

Informed Decision Making in Aviation Safety

An Evidence Based Approach

Patrick Murray & Paul Lee

Scope

- The nature of the air transport system
- What does “Evidence Based” mean?
- Two examples of current research

The air transport system

- Complex socio – technical system
- Passenger & freight transport
- Vital part of national infrastructure
- Transition from government – private ownership
- High reliability system
- Large investments in Safety
- Inherently dynamic (unstable) system

The air transport system

- Complex socio – technical system
- Passenger & freight transport
- Vital part of national infrastructure
- Transition from government – private ownership
- High reliability system
- Large investments in Safety
- Inherently dynamic (unstable) system

How are decisions made?

The air transport system

- Complex socio – technical system
- Passenger & freight transport
- Vital part of national infrastructure
- Transition from government – private ownership
- High reliability system
- Large investments in Safety
- Inherently dynamic (unstable) system

How do we conduct research?

- Identify the problem / specify purpose
- Literature review
- Determine specific research question(s) or hypothesis
- Data collection
- Analysing and interpreting the data
- Evaluating and reporting the results

Example # 1

Airline pilot recurrent training

- What is the issue with current training?
- What does the evidence say?
- The way ahead

Aerospace Strategic Study Centre

"Safety Through Education and Research"





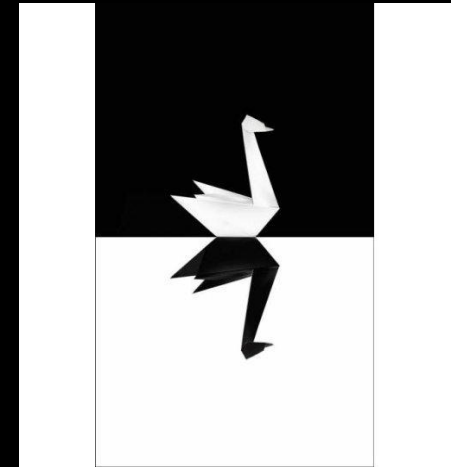
Mandatory Items

- Flight Preparation
- Before take-off checklist
- Engine failure between V1 and V2
- Rejected take-off before reaching V1
- Instrument departure and arrival procedures
- Engine-out Precision Approach to minima
- Non-Precision approach to MDA
- Go-Around 1 engine inoperative at DA
- Landing critical engine inoperative

“Black Swans”

AF 447

QF 32



***When people and complex systems interact,
there will always be an infinite number of
possible outcomes***

Resilience : Coping with the unexpected in unstable systems

**Knowledge
driven**

**Surprise “out of
range” of foreseen
incidents**

**Typical content of
recurrent training**

Expected

**Surprises
within the range
of foreseen
incidents**

**Procedure
driven**

Aerospace Strategic Study Centre

"Safety Through Education and Research"



DATA SOURCES



n ≈ 3,000

n ≈ 1,000

N ≈ 2,000,000

n > 9,000

Scientific Reports

Pilot Surveys

Training Data AQP/IATQP

Accidents/Incidents

Flight Data

LOSA

Results from the individual analyses distilled into singular declarative sentences, entered into a “Findings Database” & linked to:

Flight phases

Competencies

Training Topics

Context of the evidence if relevant

Factors analyzed in the Accident-Incident Study

Sources

Keywords associated with the conclusions of the report

Applicability to aircraft types

Hull Losses per million departures



Western Jets
June 2011

Years Of Operation

Some overall findings

Regulatory prescriptions are based on events, some of which are improbable in modern aircraft

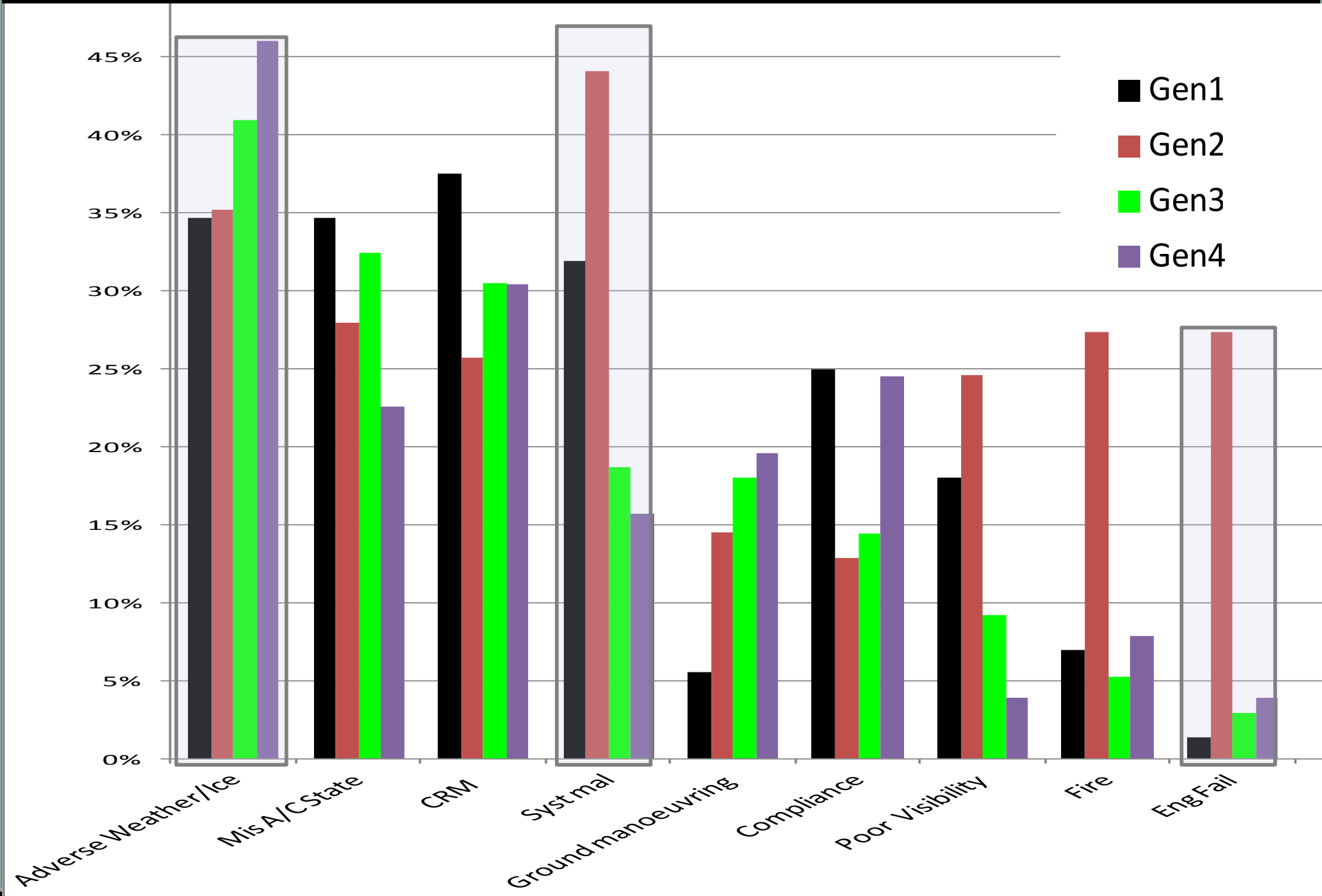
Training programmes are saturated with items that are not directly related to enhancing safety of modern aircraft

Actual events in modern aircraft indicate new & quite different risks e.g. automation control, flight-path guidance and monitoring not currently adequately considered in regulations

Findings Database enables:

- Partitioning the data in various practical ways.
- Managing multiple results from different sources
- View clear support of conclusions
- Traceability from conclusion back to source data and vice versa

% of accidents & incidents with each factor - Last 15 years



Generation 4 “A List” (2nd order)

- Adverse Weather Management
- Automation Management
- Go-Around Management (all eng op)
- Manual Aircraft Control
- Monitoring, cross checking, error detection
- Non – Compliance issues
- Unstable Approach (recognition and management)

Develop a new paradigm for competency based training and evaluation of airline pilots based on evidence

**Phase 1
Recurrent**



**Phase 2
Type Rating**

Outputs

ICAO Doc 9868 PANS-TRG

ICAO Manual of Evidence Based Training (in press)

IATA Evidence Based Training Implementation Manual (in press)

Example # 2

TEM in Flight Training

Paul Lee

Scope

- Importance of continued research in GA
- Introduction of TEM in Australia
- Current TEM training within flight training organisations

Importance of continued research in General Aviation

- ✓ Human factors education has become a significant aspect of the airline training syllabus but it is often a relatively neglected component in the general aviation environment (Simpson & Wiggins, 1999)
- ✓ It is understandable that analysis of the human performance has been mainly focusing on air transport environment because of primarily large number of passengers carried and the global economic significance (O'Hare, 1999)
- ✓ However it is the time that greater effort to be re-directed towards other areas of aviation such as GA

Importance of continued research in General Aviation

- The size and significance of problems deserve such attention

Figure 3: Hours flown by operation type, 2002 to 2011

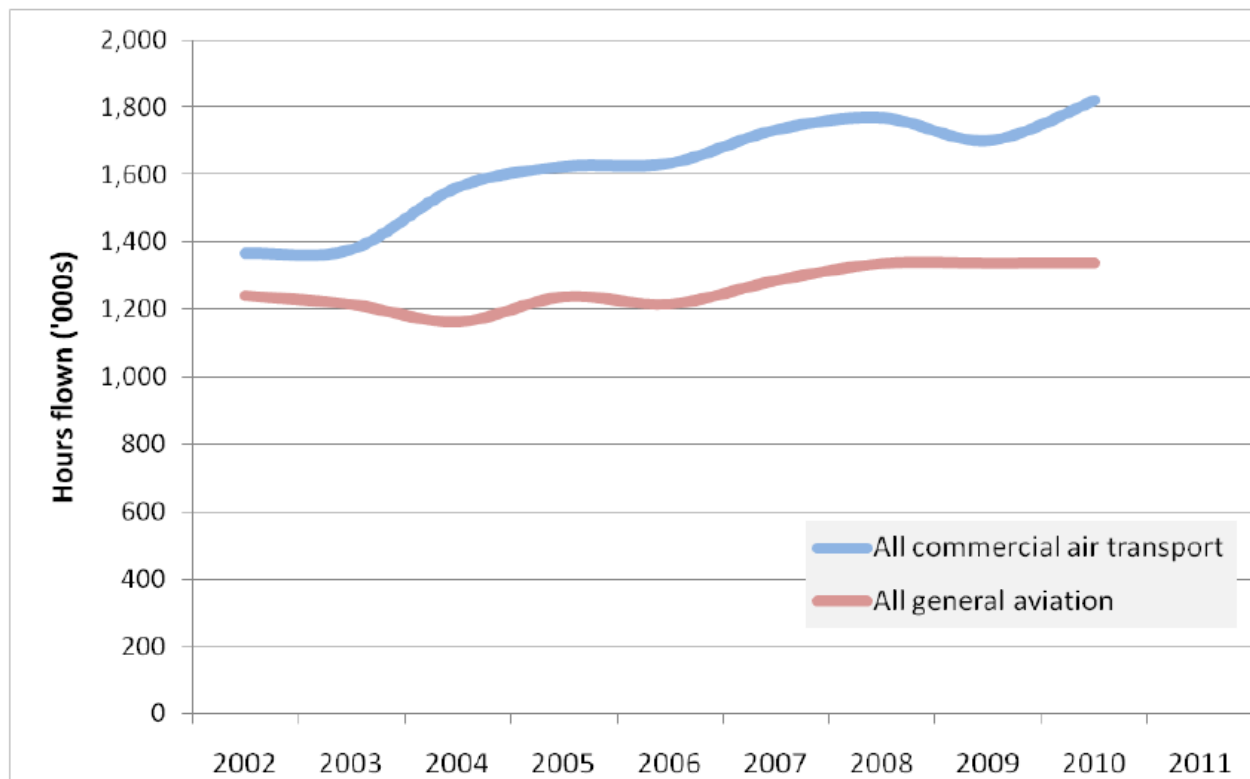


Figure 6: Commercial air transport occurrences and injuries, 2002 to 2011

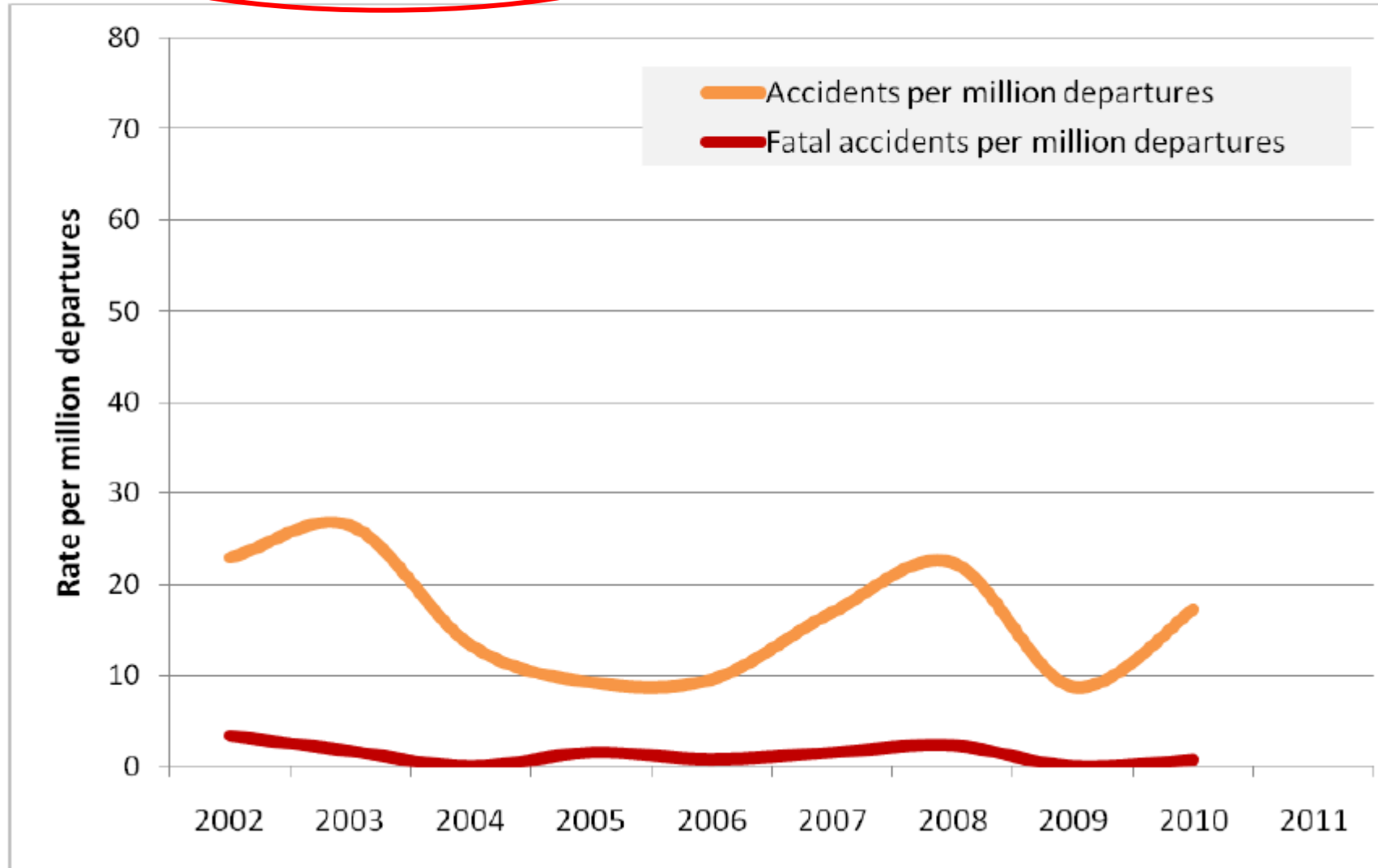


Figure 10: General aviation accident rates and injury occurrences (VH- and foreign registered aircraft), 2002 to 2011

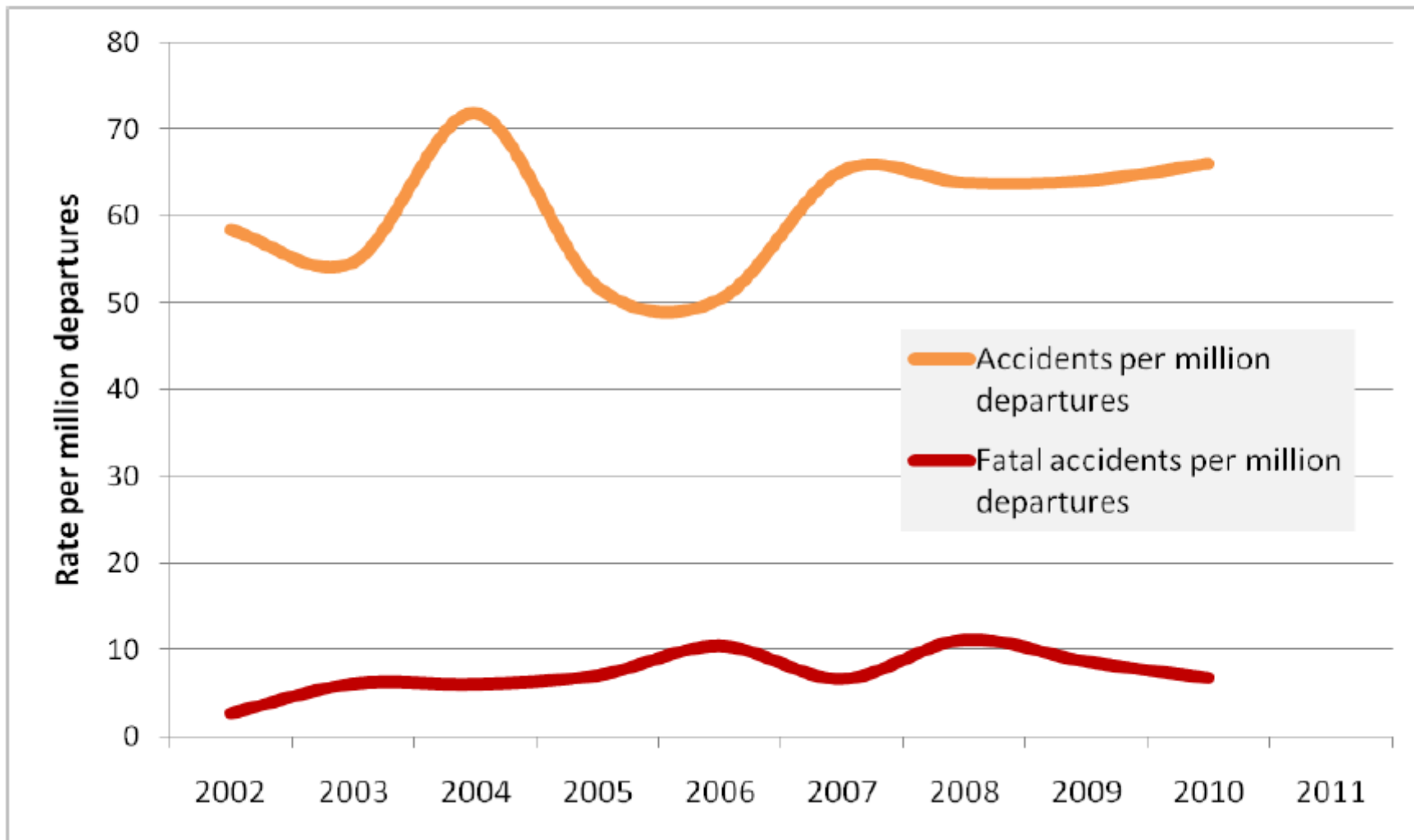
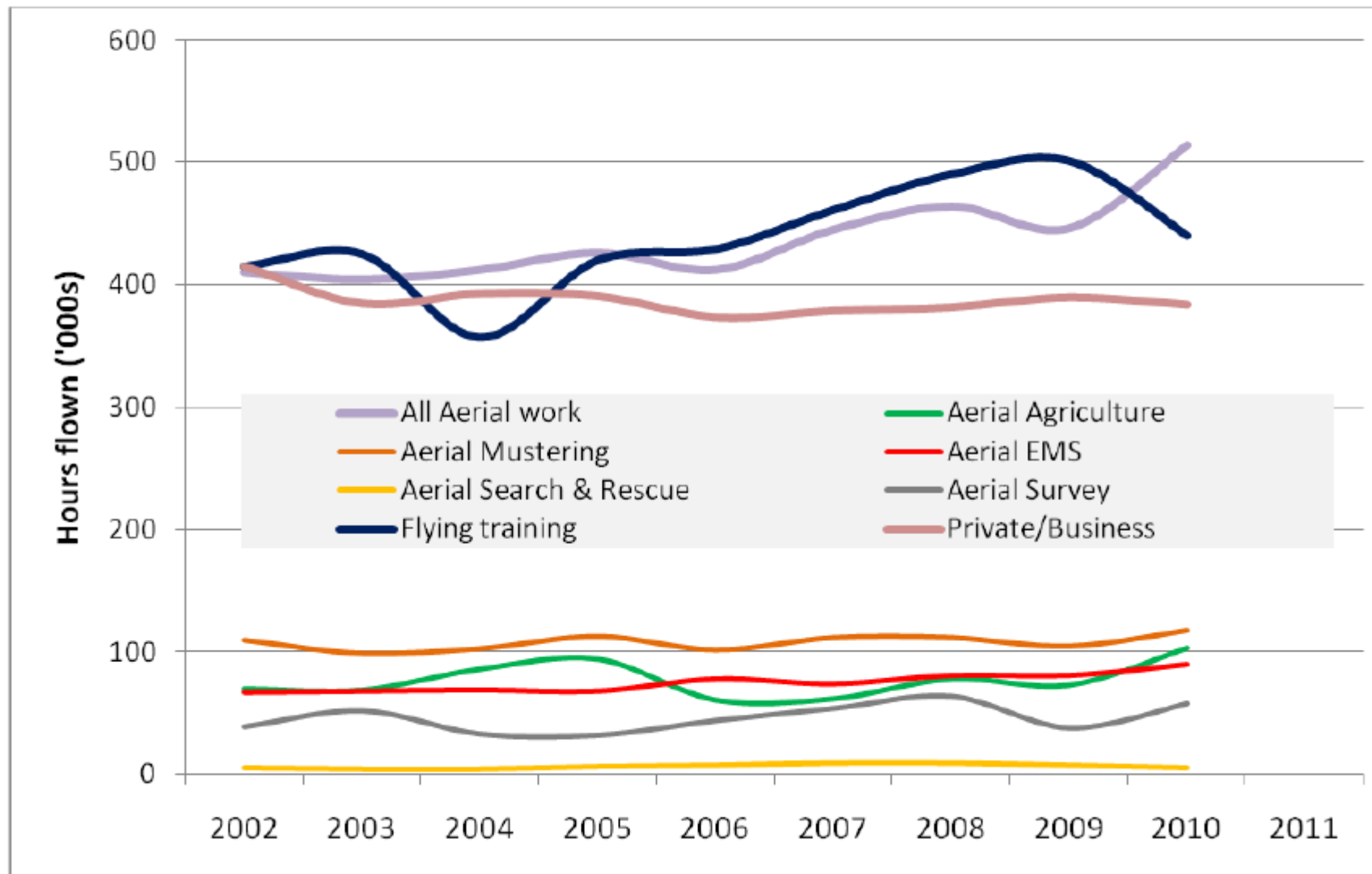


Figure 5: Hours flown in general aviation, 2002 to 2011



Importance of continued research in General Aviation

- The origin of airline pilots
 - ✓ The majority of airline pilots were once general aviation pilots
 - ✓ All airline pilots were once trainee pilots
 - ✓ Attitudes learnt in general aviation as a trainee pilot has an enduring effect (Hunter, 1999)
 - ✓ Hence a research focus should be given to the flight training organisation sector

Importance of continued research in General Aviation

- Skill development
 - ✓ Technical Skills vs Non-Technical Skills (NTS)
 - ✓ The importance of NTS has been well received and continually researched
 - ✓ Which particular NTS? TEM
 - ✓ Skill acquisition is a progressive process involving the investment of time and effort (de Montalk, 2008) as well as constructive feedback

Introduction of TEM in Australia

According to ICAO Annex 6, An operator shall establish and maintain a ground and flight training program that includes human performance including TEM

According to ICAO Annex 1, it is a licensing requirement for all pilot licences that understanding principles of TEM and application of TEM to operational performance are to be satisfied in addition to being able to recognise and manage threats and errors

CASA decided to follow the ICAO's lead in mandating TEM in pilot licensing standards

From March, 2008, TEM has been incorporated into the Day VFR syllabus

From 1st July, 2009, TEM became a part of GFPT & pilot licence testing in Australia (ATSB, 2009)

TEM training in Australia

- Attitude towards TEM training in GA (ATSB, 2009)
- Two surveys in 2007 & 2008 by the ATSB suggests positive attitudes towards implementing TEM and suggest most organisations implemented and incorporated TEM training into their training programs
- Now is the time to look at how it is incorporated, its evolution and any measurable effectiveness

Current TEM training within flight training organisations

- Overview of the study
- Stage 1 – Examination of accident reports to determine common threats and errors among trainee pilots
- Stage 2 – Collect data on how TEM training was introduced, incorporated, currently taught and practised. Also looking at perceived attitude towards such training among trainers and trainees
- Stage 3 – Analyse data to identify similarities and differences among flight training organisations

aviationresearch@griffith.edu.au

www.griffith.edu.au/aviation

Thank You

patrick.murray@griffith.edu.au

paul.lee@griffith.edu.au

Thanks and acknowledgement
to:

- CASA
- Flight Global ACAS
- IATA
- ICAO
- University of Texas (HFRP)
- The LOSA Collaborative

