



# Specifications

## Desert Hawk III Specifications

### Dimensions & Areas

Wing Span	ft	4.50
Wing Area	ft <sup>2</sup>	3.28
Wing Aspect Ratio		6.2
Tailplane Span	ft	1.5
Length Overall	ft	3.6
Height Overall	ft	1.2
Wetted Area	ft <sup>2</sup>	12.8
Elevator	ft <sup>2</sup>	0.7
Ailerons (total)	ft <sup>2</sup>	-
Rudders (total)	ft <sup>2</sup>	-
Horizontal Area (total)	ft <sup>2</sup>	-
Propeller Diameter	ft	1.1
Width Fuselage	ft	0.5
Payload Bay Length	ft	0.8
Payload Bay Width	ft	0.5
Payload Bay Height	ft	0.4
Payload Volume	ft <sup>3</sup>	0.2

### Performance (nom)

Loiter Altitude (nom AGL)	ft	300
Radius of Action	nm	8.1
Stall Speed (at SL)	ktas	21.7
Loiter Speed (nom)	ktas	26.1
Max Speed	ktas	50.0
Max Endurance	hr	1.5
Max Climb Rate (Max SL)	ft/mi	2400
Max Altitude (ceiling)	ft	7,000
Max Sustained Turn Rate	deg/s	-
Max Instant Turn Rate	deg/s	-
Max Load Factor		2.5
Takeoff Run over 50 ft	ft	-
Landing Run over 50 ft	ft	-
Takeoff Run	ft	-
Landing Run	ft	-

### Weights & Loadings

Empty Weight	lb	5.0
Pay Weight (typ)	lb	1.9
Fuel Weight (typ)	lb	2.0
Useful Load (max)	lb	3.9
Gross Weight (max)	lb	8.9
Wing Loading (TO)	lb/ft <sup>2</sup>	2.7
Thrust Loading (TO)	lb/hp	-
Power Draw (cont)	W	90

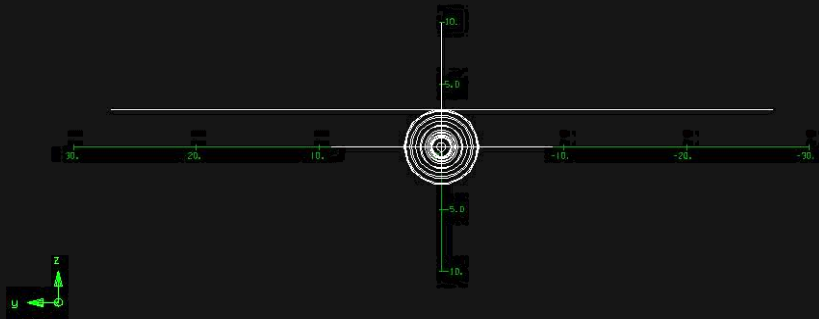
### Limits

	Units	Avg
Bank Angle	deg	-
Climb Rate	ft/min	2,400
Descent Rate	ft/min	-
Altitude	ft (ASL)	7,000
Speed	kt	50
Roll Rate	deg/sec	-
Pitch Rate	deg/sec	-

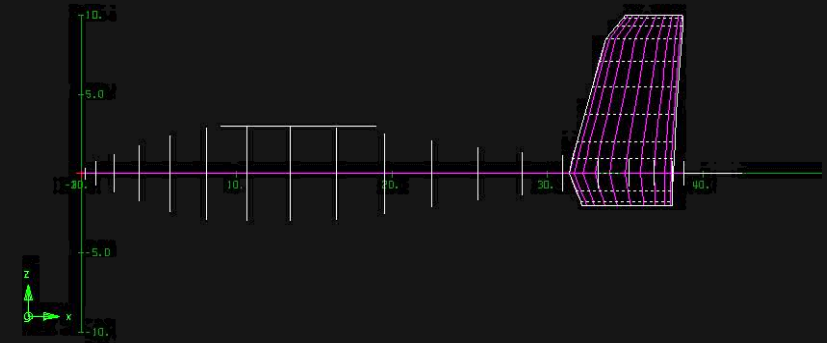




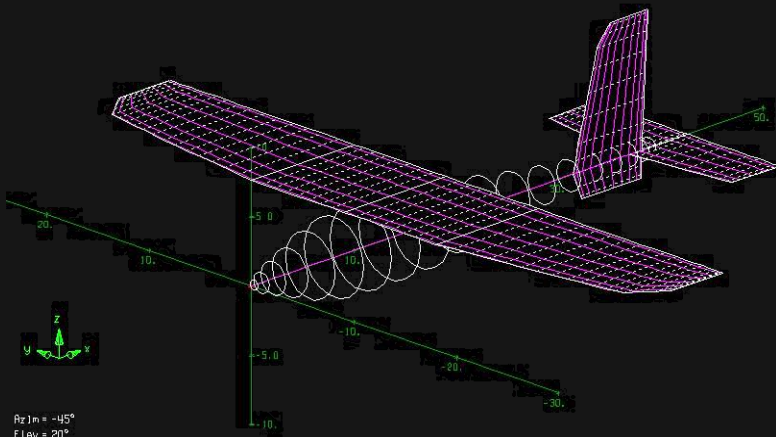
# Aerodynamics: Vortex Lattice Code Model



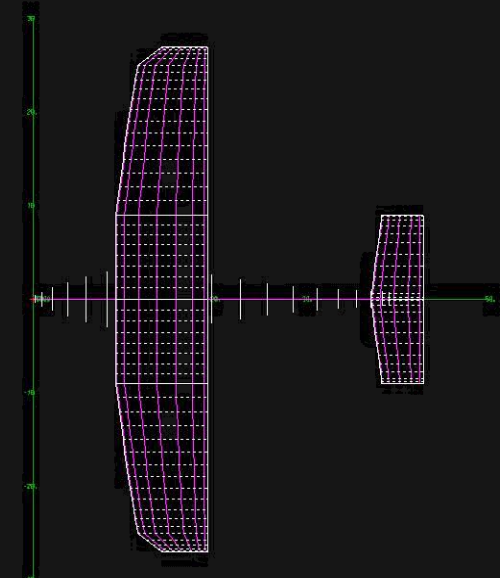
Rz1m = 0°  
Elev = 0°  
PVL 3.27 LOCKHEED DESERT HAWK II



Rz1m = -90°  
Elev = 0°  
PVL 3.27 LOCKHEED DESERT HAWK II



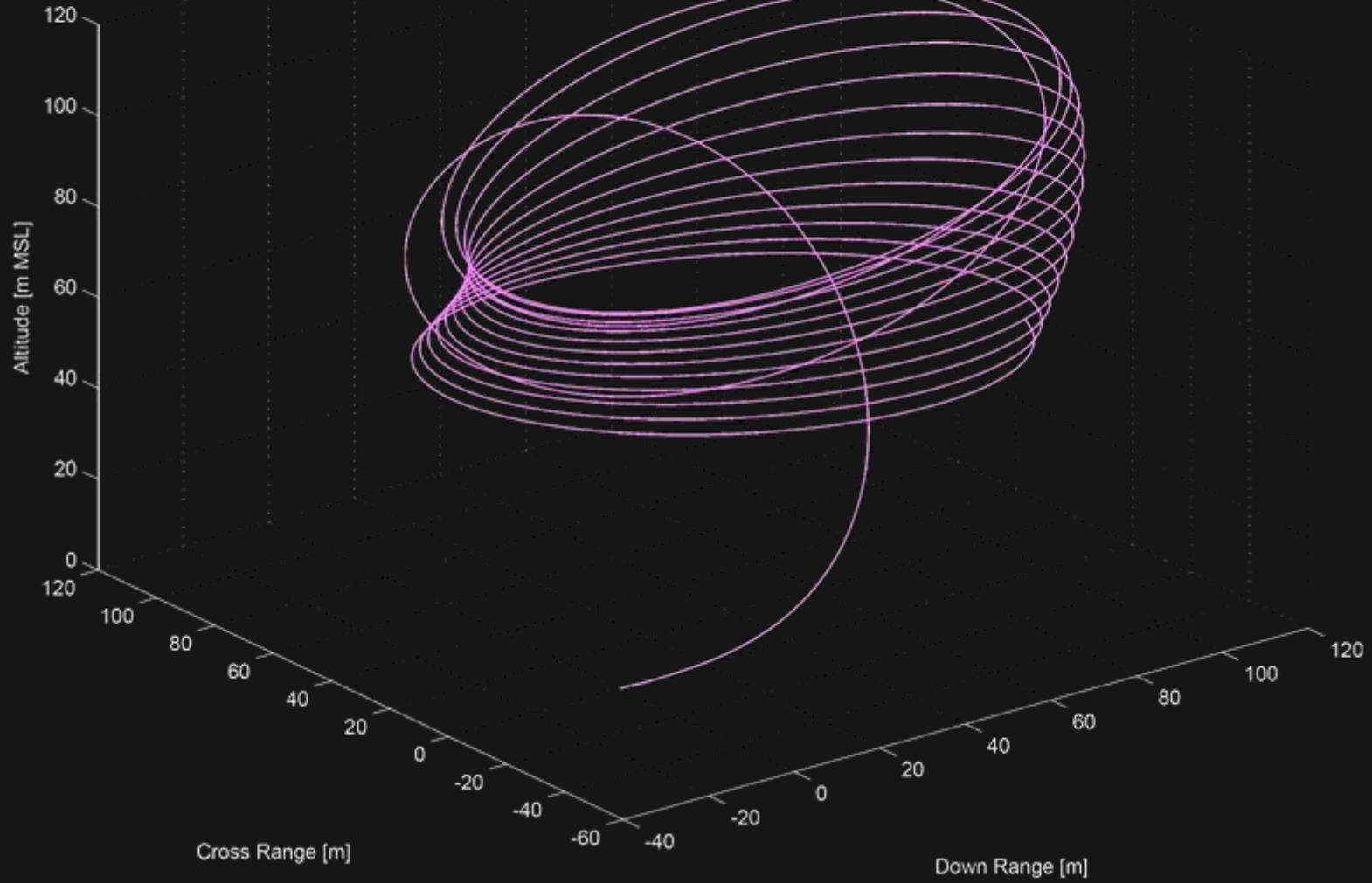
Rz1m = -45°  
Elev = 20°



Rz1m = -90°  
Elev = 90°  
PVL 3.27 LOCKHEED DESERT HAWK II



# 6-DoF Flight Simulation

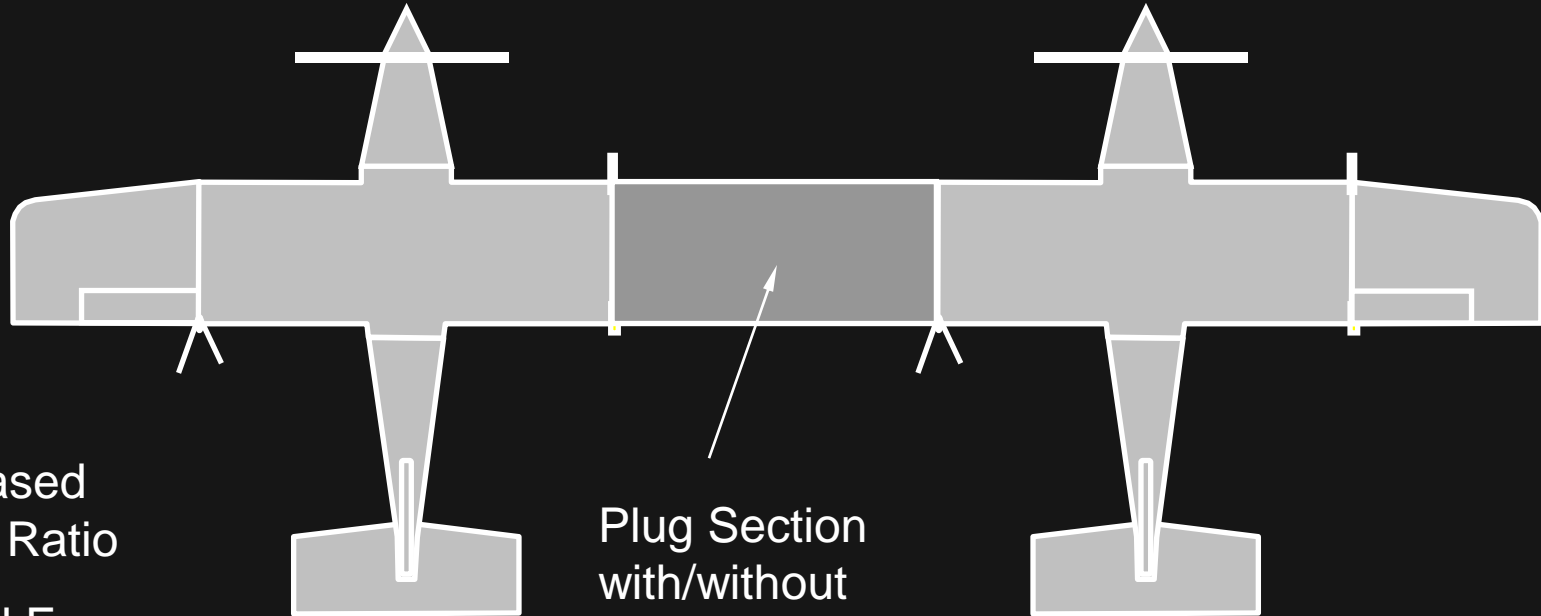
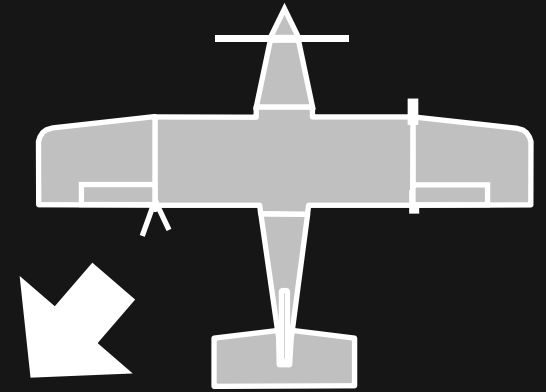




## Joined Wing + Plug



Desert  
Hawk III

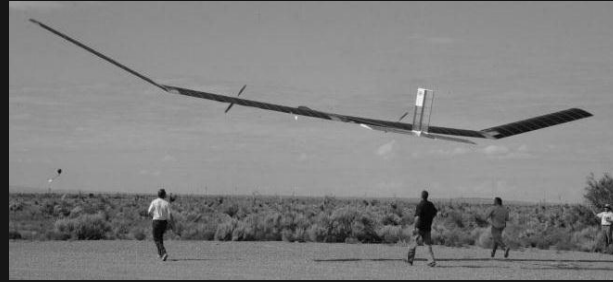


- Increased Aspect Ratio
- Added Energy Capacity

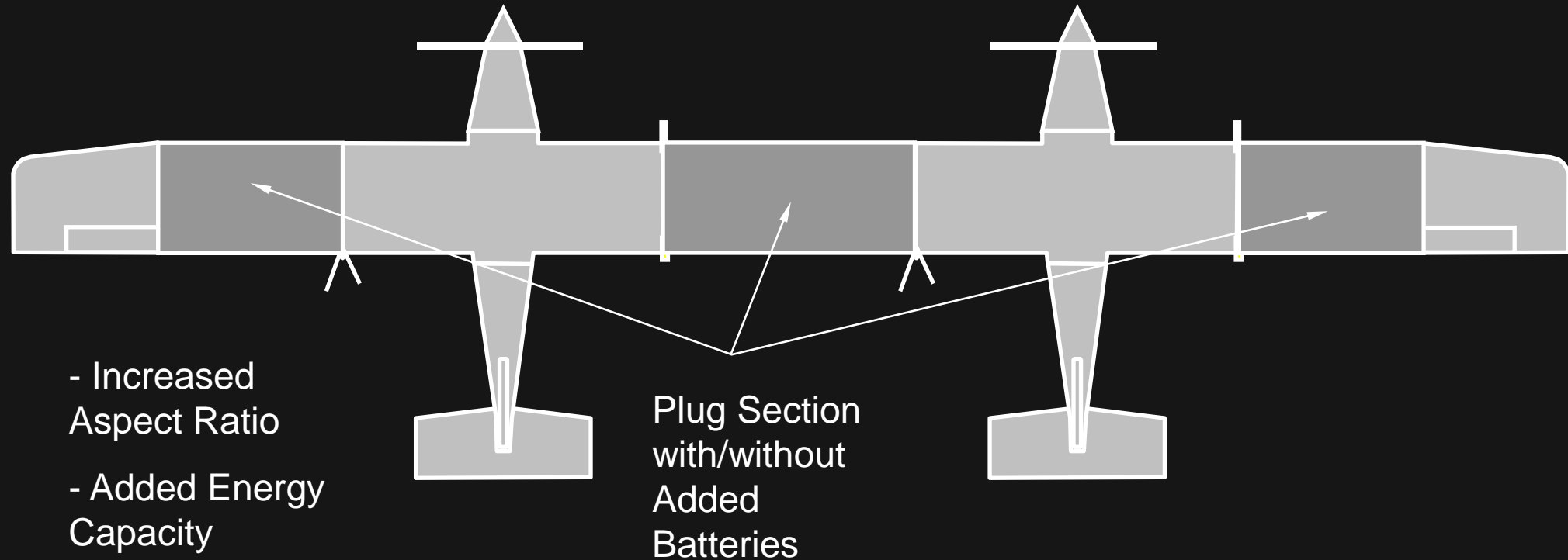
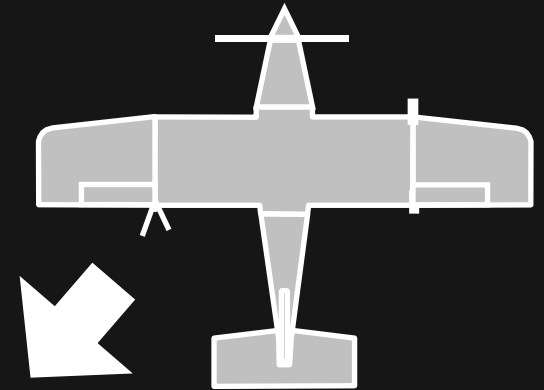
Plug Section  
with/without  
Added  
Batteries



## Joined Wing + Plugs

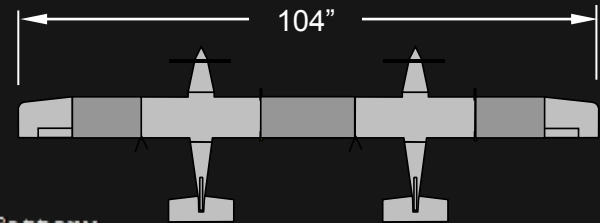
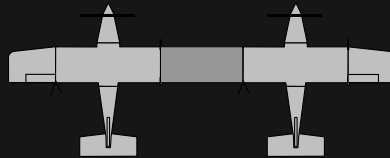
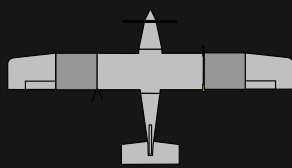
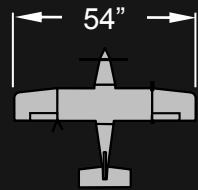


Desert  
Hawk III





# Time Aloft Comparison



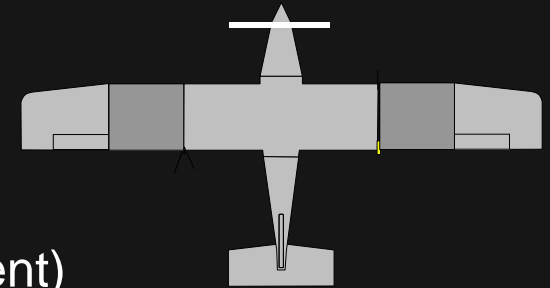
No Battery

Added Battery

	3.18	Joined	Plugs	Both	Joined	Batt Bay	Plugs	Both	Both Batt Bay
	DH III	DH IV	DH IV	DH IV	DH IV	DH IV	DH IV	DH IV	DH IV
Weight [lb]	7.0	14.8	7.8	15.5	15.9	15.9	8.3	17.0	17.0
CLloiter	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
e	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8
AR	6.0	10.0	10.0	11.6	10.0	10.0	10.0	11.6	11.6
Sref [ft <sup>2</sup> ]	3.38	5.63	5.63	6.52	5.63	5.63	5.63	6.52	6.52
W/S [lb/ft <sup>2</sup> ]	2.07	2.62	1.38	2.38	2.82	2.82	1.48	2.61	2.61
V [ktas]	26.1	29.3	21.3	27.9	30.4	30.4	22.0	29.2	29.2
q [lb/ft <sup>2</sup> ]	2.3	2.9	1.5	2.6	3.1	3.1	1.6	2.9	2.9
Cdi	0.0537	0.0322	0.0322	0.0278	0.0322	0.0322	0.0322	0.0278	0.0278
Cd0	0.0300	0.0335	0.0229	0.0306	0.0335	0.0335	0.0229	0.0306	0.0306
Cd	0.0837	0.0657	0.0551	0.0584	0.0657	0.0657	0.0551	0.0584	0.0584
Drag [lb]	0.65	1.08	0.47	1.01	1.16	1.16	0.51	1.10	1.10
L/D	10.8	13.7	16.3	15.4	13.7	13.7	16.3	15.4	15.4
Stall Speed [ktas]	21.7	24.4	17.7	23.2	25.3	25.3	18.3	24.3	24.3
Preq [W]	38.9	72.3	23.1	64.2	80.7	80.7	25.7	73.8	73.8
Systems [W]	52.0	52.0	52.0	52.0	52.0	52.0	52.0	52.0	52.0
Draw [W]	90.9	124.3	75.1	116.2	132.7	132.7	77.7	125.8	125.8
Climb Rate [ft/min]	1,195	1,307	1,170	1,267	1,191	1,191	1,077	1,130	1,130
Energy Density Increase	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Energy Avail [W-hr]	112.5	225.0	112.5	225.0	288.3	400.8	175.8	351.6	464.1
Loiter Time [hr]	1.24	1.81	1.50	1.94	2.17	3.02	2.26	2.80	3.69
Increase [min]	0	34	16	42	56	107	62	93	147
Ratio	1.00	1.46	1.21	1.56	1.75	2.44	1.83	2.26	2.98
Ratio @ CL = 0.6	1.00	1.31	1.22	1.41	1.57	2.18	1.83	2.02	2.66
Loiter Time/Mass [hr/lb]	0.18	0.12	0.19	0.12	0.14	0.19	0.27	0.16	0.22



## *Plug Wing with Batteries*

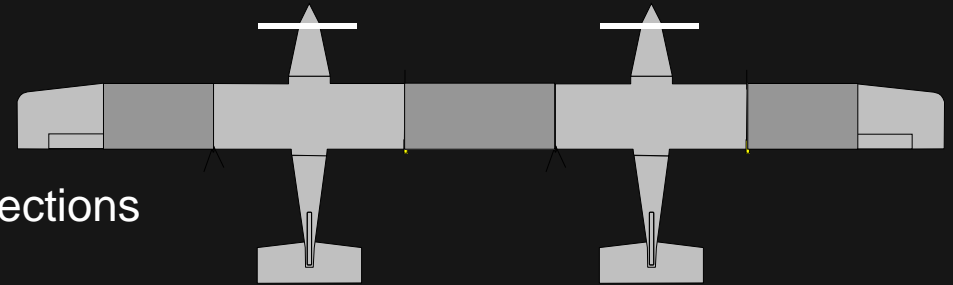


- Advantages
  - Same Packout, but with New Plug Sections
  - Time Aloft Increased 80% (configuration dependent)
  - More Roll Stable and Gust Resistant
    - Increased Rolling and Directional Moments of Inertia
  - CG Maintained at Same Fuselage Station
  - Inertia Relief – Small Structural Changes
  - Decreased Stall Speed – Lower Energy Launch
  - Same Manufactured Parts – No Retooling and Redesign
- Challenges
  - Guidance and Stability Algorithm Tuning (if any used)
  - Adverse Yaw – Dihedral through Plugs and Rudder and Aileron Scheduling
  - Center Spar Tube Area Thickness and Material Changes
  - Robust Airfoil Selection for Plugs
  - Wiring Harnesses Developed





## *Joined Wing and Plugs*



- Advantages
  - Same Packout, but with New Plug Sections
  - Payload SWAP Capacity Doubled
  - Hunter-Killer In One Platform
  - Time Aloft Increased 50% (configuration dependent)
  - More Roll Stable and Gust Resistant
    - Increased Rolling and Directional Moments of Inertia
    - Increased Wing Loading
  - CG Maintained at Same Fuselage Station
  - Inertia Relief – Small Structural Changes
  - Same Manufactured Parts – No Retooling and Redesign
- Challenges
  - Guidance and Stability Algorithm Tuning (if any used)
  - Adverse Yaw – Dihedral through Plugs and Rudder, Aileron and Variable Throttle Scheduling
  - Flaperon Control Surface Schedule for Post-Payload Deployment
  - Increased Stall Speed – Pitch Trim and Higher Energy Launch Method Changes
  - Center Spar Tube Area Thickness and Material Changes
  - Robust Airfoil Selection for Plugs
  - Wiring Harnesses Developed