```
close all
clear variables
clc

warning('off','MATLAB:table:ModifiedAndSavedVarnames');
%
% % Design variable choices
% V = 15;      % flight velocity (ft/s)
% b = 40;      % wing span (inches)
% cavg = 10;  % average wing chord length (inches)
sweep_quarter = 25.8;
t = 0.42; % wing taper ratio

V = 1.5:0.25:3.5;
b = 30:4:50;
c = 4:2:10;

Vlen = length(V);
blen = length(b);
clen = length(c);

P = zeros(Vlen, blen, clen);

best = [b(1), c(1), 1, V(1), 1000, 0, 0, 0, 0];

for i = 1:blen
    for j = 1:clen
        best_internal = [0, 0, 0, 0, 0, 0, 100];
        for k = 1:Vlen
            [P(k, i, j), SM, n, time, W, CG, Btwist, CDi, CDp] =
 main(V(k), b(i), c(j), t, sweep_quarter);
            if P(k, i, j) < best(5) && SM > 0.05 %&& Btwist > -3.0 &&
 Btwist < 3.0 && V(k) > 4.5
                best = [b(i), c(j), n, V(k), P(k, i, j), time, W, CG,
 Btwist, SM];
            end
            if P(k, i, j) < best_internal(7)
                best_internal = [b(i), c(j), V(k), W, CDi, CDp, P(k,
 i, j)];
            end
        end
        fprintf("For a b = %d, c = %d, and v = %d:\n\tW = %d\n\tCdi =
 %d\n\tCDp = %d\n\tP = %d\n", best_internal);
    end
end

for j = 1:clen
    figure()
    hold on;
    grid on;
    for i = 1:blen
        plot(V, P(:, i, j));
```

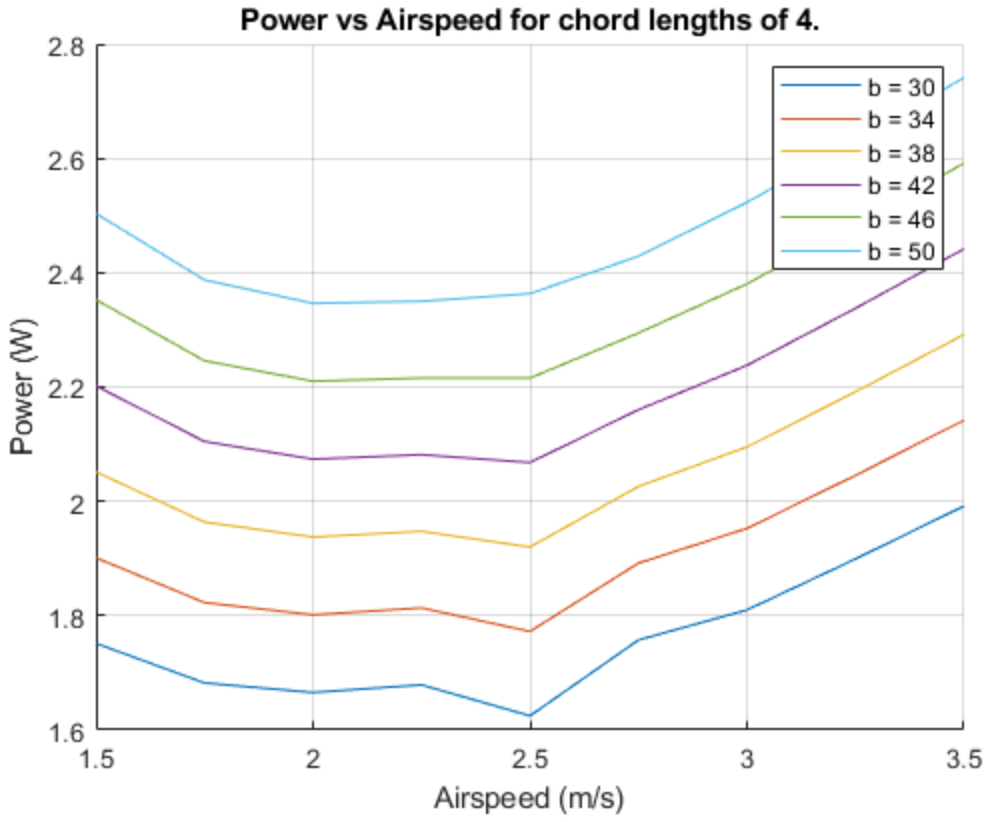
```
    end
    title(sprintf("Power vs Airspeed for chord lengths of %d.",c(j)));
    xlabel('Airspeed (m/s)');      % Correct axis labeling always
 includes the
    ylabel('Power (W)');   % variables being plotted *and* their
 units!
    legend('b = 30', 'b = 34', 'b = 38', 'b = 42', 'b = 46', 'b =
 50');
end

for i = 1:blen
    figure()
    hold on;
    grid on;
    for j = 1:clen
        plot(V, P(:, i, j));
    end
    title(sprintf("Power vs Airspeed for wingspans of %d.",b(i)));
    xlabel('Airspeed (m/s)');      % Correct axis labeling always
 includes the
    ylabel('Power (W)');   % variables being plotted *and* their
 units!
    legend('c = 4', 'c = 6', 'c = 8', 'c = 10');
end

figure()
hold on;
grid on;
for i = 1:blen
    for j = 1:clen
        plot(V, P(:, i, j));
    end
end

title('Power vs Airspeed for All Configurations');
xlabel('Airspeed (m/s)');      % Correct axis labeling always includes
 the
ylabel('Power (W)');   % variables being plotted *and* their units!
legend('b = 30, c = 4', 'b = 30, c = 6', 'b = 30, c = 8', 'b = 30, c =
 10', 'b = 34, c = 4', 'b = 34, c = 6', 'b = 34, c = 8', 'b = 34, c =
 10', 'b = 38, c = 4', 'b = 38, c = 6', 'b = 38, c = 8', 'b = 38, c =
 10', 'b = 42, c = 4', 'b = 42, c = 6', 'b = 42, c = 8', 'b = 42, c =
 10', 'b = 46, c = 4', 'b = 46, c = 6', 'b = 46, c = 8', 'b = 46, c =
 10', 'b = 50, c = 4', 'b = 50, c = 6', 'b = 50, c = 8', 'b = 50, c =
 10');
fprintf("The optimal configuration is b=%d in and c=%d in with
 propeller %d at an airspeed of v=%d m/s, taking P=%d W of power.
\nThis yields a flight time of %d minutes.\nThis gives a weight
 estimate of %d N, a center of gravity at %d m from the leading edge
 of the plane, and a wing twist of %d degrees. The static margin is
 %d", best);
```

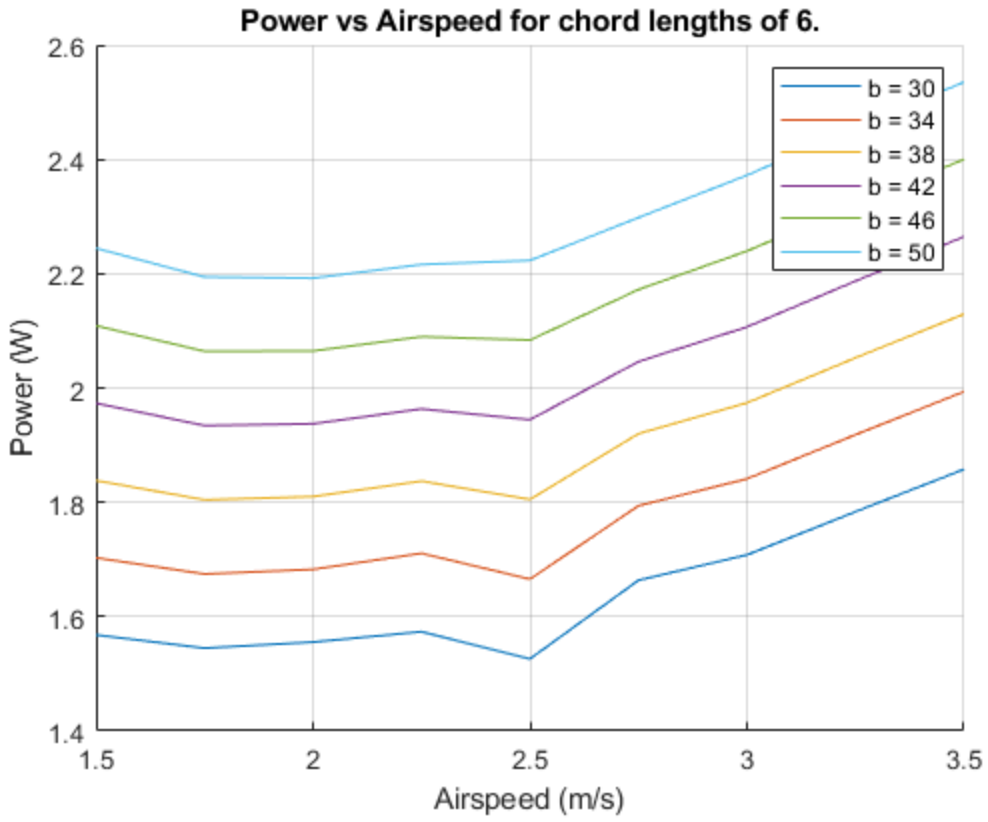
```
For a b = 30, c = 4, and v = 2.500000e+00:
 W = 7.575459e-01
```

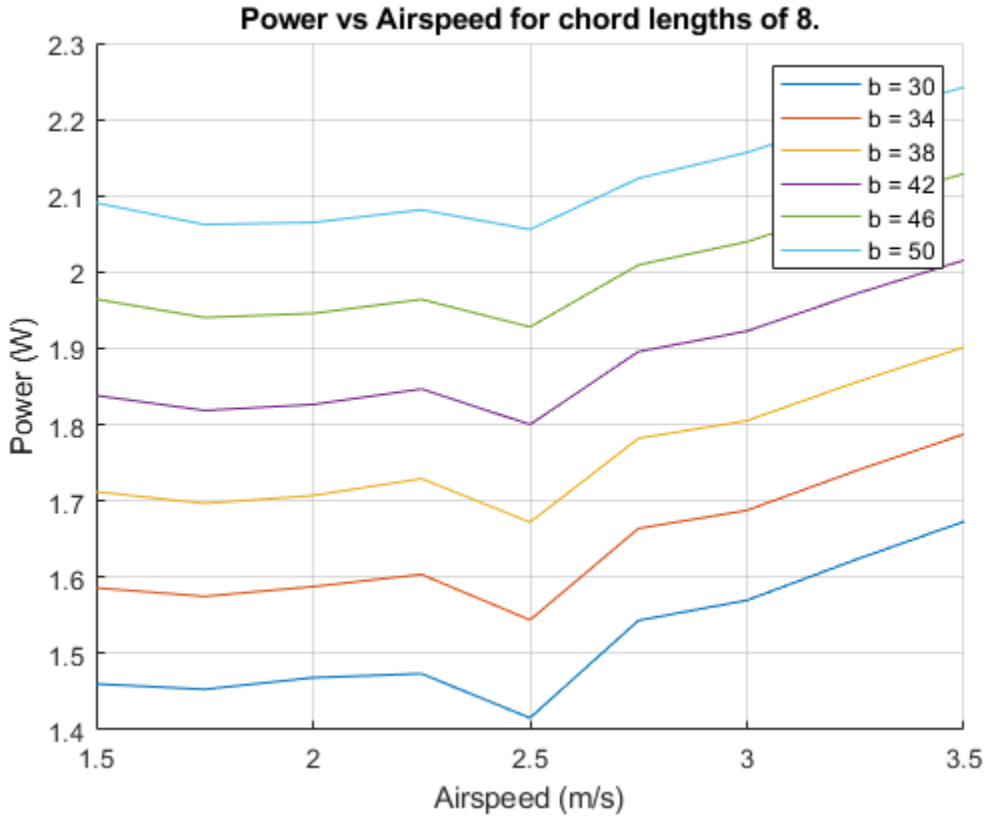
```
 Cdi = 1.585887e-03
 CDp = 2.202619e-01
 P = 1.624761e+00
For a b = 30, c = 6, and v = 2.500000e+00:
 W = 7.575459e-01
 Cdi = 1.909848e-03
 CDp = 1.351023e-01
 P = 1.526134e+00
For a b = 30, c = 8, and v = 2.500000e+00:
 W = 7.575459e-01
 Cdi = 2.099583e-03
 CDp = 9.151474e-02
 P = 1.415668e+00
For a b = 30, c = 10, and v = 2.500000e+00:
 W = 7.575459e-01
 Cdi = 2.206135e-03
 CDp = 6.433867e-02
 P = 1.289638e+00
For a b = 34, c = 4, and v = 2.500000e+00:
 W = 8.399973e-01
 Cdi = 1.481282e-03
 CDp = 2.158279e-01
 P = 1.772350e+00
For a b = 34, c = 6, and v = 2.500000e+00:
 W = 8.399973e-01
 Cdi = 1.814449e-03
 CDp = 1.326637e-01
 P = 1.665621e+00
For a b = 34, c = 8, and v = 2.500000e+00:
 W = 8.399973e-01
 Cdi = 2.023110e-03
 CDp = 8.995007e-02
 P = 1.543977e+00
For a b = 34, c = 10, and v = 2.500000e+00:
 W = 8.399973e-01
 Cdi = 2.151493e-03
 CDp = 6.325874e-02
 P = 1.404195e+00
For a b = 38, c = 4, and v = 2.500000e+00:
 W = 9.224488e-01
 Cdi = 1.388804e-03
 CDp = 2.123504e-01
 P = 1.920038e+00
For a b = 38, c = 6, and v = 1.750000e+00:
 W = 9.224488e-01
 Cdi = 1.725506e-03
 CDp = 2.840038e-01
 P = 1.804379e+00
For a b = 38, c = 8, and v = 2.500000e+00:
 W = 9.224488e-01
 Cdi = 1.947065e-03
 CDp = 8.872053e-02
 P = 1.672134e+00
For a b = 38, c = 10, and v = 2.500000e+00:
```

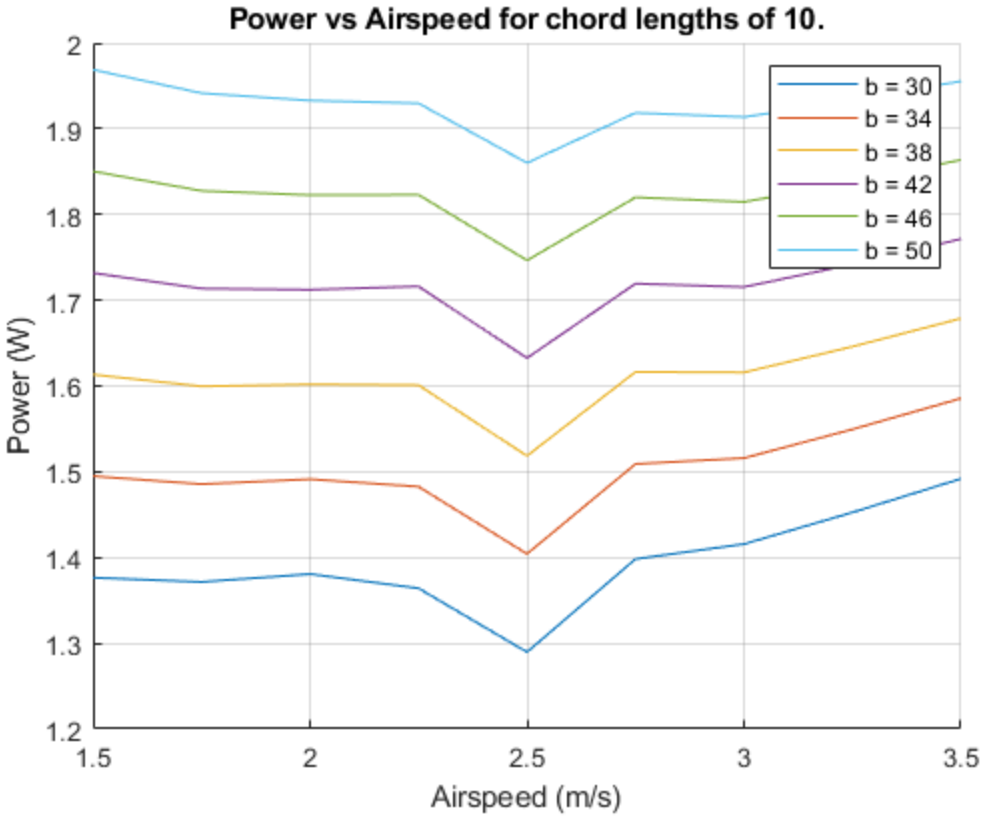
```
 W = 9.224488e-01
 Cdi = 2.092003e-03
 CDp = 6.240983e-02
 P = 1.518509e+00
For a b = 42, c = 4, and v = 2.500000e+00:
 W = 1.004900e+00
 Cdi = 1.306755e-03
 CDp = 2.095500e-01
 P = 2.067790e+00
For a b = 42, c = 6, and v = 1.750000e+00:
 W = 1.004900e+00
 Cdi = 1.643281e-03
 CDp = 2.797689e-01
 P = 1.934273e+00
For a b = 42, c = 8, and v = 2.500000e+00:
 W = 1.004900e+00
 Cdi = 1.873369e-03
 CDp = 8.772889e-02
 P = 1.800148e+00
For a b = 42, c = 10, and v = 2.500000e+00:
 W = 1.004900e+00
 Cdi = 2.030782e-03
 CDp = 6.172499e-02
 P = 1.632597e+00
For a b = 46, c = 4, and v = 2:
 W = 1.087352e+00
 Cdi = 1.233626e-03
 CDp = 3.358076e-01
 P = 2.210028e+00
For a b = 46, c = 6, and v = 1.750000e+00:
 W = 1.087352e+00
 Cdi = 1.567536e-03
 CDp = 2.762890e-01
 P = 2.064234e+00
For a b = 46, c = 8, and v = 2.500000e+00:
 W = 1.087352e+00
 Cdi = 1.802966e-03
 CDp = 8.691221e-02
 P = 1.928032e+00
For a b = 46, c = 10, and v = 2.500000e+00:
 W = 1.087352e+00
 Cdi = 1.969695e-03
 CDp = 6.116085e-02
 P = 1.746479e+00
For a b = 50, c = 4, and v = 2:
 W = 1.169803e+00
 Cdi = 1.168126e-03
 CDp = 3.321724e-01
 P = 2.346406e+00
For a b = 50, c = 6, and v = 2:
 W = 1.169803e+00
 Cdi = 1.497827e-03
 CDp = 2.031841e-01
 P = 2.192118e+00
```

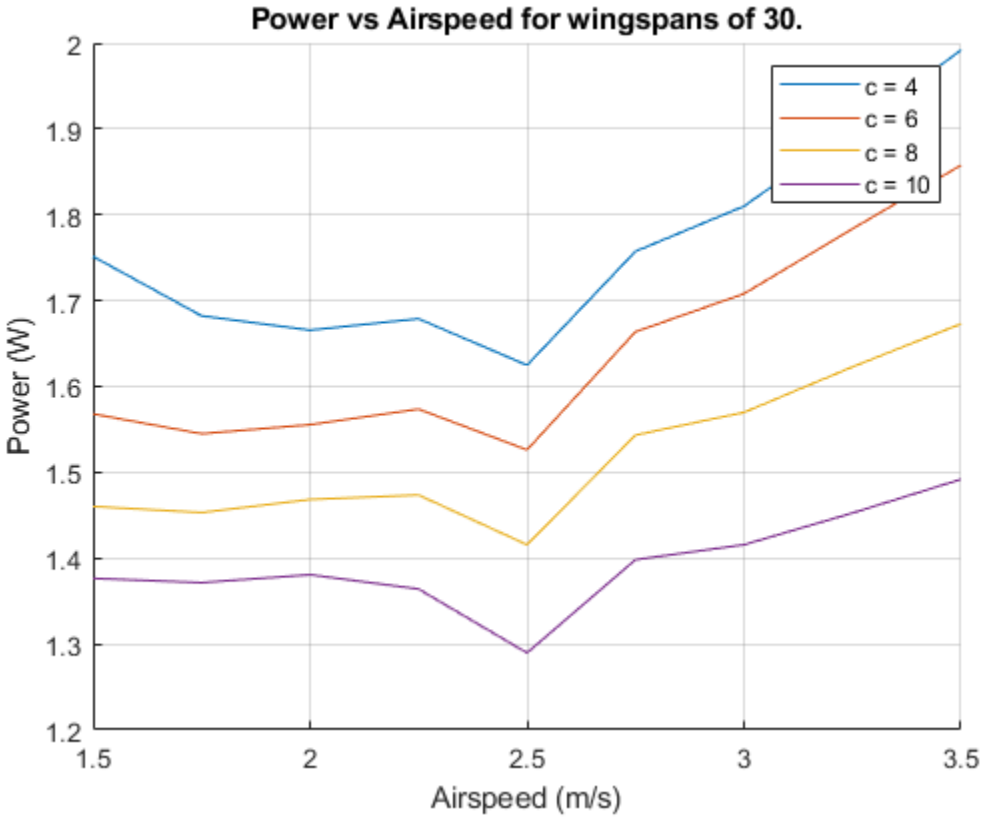
For a b = 50, c = 8, and v = 2.500000e+00:
W = 1.169803e+00
Cdi = 1.736256e-03
CDp = 8.622795e-02
P = 2.055799e+00
For a b = 50, c = 10, and v = 2.500000e+00:
W = 1.169803e+00
Cdi = 1.909848e-03
CDp = 6.068809e-02
P = 1.860174e+00
The optimal configuration is b=30 in and c=10 in with propeller 3 at an airspeed of v=2.500000e+00 m/s, taking P=1.289638e+00 W of power.
This yields a flight time of 6.541370e+01 minutes.
This gives a weight estimate of 7.575459e-01 N, a center of gravity at 6.665595e-02 m from the leading edge of the plane, and a wing twist of -1.249883e+01 degrees. The static margin is 3.765041e-01

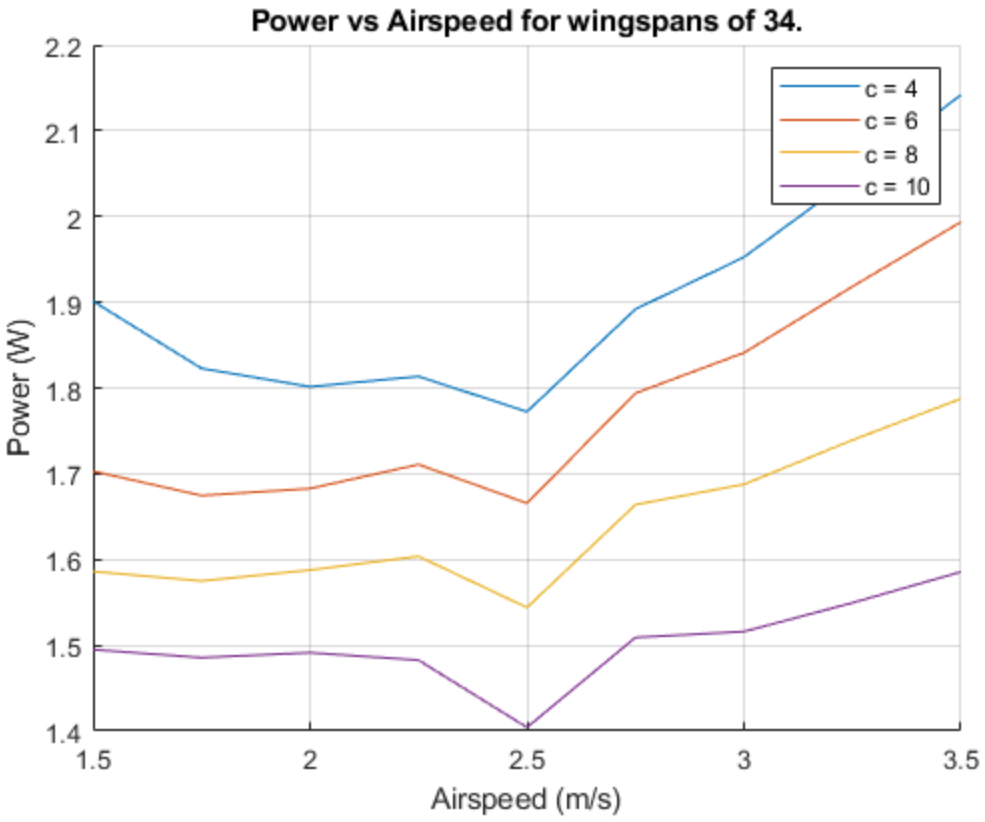


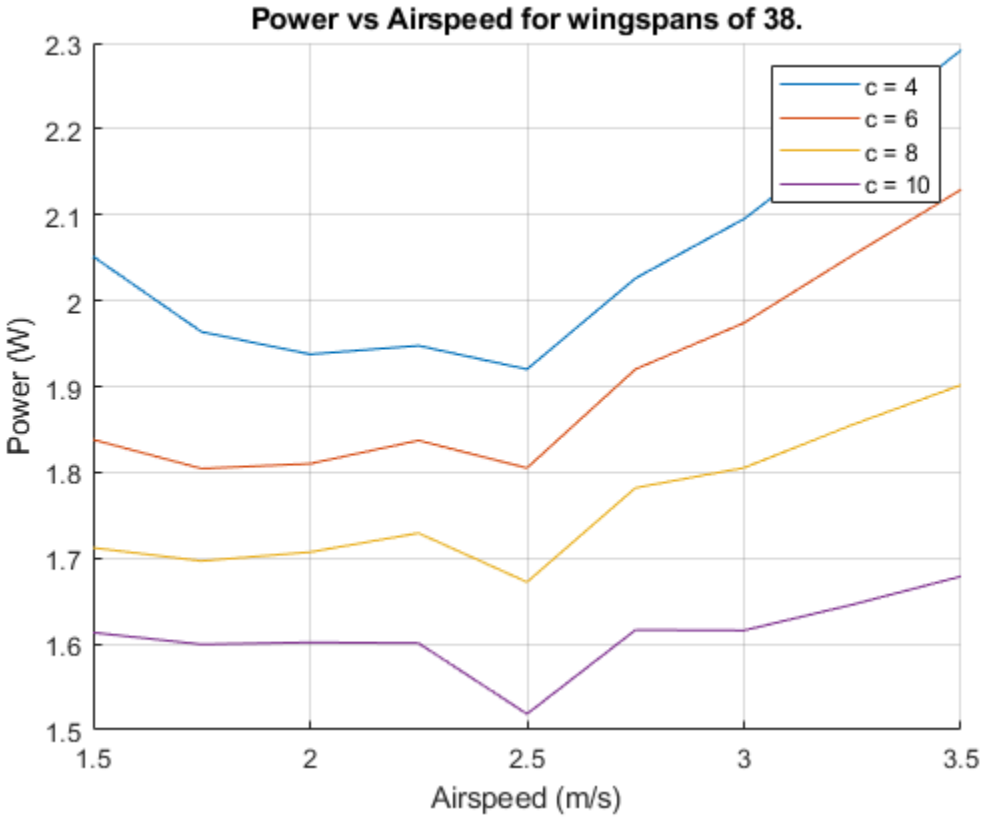

Power vs Airspeed for chord lengths of 6.
Power (W)
Airspeed (m/s)
b = 30
b = 34
b = 38
b = 42
b = 46
b = 50
2.6
2.4
2.2
2
1.8
1.6
1.4
1.5
2
2.5
3
3.5

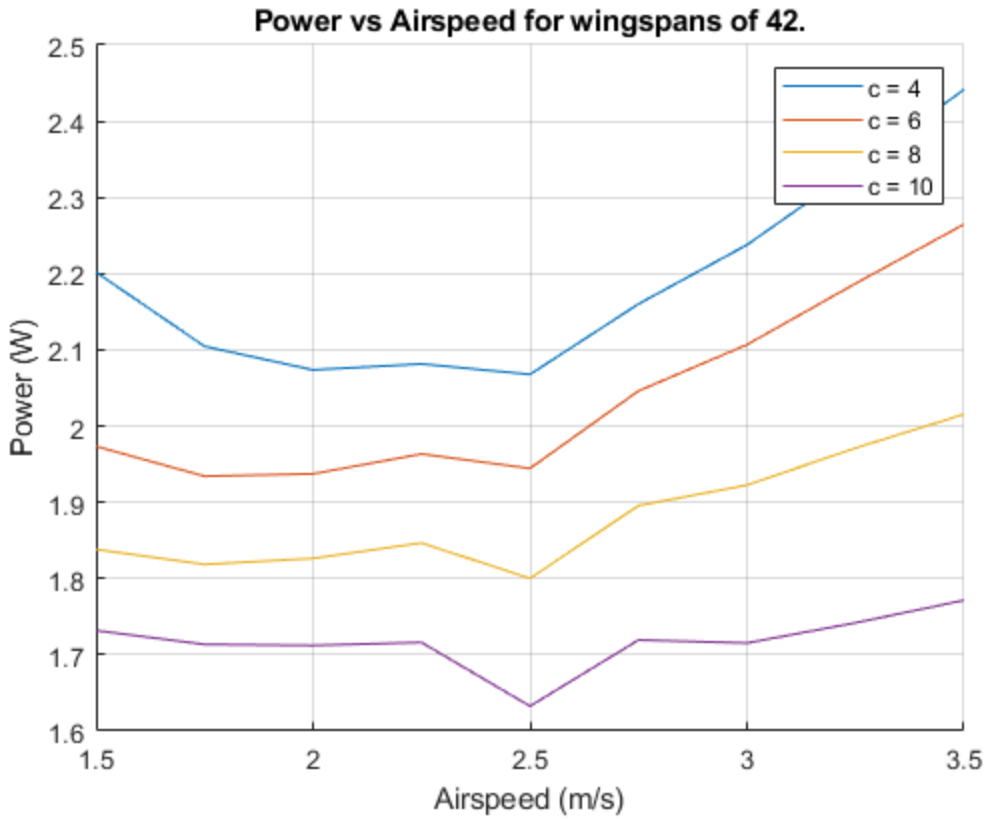

Power vs Airspeed for chord lengths of 8.
Power (W)
Airspeed (m/s)
b = 30
b = 34
b = 38
b = 42
b = 46
b = 50
2.3
2.2
2.1
2
1.9
1.8
1.7
1.6
1.5
1.4
1.5
2
2.5
3
3.5

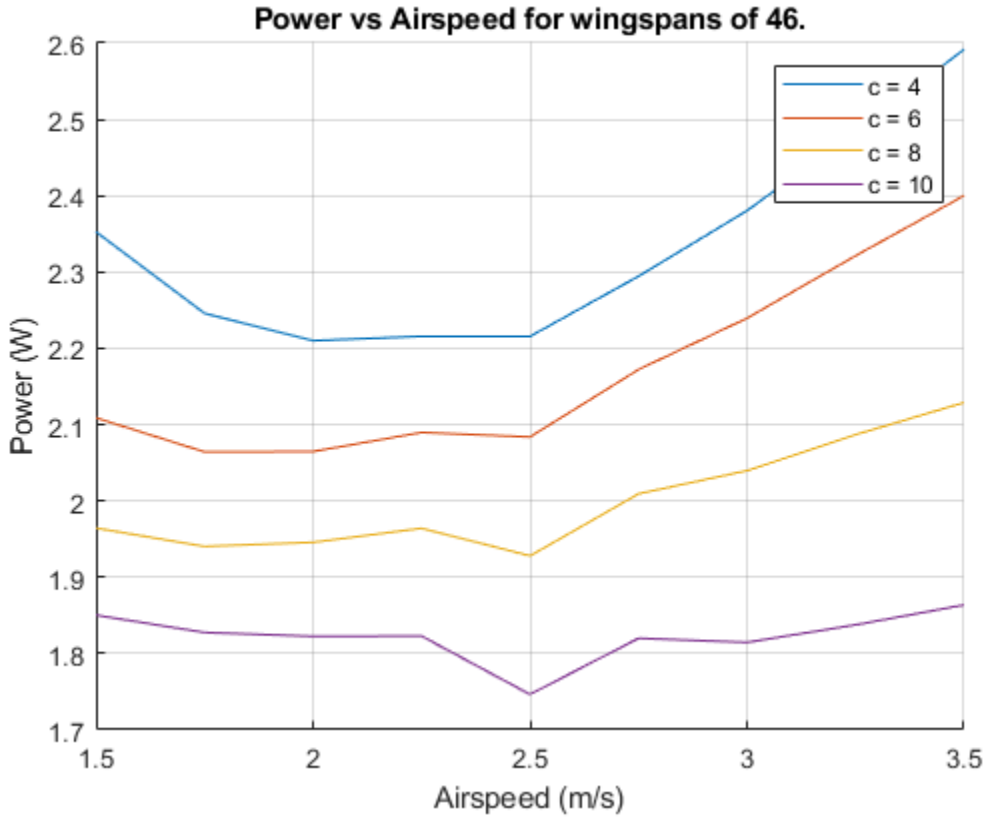

Power vs Airspeed for chord lengths of 10.
Power (W)
Airspeed (m/s)
b = 30
b = 34
b = 38
b = 42
b = 46
b = 50
2
1.9
1.8
1.7
1.6
1.5
1.4
1.3
1.2
1.5
2
2.5
3
3.5

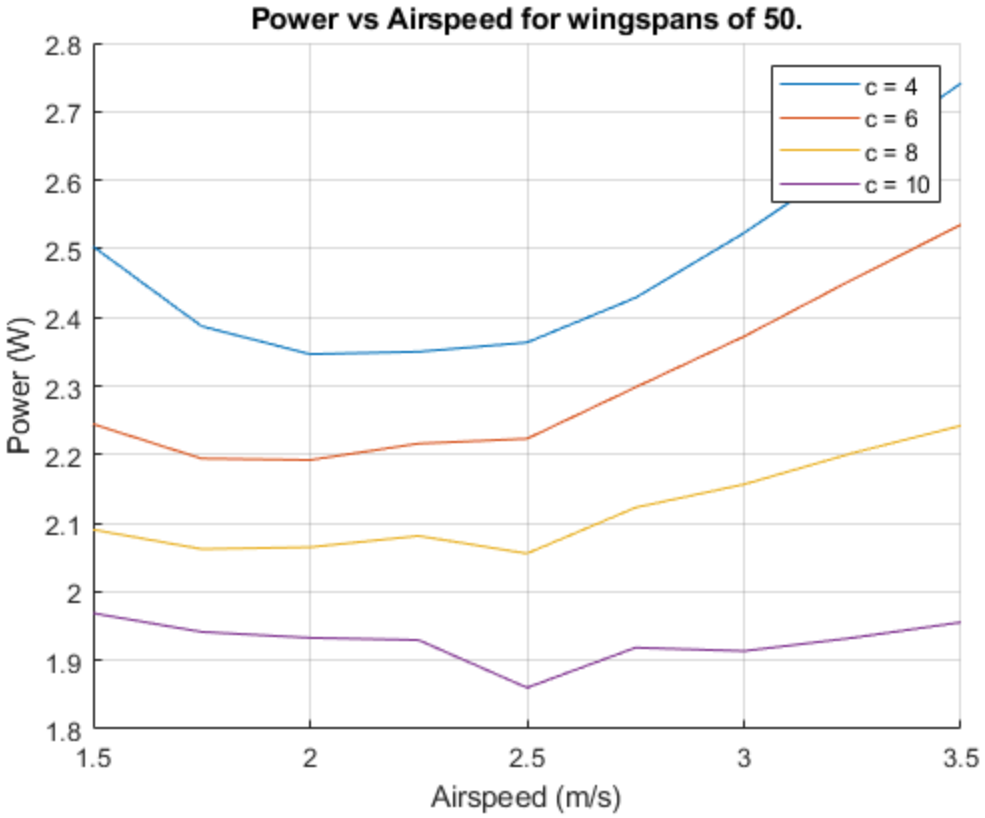

Power vs Airspeed for wingspans of 30.
Power (W)
Airspeed (m/s)
c = 4
c = 6
c = 8
c = 10
2
1.9
1.8
1.7
1.6
1.5
1.4
1.3
1.2
1.5
2
2.5
3
3.5

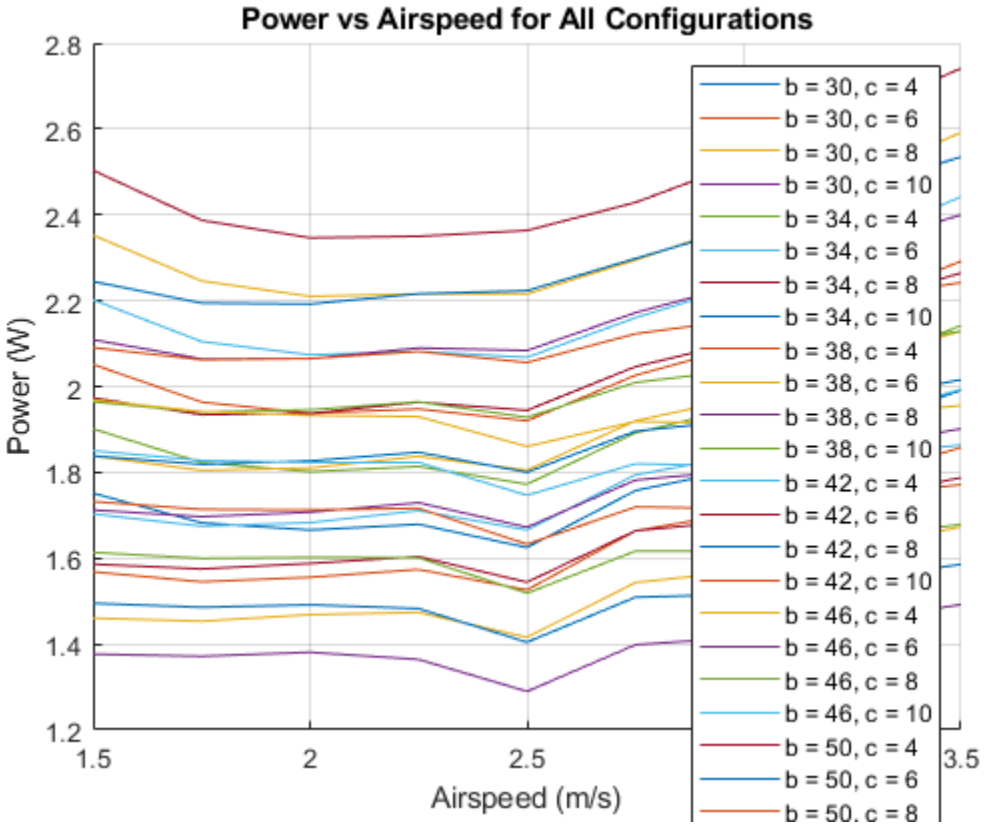

Power vs Airspeed for wingspans of 34.
c = 4
c = 6
c = 8
c = 10
Power (W)
Airspeed (m/s)
2.2
2.1
2
1.9
1.8
1.7
1.6
1.5
1.4
1.5
2
2.5
3
3.5


Power vs Airspeed for wingspans of 38.
c = 4
c = 6
c = 8
c = 10
Power (W)
Airspeed (m/s)
2.3
2.2
2.1
2
1.9
1.8
1.7
1.6
1.5
1.5
2
2.5
3
3.5


Power vs Airspeed for wingspans of 42.
Power (W)
Airspeed (m/s)
c = 4
c = 6
c = 8
c = 10
2.5
2.4
2.3
2.2
2.1
2
1.9
1.8
1.7
1.6
1.5
2
2.5
3
3.5


Power vs Airspeed for wingspans of 46.
Power (W)
Airspeed (m/s)
c = 4
c = 6
c = 8
c = 10
2.6
2.5
2.4
2.3
2.2
2.1
2
1.9
1.8
1.7
1.5
2
2.5
3
3.5


Power vs Airspeed for wingspans of 50.
Power (W)
Airspeed (m/s)
c = 4
c = 6
c = 8
c = 10
2.8
2.7
2.6
2.5
2.4
2.3
2.2
2.1
2
1.9
1.8
1.5
2
2.5
3
3.5


Power vs Airspeed for All Configurations
Power (W)
Airspeed (m/s)
b = 30, c = 4
b = 30, c = 6
b = 30, c = 8
b = 30, c = 10
b = 34, c = 4
b = 34, c = 6
b = 34, c = 8
b = 34, c = 10
b = 38, c = 4
b = 38, c = 6
b = 38, c = 8
b = 38, c = 10
b = 42, c = 4
b = 42, c = 6
b = 42, c = 8
b = 42, c = 10
b = 46, c = 4
b = 46, c = 6
b = 46, c = 8
b = 46, c = 10
b = 50, c = 4
b = 50, c = 6
b = 50, c = 8
2.8
2.6
2.4
2.2
2
1.8
1.6
1.4
1.2
1.5
2
2.5
3.5

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