

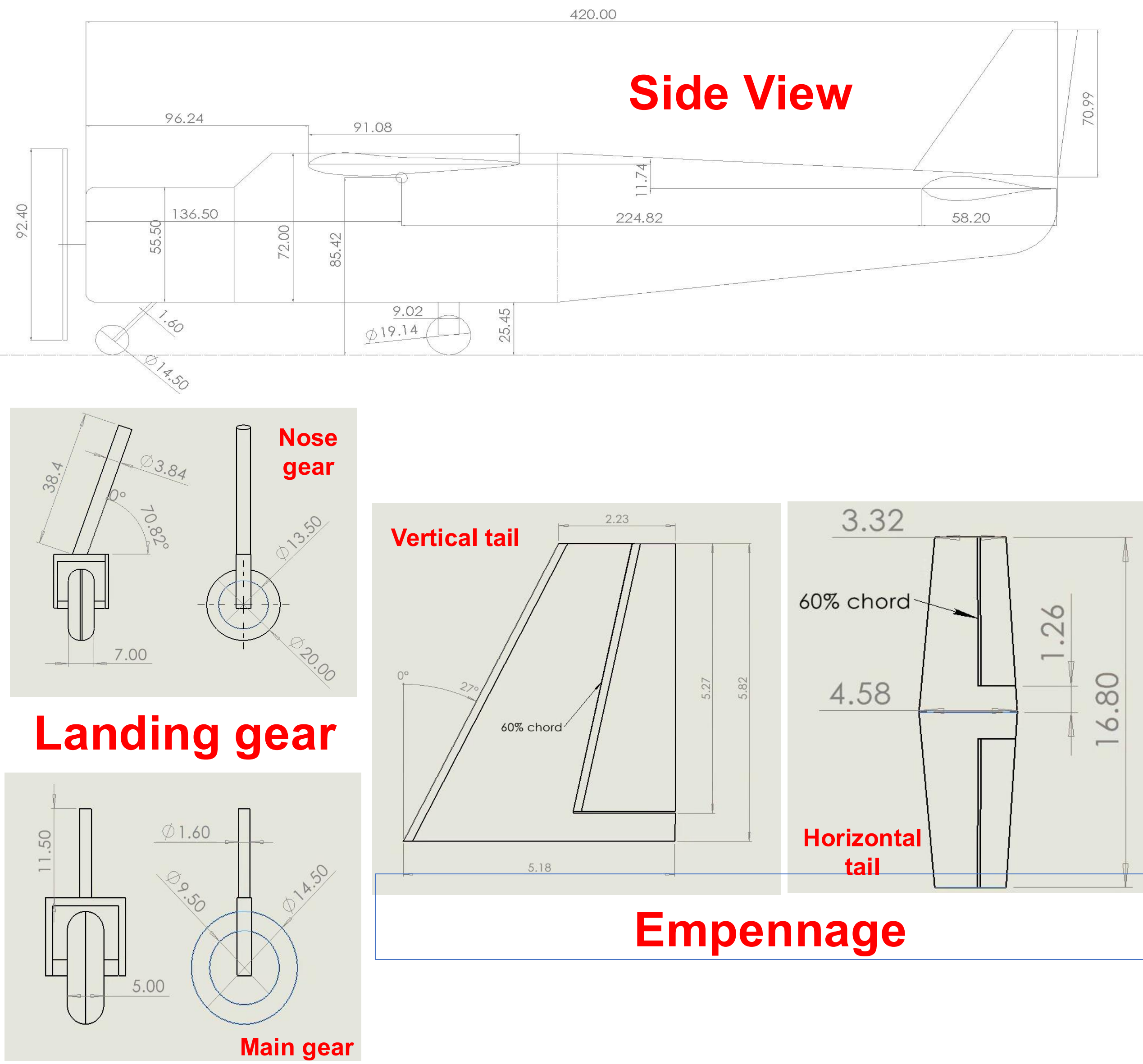
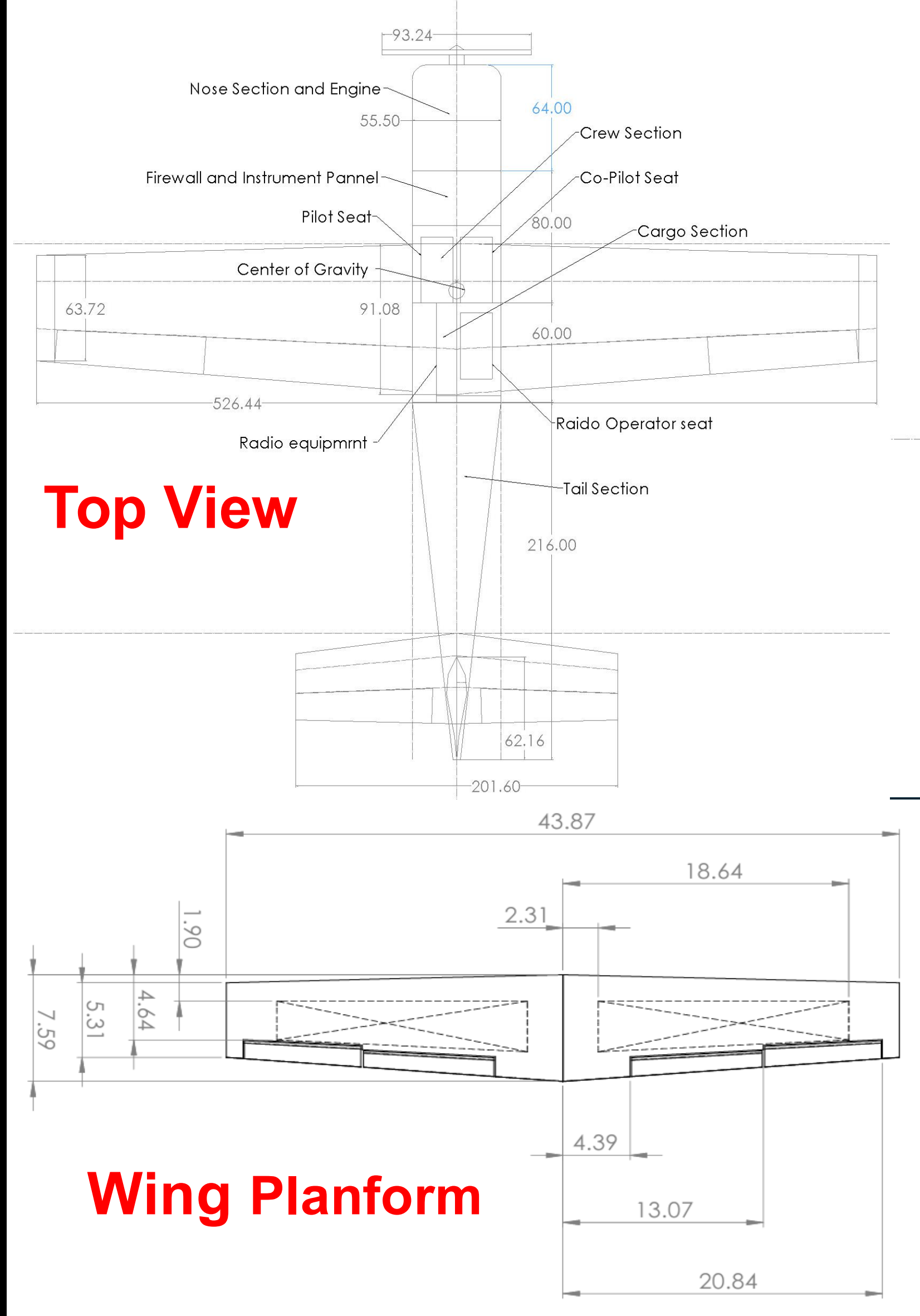
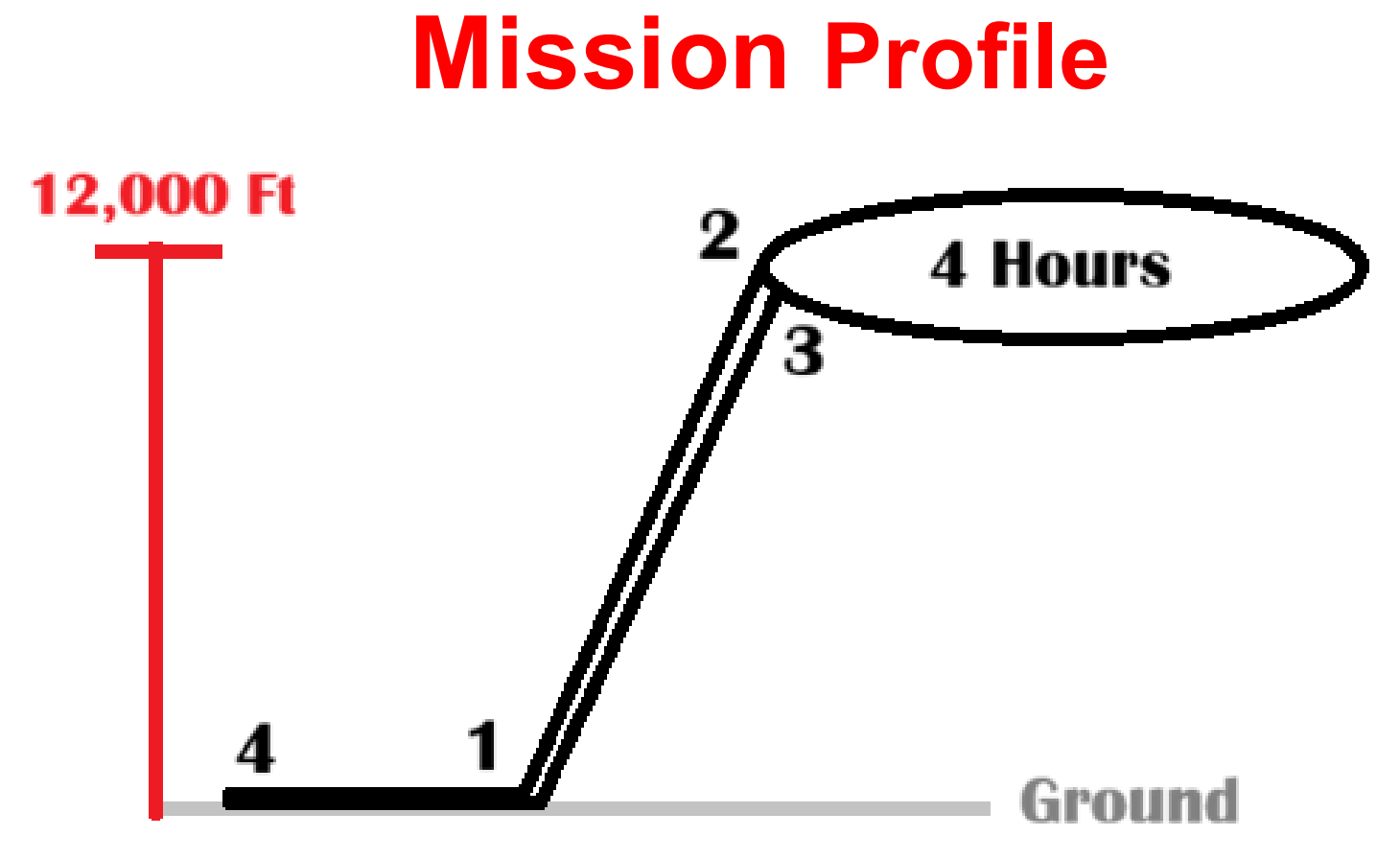
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Problem Definition

Natural disasters cause widespread destruction of ground-based communication infrastructure. This leaves the affected communities without the ability to contact emergency services during the most critical hours following impact. Existing solutions, such as temporary ground towers or satellite phones, are often slow to deploy, limited in coverage, or inaccessible to the public.

We propose the design of a single engine, propeller driven aircraft to act as an airborne cellular communications tower during disaster response operations.

REQUIREMENTS			
FIELD PERFORMANCES		CARGO	
Takeoff/Landing Altitude	65 ft AMSL	Crew -	630 lbs
Day Temperature	100 °F	Life Support -	75 lbs
SPECIAL PERFORMANCE		Payload	395 lbs
Operational Ceiling	12,000 ft	Total	1100 lbs
		ENGINE	
		Certified and readily available (Off the shelf)	



Design Calculations & Analysis

- 1) DATA**
Aircraft: Single Engine Propeller
WTO: 4124.87 lbs | WE: 2392.94 lbs | WF: 631.93 lbs | WP: 1100
Power Required: 412.45 HP | Engine: P&W R-985 Wasp Junior
Growth Factor: 3.75 | Fuel Fraction: 0.1532 | Risk: Moderate
- 2) WING**
Wing Area: 283 ft² | Aspect Ratio: 6.8 | Taper Ratio: 0.7
Airfoil: NACA 2412 | Aileron/Wing: 0.08 | Fuel: 642.3 gal
- 3) FLAPS**
Type: Slotted
Takeoff: ΔCL_{max}=0.2563, δ=15° | ΔCD0=0.0033
Landing: ΔCL_{max}=0.5437, δ=50° | ΔCD0=0.0376
- 4) VERTICAL EMPENNAGE**
Tail Volume: 0.037 | AR: 1.55 | Taper: 0.45
Sweep: 27° | Airfoil: NACA0006 | Rudder Ratio: 0.346 | Lv/b: 0.479
- 5) HORIZONTAL EMPENNAGE**
Tail Volume: 0.674 | AR: 4.25 | Taper: 0.725
Sweep: 5° | Airfoil: NACA0010 | Elevator Ratio: 0.332 | Lh/(MAC)_w: 2.8735
- 6) GEAR SIZING**
h_{cg}: 75.85 | Track: 73.2
Main Gear: l_m=20.324 ft | Tire: 7.00-6 | Diameter: 19.5
Nose Gear: l_n=136.01 | Tire: 5.00-6 | Diameter: 14.5

Results

- NATURAL DISASTER**
A hurricane makes landfall in Florida.
- FALLOUT**
Cell towers are down, and roads are blocked by trees and are not operational.
- OUR RESPONSE**
One of our 3 aircrafts from our fleet will takeoff from a close by regional airport and loiter over a 3,000 square mile radius for 4 hours.
- CONTINUOUS COVERAGE**
Once 4 hours elapse, the first aircraft comes back and lands as the second one takes off. This continues every 4 hours so there is constant coverage.
- MAINTENANCE BETWEEN SHIFTS**
While on the ground between shifts, the planes will be maintained, and any problems will be solved.
- CREW: 3 MEMBERS ON EVERY FLIGHT**
2 PILOTS For safety and redundancy
1 CELL TOWER ENGINEER To maintain the payload and make onboard repairs
- IMPACT**
The most critical hours for finding and rescuing survivors are right after the disaster hits. Our solution will save a countless number of lives by being accessible and giving first responders a connection to those who need to be saved.

3 AIRCRAFT
IN ROTATION

4-HOUR SHIFTS
24/7 COVERAGE

3,000
SQUARE MILE COVERAGE

COUNTLESS LIVES
CONNECTED. SAVED.


Payload

INTERNAL SYSTEMS
Mounted to Inner Wall in Equipment Rack

- Parallel Wireless Unified Core (EPC-in-a-box)
- Honeywell JetWave Ka-Band SATCOM (Inmarsat GX)
- Power Supply System
- Cooling Modules
- Tricom Systems Ruggedized Airborne Equipment Rack

All core electronics are housed in a centralized ruggedized equipment rack providing network processing, backhaul interface, power distribution, and thermal management.

TOPSIDE FUSELAGE
Starlink Aviation HP Terminal
High-speed satellite backhaul connectivity



BELLY-MOUNTED
Nokia AirScale Micro Remote Radio Head (RRH)
Optimized for maximum ground footprint and signal distribution

PAYLOAD WEIGHT BREAKDOWN	
COMPONENT	WEIGHT (lb)
Nokia AirScale Micro Remote Radio Head (RRH)	80
Parallel Wireless Unified Core (EPC-in-a-box)	75
Honeywell JetWave Ka-Band Satcom (Inmarsat GX)	70
Tricom Systems Ruggedized Airborne Equipment Rack	50
Starlink Aviation HP Terminal	65
Cooling / Power Supply	55
TOTAL PAYLOAD WEIGHT	395 lb

SYSTEM ARCHITECTURE OVERVIEW

STARLINK HP TERMINAL (Topside Fuselage)

SATELLITE BACKHAUL (High-Speed Connectivity)

INTERNAL EQUIPMENT RACK (Inner Wall)

- EPC Core (Network Processing)
- SATCOM Interface
- Power & Cooling Systems

NOKIA RRH (Belly Mounted)

USERS ON GROUND (Cellular Coverage)