



**WELCOME TO  
WALA 2015**

Athens,  
Sept 9<sup>th</sup>-11<sup>th</sup>, 2015

The Emergence of New Technology Supporting Air Accident Investigation

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J2 Aircraft Dynamics Ltd

12,September 2015

# Example Animation



# Flight Physics



$$F_T = ma$$
$$M_T = I\dot{\omega}$$

Host

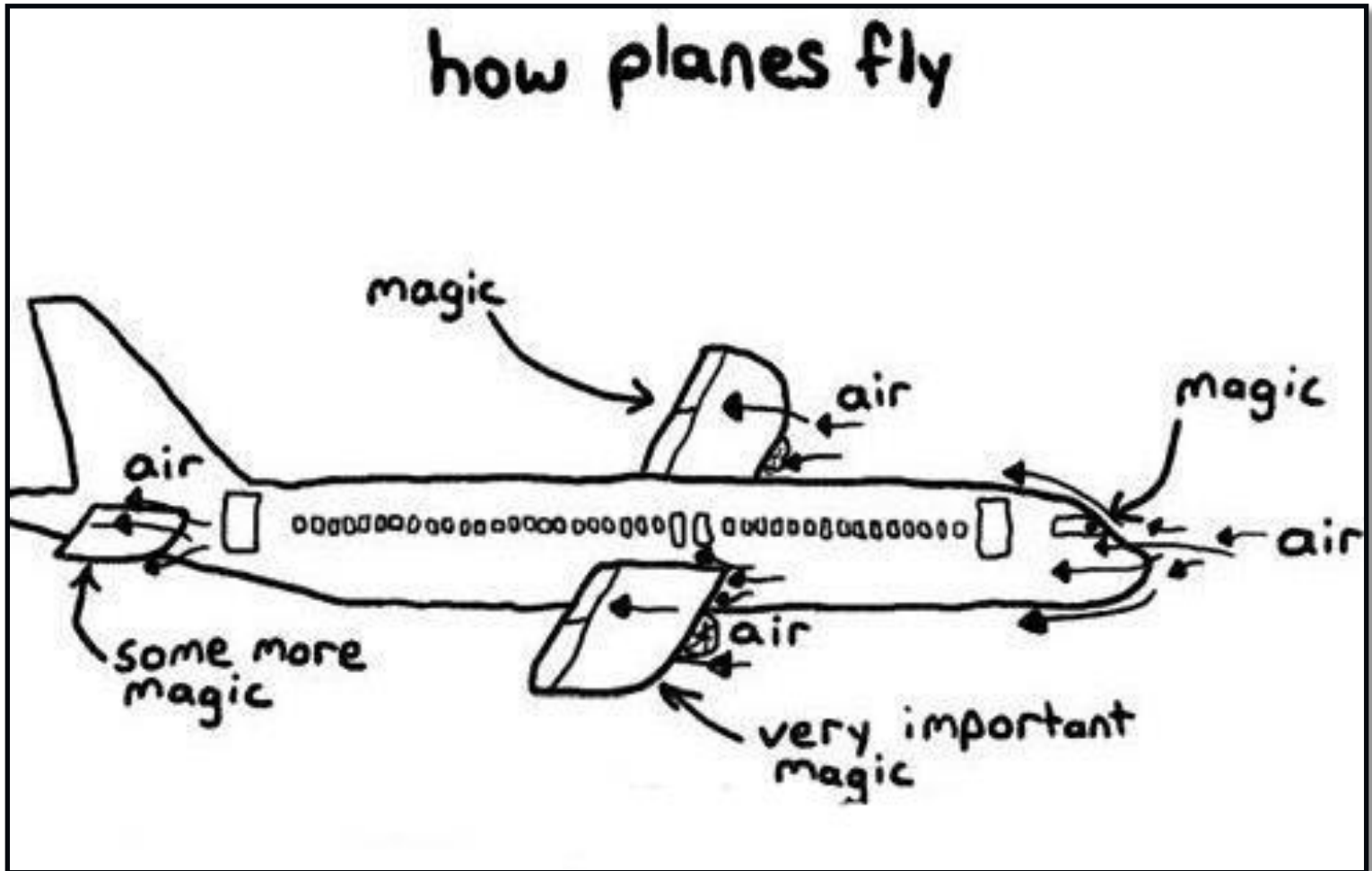


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# Translation



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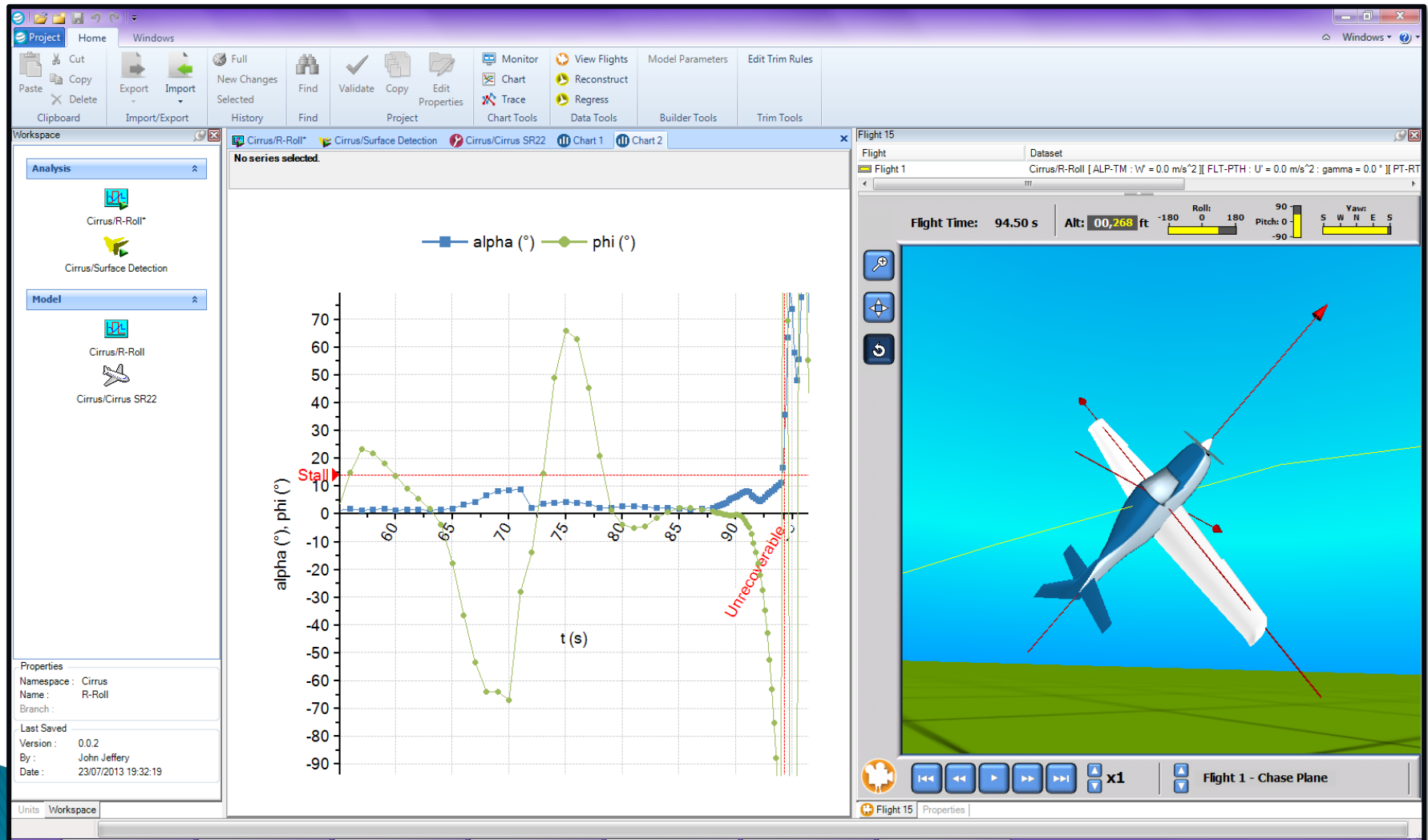
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# Video Reproduction from Flight Data



# Back Out Actual Aero Data



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# Example 1

- ▶ Piper Navajo, UK incident.
- ▶ Tree skimming and hit a tree 12 ft higher than canopy.
- ▶ Lost one third of left wing.
- ▶ Total loss
  
- ▶ What happened?

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# Piper Navajoe – Build The Model

Structure

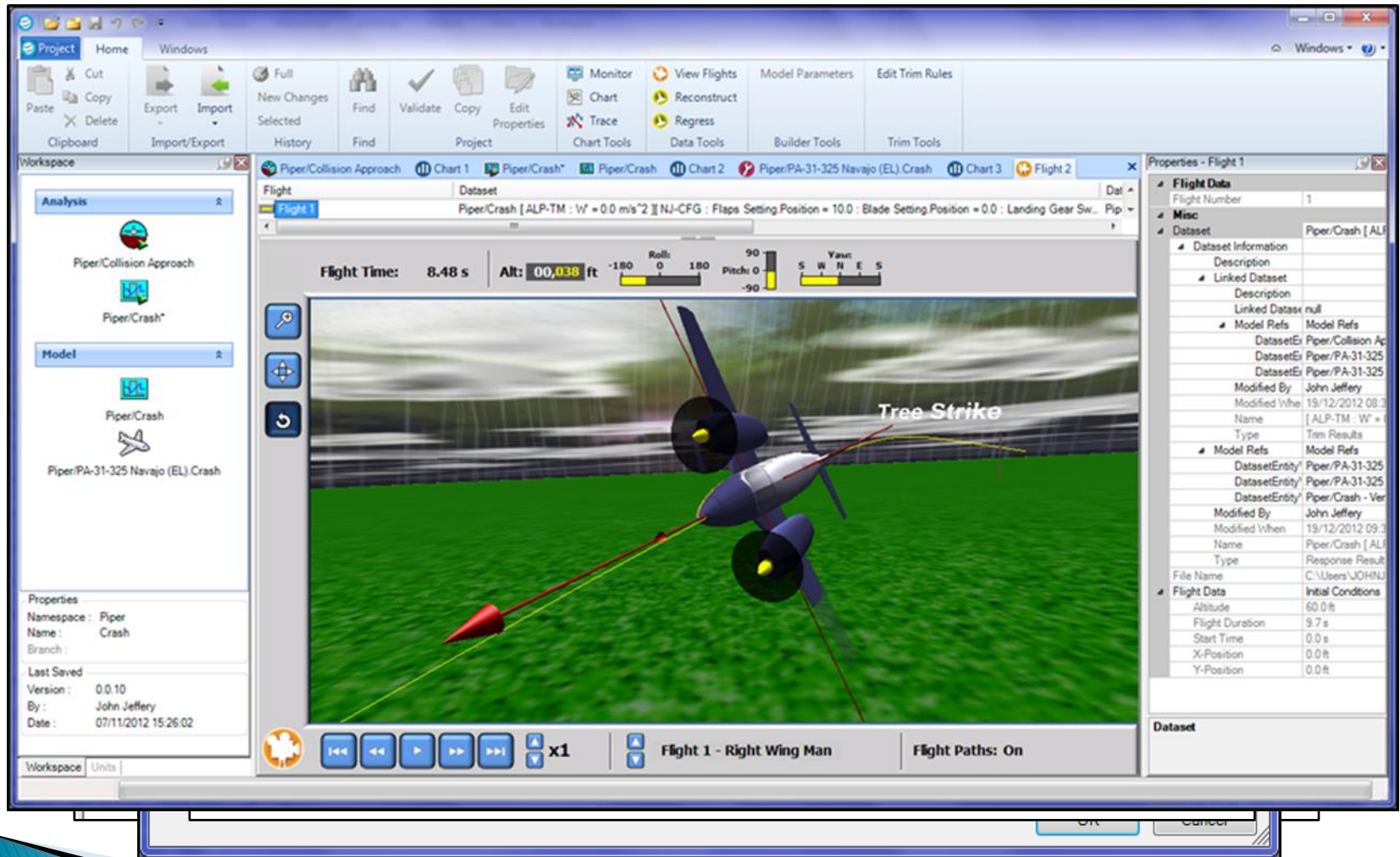
- Clean Airframe
  - Aerodynamic Coefficient
  - Coefficient Reference
  - Mass and Inertia
  - Reference Coordinate
  - User Defined
- Landing Gear
  - Aerodynamic Coefficient
- Vertical Tail
  - Horizontal Tail
    - Aerodynamic Coefficient
    - Reference Coordinate
    - User Defined
    - Elevator
      - Aerodynamic Coefficient
      - Elevator Tab
        - Aerodynamic Coefficient
  - Reference Coordinate
  - User Defined
- Rudder
  - Aerodynamic Coefficient
  - User Defined
  - Rudder Tab
    - Aerodynamic Coefficient
- Wing
  - User Defined
  - Aileron
    - Aerodynamic Coefficient
    - User Defined
    - Aileron Tab
      - Aerodynamic Coefficient
  - Flaps
  - Left Engine
    - Aerodynamic Coefficient
    - Thrust Characteristics
    - User Defined
  - Right Engine
    - Aerodynamic Coefficient
    - Thrust Characteristics
    - User Defined

6.03m  
4.02m  
1.95m  
0.02m  
Wing Apex 2.53m

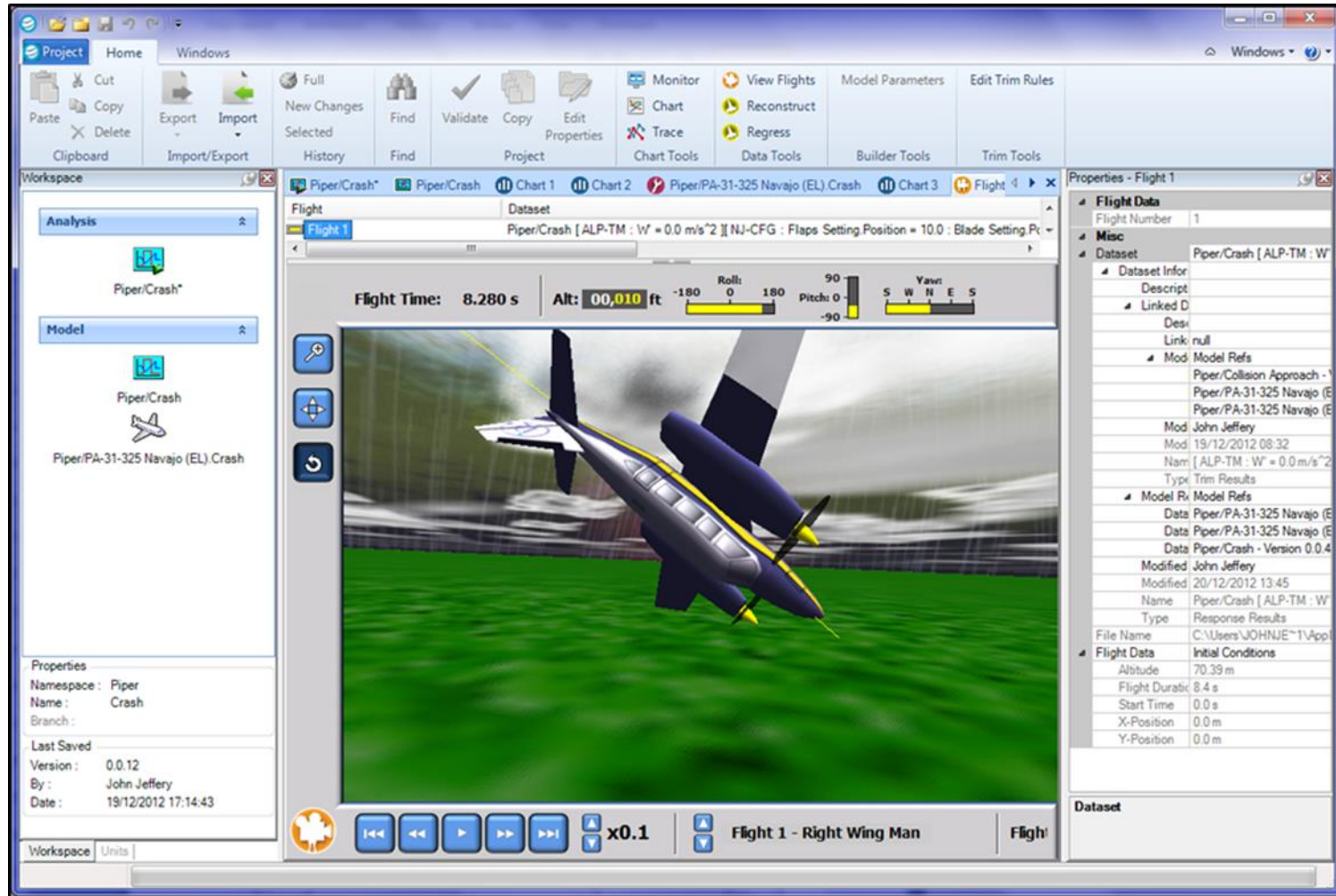




# Analyse Scenarios



# Analyse Scenarios



# Conclusion

- ▶ Clear understanding of the aerodynamics, inertias and forces acting on the aircraft following the portion of wing loss
- ▶ Was able to predict outcome supporting the available evidence using flight physics
- ▶ Delivered a capability that added to the understanding
- ▶ Demonstrated the accuracy of the capability

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# Example 2 – Tiger Moth

- ▶ Recent precedent case in the UK
- ▶ Admissability of AAIB report as evidence in court
- ▶ AAIB report blamed Pilot for the accident and death of his passenger
- ▶ Criminal charge of manslaughter
  
- ▶ An intentional failed aerobatic loop or a failed control surface leading to loss of control??.

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# J2 Process

- ▶ Build a model
- ▶ Qualify the model – experienced TM pilot input
  - Rates of change
  - Authority of control surfaces.
  - Weight and balance
  - Matching to available data – GPS and Radar.
- What could we demonstrate?

Host



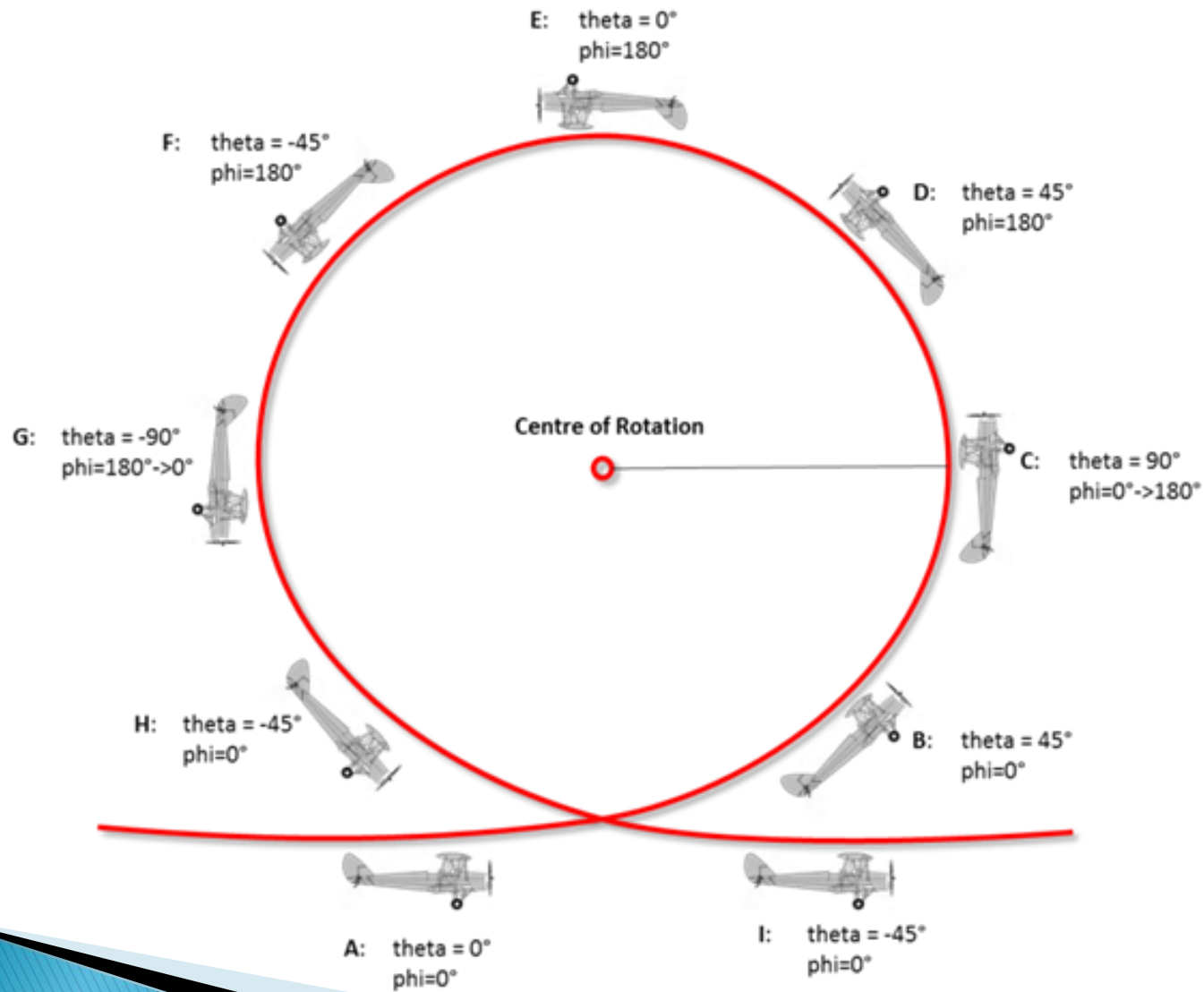
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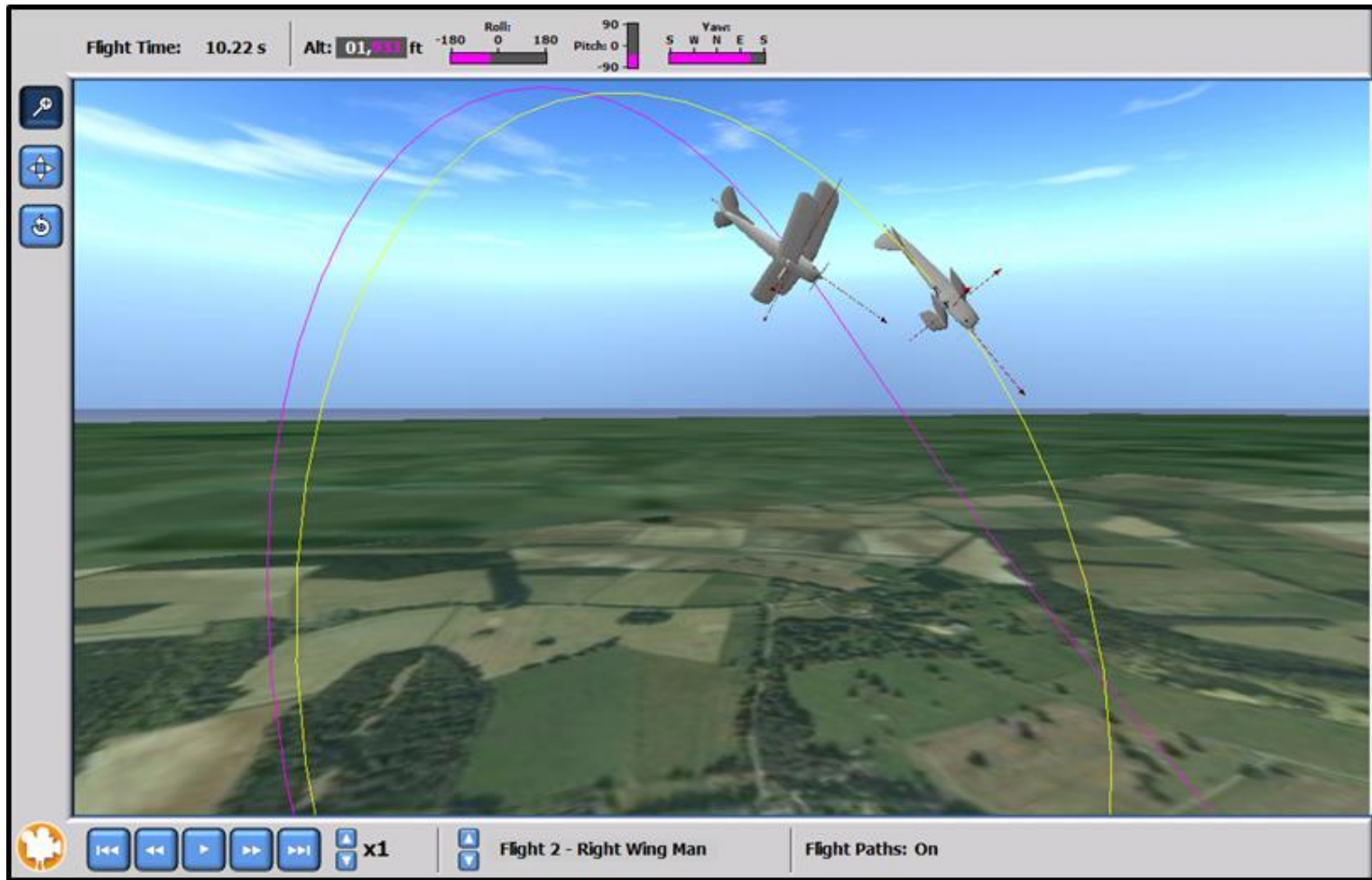
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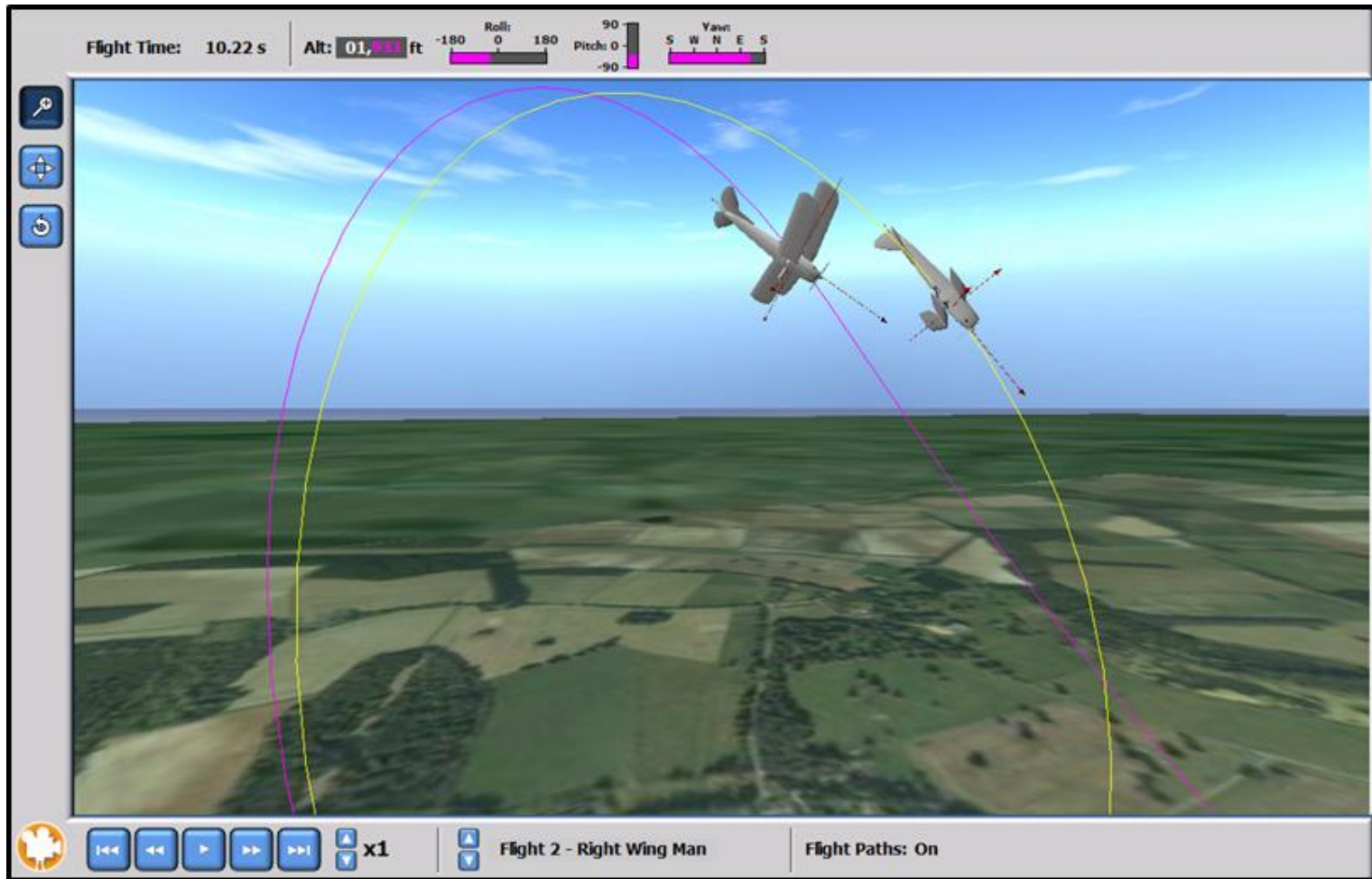
# Manoeuvre Visualisation



# What Does This Look Like 1

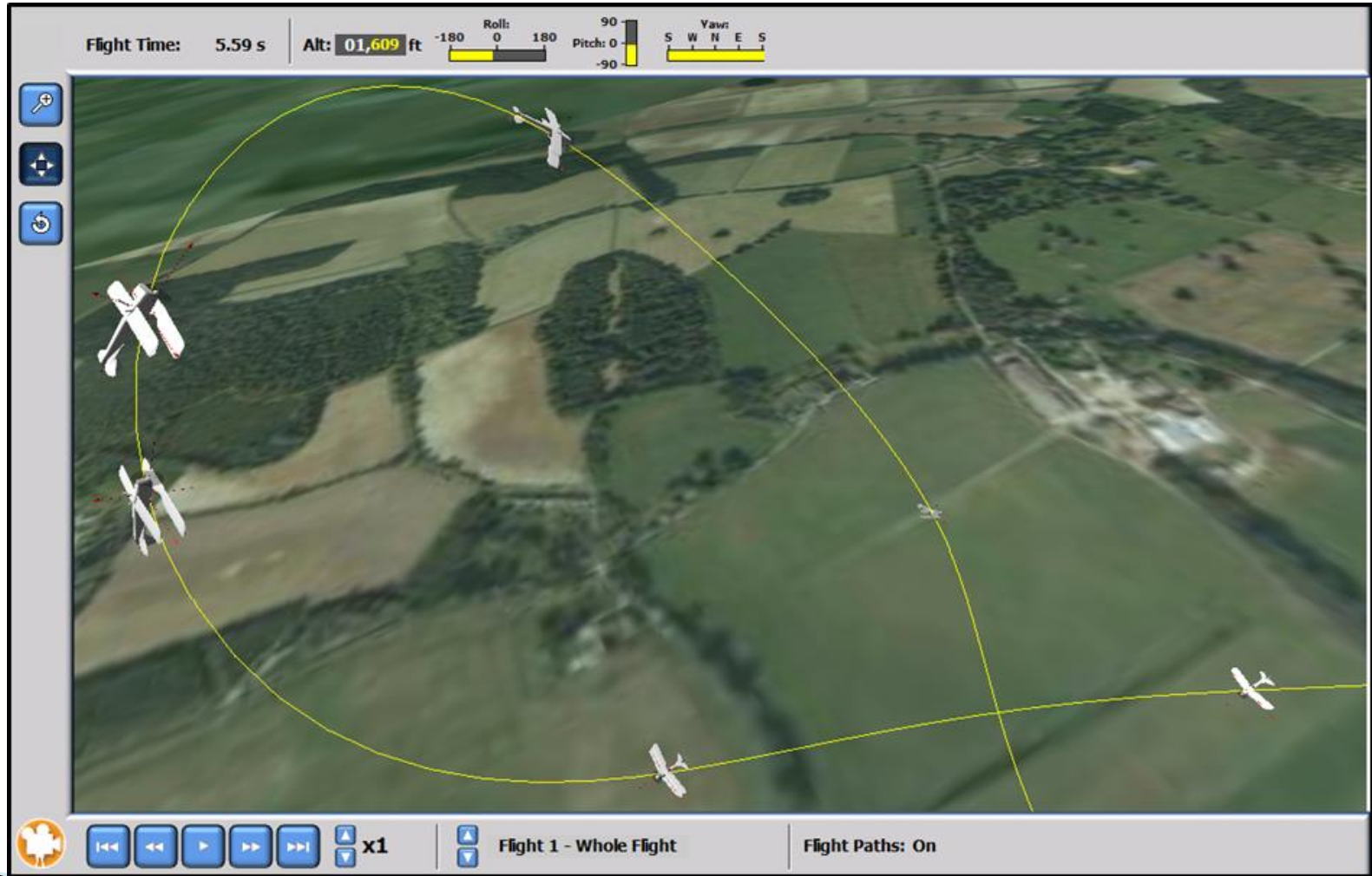


# What Does This Look Like 2

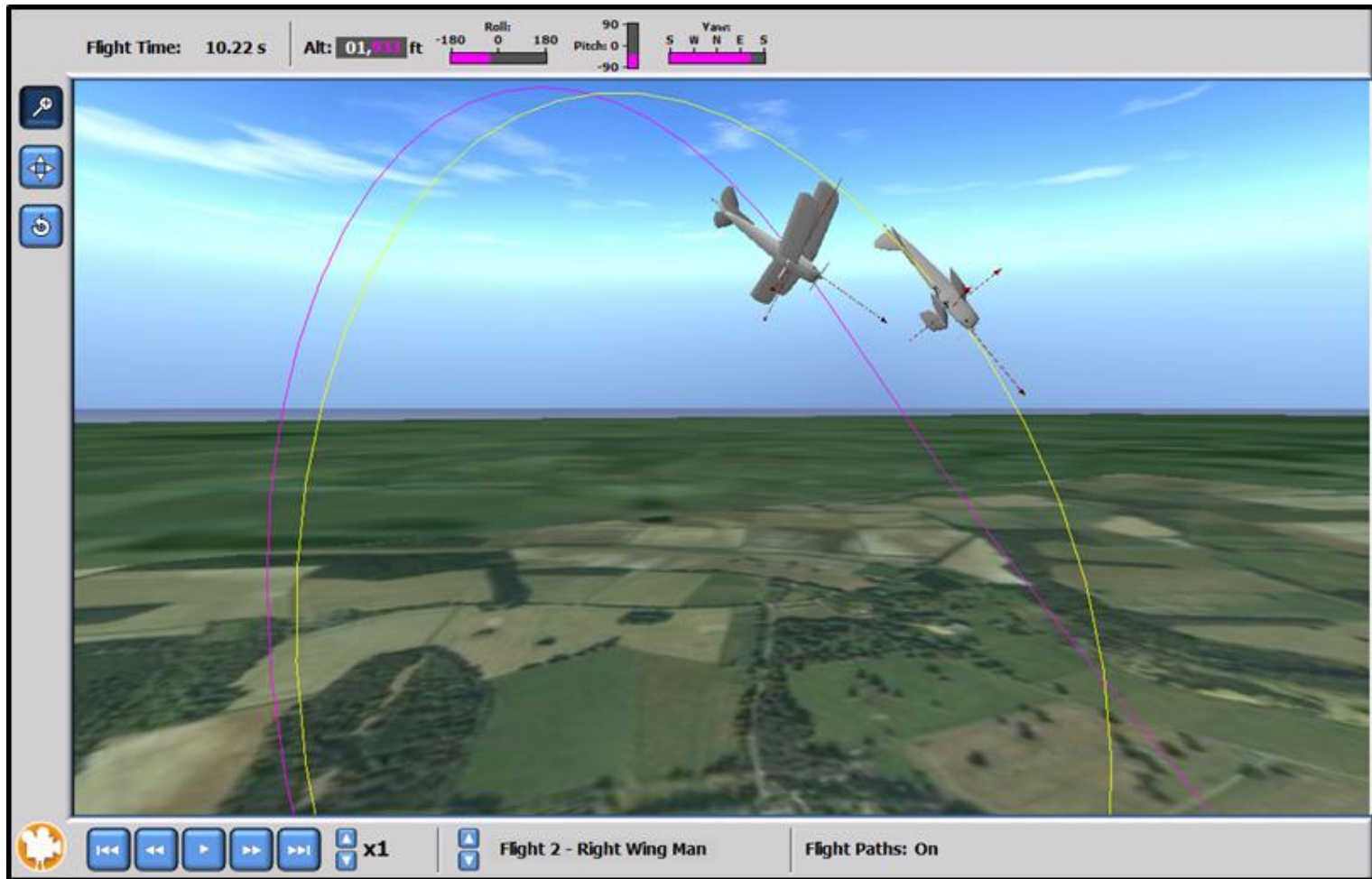




# Scenario Reconstruction



# What Does This Look Like 3



# Conclusions

- Model Fidelity Reviewed and Demonstrated
- Unable to reproduce data patterns with intentional loop
- Reconstruction of Pilot Testimony matches recorded data patterns
- Reconstruction of Pilot Testimony is consistent with Eyewitness statement.
  
- The pilot was found not guilty.

# Thank You!

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