mAEWing2-HuginnFLT05

Project Info	
Project (Class & Team)	mAEWing2
Flight/Test Identifier	**HuginnFLT05**
Test Objective	System ID
Personnel	
Operations Lead / Launcher (OL)	Chris Regan
Pilot (P)	Curt Olson
Observer (O)	
GCS Operator (GCS)	Leo Heide
Safety-of-Flight / Safety-of-Test Limits	
Airspeed Stall	**17 m/s (indicated)**
Airspeed [min max]	Min: 19 m/s, Max: 34 m/s
Bank Limit	45 degrees
Altitude	Max: 100 m AGL
Configuration	
Aircraft	mAEWing2 Huginn
Radio Frequencies and NetID	915 Mhz
Avionics Software Version	**SOC: v9.2** **FMU/Node: v8.3_mAEWing2**
GCS Software Version	

Test Overview

1. Pre-flight Procedures
    a. Perform GCS Start-up Procedure
    b. Perform Range test (Prop Power off)
    c. Perform Link loss test (Prop Power off)
    d. Perform Avionics Calibration

2. Launch

3. Test Cards
    1. Pilot Checkout (21 - 25 m/s)
    2. Test 26 m/s
        a) Bending
        b) RTSM
        c) Aero symmetric set #1
        d) Aero anti-symmetric set #1
        e) Aero symmetric set #2
        f) Aero anti-symmetric set #2
    3. Test 29 m/s
        a) Bending
        b) RTSM
        c) Aero symmetric set #1
        d) Aero anti-symmetric set #1
        e) Aero symmetric set #2
        f) Aero anti-symmetric set #2

4. Return

5. Land

6. Post-Flight Procedures

SOF/SOM

Joker Power: 3.70 V

Reserve Power for
2x landing attempts

Bingo Power: 3.50 V

Return to landing

Nominal Low speed mission contains 19 test segments

Checkout: 1
Test 26 m/s: 6
Test 29 m/s: 6
Landing Go-around: 1

Total: 14

Test Card # 2a	
Bending	
	Test Airspeed **26 m/s**
1. (GCS) Verify Altitude, Airspeed	Entry Altitude between 30 and 120 meters
2. (OL) "Clear Engage"	
3. (P) Engage Test	Attitude Control, Auto Throttle
4. Fly hands-off, small inputs only	
5. (GCS) Call Excitation %	**Engage Reference Excitations (6.3 s)**
6. (OL) Complete	**Bending**

Test Card # 2b	
Stability ID #1	
	Test Airspeed **26 m/s**
7. (GCS) Verify Altitude, Airspeed	Entry Altitude between 30 and 120 meters
8. (OL) "Clear Engage"	
9. (P) Engage Test	Attitude Control, Auto Throttle
10. Fly hands-off, small inputs only	
11. (GCS) Call Excitation %	**Engage Reference Excitations (10 s)**
12. (OL) Complete	**Roll. Pitch**

Test Card # 2c	
Aero ID - Symmetric #1	
	Test Airspeed **26 m/s**
1. (GCS) Verify Altitude, Airspeed	Entry Altitude between 30 and 120 meters
2. (OL) "Clear Engage"	
3. (P) Engage Test	Attitude Control, Auto Throttle
4. Fly hands-off, small inputs only	
5. (GCS) Call Excitation %	**Engage Surface Excitations (10 s)**
6. (OL) Complete	**Pitch: TE1, TE3, TE5**

Test Card # 2d	
Aero ID – Anti-Symmetric #1	
	Test Airspeed **26 m/s**
1. (GCS) Verify Altitude, Airspeed	Entry Altitude between 30 and 120 meters
2. (OL) "Clear Engage"	
3. (P) Engage Test	Attitude Control, Auto Throttle
4. Fly hands-off, small inputs only	
5. (GCS) Call Excitation %	**Engage Surface Excitations (10 s)**
6. (OL) Complete	**Roll: TE1, TE3, TE5**

Test Card # 2e	
Aero ID - Symmetric #2	
	Test Airspeed **26 m/s**
1. (GCS) Verify Altitude, Airspeed	Entry Altitude between 30 and 120 meters
2. (OL) "Clear Engage"	
3. (P) Engage Test	Attitude Control, Auto Throttle
4. Fly hands-off, small inputs only	
5. (GCS) Call Excitation %	**Engage Surface Excitations (10 s)**
6. (OL) Complete	**Pitch: TE2, TE4, LE**

Test Card # 2f	
Aero ID – Anti-Symmetric #2	
	Test Airspeed **26 m/s**
1. (GCS) Verify Altitude, Airspeed	Entry Altitude between 30 and 120 meters
2. (OL) "Clear Engage"	
3. (P) Engage Test	Attitude Control, Auto Throttle
4. Fly hands-off, small inputs only	
5. (GCS) Call Excitation %	**Engage Surface Excitations (10 s)**
6. (OL) Complete	**Roll: TE2, TE4, LE**

Test Card # 3a	
Bending	
	Test Airspeed **29 m/s**
1. (GCS) Verify Altitude, Airspeed	Entry Altitude between 30 and 120 meters
2. (OL) "Clear Engage"	
3. (P) Engage Test	Attitude Control, Auto Throttle
4. Fly hands-off, small inputs only	
5. (GCS) Call Excitation %	**Engage Reference Excitations (6.3 s)**
6. (OL) Complete	**Bending**

Test Card # 3b	
Stability ID #1	
	Test Airspeed **29 m/s**
1. (GCS) Verify Altitude, Airspeed	Entry Altitude between 30 and 120 meters
2. (OL) "Clear Engage"	
3. (P) Engage Test	Attitude Control, Auto Throttle
4. Fly hands-off, small inputs only	
5. (GCS) Call Excitation %	**Engage Reference Excitations (10 s)**
6. (OL) Complete	**Roll. Pitch**

Test Card # 3c	
Aero ID - Symmetric #1	
	Test Airspeed **29 m/s**
1. (GCS) Verify Altitude, Airspeed	Entry Altitude between 30 and 120 meters
2. (OL) "Clear Engage"	
3. (P) Engage Test	Attitude Control, Auto Throttle
4. Fly hands-off, small inputs only	
5. (GCS) Call Excitation %	**Engage Surface Excitations (10 s)**
6. (OL) Complete	**Pitch: TE1, TE3, TE5**

Test Card # 3d	
Aero ID – Anti-Symmetric #1	
	Test Airspeed **29 m/s**
1. (GCS) Verify Altitude, Airspeed	Entry Altitude between 30 and 120 meters
2. (OL) "Clear Engage"	
3. (P) Engage Test	Attitude Control, Auto Throttle
4. Fly hands-off, small inputs only	
5. (GCS) Call Excitation %	**Engage Surface Excitations (10 s)**
6. (OL) Complete	**Roll: TE1, TE3, TE5**

Test Card # 3e	
Aero ID - Symmetric #2	
	Test Airspeed **29 m/s**
1. (GCS) Verify Altitude, Airspeed	Entry Altitude between 30 and 120 meters
2. (OL) "Clear Engage"	
3. (P) Engage Test	Attitude Control, Auto Throttle
4. Fly hands-off, small inputs only	
5. (GCS) Call Excitation %	**Engage Surface Excitations (10 s)**
6. (OL) Complete	**Pitch: TE2, TE4, LE**

Test Card # 3f	
Aero ID – Anti-Symmetric #2	
	Test Airspeed **29 m/s**
1. (GCS) Verify Altitude, Airspeed	Entry Altitude between 30 and 120 meters
2. (OL) "Clear Engage"	
3. (P) Engage Test	Attitude Control, Auto Throttle
4. Fly hands-off, small inputs only	
5. (GCS) Call Excitation %	**Engage Surface Excitations (10 s)**
6. (OL) Complete	**Roll: TE2, TE4, LE**

Day-Before-Flight Checklist

1. Check and charge batteries
    a. Propulsion
    b. Avionics
    c. Transmitter
    d. Ground Control Station
    e. Walkie-Talkies

2. Prepare ground control station laptop
    a. Verify flight software is operational
    b. Verify GCS software is operational

3. Verify Firmware and Settings
    a. FMU firmware
    b. FCC software

4. Packing List
    a. Maintenance
        i. Aircraft specific tools
        ii. Velcro
        iii. Zip-ties
    b. Battery bag
    c. Electronics components
        i. Radio Modem
        ii. USB Cables
        iii. microSD cards
    d. Battery chargers
    e. RC transmitter(s)
    f. RC transmitter hand warmer, if applicable
    g. Laptop computer and charger
    h. Bungee launch system

5. Verify CG location
6. Verify pitot cover is secured on
7. Inspect bungee launcher condition

Day-of-Flight Checklist

1. Setup Ground Control Station
    a. Power-on laptop
    b. Connect radio modem
    c. Start GCS software

2. Assemble aircraft
    a. Attach wings, torque to spec
    b. Attach winglets

3. Setup Bungee Launch System
    a. Measure out anchor locations
    b. Install two base anchors (~20 ft apart)
    c. Install safety/release anchor

4. Perform Range test (Prop Power OFF)
    a. Verify RC and TM links
    b. Verify RSSI on GCS
    c. Transmitter to range mode
    d. Rotate aircraft

5. Perform Link loss test (Prop Power OFF)
    a. (OL) Secure aircraft, "Aircraft Secure"
    b. (P) Switch to Autopiot mode
    c. (P) Observe throttle up, surfaces pos
    d. (P) Turn transmitter off
    e. (P) Verify: throttle cut, surfaces to spiral, manual mode
    f. (P) "Link loss test complete"

6. Perform Avionics Calibration

The Day-of-Flight Checklist is performed at the flight field. The complete checklist is performed once prior to any flights, and all or portions may be performed following any in-field modification to the aircraft. Stale batteries can be used for the procedure.

Bungee Setup:

57 ft of stretch
28 lbs of total stretch

With ½ Thrust, this is predicted to give 15 m/s (@ full relax, ~2 seconds of acceleration)

Pre-Flight Checklist

1. Check battery voltages

2. Arm Bungee Launch System
    a. Stretch each bungee, verify tension, attach to safety strap (2 person)

3. Turn on transmitter, switch user if required
4. Connect and secure Avionics battery
5. Verify flight mode via GCS
    a. Verify TM Link
    b. Verify GPS Satellite
    c. Hold for Nav Filter init

The Pre-flight Checklist is Performed only prior to launch. Fresh batteries should be used.

Note Starting Battery Voltages: _____

Note Bungee Distance and Tension: _____

CHECK TELNET for all IMUs

Notes:

Launch Checklist

1. Perform Pre-flight checklist 2. Transition aircraft to launch start 3. Secure Aircraft 4. Power-on cameras, start recording 5. Install and secure Propulsion batteries 6. Ensure non-essential personnel are clear of the operation area 7. Attach bungee launcher 8. Power-on Propulsion 9. (GCS) Verify Nav Solution 10. Verify GCS is ready 11. (GCS) "Pilot, Stick Left… Right… Up… Down…" 12. (GCS) "Pilot, Throttle runup" 13. Remove launch safety strap 14. Check runway is clear 15. Verify Pilot is ready 16. Verify Launcher is ready 17. (OL) "Ready for Takeoff" **18. (P) Half stick aft, Half throttle** 19. (P) "Launch, Launch, Launch" 20. (L) Pull launch release pin 21. (GCS) Confirm Launch and Data Quality **22. (P) Gear Up**	Manual Control, Manual Throttle **Abort straight ahead, reduce throttle**

Return Checklist

1. (OL) "Approach and Recovery" 2. Check that runway is clear and everyone has left the area other than the Pilot and Operations Lead 3. Check wind 4. (P) Line-up approach 5. (P) Initiate approach mode **6. (P) Verify Gear Down** 7. (GCS) Verify Approach mode, "Approach"	Approach mode: Attitude Control, Manual Throttle

Landing Checklist

1. (OL) "Clear for landing" 2. (OL/P) Call "Flare" at 20 ft AGL 3. (P) Initiate Flare 4. (GCS) Verify Flare Mode 5. Land and come to a complete stop 6. (P) "Throttle cut, hands off"	Predicted Approach Speed is **18 m/s** Predicted Touchdown Speed is **14 m/s** Predicted Stall Speed is **13 m/s** Flare Mode: Bank, attitude, and airspeed automated Flare Bypass Mode: Bank and Attitude pilot control Airspeed hold (**16 m/s**)

Post-flight Checklist

1. (P) Power-Off Prop, "Prop Safe" 2. (OL) Power-Off Avionics 3. Transition aircraft back to setup location 4. (OL) Retreive logs, archive, clear 5. Remove and store batteries 6. Inspect aircraft	Note any Squawks: