

Header

Date: 12/06/2014

Location: UMore Park Airfield

Aircraft: Baldr

Pilot: Danny Chryst

Flights: 1 Baldr

Purpose: First flight system checkout of Baldr; testing baseline inner-loop control law.

Weather

- Clear with average wind speeds of 2mph (North). Max wind speed of 7 mph. Visibility 10 miles.
- METAR data from Lakeville (KLVN) and South Saint Paul (KSGS) reporting stations for the time period spanning the flight is given below.

Start

KLVN 061825Z AUTO 06003KT 10SM CLR M04/M08 A3062 RMK AO2

KSGS 061830Z AUTO 00000KT 10SM CLR M01/M07 A3062 RMK AO2 T10131074

Finish

KLVN 061925Z AUTO 07003KT 10SM CLR M04/M08 A3060 RMK AO2

KSGS 061930Z AUTO 00000KT 10SM CLR M01/M08 A3061 RMK AO2 T10071076

Summary

Brian, Chris, Danny, Karen, and Raghu arrived at the UMore Park Airfield around 9:00am for the very first flight of Baldr. Baldr is the UAV Lab's newest UltraStick 120 airframe that will be used for aircraft reliability research. For this first flight, only the baseline inner-loop control law was tested. The inner-loop control law consists of a pitch tracker (tracking theta), a roll tracker (tracking phi), and a yaw damper. The gains used were the same as that of Faser. The controller testing was done by commanding straight and level segments, and pitch & roll doublets.

First, Baldr was commanded to fly straight & level at 23m/s, at a pitch attitude of 5deg, and a throttle of 65%. This was repeated thrice. Next, a roll doublet of +/- 20deg was commanded (for 10s) at a pitch attitude of 5deg and a throttle of 65%. This was repeated thrice. Finally, a pitch doublet of +/- 5deg was commanded (for 6s) at a throttle of 65%. This was repeated thrice. All flight ops were smooth.

Flight code

- I. Aircraft: Baldr
- II. Guidance: guidance/guidance_1n2.c (3 straight & level, 5 roll doublets of +/- 20deg, 3 pitch doublets of +/- 5deg)
- III. Navigation: navigation/EKF_15state_quat.c
- IV. Control: control/baseline_control.c

Observations

All commanded maneuvers were tracked satisfactorily. Pitch and roll doublet responses exhibit second-order system-like characteristics. Overshoot and damping ratio are within acceptable levels. The closed-loop response of Baldr appears close to that of Faser.