Manual Flying Skill Proficiency

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Project Origins

- Flight Operations Research Centre of Excellence

- 2004 – 2009

- Automation effects research program

- Manual flying skill proficiency was a sub-issue

The Premise

- Highly automated flight decks have huge safety benefits

- Because of these advantages automation is employed extensively

- System evolves to favour or even necessitate the use of automation

- Training opportunities are constrained & prioritised

- Very little opportunity for crews to exercise 'manual flying skills'

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The Premise

- We know from laboratory studies that skills can degrade through 'out of the loop unfamiliarity'

- Lots of anecdotal evidence and concern that skills are not adequate to support requirements

- Very little empirical evidence in an aviation context

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Manifestations

- Manual flying practiced inappropriately
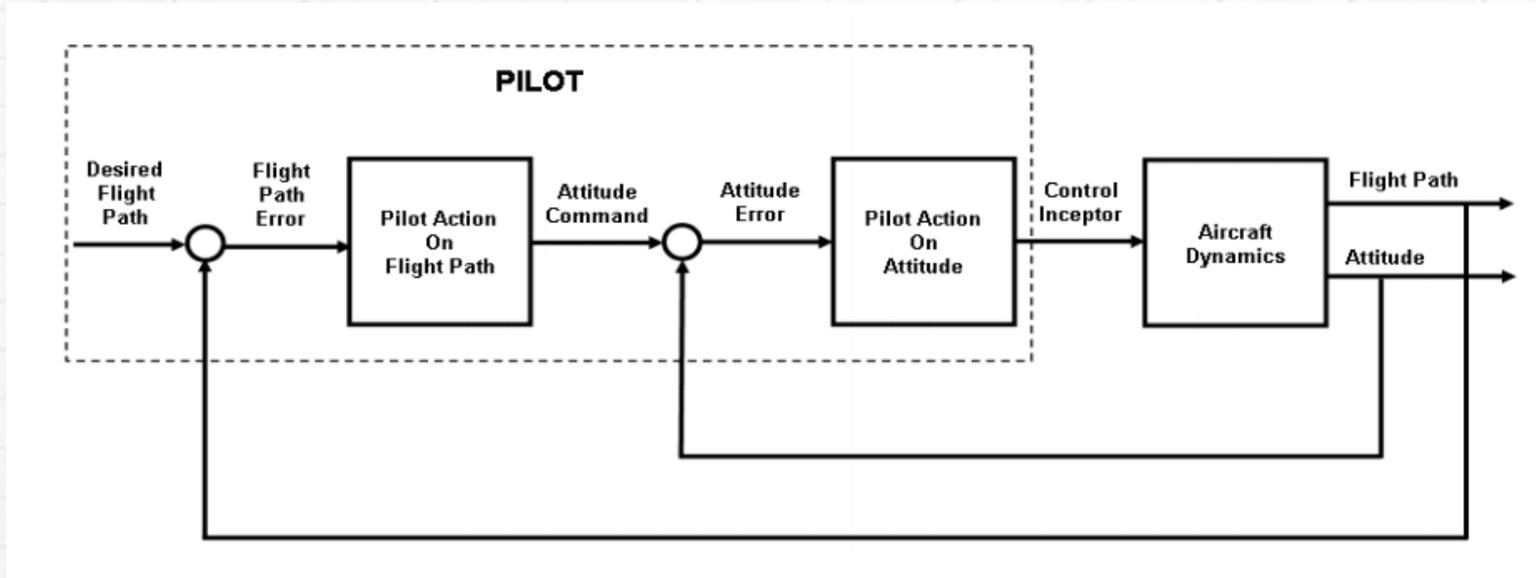- Reluctance to reduce the level of automation

Research Required

- FORCE wished to generate empirical evidence to evaluate risk

- How does manual experience relate to manual skill?

- Are particular pilot groups more or less vulnerable?

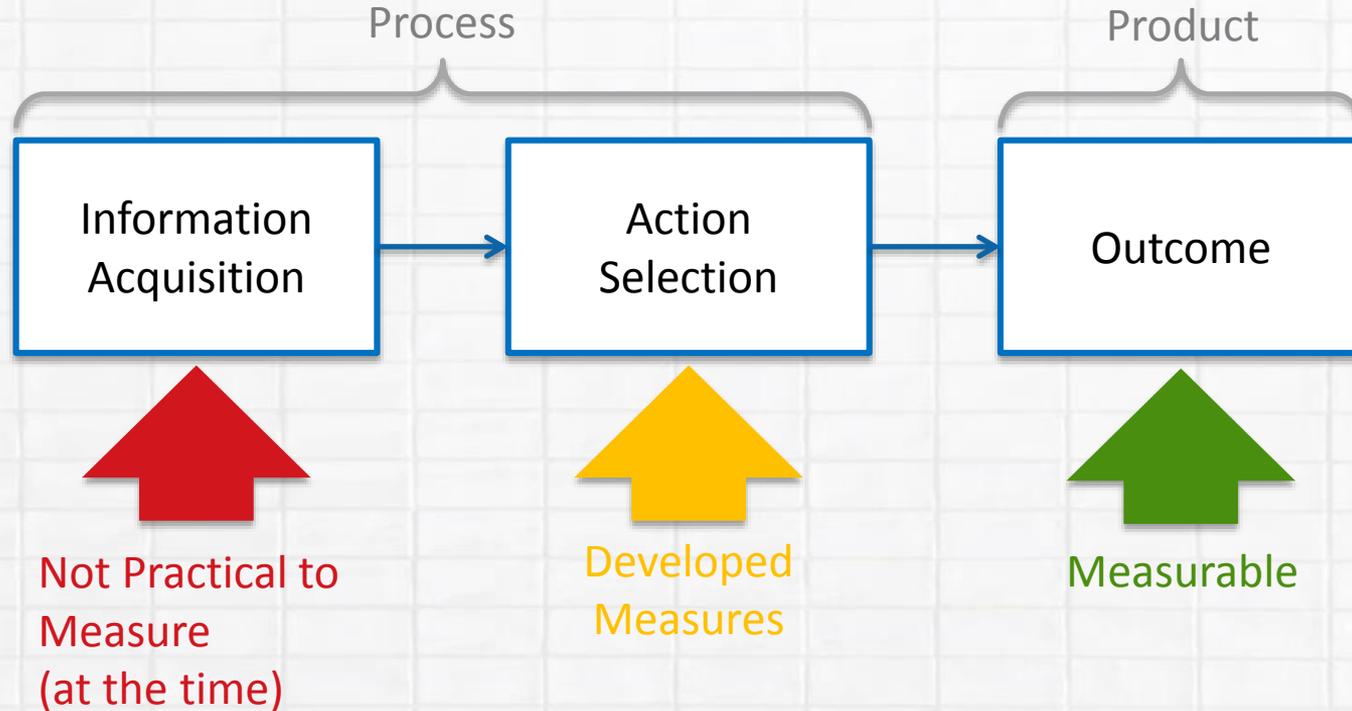- How do we measure manual flying skills objectively?

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Manual Flying Skills

- The ability of the crew to do the following in the absence of flight path control or management automation

  - Gather and interpret information to determine the aircraft's status

  - Plan a trajectory and energy profile to meet goals

  - Manipulate the primary flying controls to assure the achievement of that profile

- Note both the psychomotor and cognitive components

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Manual Flying Skills

Measuring Manual Flying Skills

Process

Product

Information Acquisition → Action Selection → Outcome

Not Practical to Measure (at the time)

Developed Measures

Measurable

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The Study

Manual Flying Tasks
737-300 Simulator

66 Crew

Data

Flight Data

2 x TRE Observations

Crew Logbooks

Metrics

Objective Flying Performance

Behaviourally Anchored Performance Evaluations
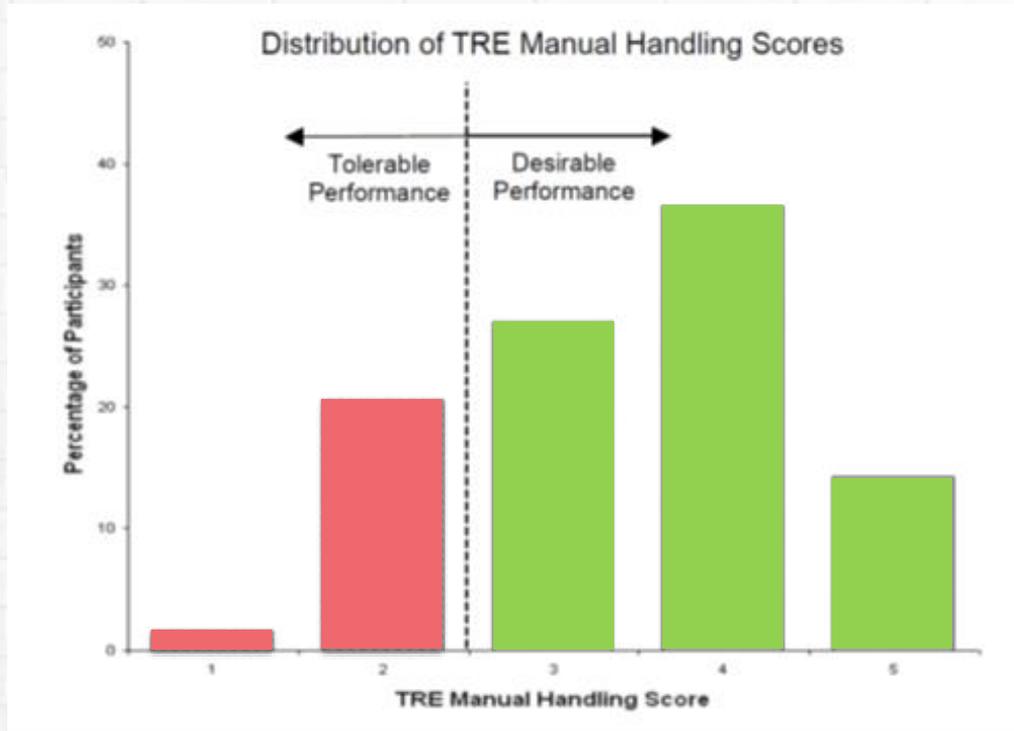
Manual Flying Experience

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Findings

- Crews had a broad range of;

    - general experience

    - exposure to highly automated aircraft

    - recent manual flying experience

- Manual flying performance varied amongst crews

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Findings

Distribution of TRE Manual Handling Scores

Findings

- Relationships between experience and performance

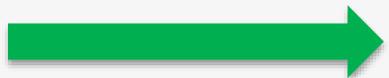|		
Total Flying Hours	→	No correlation with performance
Long Term Automation Exposure	→	No correlation with performance
Recent Manual Flying Practice	→	Correlation with tracking performance and control strategy refinement across the task profile

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Summary

- We observed large variation in manual flying ability, a sizeable proportion below where it should be

- Ability was related to the level of recent manual flying practice, not necessarily to general career experience

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Questions?