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## Clean

```
close all; clear; clc;
ttwistor;
```

## Trim Conditions

```
h = 1655;
Va = 18;
gamma0 = 0;
trim_definition = [Va; gamma0; h];

% Problem 3.1
[trim_state_1, trim_control_1] = TrimCalculator(trim_definition,
aircraft_parameters);

% Problem 3.2
[trim_state_2, trim_control_2] = TrimCalculator(trim_definition,
aircraft_parameters);

% Problem 3.3
trim_definition_3 = [Va; 10*pi/180; h];
[trim_state_3, trim_control_3] = TrimCalculator(trim_definition_3,
aircraft_parameters);
```

*Local minimum possible. Constraints satisfied.*

*fmincon stopped because the size of the current step is less than the value of the step size tolerance and constraints are satisfied to within the value of the constraint tolerance.*

*Local minimum possible. Constraints satisfied.*

*fmincon stopped because the size of the current step is less than the value of the step size tolerance and constraints are satisfied to within the value of the constraint tolerance.*

*Local minimum possible. Constraints satisfied.*

*fmincon stopped because the size of the current step is less than the value of the step size tolerance and constraints are satisfied to within the value of the constraint tolerance.*

## Simulate

```
%%
% 3.1
```

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```

tspan = [0 300];
init_state = trim_state_1;
aircraft_surfaces = trim_control_1;
wind_inertial = [0;0;0];

odeFunc = @(time, aircraft_state)AircraftEOM(time, aircraft_state,
aircraft_surfaces, wind_inertial, aircraft_parameters);
[Tout, Xout] = ode45(odeFunc, tspan, init_state);

Uout = zeros(length(Tout),4);
for i=1:length(Tout)
    Uout(i,:) = aircraft_surfaces';
end

PlotSimulation(Tout, Xout, Uout, 1:6, ['g', '-']);

%%%%%
% 3.2
init_state = trim_state_2;
aircraft_surfaces = trim_control_2;
wind_inertial = [10; 10; 0];

% Add wind
init_state(7:9) = init_state(7:9) +
TransformFromInertialToBody(wind_inertial, init_state(4:6));

odeFunc = @(time, aircraft_state)AircraftEOM(time, aircraft_state,
aircraft_surfaces, wind_inertial, aircraft_parameters);
[Tout, Xout] = ode45(odeFunc, tspan, init_state);

Uout = zeros(length(Tout),4);
for i=1:length(Tout)
    Uout(i,:) = aircraft_surfaces';
end

PlotSimulation(Tout, Xout, Uout, 1:6, ['r', '-']);

%%%%%
% 3.3
init_state = trim_state_3;
aircraft_surfaces = trim_control_3;
wind_inertial = [0; 0; 0];

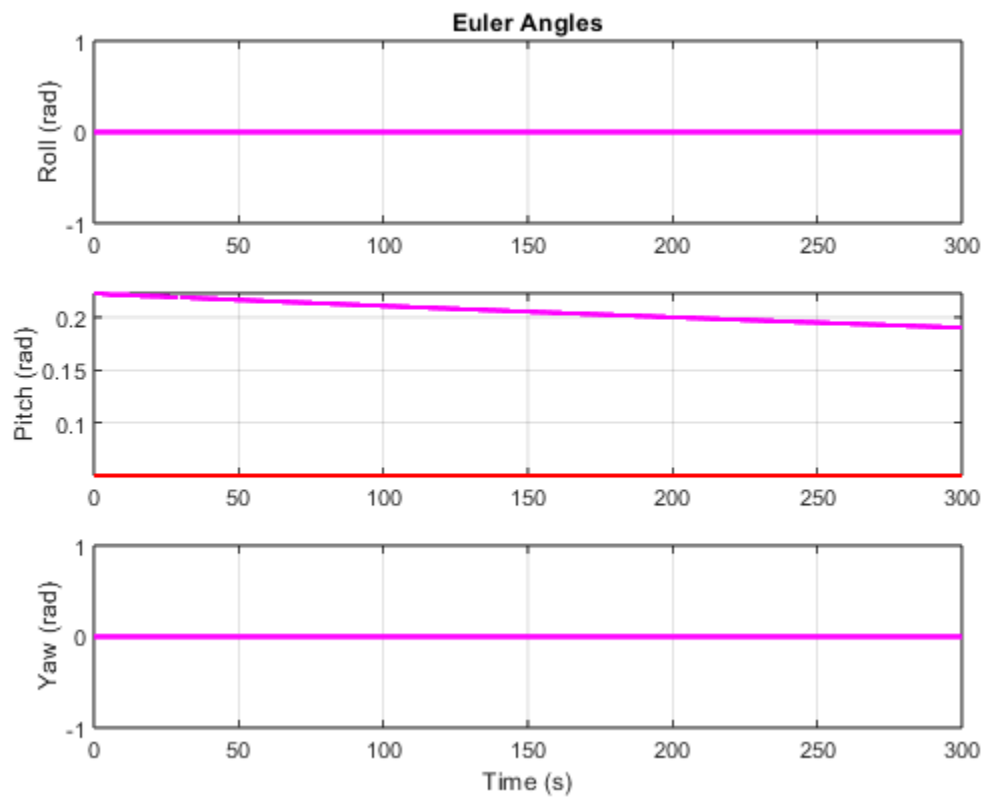
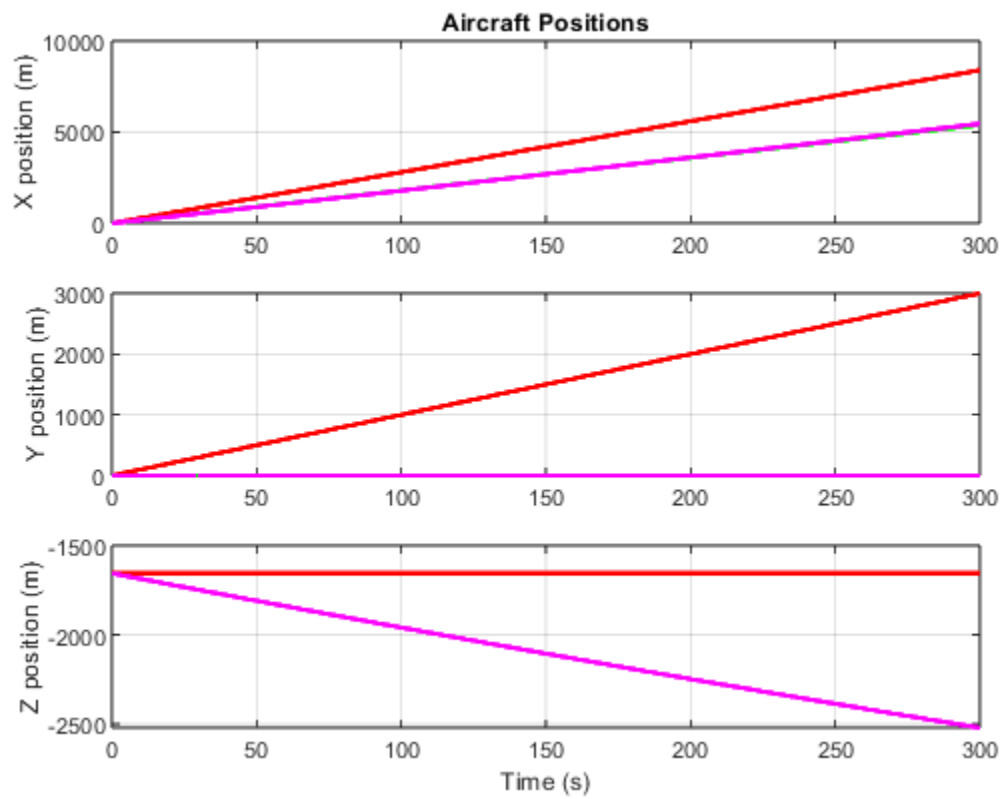
odeFunc = @(time, aircraft_state)AircraftEOM(time, aircraft_state,
aircraft_surfaces, wind_inertial, aircraft_parameters);
[Tout, Xout] = ode45(odeFunc, tspan, init_state);

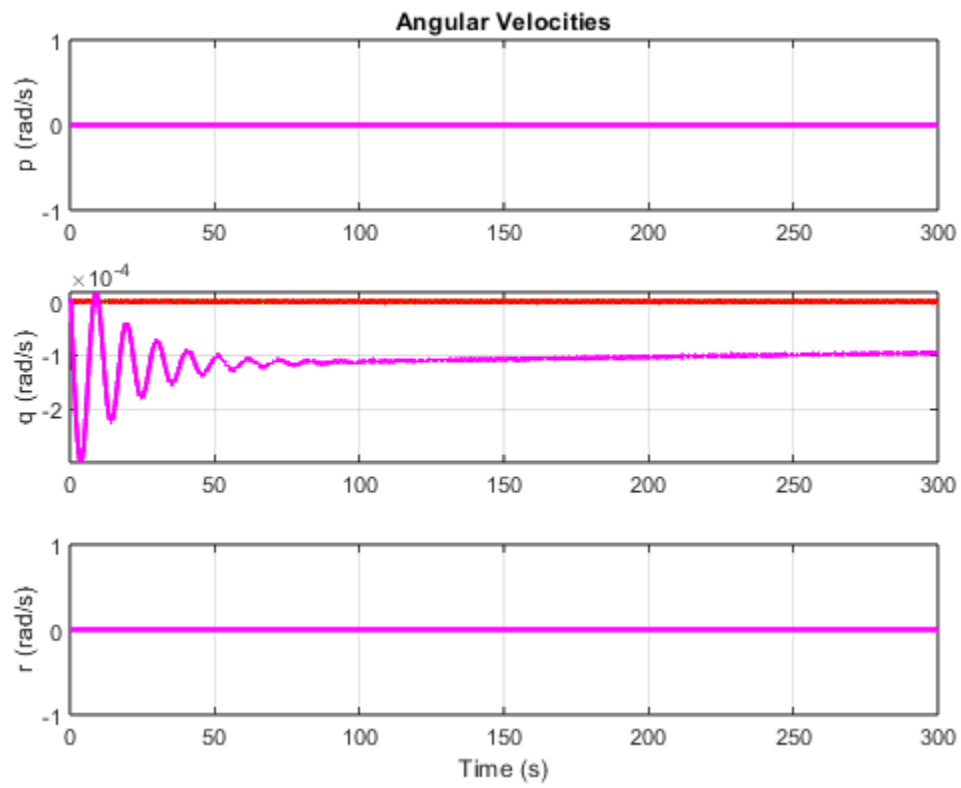
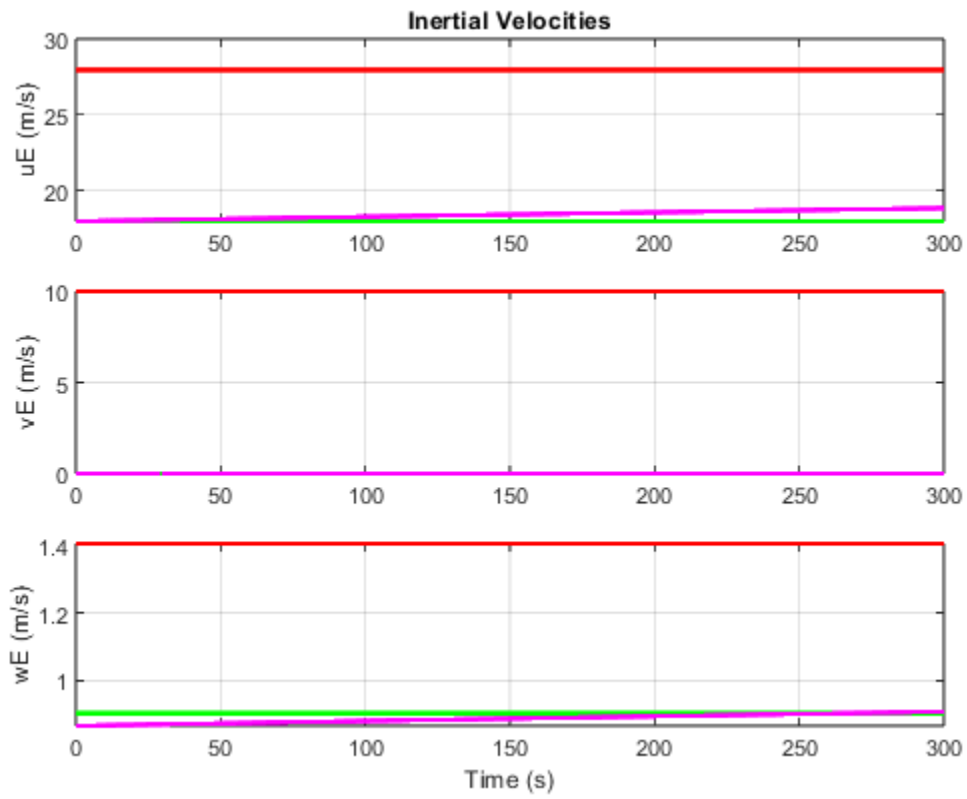
Uout = zeros(length(Tout),4);
for i=1:length(Tout)
    Uout(i,:) = aircraft_surfaces';
end

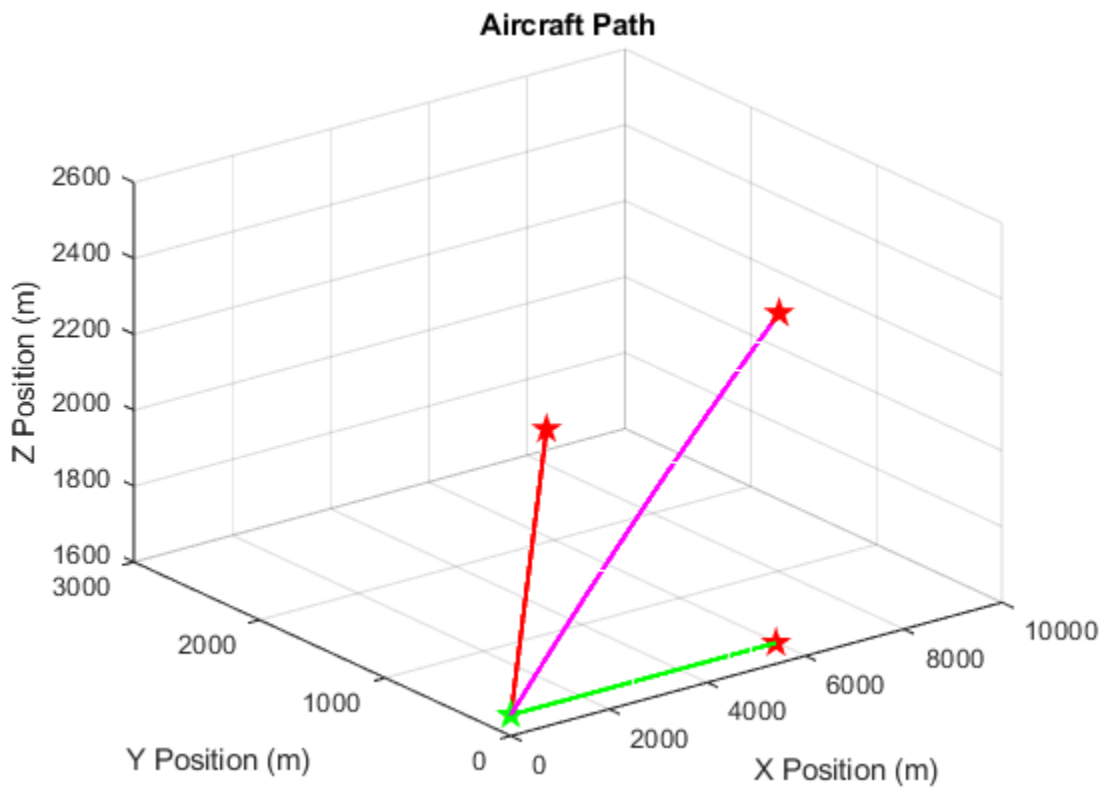
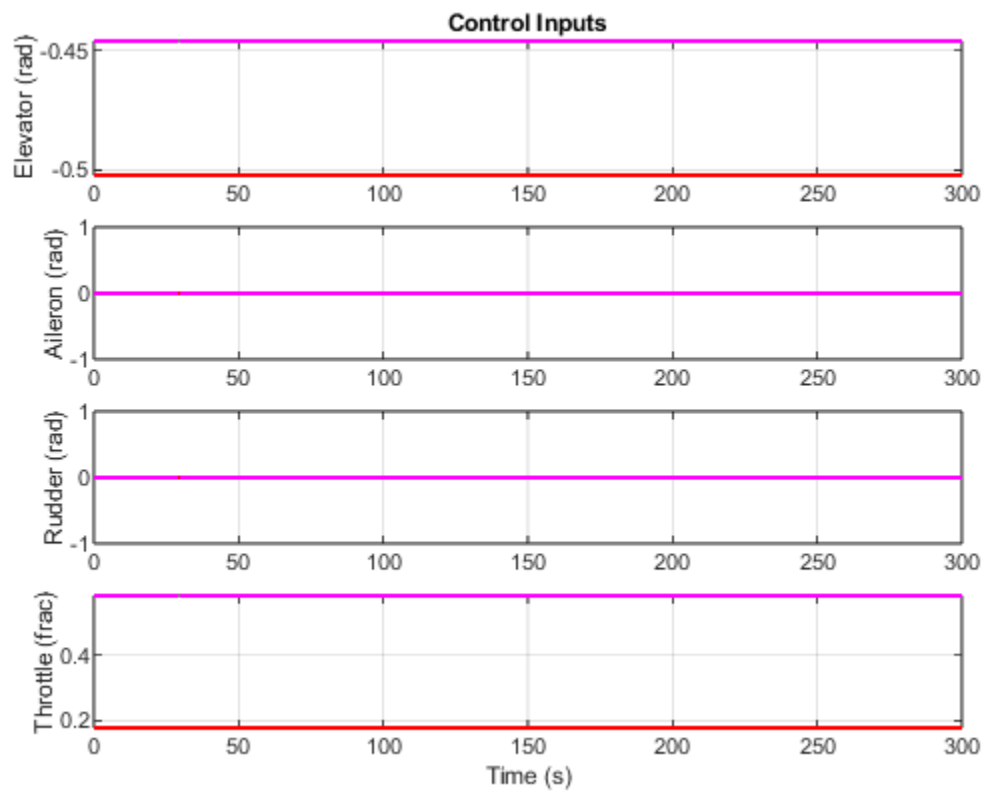
PlotSimulation(Tout, Xout, Uout, 1:6, ['m', '-']);

```

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# Coordinated Turn

Trim definition

```
h = 200;
Va = 20;
gamma0 = 0;
R0 = 500;
tspan = [0 300];
trim_definition = [Va; gamma0; h; R0];
wind_inertial = [0;0;0];

% Calculate coordinated turn conditions
[coord_state, coord_control] = CoordinatedTurnCalculator(trim_definition,
aircraft_parameters);

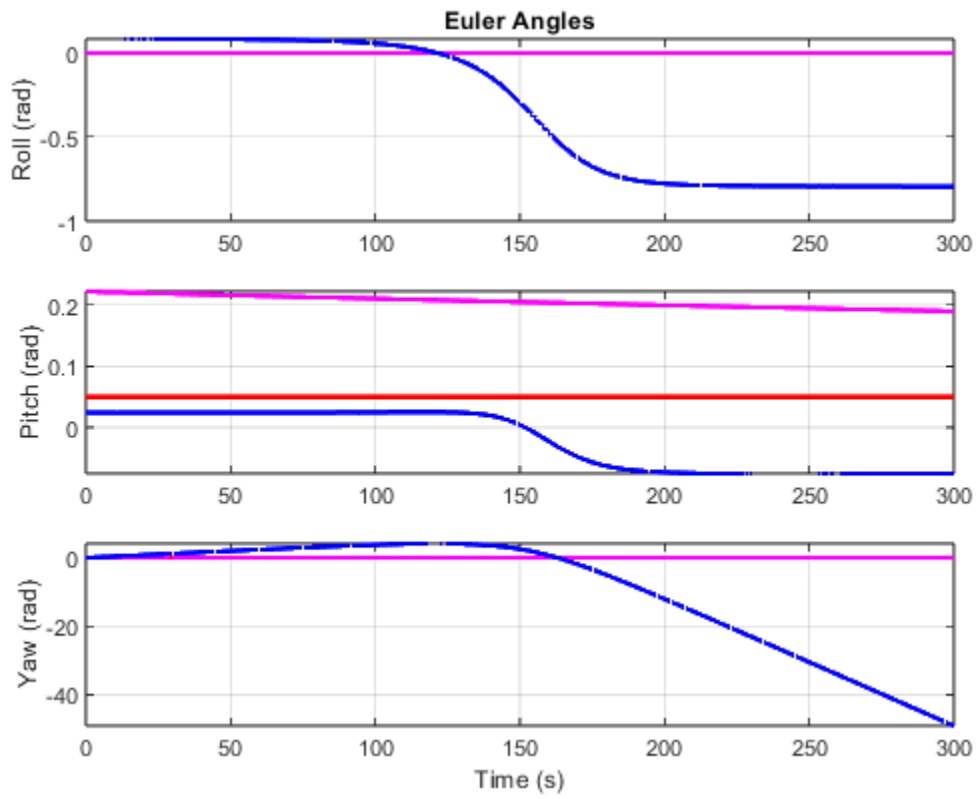
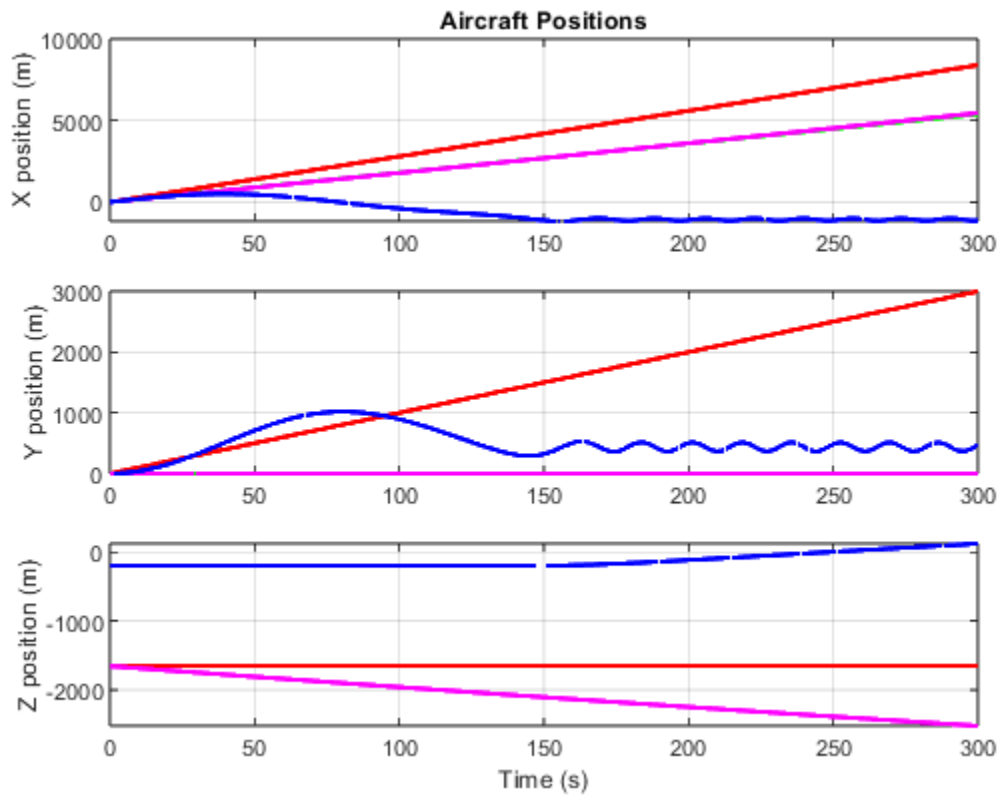
odeFunc = @(time, aircraft_state)AircraftEOM(time, aircraft_state,
coord_control, wind_inertial, aircraft_parameters);
[Tout, Xout] = ode45(odeFunc, tspan, coord_state);

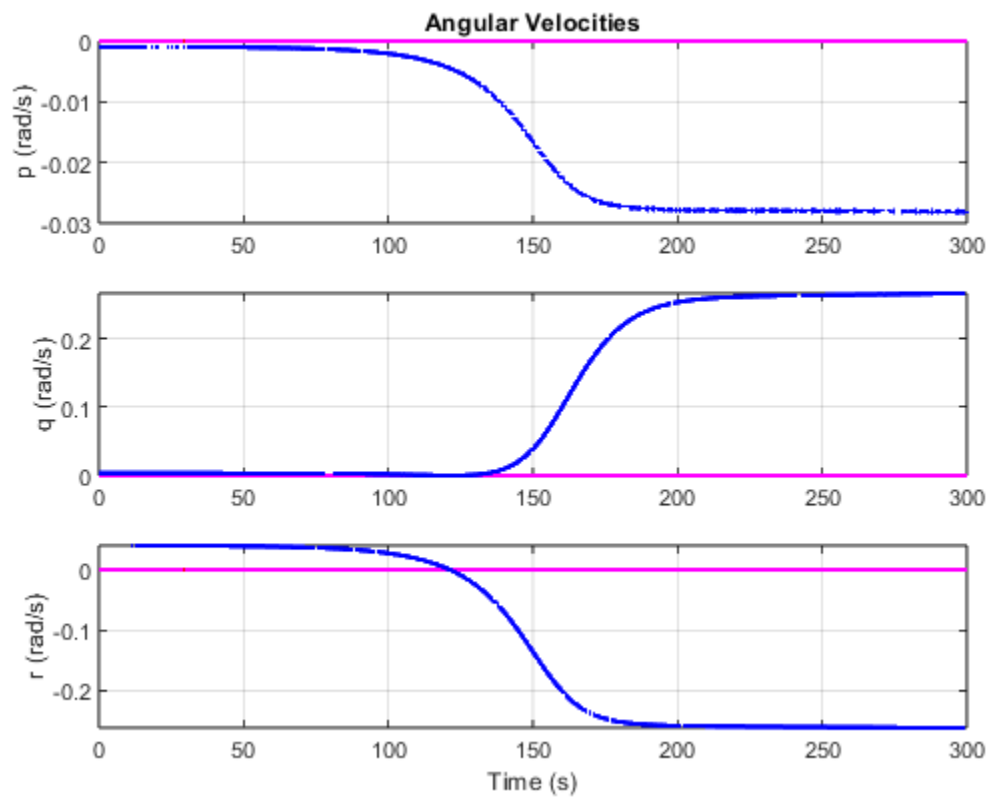
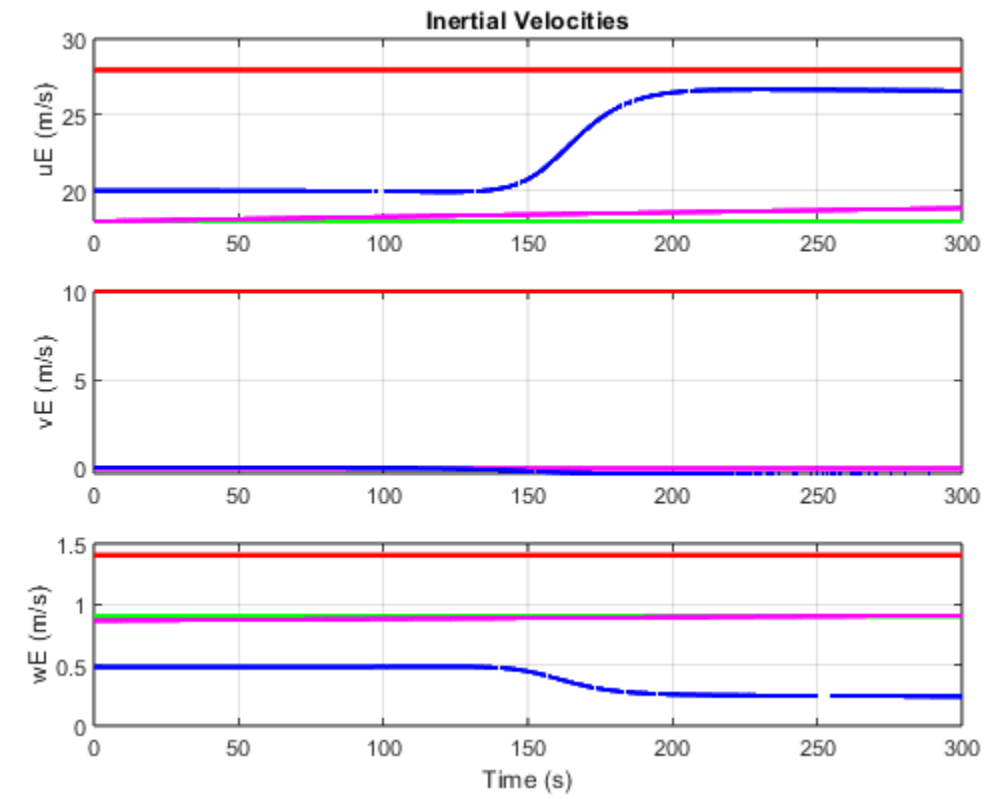
Uout = zeros(length(Tout),4);
for i=1:length(Tout)
    Uout(i,:) = coord_control';
end

PlotSimulation(Tout, Xout, Uout, 1:6, ['b', '-']);
```

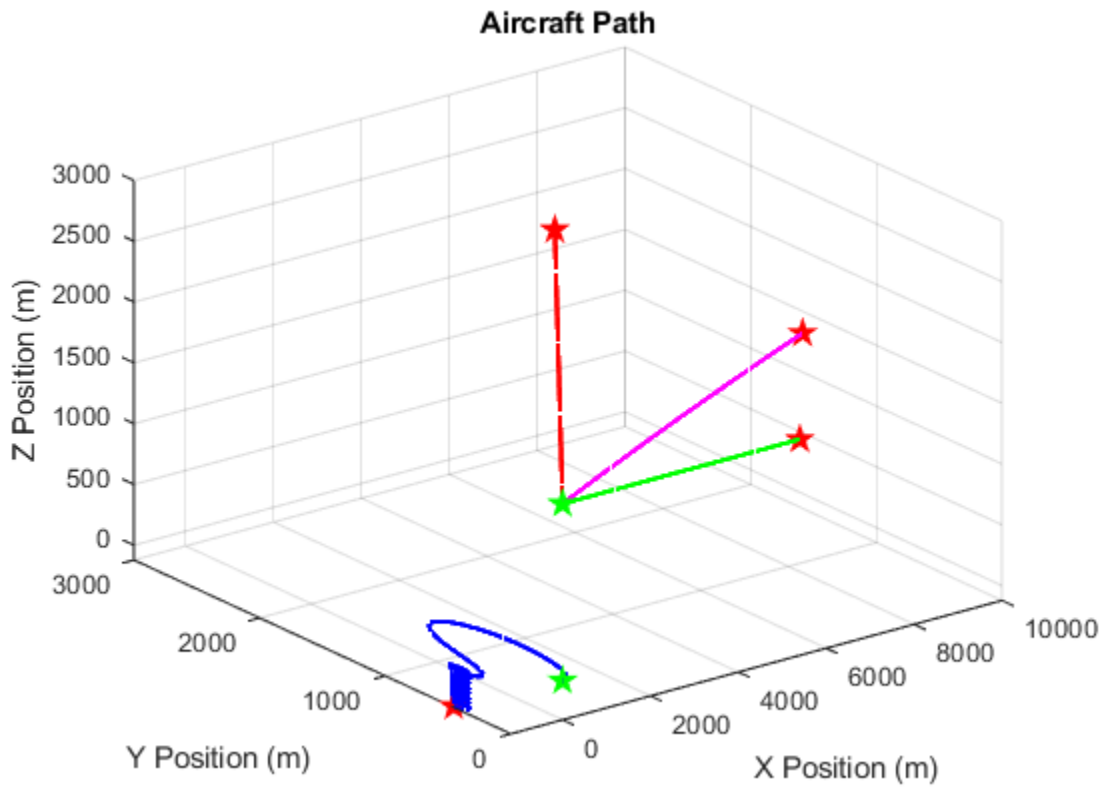
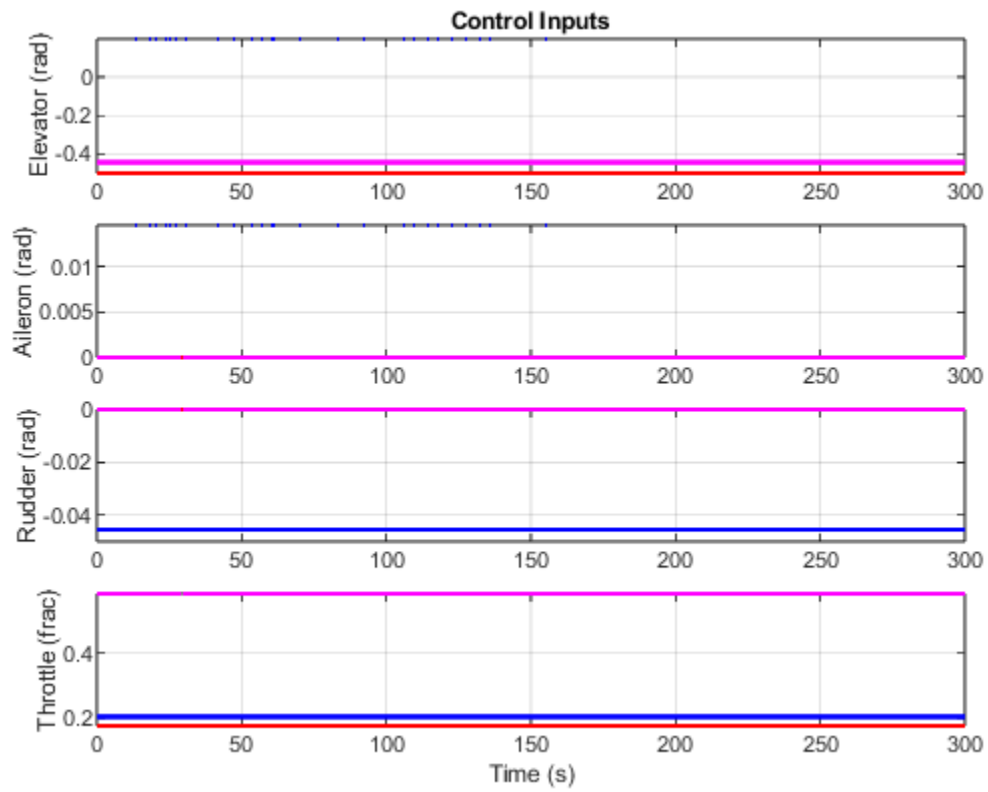
*Local minimum possible. Constraints satisfied.*

*fmincon stopped because the size of the current step is less than  
the value of the step size tolerance and constraints are  
satisfied to within the value of the constraint tolerance.*









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