



San Diego State
University

Arthropod Aeronautics: Anomalocaris

Advanced Pilot Trainer

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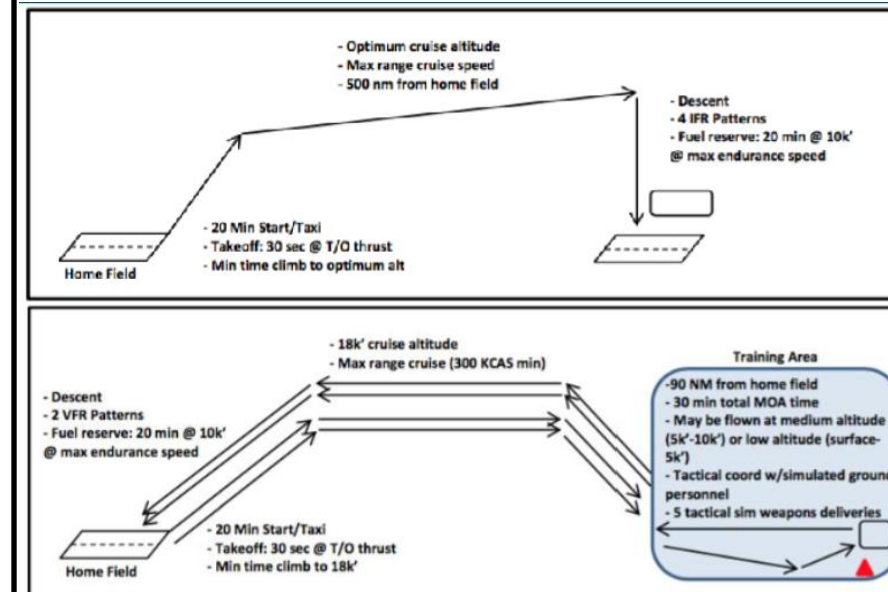


Department of Aerospace Engineering San Diego State University

MISSION PURPOSE

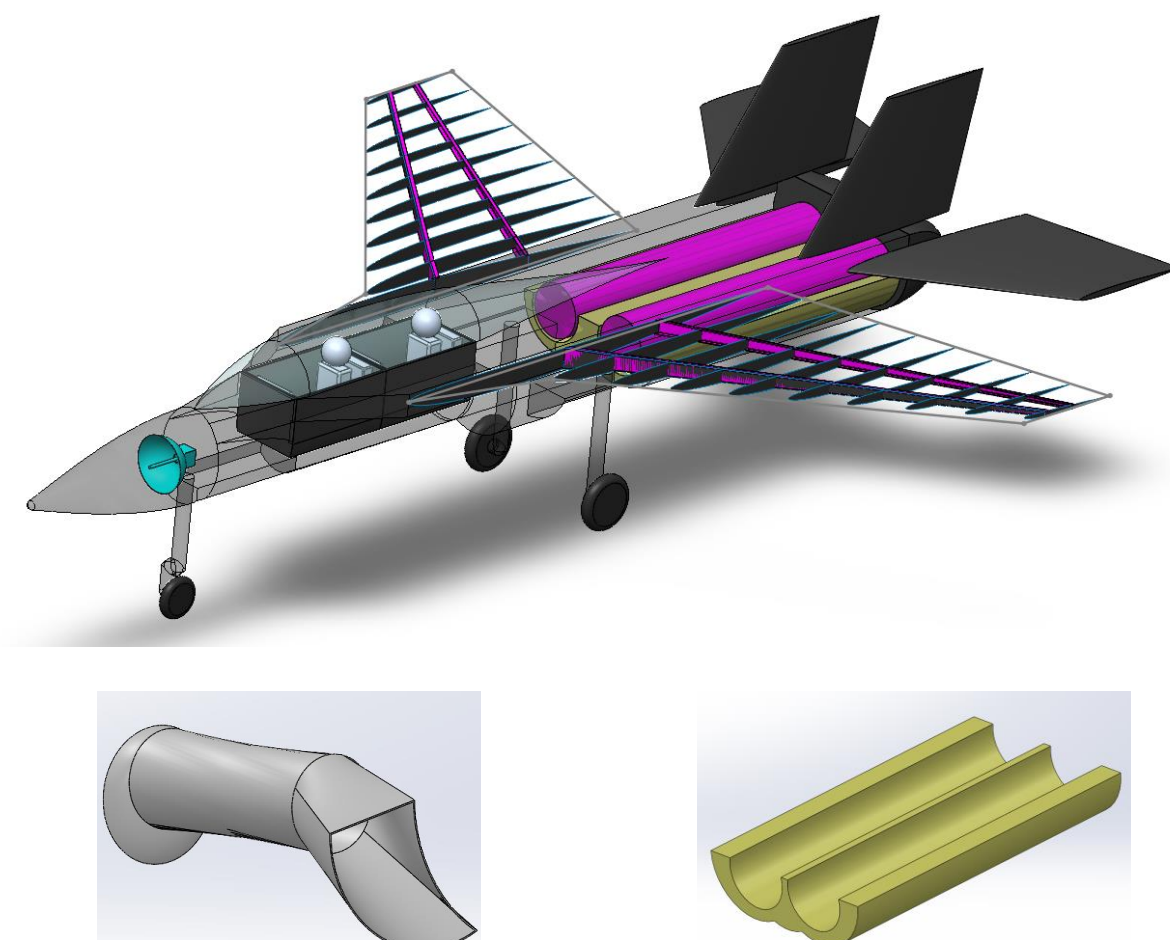
General Design Requirements (APT)

- 2 pilots
- Twin Engine
- Max turn speed of Mach 0.9
- Service Life
 - 22 years + 8000 flight hours
- Take off/Landing distance
 - 8000 ft rwy
- Service Ceiling
 - 40,000 ft
- Mission 1
 - 500 nm range
 - Optimum Alt. for mission
- Mission 2
 - 180 nm range
 - 18,000 ft Alt.



INTERNAL VIEW

- Pink: 2x F-125 Engine
- Yellow: Fuel Tank
- Light Blue: Radar
- Blue: Avionics
- Green: ESC
- White: Inlet

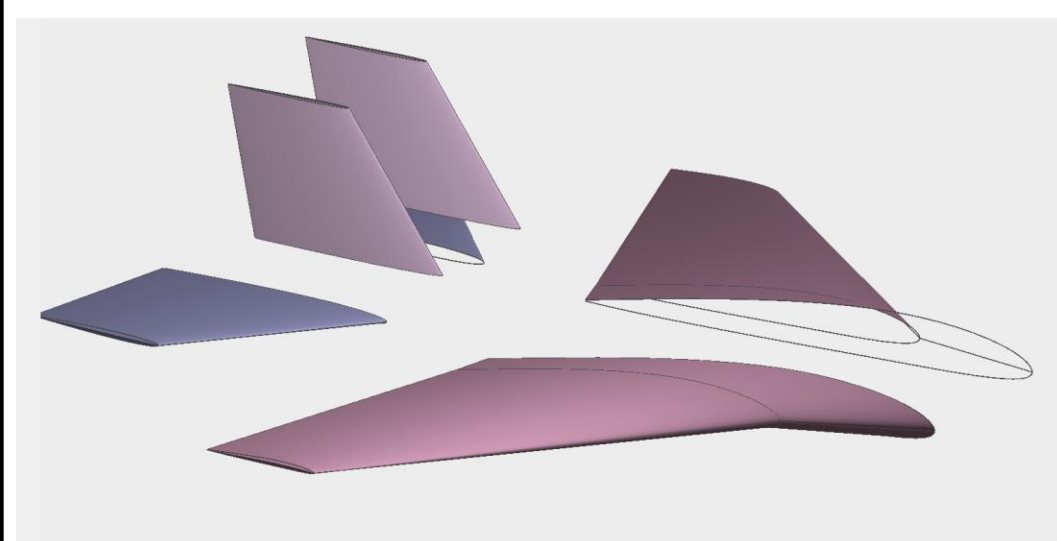


- Fuel Tank Volume 48.34 ft³
- Spar Material: 7075-T6 Aluminum (1.5 SF)
- 2 spars
- 25% chord to support Landing Gear
- 60% chord to support Control Surfaces
- 10 Ribs, 15.1 inches apart
- Rib thickness: 0.10 inches maximum at root.
- Stabilize spar box

CONTROL SURFACES

Control Surfaces

	Main Wing	Horizontal Tail	Vertical Tail
Airfoil	NACA 63-410 NACA 63-205	NACA 63-005	
Area	222.5 ft ²	82 ft ²	39.4 ft ²
Span	31 ft 7.6 in	6 ft	5 ft
Taper Ratio	0.24	0.56	0.64
Aspect Ratio	4.334	4.29	1.74



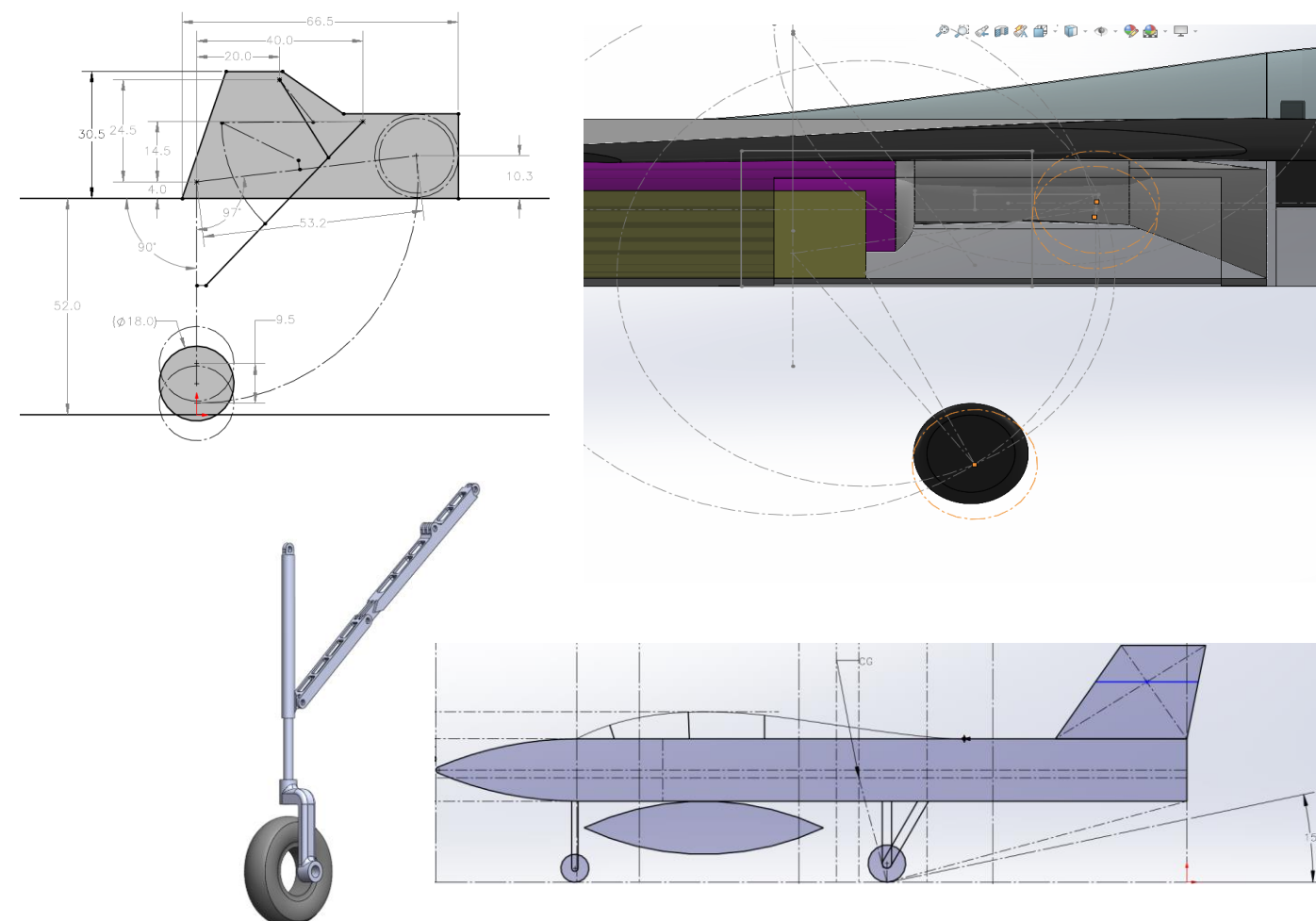
LANDING GEAR

Main Gear:

- Tire: 22 x 8.5, 16PR
- 210 psi (inflate to 170 psi)
- 250 mph (217 kts) max. speed
- Tubeless
- 10000 lbs max. loading
- Single tire per gear strut
- Shock
- 3.5 in bore diameter
- 10 in stroke length (vertical)
- Angled

Nose Gear

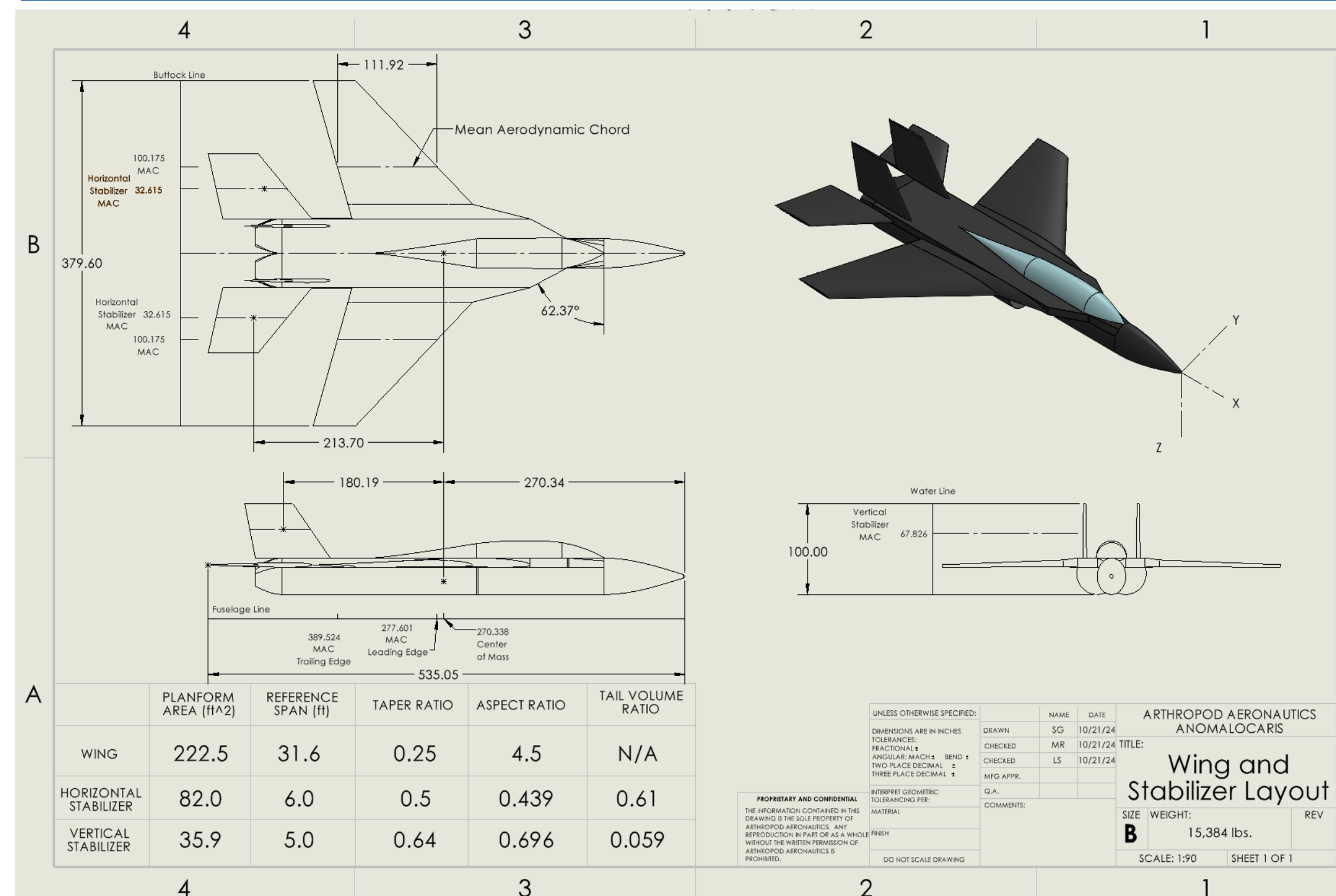
- Tire: 18 x 5.5, 12PR
- 170 psi
- 160 mph (139 kts) max. speed
- Uses inner Tube
- 5050 lbs max. loading
- Single tire
- Shock
- 2 in bore diameter, 10 in stroke length, Inline with main strut



3D CAD MODEL



BASIC DIMENSIONS OF ANOMALOCARIS



Length: 44 ft 7 in MTOW: 15,216 lb
Height: 8 ft 4 in w/o landing gear
Height: 9 ft 1.3 in w/ landing gear

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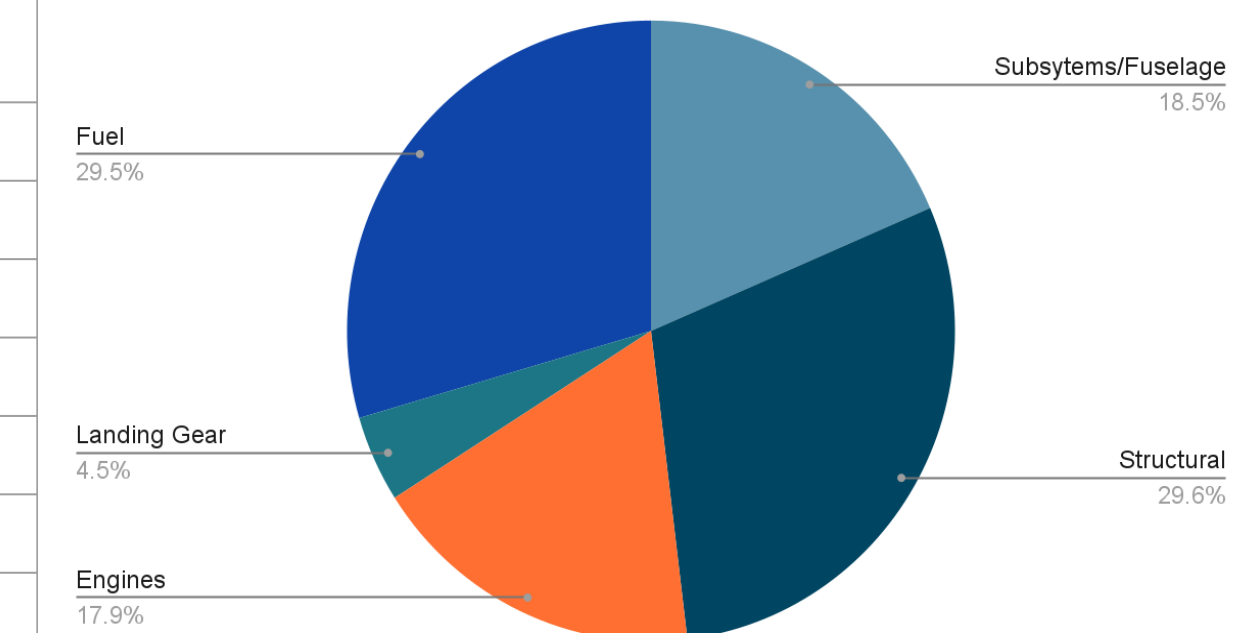
ACKNOWLEDGEMENTS

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PAYLOAD OVERVIEW

Configuration	Weight (lb)
Operating Empty Weight (W_E)	9,613.6
Empty Weight (W_{EFO})	9,081
Trapped Fuel and Oil (W_{TFO})	80
Crew Weight (W_{CREW})	452.6
Fuel (W_F)	4,493
$W_{OEW} + 60\% W_F$	12,309
$W_{OEW} + W_F$	14,106
Payload Weight (W_P)	1,110
$W_{OEW} + W_F + W_P$	15,216

Weight Estimates



PERFORMANCE

Engine

- 2x F125-GA-100
- Thrust:
 - 6025 lbf Dry
 - 9250 lbf Wet
- SFC:
 - 0.81 lb/(lbf hr) Dry
 - 2.06 lb/(lbf hr) Wet
- Weight: 1360 lb

Service Ceiling

- 54,595 ft

Range

- 536 nmi

Take off distance

- 4,494.3 ft Dry
- 2,593.9 ft Wet

Landing Distance

- 7,584.3 ft (Required distance is less than 8,000ft)



STABILITY ANALYSIS

Dynamic Stability – Calculations

Longitudinal – A Matrix			
2.232E-05	9.748E-05	0	1.640E-01
2.441E-04	-1.972E-05	1	0
-2.649E-02	1.325E-02	1.76E-04	0
0	0	1	0
Eigenvalues			
-0.06818 + 0.1649i			
-0.06818 - 0.1649i			
-0.1364 + 0.0349i			
-0.1364 - 0.0349i			
s4 + 0.4093s3 + 0.0889s2 + 0.0114s + 0.0006318			

Lateral – A Matrix			
-0.2961	-0.9870	-7407.1078	32.1700
-0.0003	-0.0073	0.2793	0
0.0003	0.0004	0.0198	0
0	1	0	0
Eigenvalues			
-0.1355 + 1.3616i			
-0.1355 - 1.3616i			
-0.04333			
0.03068			
s4 + 0.2837s3 + 1.874s2 + 0.02334s - 0.002489			

Dynamic Stability - Results

Longitudinal			
Mode	Required	Recommended	Calculated
Short Period Damping	0.25 - 2.00	0.35-1.30	0.38
Phugoid Damping	>0	>0.04	0.97

Lateral			
Dutch Roll Damping	>0.02	>0.4	0.10
Dutch Roll Frequency	>0.4	>1.0	1.368
Roll Time of Half	<1.4 sec	<1.0 sec	16.0 sec
Spiral Time to Double	>8 sec	>12 sec	22.6 sec