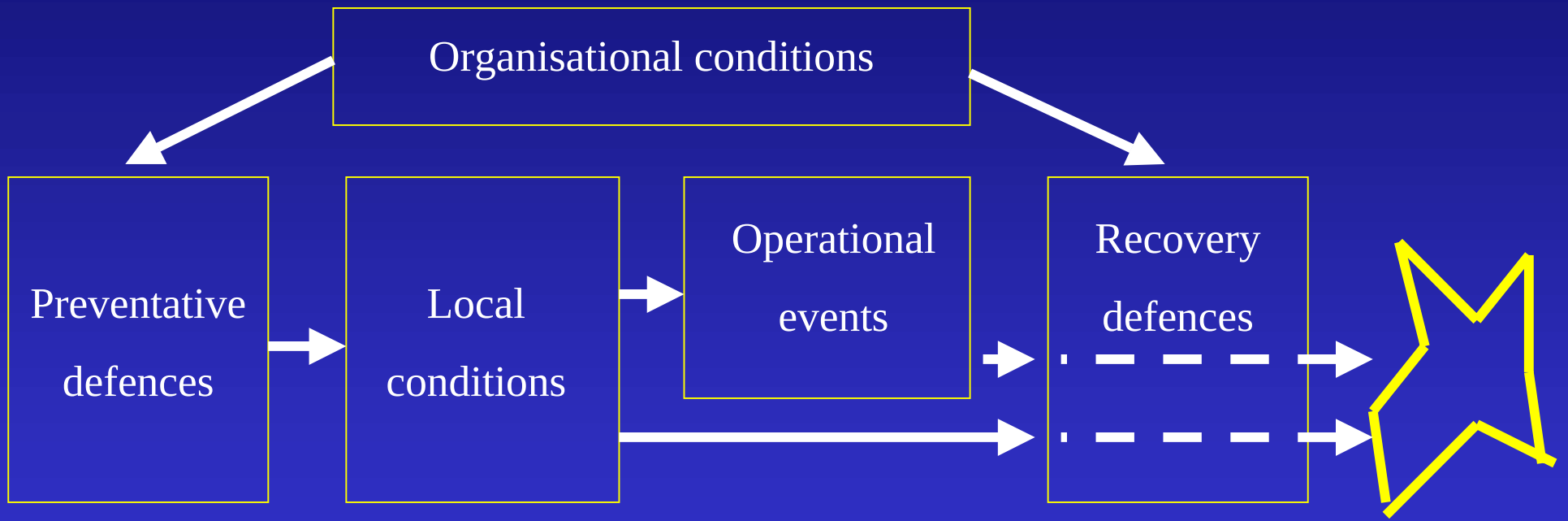
Reason model

- 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



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

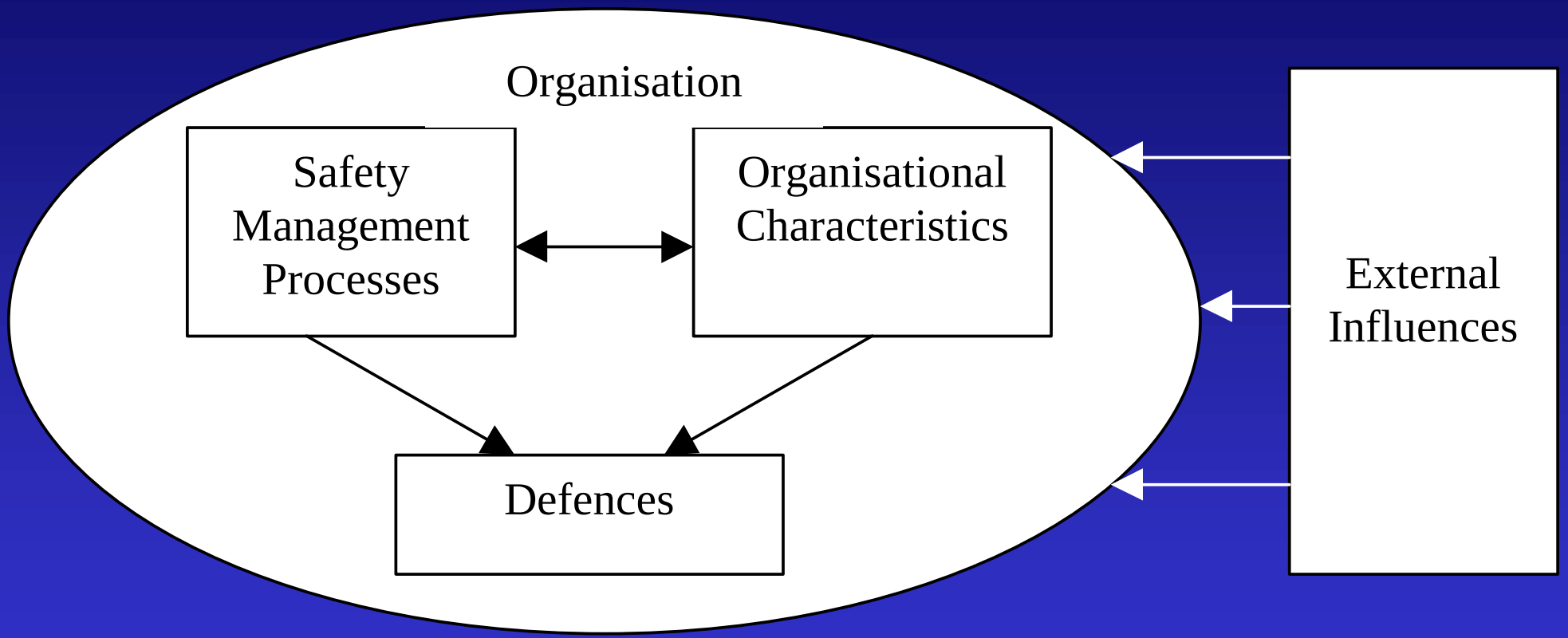
- measures put in place by an organisation to facilitate and assure safe performance of the operational components
- cannot control the existence of many undesirable local conditions and operational events, but can manage their influence
- if increase accident risk, can be termed ‘safety deficiencies’

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'


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?)*

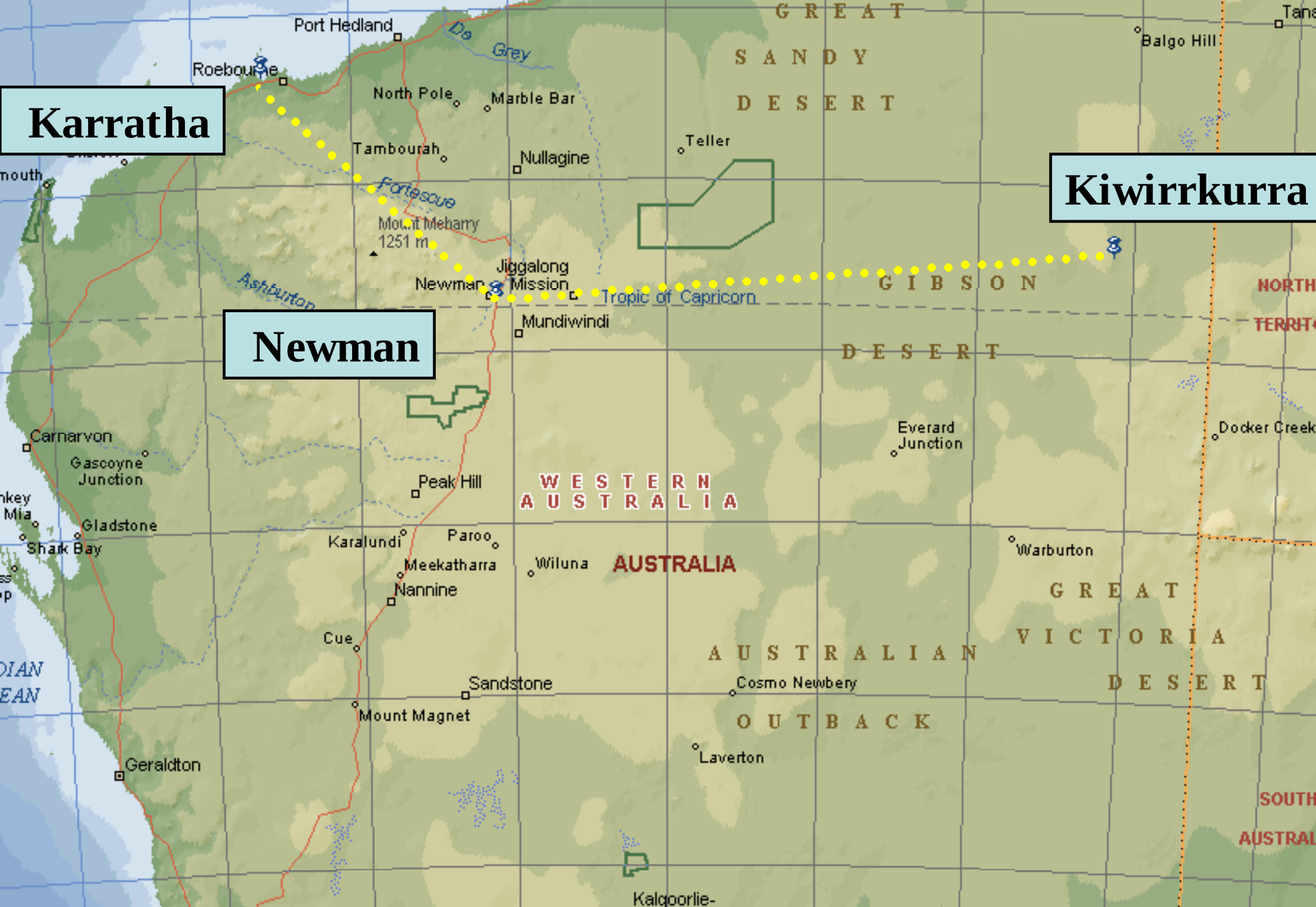
- Assess safety issues *(What improvements are left to be made?)*

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)


Karratha
Kiwirrkurra
Newman
Port Hedland
De Grey
Roebourne
North Pole
Marble Bar
Balgo Hill
GREAT SANDY DESERT
Tambourah
Nullagine
Teller
Fortescue
Mount Meharry
1251 m
Jiggalong Mission
Newman
Ashburton
Tropic of Capricorn
GIBSON
Mundiwindi
DESERT
Carnarvon
Gascoyne Junction
Everard Junction
Peak Hill
WESTERN AUSTRALIA
Gladstone
Shark Bay
Karalundi
Paroo
Meekatharra
Wiluna
AUSTRALIA
Warburton
Nannine
GREAT VICTORIA
Cue
AUSTRALIAN
Sandstone
Cosmo Newbery
DESERT
Mount Magnet
OUTBACK
Laverton
Geraldton
Kalgoorlie-

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


VH-HCP

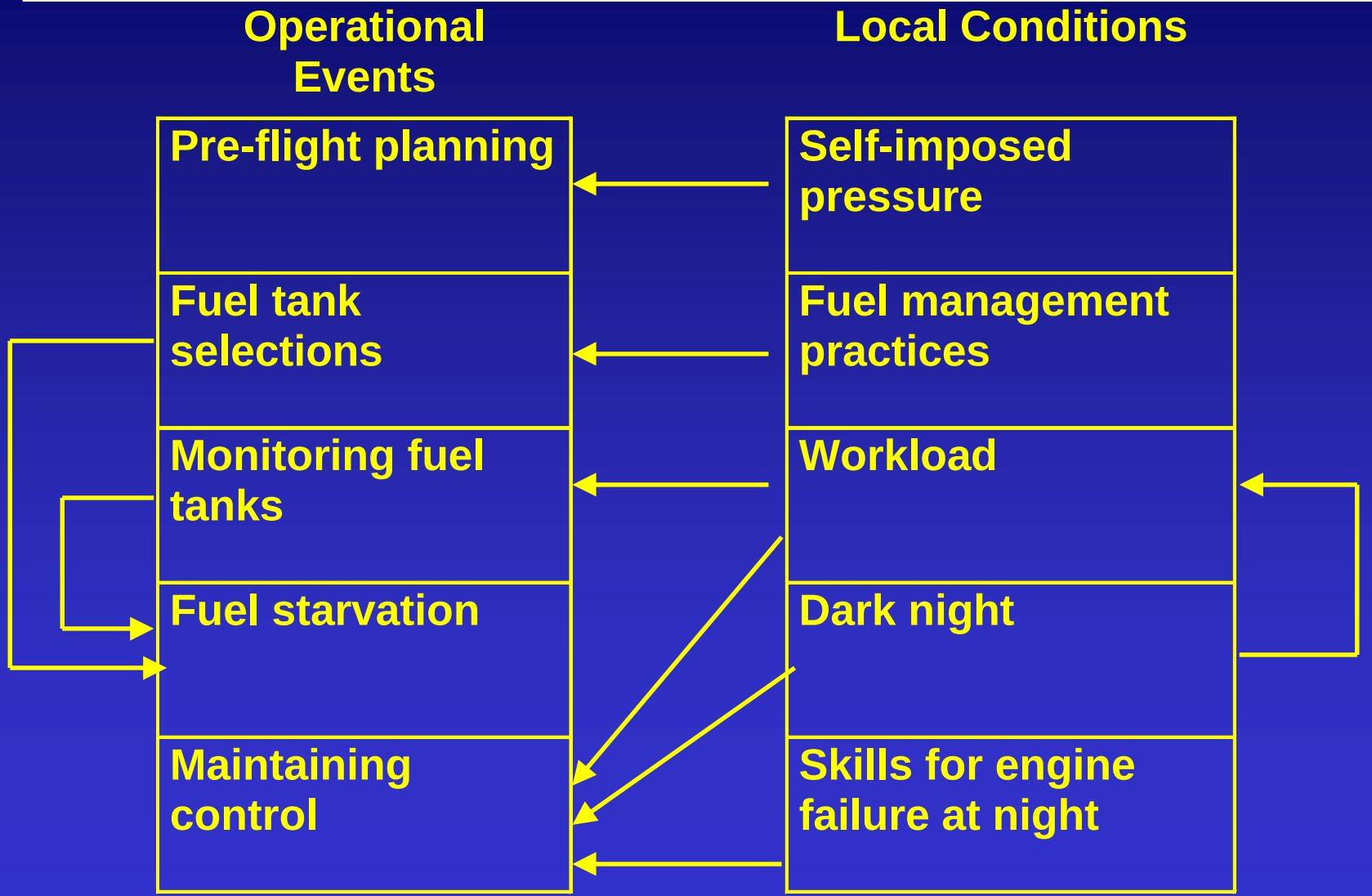
Operational events

- 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
Local Conditions
Pre-flight planning
Self-imposed pressure
Fuel tank selections
Fuel management practices
Monitoring fuel tanks
Workload
Fuel starvation
Dark night
Maintaining control
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
Organisational Conditions
Fuel planning defences
Night operations defences
Chief pilot preparation
Safety management program
Guidance for safety management
Processes to identify safety issues
Regs and advice on night VFR
Chief pilot approval processes
Surveillance

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