

ALL ELECTRIC SR20

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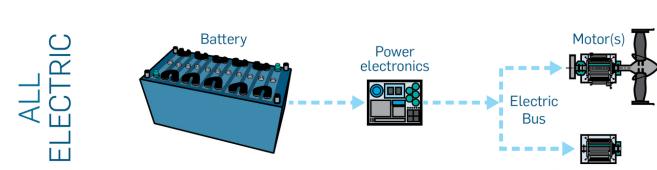


OBJECTIVE

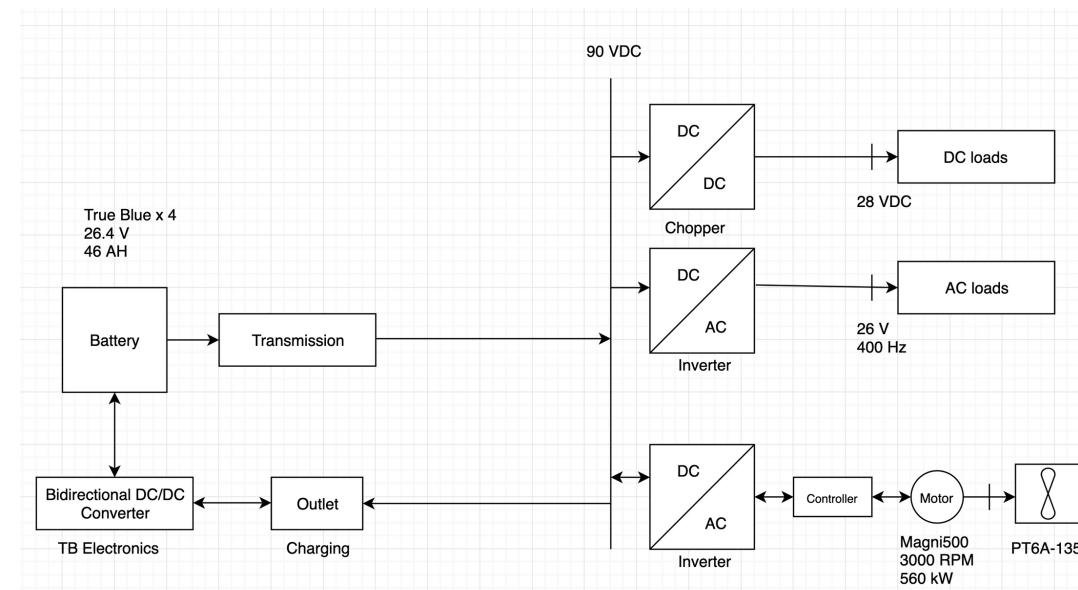
To design an all electric power system for the Cirrus SR20

BLOCK DIAGRAM

IDEA



DESIGN



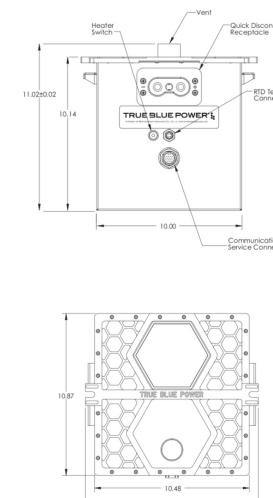
SIZING



| Product comparison | | | | | |
|--------------------|--------------------|----------------|--------------------|-----------|-----------------|
| | Battery Technology | Voltage Output | Capacity (IC rate) | Weight | Maintenance |
| TB44 | Lithium-ion | 26.4 VDC | 46 amp-hour | 51.7 lbs. | 2 years |
| | Lead-acid | 24 VDC | 42 amp-hour | 86 lbs. | Annual |
| | Nickel-cadmium | 24 VDC | 44 amp-hour | 80 lbs. | 200 – 400 hours |
| | | | | | 5 – 10 years |

| Components | | Sizing |
|-------------|----------|--------|
| Weight | 1500 kg | |
| Power | 192 kw | |
| Battery | 30 A-hrs | |
| Flight time | 4h | |

| Technical specifications | | | | | |
|--------------------------|---|--|--|--|--|
| CAPACITY | 46 amp-hour battery nominal at 23°C/73.4°F | | | | |
| CHARGE VOLTAGE | 28 VDC nominal | | | | |
| OUTPUT VOLTAGE | 26.4 VDC nominal | | | | |
| OUTPUT CURRENT | 750A continuous, 1500A max | | | | |
| TECHNOLOGY | Advanced Nickel Phosphate Lithium-ion cell chemistry | | | | |
| PROTECTION | Overcharge, over-discharge, over-current, short circuit, over-temperature and under-temperature | | | | |
| ENERGY DENSITY | 52.0 Wh/kg 64.6 Wh/liter | | | | |
| OPERATING TEMPERATURE | -40°C to 70°C (-40°F to 158°F) | | | | |
| WEIGHT | 51.7 lbs. (23.45 kg) | | | | |
| DIMENSIONS | 10.87" L x 10.40" W x 10.14" H | | | | |
| CONFIGURATION | 8S1P; 1 parallel x 8 in series x 19 | | | | |
| MAINTENANCE | 2-year maintenance interval; offers 50–90% savings on maintenance costs | | | | |
| CASE | Powder-coated steel, blue | | | | |
| CERTIFICATION | FAA TSO certified to C179a ETSO certified to C179a RTCA DO-160G qualified RTCA DO-160D qualified UNDOT/IATA qualified | | | | |



TB44 Certified Lithium-ion Aircraft Battery

DESIGN FOCUS & AIRCRAFT SPECIFICATIONS

WEIGHT

| | |
|--|-------------------|
| Base Weight | 2119 lbs (958 kg) |
| Useful Load | 1031 lbs (470kg) |
| Cabin payload with 3 hr trip fuel and 45 min reserve | 777 lbs (355 kg) |

ENGINE

| | |
|--------------|-------------|
| Manufacturer | Lycoming |
| Model | IO-390-C3B6 |
| Horsepower | 215 |

Recharge battery while landing

All power electronics are provided by True Blue Power

DIMENSIONS

| | |
|--------------|----------------------|
| Wingspan | 38 ft 4 in (11.68 m) |
| Length | 26 ft (7.92 m) |
| Height | 8 ft 11 in (2.7 m) |
| Cabin Width | 49 in (124 cm) |
| Cabin Height | 50 in (127 cm) |

PERFORMANCE

| | |
|------------------------|-------------------------|
| Takeoff | 1,685 ft (514 m) |
| Climb Rate | 781 ft/min (3.97 m/sec) |
| Max operating Altitude | 17,500 ft (5,334 m) |
| Stall Speed with Flaps | 57 KCAS |
| Max Cruise Speed | 155 KTAS |
| Landing Groundroll | 853 ft (260 m) |

QUESTION & SUMMARY

How can lithium ion batteries be made weight sensitive for bigger aircrafts and how cost effective is this solution?

Learning Point:

Power Density : kW/kg

x2 Weight = x8 power

REFERENCES

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