Assumptions

First to find the takeoff gross weight

Wfixed;

19 passengers, 2 crew, 1 attendant, (22\*225lbs), 5450lbs

Wfuel

Mission parameters:

% Mission is simple cruise

% 0-1 Takeoff

% 1-2 Climb

% 2-3 Cruise

% 3-4 Descent

% 4-5 Loiter

% 5-6 Decent

% 6 Landing

% W(i+1)/W(i)

% 0 0.97

% 1 0.985

% 2 for 1000 miles Range

% 3 1

% 4 for 60 min Loiter

% 5 0.985

Given, Range=1000 miles,

Loitter time take as 1 hour

Velocity @ 250 mph

Assuming that this aircraft acts like a turbojet (as we need a turboelectric generator, then sent to the individual DEP points. Sfc=0.9 during cruise, 0.8 during loiter

L/D=17 From data of puddle hoppers that are intended to go roughly 1000 miles range. (from 15-20 LD)

This brings the Fuel Ratio to 0.2997 of Total Takeoff Weight

Empty Weight

Taken from trend/historical data, this fraction is roughly 0.55

Therefore Takeoff weight =

27209 lbs

Moving onward:

AspectRatio=12 (conservative estimate from trend/historical data for midsize commercial

Cd0 = 0.02

e=0.75 (on conservative side)

CL\_max (calculated from drag polar) ~= 1.2 This is a bit low, but the LD of 17 was a bit low too.

rho=8.9e-4, density of air at 30,000ft, standard cruise altitude of most long distance flights. The NASA RFP required service ceiling of 28,000ft, so we can play with this number is we want.

TW=0.45 (a liberal estamte of thrust/weight ratio) This number is totally an estimate for the purpose of DEP is to increase this.

Therefore, Since our above assumptions about weight, we need a WingLoading of roughly 30. And anything less than ~65 lb/ft^2 will be low enough to meet the 3000 ft takeoff distance.