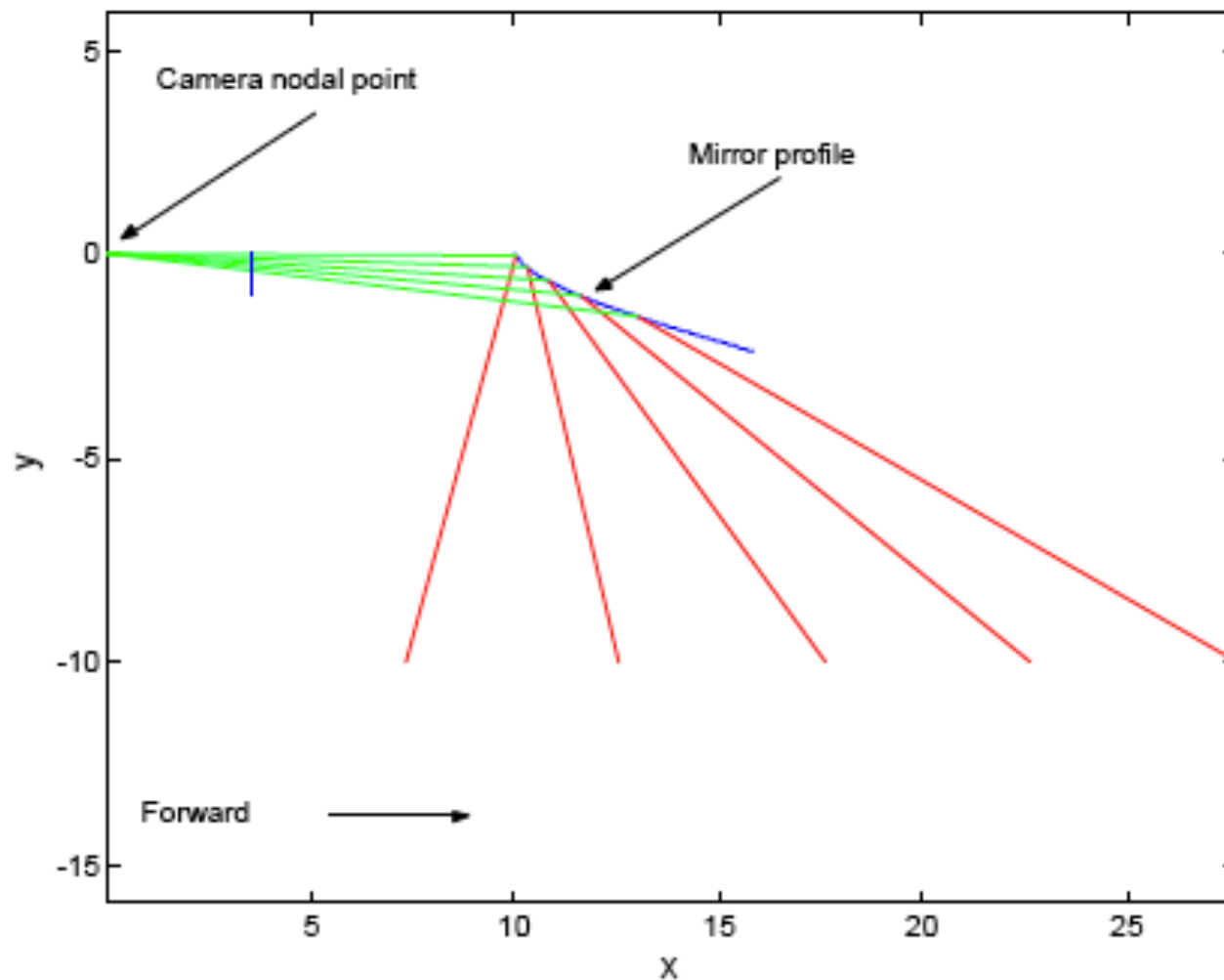
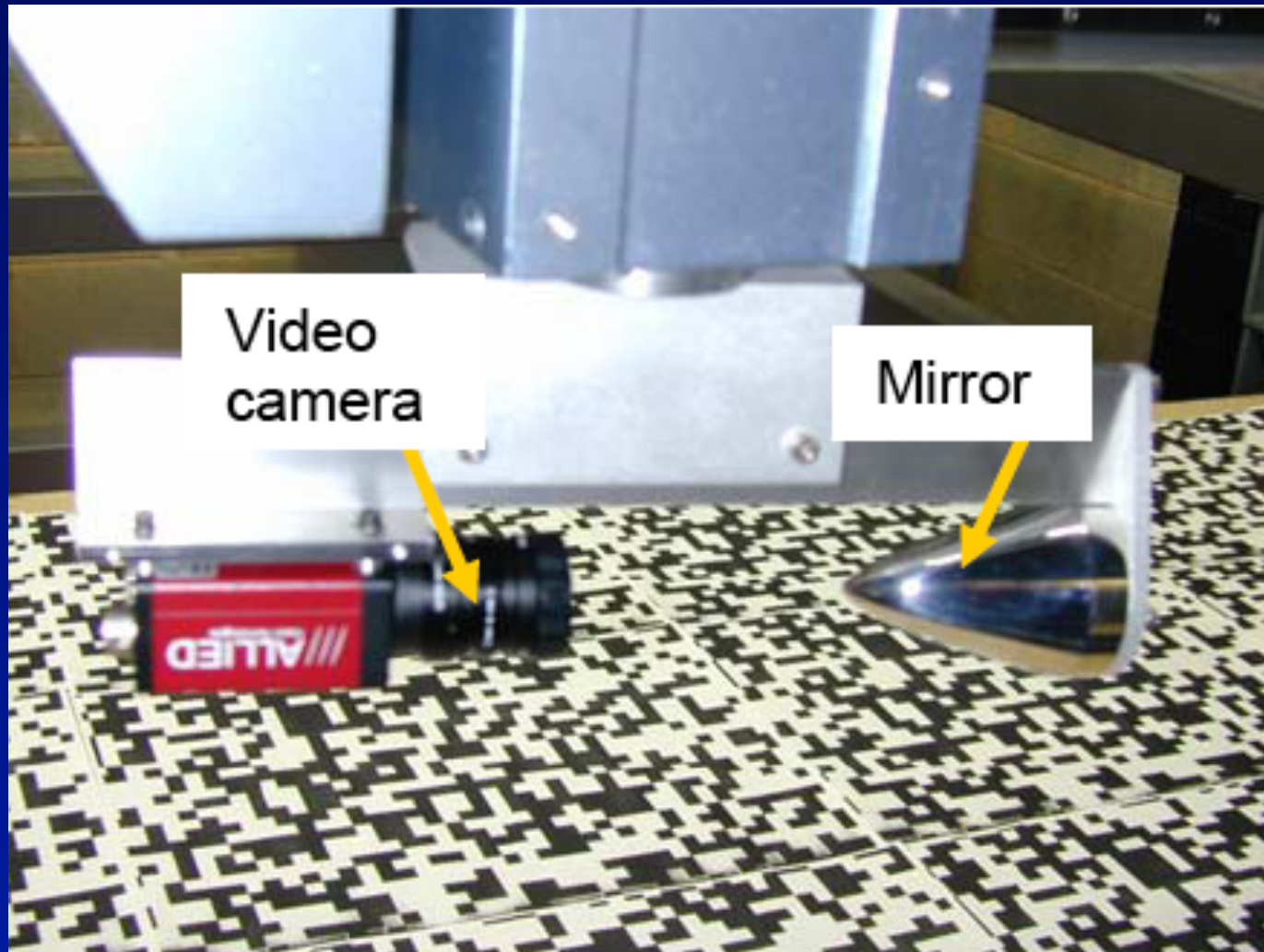


Illustration of vision system for visually guided terrain following and landing (not to scale). The vision system is shown on an enlarged scale relative to the aircraft in order to clarify its configuration.

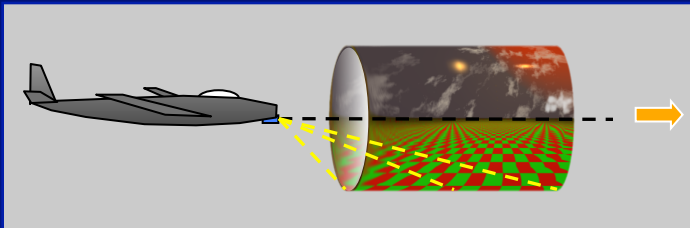
Design of terrain-following mirror profile



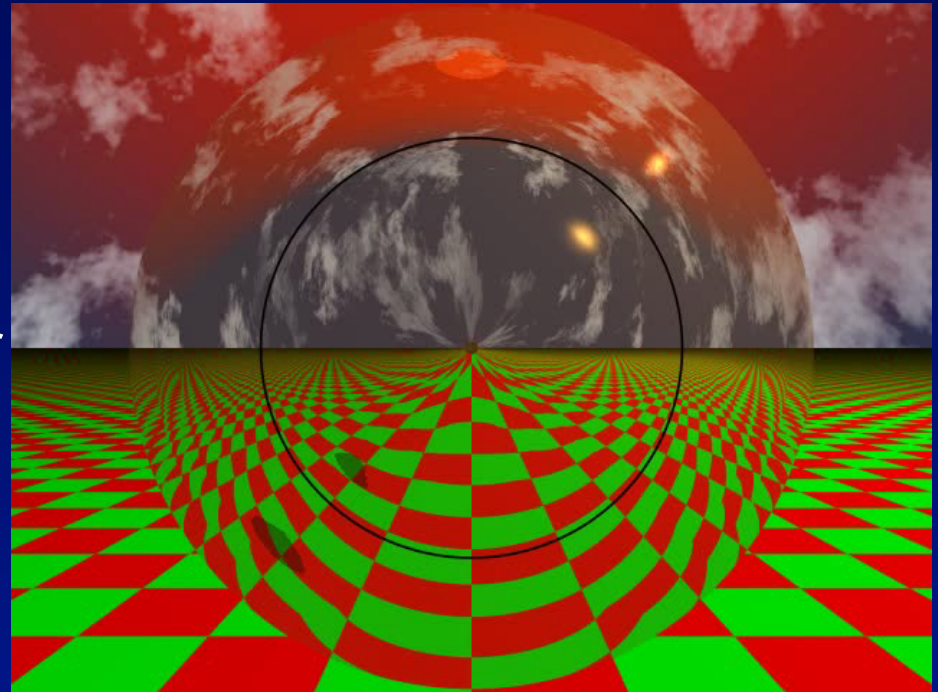


Imaging properties

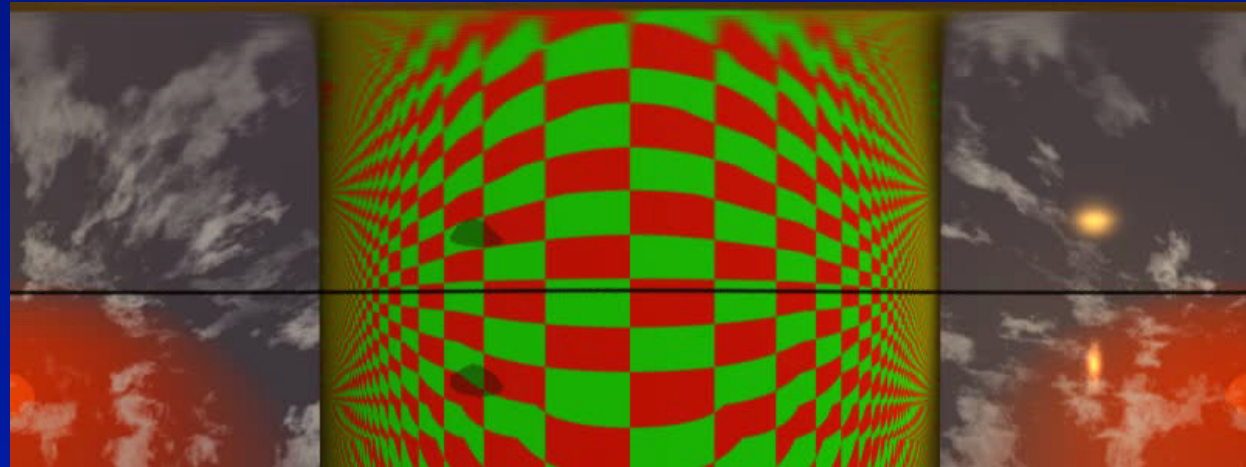
- *Removes perspective distortion*
- *Scales down image motion*
- *Defines a “collision free” cylinder*



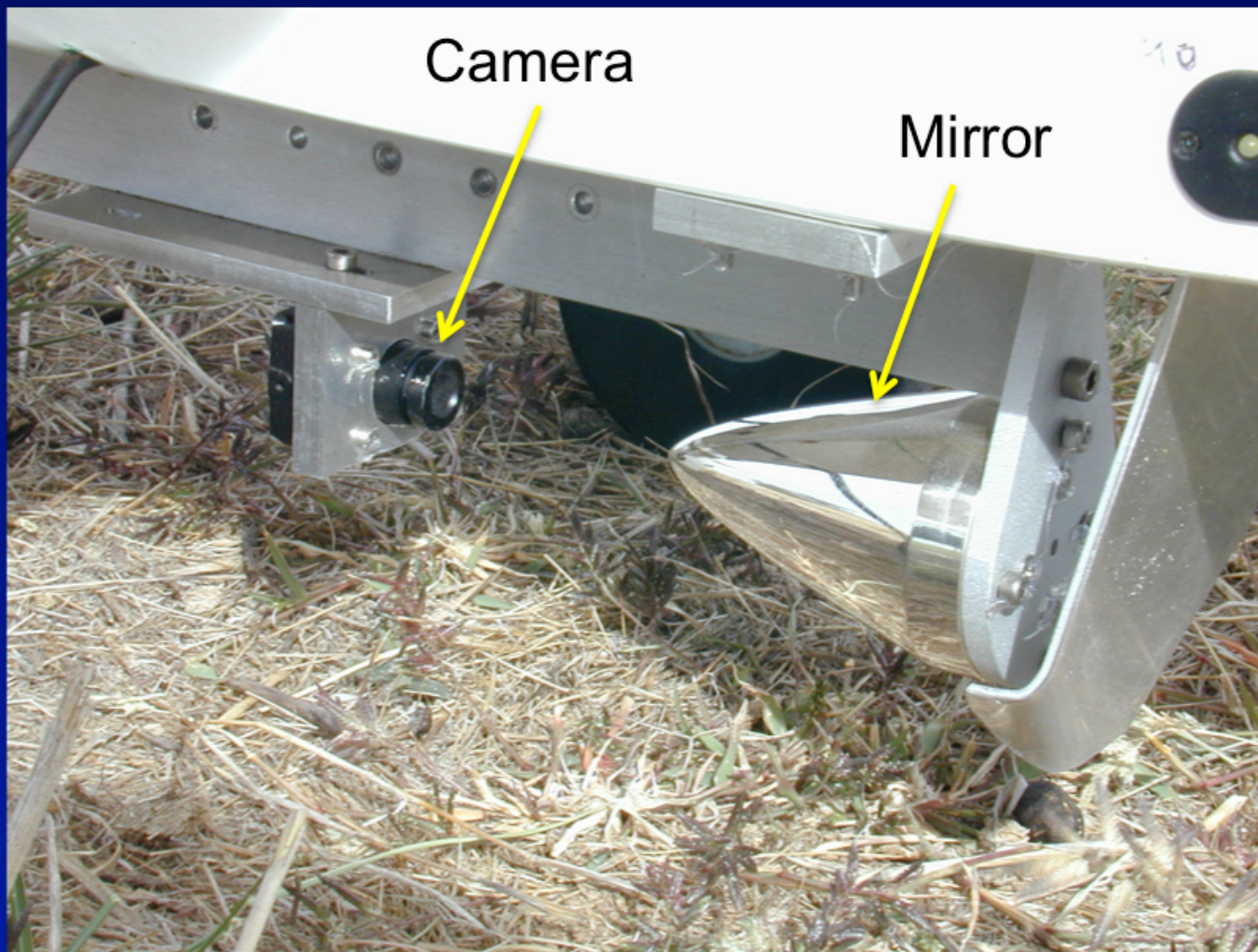
Centre of
mirror



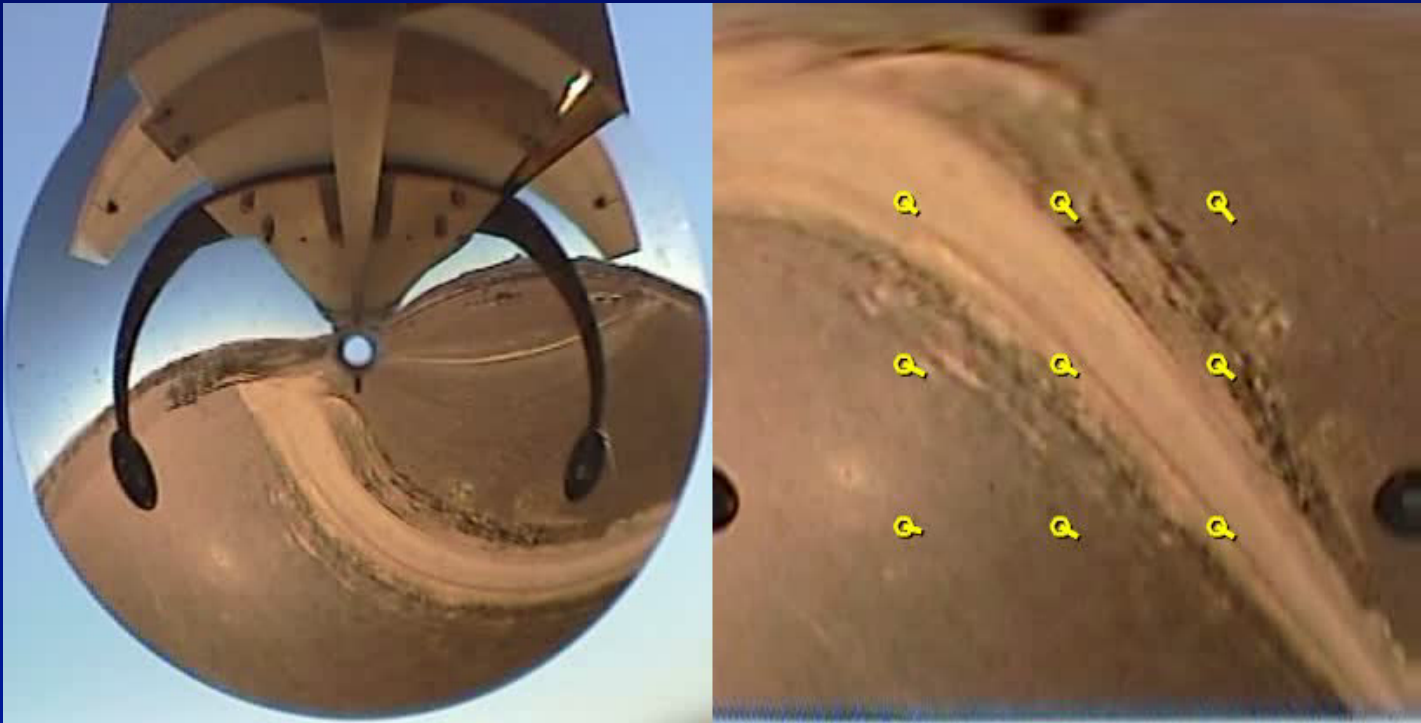
Work with
Saul
Thurrowgood
and Dean Soccol



Digitally remapped version

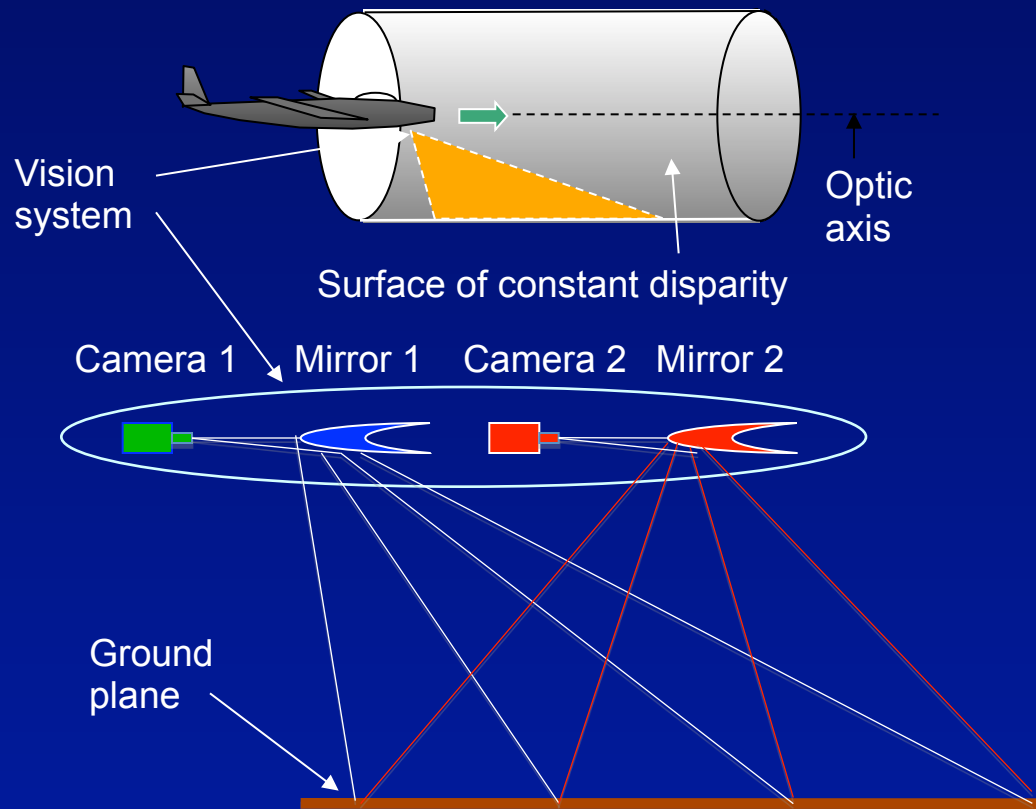


Flight test -1

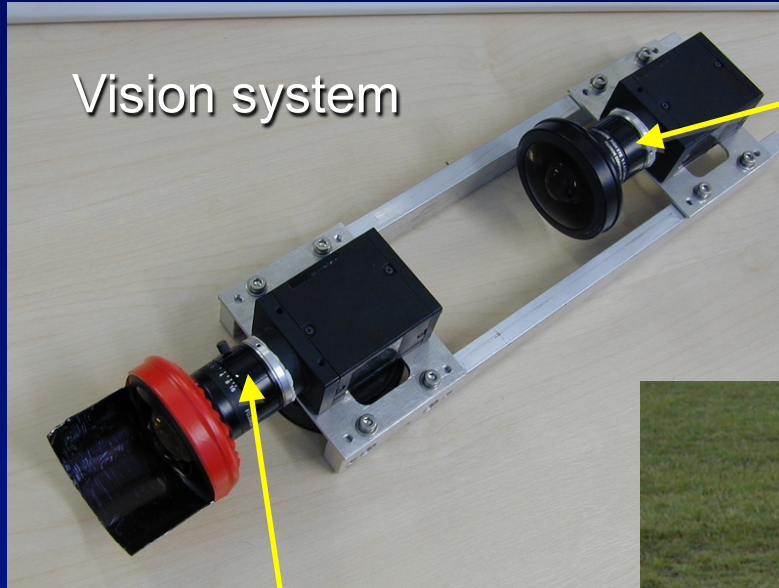


Work in progress with Saul Thurrowgood and Dean Soccol

Collision-free cylinder



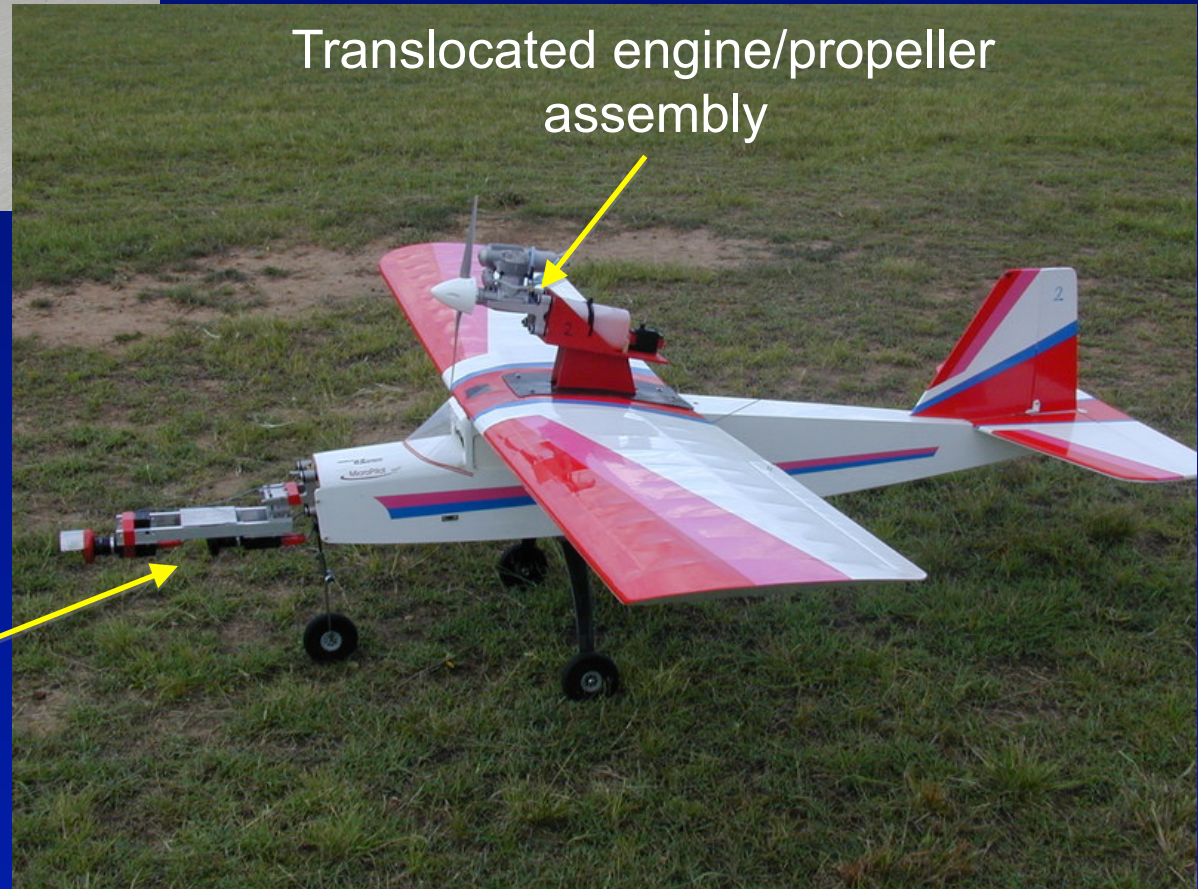
Moore, Thurrowgood, Bland, Soccol, Srinivasan (2009)



Vision system

Coaxial rear camera

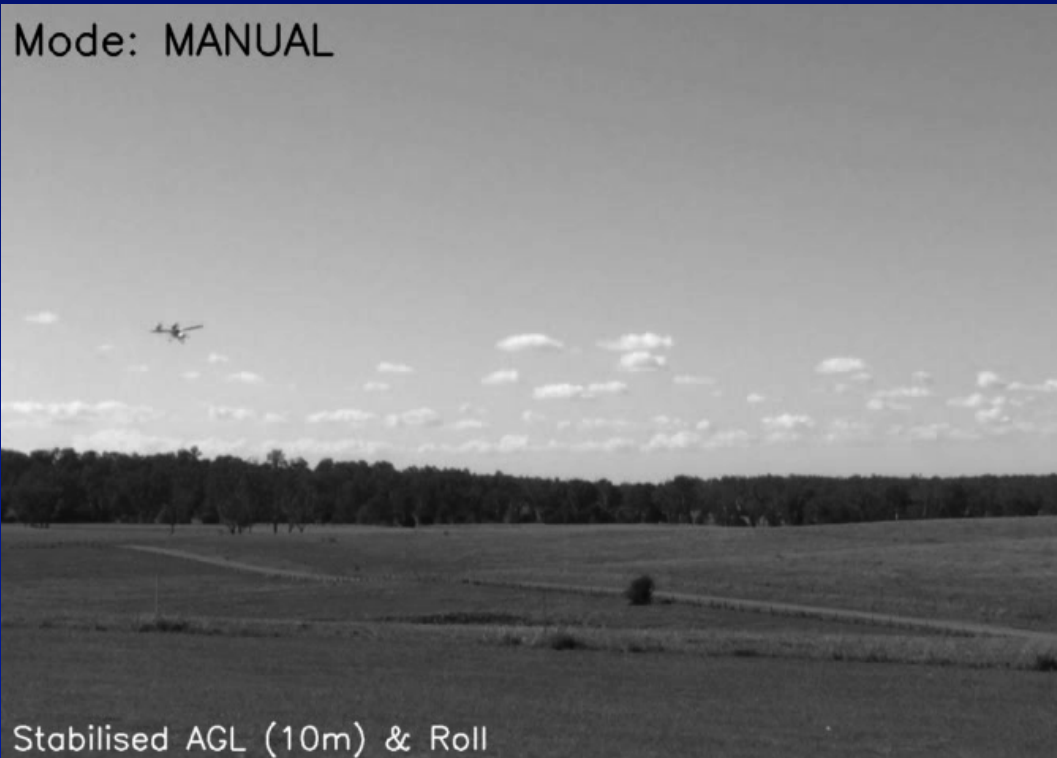
Front camera



Translocated engine/propeller
assembly

Vision system

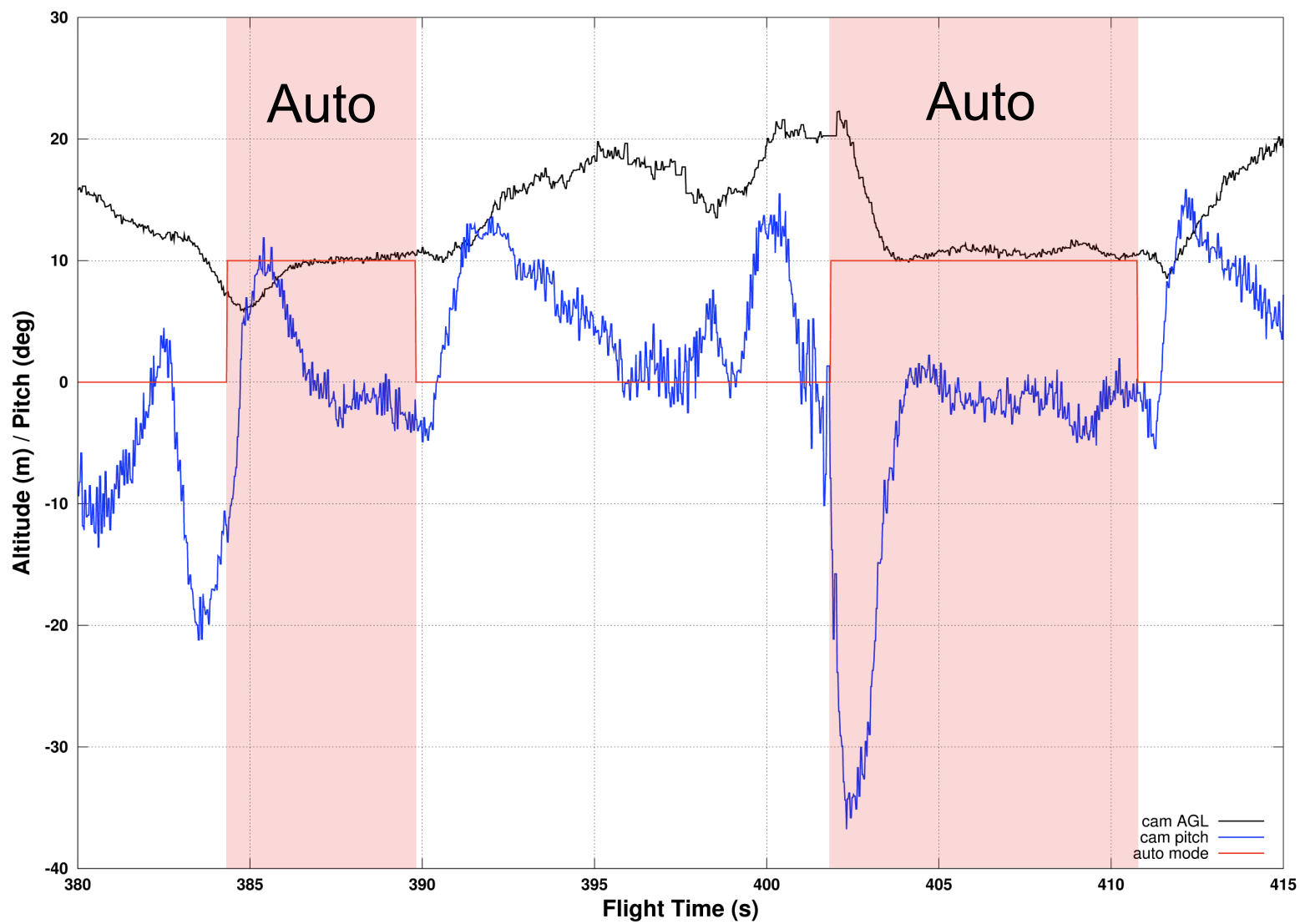
Closed loop flight test



Field view

Front camera view

Moore, Thurrowgood, Bland, Soccol, Srinivasan (2009)



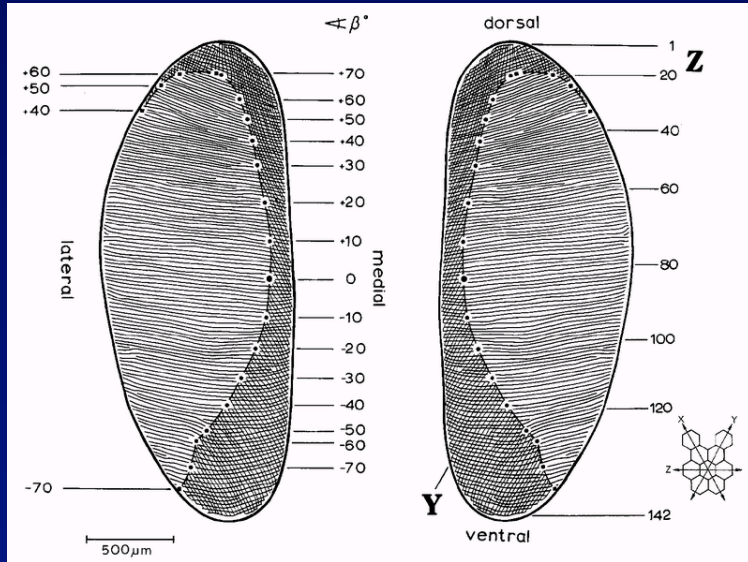
The Ocelli

Visual horizon sensing

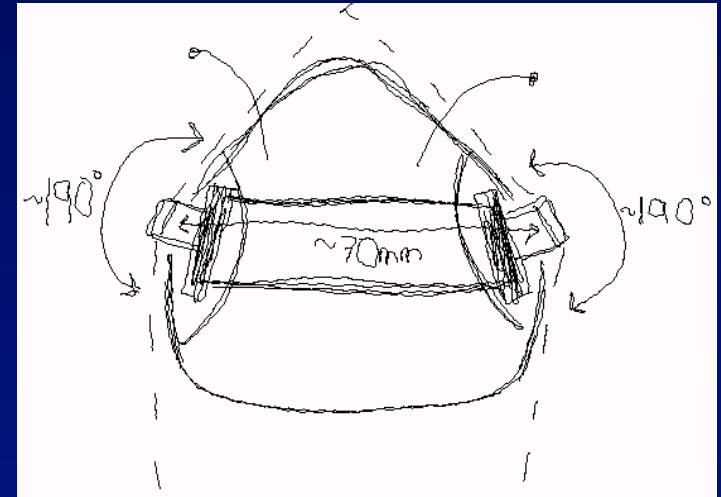


Image from Goodman (2000)

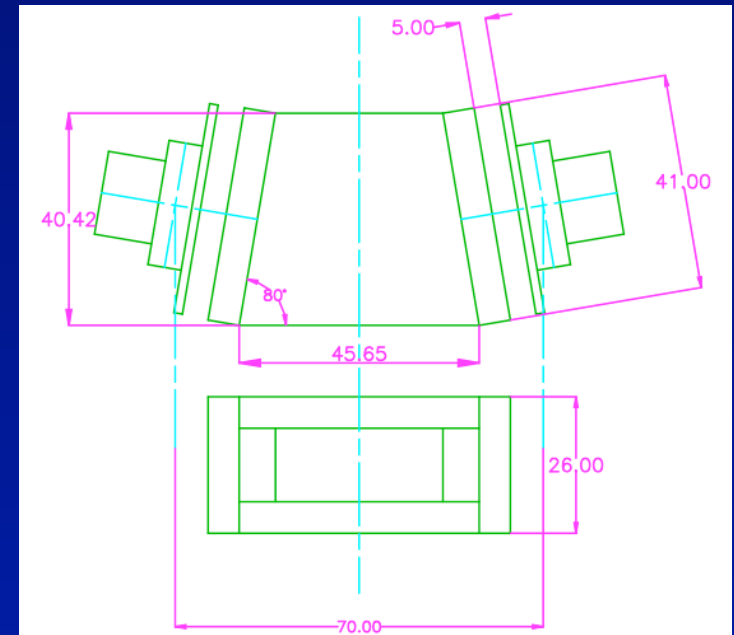
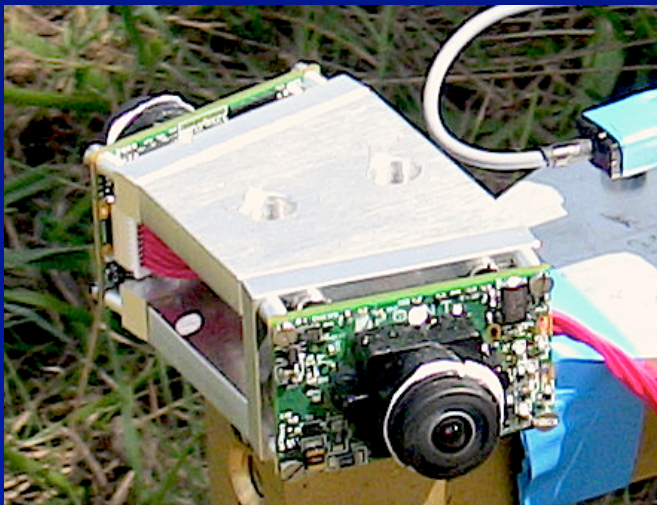
Bee Eye



IEye

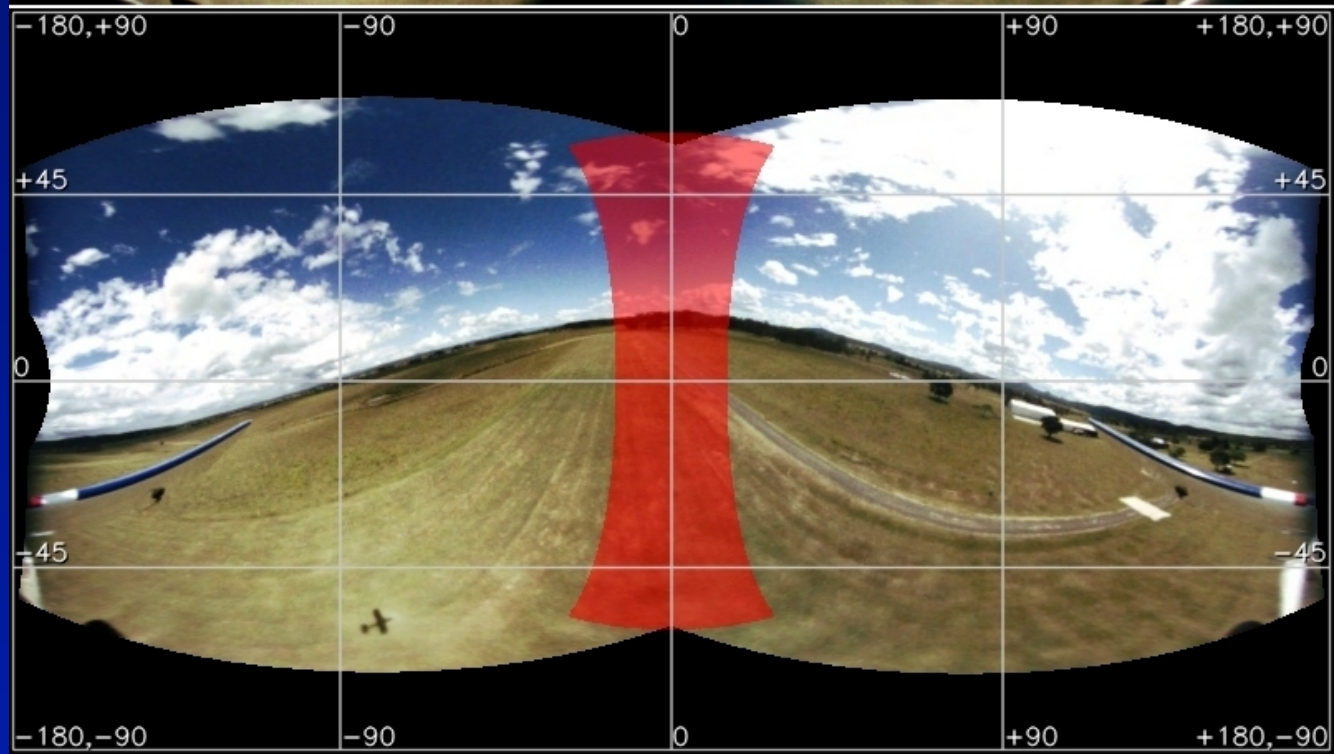
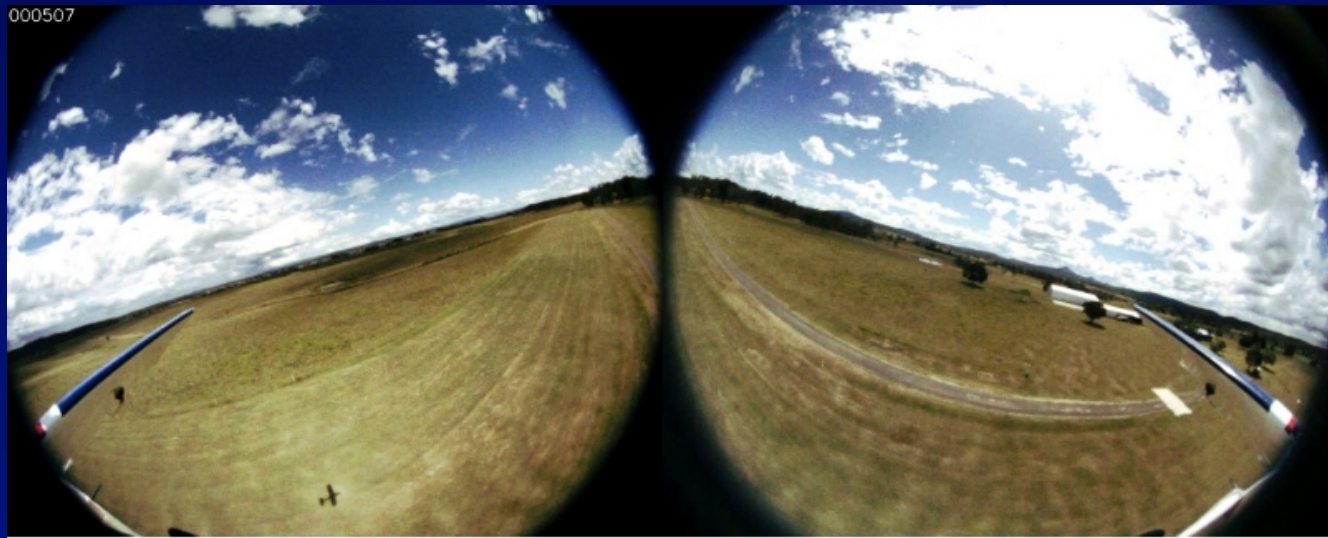


Design of I-Eye (right) to emulate the functionality of a honeybee eye (above)

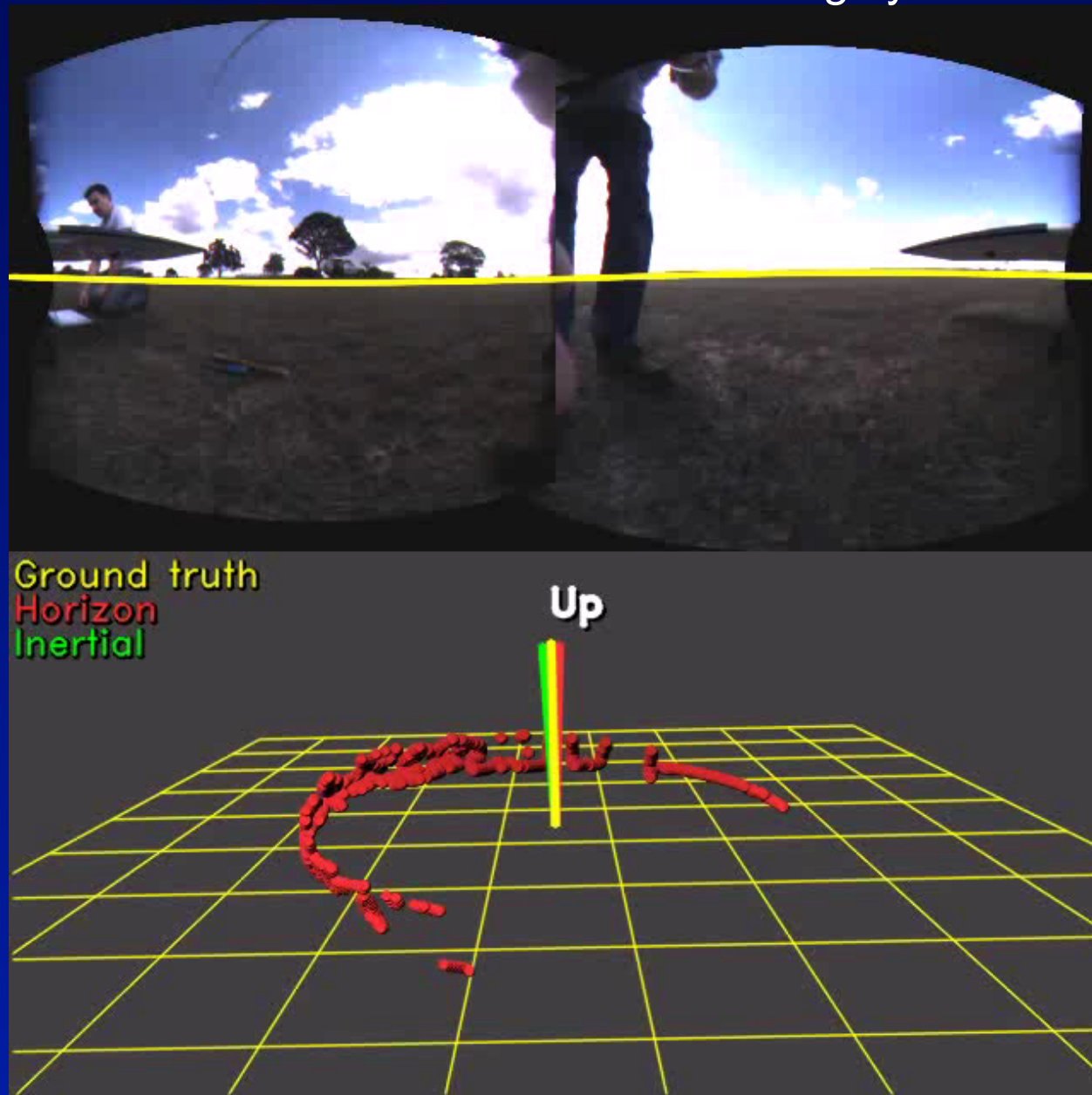


Thurrowgood, Moore, Bland, Soccol

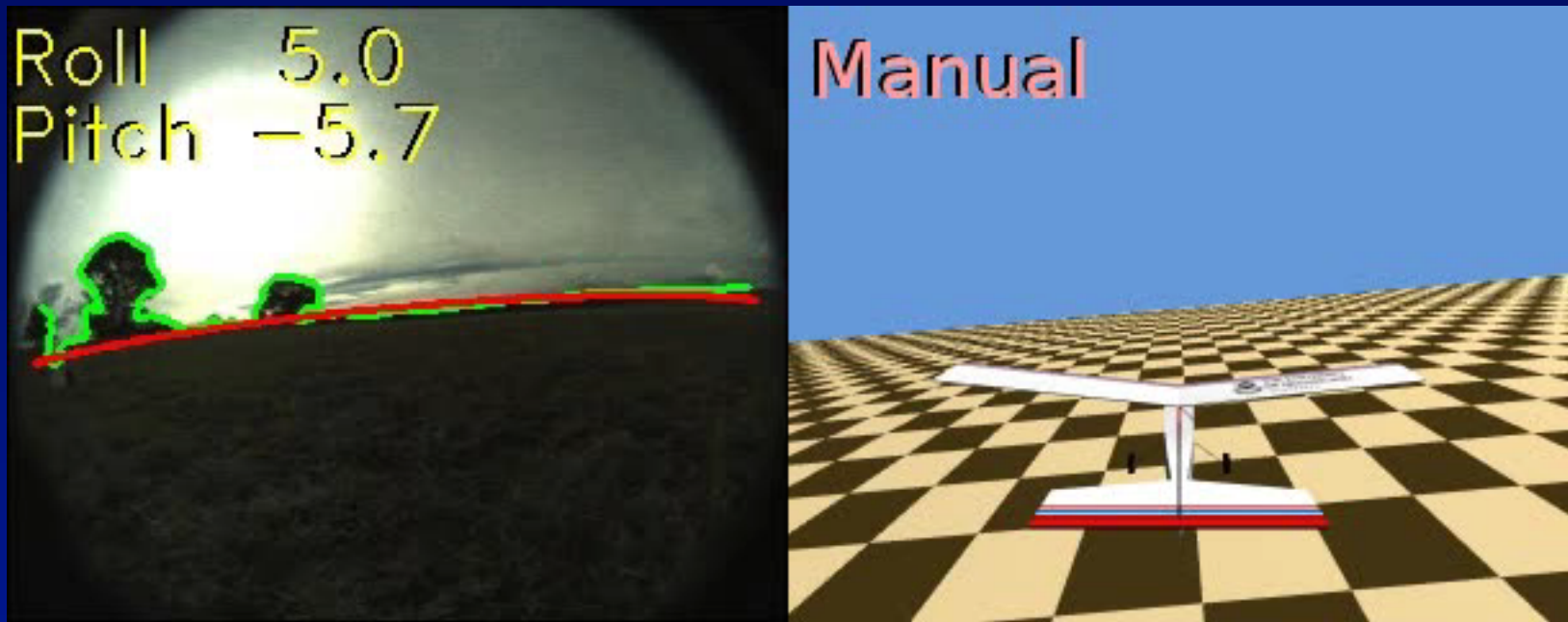
000507



Test of horizon-based attitude sensing system



Flight test: Horizon-based closed-loop control of roll and pitch



‘Manual’: Human pilot controls attitude

‘Automatic’: Horizon-sensing autopilot regulates attitude

(Roll: +40.0 deg; Pitch: -2.0 deg)

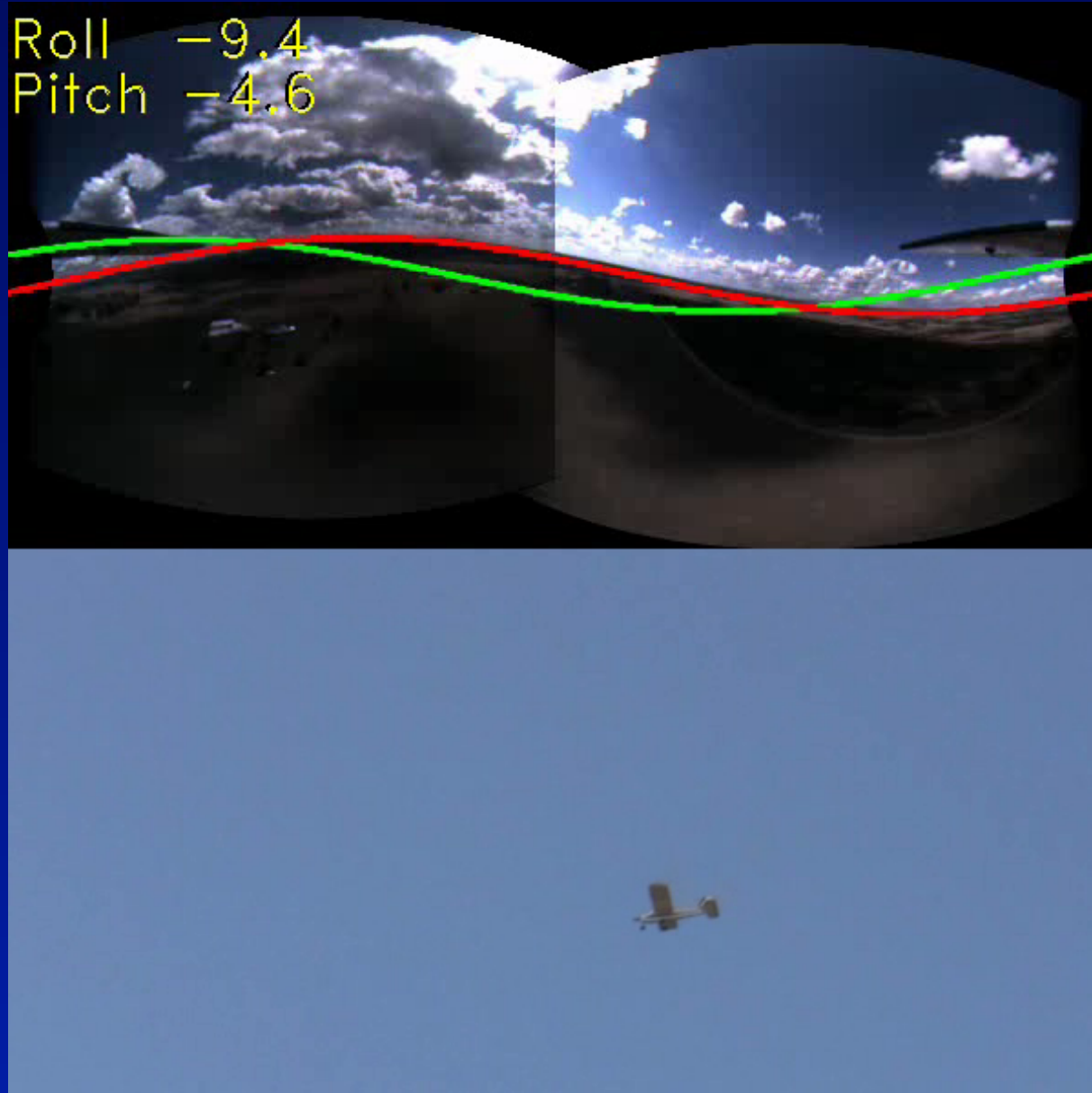
Thurrowgood, Soccol, Moore, Bland, Srinivasan (2009)

Example 1 Loop

Extreme maneuver accomplished autonomously by controlling the position of the horizon in the I-Eye vision system

Visual
horizon

Inertial
horizon

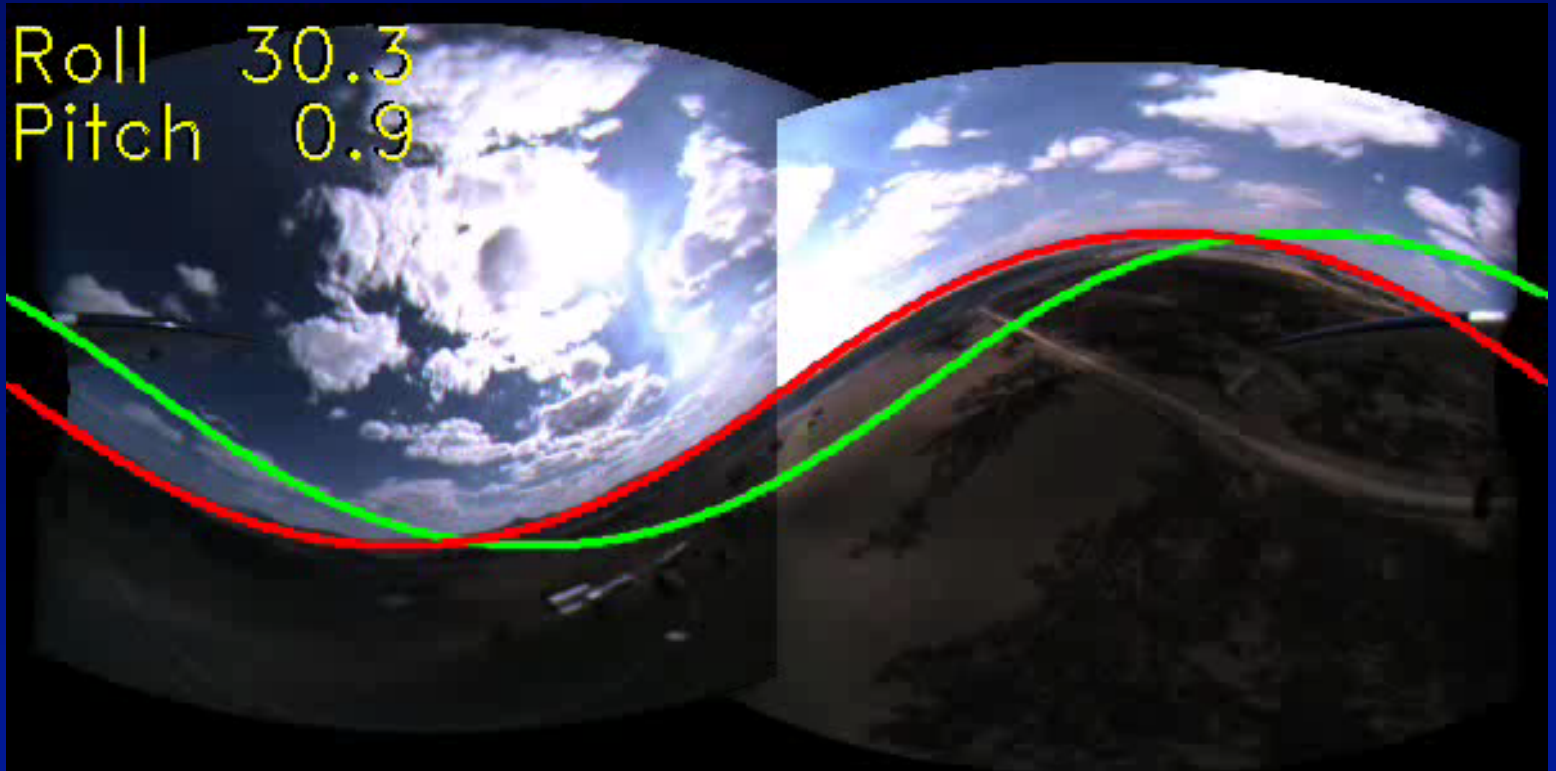


Thurrowgood, Soccol, Moore, Bland, Srinivasan (2011)

Extreme maneuver accomplished autonomously by controlling the position of the horizon in the I-Eye vision system

Visual
horizon

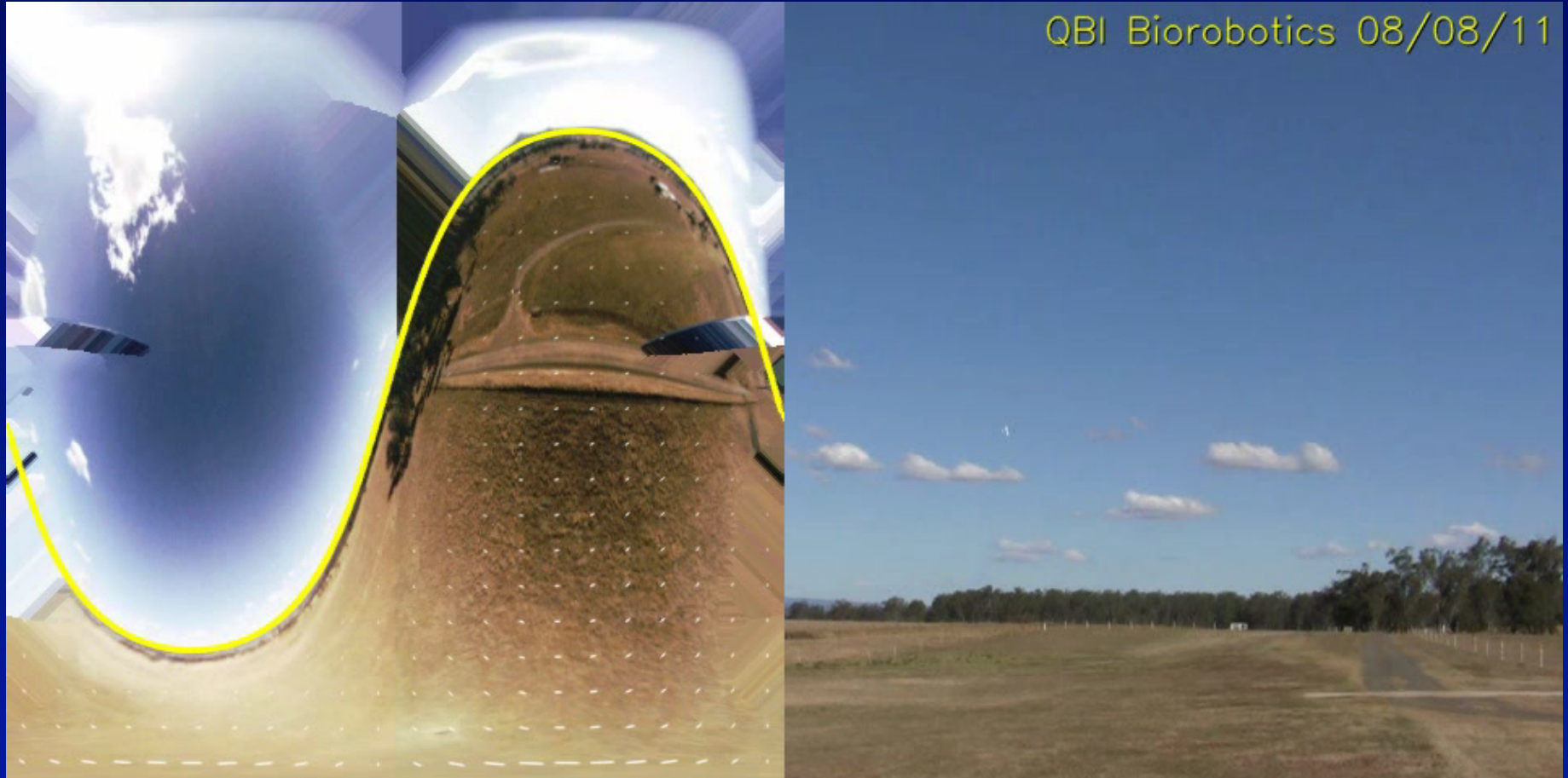
Inertial
horizon



Example 2 -- Immelmann maneuver

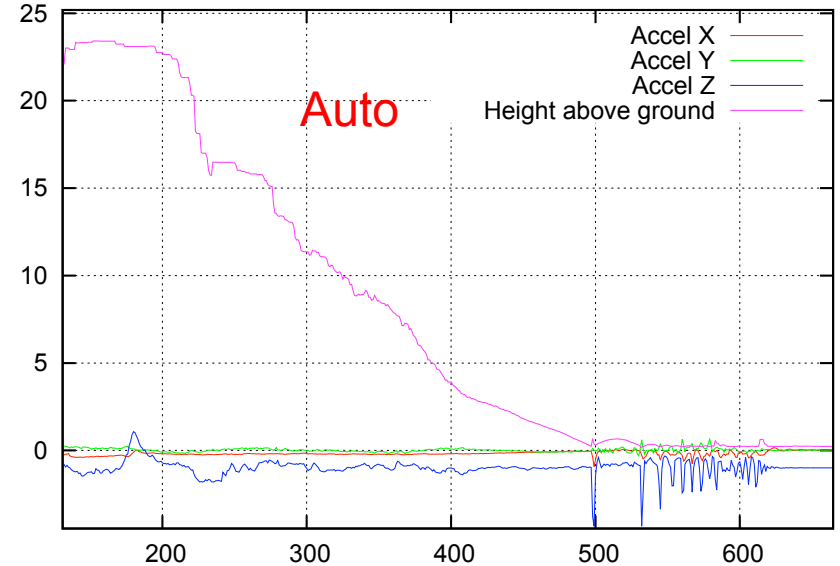
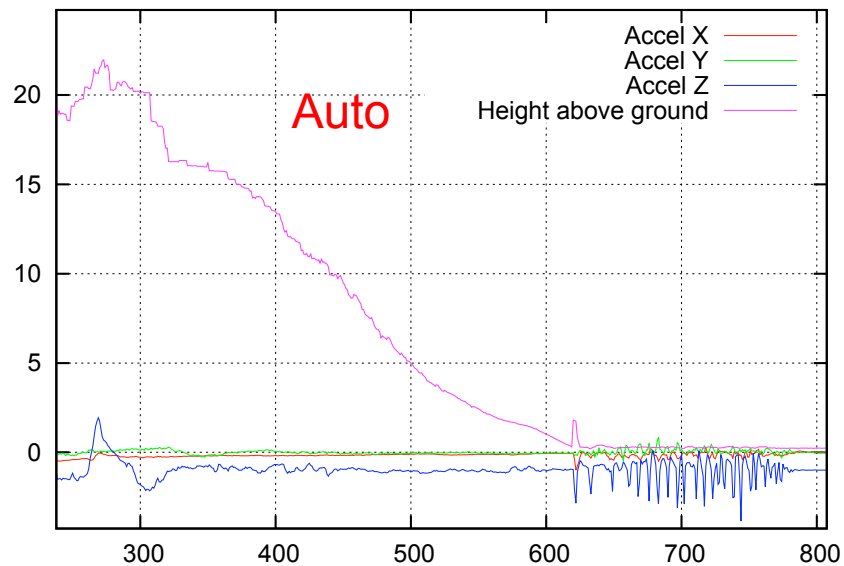
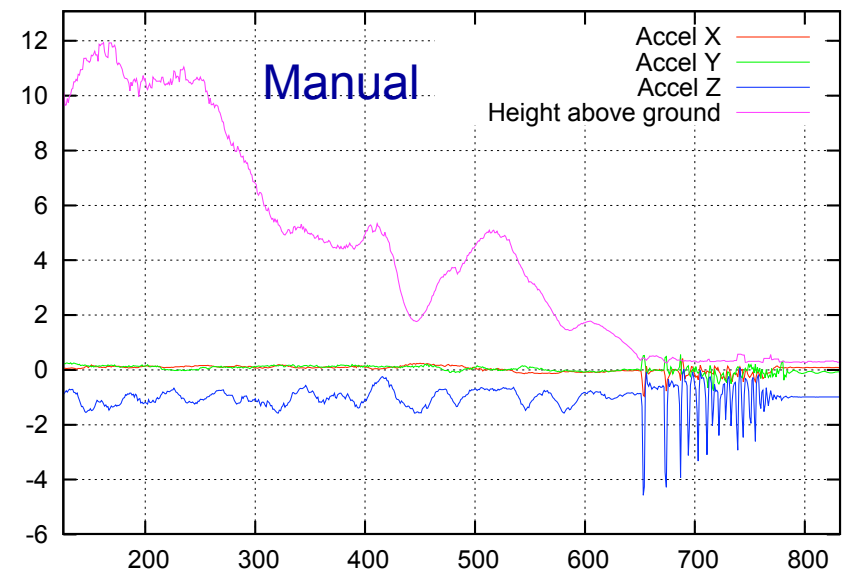
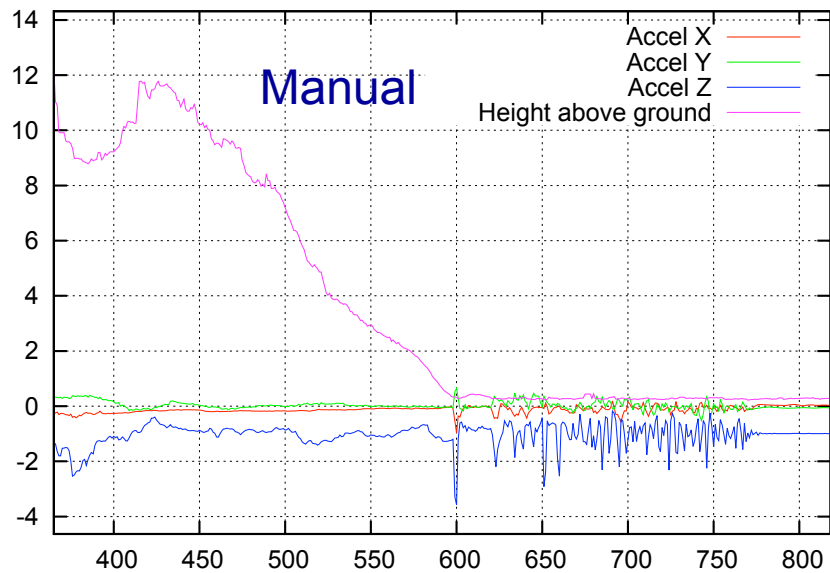
Thurrowgood, Soccol, Moore, Bland, Srinivasan (2011)

Automatic landing



S. Thurrowgood, R.J.D. Moore,
D. Soccol, D. Bland and M.V. Srinivasan (in progress)

Automatic versus best manual landings: comparison



Sam Baker, Daniel Bland, Natalie Bland, Nikolai Liebsch,
Richard Moore, Gavin Taylor, Saul Thurrowgood, Dean Soccol

