

Date: 9/27/2012  
Location: ACRC  
Aircraft: Thor  
Pilot: Arion Mangio  
Flights: 4 Thor

### **Weather**

Sunny with a slight breeze from the south/southwest  
METAR (Anoka County)

KANE 271950Z 21003KT 10SM SKC 19/01 A3021

Andrei, Arion, and Will arrived at ACRC around 3:00pm to obtain fault detection data from Thor. Three tests were conducted in which artificial faults were injected into one of the ailerons, and into the roll rate signal during a roll angle tracking pattern. After these three tests, there was time and batteries for one more test, so a new waypoint tracking pattern was successfully tested. All flight ops ran smoothly.

Software used for this flight was [trunk/Software/FlightCode rev 907](#)

Each of the three fault detection tests consisted of six different fault cases, each being repeated 3 times. The first two cases were unfaulted scenarios to compare to. The next four cases inject an aileron fault 7 seconds after autopilot (A/P) is engaged, and a -80 deg/sec roll rate impulse fault 12 seconds after A/P is engaged. The third case aileron fault is a ramp of 5 degrees for 13 seconds. Case four is a 13 second, 10 degree right aileron fault. Case five is a 5 deg impulse fault on the right aileron, and case six is a 10 deg impulse fault on the right aileron.

During each case, a roll angle tracking pattern was conducted using a different baseline controller for each flight.

Thor flight 69 used the standard baseline controller, [baseline\\_control](#).

Thor flight 70 used the same control architecture as the standard baseline controller, but with reduced controller gains to test a slower response design, [baseline\\_control\\_slower](#).

Thor flight 71 used the LQR baseline controller designed by Rohit Pandita, [lqr\\_control](#).

The other software modules used for each fault detection flight were [fault\\_onerate](#), [fault\\_onesurf](#), [phi\\_pattern\\_cmd](#), and [EKF\\_15state](#).

Thor flight 72 was conducted to test Peter Bauer's waypoint tracking algorithm with a more precise waypoint tolerance of 10 meters instead 20 meters. A waypoint pattern consisting of five points was used. The algorithm and controller performed very well. Software modules used were [waypoint\\_guidance\\_100](#), [heading\\_tracker\\_BP](#), and [EKF\\_15state](#).

### **Thor Flight 69**

Rx Data: A044, L999, F000, H000

### **Thor Flight 70**

Rx Data: A085, L999, F013, H000

**Thor Flight 71**

Rx Data: A061, L999, F000, H000

**Thor Flight 72**

Rx Data: A061, L999, F000, H000

**Issues** None