UNIVERSITY OF LIVERPOOL

WP2: Flight simulation and training

Drs. M. Jump, M.D. White, P. Perfect, L. Lu
and Mr. M. Jones

mycopter

http://www.mycopter.eu

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Objectives

- To build a medium to high fidelity simulation model of a likely PAV configuration.
- To quantify the flying qualities and training requirements for various levels of PAV response characteristics

A Handling Qualities Approach

- Handling Qualities – "*those qualities or characteristics of an aircraft that govern the ease and precision with which a pilot is able to perform the tasks required in support of an aircraft role*"

- Approach from: ADS33E-PRF, Aeronautical Design Standard Performance Specification Handling Qualities Requirements for Military Rotorcraft → 'state-of-the-art'

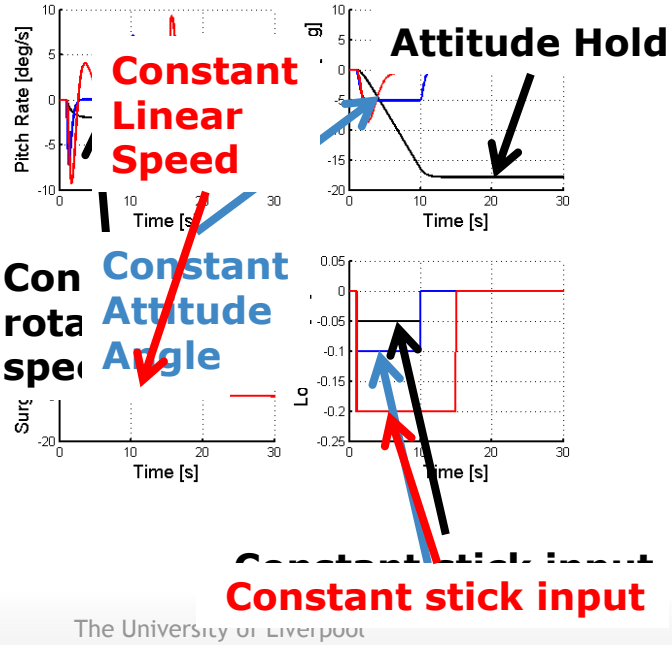
Simulation Environment

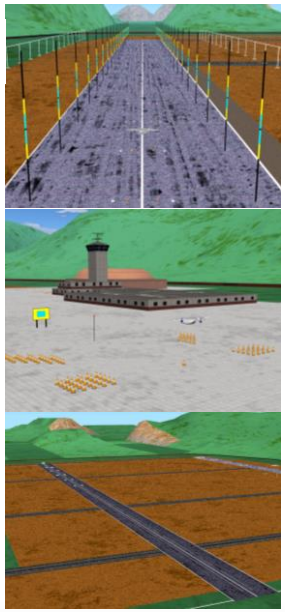
- To meet the WP objectives…

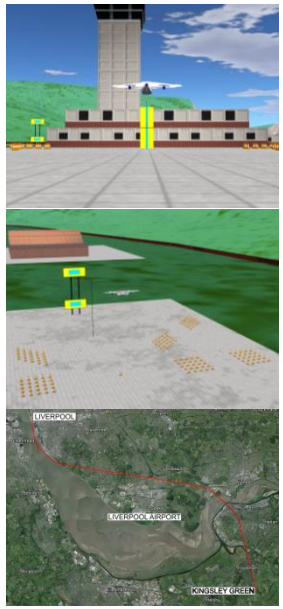
Flight Dynamics Simulation Models

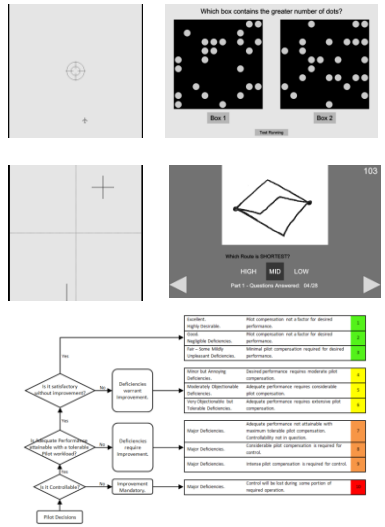
Virtual Test Environments / Courses

Test Subject Assessments



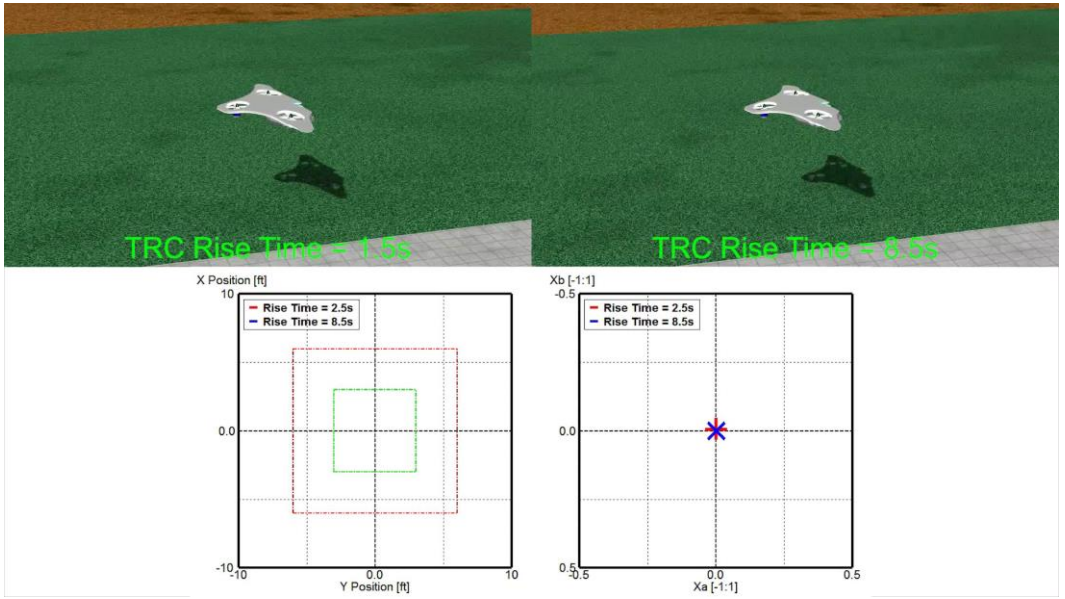






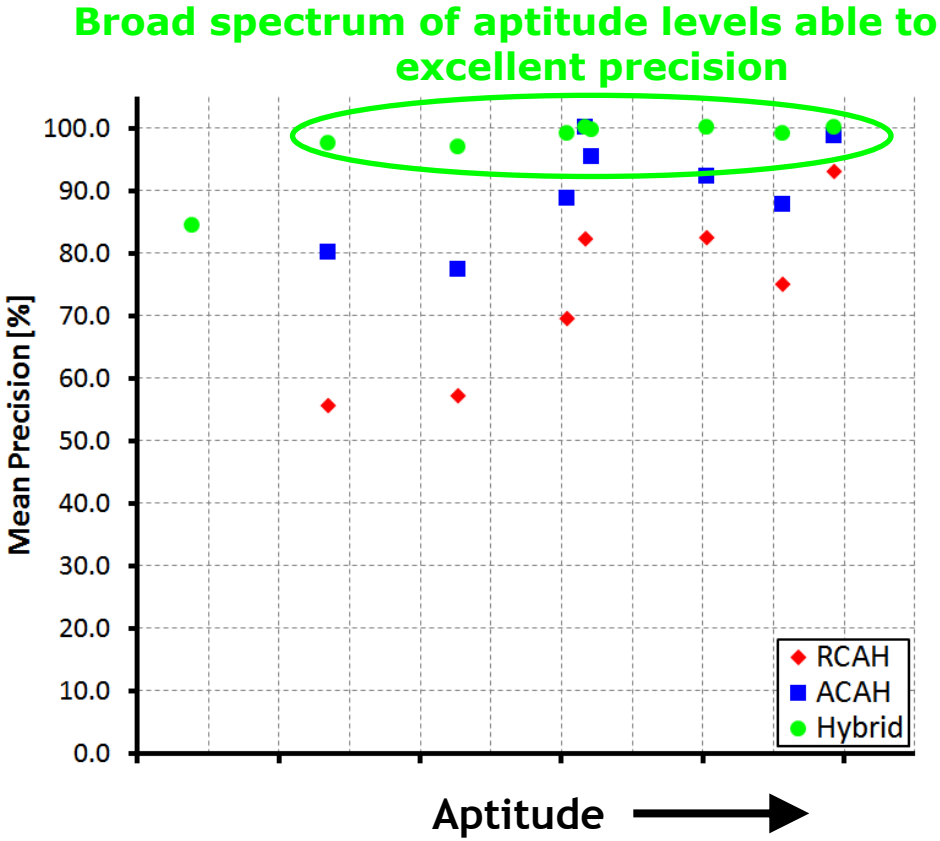
Handling Qualities Evaluations

- A range of response types, configurations and control characteristics were evaluated in simulation to find the ‘optimum’
- E.g. ‘rise time’ for translational rate command system response



Handling Qualities Evaluations

- The research showed that the Translational Rate Command (TRC) response type of a 'Hybrid' system was most suitable for use on a future PAV for hover and low speed flight in benign and harsh conditions

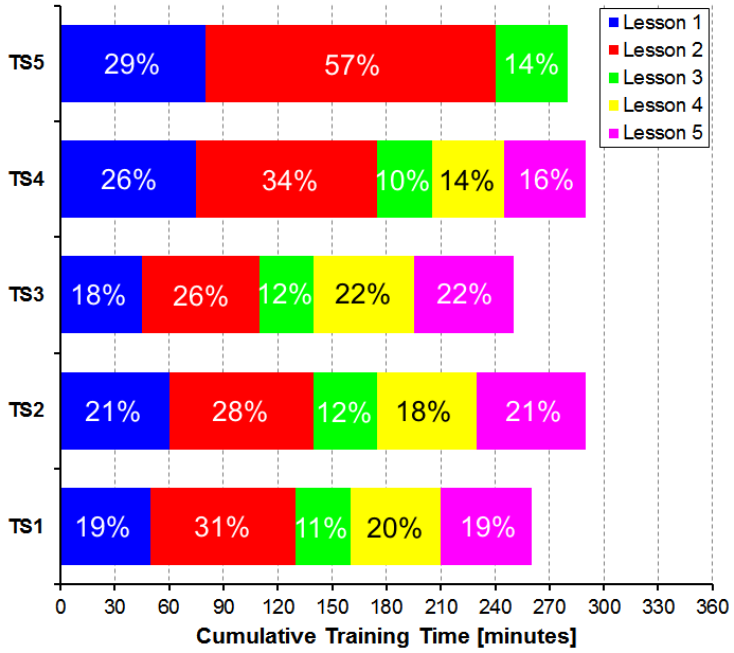


Training Programme

- Existing relevant (UK) syllabi and philosophies for driver and private pilot training were reviewed
  - Interview with Driving Instructor instructors
  - Interview with Private Pilot instructor
- Training programme developed based upon this review

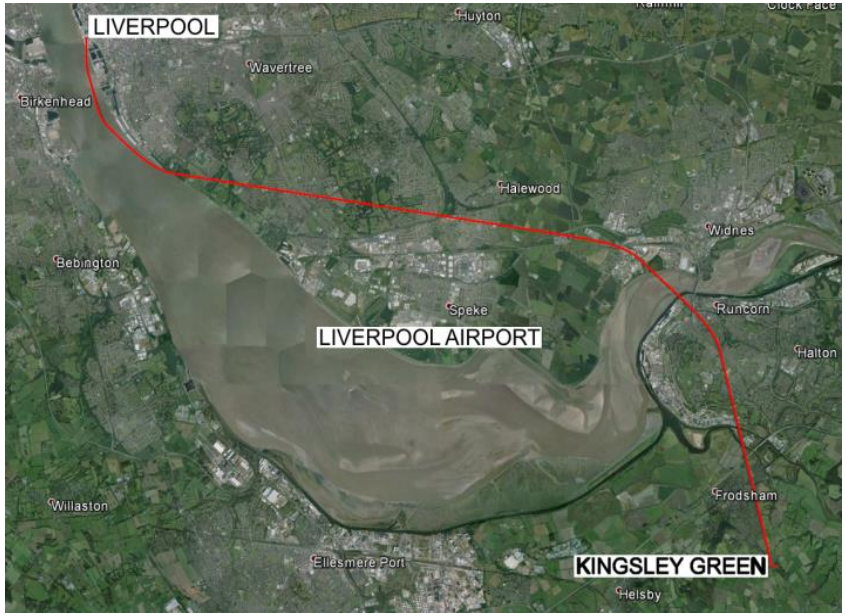
Training Programme

- 24 skills required to fly a PAV → 5 lessons created
- 5 test subjects (4 male, 1 female. Age 22 – 45. 5 – 25 years driving experience. No flying experience)
- 4 out of 5 completed the training in less than 5 hours



Training Programme

- Simulated ‘PAV Driving Test’ conducted to see if skills developed would allow the participants to fly a commute scenario



Key Results

- Quantify Response Types/Flying Qualities Requirements
  - → Different start point for professional/flight-naïve pilots in good conditions
  - → Same end point for professional/flight-naïve pilots in degraded conditions
  - → 'Hybrid' configuration found to be intuitive, selected for training program
- Training Requirements
  - → flight-naïve pilots can gain the required PAV handling skills in a 'reasonable' number of hours of training (in simulation).
- Use of conventional rotorcraft pedals as car-like controls
  - → showed promise to allow precise and easy PAV control.
- Approach profiles
  - → Flight-naïve pilots preference depends upon manual or automatic flight.

Thank you for your attention…