Flight Test for System Identification

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Testing Objective	To exercise behaviors in the lateral axis, longitudinal axis, and the vertical axis of the RC F-16 by performing a frequency sweep on the elevator, aileron, and rudder. The following information will be collected. • Ulog File from Qgroundcontrol

Technique	• Take Off
	• Perform racetrack pattern in steady state flight
	  ○ Fly one Racetrack pattern with throttle at 40% to 60% to keep steady state flight
	  ○ Measure the lengths of the parallel straightaways to achieve a 60 second straightaway flight
	  ○ Exit first Racetrack pattern in steady state level flight to begin the second racetrack pattern
	• Perform second racetrack pattern with Logarithmic Chirp
	  ○ Begin first parallel straight in steady state level flight
	  ○ Once the plane is in steady state level flight in the first parallel straight, the pilot should begin the frequency sweep by moving the deviating the elevator stick ± 0.5–1.0 in. from the center, the pilot should slowly increase the oscillations positive and negative in intervals of 3, 6, 9, and 12 seconds.
	  ○ After the first frequency sweep return the flight to steady state level flight
	  ○ The pilot should then perform a second frequency sweep of the aileron
	  ○ After the second frequency sweep return the flight to steady state level flight
	  ○ Complete racetrack turn
	  ○ On the second parallel straight, the pilot should complete a frequency sweep of the rudder and return to steady state flight to complete the second racetrack turn and prepare for the third racetrack pattern
	• Perform Third racetrack pattern with Doublet
	  ○ Begin first parallel straight in steady state level flight
	  ○ Five seconds into the parallel straight, the pilot should execute the doublet with a sharp input in the positive direction of the elevator until maximum angular rate is achieved, followed by the same input in the opposite direction
	  ○ Return to steady state level flight
	  ○ The pilot should then execute the doublet with a sharp input in the positive direction of the aileron until maximum angular rate is achieved, followed by the same input in the opposite direction
	  ○ Complete the racetrack turn
	  ○ Fifteen seconds into the second parallel straight, the pilot should execute the doublet with a sharp input in the positive direction of the rudder until maximum angular rate is achieved, followed by the same input in the opposite direction
	  ○ Complete the second racetrack turn and prepare for landing
	• Land

Required Tools	• Instrumented Plane with battery • Radio Controller • Armed PX4 • Laptop Equipped with QGroundControl • Pilot
Success Criteria	• Pilot enters steady state level flight before and after each maneuver • Pilot performs test with limited coupling of axes • Pilot does not collide the plane with the ground or other interferences in the airspace
Special Considerations	• Limited wind gusts • Mostly clear weather • Does Safe Select Mode prohibit the frequency sweep?

Testing Objective	To exercise behaviors in the lateral axis of the RC F-16 by performing a frequency sweep on the elevator. The following information will be collected. • Ulog File from Qgroundcontrol

Technique	• Take Off
	• Perform first racetrack pattern in steady state flight
	  ○ Fly one Racetrack pattern with throttle at 40% to 60% to keep steady state flight
	  ○ Measure the lengths of the parallel straightaways to achieve a 60 second straightaway flight
	  ○ Exit first Racetrack pattern in steady state level flight to begin the second racetrack pattern
	• Perform Second racetrack pattern with Logarithmic Chirp
	  ○ Begin first parallel straight in steady state level flight
	  ○ Once the plane is in steady state level flight in the first parallel straight, the pilot should begin the frequency sweep by moving the deviating the elevator stick ± 0.5–1.0 in. from the center, the pilot should slowly increase the oscillations positive and negative in intervals of 3, 6, 9, and 12 seconds.
	  ○ After the first frequency sweep return the flight to steady state level flight
	  ○ The pilot should then perform a second frequency sweep of the same type
	  ○ After the second frequency sweep return the flight to steady state level flight
	  ○ Complete racetrack turn
	  ○ On the second parallel straight, the pilot should complete the same two frequency sweeps as before and return to steady state flight to complete the second racetrack turn and prepare for the third racetrack pattern
	• Perform Third racetrack pattern with Doublet
	  ○ Begin first parallel straight in steady state level flight
	  ○ Fifteen seconds into the parallel straight, the pilot should execute the doublet with a sharp input in the positive direction of the elevator until maximum angular rate is achieved, followed by the same input in the opposite direction
	  ○ Return to steady state level flight
	  ○ Complete the racetrack turn
	  ○ Fifteen seconds into the second parallel straight, the pilot should execute the doublet with a sharp input in the positive direction of the elevator until maximum angular rate is achieved, followed by the same input in the opposite direction
	  ○ Complete the second racetrack turn and prepare for landing
	• Land

Required Tools	• Instrumented Plane with battery • Radio Controller • Armed PX4 • Laptop Equipped with QGroundControl • Pilot

Success Criteria	• Pilot enters steady state level flight before and after each maneuver • Pilot performs test with limited coupling of axes • Pilot does not collide the plane with the ground or other interferences in the airspace
Special Considerations	• Limited wind gusts • Mostly clear weather • Does Safe Select Mode prohibit the frequency sweep?

Testing Objective	To exercise behaviors in the longitudinal axis of the RC F-16 by performing a frequency sweep on the Aileron. The following information will be collected. • Ulog File from Qgroundcontrol

Technique	• Take Off
	• Perform first racetrack pattern in steady state flight
	  ○ Fly one Racetrack pattern with throttle at 40% to 60% to keep steady state flight
	  ○ Measure the lengths of the parallel straightaways to achieve a 60 second straightaway flight
	  ○ Exit first Racetrack pattern in steady state level flight to begin the second racetrack pattern
	• Perform Second racetrack pattern with Logarithmic Chirp
	  ○ Begin first parallel straight in steady state level flight
	  ○ Once the plane is in steady state level flight in the first parallel straight, the pilot should begin the frequency sweep by moving the deviating the aileron stick ± 0.5–1.0 in. from the center, the pilot should slowly increase the oscillations positive and negative in intervals of 3, 6, 9, and 12 seconds.
	  ○ After the first frequency sweep return the flight to steady state level flight
	  ○ The pilot should then perform a second frequency sweep of the same type
	  ○ After the second frequency sweep return the flight to steady state level flight
	  ○ Complete racetrack turn
	  ○ On the second parallel straight, the pilot should complete the same two frequency sweeps as before and return to steady state flight to complete the second racetrack turn and prepare for the third racetrack pattern
	• Perform Third racetrack pattern with Doublet
	  ○ Begin first parallel straight in steady state level flight
	  ○ Fifteen seconds into the parallel straight, the pilot should execute the doublet with a sharp input in the positive direction of the aileron until maximum angular rate is achieved, followed by the same input in the opposite direction
	  ○ Return to steady state level flight
	  ○ Complete the racetrack turn
	  ○ Fifteen seconds into the second parallel straight, the pilot should execute the doublet with a sharp input in the positive direction of the aileron until maximum angular rate is achieved, followed by the same input in the opposite direction
	  ○ Complete the second racetrack turn and prepare for landing
	• Land

Required Tools	• Instrumented Plane with battery • Radio Controller • Armed PX4 • Laptop Equipped with QGroundControl • Pilot

Success Criteria	• Pilot enters steady state level flight before and after each maneuver • Pilot performs test with limited coupling of axes • Pilot does not collide the plane with the ground or other interferences in the airspace
Special Considerations	• Limited wind gusts • Mostly clear weather • Does Safe Select Mode prohibit the frequency sweep?

Testing Objective	To exercise behaviors in the vertical axis of the RC F-16 by performing a frequency sweep on the Rudder. The following information will be collected. • Ulog File from Qgroundcontrol

Technique	• Take Off
	• Perform first racetrack pattern in steady state flight
	  ○ Fly one Racetrack pattern with throttle at 40% to 60% to keep steady state flight
	  ○ Measure the lengths of the parallel straightaways to achieve a 60 second straightaway flight
	  ○ Exit first Racetrack pattern in steady state level flight to begin the second racetrack pattern
	• Perform Second racetrack pattern with Logarithmic Chirp
	  ○ Begin first parallel straight in steady state level flight
	  ○ Once the plane is in steady state level flight in the first parallel straight, the pilot should begin the frequency sweep by moving the deviating the rudder stick ± 0.5–1.0 in. from the center, the pilot should slowly increase the oscillations positive and negative in intervals of 3, 6, 9, and 12 seconds.
	  ○ After the first frequency sweep return the flight to steady state level flight
	  ○ The pilot should then perform a second frequency sweep of the same type
	  ○ After the second frequency sweep return the flight to steady state level flight
	  ○ Complete racetrack turn
	  ○ On the second parallel straight, the pilot should complete the same two frequency sweeps as before and return to steady state flight to complete the second racetrack turn and prepare for the third racetrack pattern
	• Perform Third racetrack pattern with Doublet
	  ○ Begin first parallel straight in steady state level flight
	  ○ Fifteen seconds into the parallel straight, the pilot should execute the doublet with a sharp input in the positive direction of the rudder until maximum angular rate is achieved, followed by the same input in the opposite direction
	  ○ Return to steady state level flight
	  ○ Complete the racetrack turn
	  ○ Fifteen seconds into the second parallel straight, the pilot should execute the doublet with a sharp input in the positive direction of the rudder until maximum angular rate is achieved, followed by the same input in the opposite direction
	  ○ Complete the second racetrack turn and prepare for landing
	• Land

Required Tools	• Instrumented Plane with battery • Radio Controller • Armed PX4 • Laptop Equipped with QGroundControl • Pilot

Success Criteria	• Pilot enters steady state level flight before and after each maneuver • Pilot performs test with limited coupling of axes • Pilot does not collide the plane with the ground or other interferences in the airspace
Special Considerations	• Limited wind gusts • Mostly clear weather • Does Safe Select Mode prohibit the frequency sweep?