



Australian Government

Australian Transport Safety Bureau

Amateur-built aircraft

Analysis of VH-registered non-factory-built aircraft accidents 1988-2010

Presented by

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Presentation overview

- Why study amateur-built aircraft accidents
- Data gathered in the study and analysis challenges
- Amateur-built aircraft accident rates
- Key Conclusions
 - Mechanical reliability issues
 - Pilot inexperience on aircraft type
 - Reduced occupant survivability
- What has been done to reduce the accident rate

Why study amateur-built aircraft

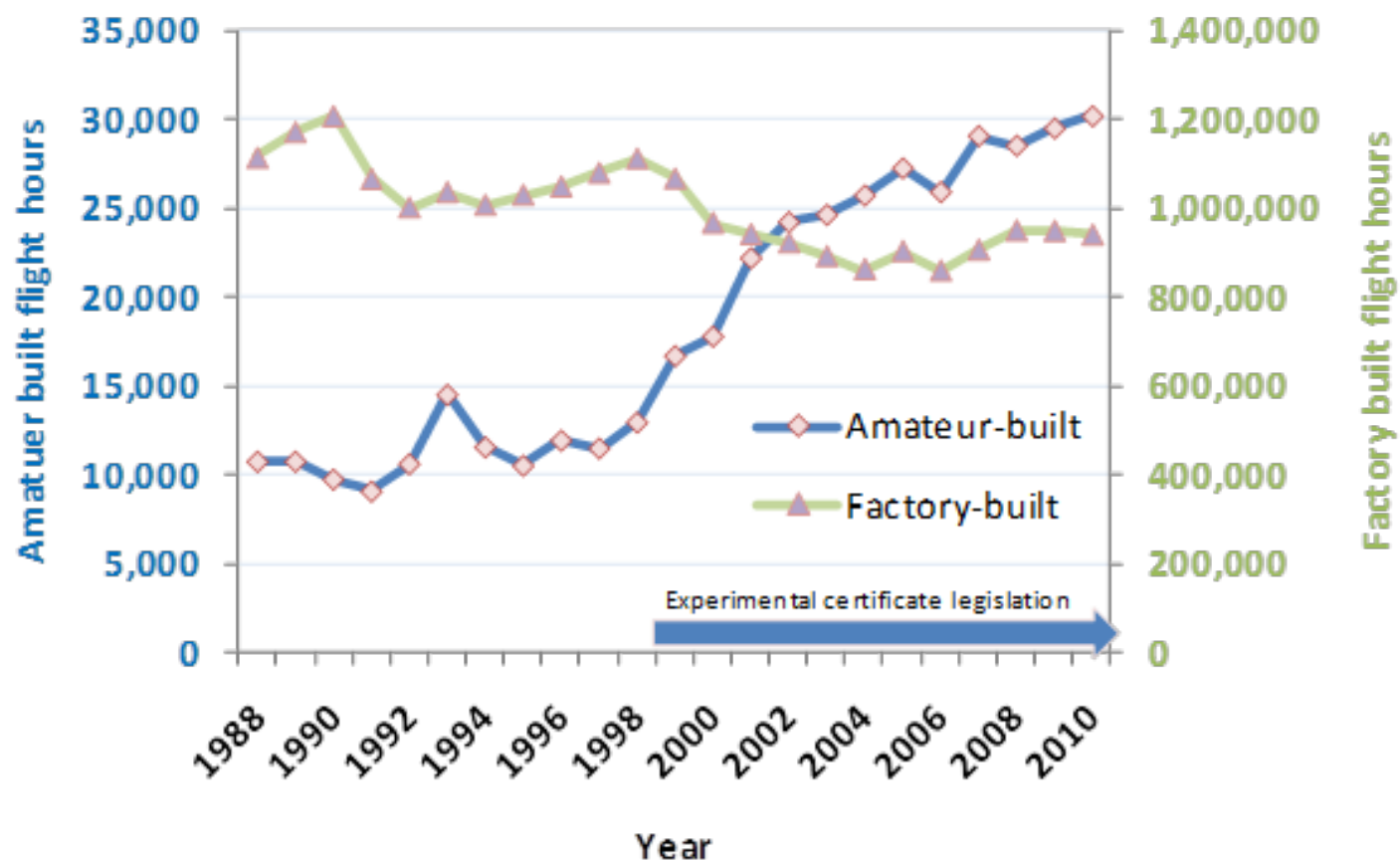
- Significant growth in amateur-built aircraft
- To determine whether the rate and types of accidents were different to similar factory-built aircraft
- To determine the main contributing factors to accidents involving amateur-built aircraft
- This report follows a study conducted on owners and builders of amateur-built aircraft - AR-2007-043(1).

What are amateur-built aircraft?

Amateur-built aircraft are:

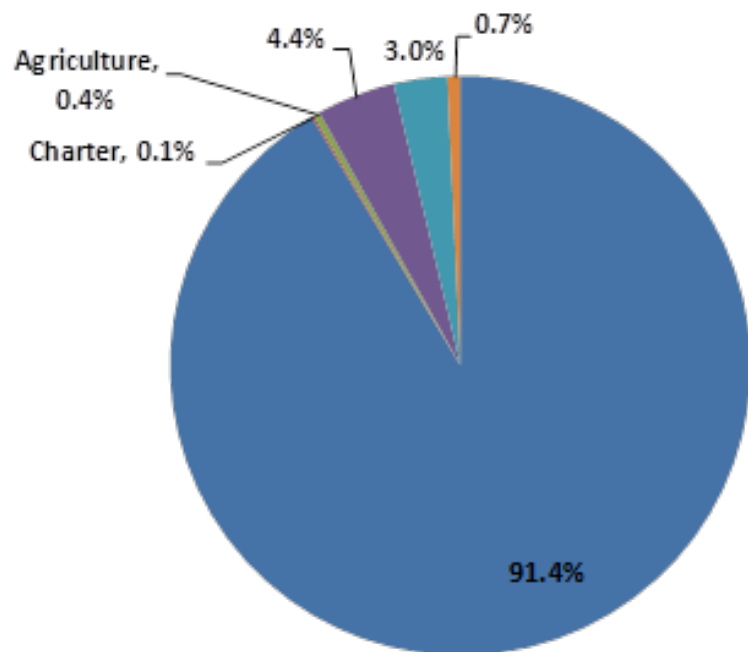
- Built from an original design, established plans or kit
- More than 51 per cent built by builder(s) solely for education or recreation – i.e. not built in a factory
- For personal use
- Built under 2 legislative schemes in Australia
 - Amateur-built and experimental (ABE) – Post 1998
 - Amateur-built Aircraft Approval (ABAA) – Prior to 1998

Hours flown

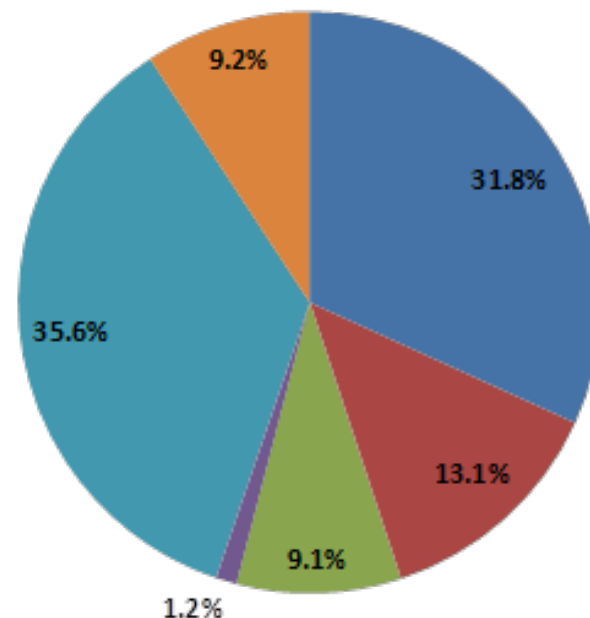


Aircraft hours by type of operation

Amateur-built aircraft



Factory-built aircraft



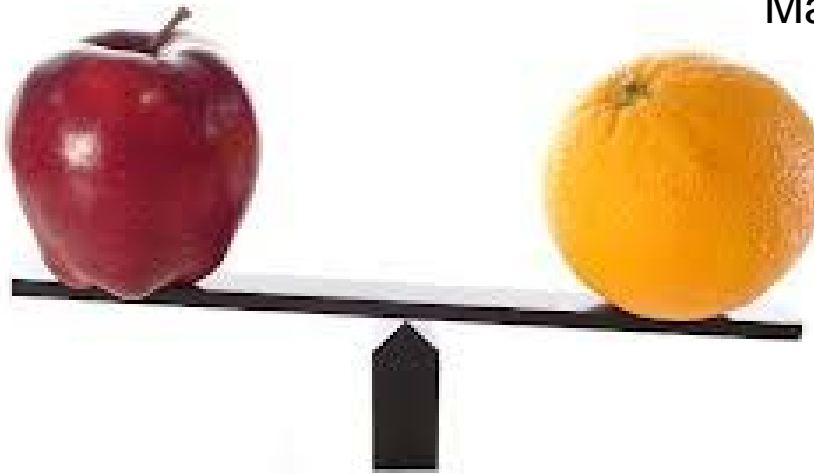
■ Private and business ■ Charter ■ Agriculture ■ Test and ferry ■ Training ■ Aerial work

Benchmarks for comparison

Comparing amateur-built to 'equivalent' factory-built aircraft

Accident rates

Matched samples analysis...



Matched-samples analysis

What is a matched-samples and why is it used?



Aircraft data matching

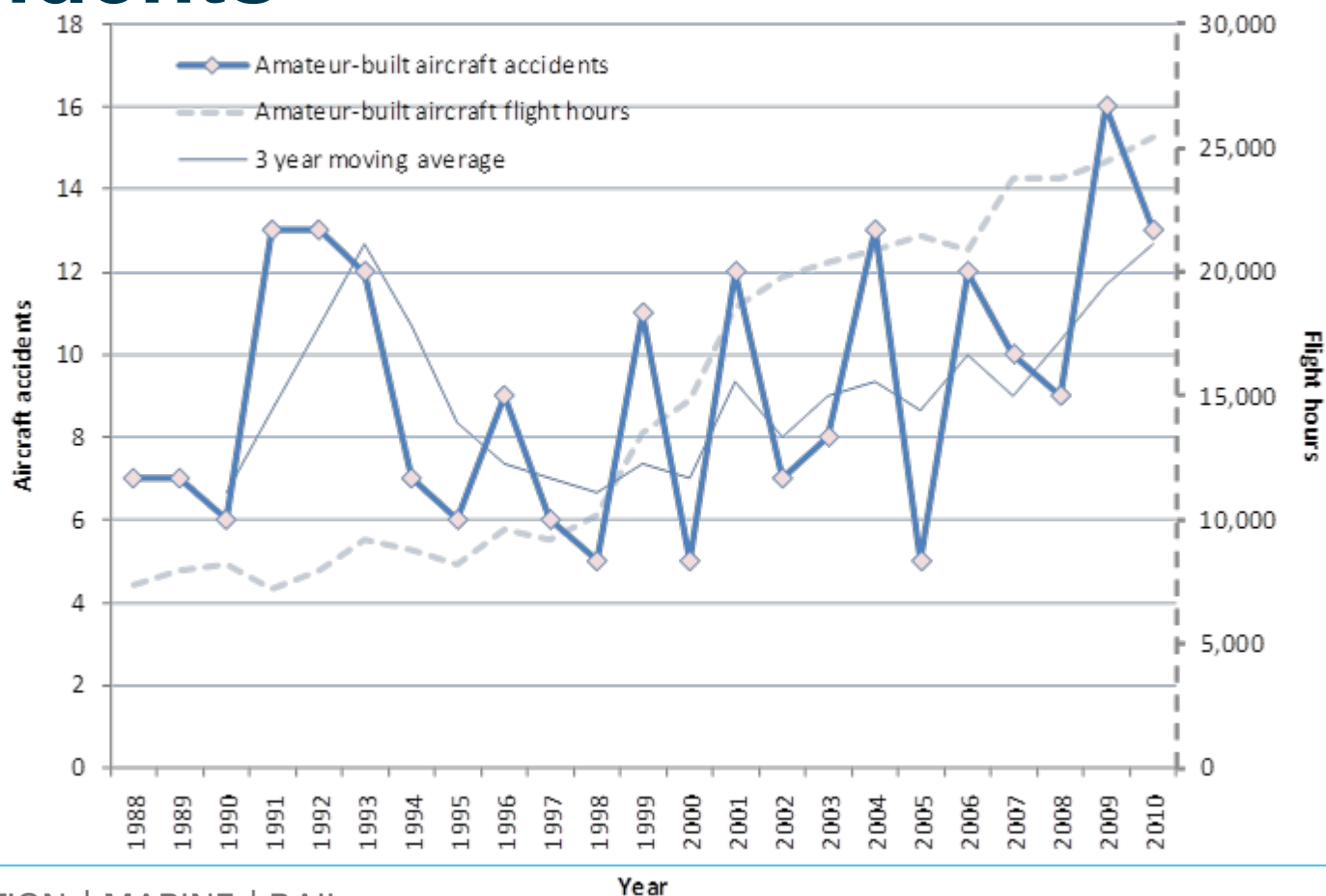
Matching conditions

- Wing loading ± 1 standard deviation
- Landing energy ± 1 standard deviation
- Operation type and sub-operation type where available
- Landing gear configuration where available

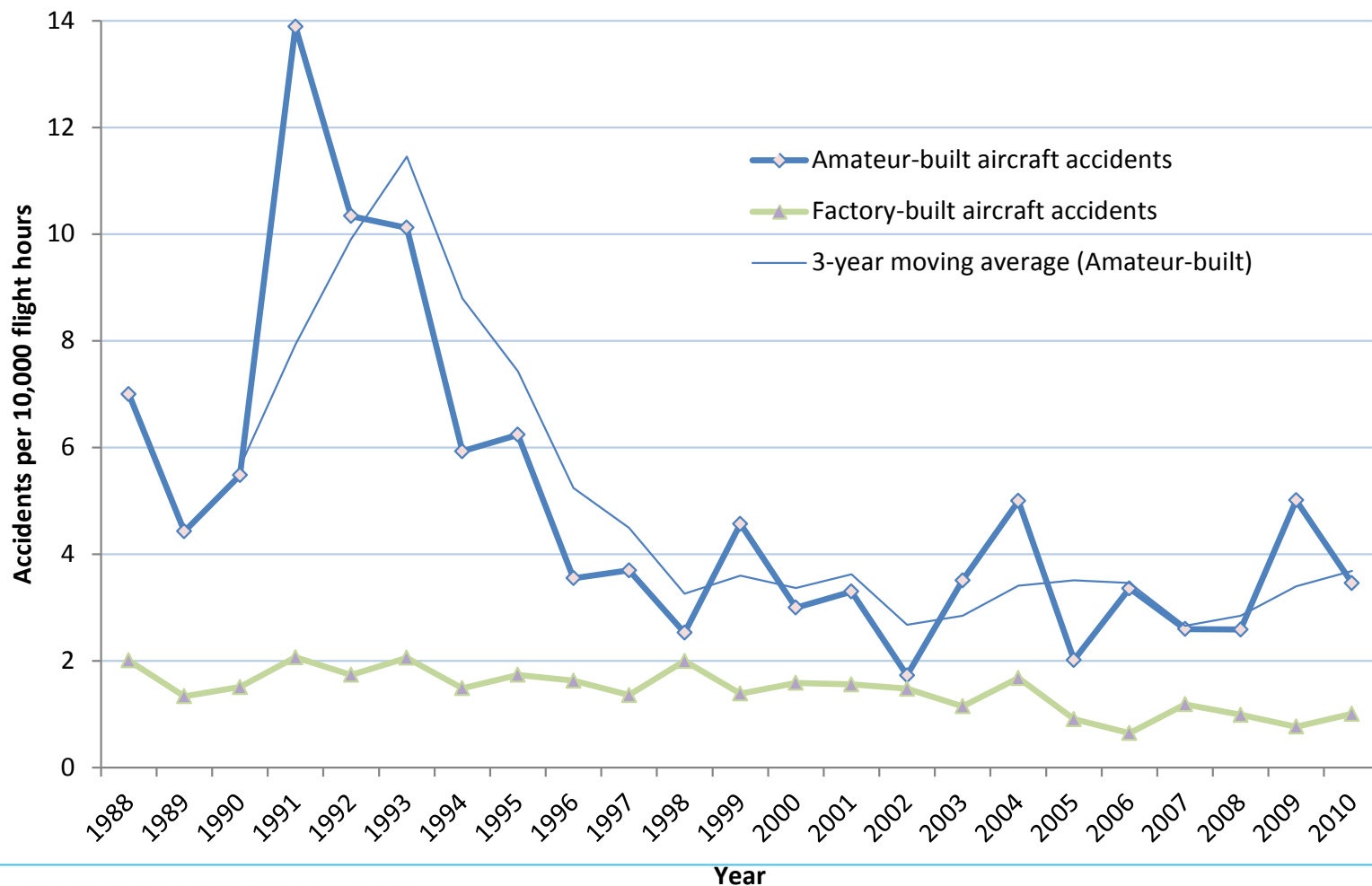
Filters

- Only similar operation types allowed into selection pool

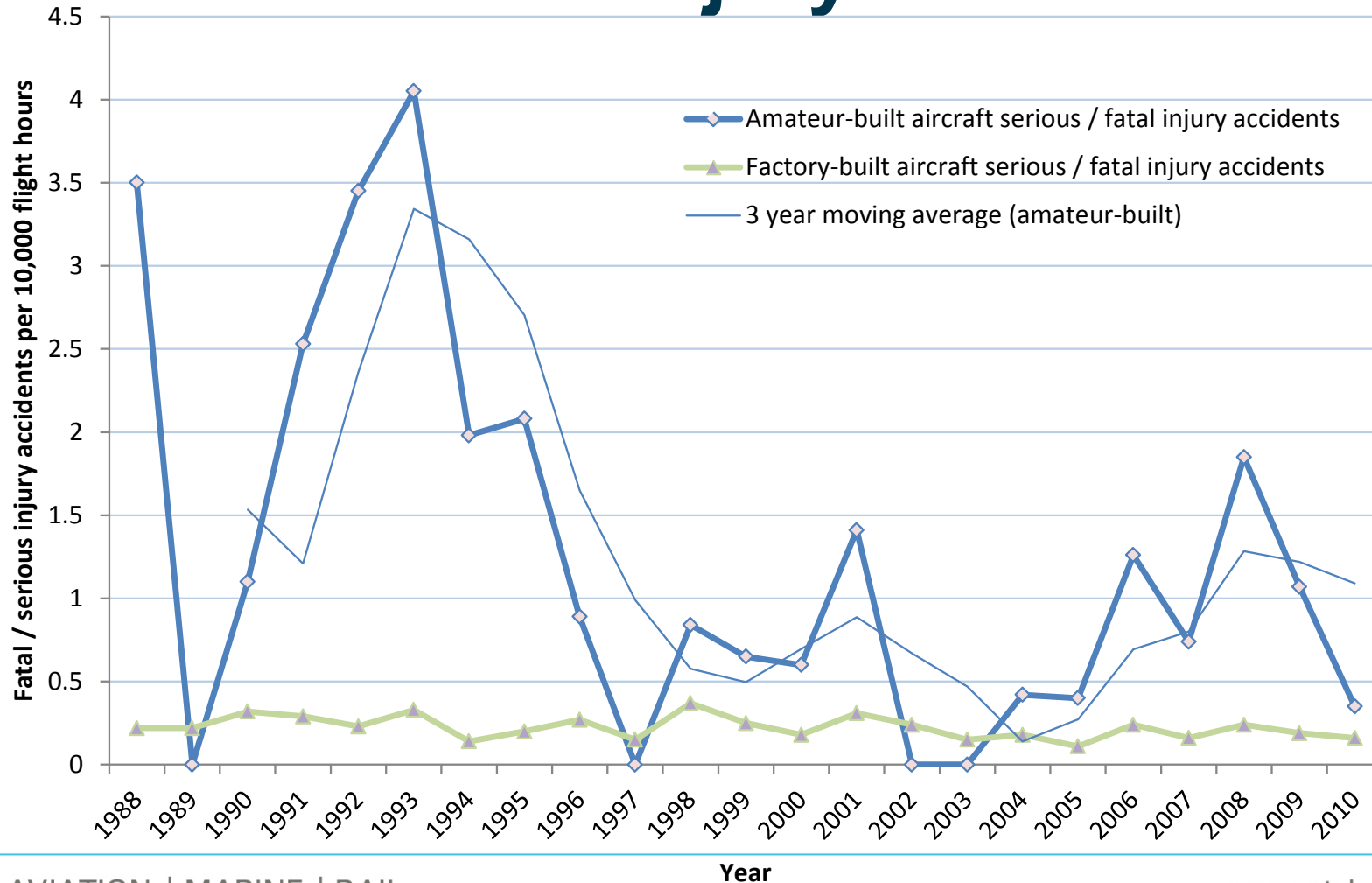
Number of amateur-built aircraft accidents



Amateur-built aircraft accident rate

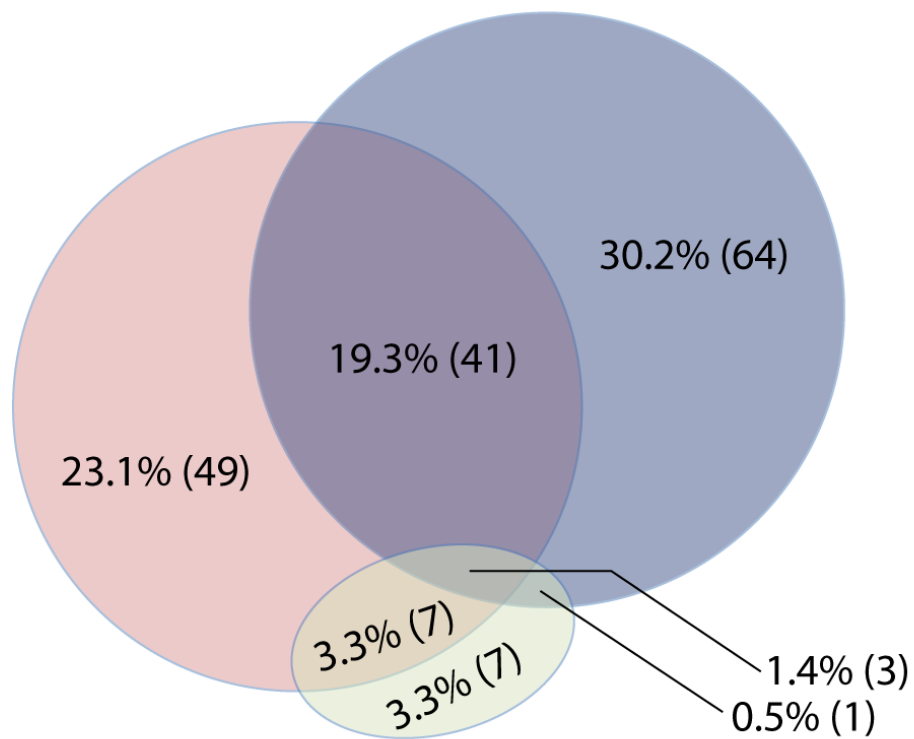


Fatal and serious injury accident rates

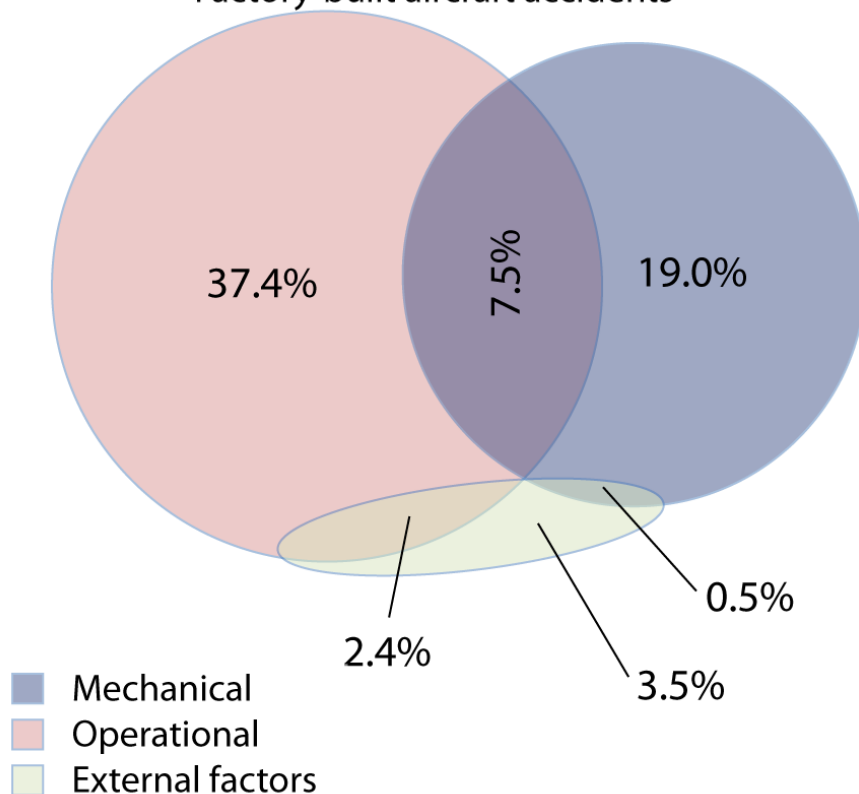


Accident pre-cursors

Amateur-built aircraft accidents

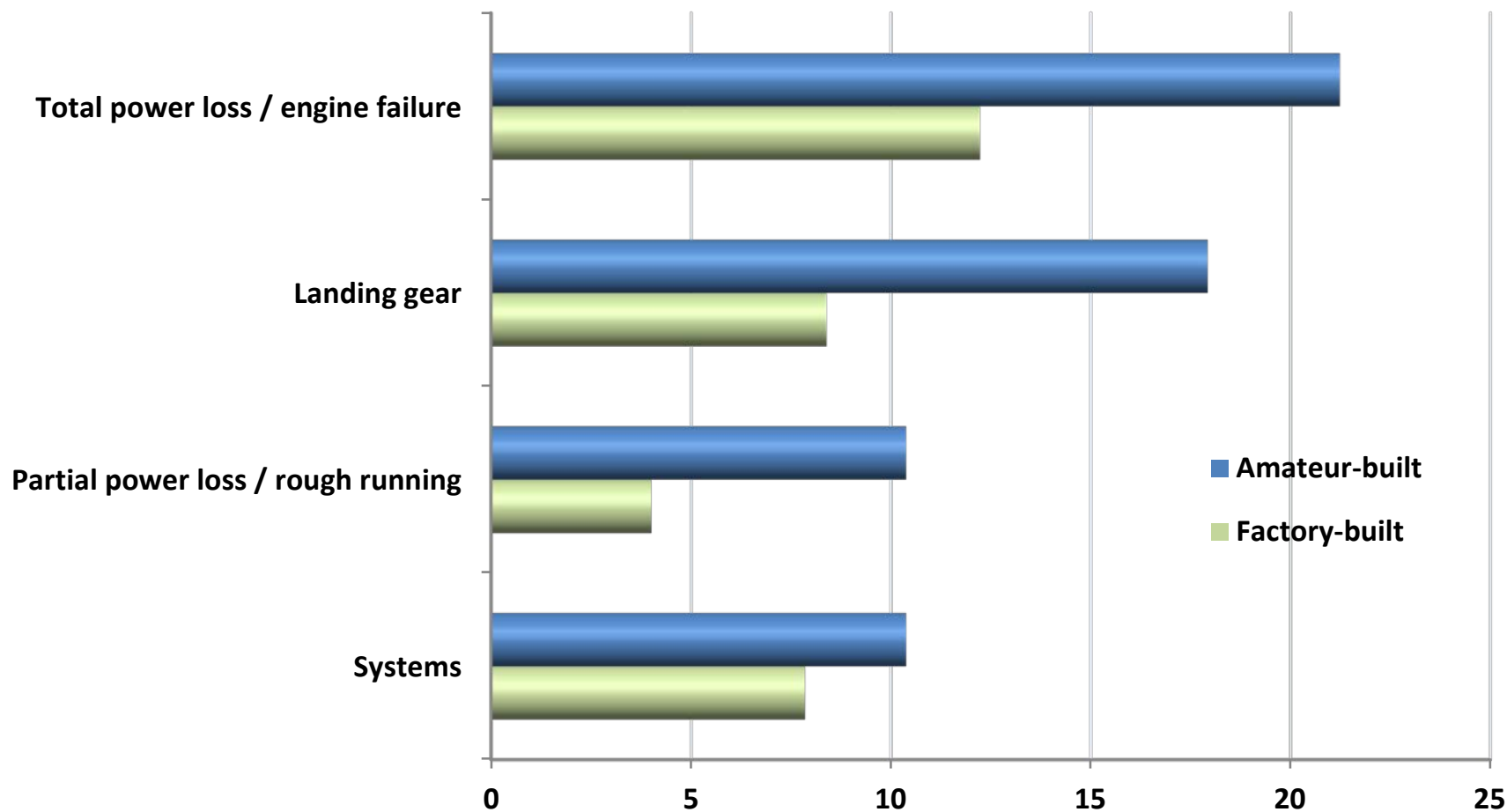


Factory-built aircraft accidents

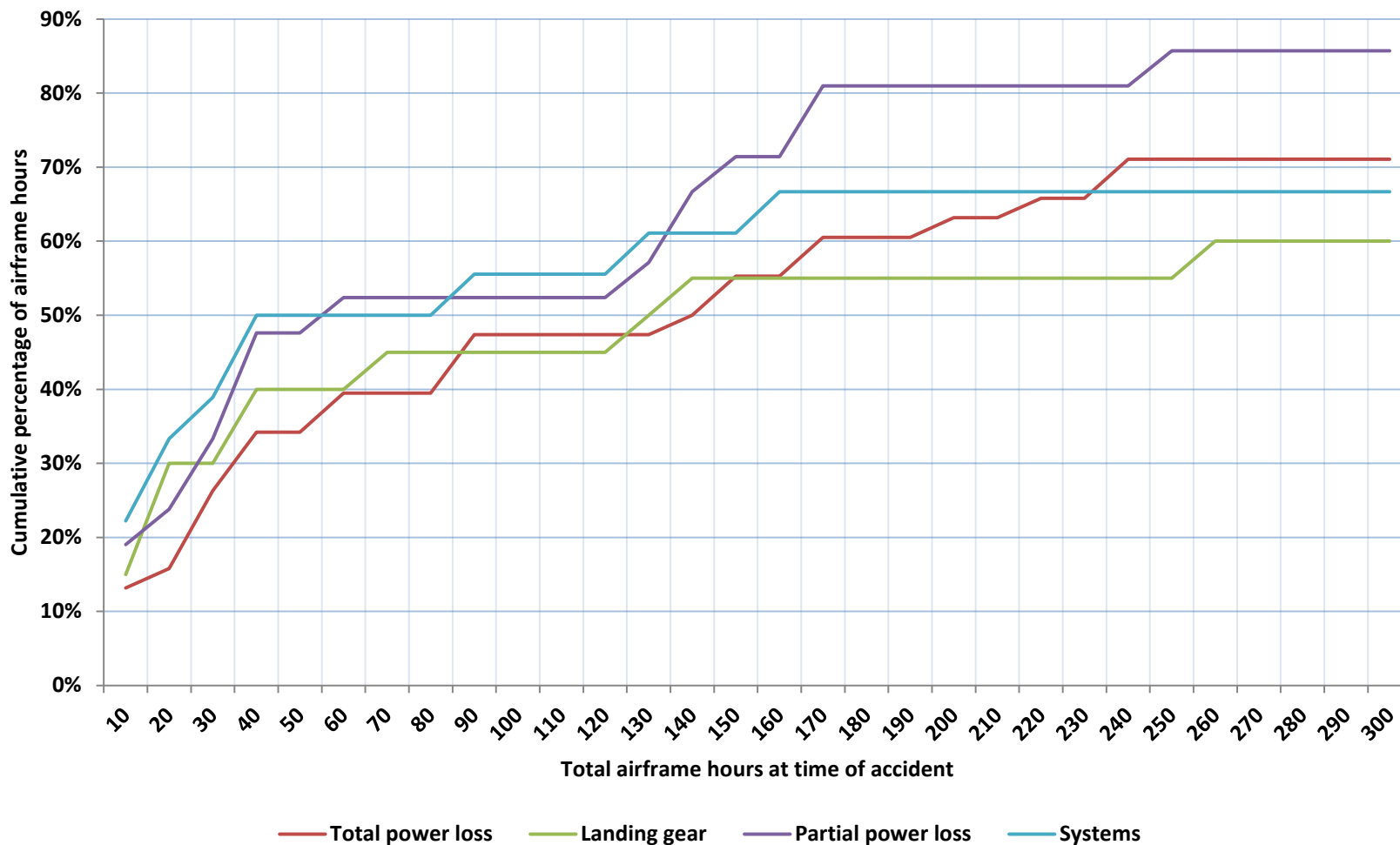


Mechanical reliability issues

Mechanical accident precursors



Airframe hours accrued prior to mechanically related accident



Engine failures and partial power loss



25 of 63 were technical failures

- Mechanical discontinuities (14)
 - Mainly affecting the fuel system – mostly around the fuel filter
- Fractured and deformed components (5)
 - Crank shaft, cylinder valve rocker arm, timing belt, push-rods
- Others included an electrical discontinuity and a software/firmware anomaly.

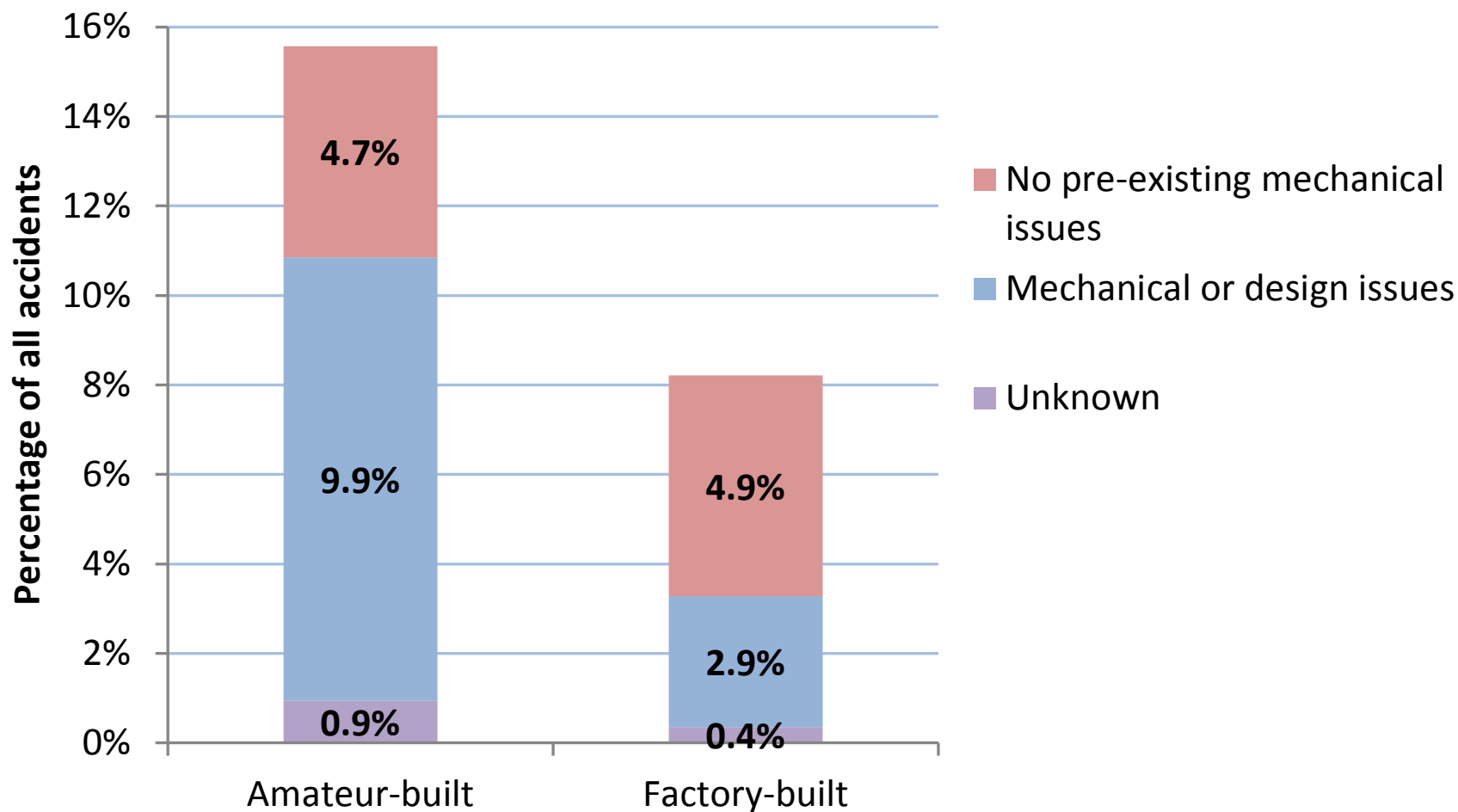
Engine failures and partial power loss



7 of 63 were design faults including

- Supercharger bypass valve too small
- Reduced redundancy - single ignition switch
- No carburettor heat
- Ineffective engine cooling due to cowling design

Landing gear issues



Other mechanical issues



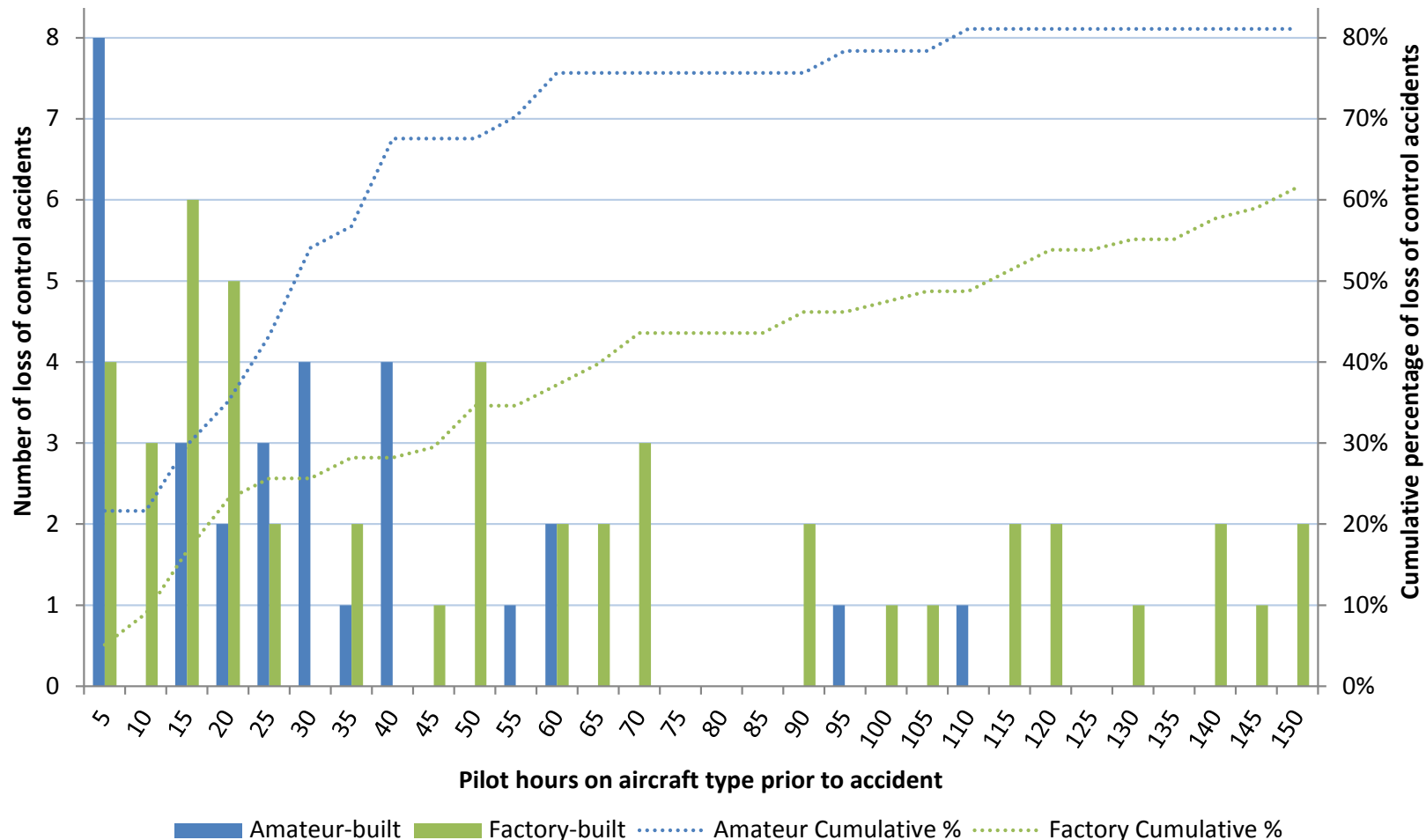
Pilot inexperience on aircraft type

Loss of control accidents

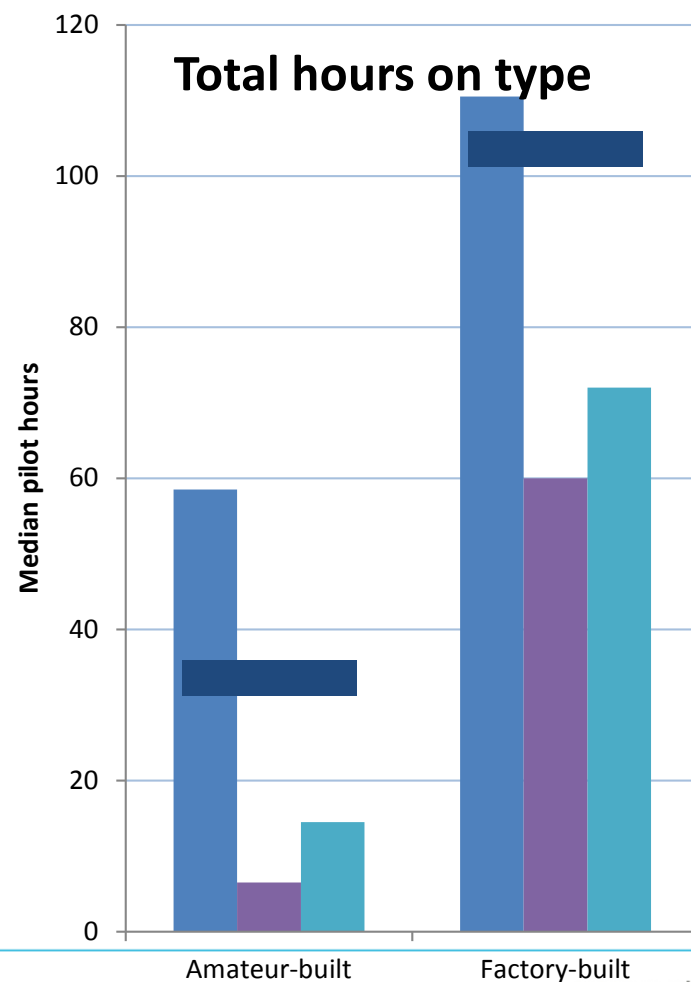
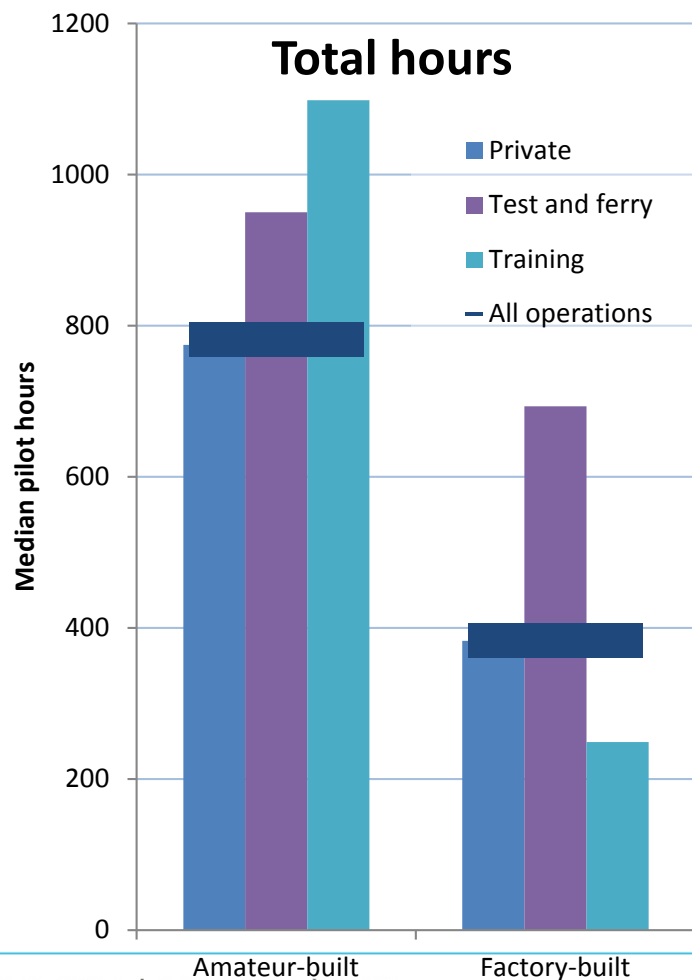
- Aircraft handling
 - On ground
 - Mishandled crosswinds
 - Hard landings
 - In air
 - Stall/spin
- Powerplant problems
 - Mainly after takeoff



Pilot experience and loss of control



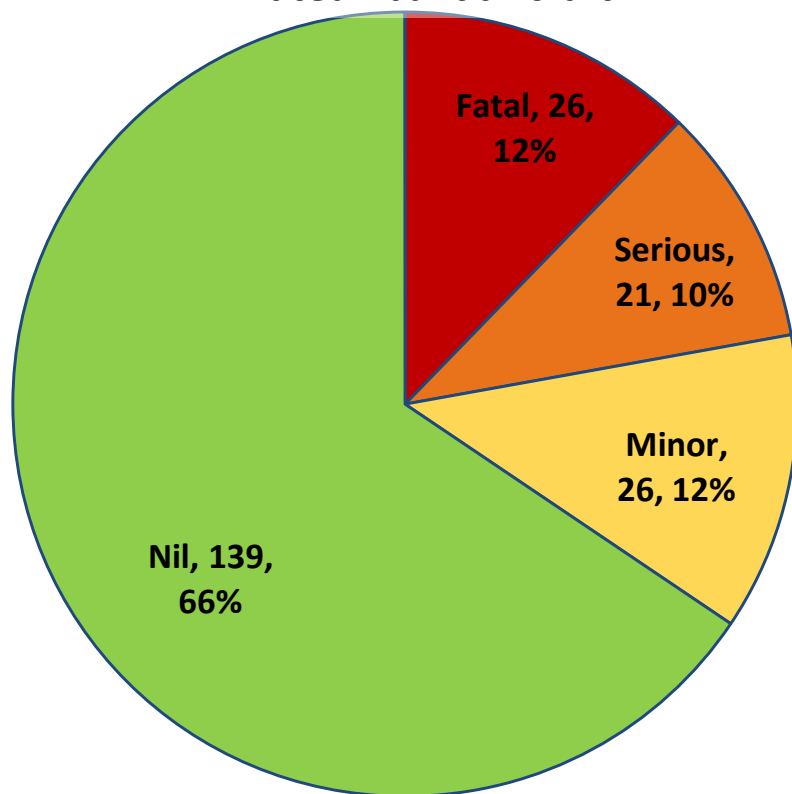
Pilot inexperience



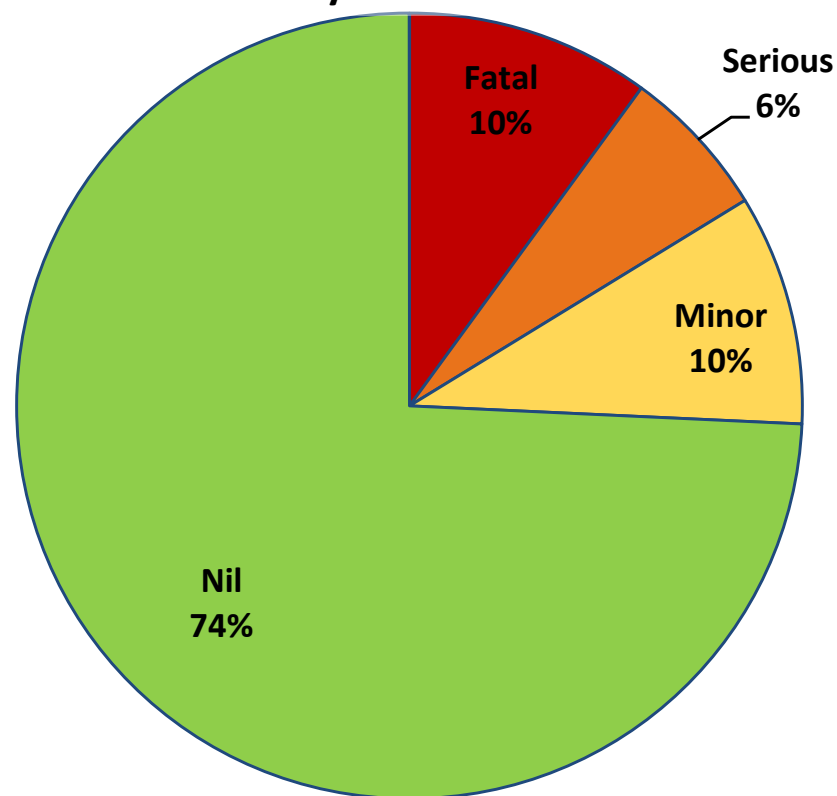
Reduced occupant survivability

Overall injuries

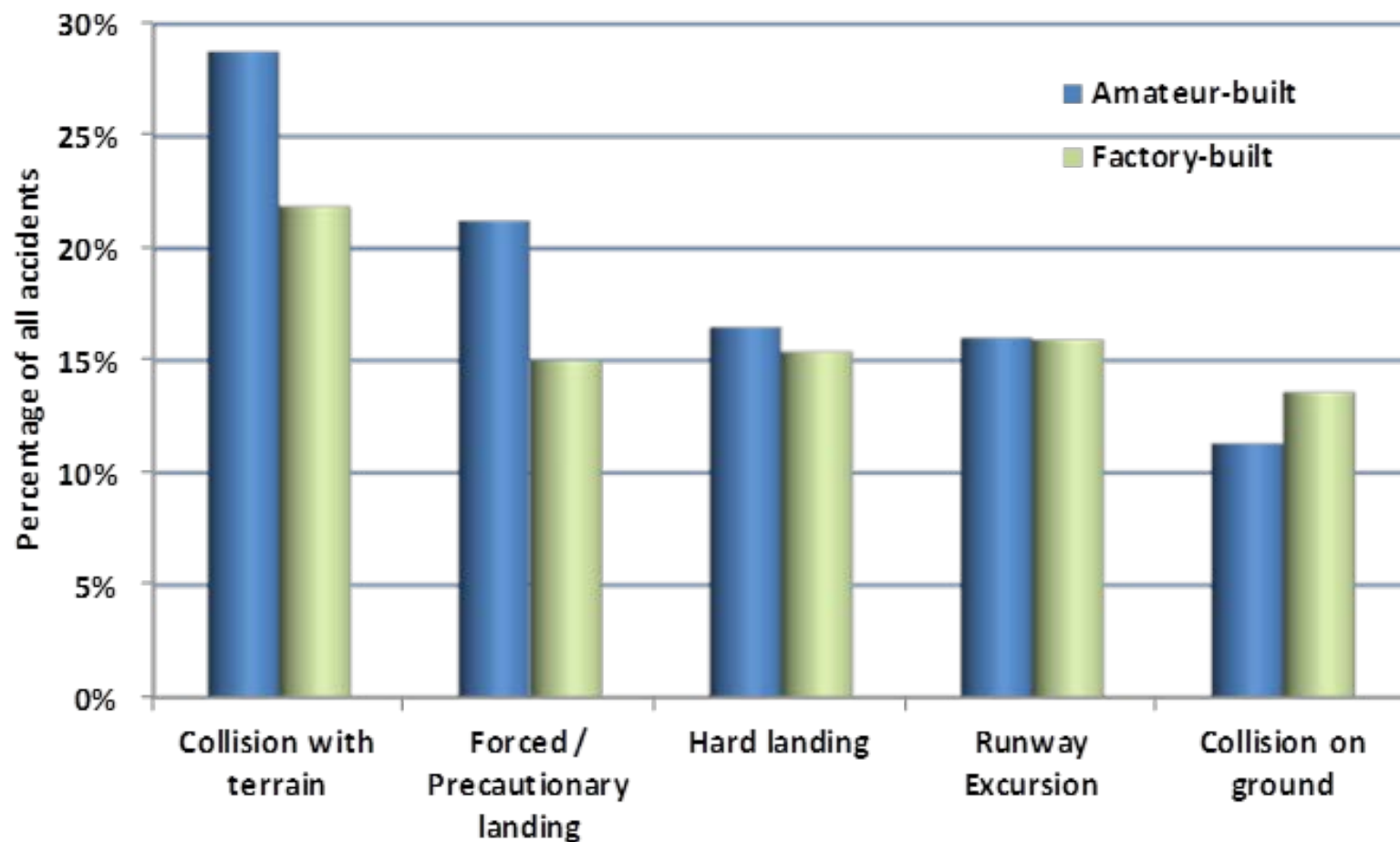
Amateur-built aircraft



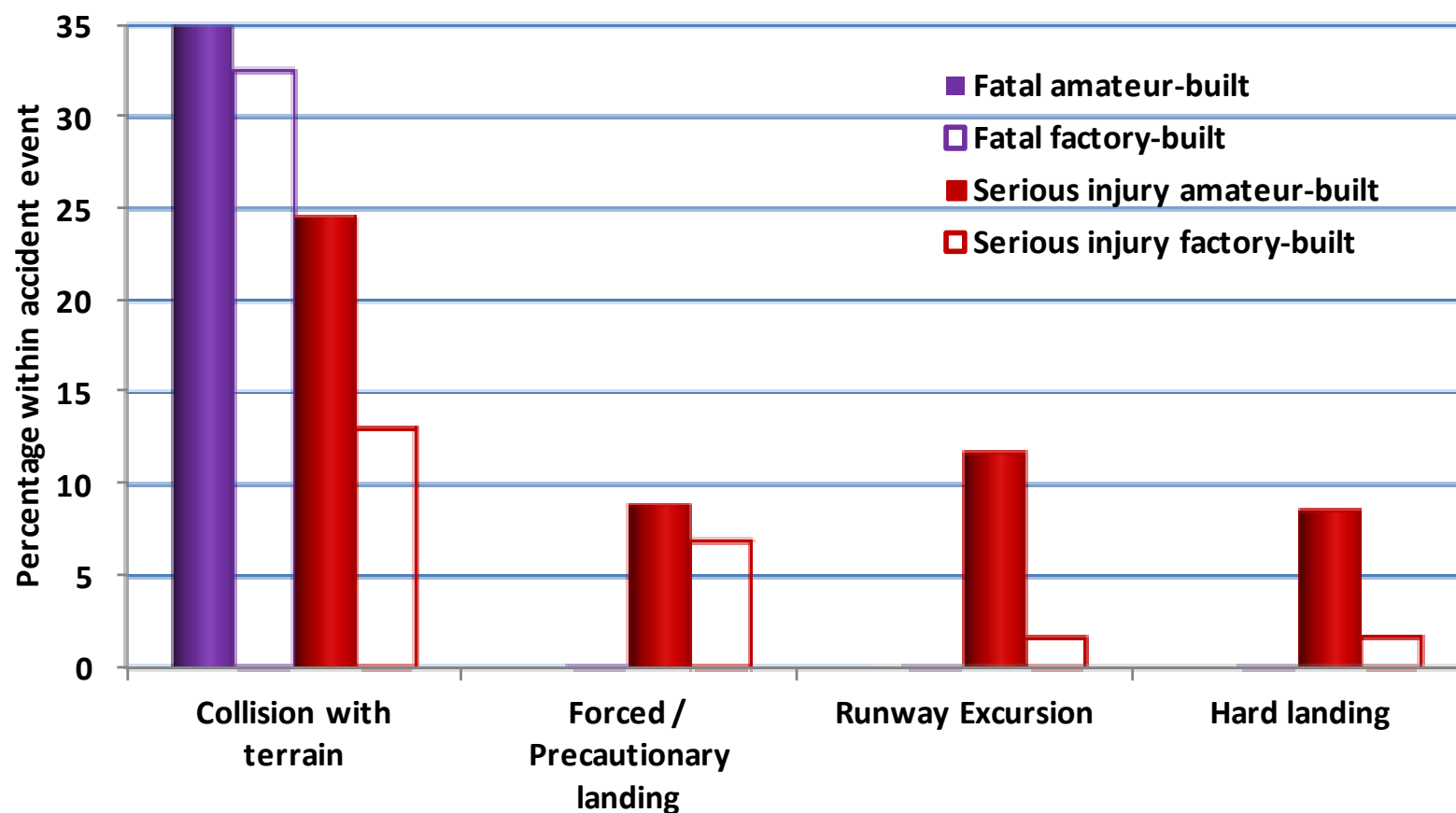
Factory-built aircraft



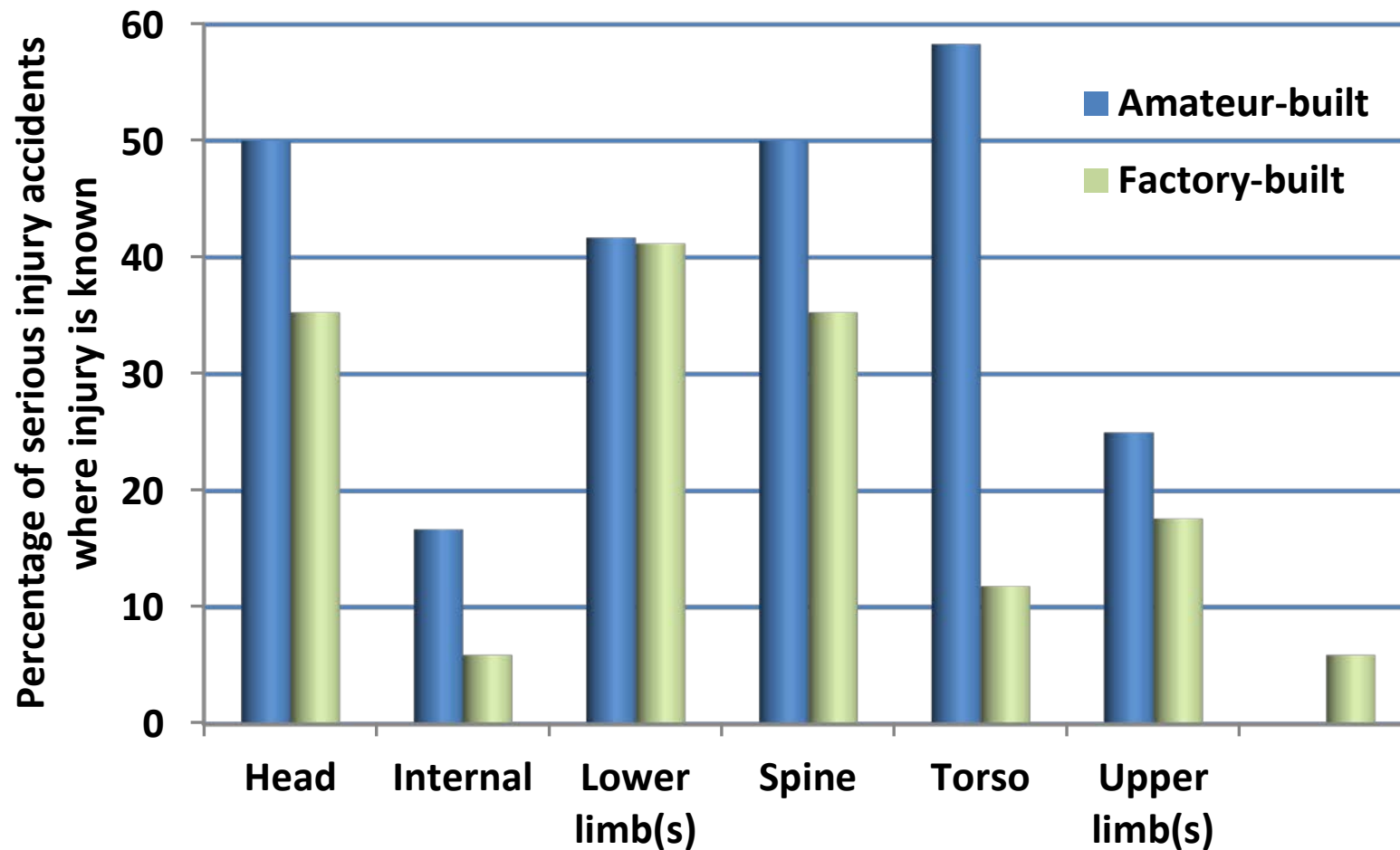
Accident events



Serious injuries



The nature of serious injuries



Survivability issues?



Atypical amateur-built aircraft accidents

Inflight breakups, aircraft modifications and control jamming

- Is not the reason the accident rate is higher
- Serve as reminders to take care during construction and flight.



Conclusions

When comparing with similar factory-built aircraft and operations, amateur-built aircraft accident(s):

- Accident rate 3 times higher, fatal/serious injury rate 5 times higher
- Three times more likely to include mechanically related problems
- Pilots were more experienced overall and less experienced on type
- Loss of control is one and a half times more common
- Serious injuries more common in comparable accidents

What has been done

The Sport Aircraft Association of Australia Action

- Working with the Civil Aviation Safety Authority to provide a legal framework for better training in amateur-built aircraft, including instruction and transition training
- More detailed technical inspections prior to first flight
- Accepts all other conclusions and will work towards addressing all issues

Australian Transport Safety Bureau Action

- Established routine reporting to the SAAA for any accidents and incidents involving amateur-built aircraft

Questions

Thank you

