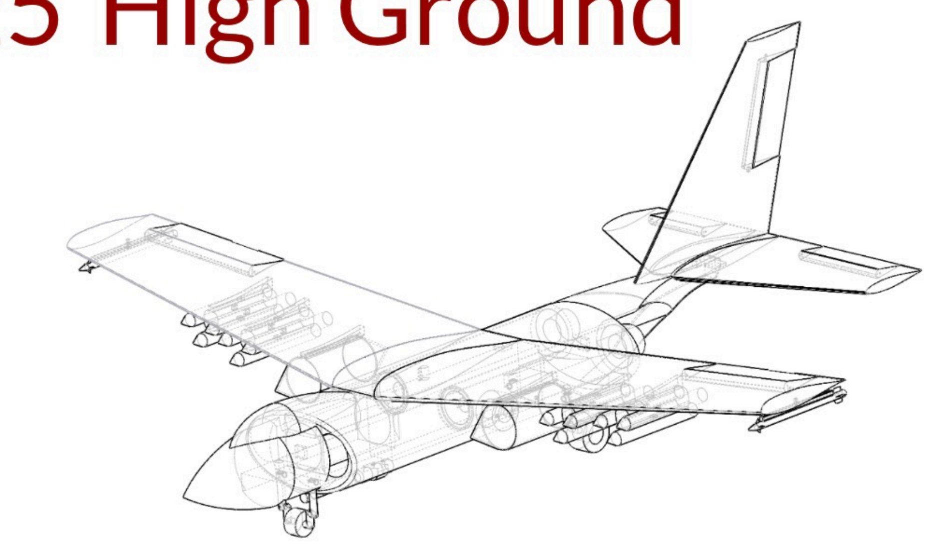
YA-25 High Ground

Close Air Support Aircraft

SDSU



Objective: Engage in high intensity combat at maximum thrust while maintaining stability for swift climb and descent of 5000ft.

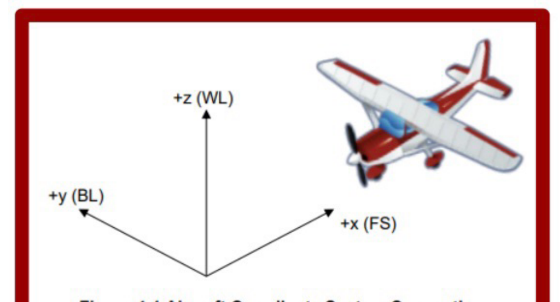
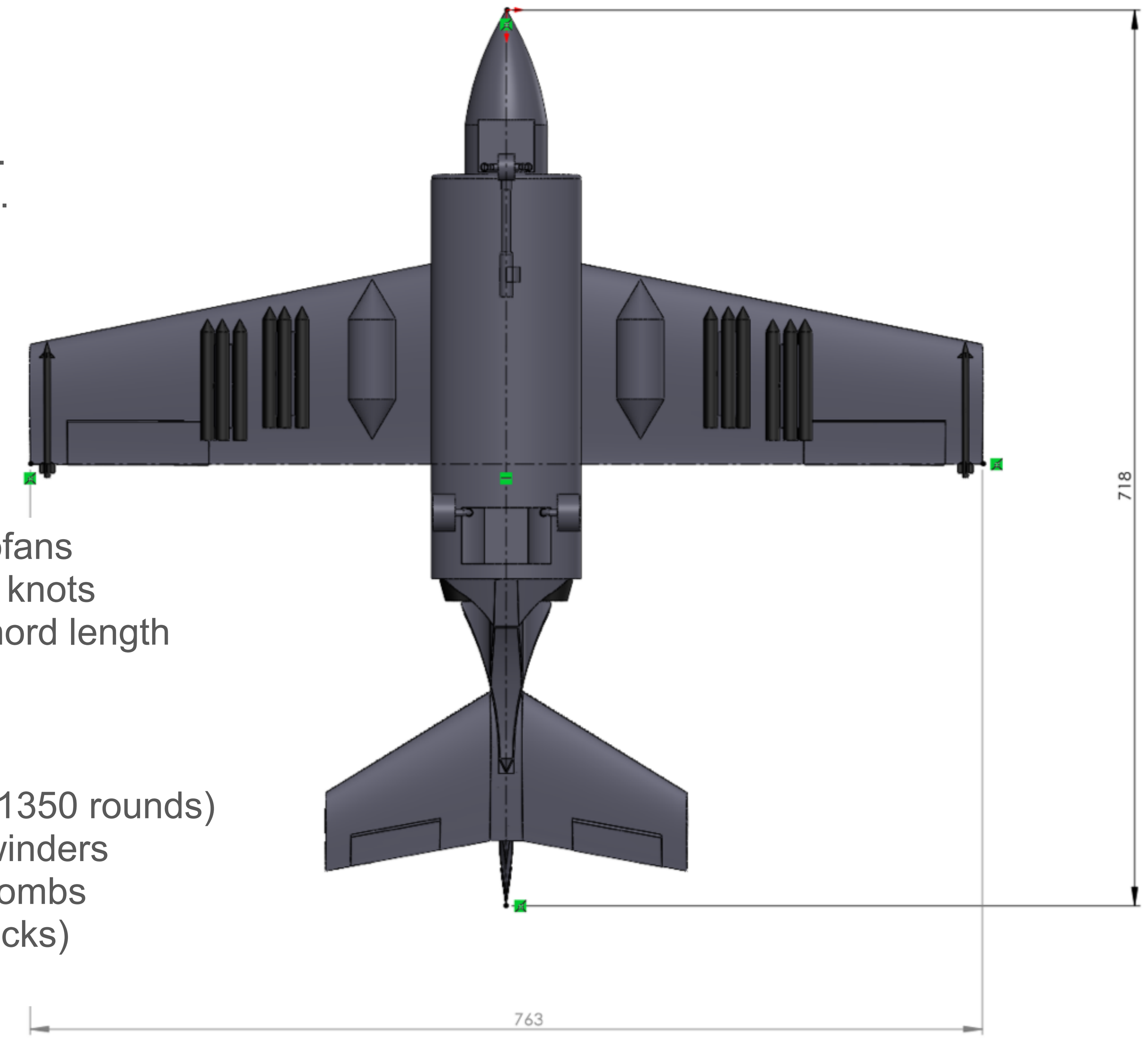


Figure 4-1 Aircraft Coordinate System Convention

CG location (X, Y, Z)	(218, -0.035, 2.92)
%MAC	31.7%

Crew: 1
Height: 9.3 ft
WTO: 45,270 lbs.
WOE: 20,908 lbs.
WF: 12,180 lbs.
WPL: 12,183 lbs.

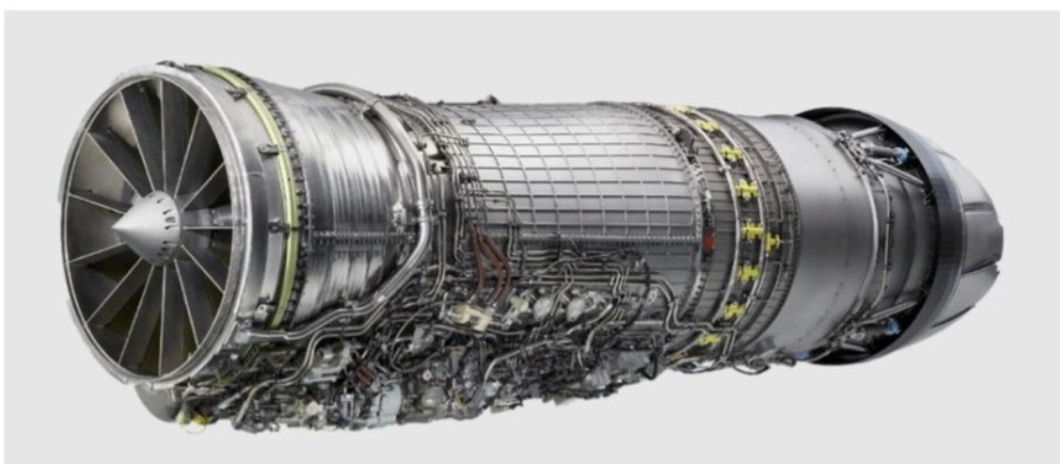


Engines: 2 turbofans
Max speed: 566 knots
CG: 31.7% of chord length

Armaments
GAU-8 Avenger (1350 rounds)
2 X AIM-9L Sidewinders
12 X Mk 82 GP bombs
(Triple Ejector Racks)

(2x) General Electric F110-100

- Non afterburning configuration
- Max thrust: 18,330 lbf
- Bypass Ratio: 0.76
- Thrust-to-weight ratio: 4.33:1
- Compressor: 2 spool, 3-stage fan and 9-stage HPC
- Combustors: Annular
- Turbine: 1-stage HPT and 2-stage LPT



Key Components

Modular payload bay in between the engines can be used for a number of potential missions

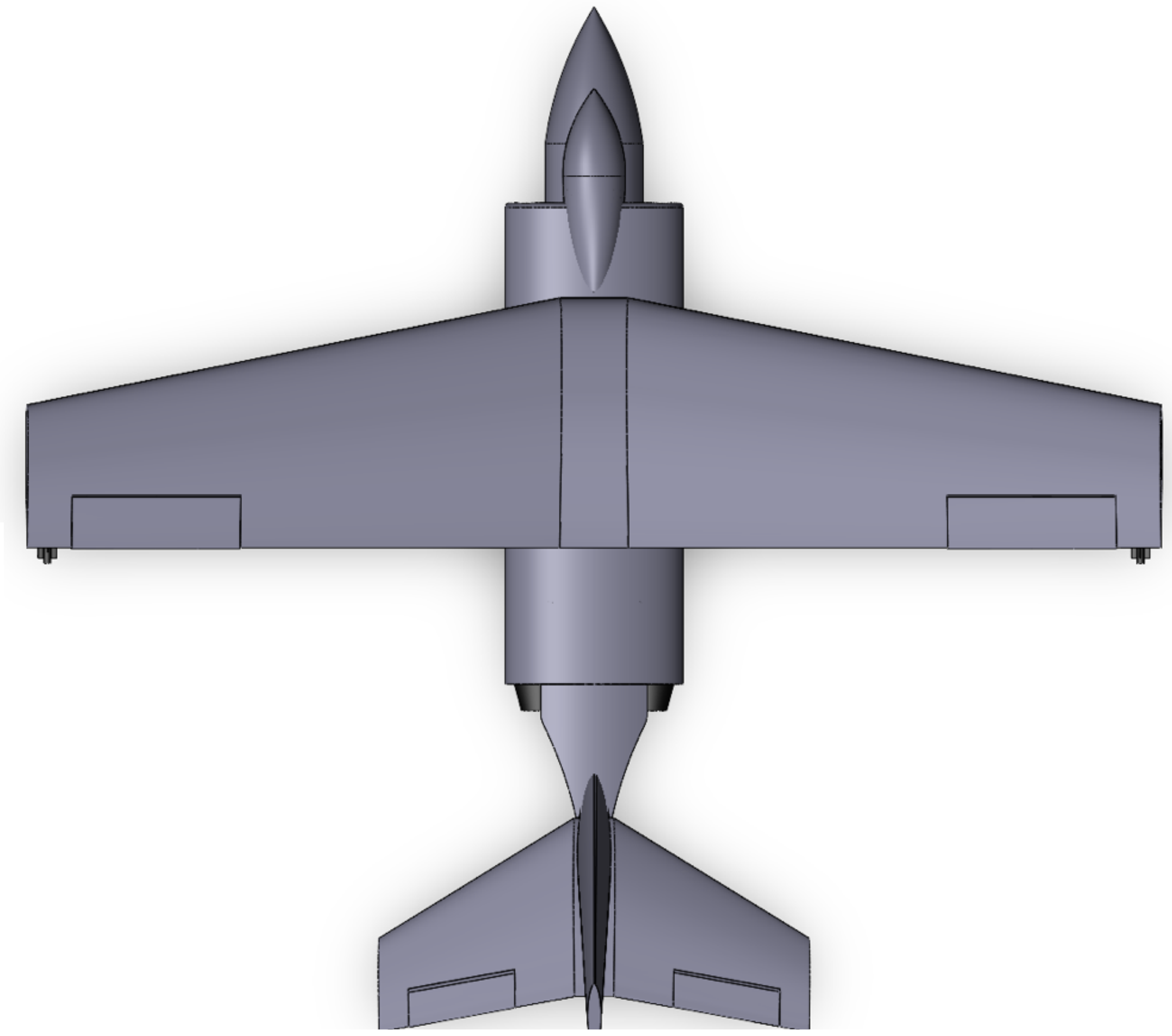
Both engines lodged within midsection fuselage

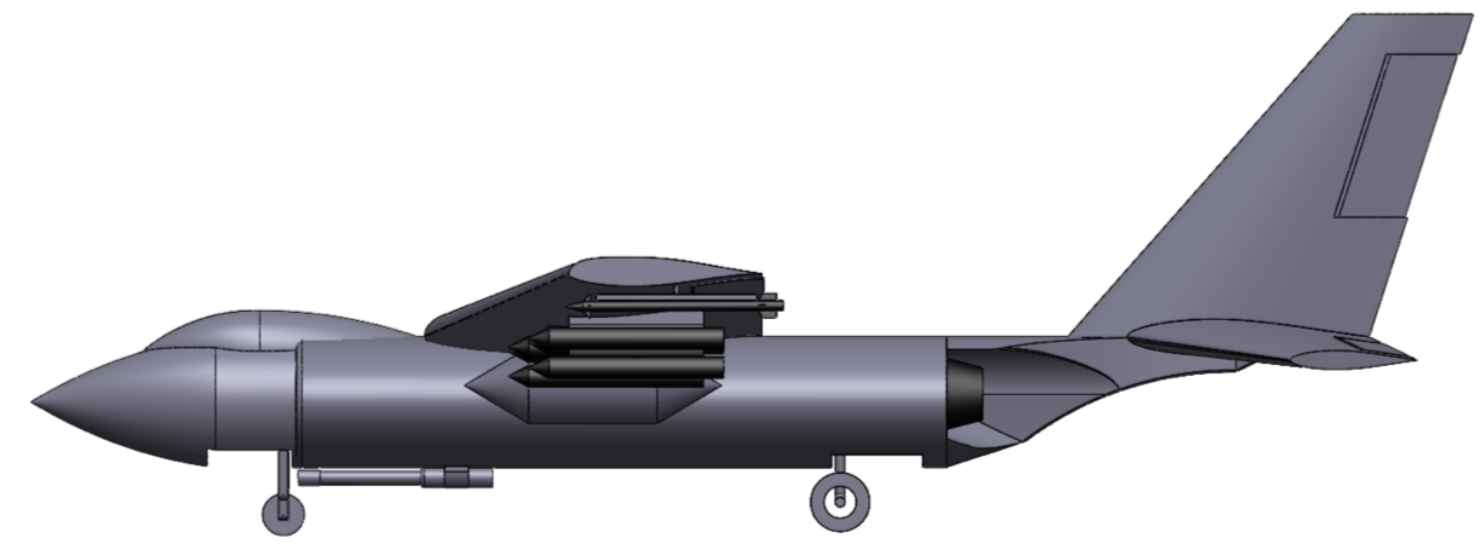
High Wing Configuration

Aft Landing gear when stowed extends past the fuselage to act as additional cushion in the event of a belly landing

GAU 8 is mounted underside of fuselage

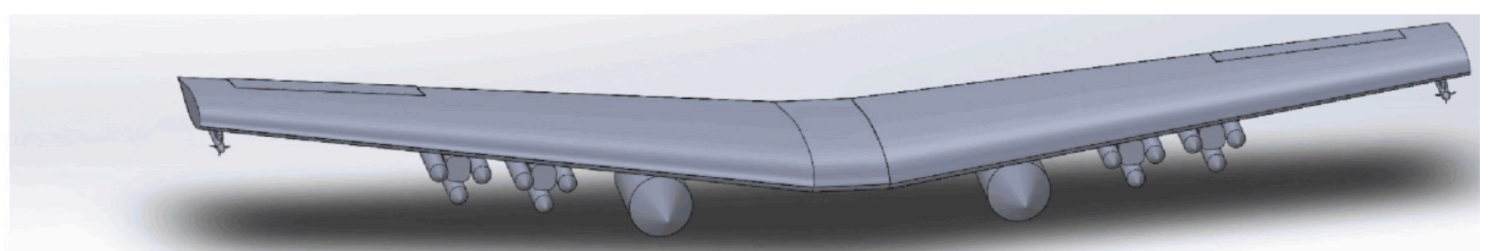
Anhedral empennage for control authority



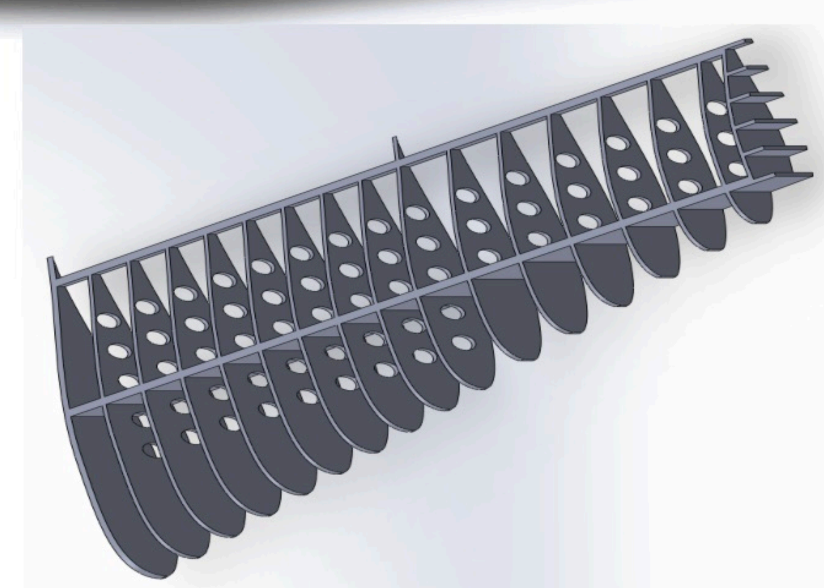


NACA 63(2)-215 Mod B

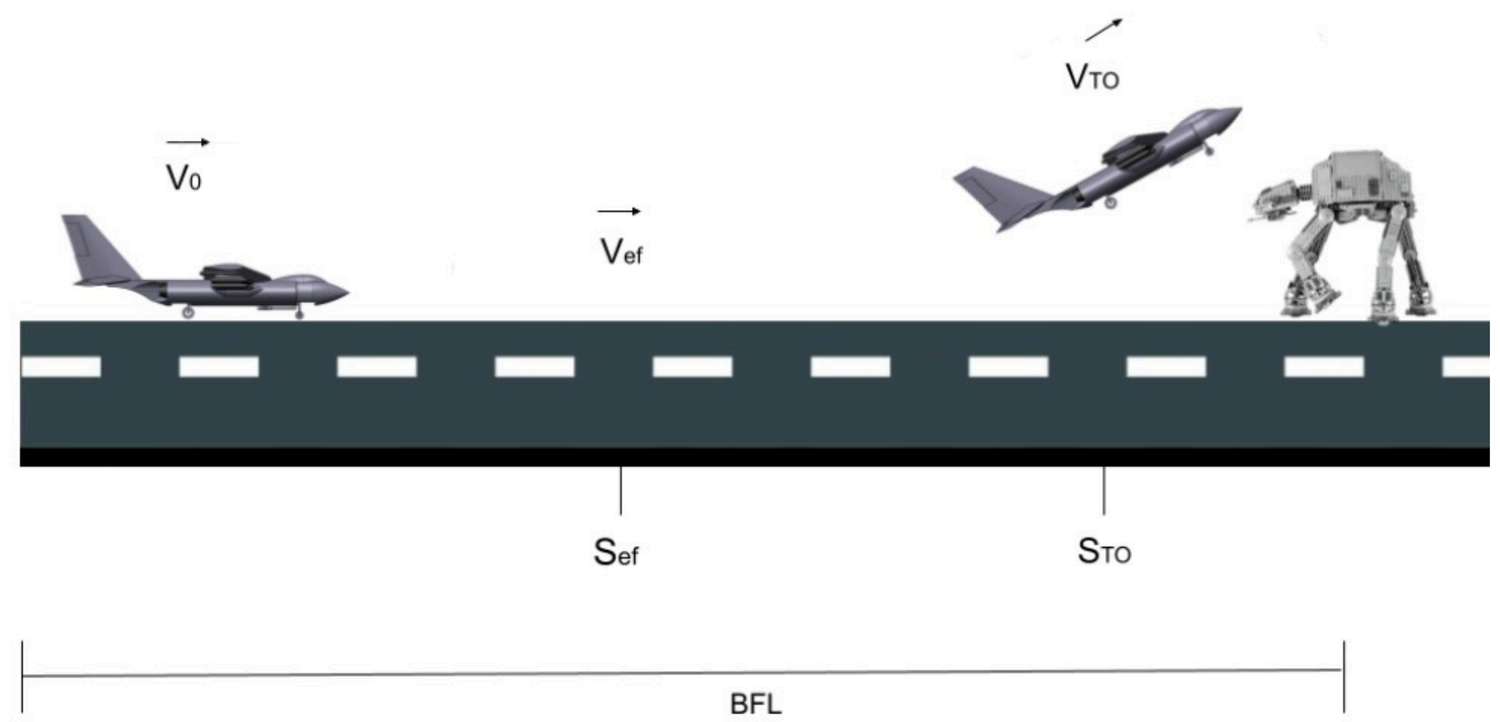
Max thickness 15% at 30% chord. Max camber 1.5% at 10% chord.



Wing Area: 654 ft^2
Wing Span: 60ft
Root Chord: 14ft,
Tip Chord: 8ft
Sweep Angle: 11.3 degrees
Dihedral Angle: 4 degrees
Estimated at least 1000 gal of fuel to fit within the wing.
Control Surface Area = 54 ft^2 (combined)



Large wing available to fit armaments such as (2x) AIM-9L Sidewinder missiles and (12x) Mk 82 GP bombs and (2x) Additional 370 gal Fuel tanks. Structural and bending considerations should would be the next step for more serious consideration.



Takeoff Performance

Maximum Lift Coefficient	1.305
Stall Velocity	211.12 ft/s
Take off velocity	253.34 ft/s
Ground run with 3-second TO speed hold	2122 ft/s
Rotation distance	506.69 ft
Transition distance at 0.15g	1030 ft
Total Distance	**3661 ft**

Landing performance with 40 ft. obstacle

	1% fuel (ft.)	60% fuel (ft.)	100% fuel (ft.)
Approach distance	1688	1907	2056
Free roll distance	623	668	728
Braking distance	2127	2588	2900
Total Distance	**4439**	**5183**	**5684**

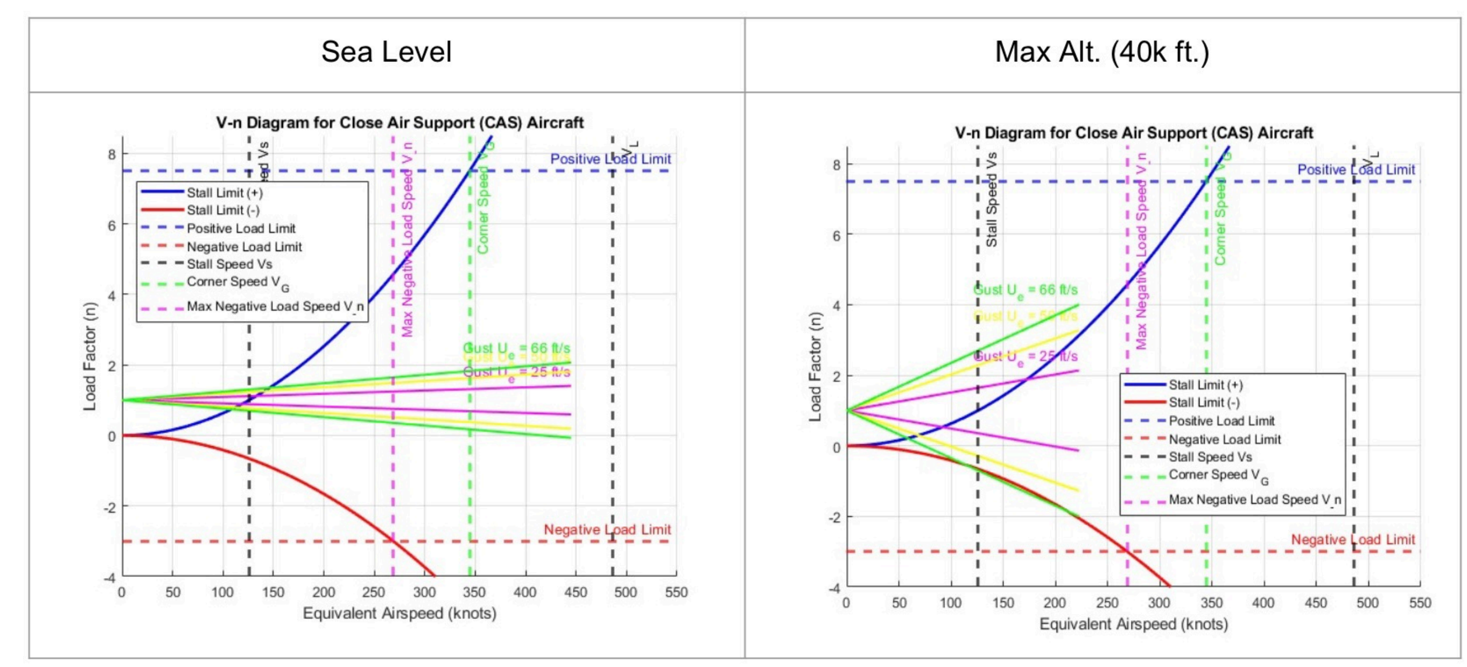
The High Ground will be versatile to accommodate various missions types.

Longitudinally Stable

Laterally Stable

We can see real potential in this design for a highly efficient CAS to maximize delivery of ordnance and minimize the loss of aircraft during missions.

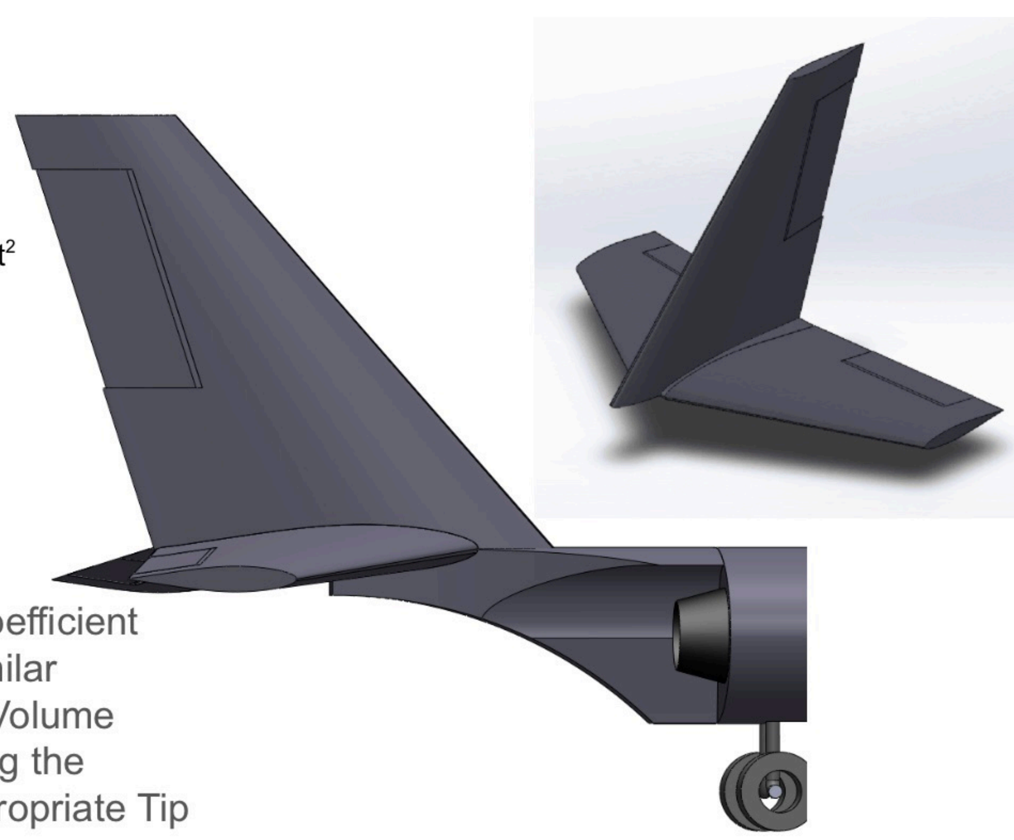
V-n Diagrams (45270 lb - Heaviest Configuration)



Tail / Empennage

Horizontal Stabilizer
Area = 209.9 ft^2
Control Surface Area = 25.4 ft^2
Span = 23 ft
Root Chord = 10 ft
Tip Chord = 5.25 ft
Sweep Angle = 31.5 degrees
Anhedral Angle: 4 Degrees
Airfoil: NACA 63-015A
V_h coefficient: .6

Vertical Stabilizer
Area = 123.7 ft^2
Control Surface Area = 20.9 ft^2
Height: 13.5 ft
Root Chord: 12 ft
Tip Chord = 5 ft
Sweep Angle = 41.2 degrees
Airfoil: NACA 63-015A
V_v coefficient: .07



Empennage sizing was done using the tail volume coefficient equations. Using these equations and comparing similar CAS/fighter aircrafts within Table 8.9 of Roskam for Volume Coefficients, we arrived at our tail area. From knowing the required area we then worked backwards to find appropriate Tip and Root chords to match up with the needed area.

Life Cycle Cost

Similar Aircraft

CAS Title	Unit Cost (2025 USD)
A-10 Thunderbolt II	55 million
AV-8B Harrier	75 million
F/A-18 Hornet	80 million

Engineering Hours (E)	$2,196,797,216.31	Hourly Rate RE	158.4
Tooling Hours (T)	$1,427,778,560.80	Hourly Rate RT	172.075
Manufacturing Labor Hours (L)	$31,581,261.30		
Quality Control (QC)	$367,226,906.40	Hourly Rate RQC	153
Manufacturing Material and Equipment (M)	$8,130,564,930.11	Hourly Rate RM	137.9
Engine and Avionics Cost (P)	$10,348,175.00		
Development Support (D)	$214,469,681.89		
Flight Test Operations (F)	$77,508,298.78	Weight (lbs)	45270
		Speed (knots)	566
Total	$12,456,275,030.58	Test Aircraft	5
		Total Production	205
Per Unit	**$60,762,317.22**		

The High Ground

Spring 2025