

# Situation Awareness and Stories in Experienced Pilots' Decision Making

"Superior pilots use superior judgement to avoid situations where they would have to rely on their superior skill"

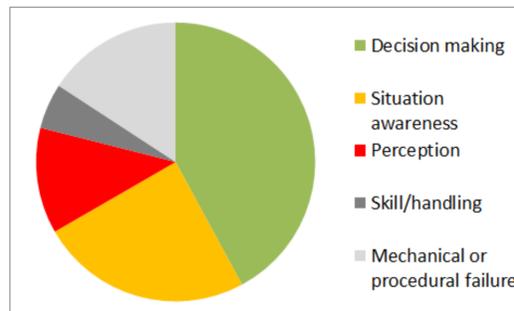
Frank Borman, NASA astronaut and US Airforce test pilot



## The problem:

Safety efforts in aviation have focused on technological reliability, procedures and routinization of pilots' tasks. While successful this has left a stubborn group of accidents, usually lumped under the catch-all category of "Pilot error"<sup>1</sup>

A prior study investigated gliding aviation accidents between 2010 and 2014. More than 80 % of accidents could be attributed to psychological factors, particularly in decision making and situational awareness<sup>2</sup>.



Accidents, 2010-2014 by underlying cause (Brunsgaard, 2015)

## Aims of the current study:

Aviation accidents are rare. Thus they only provide limited data, and can only identify causes, not cures. Instead, the current study investigates how expert pilots routinely make successful decisions that prevent accidents<sup>3</sup>.

The study aims to provide an analysis of:

- Types of decision making processes employed
- Cognitive foundations and knowledge structures in pilots' decision making
- How expert pilots learn and develop good decision making skills

## Method and participants

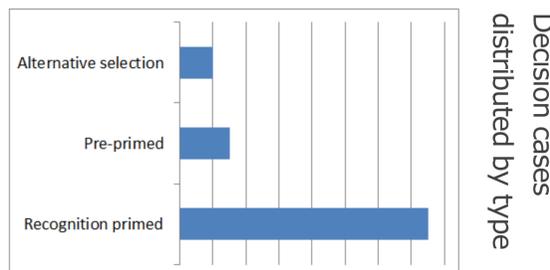
Highly experienced Danish glider pilots were recruited for the study (mean age = 53, mean flight experience = 36 years/1900 flight hours, all male). All held instructor's ratings and had competition experience at national or international level.

Based on Flanagan's *Critical Incident* technique pilots were asked to select and recall incidents that had been handled successfully, but in other similar cases had led to accidents. The incidents were explored in-depth using iterative structured time-line based interviews, adapted from Klein et al.'s *Critical Decision Method*<sup>4</sup>. This identified critical decision points, situational cues, decision processes and information recalled and used in the decisions.

## Decision making

The majority of decisions came directly as a result of recognition of the situation, not from conscious analysis or evaluation of alternatives<sup>5</sup>. Pilots report:

- Problematic aspects of situation presented itself without analysis.
- Solution presented itself without conscious thought as "the obvious thing to do".
- Alternative solutions were rarely considered.
- Entering into known critical flight phases pilots pre-primed themselves for solutions to specific possible events.
- Situations were not perceived as dangerous until on later reflection. The solutions that presented themselves made situations appear as "just another day at the office".



## Cognitive foundations

- Pilots perceived situation in their totality, rather than attend to specific cues<sup>6,7</sup>.
- Salient aspects of situations were primarily functional, not perceptual.
- Outcome of decisions were evaluated based on mental simulations pre-decision, rather than on post-decision monitoring of events<sup>8</sup>.
- Situations were evaluated based on match with prototypical cases recalled from memory along with prototypical solutions.

## Learning

- Learning NOT to do things wrong is different from learning to do things right<sup>9</sup>.
- Knowledge of risk and potential negative outcomes of situations were not based on actual personal experience.
- Pilots referred to risks inherent in prototypical situations by retelling "war stories" of other pilots' experience<sup>10</sup>.
- Stories were not recalled during actual decision cases but served to classify situations and aid situation recognition.
- Stories represented negative knowledge, i.e. knowledge of what NOT to do in a given situation<sup>11</sup>.
- Storytelling was seen as an integrative social practice.

## Implications for practice: pilots' training



Training in *Pilot Decision Making* (PDM) is often prescriptive, based on a rational/utility concept of decision making, involving posing alternatives, step-by-step evaluation, optimal solution selection, and continuous monitoring and re-evaluation. The study suggest that this is not the way experienced pilots make time-critical inflight decisions.

Results support the view that traditional PDM training could benefit from including *recognition primed decision making*, involving scenario-based training and the use of stories as scaffolding to establish situation recognition<sup>12</sup>.