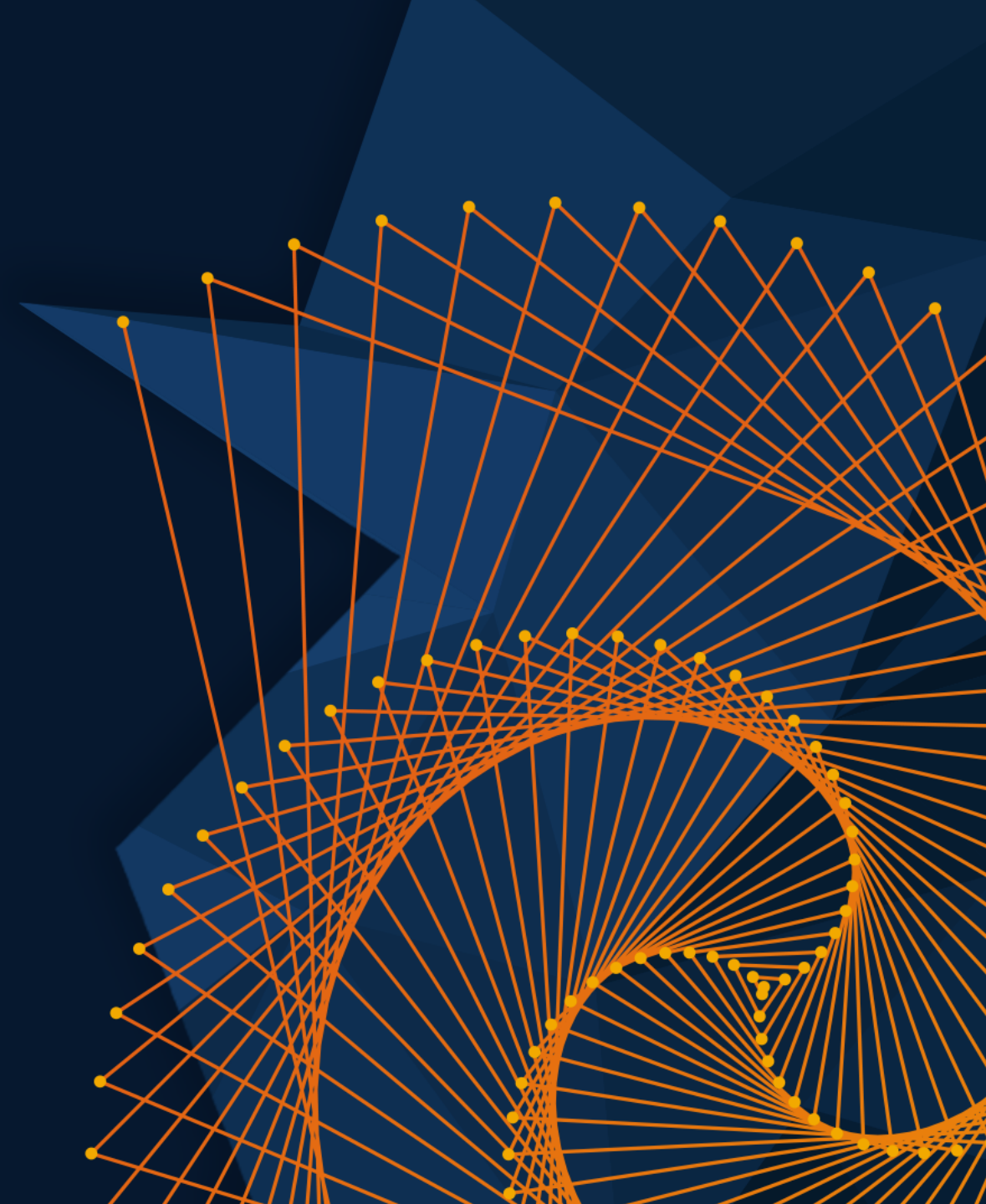


# MATLAB EXPO

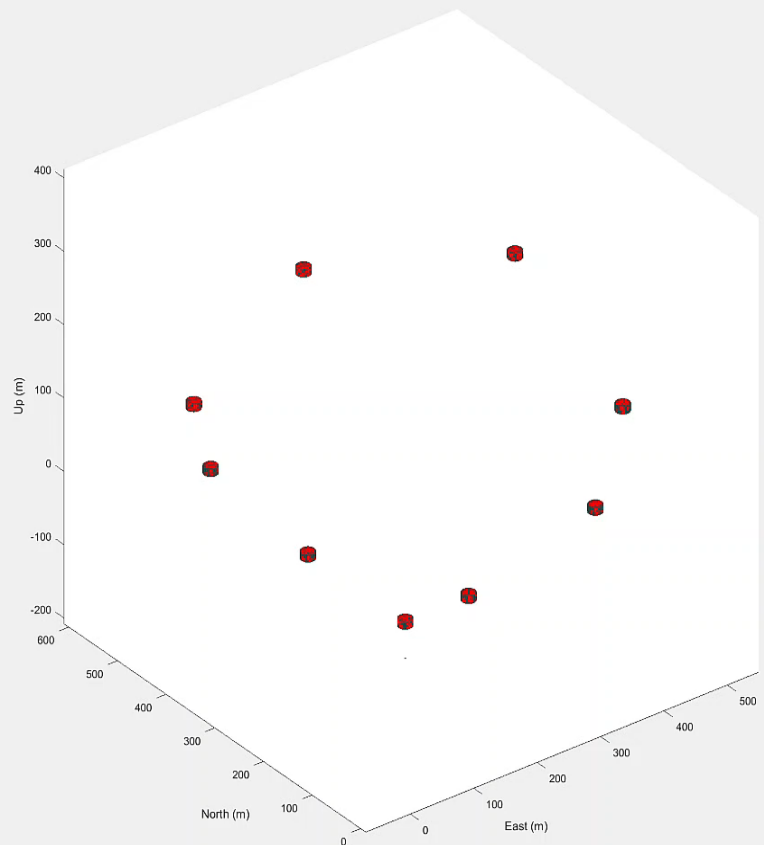
## 고정익 UAV의 경로 추종 비행 시뮬레이션

한재훈, 매스웍스코리아



# Simulation Result

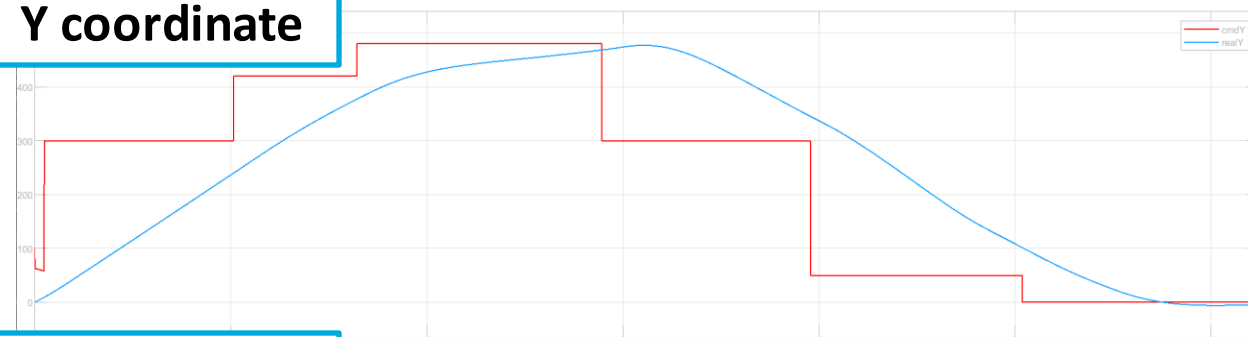
Visualization in UAV Scenario



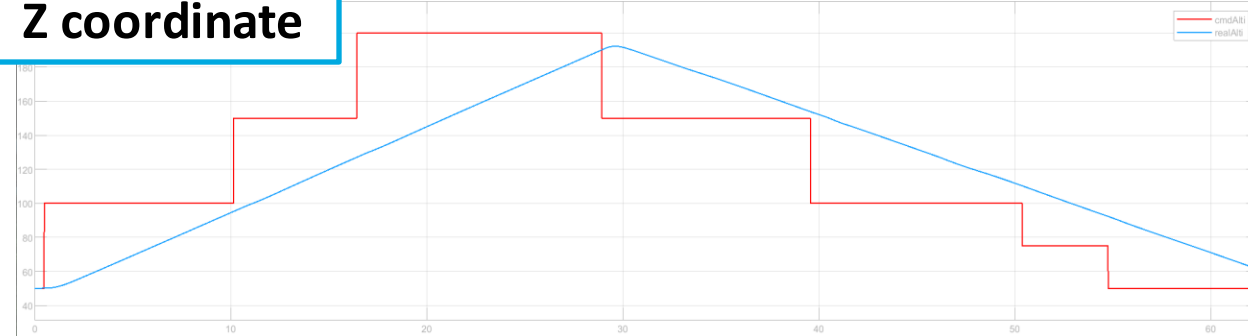
X coordinate



Y coordinate

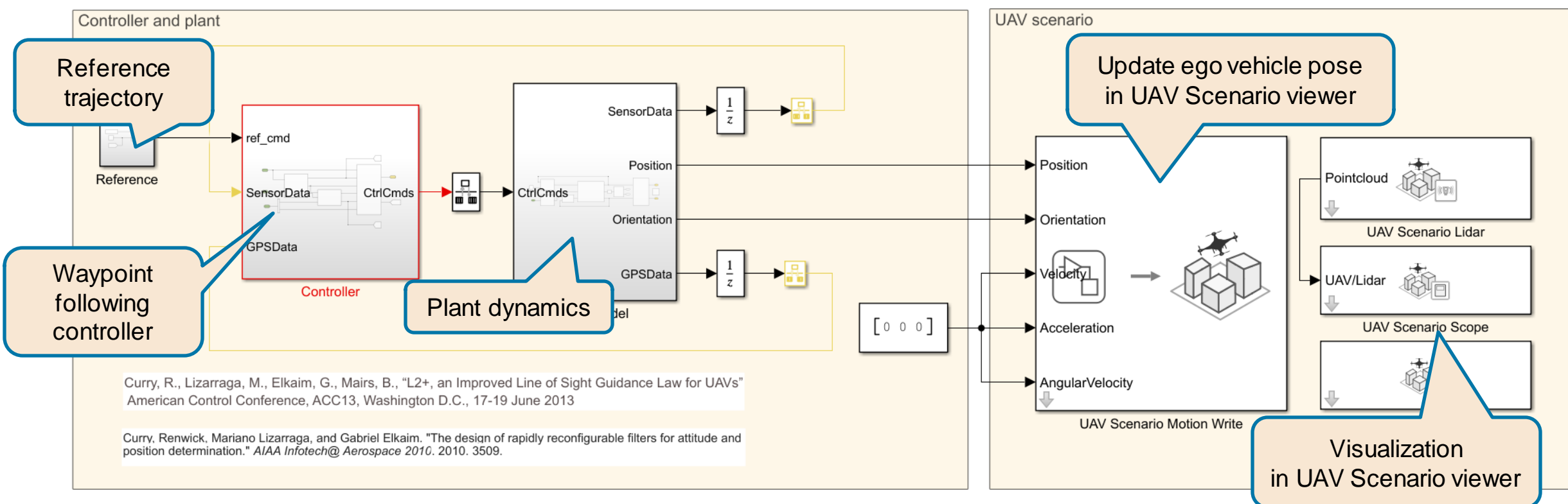


Z coordinate



# Structure of the Entire Model

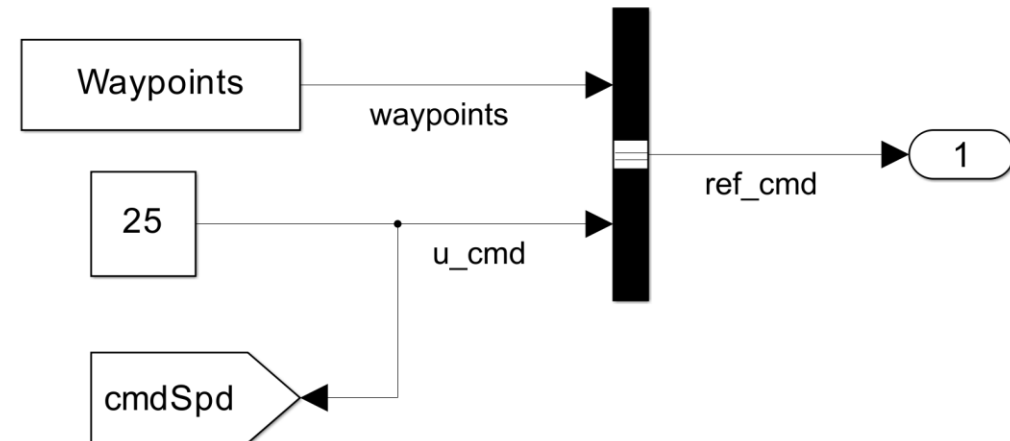
- Calculate actuator command to follow the waypoints with reference speed
- Dynamics of the aircraft
- Visualizing motion of the aircraft



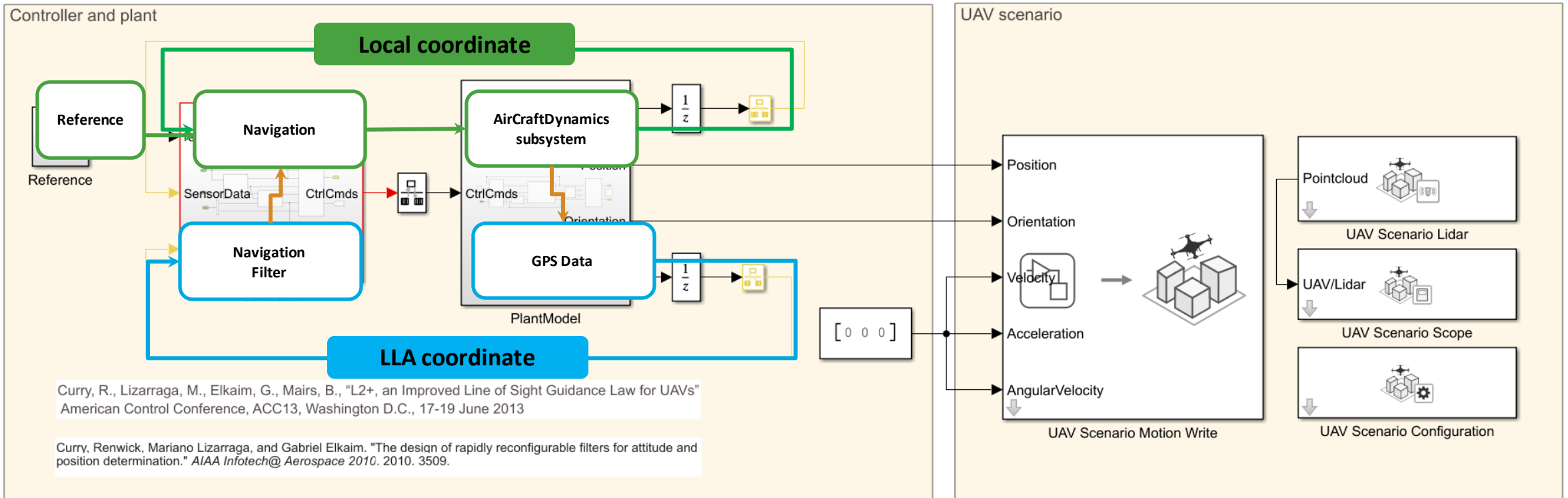
## Reference Command Input

- Reference input for points to follow and speed defined in the local coordinates (meter)

```
X_crdn = [0 0 0 100 400 600 500 400 200]; % North Direction  
Y_crdn = [0 100 300 420 480 300 50 0 0]; % East Direction  
altitude = [50 50 100 150 200 150 100 75 50]; % This value is altitude  
Waypoints = [X_crdn; Y_crdn; altitude]';
```

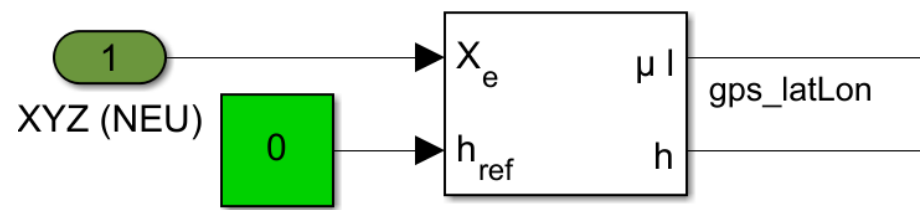


# Position Coordinate Conversion



# Flat Earth ↔ LLA Coordinate Conversion

- Converts a 3-by-1 vector of flat Earth position into geodetic latitude, longitude, and altitude



Block Parameters: Flat Earth to LLA

Flat Earth to LLA (mask) (link)

Estimate geodetic latitude, longitude, and altitude from flat Earth position. The flat Earth coordinate system assumes the z-axis is positive downwards.

Parameters

Units: Metric (MKS)

Planet model: Earth (WGS84)

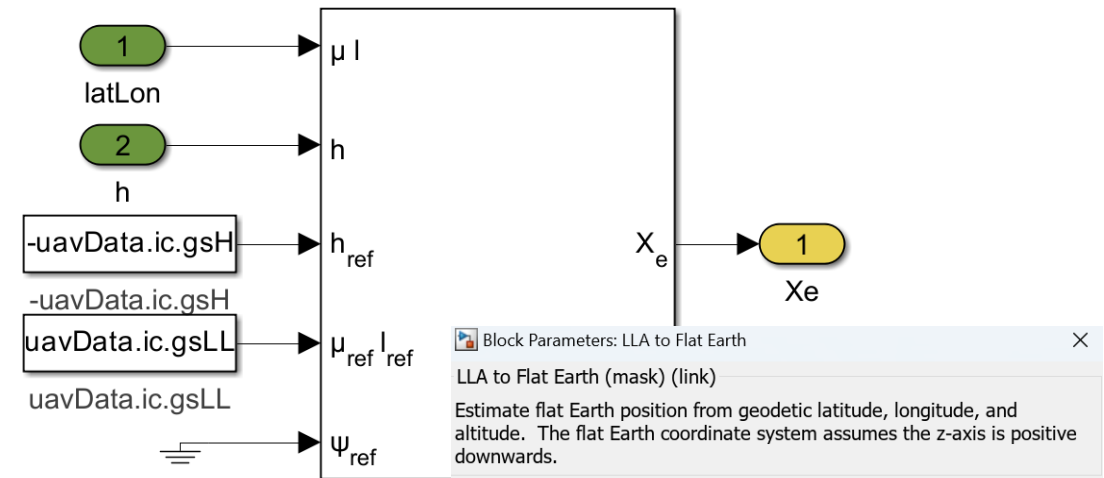
Input reference position and orientation

Reference geodetic latitude and longitude [deg]:  
uavData.ic.gsLL [42.3,-71.352]

Direction of flat Earth x-axis (degrees clockwise from north):  
0

OK Cancel Help Apply

- Converts a geodetic latitude, longitude, and altitude into a 3-by-1 vector of flat Earth position.



Block Parameters: LLA to Flat Earth

LLA to Flat Earth (mask) (link)

Estimate flat Earth position from geodetic latitude, longitude, and altitude. The flat Earth coordinate system assumes the z-axis is positive downwards.

Parameters

Units: Metric (MKS)

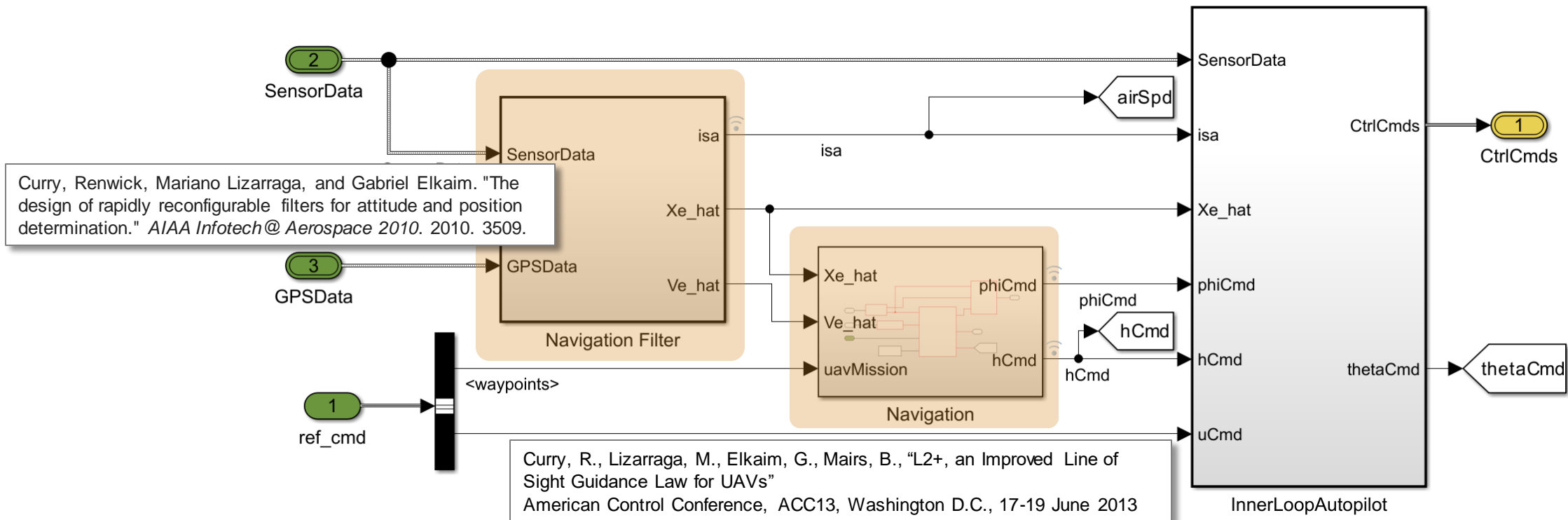
Planet model: Earth (WGS84)

Input reference position and orientation

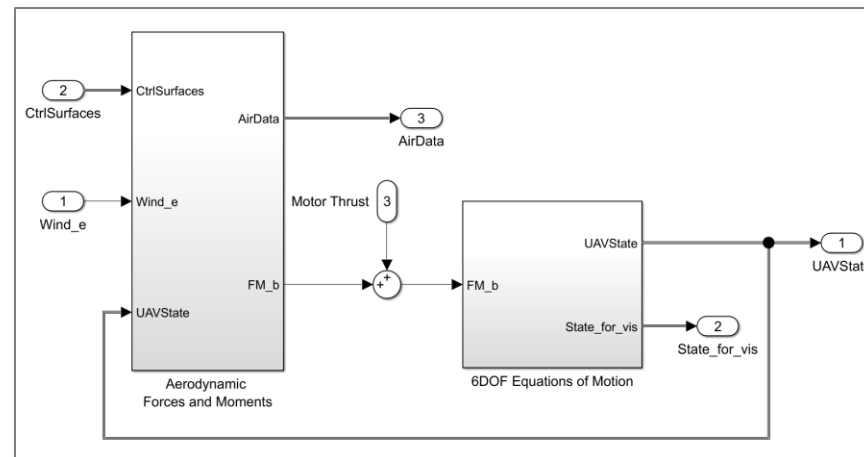
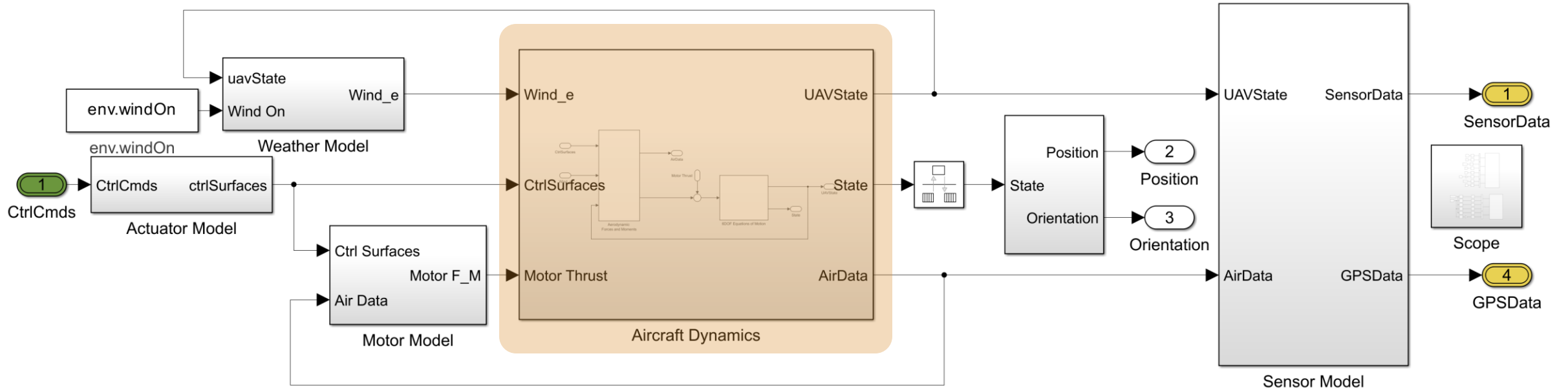
OK Cancel Help Apply

# Controller Model

- Conversion from LLA (GPS sensor data) to the Local Coordinate System
- Roll angle & height command from 'Navigation'
- Actuator command from 'InnerLoopAutopilot'

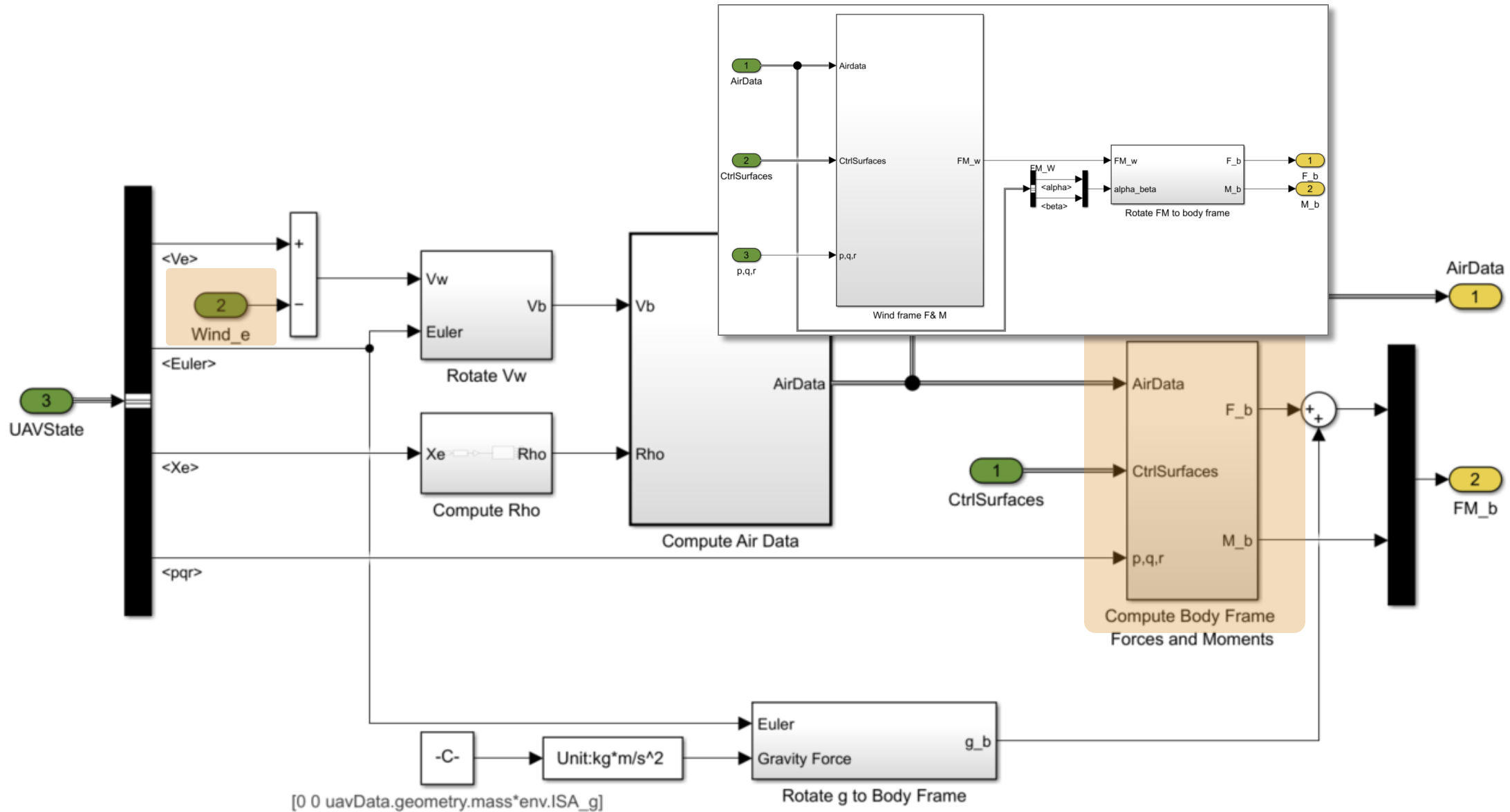


# Plant Model



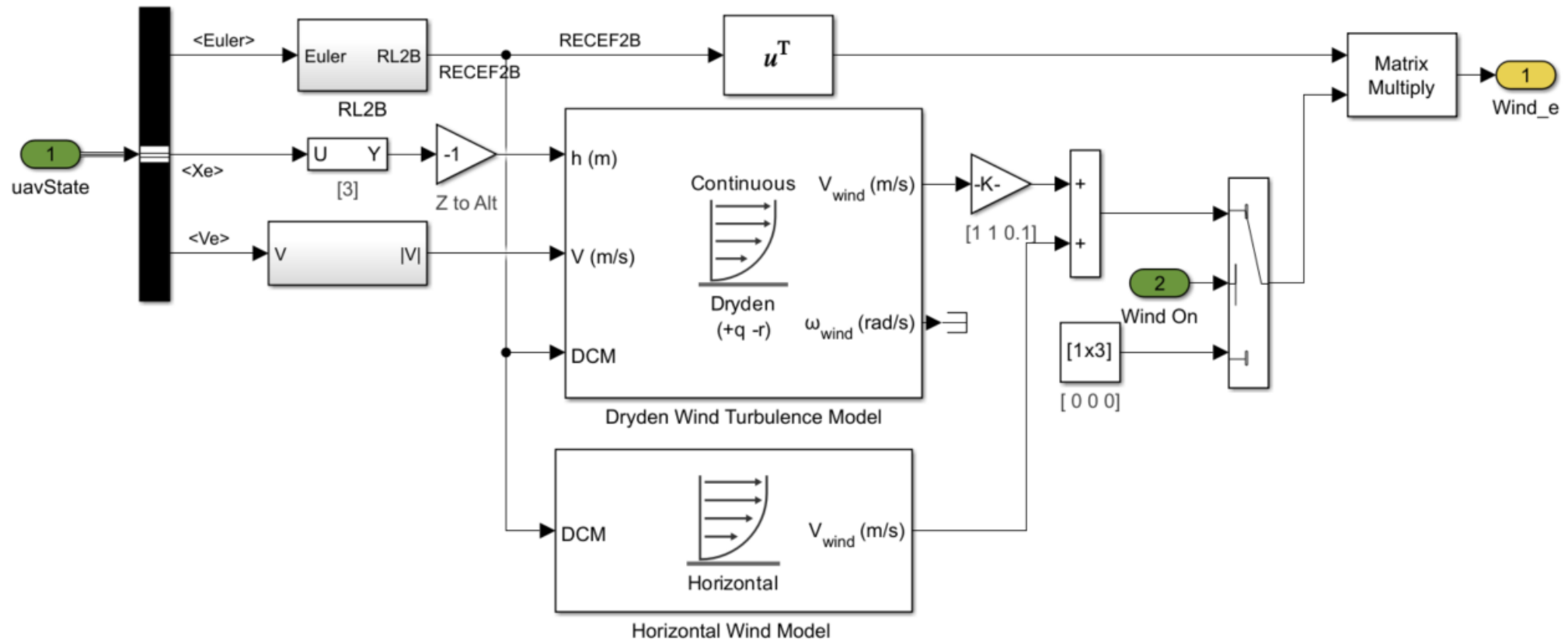


# Aerodynamics Forces & Moments in Aircraft Dynamics



# Weather Model

- Calculate speed of wind



# MATLAB EXPO



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