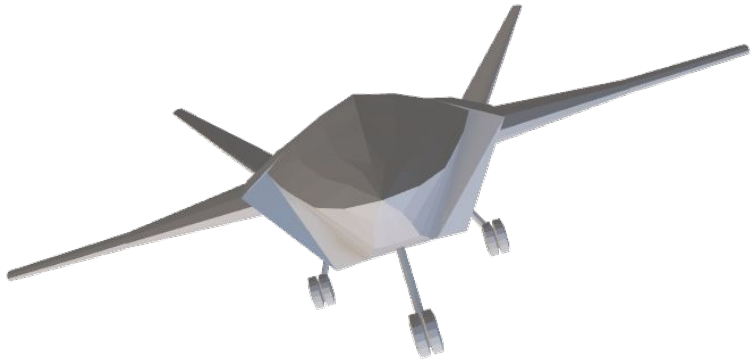
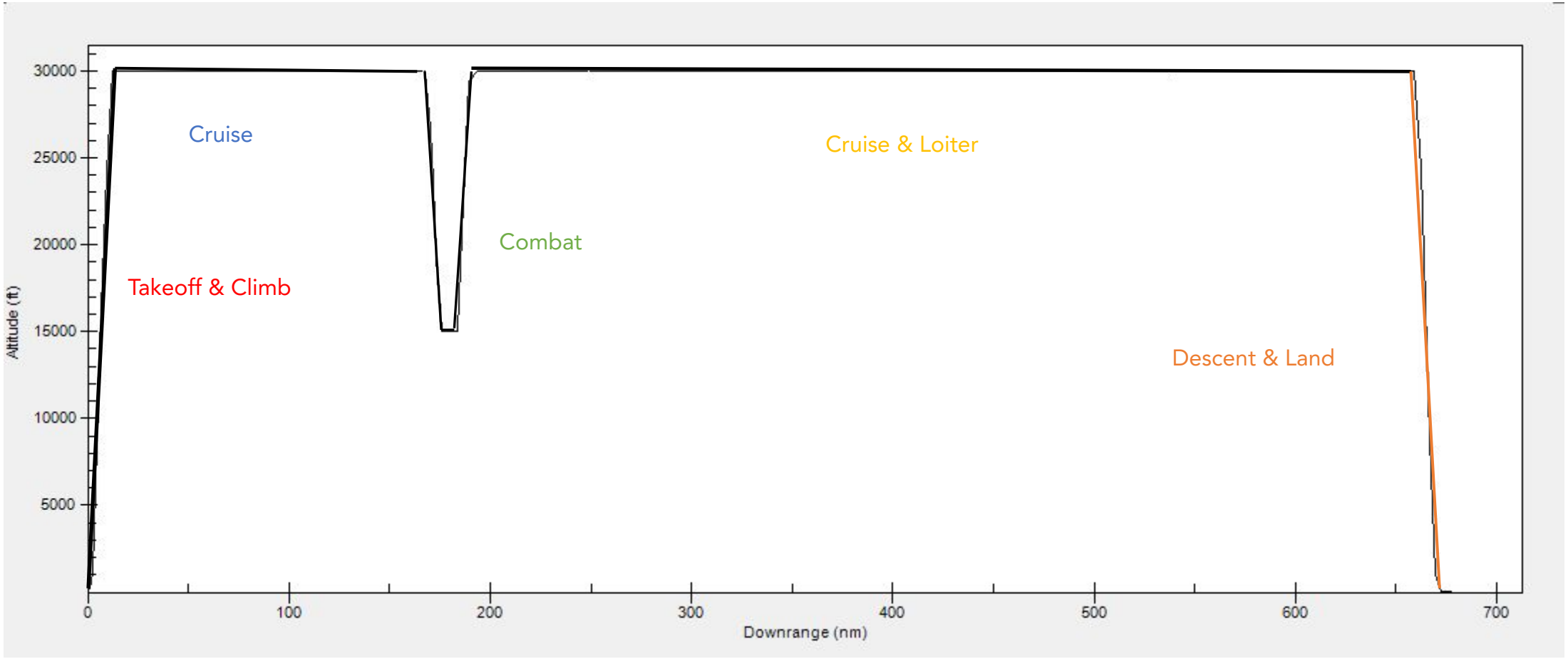
FLYING FOX

- Unmanned
- Multirole
- High speed
- High maneuverability
- Combat Aerial Vehicle
- Surveillance
- Reconnaissance
- Wingman



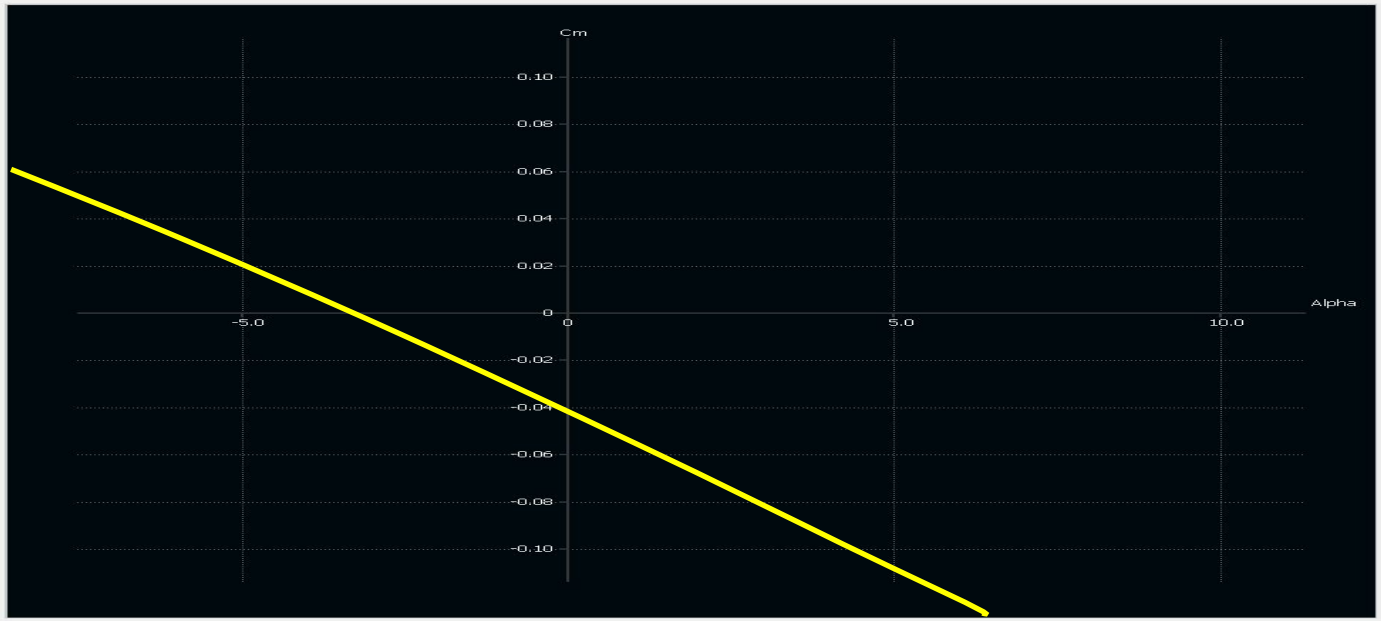
Designed Using ‘Planemaker’

FLYING FOX MISSION PROFILE



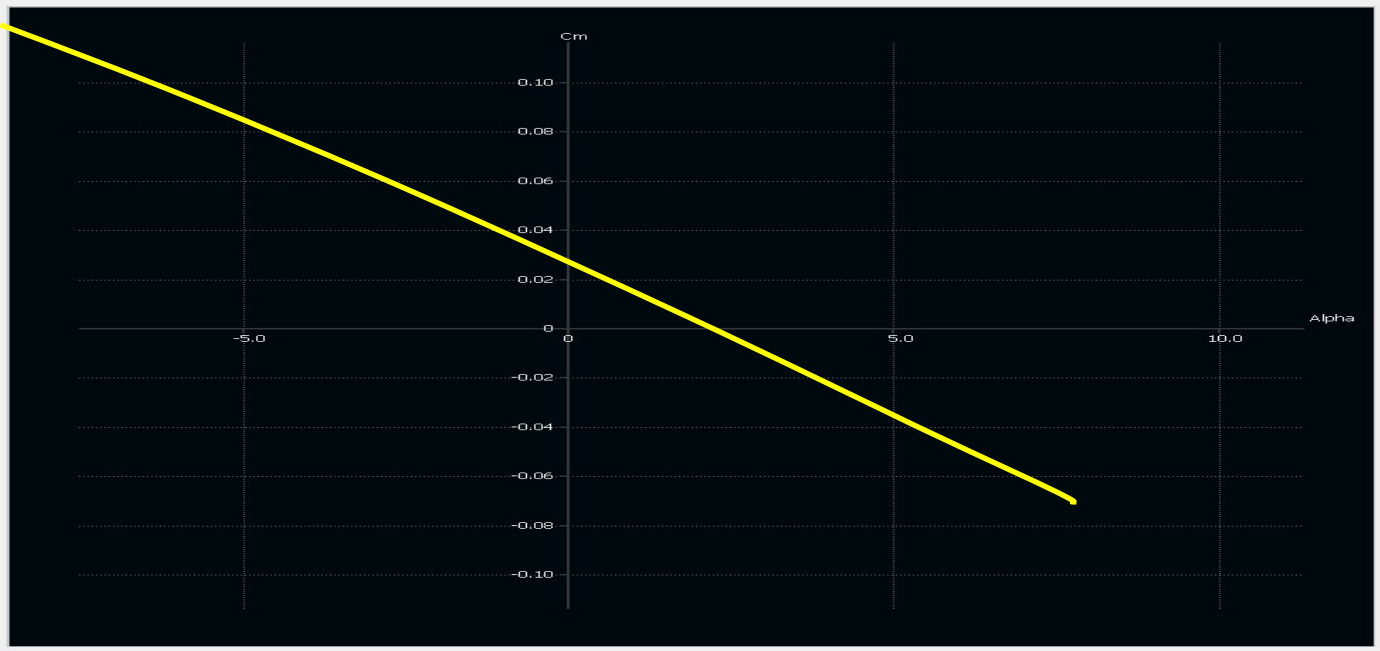
XFLR5 ANALYSIS

[Unstable]

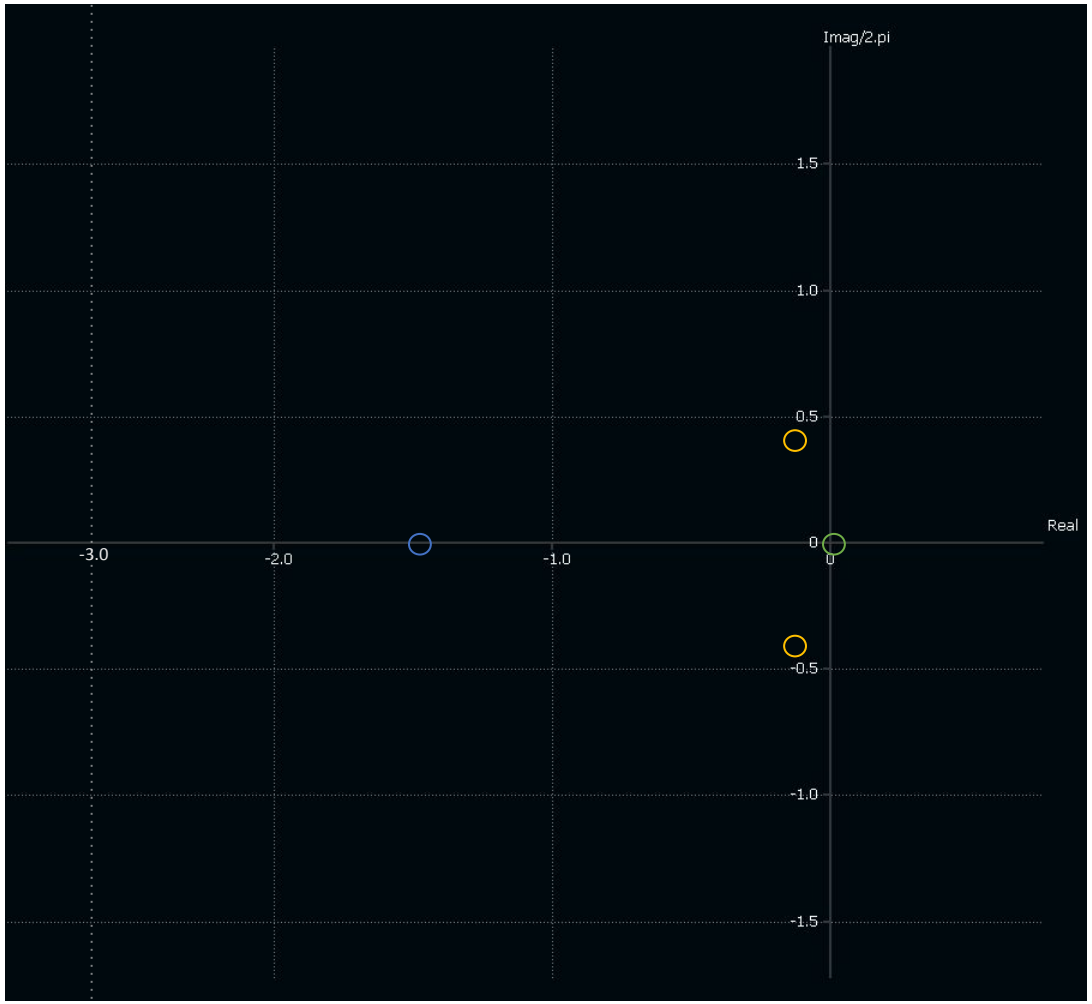


[Stable]

-ve 8 angle of incidence

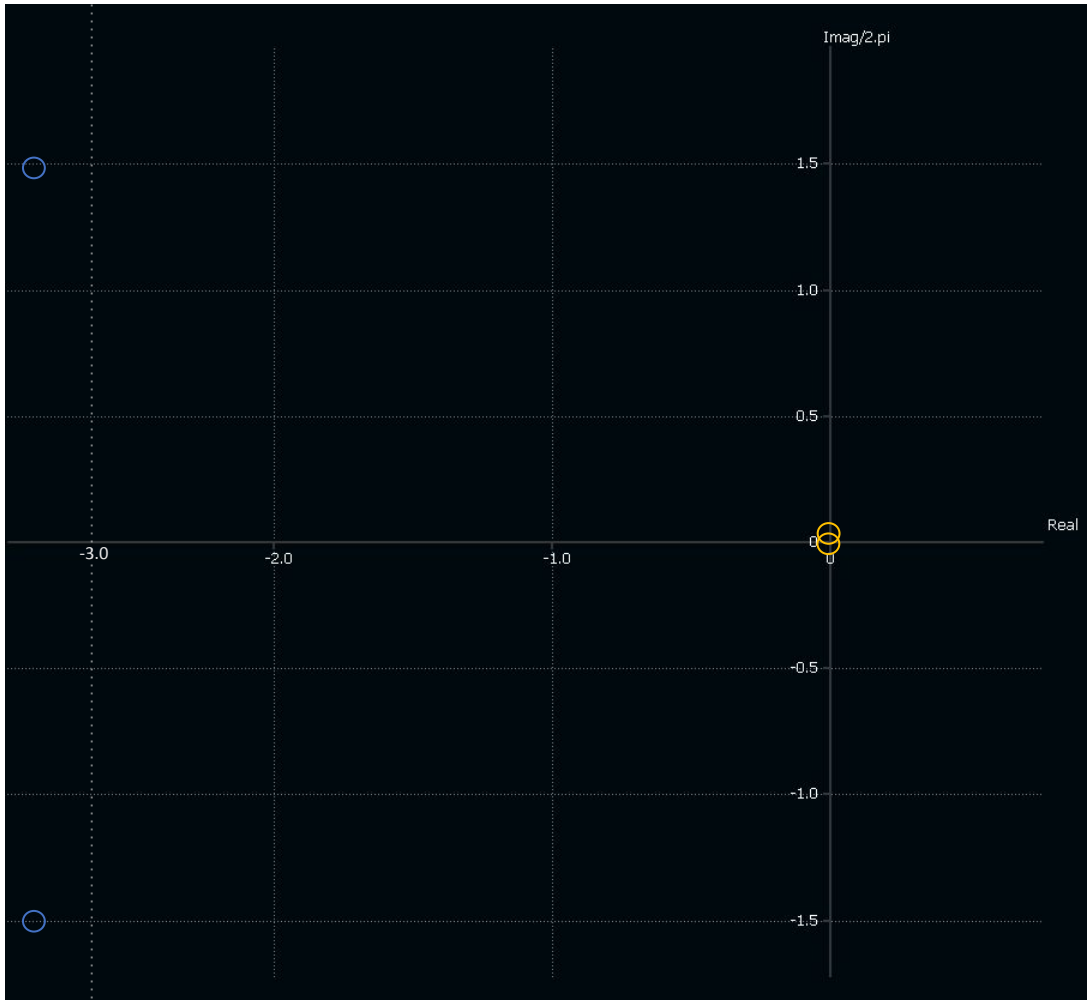


XFLR5 ANALYSIS [Stability]



- Spiral mode
- Roll mode
- Dutch roll mode

Lateral Stability root locus



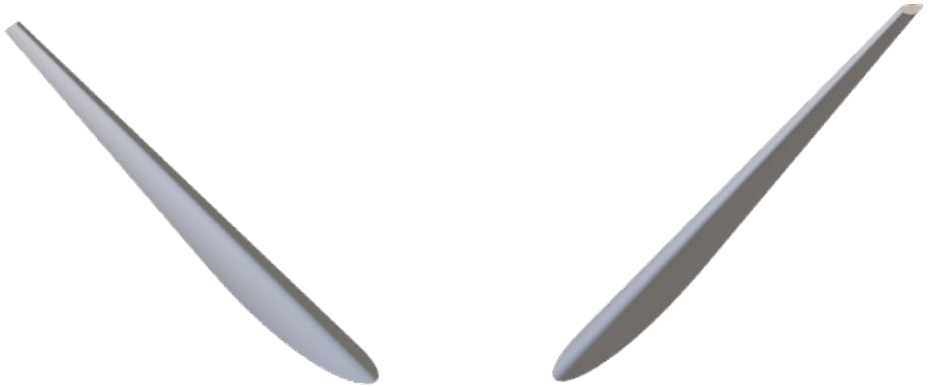
- Short Period mode
- Phugoid mode

Longitudinal Stability root locus

Airfoil Selection

- High stability
- Low drag
- Symmetric

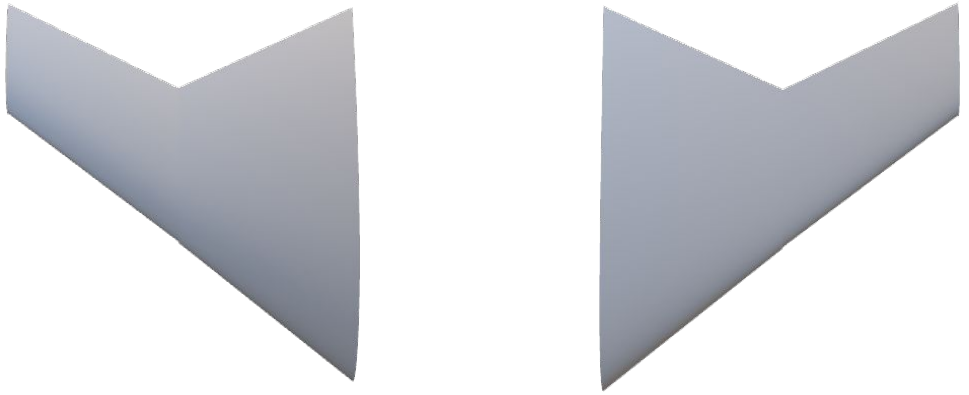
0009



V tail

- Good stability
- Enhanced lift
- Delay drag rise

2412

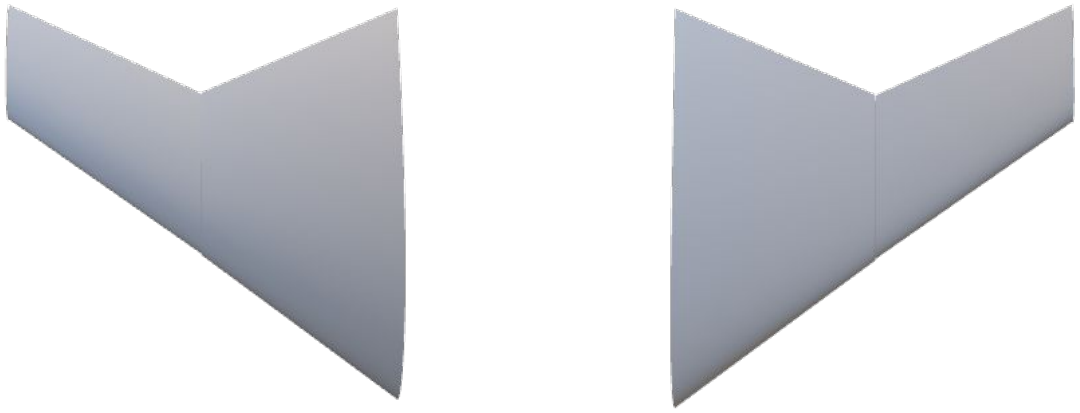


Swept Wing

Note: We used airfoil NACA 2412 for our UAV as a substitute to NASA lrn 1015 due to the unavailability of .afl file of it. Hence, the test results are different respectively.

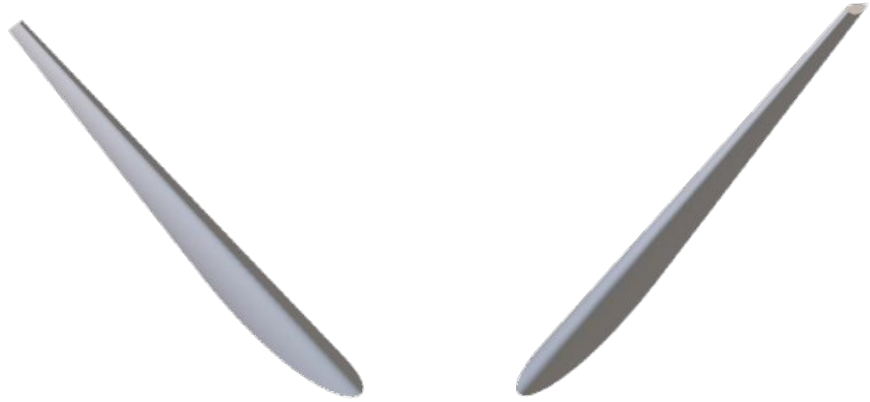
XFLR5 ANALYSIS

Configuration



Swept Wing

- Reduces adverse effects of transonic & supersonic flow
- Increase Divergence Mach number
- High maneuverability with low aspect ratio



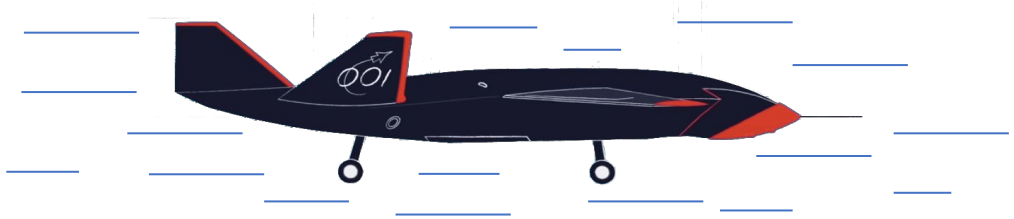
V tail

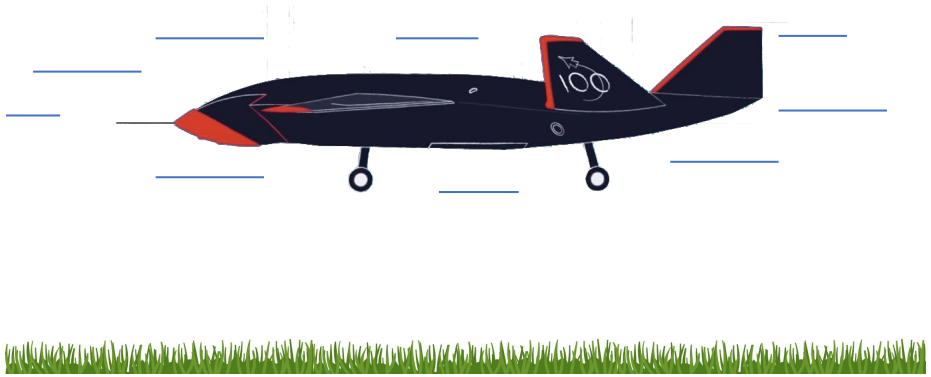
- Reduced Interference Drag
- Reduced weight than conventional tail configuration
- Enhanced Maneuverability

STABILITY TEST

High Altitude High Speed [Mode H]

Altitude – 44,000 ft (above MSL)
Speed – 171 knots (IAS)





Low Altitude Low Speed [Mode L]

Altitude – 16,000 ft (above MSL)
Speed – 155 knots (IAS)

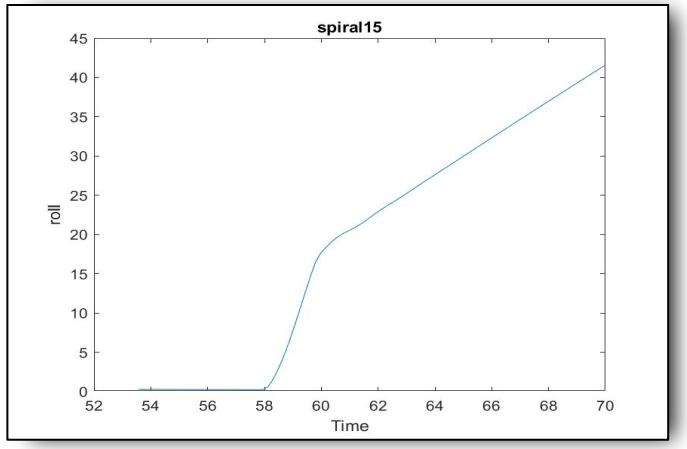
*Images not to scale

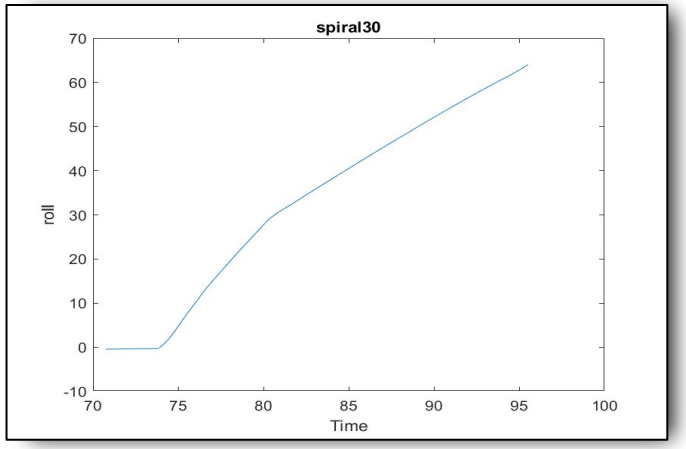
STABILITY TEST

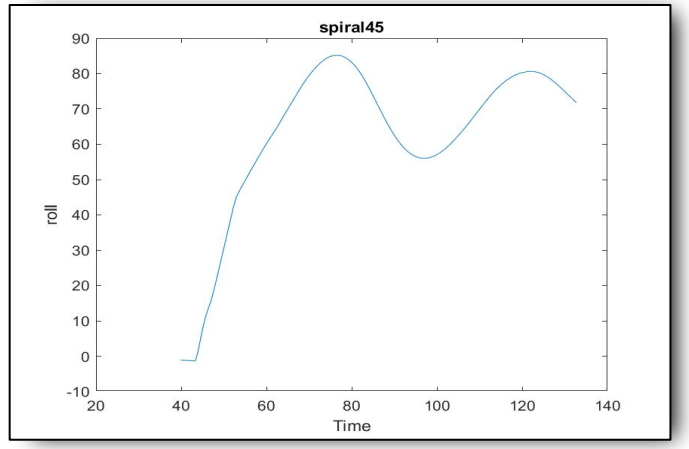
Spiral Mode

[Mode H]

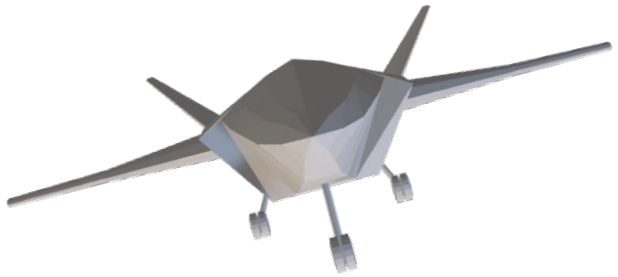
Graph Roll vs Time







15^0



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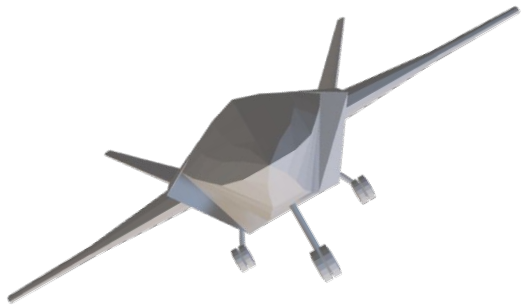

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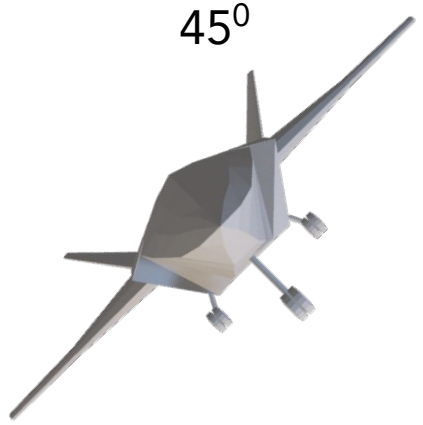
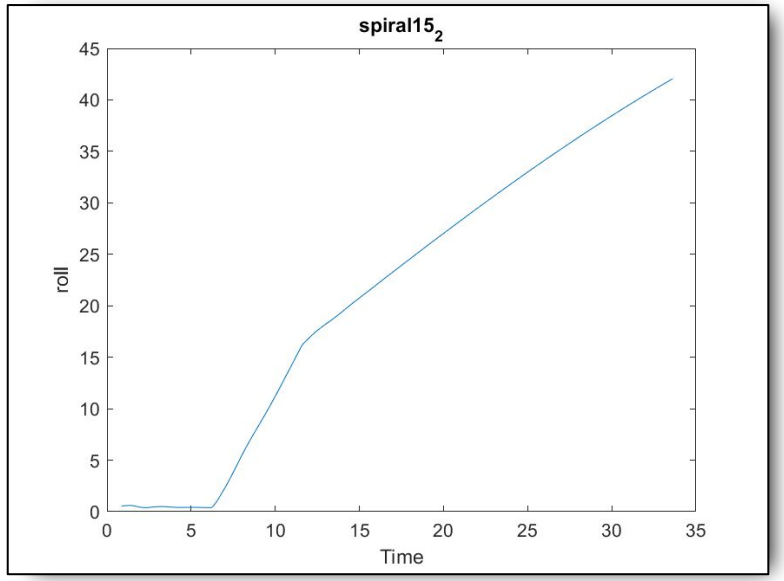


STABILITY TEST

Spiral Mode

[Mode L]



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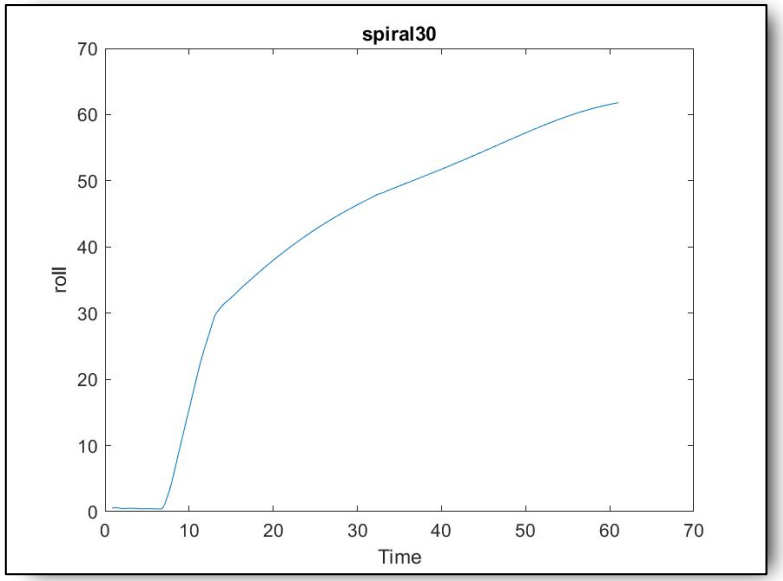

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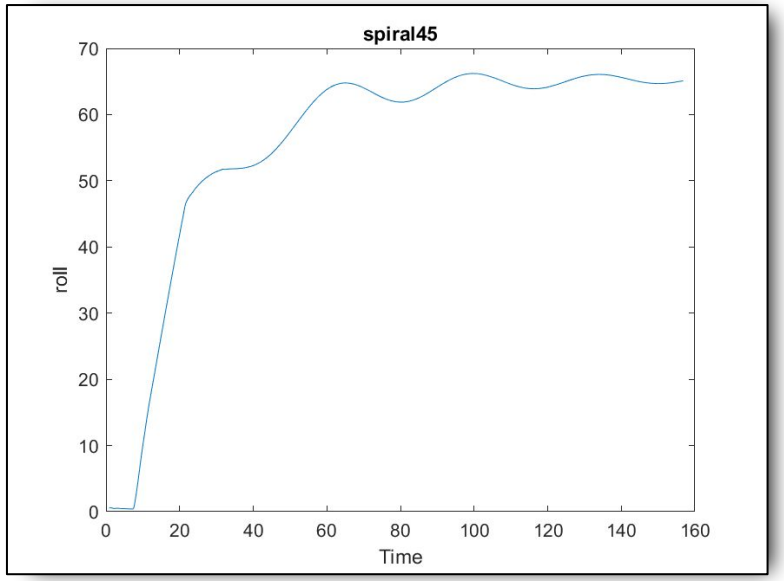


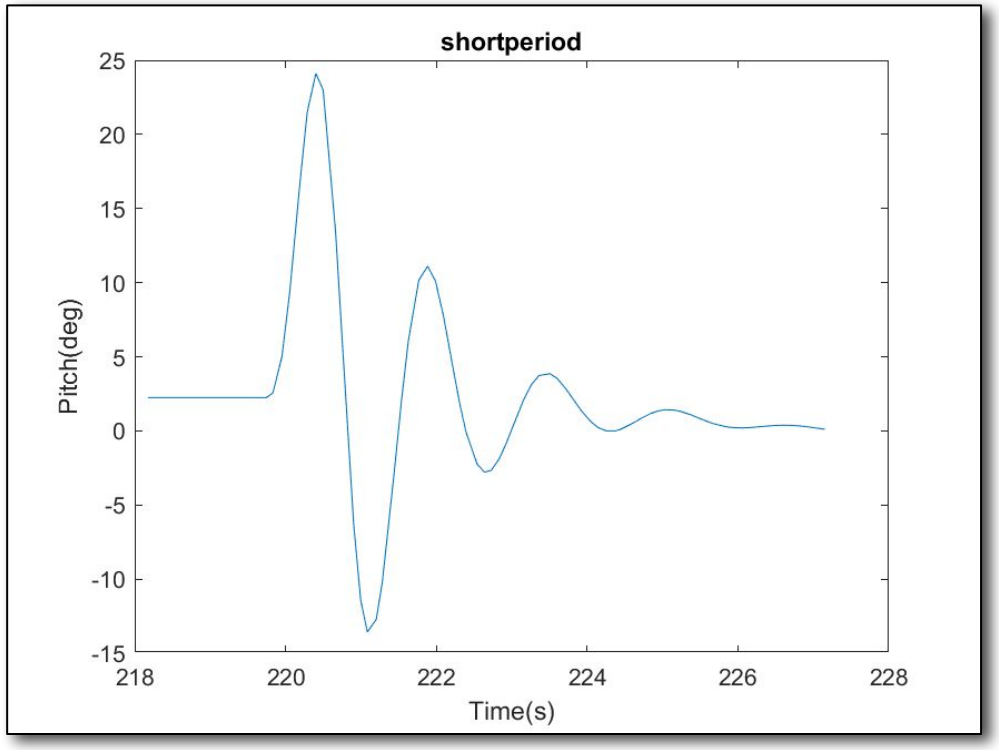
45^0

Graph Roll vs Time

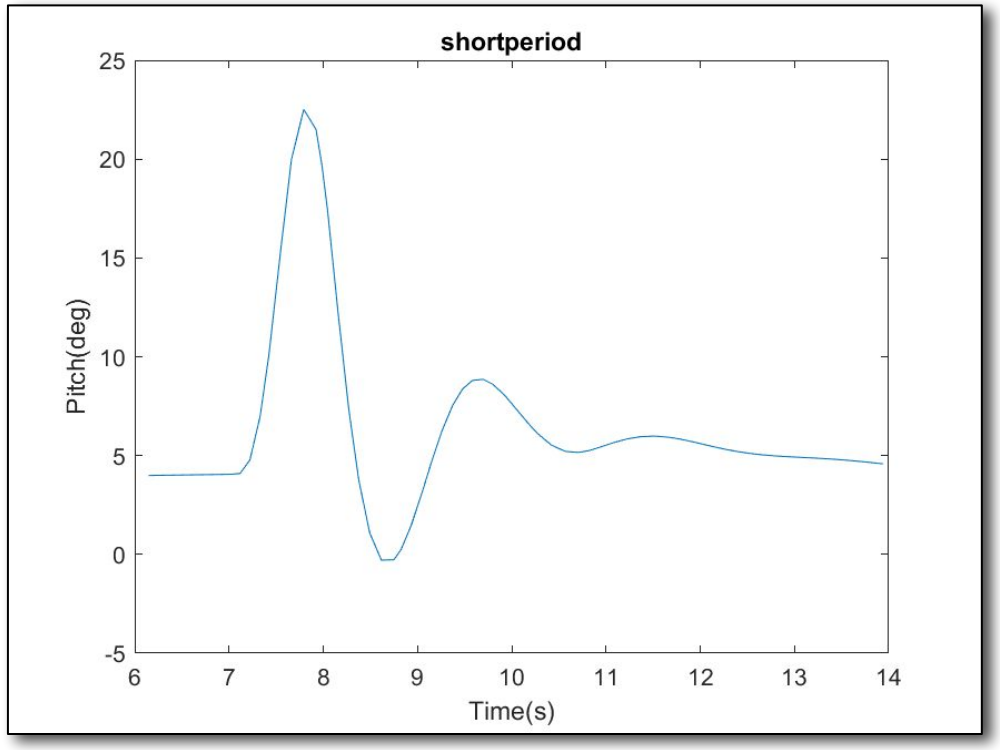
STABILITY TEST

Short Period Mode

[Mode H]



[Mode L]



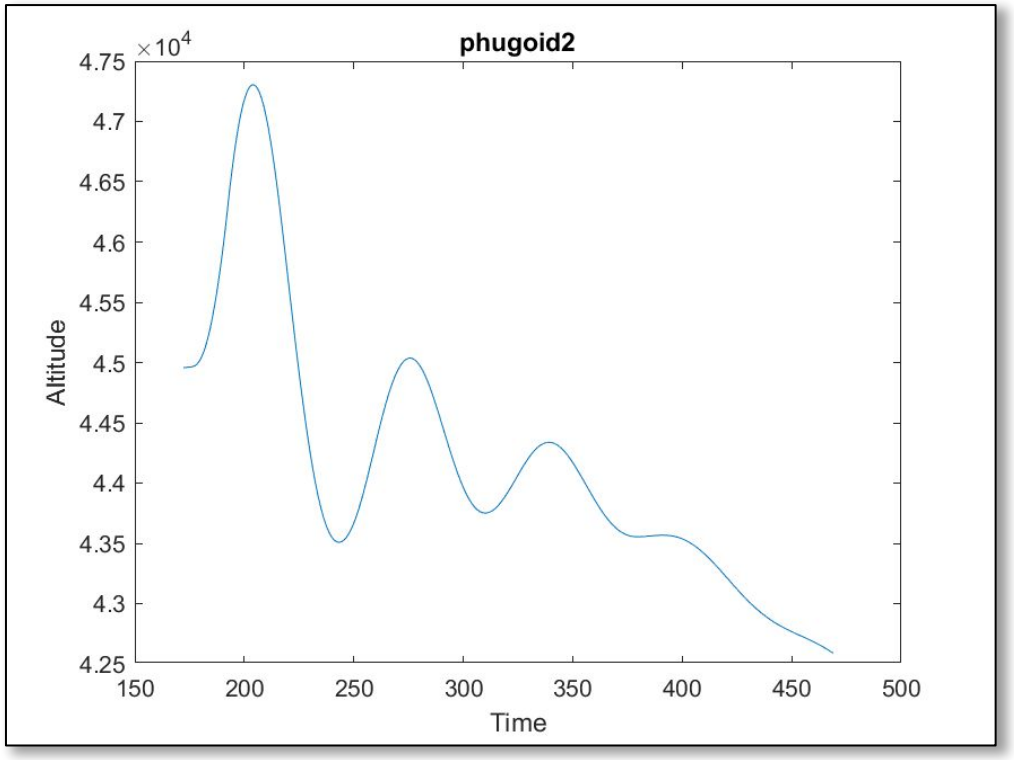
Graph Pitch vs Time

STABILITY TEST

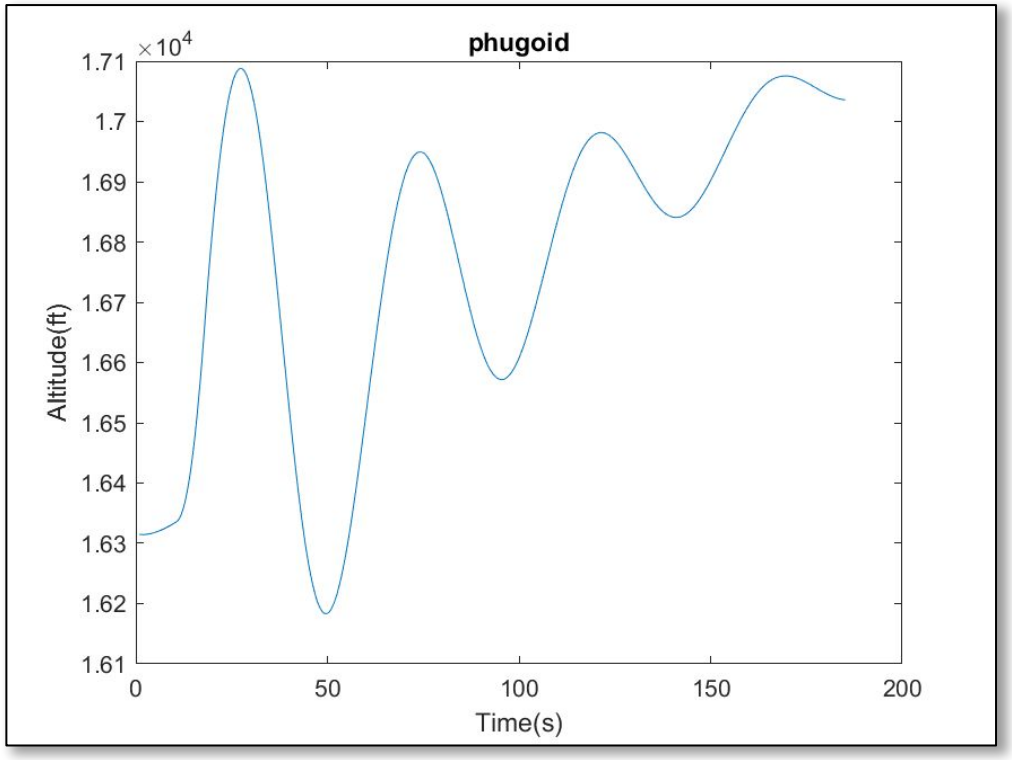
Phugoid Mode

Performed by: 20^0 Nose Up , 10% decrease in velocity

[Mode H]



[Mode L]

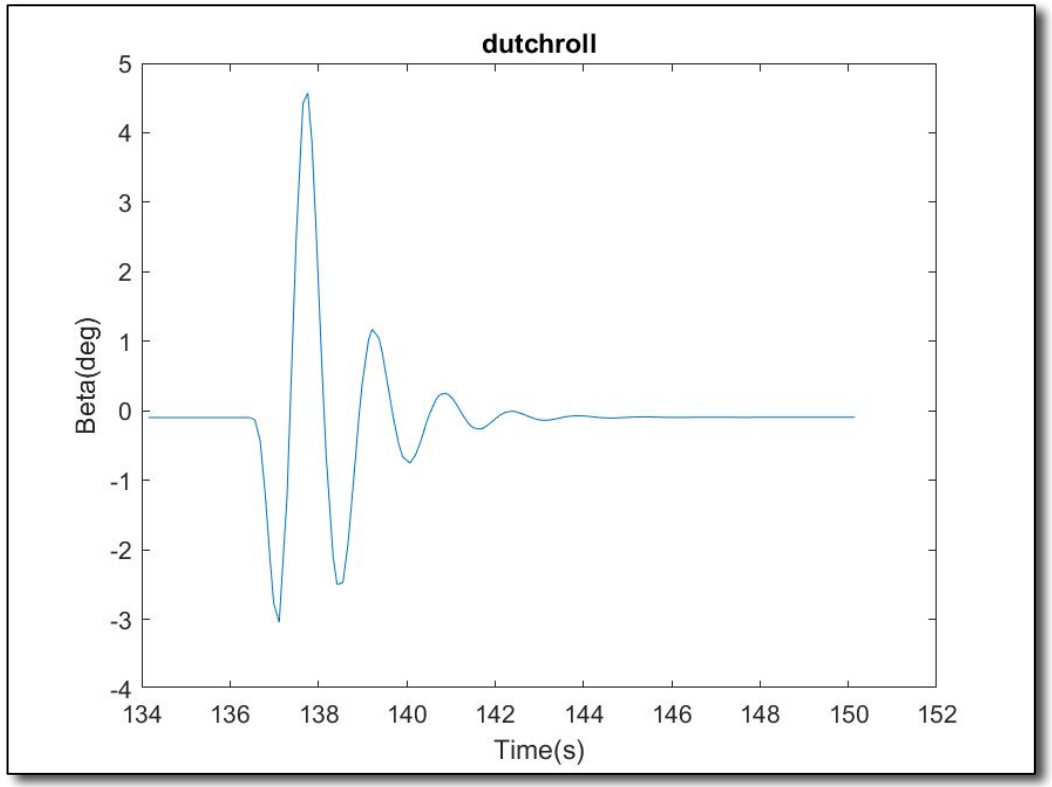


Graph Altitude vs Time

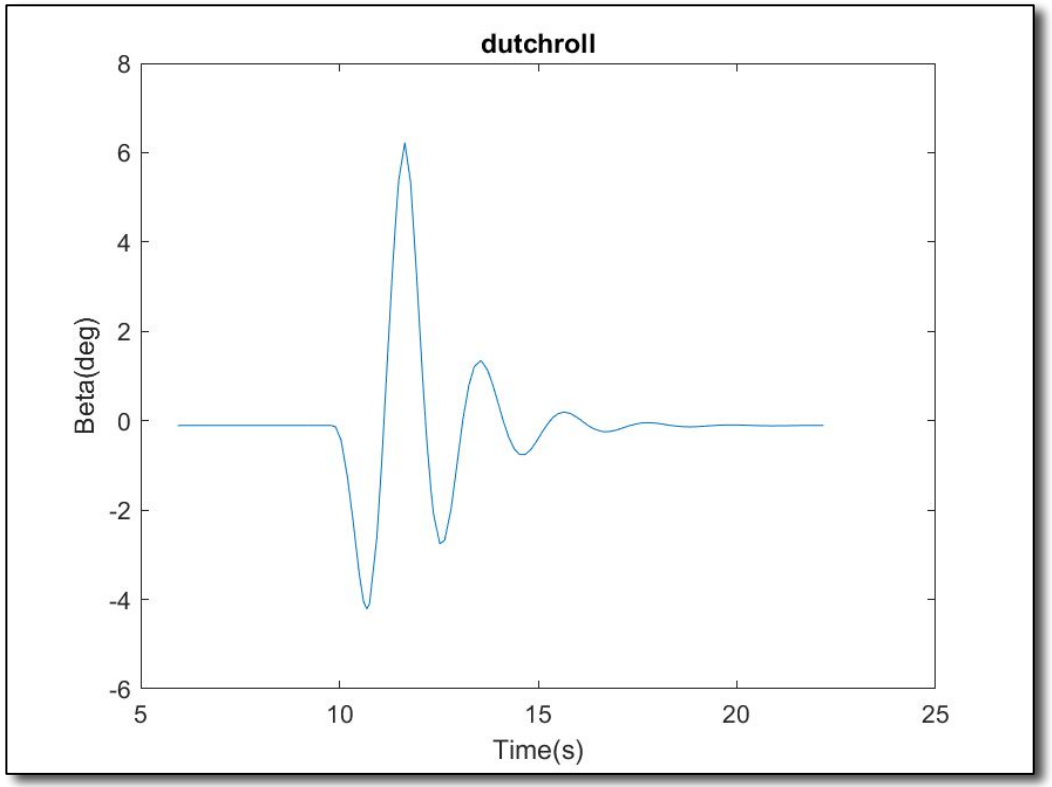
STABILITY TEST

Dutch Roll Performed by: Rudder Doublet

[Mode H]



[Mode L]



Graph **β** vs Time

APPENDIX I

	Wing Section	Tail Section
Airfoil	NACA 2412	NACA 0009
MAC	2.194m	0.6
Aspect Ratio	6.599	2.2
Wingspan	9.420m	0.273
Incidence Angle	0	-8
Sweep	24	12

APPENDIX II

Takeoff weight	2950 kg
Empty weight	1371 kg
Fuel weight	579 kg
Payload weight	700 kg
Avionics weight	300 kg
Engine weight	300 kg

APPENDIX III

	High Altitude	Low Altitude
Speed	171 knots	155 knots
Altitude	44000 ft.	16000 ft.

APPENDIX IV

	High Altitude			Low Altitude		
Modes	Dutch Roll	Short Period	Phugoid	Dutch Roll	Short Period	Phugoid
Frequency	0.6609	0.6428	0.0160	0.4640	0.5370	0.0237
Damping Ratio	-	0.1	0.3159	0.0154	0.0470	-
Subsidence Ratio	-	0.5318	0.1234	0.9071	0.7438	-
Max. Amplitude	4.5718	24.1132	47304.6680	6.2231	22.5106	17087.8652