The ATSB perspective on Safety Management Systems in Australia

Kym Bills
Executive Director ATSB
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Overview

• Some context on transport fatalities
• Indicate how and why the ATSB seeks to prioritise limited investigation resources
• Outline some recent work with Indonesia
• An ATSB perspective on SMS in Australia
• Introduce the methodology used in larger investigations such as Lockhart River
• Transair re operator SMS issues/lessons
• Importance of threat and error management
• Conclude with some challenges
Multi-modal ATSB
ATSB

- Multi-modal body to investigate, analyse and report independently on aviation, interstate rail & major marine safety occurrences
- Transport safety investigations are not intended to be the means to apportion blame or liability, in accordance with the *Transport Safety Investigation Act 2003* (TSI Act) & Annex 13 to the Chicago Convention
- Powers to investigate, including to search and compel evidence even if incriminatory
- But reports/evidence can’t be used in courts with the exception of Coronal inquests.
• The ATSB is part of the Australian Government Department of Transport and Regional Services (DOTARS) for administrative and resourcing purposes.
• Separate from State bodies like Police and rail regulators, and federal bodies like the Civil Aviation Safety Authority (CASA) and Airservices Australia.
• Importantly, separate investigations by police, regulators and OHS bodies occur consistent with a ‘just culture’ (perhaps 10% of accidents via a form of culpable actions).
• Hence, the ATSB’s no-blame safety investigation is only one part of the system
• To reinforce independence, under the TSI Act S15, neither the Minister nor Secretary are to influence ATSB investigations
• ATSB mandatory occurrence reporting, voluntary confidential reporting and data analysis and research supplement both investigation & industry schemes, eg SMS
• Approx 115 ATSB staff, most in Canberra and three quarters aviation-related including notifications, administration etc - annual budget now almost $20 million.
Australian transport safety data

- The overall transport accident death rate across road, rail, marine and aviation decreased from 10.4 deaths per 100,000 population in 1997 to 8.3 in 2006:
Australian transport safety data

- As in other OECD countries, most fatalities are on roads—overall crash cost A$18b pa

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Aviation safety data

- Fatal LCRPT accidents in 2000 (Whyalla) & 2005 (Lockhart River) but most accidents/fatalities GA as shown:
Aviation safety data

• We continue to see many of the same types of fatal accident, eg:
  - controlled flight into terrain
  - weather (eg VFR into IFR conditions)
  - fuel exhaustion/starvation
  - hitting powerlines
  - high risk GA behaviour (eg low passes)

• In aviation & other modes human factors continue to dominate - management lack of awareness of human performance limits & org. structure importance remain issues
Some key ATSB references

ATS B website has:
• all ATSB investigation reports and an increasing number of key BASI reports
• aviation data updated monthly and weekly summaries of occurrences processed
• ATSB research reports for aviation: eg Digest of all ATSB research for 2006; HFACS comparison with US; initial *Australian Aviation Safety in Review*
• The ATSB *Annual Review 2007*
Investigation prioritisation

- In aviation we received over 13,000 event reports last FY of which almost 8,000 were classified as accidents (112) or incidents
- Resourced for 80 investigations (30 larger)
- Required under Chicago Convention to investigate international carrier accidents
- Annex 13 standard re all accidents and recommended practice re serious incidents
- Do non-sport fatals to assist Coroners but often most safety value in selected RPT incidents so very tough judgements/choices
Indonesian safety cooperation

• The ATSB has a longstanding relationship with Indonesian counterparts (NTSC) and had arranged last year a ATPL pilot placement to do our Investigation Diploma
• Garuda 7 March 2007 accident we assisted on site and with recorders - major report drafting assistance et al
• Ongoing cooperation re Adam Air 1/1/07 and marine investigations, plus training in investigation, HF etc
Garuda 737-400, Yogyakarta
Indonesian safety cooperation

• Final report into the Garuda accident was released by the National Transportation Safety Committee on 22 October 2007

• The report is thorough, comprehensive and timely and pulls no punches about the pilots, company, regulator, airport, and rescue and fire-fighting services

• Public release of this 1\textsuperscript{st} major report in years demonstrates commitment from the President, Minister & NTSC to air safety
Final Garuda Investigation Report released 22 October 2007

BOEING 737-497
PK-GZC
ADI SUCIPTO AIRPORT, YOGYAKARTA
INDONESIA
7 MARCH 2007

REPUBLIC OF INDONESIA
MINISTRY OF TRANSPORTATION
NATIONAL TRANSPORTATION SAFETY COMMITTEE

Australian Government
Australian Transport Safety Bureau
ATSB perspective re SMS

- The ATSB is naturally strongly supportive of robust safety management systems
- Prior to the ATSB’s formation, BASI (‘96, ‘97, ‘99) developed INDICATE basic SMS type guide for small operators (also a CD)
- CASA has since championed SMS and some of its material has been commended and used by ICAO, which is good for Aust.
- The 2006 ICAO Manual is a key document and was developed by Capt Dan Maurino
Safety Management Manual (SMM)

International Civil Aviation Organization

First Edition — 2005

Doc 9859
AN/460

ICAO Manual 2006

Australian Government
Australian Transport Safety Bureau
ICAO 2006 Manual

• “Safety is the state in which the risk of harm to persons or of property damage is reduced to, and maintained at or below, an acceptable level through a continuing process of hazard identification and risk management.”

• The Manual notes that ICAO differentiates between safety programmes and safety management systems (SMS) as follows:

• “A safety programme is an integrated set of regulations and activities aimed at improving safety.”
ICAO 2006 Manual

• “A safety management system is an organized approach to managing safety, including the necessary organizational structures, accountabilities, policies and procedures.”

• Annexes 6, 11 & 14 “require establishment of a safety programme to achieve an acceptable level of safety in aviation operations. The acceptable level of safety shall be established by the State(s) concerned. … [and] may include provisions for such diverse activities as incident reporting, safety investigations, safety audits and safety promotion. To implement such safety activities in an integrated manner requires a coherent SMS.”
• “Therefore, in accordance with the provisions of Annexes 6, 11 and 14, States shall require that individual operators, maintenance organizations, ATS providers and certified aerodrome operators implement SMS accepted by the State.

• As a minimum, such SMS shall: identify safety hazards; ensure that remedial actions necessary to mitigate the risks/hazards are implemented; and provide for continuous and regular assessment of the safety level achieved.

• An organization’s SMS accepted by the State shall also clearly define lines of safety accountability, including … senior management.”
ICAO 2006 Manual

- ICAO stresses ‘acceptable level of safety’ is the overarching concept and regulatory compliance has to be complemented by a performance-based approach [ie ‘both/and’]
- Further, an ‘acceptable level of safety’ can vary across industry sectors and should be set with regard to implied risk, cost-benefit of improvements, operational context and complexity, and public safety expectations
- This is not an easy or uncontroversial task!
ICAO 2006 Manual

- ICAO says an ‘acceptable level of safety’ is expressed via safety performance targets and safety performance indicators, and implemented through safety requirements.
- Many bodies share responsibility for safety and effective safety management - ICAO sees ‘considerable merit’ in a regulatory system with ‘a well-balanced allocation of responsibility’ between the regulator and the operator or service provider that is justifiable given the economic resources of the State - & risk-based regulatory resource allocation.
ICAO 2006 Manual

- Specialist independent accident & incident investigation authorities are important to avoid potential conflicts of interest [cf ATSB]

- A positive safety culture is crucial, including:
  - a senior management safety emphasis;
  - realistic view of ST and LT hazards;
  - fostering feedback & deal with safety deficiencies;
  - non-punitive ‘just culture’ (but punish if culpability);
  - communicating safety at all levels;
  - good training & learning;
  - safety ethic so little risk-taking behaviour;
  - human factors understood and defences in place;
  - pro-active data gathering, analysis & response.
ATSB perspective on SMS

• The ATSB’s primary perspective on SMS is as an independent, no-blame professional safety investigator

• In the context of an accident or a more serious incident, we may need to look at what type of Safety Management System was in place and how it was operating

• A further ATSB perspective derives from analysis based on mandatory reporting & any issues raised via REPCON reporting
ATSB perspective – J. Anca

- ATSB seeks key learnings from all modes
- Many Australian examples and argues
  - safety management and human factors foundations across modes are universal
  - emerging tools like monitoring of normal operations are interoperable in all modes [think LOSA, FOQA, TEM]
  - pre-eminence of data drivers, and
  - learning from ‘other mode’ important.
ATSB perspective – Anca (2007)

• Swinburne’s Dr Anca cites the example of a squirrel as an iconic representation of SMS because a squirrel is in constant motion, anxiously scanning the environment for threats and opportunities: “the essence to the mad anxiety is an incessant monitoring of what goes as expected (normal operations) and what doesn’t (deviations)”

• The picture is courtesy of Wikipedia:
ATSB perspective – A. Hopkins

- ANU Professor Hopkins’s latest book *Safety, Culture and Risk* (CCH, 2005) emphasises organisational safety culture, collective mindfulness, & risk-awareness
- “The attention now being paid to the cultural approach to safety stems from a recognition of the limitations of safety management systems as a means of achieving safety.”
- Partly definitional but Hopkins right to cite Reason (2000) that a cultural perspective needs to augment the system perspective
ATSB perspective: Hopkins (‘05)

• Hopkins notes that: “Major accidents are frequently traced to failures in safety management systems and investigations sometimes reveal SMS are little more than sets of manuals occupying metres of shelf space …”

• He argues that the Royal Commission on the Esso Melbourne gas plant explosion in 1998 came close to describing the SMS at the site as ‘virtual’

• Learning from bad practice is another window into our theme: making SMS work
Perhaps a dead wombat cf a squirrel is an appropriate icon for a poor or virtual SMS?
ATSB perspective on SMS

- ATSB investigations have found weak SMS: eg re Ansett 767 cracks & Transair
- Ansett became increasingly complex with a mixed and ageing fleet, inadequate KM system, and major commercial pressures
- Perhaps also a ‘tyranny of small decisions’ (Odum 1982) & ‘normalisation of deviance’ (Vaughan 1996) played roles
- Leading into Transair, I want to provide some context & investigation methodology
Collison with Terrain
11 km NW Lockhart River Aerodrome
7 May 2005, RPT 2 crew/13 pax fatalities
VH-TFU, SA227-DC (Metro)
Lockhart River Investigation

Large team of investigators:

- Examined aircraft components - on-site and in laboratory
- Examined cockpit voice recorder and flight data recorder and radio recordings
- Hindered by lack of usable cockpit voice recorder information, level of damage to aircraft, and no survivors or witnesses
- Assisted by flight data recorder, 25,000 pages of evidence, over 100 interviews
Lockhart River investigation

- Considered all aspects of the aviation system which included organisational & regulatory issues as well as aircraft/crew
- Conducted a research study into instrument approaches
- 10 recommendations before final report
- 500 page final report released 4 April ‘07
- Used ATSB Safety Investigation Information Management System (SIIMS) developed via $6.1m over 4 years.
Controlled flight into terrain (CFIT)

- Copilot not qualified for RNAV(GNSS)
- Experienced PIC flying & descending fast
- Pilots lost situational awareness in cloud during the GPS-linked IFR approach & made no discernable attempt to pull up
- No evidence of
  - problems with flight controls
  - problems with engines or propellers
  - pilot incapacitation
  - windshear etc
Lockhart River approach profile
ATSB investigation analysis model
ATSB investigation analysis model

Organisational Influences
(What could have been in place to minimise problems with the risk controls?)

Risk Controls
(What could have been in place to reduce the likelihood or severity of problems at the operational level?)

Local Conditions
(What aspects of the local environment may have influenced the individual actions / technical problems?)

Individual Actions
(What individual actions increased safety risk?)

Occurrence Events
(including technical problems)
(What events best describe the occurrence?)

Safety issues

Safety indicators

Investigation path
Contributing safety factors

- Defined as a safety factor that, if it hadn’t occurred/existed … the accident would probably not have occurred … or another contributing safety factor would probably not have occurred or existed
- Evidence not sufficient for some (eg CRM) with ‘probably’ defined as >66% (c. 2 in 3)
- ‘Acci-map’ diagram shows 19 contributing safety factors (black border) and 13 other safety factors (purple outline).
The Acci-map diagram is built from bottom up
Lockhart River methodology

• CASA suggested ATSB methodology not mature, biased towards finding regulator issues, >66% test too weak, etc
• ‘No direct influence on cockpit’
• QLD State Coroner did not accept the accident began and ended in the cockpit
• The >66% and probably/likely terminology is supported by International Panel on Climate Change, but we are reviewing differences with legal >50% overall, etc
Methodology – Reason & Hopkins

• I note Reason’s (1997) chapter regarding “The regulator’s lot is not a happy one”

• Hopkins (who speaks tomorrow) Lessons from Longford (2000) repays careful study: “Three different principles of causal selection, based on three different perspectives … Self-interest: select causes consistent with self-interest. Accident prevention: select causes which are most controllable. The legal perspective: select causes which generate legal liability.”
Methodology – Hopkins (2000)

• Hopkins’s argues, for example, regarding: “Workcover and the State Government … On the one hand, the principle of avoiding blame led them to assert that the regulatory system was in no way a cause of the accident. On the other hand, they were concerned about accident prevention, and their regulatory role led them both to propose an alternative, safety case regime.”

• Perhaps this reinforces the ICAO Manual best practice of an independent systemic safety investigator investigating without fear or favour cf legal or self-interest paradigms
Lockhart River and SMS

• All agree on importance of a sound SMS, but can we learn more from the less good?
• The ATSB Lockhart River investigation found Transair’s SMS to be poor
• Contributing safety factors included the poor company org. structure, weak Chief Pilot commitment to safety, inadequate risk management processes, & variable training
• Other factors includes the Ops Manual, and lack of HF training including CRM
Transair’s SMS

• Chief Pilot was also MD & head of Check & Training and regularly in PNG – overloaded & poor organisational structure back-ups

• He did not demonstrate a high level of commitment to safety, eg Cairns base largely unsupervised and checked itself, reported pilot hazards not addressed, no safety committee minutes available, incidents not reported to the ATSB etc etc

• SMS largely in manuals not reality: virtual
Transair’s SMS

• Transair did not have a structured process for proactively managing safety-related risks associated with its flight operations
• This included the move from charter into RPT with passengers in QLD, & expansion of operations in QLD and NSW to 25 pilots with new ports such as Lockhart River
• Training was variable and sometimes entailed little more than an open book exam
Transair’s SMS

• Transair’s Operations Manual involved a mass of Word documents slapped onto a CD with no indexing or version control
• Manual requirements for human factors training, like crew resource management for multi-crew operations, did not happen
• Transair appeared to have a SMS and a commitment to best practice but actual practice reflected a poor safety culture driven from the top (cf ICAO 2006 Manual)
Threat and Error Management

• At Safeskies 2005 it was reported that the ATSB had provided GAPAN with a $250k grant to develop a TEM course
• GAPAN did a fine job in developing that course and recently offering it to Check and Training pilots and flight instructors around Australia (ie ‘training the trainers’)
• I launched the course on 20 August with GAPAN Chairman John Whittington, with strong support from CASA’s Patrick Murray
GAPAN Threat and Error Management launch 20/8/07
Threat and Error Management

• As noted in the FSF’s July ’07 magazine, TEM is a ‘critical element’ of a SMS

• GAPAN’s course was developed using data on threats and errors from the University of Texas LOSA database & from past ATSB investigations

• Since the ATSB grant to GAPAN, ICAO has given greater prominence to TEM training which CASA has taken up
Growing challenges

- Striking the right balances between protecting safety data and use in legal and regulatory systems, and between no-blame and culpability in a ‘just culture’
- Agreeing ‘acceptable levels of safety’
- Dealing with pilot, LAME etc shortages
- The growing safety/security interface
- Proactively using tools/data like LOSA, FOQA etc
- Assisting neighbours in our region
Continuing challenges

- Using all available means to avoid a major accident remains our primary challenge.
- Understanding of the limits to human performance and organisational behaviour.
- Balance & excellence in regulation/investig.
- Risk analysis, threat & error management.
- Learning from others, mindfulness of past lessons.
- Good safety management systems among all key players that are real and reflect a culture driven by senior management.
Be a scanning SMS squirrel not a dead SMS wombat!
Thank you

Questions?